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MEDICAID 1115 DEMONSTRATIONS

Medicaid Section 1115 Demonstrations Summative Evaluation Report

Appendices

Premium Assistance, Monthly Payments, and Beneficiary Engagement

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Appendix A

Design Tables by Domain

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Table A.1. Domain 1 research questions and approaches for the summative evaluation: Medicaid-supported enrollment in qualified health plans (QHPs)

Analytical approach	Outcome measures	Data sources	Demonstration states	Comparison states
1. How do states supporting QHP enrollment for newly eligible beneficiaries compare with other Medicaid expansion states in terms of access and health outcomes?				
1a. Can beneficiaries enrolled in QHPs access care at similar or better rates compared with beneficiaries enrolled in traditional Medicaid expansions?				
Descriptive statistics, difference-in-differences model, and cross-sectional model Descriptive analysis of whether there is differential receipt of care by demographic characteristics Descriptive analysis of utilization by QHP beneficiaries	Percentage receiving: Any physician office visit within two and six months of enrollment A prescription within two and six months of enrollment Wraparound services that are standard benefits in Medicaid expansion states Average PMPM use of: Physician office visits Prescriptions Wraparound services	MAX/Alpha-MAX/TAF Administrative data from demonstration states and APCDs	Arkansas, Iowa, New Hampshire	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
1c. What is the unmet need for medical care?				
Descriptive statistics and difference-in-differences model Synthesis of state-reported beneficiary survey data	Percentage self-reporting: A personal doctor or health provider Unmet medical need because of cost Time since last routine doctor visit State-reported metrics from beneficiary surveys	BRFSS State evaluation reports	Arkansas, Iowa, New Hampshire	Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, West Virginia
1d. Is there continuity of coverage when switching between Medicaid and Marketplace coverage?				
Qualitative analysis of patterns in issuer participation	Patterns of issuer participation in Marketplace and Medicaid premium assistance programs	Marketplace and Medicaid data on plan participation	Arkansas, Iowa, New Hampshire	Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, West Virginia

Table A.1 (*continued*)

Analytical approach	Outcome measures	Data sources	Demonstration states	Comparison states
2. How do states supporting QHP enrollment compare with other Medicaid expansion states in terms of total spending?				
2a. How do premium assistance states compare with other Medicaid expansion states in terms of per beneficiary spending on direct medical services and capitation payments?				
Descriptive statistics, difference-in-differences model, and cross-sectional model	Total PMPM spending on direct medical expenditures and premium payments to QHPs	MAX/Alpha-MAX/TAF Administrative data from demonstration states and APCDs	Iowa[a], New Hampshire	Kentucky, New Mexico, Ohio, West Virginia
3. How do states supporting QHP enrollment compare with other Medicaid expansion states in terms of take-up rates?				
3a. How does the take-up rate among likely eligible individuals in premium assistance states compare with states with traditional Medicaid expansions?				
Descriptive analysis of whether there is differential participation by key demographic groups	Proportion of likely eligible population enrolled in Medicaid at the time of the survey (annual) by demographic characteristics	MAX/Alpha-MAX/TAF IPUMS-ACS	Arkansas, Iowa, New Hampshire	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
3b. Are there patterns in the timing of Medicaid beneficiary enrollment in premium assistance states that could be related to the Marketplace open enrollment period, even though Medicaid beneficiaries are not subject to open enrollment periods?				
Descriptive statistics	Counts of monthly enrollment	MAX/Alpha-MAX/TAF	Arkansas, Iowa, New Hampshire	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia

Note: Question numbering is not consecutive where we dropped a research question initially planned in 2015 due to data insufficiency.

[a] Iowa is not included in the difference-in-differences model because expenditures data outside of the demonstration period were unreliable.

Alpha-MAX = Alpha Medicaid Analytic eXtract; APCD = All Payer Claims Database; BRFSS = Behavioral Risk Factor Surveillance System; IPUMS-ACS = Integrated Public Use Microdata Sample, American Community Survey; MAX = Medicaid Analytic eXtract; PMPM = per-member per-month; QHP = qualified health plan; TAF = T-MSIS Analytic Files.

Table A.2. Domain 2 research questions and approaches for the summative evaluation: Premiums and other monthly contributions (monthly payments)

Analytical approach	Outcome measure	Data sources	Demonstration states	Comparison states
1. To what extent do requirements for monthly payments affect enrollment patterns?				
1a. Do eligible adults in states with required monthly payments enroll in Medicaid (or premium assistance programs) at the same rate as eligible adults in other states?				
Regression model of Medicaid enrollment among the likely eligible population	Reported enrollment in Medicaid at the time of survey (annual)	IPUMS-ACS	Arkansas, Indiana, Iowa, Michigan, Montana	Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, West Virginia
Descriptive analysis of take-up among likely eligible population	Proportion of likely eligible population enrolled in demonstration (annual)	State enrollment data and MAX/Alpha-MAX/TAF; IPUMS-ACS	Arkansas, Indiana, Iowa, Michigan, Montana	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
1b. Do eligible adults in key demographic groups who live in states with required monthly payments enroll in Medicaid (or premium assistance programs) at the same rate that eligible adults in other states do?				
Regression model of Medicaid enrollment among key demographic groups	Reported enrollment in Medicaid at the time of survey (annual), by demographic characteristics	IPUMS-ACS	Arkansas, Indiana, Iowa, Michigan, Montana	Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, West Virginia
Descriptive analysis of differential take-up among key demographic groups	Proportion of likely eligible population enrolled in demonstration (annual), by demographic characteristics	State enrollment data and MAX/Alpha-MAX/TAF; IPUMS-ACS	Arkansas, Indiana, Iowa, Michigan, Montana	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
1d. How do monthly payment amounts affect take-up of coverage?				
Regression model of enrollment among the likely eligible population, given likely monthly payment amount required	Reported enrollment in Medicaid at the time of survey (annual)	IPUMS-ACS	Arkansas, Indiana, Iowa, Michigan, Montana	Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, West Virginia
2. What effects do monthly payments appear to have on continuity of coverage?				
2a. Is there a relationship between midyear disenrollments and the timing of monthly payment policies?				
Descriptive regression analysis of payment onset and likelihood of enrollment continuity	Continued enrollment at specified policy-relevant months	State enrollment data and MAX/Alpha-MAX/TAF	Arkansas, Indiana, Iowa, Michigan, Montana	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia

Table A.2 (*continued*)

Analytical approach	Outcome measure	Data sources	Demonstration states	Comparison states
Descriptive analysis of proportion disenrolled midyear	Proportion disenrolled midyear (all states) and proportion disenrolled midyear for nonpayment (Indiana only)	State enrollment data and MAX/Alpha-MAX/TAF	Arkansas, Indiana, Iowa, Michigan, Montana[a]	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
2b. Is there a relationship between monthly payment requirements and renewals?				
Descriptive regression analysis of enrollment continuity at renewal	Renewed enrollment rates by whether payments are required for any beneficiaries	State enrollment data and MAX/Alpha-MAX/TAF	Arkansas, Indiana, Iowa, Michigan, Montana	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
2c. What is the effect of payment enforcement rules such as non-eligibility periods before re-enrollment?				
Descriptive analysis of re-enrollment after non-eligibility period	Percentage of beneficiaries returning to program after disenrolling, by reason for disenrollment and length of enrollment gap	Administrative data from demonstration state	Indiana	NA
2d. Is there a relationship between monthly payment requirements and long-term enrollment continuity?				
Descriptive regression analysis of enrollment continuity for periods longer than a year	Continued enrollment at 18, 24, 36, and 48 months	State enrollment data and MAX/Alpha-MAX/TAF	Arkansas, Indiana, Iowa, Michigan, Montana	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
2e. Is there a relationship between monthly payment requirements and enrollment duration?				
Survival analysis of enrollment continuity using accelerated failure time regression model	Time (in months) from enrollment to disenrollment	State enrollment data and MAX/Alpha-MAX/TAF	Arkansas, Indiana, Iowa, Michigan, Montana	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia

Note: Question numbering is not consecutive where we dropped a research question initially planned in 2015 due to data insufficiency.

[a] Montana and Iowa also disenroll beneficiaries for nonpayment, but disenrollment reasons are not captured in TAF, so we do not have access to that information for Montana and Iowa.

Alpha-MAX = Alpha Medicaid Analytic eXtract; IPUMS-ACS = Integrated Public Use Microdata Sample, American Community Survey; MAX = Medicaid Analytic eXtract; NA = not available; TAF = T-MSIS Analytic Files.

Table A.3. Domain 3 research questions and approaches for the summative evaluation: Beneficiary engagement programs to encourage health behaviors

Analytical approach	Outcome measure	Data sources	Demonstration states	Comparison states
1. What strategies are states using to educate beneficiaries about preferred health behaviors?				
1a. What strategies are states using to explain incentives and disincentives? Which strategies are perceived to be effective?				
Narrative and synthesis of state-reported data and rapid-cycle reports	Mode, content, timing, and other aspects of education materials	State evaluation reports, survey and focus group data, rapid-cycle reports	Indiana, Iowa, Michigan	NA
2. To what extent are Medicaid enrollees responsive to explicit behavior incentives?				
Descriptive analysis (including regressions) of incentivized behavior completion	Receipt of wellness visit Time to completion of wellness visits	MAX/Alpha-MAX/TAF Administrative data from demonstration state	Indiana, Iowa, Michigan	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
Descriptive analysis of health risk assessment completion	Completion of health risk assessment	Administrative data from demonstration state	Iowa[a]	NA
Descriptive analysis of health account operations	Percentage of beneficiaries with two or more spans who receive a rollover or doubled rollover	Administrative data from demonstration state	Indiana	NA
Synthesis of state findings on health account utilization	State-reported metrics on account awareness and utilization	State evaluation reports and surveys	Indiana, Michigan	NA
3. Do behavior incentives affect overall access to and use of care?				
3a. Do behavior incentives yield gains in preventive care and chronic condition management?				
Descriptive analysis (including regressions) of preventive service receipt given financial incentive for health behavior	Receipt of specific preventive services Completion of all recommended health behaviors for age and sex Time to completion of all recommended preventive services for age and sex	MAX/Alpha-MAX/TAF Administrative data from demonstration state	Indiana, Iowa, Michigan	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
Descriptive analysis (including regressions) of chronic condition management given financial incentive for health behavior	Adherence to recommended chronic care regimen (Core Set of Adult Health Care Quality Measures for Medicaid-Eligible Adults)	MAX/Alpha-MAX/TAF Administrative data from demonstration state	Indiana, Iowa, Michigan	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia

Table A.3 (*continued*)

Analytical approach	Outcome measure	Data sources	Demonstration states	Comparison states
Descriptive analysis of preventive service receipt or chronic condition management as function of health risk assessment completion	Receipt of wellness visit Receipt of specific preventive services Completion of all recommended health behaviors for age and sex Adherence to recommended chronic care regimen (Core Set of Adult Health Care Quality Measures for Medicaid-Eligible Adults)	Administrative data from demonstration state	Iowa[a]	NA
3b. Do behavior incentives yield reductions in disincentivized care (that is, non-emergent ED visits)?				
Descriptive analysis (including regressions) of non-emergent ED utilization given incentive for health behavior	Flag for any non-emergent ED visit Count of non-emergent ED visits	MAX/Alpha-MAX/TAF Administrative data from demonstration state	Indiana, Iowa, Michigan	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
3c. How do behavior incentives affect volume of and access to care?				
Descriptive analysis of volume of care	Volume of care by category (primary care, specialty care)	MAX/Alpha-MAX/TAF Administrative data from demonstration state	Indiana, Iowa, Michigan	Kentucky, New Mexico, Ohio, Pennsylvania, West Virginia
4. Are population-level effects observed from Medicaid demonstration policies?				
Regression analysis of population-level effects of Medicaid expansion and incentives	Preventive service receipt Smoking cessation Physical activity A1C checked in past 12 months Diabetes-related physician visit in past 12 months	BRFSS[b]	Indiana, Iowa, Michigan	Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, West Virginia

[a] Individual-level data on completion of health risk assessments are not available in MAX, Alpha, MAX, or TAF, so we cannot include Indiana or Michigan in this analysis, although their demonstrations encourage health risk assessments.

[b] Questions about management of chronic conditions are generally found in the optional BRFSS modules. All three demonstration states fielded the diabetes module, but use of the other chronic condition modules varied.

Alpha-MAX = Alpha Medicaid Analytic eXtract; BRFSS = Behavioral Risk Factor Surveillance System; ED = emergency department; HRA = Health Risk Assessment; MAX = Medicaid Analytic eXtract; NA = not available.

Appendix B

Key Features of State Demonstrations

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Table B.1. Demonstration policies by state, 2014–2017

	Arkansas		Indiana	Iowa	Michigan	Montana	New Hampshire
	Health Care Independence Program	Arkansas Works	Healthy Indiana Plan (HIP) 2.0	Iowa Health and Wellness Plan[a]	Healthy Michigan Plan	Health and Economic Livelihood Partnership	Health Protection Program
Dates of demonstration in study period	1/1/2014–12/31/2016	1/1/2017–12/31/2017	2/1/2015–12/31/2017	1/1/2014–12/31/2017	4/1/2014–12/31/2017	1/1/2016–12/31/2017	1/1/2016–12/31/2017
Eligibility							
Income groups eligible for premium assistance	Adults with incomes through 133% FPL	Adults with incomes through 133% FPL	n.a.	Adults with incomes >100%–133% FPL[a]	n.a.	n.a.	Adults with incomes through 133% FPL
Income groups for which beneficiary engagement and/or monthly payment policies apply	Adults with incomes >100%–133% FPL	Adults with incomes >100%–133% FPL	Adults with incomes through 133% FPL	Adults with incomes through 133% FPL	Beneficiary engagement policies apply to adults with incomes through 133% FPL. Monthly payments required for those >100% FPL.	Adults with incomes 50%–133% FPL	n.a.

Table B.1 (*continued*)

	Arkansas		Indiana	Iowa	Michigan	Montana	New Hampshire
	Health Care Independence Program	**Arkansas Works**	**Healthy Indiana Plan (HIP) 2.0**	**Iowa Health and Wellness Plan[a]**	**Healthy Michigan Plan**	**Health and Economic Livelihood Partnership**	**Health Protection Program**
Populations exempt from demonstration policies	Medically frail individuals and those determined to have "exceptional medical needs" as identified through screening. Pregnant women, dually eligible beneficiaries, and American Indian/ Alaska Natives were not included in the demonstration group or subject to payment requirements.	Medically frail individuals; American Indian/Alaska Natives can opt in to premium assistance; pregnant women can opt out.	American Indian/ Alaska Natives can opt out. Individuals eligible for Medicare are exempt. Medically frail individuals and those with special circumstances as described in STCs are exempt from disenrollment and lock-out provisions (applicable to HIP Plus beneficiaries above 100% FPL), and receive same benefits as those in state plan coverage.	Beneficiaries who have an annual physician visit or dental wellness exam and complete a health risk assessment annually are exempted from monthly payments in the following year. Medically frail individuals and those enrolled in cost-effective employer-sponsored insurance under the state Health Insurance Premium Payment program are not subject to monthly payments.	American Indian/ Alaska Natives can opt in. Pregnant women and people with disabilities are not included in the demonstration group.	Medically frail individuals, those with exceptional health care needs, and American Indian/Alaska Natives are exempt. Individuals who live in a region with too few providers are also exempt, as are those who require continuity of coverage not effectively delivered through the network of contracted providers.	Medically frail individuals are exempt. American Indian/ Alaska Natives and pregnant women can opt out of premium assistance.
Populations exempt from demonstration policies (*continued*)			Individuals enrolled in HIP Basic (open to those 0–100% FPL) are also exempt from disenrollment and non-eligibility period and from monthly payment requirement, although they are subject to co-payments at the point of service.	Individuals who self-attest to financial hardship are exempt from monthly payments (can be done each month). American Indian/ Alaska Natives can opt in to premium assistance.			

Table B.1 (*continued*)

	Arkansas		Indiana	Iowa	Michigan	Montana	New Hampshire
	Health Care Independence Program	Arkansas Works	Healthy Indiana Plan (HIP) 2.0	Iowa Health and Wellness Plan[a]	Healthy Michigan Plan	Health and Economic Livelihood Partnership	Health Protection Program
Wraparound benefits in premium assistance demonstrations							
Non-emergency medical transportation	Yes (with prior authorization)	Yes (with prior authorization)	n.a.	No	n.a.	n.a.	Yes
EPSDT services for those under age 21	Yes	Yes	n.a.	Yes	n.a.	n.a.	Yes
Family planning services	Yes	Yes	n.a.	Yes	n.a.	n.a.	Yes
Dental or vision	No	No	n.a.	Yes	n.a.	n.a.	Yes
Monthly payments and cost-sharing							
Monthly payment amounts	0–100% FPL: $0 >100%–115% FPL: $10 >115%–133% FPL: $15 (Payments encouraged to fund Independence Accounts, which were only in effect Jan. 2015–April 2016.)	0–100% FPL: $0 >100%–133% FPL: 2% of income; equivalent to $20–$27[b]	For HIP Plus members (HIP Basic members do not make monthly payments): 0–5% FPL: $1 6%–100% FPL: 2% of income, equivalent to $1–$20[c] >100%–133% FPL: 2% of income, equivalent to $20–$27 ($100 maximum)[b]	0–49% FPL: $0 50%–100% FPL: $5 >100%–133% FPL: $10	0–100% FPL: $0 >100%–133% FPL: 2% of income, equivalent to $20–$27[b]	0–49% FPL: $0 50%–100% FPL: 2% of income, equivalent to $10–$20[c] >100%–133% FPL: 2% of income, equivalent to $20–$27[b]	n.a.

Table B.1 (*continued*)

	Arkansas		Indiana	Iowa	Michigan	Montana	New Hampshire
	Health Care Independence Program	Arkansas Works	Healthy Indiana Plan (HIP) 2.0	Iowa Health and Wellness Plan[a]	Healthy Michigan Plan	Health and Economic Livelihood Partnership	Health Protection Program
Timing of first payment	Upon enrollment. (Payments encouraged to fund Independence Accounts, which were only in effect Jan. 2015–April 2016.)	Upon enrollment.	Beneficiaries with income >100% FPL cannot enroll until the first monthly payment is made. For those with income ≤100% who do not make payments, coverage is effective the first day of the month in which the 60-day initial grace period expires.	Payments begin after 12 months of enrollment if beneficiary does not achieve incentivized healthy behaviors. There is also a 30-day grace period for making the first payment or completing healthy behaviors.	Payments begin after first 6 months of enrollment.	Upon enrollment.	n.a.
Consequences of nonpayment for those subject to monthly payments	If beneficiaries above 100% FPL did not make monthly payments, they were required to pay QHP co-payments or coinsurance at the point of service. (Payments were encouraged to fund Independence Accounts, which were only in effect Jan. 2015–April 2016.)	The state and/or its vendor can attempt to collect unpaid premiums after a 2-month grace period, but may not report the debt to credit reporting agencies or debt collectors.	>100% FPL: disenrollment and 6-month non-eligibility period after 60-day grace period 0–100% FPL: enrollment in HIP Basic	>100% FPL: disenrollment, but may re-enroll at any time 50%–100% FPL: cannot be disenrolled, but unpaid payments can become a collectible debt	Cannot be disenrolled. State can garnish beneficiaries' state tax refunds and lottery winnings (if any) to recover the unpaid amount	>100% FPL: disenrollment for nonpayment after 30-day notice of nonpayment and a 90-day grace period; may reenroll upon payment or when debt is assessed. 50%–100% FPL: cannot be disenrolled, but unpaid payments can become a collectible debt	n.a.

Table B.1 (*continued*)

	Arkansas		Indiana	Iowa	Michigan	Montana	New Hampshire
	Health Care Independence Program	Arkansas Works	Healthy Indiana Plan (HIP) 2.0	Iowa Health and Wellness Plan[a]	Healthy Michigan Plan	Health and Economic Livelihood Partnership	Health Protection Program
Use of health account	Monthly payments were made to Independence Accounts. (Independence Accounts in effect Jan. 2015–April 2016.)	None	HIP Plus members make monthly payments to POWER accounts, and state also contributes to POWER accounts to fully fund up to $2,500. State funds POWER accounts for HIP Basic members. POWER account funds are used to cover the first $2,500 of non-preventive care, structured as a deductible.	None	Beneficiaries with income above 100% FPL make monthly payments to a MI Health Account, which is also used to track the accrual of co-payments and credits earned.	None	n.a.

Table B.1 (*continued*)

	Arkansas		Indiana	Iowa	Michigan	Montana	New Hampshire
	Health Care Independence Program	**Arkansas Works**	**Healthy Indiana Plan (HIP) 2.0**	**Iowa Health and Wellness Plan[a]**	**Healthy Michigan Plan**	**Health and Economic Livelihood Partnership**	**Health Protection Program**
Point-of-service cost-sharing requirements (co-payments, co-insurance)	If beneficiaries above 100% FPL did not make monthly payments, they were required to pay QHP co-payments or coinsurance at the point of service. (Those below 100% FPL were not subject to co-payments.) Beginning in July 2016, after the Independence Accounts were closed, co-payments were collected at the point of service for all beneficiaries with incomes above 100% FPL.	Beneficiaries with incomes above 100% FPL pay cost-sharing in amounts consistent with approved state plan.	HIP Basic members are required to pay co-payments at the point of service. All members pay $8 for first non-emergency use of ED, $25 for recurrent non-emergency use of ED.	No demonstration-specific co-payments. Iowa has authority to apply an $8 co-payment for non-emergency use of the ED, but has not implemented this policy.	All beneficiaries are subject to co-payments; can be reduced with credits earned by committing to a healthy behavior goal. No co-payments collected for first six months of enrollment. A quarterly statement shows co-payments for services used in months 1–3, payable in months 7–9 of enrollment. There is always a 6-month lag between services use and co-payment billing. Co-payments are paid into the MI Health Account, except for point-of-service co-payments for a small set of services carved out of the health plans, such as certain drugs.	All beneficiaries with incomes >50% FPL are subject to co-payments. Medically necessary health screenings, preventive health care services, and services to help manage chronic conditions are exempt from cost-sharing. Monthly payments were credited toward co-payment obligations until December 2017, when this policy was removed through an amendment. Montana also has authority to apply a co-payment for non-emergency use of the ED, but has not implemented this policy.	Beneficiaries with incomes above 100% FPL who are enrolled in premium assistance make co-payments at the point of service in different amounts than those not enrolled in premium assistance, who make co-payments in amounts consistent with approved state plan.

Table B.1 (*continued*)

	Arkansas		Indiana	Iowa	Michigan	Montana	New Hampshire
	Health Care Independence Program	Arkansas Works	Healthy Indiana Plan (HIP) 2.0	Iowa Health and Wellness Plan[a]	Healthy Michigan Plan	Health and Economic Livelihood Partnership	Health Protection Program
Beneficiary engagement							
Encouraged healthy behaviors	None	None	Recommended preventive care tailored to age and gender.	Yearly health risk assessment. Wellness exam (can be dental instead of physical, or, starting in Year 2, a routine medical exam).	Yearly health risk assessment; agreement to address or maintain a healthy behavior.	None	n.a.
Financial rewards for incentivized health or financial behaviors	Monthly payments waived co-payment obligations. Contributions up to $200 could be used for future employer-sponsored insurance premiums, or Medicare cost-sharing if the beneficiary made 6+ contributions. (Independence Accounts in effect Jan. 2015–April 2016.)	None	Monthly payments are required for HIP Plus. Other than for non-emergency use of the ED, HIP Plus members are exempt from co-payments. HIP Plus members can reduce monthly payment amounts after a year based on unused account funds, which roll over to the next year. For members who receive recommended preventive care, the rollover is doubled. HIP Basic members can earn reductions in future monthly payments if unused funds remain in their accounts and they opt into HIP Plus at renewal.	Completing healthy behaviors in Year 1 waives monthly payments in Year 2. (There are no monthly payments in Year 1.) Each year of completed healthy behaviors waives monthly payments in subsequent year.	>100% FPL: Monetary credits for incentivized behaviors will appear in MI Health Account and can be used to reduce monthly payments and co-payments. ≤100% FPL: Receive $50 gift cards for completing health risk assessment. Funds contributed by beneficiaries can be returned for purchase of private insurance after leaving Medicaid.	None	n.a.

Table B.1 (*continued*)

	Arkansas		Indiana	Iowa	Michigan	Montana	New Hampshire
	Health Care Independence Program	Arkansas Works	Healthy Indiana Plan (HIP) 2.0	Iowa Health and Wellness Plan[a]	Healthy Michigan Plan	Health and Economic Livelihood Partnership	Health Protection Program
Benefit rewards for incentivized health or financial behaviors	None	None	Individuals who make monthly payments to maintain HIP Plus enrollment receive extra benefits, including access to dental, vision, and enhanced pharmacy benefits.	Members who have an initial dental exam and a follow-up visit within 6-12 months can receive enhanced dental benefits in follow-up visits. If members have an additional follow-up dental visit within 6 to 12 months, they can receive additional enhanced dental benefits.	None	None	n.a.

Source: Mathematica analysis of:
Arkansas Special Terms and Conditions, Approval Period: September 27, 2013–December 31, 2016; as amended January 1, 2015.
Arkansas Special Terms and Conditions, Approval Period: January 1, 2017–December 31, 2021.
Indiana Special Terms and Conditions, Approval Period: February 1, 2015–January 31, 2018.
Iowa Wellness Plan Special Terms and Conditions, Approval Period: January 1, 2017–December 31, 2019; as amended November 23, 2016.
Iowa Marketplace Choice Plan Special Terms and Conditions, Approval Period: January 1, 2014–December 31, 2016; as amended December 31, 2014.
Michigan Special Terms and Conditions, Approval Period: December 30, 2013–December 31, 2018; as amended December 17, 2015.
Montana Special Terms and Conditions, Approval Period: January 1, 2016–December 31, 2020.
New Hampshire Special Terms and Conditions, Approval Period: March 4, 2015–December 31, 2018.
Key informant interviews with Medicaid officials in Arkansas, Indiana, Iowa, Michigan, and New Hampshire.

[a] The Iowa Health and Wellness Plan comprised two different demonstrations during 2014 and 2015: the Iowa Wellness Plan and Marketplace Choice. Marketplace Choice was a premium assistance program that supported the purchase of qualified health plans (QHPs) by non-exempt beneficiaries with incomes above the federal poverty level. Marketplace Choice was effectively closed on December 31, 2015. The state received approval in January 2016 to modify eligibility for the Iowa Wellness Plan to include the population formerly enrolled in premium assistance. Although the care delivery mechanism changed, beneficiary incentives and monthly payment policies did not.

[b] This dollar estimate is calculated for a family of one using 2017 FPL ($12,060/year, or about $1,005 per month).

[c] This dollar estimate is calculated for a household of one using the 2017 FPL threshold ($12,060/year, or about $1,005 per month).

ED = emergency department; EPSDT = Early and Periodic Screening, Diagnostic, and Treatment; ESI = employer-sponsored insurance; FPL = federal poverty level; n.a. = not applicable (the policy element is not relevant to the demonstration); POWER Account = Personal Wellness and Responsibility Account; QHP = qualified health plan; STCs = special terms and conditions.

Appendix C

Data Availability, Modeling Specifications, and Sample Characteristics for Analyses of Administrative Data

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A. Administrative data sources

Table C.1 presents sources of administrative data by state and year. We used MAX, Alpha-MAX, and/or TAF for all states, depending on the year. For Arkansas and New Hampshire, we obtained All-Payer Claims Database (APCD) data, which include qualified health plan encounters for premium assistance beneficiaries. We used only this data source for Arkansas for post-demonstration years because of the poor quality of Arkansas's TAF. For New Hampshire, we merged APCD and TAF data. We also obtained HIP 2.0 data from Indiana because these data included variables not available in federal administrative data. Administrative data obtained directly from the state were the only data source for Indiana for 2017 because its TAF data did not meet quality standards.

Table C.1. Source of Medicaid administrative data

State	2012	2013	2014	2015	2016	2017
Demonstration states						
Arkansas	MAX	MAX	State APCD	State APCD	State APCD	State APCD
Iowa	MAX	MAX	State Medicaid files	State Medicaid files	TAF	TAF
Indiana	MAX	MAX	Alpha-MAX (Q1–Q3) TAF (Q4)	TAF State Medicaid files	TAF State Medicaid files	State Medicaid files
Michigan	MAX	MAX	MAX	Alpha-MAX (Q1–Q3) TAF (Q4)	TAF	TAF
Montana	MAX	Alpha-MAX	TAF	TAF	TAF	TAF
New Hampshire	MAX	Alpha-MAX	TAF	TAF	TAF State APCD	TAF State APCD
Comparison states						
Kentucky	MAX	Alpha-MAX	Alpha-MAX (Q1–Q2) TAF (Q3-Q4)	TAF	TAF	TAF
New Mexico	MAX	Alpha-MAX	TAF	TAF	TAF	TAF
Ohio	MAX	MAX	Alpha-MAX (Q1–Q3) TAF (Q4)	TAF	TAF	TAF
Pennsylvania	MAX	MAX	MAX	Alpha-MAX (Q1–Q3) TAF (Q4)	TAF	TAF
West Virginia	MAX	MAX	MAX	Alpha-MAX (Q1–Q3) TAF (Q4)	TAF	TAF

APCD = all-payer claims database; MAX = Medicaid Analytic eXtract; TAF = T-MSIS Analytical Files.

Table C.2 provides information on the timing of Medicaid expansions, demonstration implementation, and when demonstration policies were in effect during the study period for each research domain.

Table C.2. Timing of Medicaid expansions and demonstration policy implementation for 2014–2017

State	Medicaid expansion	Demonstration implementation	Months in study period when premium assistance was in effect	Months in study period when monthly payments were in effect	Months in study period when beneficiary incentives were in effect
Demonstration states					
Arkansas	Jan. 2014	Jan. 2014	Jan. 2014–Dec. 2017	Jan. 2015–April 2016; Jan. 2017–Dec. 2017	n.a.[a]
Indiana	Feb. 2015	Feb. 2015	n.a.	Feb. 2015–Dec. 2017	Feb. 2015–Dec. 2017
Iowa	Jan. 2014	Jan. 2014	Jan. 2014–Dec. 2015	Effective Jan. 2015 (enrollment mo. 13)–Dec. 2017	Jan. 2014–Dec. 2017
Michigan	April 2014	April 2014	n.a.	Effective Oct. 2014 (enrollment mo. 7)–Dec. 2017	April 2014–Dec. 2017
Montana	Jan. 2016	Jan. 2016	n.a.	Jan. 2016–Dec. 2017	n.a.[b]
New Hampshire	Aug. 2014	Jan. 2016	Jan. 2016–Dec. 2017	n.a.	n.a.
Comparison states					
Kentucky	Jan. 2014	n.a.	n.a.	n.a.	n.a.
Nevada	Jan. 2014	n.a.	n.a.	n.a.	n.a.
New Mexico	Jan. 2014	n.a.	n.a.	n.a.	n.a.
North Dakota	Jan. 2014	n.a.	n.a.	n.a.	n.a.
Ohio	Jan. 2014	n.a.	n.a.	n.a.	n.a.
Oregon	Jan. 2014	n.a.	n.a.	n.a.	n.a.
Pennsylvania	Jan. 2015	Jan.–Sept. 2015[c]	n.a.	n.a.	n.a.
Washington	Jan. 2014	n.a.	n.a.	n.a.	n.a.
West Virginia	Jan. 2014	n.a.	n.a.	n.a.	n.a.

[a] During the time that monthly payment requirements were in effect in Arkansas as part of the Independence Account program—in 2015 and 2016— the demonstration incorporated beneficiary engagement policies and education focused on financial behaviors. As Domain 3 is defined for this evaluation, it includes only those demonstrations that engage beneficiaries to encourage health-related behaviors.

[b] Montana's demonstration includes beneficiary engagement policies focused on financial behaviors. As Domain 3 is defined for this evaluation, it includes only those demonstrations with incentives for health-related behaviors.

[c] Pennsylvania's 1115 demonstration was designed to enroll newly eligible beneficiaries into qualified health plans. The state initially implemented the demonstration on January 1, 2015, but announced on February 1, 2015, that it would transition away from the demonstration to expand coverage through a state plan amendment. Because of this, we consider Pennsylvania a comparison state and not a demonstration state.

n.a. = not applicable.

B. Identifying adult expansion beneficiaries in administrative data

As noted in Chapter II of the summative report, there were no standardized eligibility codes for adults in the Medicaid expansion group in MAX and Alpha-MAX. Therefore, we identified the expansion population in Michigan and in comparison states using state-specific eligibility codes with large enrollment increases after Medicaid expansions were implemented. The state-specific codes used for these states are listed in Table C.3.

Table C.3. State-specific eligibility codes for states with MAX/Alpha-MAX data

State	Label	Code
Michigan[a]	Healthy Michigan Plan, eligible for full Adult Benefit Waiver (ABW) coverage	H3G000
	Healthy Michigan Plan, adult eligible for full ABW coverage	H3G020
	Healthy Michigan Plan, child eligible for full ABW coverage	H3G080
Kentucky	Not available	PEX3
	Not available	XAI3I3
	Not available	XAI3I5
	Not available	XAI3X3
	Not available	XAX3
	Not available	XAX301
	Not available	XAX303
	Not available	XAX304
	Not available	XAX305
	Not available	XAX315
	Not available	XAX3X3
	Not available	XAX3X5
	Not available	XAX6X6
Ohio	MAGI expansion adult, below 100% FPL	4112
	MAGI expansion adult, 100%–138% FPL	4113
	MAGI expansion Ribicoff-like non-disabled kid, >44%–66% FPL[b]	4148
	MAGI expansion Ribicoff-like non-disabled kid, >66%–100% FPL[b]	4149
	MAGI expansion Ribicoff-like non-disabled kid, >100%–138%FPL[b]	4150
	MAGI expansion non-disabled adult, ≤66% FPL	4160
	MAGI expansion non-disabled adult, >66%–100% FPL	4161
	MAGI expansion non-disabled adult, >100%–138% FPL	4162
Pennsylvania[c]	Newly eligible, medical assistance effective with Healthy Pennsylvania (HPA)	MG91
	Former Medically Needy Only, medical assistance effective with HPA	MG92
	Medical assistance to Private Coverage Option gap coverage effective with HPA	MG93
	Former Medically Needy Only, gap coverage	MG94
	Newly eligible, Private Coverage Option effective with HPA	PCO91
	Former Medically Needy Only, Private Coverage Option effective with HPA	PCO92
West Virginia	MAGI adult expansion	FCMGAD

Table C.3 (*continued*)

Source: State-specific eligibility crosswalks: Michigan (August 2016), Ohio (November 2015), Pennsylvania (January 2016), and West Virginia (February 2015). A state-specific eligibility crosswalk for Kentucky was not available.

Note: Label descriptions may be out of date.

[a] Michigan's crosswalk does not directly provide labels for each code. The labels noted here are summaries derived from the state's coding scheme.

[b] Individuals ages 19 or 20 with this code were considered adult expansion beneficiaries.

[c] Pennsylvania's crosswalk labels relate to the state's Medicaid expansion through a section 1115 demonstration implemented on January 1, 2015, which included a provision to enroll newly eligible beneficiaries into qualified health plans, known as the Private Coverage Option. The state announced on February 1, 2015, that it would transition from expansion through a demonstration to expansion through a state plan amendment. Although it is possible that Pennsylvania has since changed the labels for these codes, the state had not done so as of January 2016. Enrollment frequencies suggest that the state continued to use these codes after its decision to expand coverage through a state plan amendment.

ABW = adult benefit waiver; FPL = federal poverty level; HPA = Healthy Pennsylvania; MAGI = modified-adjusted gross income.

C. Domain 1: Measure construction, modeling specifications, and demographic characteristics of analytic samples

1. Constructing the outcome measures

Access to care. To assess whether beneficiaries in states with premium assistance demonstrations that support enrollment in QHPs are able to access care at similar or better rates than beneficiaries enrolled in Medicaid in comparison states, we created variables for utilization outcomes related to patient access to care. We used administrative data for enrollees whose first enrollment span was in an expansion eligibility group and whose enrollment span was at least six months long (to allow for a reasonable amount of time for utilization of care, and to align with the time frame of many of the measures). We analyzed the claims data for services that occurred during these spans to create outcome measures that indicated (1) whether the beneficiary used any of a type of service, and (2) the count of services of that type that were used. The services included physician office visits, prescriptions,[1] vision services, dental services, family planning services,[2] and non-emergency medical transportation.

For each span of least 6 months, we created a count of each of these services within the first 6 months of the span. We also examined spans that were at least 12 months long and created a count of each service within the first 12 months of the span. We used these counts and the number of months in the spans to calculate the per-member per-month (PMPM) rate of service use of each type. Then, to examine how quickly beneficiaries were able to access care, for each first span at least 6 months long, we created binary variables indicating whether the beneficiary had any physician office visits within 2 and 6 months, any prescription claims within 2 and 6 months, any vision claims within 6 months, any family planning claims within 6 months, and any claims for non-emergency medical transportation within 6 months. Finally, we examined first

[1] We standardized counts of prescription claims to 30-day fills.

[2] We standardized counts of prescription claims for family planning to 30-day fills.

enrollment spans that were at least 12 months long and created binary indicators of service use within 12 months.

We were able to construct these variables for Arkansas, Iowa, and New Hampshire, and for a set of comparison states—Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia. New Mexico was excluded from prescription drug analyses because of data limitations in the Medicaid prescription drugs claims file that prevented us from distinguishing prescription drug fills from other types of claims.

Expenditures. To study how premium assistance states compared to traditional Medicaid expansion states in terms of per-beneficiary spending on medical services and capitation payments, we created an analytic file at the person-quarter level that contains information on enrollment, demographics, and spending. To be included in the analysis, the person-quarter must have had at least one month of Medicaid enrollment in the post-expansion period, and we limited the file to adult expansion beneficiaries. We created a quarterly spending variable that summed amounts paid for medical services and capitation payments[3] during the months that the beneficiary was enrolled in Medicaid during the quarter.[4] We then converted the quarterly spending into PMPM spending by dividing quarterly spending by the number of months of Medicaid enrollment for that beneficiary in that quarter.

Enrollment timing. To assess whether there were patterns in the timing of Medicaid beneficiary enrollment that might have been related to the Marketplace open enrollment period—even though Medicaid beneficiaries are not subject to open enrollment periods—we used administrative data to create an analytic file at the state-month level. The file contained measures that count monthly enrollment for all non-disabled, non-elderly, non-dual–eligible adult Medicaid beneficiaries and for adult expansion beneficiaries.

2. Specifications for regression models of access to care and expenditures

Access to care. Our examination of service use involves (1) a difference-in-differences (DD) regression design and (2) a cross-sectional regression design. We analyzed measures for 2014–2017 as listed in Appendix Table A.1 and controlled for beneficiary characteristics. For these regression analyses, we used the following five comparison states: Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia. New Mexico was excluded from analyses with outcomes that used prescription drug data (prescription drug and family planning variables) because of the data limitations already noted.

[3] Including, in Iowa and New Hampshire, payments made to qualified health plans.

[4] For QHP beneficiaries, only wraparound services were paid directly by Medicaid. Other medical services were covered by the plan and are accounted for by the capitation payment amount.

Difference-in-differences model

Our main analysis was based on a DD regression model exploiting variation in the timing of premium assistance demonstrations during the Medicaid expansion period in Iowa and New Hampshire.[5] Iowa expanded Medicaid eligibility in January 2014; its premium assistance demonstration was in effect from January 2014–December 2015, but not January 2016–December 2017. New Hampshire expanded Medicaid eligibility in August 2014, but did not begin premium assistance until January 2016. We were able to separately identify the effect of the premium assistance demonstration from that of the Medicaid expansion by exploiting the difference in timing between the two events in Iowa and New Hampshire (the expansion and the implementation of premium assistance) and including comparison states. We compared utilization during the premium assistance program to utilization during a baseline period that was after Medicaid expansion, but while premium assistance was not active. Importantly, by comparing the change in utilization in these two demonstration states to the change in utilization in comparison states over the same time period, the DD design allows us to control for unmeasured differences across states (such as regional variation in health care utilization) that could potentially confound cross-sectional analyses.

We pooled data across comparison states and used the following regression model to identify the effect of the Iowa and New Hampshire demonstrations:

$$y_{it} = \alpha + \beta_{IA} * IA\_demo_{it} + \beta_{NH} * NH\_demo_{it} + \beta_1 * State_i + \beta_2 * Year_t + \beta_3 * Streak_{it} + \delta * X_{it} + \varepsilon_{it}$$

where:

- y_{it} is the binary or continuous utilization outcome *(y)* for a person *(i)* in a span *(t)*.
- α is a constant term.
- IA_demo_{it} is the indicator of a person's *(i)* residence in Iowa during an active premium assistance demonstration (2014–2015).
- NH_demo_{it} is the indicator of a person's *(i)* residence in New Hampshire during an active premium assistance demonstration (2016–2017).
- $State_i$ is an indicator of a person's *(i)* state of residence: Iowa, New Hampshire; Kentucky, New Mexico, Ohio, Pennsylvania, or West Virginia.
- $Year_t$ is an indicator of the year *(t)* the span began.
- $Streak_{it}$ is an indicator of the number of months in the span.

[5] Arkansas was not included in DD regressions because the expanded eligibility period and the premium assistance demonstration overlapped completely. Arkansas is included in cross-sectional regression analysis.

- X_{it} is a vector of sociodemographic and health characteristics of person (*i*), including sex, age, a measure of the proportion of residents in the state living in a rural area, and the Chronic Illness and Disability Payment System (CDPS) score,[6] a score created for and applicable to only the 12-month variable and thus used only in the 12-month models.
- ε_{it} is a random error term.

We used logistic regression for binary outcome variables that examined any service use, and negative binomial models for continuous outcome variables that counted the number of services used. The coefficients IA_demo_{it} and NH_demo_{it} represent the estimated effect of the Iowa and New Hampshire demonstrations, respectively, on the outcome variable in question. Given that the count variables were calculated for all spans, and that beneficiaries could contribute more than one span to the analyses, we estimated standard errors for the count variable models while clustering at the beneficiary level to account for correlation between utilization outcomes for the same beneficiary across enrollment spans. We then calculated the average marginal effects of being enrolled in Medicaid demonstration states during an active demonstration to obtain the expected change in the outcome associated with exposure to a statewide premium assistance demonstration, controlling for individual characteristics, baseline differences across states using state fixed effects, and time trends using year fixed effects. To calculate the average marginal effects, we computed the average of the estimated difference in outcomes between demonstration and comparison states, using the covariate distribution of the demonstration group.

Cross-sectional model

We also conducted a cross-sectional regression analysis, which enabled us to include Arkansas. We compared outcomes in each of the three demonstration states to outcomes in comparison states, controlling for observable beneficiary characteristics and common time trends. We pooled data across comparison states and used the following model:

$$y_{it} = \alpha + \beta_{AR} * AR\_demo_{it} + \beta_{IA} * IA\_demo_{it} + \beta_{NH} * NH\_demo_{it} + \beta_1 * Year_t + \beta_2 * Streak_{it} + \delta * X_{it} + \varepsilon_{it}$$

where:

- y_{it} is the binary or continuous utilization outcome *(y)* for a person *(i)* in a span *(t)*.
- α is a constant term.
- AR_demo_{it} is the indicator of a person's *(i)* residence in Arkansas during an active premium assistance demonstration (2014–2017).

[6] The CDPS score is created for and applicable only to 12-month variables and models. We used a Winsorized version of the CDPS score, meaning that we limited more extreme values in the data to reduce the effect of outliers. Software to create CDPS scores is available at http://cdps.ucsd.edu/.

- IA_demo_{it} is the indicator of a person's *(i)* residence in Iowa during an active premium assistance demonstration (2014–2015).
- NH_demo_{it} is the indicator of a person's *(i)* residence in New Hampshire during an active premium assistance demonstration (2016–2017).
- $Year_t$ is an indicator of the year *(t)* the span began.
- $Streak_{it}$ is an indicator of the number of months in the span.
- X_{it} is a vector of sociodemographic and health characteristics of person *(i)*, including sex, age, a measure of the proportion of residents in the state living in a rural area, and the Chronic Illness and Disability Payment System (CDPS) score, a score created for and applicable to only the 12-month variable and thus used only in the 12-month models.
- ε_{it} is a random error term.

We also explored alternative definitions of the demonstration group in both the DD and cross-sectional models. Instead of including all beneficiaries enrolled during an active demonstration, we included only those enrolled in QHPs, excluding those enrolled in traditional Medicaid in a state with an active demonstration. See Appendix G for details.

Expenditures. We also used both DD and cross-sectional regression designs for the analyses examining Medicaid expenditures for beneficiaries under premium assistance demonstrations versus traditional Medicaid expansions. We analyzed quarterly beneficiary expenditures for periods after states expanded Medicaid eligibility during 2014–2017, controlling for beneficiary characteristics. All expenditures are reported as PMPM expenditures. For all regression analyses, we use the following four comparison states: Kentucky, New Mexico, Ohio, and West Virginia (October 2015–December 2017 only). West Virginia data from January 2014–September 2015 were excluded due to poor data quality on encounter payments in the pre-TAF data. Pennsylvania was excluded because it had a large number of invalid capitation payment amounts.

Difference-in-differences model

We conducted DD regression analyses of expenditures from 2014–2017 for expansion beneficiaries, controlling for beneficiary characteristics. (Beneficiary characteristics are shown in Tables C.4, C.5, and C.6.) New Hampshire was the only demonstration state included; Kentucky, New Mexico, Ohio, and West Virginia were the comparison states. We excluded Iowa from the DD model because Iowa had much lower expenditures in 2012–2013 and 2016–2017 than other states in the analysis did, and much lower expenditures in those years than its own expenditures in 2014–2015. We could not determine how much of the expenditures trend in Iowa 2012–2013 and 2016–2017 is related to the implementation of premium assistance and how much of it is attributable to the different data sources we used for Iowa in different years. Arkansas was excluded from the DD and cross-sectional expenditures analyses because the APCD data did not

contain information on capitation payments to QHPs and could not be linked to Medicaid administrative data. We defined Medicaid expenditures to include all Medicaid for fee-for-service payments as well as capitation payments for beneficiaries enrolled in Medicaid Managed Care plans or QHPs.

We used a generalized linear regression model with log link and gamma distribution, controlling for beneficiary characteristics. We weighted beneficiary-quarter observations based on how many months in the quarter the beneficiary was enrolled. Given that the expenditures were calculated at the quarter level, and that beneficiaries could contribute more than one quarter to the analyses, we estimated standard errors while clustering at the beneficiary level to account for correlation between the expenditures outcome for the same beneficiary across quarters. We used the regression coefficients to calculate the average marginal effects of being in New Hampshire during its premium assistance demonstration to arrive at an estimate of the difference in expenditures associated with the premium assistance model. We included a $\mathrm{Pre}TAF_q$ indicator variable in the model because descriptive analyses showed that in many states, there was a dip in mean expenditures in the quarter before Medicaid administrative data transitioned from Alpha-MAX to TAF, likely due to a limited claims runout period. The model is:

$$y_{iq} = \alpha + \beta_{NH} * NH\_demo_{iq} + \beta_1 * State_{iq} + \beta_2 * Quarter_q + \beta_3 * PreTAF_q + \beta_4 * Streak_{iq} + \delta * X_{iq} + \varepsilon_{iq}$$

where:

- y_{iq} is the continuous expenditures outcome *(y)* for a person *(i)* in a quarter *(q)*.
- α is a constant term.
- NH_demo_{iq} is the indicator of a person's *(i)* residence in New Hampshire during an active premium assistance demonstration (2016–2017).
- $State_{iq}$ is an indicator of a person's *(i)* state of residence in quarter *(q)*.
- $Quarter_q$ is an indicator of the quarter *(q)*.
- $PreTAF_q$ is an indicator of the quarter *(q)* just before the beginning of TAF data, determined by the state-specific schedule.
- $Streak_{iq}$ is an indicator of the number of months in person's *(i)* enrollment span into which quarter *(q)* falls.
- X_{iq} is a vector of sociodemographic and health characteristics of person *(i)*, including sex, age, and a measure of the proportion of residents in the state who live in a rural area.
- ε_{iq} is a random error term.

Cross-sectional model

Limiting the quarters and population to those in the expansion period, we estimated generalized linear regression models for the expenditures variable. The demonstration states for this analysis were Iowa (2014-2015 only) and New Hampshire. We estimated average marginal effects for the two states separately and pooled data across comparison states. The models took the following form:

$$y_{iq} = \alpha + \beta_{IA} * IA\_demo_{iq} + \beta_{NH} * NH\_demo_{iq} + \beta_1 * Quarter_q + \beta_2 * Streak_{iq} + \beta_3 * PreTAF_q + \delta * X_i + \varepsilon_{iq}$$

where:

- y_{iq} is the continuous expenditures outcome *(y)* for a person *(i)* in a quarter *(q)*.
- α is a constant term.
- IA_demo_{iq} is the indicator of a person's *(i)* residence in Iowa during an active premium assistance demonstration.
- NH_demo_{iq} is the indicator of a person's *(i)* residence in New Hampshire during an active premium demonstration.
- $Quarter_q$ is an indicator of the quarter *(q)*.
- $Streak_{iq}$ is an indicator of the number of months in person's *(i)* enrollment span into which quarter *(q)* falls.
- $PreTAF_q$ is an indicator of the quarter *(q)* just before the beginning of TAF data, determined by the state-specific schedule.
- X_i is a vector of sociodemographic characteristics of a person (*i*), including sex, race, age, and an indicator of residence in a rural area.
- ε_{iq} is a random error term.

As before, we estimated these models using a demonstration group restricted to those enrolled in QHPs. We found effects similar to those found in the main analysis, which included beneficiaries in traditional Medicaid coverage who resided in states with active premium assistance demonstrations. (See Tables III.5 and III.6 in the main report) The results restricted to those enrolled in QHPs were similar in sign and statistical significance, but smaller in magnitude. See Appendix G for details.

3. Demographic characteristics of analytic samples

The study populations for the analyses of access to care, health care expenditures, and timing of Medicaid enrollment all differed slightly because there were different criteria for the samples used in each. The sample for analyses of access to care comprised adults in both the demonstration and comparison states who were enrolled in expansion eligibility groups and who had a first enrollment span of at least 6 months. Twelve-month analyses were further limited to those with first enrollment spans of at least 12 months. Table C.4 shows the demographic characteristics of beneficiaries included in the utilization analyses.

The expenditures analyses included only adult beneficiaries in the expansion population, but did not require a minimum enrollment span duration. The enrollment timing analyses included all non-disabled, non-dual eligible Medicaid beneficiaries ages 19 through 64, regardless of whether they enrolled under an adult expansion eligibility group. The demographic characteristics of beneficiaries included in the expenditures models (Table C.5) and enrollment timing analysis (Table C.6) reflect all beneficiaries with at least one month of enrollment in Medicaid in 2014–2017 and during their state's expansion.[7] Because the utilization and expenditure analyses allowed beneficiaries to contribute multiple observations (spans or quarters), each beneficiary is potentially counted more than once in Table C.5, which presents beneficiary-quarter-level statistics. Beneficiaries are represented only once in Tables C.4 and C.6, which are based on each beneficiary's characteristics in the beneficiary's first enrolled month after each state's expansion start date.

Demographic characteristics of beneficiaries included in access-to-care models. Table C.4 shows the demographic characteristics of beneficiaries included in the access-to-care models. Beneficiaries in demonstration and comparison states were similar in terms of age and CDPS score, with standardized differences below 5 percent,[8] although they differed in terms of sex and rural residence. Demonstration states had a higher proportion of female beneficiaries (56 percent in demonstration states vs. 51 percent in comparison states) and a higher proportion in rural areas (43 percent in demonstration states vs. 30 percent in comparison states).

[7] Table C.5 includes demographic characteristics for Iowa for 2014–2015, reflecting the time period for which we have reliable expenditures data for Iowa. Iowa was not included in the difference-in-differences model.

[8] Although there are no broadly accepted thresholds of acceptability for standardized differences, the What Works Clearinghouse, a repository of education research, maintains that regression adjustment is adequate to control for standardized differences of 5 percent and lower.

Table C.4. Demographic characteristics and outcome variables for beneficiaries included in analyses of service utilization during first Medicaid expansion enrollment span of at least six months

Characteristic	Demonstration states						All demonstration states %	All comparison states %	Standardized difference
	Arkansas (entire state) %	Arkansas (QHP only) %	Iowa (entire state) %	Iowa (QHP only) %	New Hampshire (entire state) %	New Hampshire (QHP only) %			
Age									
19–26	20.28	20.40	22.94	18.01	23.36	23.94	21.21	21.69	0.03
27–35	25.38	25.77	23.35	24.44	25.29	25.88	24.82	24.31	
36–45	21.69	21.77	19.99	21.41	18.02	18.14	20.98	20.55	
46–55	19.49	19.13	20.85	20.19	18.81	18.14	19.81	20.43	
56–64	13.16	12.93	12.87	15.95	14.52	13.91	13.17	13.02	
Female	58.01	57.61	52.41	60.56	50.81	50.92	55.99	50.65	0.11
CDPS score Mean (s.d.)	1.11 (1.15)	1.08 (1.10)	1.16 (1.08)	0.97 (0.92)	1.07 (1.03)	1.03 (0.97)	1.12 (1.12)	1.18 (1.19)	-0.05
Rural Mean (s.d.)	42.85 (33.02)	43.05 (33.04)	41.52 (49.28)	41.79 (49.32)	44.50 (49.70)	44.66 (49.71)	42.60 (39.36)	29.57 (45.64)	30.56
Total beneficiaries in sample	940,333	800,898	388,110	27,193	97,528	69,064	1,425,971	5,428,429	

Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in this table includes adult expansion beneficiaries with a first span of at least 6 months where covariates other than CDPS score were nonmissing. CDPS score requires 12-month spans and is therefore only reported for those with spans of 12 months. The difference between demonstration and comparison groups as a percentage of a standard deviation is shown in the standardized difference column.

CDPS = Chronic Illness and Disability Payment System; n.a. = not applicable; s.d. = standard deviation.

Demographic characteristics of beneficiaries included in the analysis of health care expenditures. We examined spending from 2014 to 2017 in Iowa and New Hampshire (demonstration states) and in Kentucky, New Mexico, Ohio, and West Virginia (comparison states) to study how premium assistance states compare to Medicaid expansion states in terms of per-beneficiary spending on direct medical services and capitation payments. Arkansas was excluded from this analysis because we did not have data on capitation payments to QHPs in the Arkansas APCD data, and we could not link beneficiaries in the APCD data to administrative Medicaid claims data. We report demographic characteristics for beneficiaries included in the expenditure analyses in Table C.5. The sample differs from that shown in Table C.4 because it includes beneficiaries enrolled for at least one month, whereas those included in the utilization analyses must have been enrolled for at least six months consecutively.

Table C.5. Demographic characteristics of adult Medicaid beneficiaries included in difference-in-differences and cross-sectional analyses of expenditures

Characteristic	Demonstration states		All demonstration states %	All comparison states %	Standardized difference
	Iowa (entire state) %	New Hampshire (entire state) %			
Age					
19–26	28.12	26.15	27.75	26.25	0.07
27–35	27.60	29.42	27.93	28.93	
36–45	20.33	20.18	20.30	22.11	
46–55	15.62	15.04	15.52	14.86	
56–64	8.33	9.22	8.50	7.86	
Female	61.34	62.33	61.52	60.71	0.02
Rural	41.92 (49.34)	43.36 (49.56)	42.17 (49.38)	32.08 (46.68)	21.00
Total beneficiary-quarters in sample	4,572,852	1,045,086	5,617,938	40,601,193	

Source: Mathematica analysis of Iowa Medicaid administrative data and state administrative data, New Hampshire Medicaid administrative data and All-Payer Claims Data Base, and Kentucky, New Mexico, and Ohio MAX, Alpha-MAX and TAF data, 2014–2017; and West Virginia TAF data October 2015–December 2017. Years included for each state depend on the date of demonstration implementation or coverage and data availability.

Note: The population reflected in this table includes all adult expansion beneficiaries with at least one month of enrollment during 2014 to 2017 (2014 to 2015 for Iowa). Given that the analysis was conducted at the beneficiary-quarter level, each beneficiary is included several times—once for each quarter that the beneficiary was enrolled in Medicaid. The difference between demonstration and comparison groups as a percentage of a standard deviation is shown in the standardized difference column.

s.d. = standard deviation.

Demographic characteristics of beneficiaries included in the analyses of the timing of Medicaid enrollment. We examined enrollment from 2012 to 2017 in Arkansas, Iowa, and New Hampshire (demonstration states) and in Kentucky, New Mexico, Ohio, and West Virginia (comparison states) to study how the timing of open enrollment periods was associated with changes in Medicaid enrollment. We created descriptive statistics of the demographic characteristics of beneficiaries included in the enrollment timing analysis (Table C.6). There were comparable proportions of male and female beneficiaries in demonstration and comparison states, with standardized differences below 5 percent. Demonstration states had higher proportions of beneficiaries between the ages of 56 and 64. Beneficiaries in demonstration states were also more likely to live in rural areas (43 percent in demonstration states vs. 28 percent in comparison states).

Table C.6. Demographic characteristics of adult Medicaid beneficiaries included in enrollment timing analyses

Characteristic	Demonstration states			All demonstration states %	All comparison states %	Standardized difference
	Arkansas %	Iowa %	New Hampshire %			
Age						
19–26	21.95	27.11	24.75	24.15	25.81	
27–35	25.32	27.88	28.74	26.60	28.39	
36–45	21.32	20.89	20.23	21.06	21.82	0.10
46–55	18.78	15.71	16.08	17.38	15.58	
56–64	12.62	8.40	10.21	10.82	8.40	
Female	57.64	60.80	59.37	58.99	59.82	-0.02
Rural	42.61	42.18	43.68	42.56	27.49	1.27
Total beneficiaries in sample	13,901,382	9,787,460	2,472,240	26,161,082	138,237,801	

Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in this table includes all non-disabled, non-dual eligible beneficiaries ages 19 through 64 (that is, not only the adult expansion beneficiaries) with at least one month of enrollment from 2014 to 2017. Each beneficiary is counted once in the table, according to that beneficiary's demographic information in the first enrolled month after each state's expansion start date. The difference between demonstration and comparison groups as a percentage of a standard deviation is shown in the standardized difference column.

NA = data not available; s.d. = standard deviation.

D. Domain 2: Modeling specifications and descriptive statistics

1. Specifications for regression models of enrollment continuity among adult expansion beneficiaries

Continuous enrollment within potential 12-month spans. To examine the effects of monthly payment timing on enrollment continuity, we conducted a descriptive regression analysis to compare enrollment outcomes for adult expansion beneficiaries in their first, second, and third enrollment spans in demonstration and comparison states, after controlling for differences in observable characteristics. We used individual-level state administrative data for people in the expansion population who began an enrollment spell in 2014, 2015, 2016, or 2017 and for whom it was possible to observe a continuous 12-month period in which they potentially could have been enrolled. We estimated a series of state- and span-specific regression models to assess the probability of continued enrollment after monthly payment requirements took effect and after payment grace periods ended. These models take the following general form:

$$y_{i\tau} = \alpha + \delta X_i + \theta Enr_i + \varepsilon_{it}$$

where:

- $y_{i\tau}$ is the enrollment outcome (y) for a person (i) in the month after a milestone (τ), which equals 1 if person (i) has remained continuously enrolled in Medicaid from their start date through the milestone month, and 0 otherwise.
- α is a constant term.
- X_i is a vector of sociodemographic and health characteristics of person i, including sex, race/ethnicity (except for Arkansas, Iowa, Kentucky, New Mexico, and West Virginia), and age.
- Enr_i is a fixed effect for the beneficiary's initial enrollment month (for each span).
- ε_{it} is a random error term.

We estimated these models at specific time points within a beneficiary's first year of enrollment, including at 3 months, 8 months, and 12 months. We then generated the predicted probability of continued enrollment at these key points for first, second, and third spans in each state.

We also estimated models of enrollment that pooled all states, included state fixed effects, and controlled for sex and age. It was not possible to include race/ethnicity because this variable was not available for all states. Results were similar to those obtained using state-specific regressions with all available control variables. Finally, as a sensitivity check, we also estimated a separate model for Arkansas that was limited to first spans starting in January 2017, when there were new monthly payment amounts in effect.

Renewal outcomes after 12-month spans. To examine renewals after the first, second, and third enrollment year for adult expansion beneficiaries, we conducted a descriptive regression analysis to compare renewal outcomes for adult expansion beneficiaries in demonstration and comparison states, after controlling for differences in observable characteristics. We used individual-level state administrative data for people in the expansion population who began an enrollment spell in 2014, 2015, or 2016 and maintained 12 months of enrollment, and for whom it was possible to observe 14 months of enrollment after the start of each span. We estimated the probability of three different renewal outcomes after the first, second, and third year: (1) renewal into the expansion (or demonstration) group, (2) renewal into a different eligibility group, and (3) no renewal. We estimated a series of state- and span-specific regression models that modeled each of these outcomes separately (except for Arkansas, where we had data only for the expansion group, and therefore could not model renewals into a different eligibility group). These models took the same general form as the models of enrollment continuity, but the outcomes were the renewal outcome (y_{it}) for person *(i)* after the first 12 months of continuous enrollment. After estimating renewal outcomes for each state, we generated the predicted probability of each outcome.

We also estimated models of renewal outcomes after first, second, and third spans that pooled all states, included state fixed effects, and controlled for sex and age. It was not possible to include race/ethnicity because this variable was not available for all states. Results were similar to the ones we obtained using state-specific regressions with all available control variables.

Long-term enrollment outcomes. We conducted a similar descriptive regression analysis to compare long-term enrollment among adult expansion beneficiaries in states with and without monthly payments, after controlling for differences in observable characteristics for these groups. We used individual-level state administrative data for people in the expansion population who began an enrollment spell in 2014, 2015, or 2016 and for whom it was possible to observe at least 18 months of enrollment after the start of a span. We estimated the probability of remaining continuously enrolled in a state's Medicaid expansion for 18 months, 24 months, 36 months, and 48 months, using a series of state-specific regression models that estimated each of these outcomes separately. These models took the same general form as the models of enrollment continuity. Given the dates that states expanded coverage and our use of data through 2017, we cannot observe 48-month continuous enrollment for Indiana, Michigan, Montana, New Hampshire, or Pennsylvania; we cannot observe 36-month continuous enrollment for Indiana or Montana.

We also estimated models of long-term enrollment that pooled all states, included state fixed effects, and controlled for sex and age. It was not possible to include race/ethnicity because this variable was not available for all states. Results were similar to the ones we obtained using state-specific regressions with all available control variables.

Accelerated failure time model. To examine the effect of monthly payments on duration of enrollment in the Medicaid expansion group, we conducted a survival analysis using an

accelerated failure time model. This model uses individual-level data on Medicaid beneficiaries who began one or more enrollment spells in Medicaid expansion programs from 2014 to 2017 to estimate the effect of monthly payments on the length of time a person remains enrolled ("survives") in the Medicaid expansion group. The survival function is the probability of remaining enrolled through each month and decreases over time. We estimated a multivariate accelerated failure time model with controls for individual characteristics that change over time, including onset of monthly payment obligations, calendar year, and age, and characteristics that we do not observe changing over time, including state of residence and sex. It was not possible to include race/ethnicity because this variable was not available for all states. The model takes the following form:

$$S(t_i) = S_0 exp(-(\delta X_i + \theta State_i + \mu Year_i)t_i)$$

where:

- $S(t_i)$ is the probability of remaining enrolled ("surviving") beyond time t for a person (i).
- S_0 is the baseline survival function, or the survival function when all of the covariates are set to 0. S_0 is calculated by assuming a distributional form. After testing for the best-fitting distribution, we used a generalized gamma distribution for the primary specification of this model.[9] The generalized gamma distribution has three parameters that are estimated from the data: α, σ, and κ. α is similar to other regression constants, and σ and κ determine the shape and scale of the generalized gamma distribution. The generalized gamma cumulative distribution function is:

$$S(t) = \begin{cases} 1 - I(\gamma, u), & if\ \kappa > 0 \\ 1 - \Phi(z), & if\ \kappa = 0 \\ I(\gamma, u), & if\ \kappa < 0 \end{cases}$$

  where: $\gamma = |\kappa|^{-2}$, $z = \frac{sign(\kappa)\{\ln(t) - \alpha\}}{\sigma}$, and $u = \gamma \exp(|\kappa| z)$. $\Phi(\ )$ is the standard normal cumulative distribution function and $I(\ )$ is the incomplete gamma distribution.
- X_i is a vector of characteristics of person *i*, including sex and age.
- $State_i$ is a fixed effect for state.
- $Year_i$ is a fixed effect for year.

We estimated the model using cluster-robust variance estimates to adjust for repeated measures per beneficiary. We report results in time ratios.

[9] We also tested Weibull, exponential, log-logistic, and log-normal distributions.

We also estimated a proportional hazards model using all of the same distributions we tested for the accelerated failure time model. Proportional hazards models are more common than accelerated failure time models, but assume that in any given month the instantaneous probability of disenrolling is a certain number of times greater for those with monthly payments versus those without. We found consistent results using both approaches. Finally, we estimated a version of the model without Indiana as a sensitivity check on how much Indiana might be driving results, and found comparable results.

2. Descriptive statistics for variables included in enrollment continuity models

Descriptive statistics for variables included in models of continued enrollment and renewal outcomes, including demographic characteristics of beneficiaries in the sample, are included in Tables C.7–9. Flags for continuous enrollment at 18, 24, 26, and 48 months are included only in Table C.7 because these were defined for the first span only.

Demographic characteristics for beneficiaries included in the accelerated failure time models are weighted by span length—or survival time—and are shown in Table C.10. The number of observations is the sum of all months of continuous enrollment (or time at risk) across all beneficiaries in each state. The percentage of enrollment months with a monthly payment in demonstration states reflects the timing of the onset of payment obligations in individual enrollment spans and the periods when payment policies were in effect in each state. For example, enrollment months in Arkansas were coded as having no payments after the Independence Accounts were closed and before the 2017 premium policy took effect. As another example, enrollment months in Michigan were coded as having no payments until Month 7 in each beneficiary's enrollment span, consistent with the Healthy Michigan Plan design. We were unable to distinguish between beneficiaries who actually would and would not owe monthly payments due to the poor quality of the available income variables.

Table C.7. Descriptive statistics for adult expansion beneficiaries in first enrollment spans

	Demonstration states					Comparison states				
Variable	Arkansas %	Indiana %	Iowa %	Michigan %	Montana %	Kentucky %	New Mexico %	Ohio %	Pennsylvania %	West Virginia %
Enrolled at 3 months	98.4	84.1	97.2	94.4	96.1	97.5	95.8	96.1	95.7	96.5
Enrolled at 8 months	90.3	69.9	83.8	75.5	80.2	85.4	79.8	86.1	75.1	80.6
Enrolled at 12 months	87.0	62.7	71.0	61.8	71.9	82.5	70.1	79.8	62.1	67.8
Renewed into expansion group	98.1	80.4	78.5	80.0	97.4	97.1	96.8	87.7	94.2	76.7
Renewed into a different eligibility group	NA	0.0	1.9	1.4	0.2	0.0	0.7	1.9	1.0	1.2
Did not renew Medicaid coverage	1.9	19.6	19.6	18.6	2.5	2.9	2.5	10.4	4.8	22.1
Enrolled at 18 months	80.6	46.5	38.8	38.3	61.0	75.2	57.7	60.6	44.2	41.9
Enrolled at 24 months	71.9	NA	31.5	30.9	55.8	72.4	49.1	53.8	35.3	34.0
Enrolled at 36 months	60.4	n.a.	19.7	21.0	n.a.	64.2	38.1	41.3	25.3	24.2
Enrolled at 48 months	42.4	n.a.	16.2	NA	n.a.	51.0	26.3	30.3	n.a.	20.5
Sex										
Female	56.5	61.3	53.4	51.2	53.4	51.5	52.6	49.5	53.4	52.1
Male	43.4	38.7	46.6	48.8	46.6	48.5	47.4	50.5	46.6	47.9
Race/ethnicity										
White, non-Hispanic	NA	68.8	NA	57.6	68.9	NA	NA	57.4	57.6	NA
Black, non-Hispanic	NA	19.9	NA	22.8	NA	NA	NA	22.7	23.1	NA
Hispanic	NA	4.7	NA	4.9	NA	NA	NA	2.5	10.1	NA
Other /unknown	NA	6.6	NA	14.8	31.1	NA	NA	17.4	9.2	NA
Age at end of last month in enrollment span Mean (s.d.)	37.0 (13.0)	36.1 (11.9)	36.2 (13.0)	36.7 (13.1)	37.1 (13.1)	36.2 (12.7)	36.6 (13.3)	38.5 (13.2)	36.1 (12.9)	36.9 (12.6)
Total in sample	524,647	650,726	348,741	1,389,877	120,381	765,193	458,560	1,340,393	1,372,619	352,380

Source: Mathematica analysis of administrative data from 2014–2017. Years included for each state depend on date of demonstration implementation or coverage expansion. 2017 data for Indiana are not included.

NA = data not available; n.a. = not applicable given demonstration start date; s.d. = standard deviation.

Table C.8. Descriptive statistics for adult expansion beneficiaries in second enrollment spans

Variable	Demonstration states					Comparison states				
	Arkansas %	Indiana %	Iowa %	Michigan %	Montana %	Kentucky %	New Mexico %	Ohio %	Pennsylvania %	West Virginia %
Enrolled at 3 months	98.0	97.2	96.2	95.2	97.4	99.0	96.1	96.9	94.3	95.5
Enrolled at 8 months	87.4	86.7	76.6	79.2	85.8	94.0	81.1	85.8	74.9	79.9
Enrolled at 12 months	82.1	74.8	65.9	68.8	80.1	91.5	72.2	77.4	63.2	68.3
Renewed into expansion group	97.5	75.8	84.3	90.0	97.3	97.9	96.8	91.7	95.1	85.9
Renewed into a different eligibility group	NA	0.0	1.2	0.9	0.2	0.0	0.6	0.7	0.6	0.5
Did not renew Medicaid coverage	2.5	24.2	14.5	9.1	2.6	2.1	2.6	7.6	4.3	13.6
Sex										
Female	57.1	70.3	54.2	51.2	55.3	51.6	52.1	48.2	53.6	53.1
Male	42.9	29.7	45.8	48.8	44.7	48.4	47.9	51.8	46.4	46.9
Race/ethnicity										
White, non-Hispanic	NA	72.1	NA	58.0	70.3	NA	NA	57.3	57.9	NA
Black, non-Hispanic	NA	19.5	NA	24.3	NA	NA	NA	23.7	23.9	NA
Hispanic	NA	4.8	NA	4.5	NA	NA	NA	2.3	9.5	NA
Other /unknown	NA	3.5	NA	13.2	29.7	NA	NA	16.7	8.7	NA
Age at end of last month in enrollment span Mean (s.d)	38.2 (12.6)	37.7 (11.5)	37.8 (12.8)	38.1 (13.0)	38.7 (13.0)	36.5 (11.9)	37.8 (13.1)	40.4 (13.0)	37.3 (12.7)	38.2 (12.2)
Total in sample	396,677	250,165	196,886	810,190	63,590	541,821	323,865	862.247	790,546	221,158

Source: Mathematica analysis of administrative data from 2014–2017. Years included for each state depend on date of demonstration implementation or coverage expansion. 2017 data for Indiana are not included.

NA = data not available; s.d. = standard deviation.

Table C.9. Descriptive statistics for adult expansion beneficiaries in third enrollment spans

Variable	Demonstration states					Comparison states				
	Arkansas %	Indiana %	Iowa %	Michigan %	Montana %	Kentucky %	New Mexico %	Ohio %	Pennsylvania %	West Virginia %
Enrolled at 3 months	98.0	97.5	96.9	95.9	97.4	99.2	96.6	97.2	94.8	96.4
Enrolled at 8 months	88.6	83.5	81.3	82.8	87.3	94.9	82.5	86.1	77.9	83.2
Enrolled at 12 months	81.0	68.4	73.3	74.0	80.0	91.9	75.3	77.7	67.8	74.5
Renewed into expansion group	95.9	n.r.	93.8	93.8	n.r.	97.7	97.4	93.3	94.3	90.1
Renewed into a different eligibility group	NA	n.r.	0.7	0.6	n.r.	0.2	0.4	0.3	0.9	0.3
Did not renew Medicaid coverage	4.1	n.r.	5.5	5.6	n.r.	2.1	2.2	6.5	4.7	9.6
Sex										
Female	58.8	77.3	54.6	50.8	63.4	53.1	51.9	47.2	54.3	53.9
Male	41.2	22.7	45.4	49.2	36.6	46.9	48.1	52.8	45.7	46.1
Race/ethnicity										
White, non-Hispanic	NA	68.9	NA	58.4	70.5	NA	NA	56.9	58.5	NA
Black, non-Hispanic	NA	23.4	NA	25.5	NA	NA	NA	25.1	23.8	NA
Hispanic	NA	4.4	NA	3.9	NA	NA	NA	2.3	9.1	NA
Other /unknown	NA	33	NA	12.1	29.5	NA	NA	15.7	8.6	NA
Age at end of last month in enrollment span Mean (s.d.)	39.4 (12.2)	35.5 (9.9)	39.5 (12.4)	39.9 (12.9)	36.4 (10.9)	37.7 (11.5)	39.2 (13.0)	42.2 (12.8)	38.6 (12.6)	39.4 (11.7)
Total in sample	268,741	7,966	99,973	447,116	3,397	413,489	209,661	512,574	348,764	132,774

Source: Mathematica analysis of administrative data from 2014–2017. Years included for each state depend on date of demonstration implementation or coverage expansion. 2017 data for Indiana are not included.

NA = data not available; n.r. = not reported due to small cell sizes; s.d. = standard deviation.

Table C.10. Descriptive statistics for enrollment spans in accelerated failure time model, weighted by survival time (months in each span)

Characteristic	Demonstration states					Comparison states				
	Arkansas %	Indiana %	Iowa %	Michigan %	Montana %	Kentucky %	New Mexico %	Ohio %	Pennsylvania %	West Virginia %
Monthly payment										
Yes	67.2	100.0	60.4	79.6	94.7	0.0	0.0	0.0	0.0	0.0
No	32.8	0.0	39.6	20.4	5.3	100.0	100.0	100.0	100.0	100.0
Age										
19–26	19.1	22.5	23.5	23.8	23.0	22.5	23.1	17.7	24.9	19.1
27–35	25.8	28.9	23.6	23.1	26.6	26.6	24.2	22.3	25.4	23.7
36–45	22.2	23.3	20.1	19.0	19.4	23.8	18.5	19.0	19.7	24.2
46–55	19.6	16.8	20.4	20.5	17.0	18.8	19.2	23.3	18.1	21.3
56–64	13.4	8.5	12.4	13.6	14.1	8.3	15.1	17.7	11.9	11.8
Sex										
Female	58.2	67.6	53.4	50.7	54.2	52.9	50.8	47.9	53.3	52.9
Male	41.8	32.4	46.6	49.3	45.8	47.1	49.2	52.1	46.7	47.4
Months of continuous enrollment in sample	35,482,388	10,225,063	14,075,407	53,978,305	2,437,680	46,604,658	21,515,714	58,611,596	36,388,760	14,592,520

Source: Mathematica analysis of administrative data from 2014–2017. Years included for each state depend on date of demonstration implementation or coverage expansion. 2017 data for Indiana are not included.

Notes: The unit of analysis is the enrollment span. Observations reported in Table C.10 are weighted by total survival time (the number of months in a span before disenrollment). For example, the 1,971,936 spans in Arkansas had a total of 35,482,388 months of survival time.

Years were also included in the model as fixed effects. Control variables included state, year, monthly payment, age, and sex.

E. Domain 3: Measure construction, modeling specifications, and demographic characteristics of analytic sample

1. Construction of outcome measures

To select the age- and sex-specific preventive service outcome measures, we reviewed the services that were typically incentivized either by demonstration states or by their contracted health plans, most of which were based on U.S. Preventive Services Task Force (USPSTF) recommendations. We limited possible outcome measures to USPSTF's grade A or B preventive services to ensure they would be of a sufficiently high priority that beneficiaries could reasonably be expected to be aware of and receive them. We also cross-referenced the USPSTF measures with the 2017 Healthcare Effectiveness Data and Information Set (HEDIS) and the 2017 Core Set of Adult Health Care Quality Measures (Adult Core Set) to (1) determine which preventive service measures could be calculated by using Medicaid administrative claims data and (2) fill any gaps observed in the USPSTF listings. We excluded several preventive services that were prioritized by states and plans but that are not reliably captured in claims data alone, including HIV testing and receipt of a flu shot. We settled on four core preventive services that are prioritized by states, that are assigned grade B or higher under the USPSTF, and that are included in either HEDIS or Adult Core Set specifications (Table C.11). In addition, we included completion of a wellness visit, which is incentivized by all three states but is not technically considered a preventive service by USPSTF. When both HEDIS and Adult Core Set had variants of the same measure, we prioritized the Adult Core Set measure because the set was developed specifically for the Medicaid population.[10]

Table C.11. Preventive services: Outcome measures and sources

Preventive service	Measure name	Source
Wellness visit	Adults' Access to Preventive/Ambulatory Health Services (AAP) (binary)	HEDIS
Breast cancer screening	Breast cancer screening (BCS-AD) (binary)	HEDIS, Adult Core Set
Cervical cancer screening	Cervical cancer screening (CCS-AD) (binary)	HEDIS, Adult Core Set
Chlamydia screening	Chlamydia screening (CHL-AD) (binary)	HEDIS, Adult Core Set
Colorectal cancer screening	Colorectal cancer screening (COL) (binary)	HEDIS

Note: When a measure is included in both HEDIS and the Adult Core Set, we prioritized the Adult Core Set.
HEDIS = Healthcare Effectiveness Data and Information Set.

We used a similar process to select HEDIS and Adult Core Set measure specifications that are indicative of chronic condition management. Unfortunately, with the exception of HbA1c tests for beneficiaries with diabetes, we could not find widely accepted measures of active management of chronic conditions. Instead, we included measures of short-term hospital admissions for three types of chronic conditions: diabetes, cardiovascular conditions, and

[10] Available at https://www.medicaid.gov/medicaid/quality-of-care/performance-measurement/adult-core-set/index.html. Accessed June 9, 2017.

respiratory conditions. Each of these conditions is manageable with appropriate primary care; therefore, high rates of hospitalization for these chronic conditions serve as a proxy for poor access to primary care or poor management of the condition. We also included two measures pertaining to access to follow-up care after an acute hospitalization. We selected an existing measure of follow-up after hospitalization for mental illness and adapted it to create a novel measure of follow-up with a physician after an acute hospitalization. In Table C.12, we specify our measures for chronic condition management.

Table C.12. Chronic condition management: Outcome measures and sources

Chronic condition	Measure name	Source
Diabetes	Comprehensive Diabetes Care: Hemoglobin A1c (HbA1c) Testing (HA1C-AD) (binary)	Adult Core Set, HEDIS
	Diabetes Short-Term Complications Admission Rate (PQI01-AD) (binary)	Adult Core Set
Cardiovascular	Heart Failure Admission Rate (PQI08-AD) (binary)	Adult Core Set
Respiratory	Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate[a] (PQI05-AD) (binary)	Adult Core Set
	Asthma in Younger Adults Admission Rate[b] (PQI15-AD) (binary)	Adult Core Set
History of hospitalization	Follow-up after acute hospitalization (binary)	Created internally
	Follow-up after hospitalization for mental illness (FUH-AD) (binary)	Adult Core Set, HEDIS

Note: When a measure is included in both HEDIS and the Adult Core Set, we prioritized the Adult Core Set.

[a]Older adults are defined as those ages 40–64.

[b]Younger adults are defined as those ages 19–39.

HEDIS = Healthcare Effectiveness Data and Information Set.

To generate measures of primary and specialty care delivered in an ambulatory setting, we identified services by using (1) Berenson-Eggers Type of Service codes indicating office visits for new or established patients (M1A and M1B), and (2) HCPCS codes for annual wellness visits (G0438 and G0439). Using physician taxonomy, we classified visits as primary or specialty care. If the performing physician on the claim had one of the taxonomy codes in Table C.13, we classified the visit as primary care. Otherwise, we classified the visit as specialty care.

Table C.13. Primary care taxonomy codes

Medicare specialty code	Medicare provider/supplier type description	Provider taxonomy code	Provider taxonomy description
01	Physician/general practice	208D00000X	Allopathic and osteopathic physicians/general practice
08	Physician/family practice	207Q00000X	Allopathic and osteopathic physicians/family medicine
		207QA0000X	Allopathic and osteopathic physicians/family medicine, adolescent medicine
		207QA0505X	Allopathic and osteopathic physicians/family medicine, adult medicine
		207QG0300X	Allopathic and osteopathic physicians/family medicine, geriatric medicine
11	Physician/internal medicine	207R00000X	Allopathic and osteopathic physicians/internal medicine
		207RA0000X	Allopathic and osteopathic physicians/internal medicine, adolescent medicine
		207RG0300X	Allopathic and osteopathic physicians/internal medicine, geriatric medicine
37	Physician/pediatric medicine	208000000X	Allopathic and osteopathic physicians/pediatrics
		2080A0000X	Allopathic and osteopathic physicians/pediatrics, adolescent medicine
38	Physician/geriatric medicine	207RG0300X	Allopathic and osteopathic physicians/internal medicine, geriatric medicine
		207QG0300X	Allopathic and osteopathic physicians/family medicine, geriatric medicine
50	Nurse practitioner	363L00000X	Physician assistants and advanced practice nursing providers/nurse practitioner
		363LA2200X	Physician assistants and advanced practice nursing providers/nurse practitioner, adult health
		363LF0000X	Physician assistants and advanced practice nursing providers/nurse practitioner, family
		363LG0600X	Physician assistants and advanced practice nursing providers/nurse practitioner, gerontology
		363LP0200X	Physician assistants and advanced practice nursing providers/nurse practitioner, pediatrics
		363LP2300X	Physician assistants and advanced practice nursing providers/nurse practitioner, primary care
89	Certified clinical nurse specialist	364S00000X	Physician assistants and advanced practice nursing providers/clinical nurse specialist
		364SA2200X	Physician assistants and advanced practice nursing providers/clinical nurse specialist, adult health
		364SC2300X	Physician assistants and advanced practice nursing providers/clinical nurse specialist, chronic care
		364SF0001X	Physician assistants and advanced practice nursing providers/clinical nurse specialist, family health
		364SG0600X	Physician assistants and advanced practice nursing providers/clinical nurse specialist, gerontology

Table C.13 (*continued*)

Medicare specialty code	Medicare provider/supplier type description	Provider taxonomy code	Provider taxonomy description
		364SH1100X	Physician assistants and advanced practice nursing providers/clinical nurse specialist, holistic
		364SP0200X	Physician assistants and advanced practice nursing providers/clinical nurse specialist, pediatrics
		364SS0200X	Physician assistants and advanced practice nursing providers/clinical nurse specialist, school
97	Physician assistant	363A00000X	Physician assistants and advanced practice nursing providers/physician assistant
		363AM0700X	Physician assistants and advanced practice nursing providers/physician assistant, medical
99	Physician/undefined physician type	208D00000X	Allopathic and osteopathic physicians/general practice
B4	Federally Qualified Health Center	261QF0400X	Ambulatory health care facilities/FQHC
	Rural health clinic	261QR1300X	Ambulatory health care facilities/clinic center, rural health

Finally, we created a set of measures capturing use of the emergency department (ED) overall, use of the emergency department for non-emergency care, and use of urgent care (Table C.14). To classify whether an ED visit was for emergency or non-emergency care, we used the NYU-ED algorithm,[11] which assigns to each ED visit a probability that the visit was for emergency care based on the diagnosis codes on the claim. If the probability that a visit was for emergency care was greater than or equal to 70 percent, we designated the visit as emergency use of the ED. If the probability that a visit was for emergency care was less than 70 percent, we designated the visit as non-emergency use of the ED. However, if a visit did not meet our NYU-ED definition of emergency care, we still classified the visit as one for emergency care if it resulted in an inpatient stay. We identified urgent care visits by using the Place of Service code indicating "urgent care facility." Our method was not successful in identifying urgent care visits in Iowa; as a result, we limited the analysis of urgent care use to Indiana, Michigan, and the comparison states.

Table C.14. Health care utilization: Outcome measures and sources

Measure name	Definition	Source
ED utilization	Any ED visit (binary and count)	Created internally
Non-emergency ED utilization	Non-emergency ED use (binary and count)	NYU-ED algorithm[a]
Urgent care utilization	Visit to an urgent care facility (binary and count)	Created internally

[a]Available at https://wagner.nyu.edu/faculty/billings/nyued-background. Accessed October 11, 2018.

[11] Available at https://wagner.nyu.edu/faculty/billings/nyued-background. Accessed October 11, 2018.

2. Specifications for regression models of health care utilization

To examine the association of financial incentives for healthy behaviors with receipt of preventive care, management of chronic conditions, and non-emergency use of the emergency department, we conducted descriptive regressions. For these analyses, we used administrative data for expansion enrollees in Indiana, Iowa, Michigan, Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia. In Michigan, financial rewards were available starting 6 months from the date of enrollment, but in Indiana and Iowa, the financial rewards were not realized until the second enrollment year. We therefore limited the analysis to expansion beneficiaries whose enrollment spans lasted at least 12 months, thereby characterizing patterns of utilization over the entire period in which beneficiaries might take actions to earn financial rewards. We estimated a series of cross-state regressions at the beneficiary-span level that take the following general form:

$$y_{its} = \alpha + \beta_{IN} * IN_s + \beta_{IA} * IA_s + \beta_{MI} * MI_s + \delta X_{its} + \varepsilon_{its}$$

where:

- y_{its} is the health care utilization outcome *(y)* for person *(i)* in his or her t^{th} 12-month enrollment span in state *(s)*, with outcomes including binary, continuous, and count measures.
- α is a constant term.
- $IN_s, IA_s, and\ MI_s$ are indicators that equal 1 if the beneficiary-span occurred in the respective state and 0 otherwise.
- X_{its} is a vector of demographic and health characteristics of person *(i)* in span *(t)* and state *(s)*, including age, sex, Chronic Illness and Disability Payment System (CDPS) score,[12] year in which the span began, and an indicator of residence in a rural area.
- β and δ are parameters to be estimated in the regression.
- ε_{its} is a random error term.

We used logistic regression for binary outcomes, negative binomial regression for count outcomes, and ordinary least squares regression for continuous outcomes. We estimated standard errors clustering at the beneficiary level to account for correlation between utilization outcomes for the same beneficiary across enrollment spans.[13] We then calculated the average marginal effects of residing in each of the demonstration states to obtain the expected change in the level of the outcome associated with exposure to demonstration incentives, controlling for individual characteristics. To calculate the average marginal effects, we computed the average of the

[12] Software to create CDPS scores is available at http://cdps.ucsd.edu/.

[13] About 53 percent of the beneficiaries in the analysis have more than one enrollment span.

estimated difference in outcomes between demonstration and comparison states, using the covariate distribution of the demonstration states.

We estimated several alternative models. First, we ran separate regressions for each demonstration state, excluding the others. In the above equation, the model is equivalent to limiting the sample to a single demonstration state and the five comparison states and removing the terms for the excluded states. Next, we restricted the effect of beneficiary engagement policies to be the same across the three demonstration states by estimating a regression model with a single indicator variable for residence in any of the three demonstration states. In the above equation, the model is equivalent to replacing the *Indiana, Iowa,* and *Michigan* variables with a single variable *Demo*, where *Demo* is equal to 1 if the beneficiary resides in Indiana, Iowa, or Michigan and 0 otherwise. The model estimates the binary effect of a state's adoption of any beneficiary engagement program. Finally, we included state-specific fixed effects for seven of the eight included states and generated predicted values of the utilization outcomes. This approach relaxes the restriction that the comparison states have the same influence on the outcomes. We found that the results were similar across all specifications.

For the main model specification and for each of the alternative specifications described above, we estimated models that allowed the effect of the demographic and health characteristics to vary by state or by demonstration status by including interactions between the state-specific indicator variables or the single demonstration indicator and each of the control variables. The main model specification results in the following functional form:

$$y_{its} = \alpha + \Sigma_{s\in\{IN,IA,MI\}}(I_s * (\beta_{s1} + \beta_{s2} X_{its})) + \delta X_{its} + \varepsilon_{its}$$

Using this alternative specification produced results similar to those obtained by using our main specification.

3. Demographic characteristics for sample in health care utilization models

In Table C.15, we report the demographic characteristics of beneficiaries we included in our analyses. Beneficiaries in demonstration and comparison states are similar in age, sex, and CDPS score, with standardized differences below 5 percent.[14] Demonstration beneficiaries are on average less likely to live in rural areas than comparison state beneficiaries are, although there is substantial variation in rural residence within both demonstration and comparison states.

[14] Although there are no broadly accepted thresholds of acceptability for standardized differences, the What Works Clearinghouse, a repository of education research, maintains that regression adjustment is adequate to control for standardized differences of 5 percent and lower.

Table C.15. Demographic characteristics of beneficiaries included in analyses of beneficiary engagement programs

Characteristic	Demonstration states			All demonstration states %	All comparison states %	Standardized difference
	Indiana %	Iowa %	Michigan %			
Age						
19–26	22.7	22.9	22.9	22.9	21.7	0.03
27–35	29.1	23.4	23.1	24.0	24.3	
36–45	23.2	20.0	19.0	19.8	20.6	
46–55	16.7	20.9	21.1	20.4	20.4	
56–64	8.4	12.9	13.9	12.9	13.0	
Sex						
Female	68.5	52.4	49.7	52.9	50.7	0.05
Geographic location						
Rural	23.7	41.5	18.0	23.2	29.6	-0.14
CDPS score Mean (s.d.)	1.2 (1.0)	1.2 (1.1)	1.2 (1.2)	1.2 (1.1)	1.2 (1.2)	-0.01
Total in sample	296,984	388,110	1,391,813	2,076,907	5,428,429	

Source: Mathematica analysis of state administrative data and Medicaid MAX and Alpha-MAX data, January 2014–December 2017, for Indiana, Iowa, and Michigan (demonstration states) and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states).

Note: The table shows demographic and health characteristics of demonstration or expansion enrollees in each state by treatment condition. The difference between demonstration and comparison groups as a percentage of a standard deviation is shown in the standardized difference column.

s.d. = standard deviation.

Appendix D

IPUMS-ACS: Modeling Specifications and Descriptive Statistics

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To gauge the effect of monthly payments on enrollment for the Domain 2 analyses summarized in Chapter IV, we used logistic regression models to estimate the probability that a person in the expansion population reported being enrolled in Medicaid. We used Integrated Public Use Microdata Series (IPUMS) American Community Survey (ACS) data from 2012 through 2017 to estimate pooled cross-sectional time-series models with fixed effects for states and years.

A. Defining the likely eligible population

We used IPUMS-ACS data to estimate the low-income adult population that is not elderly, disabled, or dual eligible—and would therefore likely be eligible for Medicaid. We included people in the data set who (1) are ages 19 to 64, (2) are citizens or likely eligible noncitizens, (3) have a modified adjusted gross income (MAGI) that is less than or equal to 138 percent of the federal poverty level (FPL), and (4) do not receive Supplemental Security Income (SSI).

Excluding all noncitizens could cause us to underestimate the overall Medicaid-eligible population because there are several categories of "lawfully present" immigrants who are eligible for Medicaid. However, including all noncitizens would also introduce errors that would differ from state to state because some states have more noncitizens than others.

To identify noncitizens who are likely eligible for Medicaid, we applied an algorithm developed by George Borjas (2017a, 2017b) to impute the immigration status of noncitizens at the individual level in microdata series such as the ACS. The Borjas algorithm classifies noncitizens as "legal immigrants" if they or their spouses meet conditions such as military service; employment in the public sector; or enrollment in or receipt of government services, including the Supplemental Nutrition Assistance Program, Temporary Assistance for Needy Families, Social Security benefits, SSI, Medicare, Medicaid, or TRICARE. The algorithm assumes all other noncitizens to be undocumented and ineligible for Medicaid. The Borjas imputation criteria have been applied in other studies using ACS data to examine Medicaid enrollment (Cohen and Schpero 2018).

We estimated FPL by constructing health insurance units (HIUs) because family income underestimates the number of adults likely eligible for Medicaid (SHADAC 2012). The HIU is different from the Census Bureau's definitions of household or family. A household includes all people who are living together, whereas a family includes all related members of a household. The HIU is a narrower definition that groups people based on relationships that matter for public insurance eligibility. For example, the Census Bureau would designate a household with a parent and an adult child as a family, but the adult child would not be eligible for coverage under his or her parent's health insurance and, therefore, would be assigned a separate HIU. We used the State Health Access Data Assistance Center's algorithm to construct HIUs based on age, marital status, and relationships to household members.

B. Specifications for regression models of Medicaid enrollment in the likely eligible population

The inclusion of fixed effects for states in the pooled cross-sectional time-series models reduces the potential for omitted-variable bias by controlling for unique, unobservable characteristics of each state, independent of the state's implementation of Medicaid expansions and monthly payment requirements. The inclusion of fixed effects by year accounts for secular nationwide trends. This is an analytically strong approach that isolates the relationship between the probability of Medicaid enrollment and monthly payments. However, these models do not definitively establish causality.

The demonstration states were Arkansas, Indiana, Iowa, Michigan, and Montana. Comparison states included Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, and West Virginia.

Primary model. The primary model took the following form, where person-years are the unit of analysis:

$$y_{ist} = \alpha + \beta_1 Exp_{st} + \beta_2 Prem_{st} + \beta_3 Amt_{ist} + \theta State_s + \mu Year_t + \delta X_i + \varepsilon_{ist}$$

where:

- y_{ist} is the enrollment outcome *(y)* for a person *(i)* in a state *(s)* in year *(t)*, which equals 1 if person *(i)* reports enrollment in Medicaid in year *(t)* and 0 otherwise, including people who are uninsured or have private insurance. *t* ranges from 2012 to 2017.
- α is a constant term.
- Exp_{st} is an indicator equal to 1 if state *(s)* has expanded Medicaid coverage in year *(t)*.
- $Prem_{st}$ is an indicator equal to 1 if state *(s)* requires monthly payments in year *(t)*.
- Amt_{st} is the payment amount applied to person *(i)* in demonstration states. Because the distribution of monthly payment amounts is not linear—for example, Iowa requires two different dollar amounts, and Michigan requires payment amounts of 2 percent of income, but only for people with incomes above 100 percent of the FPL—we bucketed monthly payment amounts as follows: $0, $1–5, $6–10, $11–20, $21–30, and over $30.[15]
- $State_s$ is a set of fixed effects for states.
- $Year_t$ is a set of fixed effects for years.

[15] We also coded payment amounts as a continuous variable; estimates for which we used this coding were comparable to those presented above.

- X_i is a vector of sociodemographic and health characteristics of person *(i)*. These included age, sex, race, Hispanic/Latino ethnicity, education level, employment status, presence of children in the household, and disability status.
- ε_{ist} is a random error term.

The model captures how in most demonstration states (except Indiana and Montana), monthly payments ($Prem_{st}$) are imposed with a lag after the Medicaid expansion (Exp_{st}) takes effect. Essentially, this model treats the expansion and advent of monthly payments as two separate events. This model allows these events to be either staggered or concurrent, which enables us to better isolate the effect of each event so that the effect of expansion—which we expect to be quite large—does not swamp the effect of monthly payments. We include a weighting variable made available by IPUMS to ensure the survey data are representative of each state's population.

The critical parameters in the model are β_2, a coefficient that measures the effect of being in a state where monthly payments are required, and β_3, a coefficient that measures the impact of the effect of the monthly payment amount on the probability that person *i* reports being enrolled in Medicaid. The β_2 effect estimate equals the difference in the probability of reported Medicaid enrollment when monthly payment obligations are in effect compared with the probability of reported Medicaid enrollment in states and years when monthly payments are not required as part of the expansion. If monthly payments dampen Medicaid enrollment, we would expect β_2 to be negative and statistically significant. In other words, the model assumes that changes in the probability of Medicaid enrollment before and after monthly payments took effect in demonstration states would be similar to the trend in comparison states had they too expanded without introducing monthly payments. The difference between the two groups of states in the probability of enrolling in Medicaid can thus be ascribed to monthly payment obligations.

This design differs from a classic difference-in-differences design in that there is no single demarcation between pre-periods and post-periods in our data. Instead, this model uses indicator variables to reflect staggered implementation of both Medicaid expansions and monthly payment requirements. This allows each state its own baseline probability of Medicaid enrollment. The coefficient on β_2 is the coefficient on the indicator that reflects implementation of monthly payment requirements, which took place in different years for different states.

Sensitivity analyses. We conducted tests to assess whether our results were sensitive to different coding decisions. First, we conducted sensitivity tests to address unique characteristics of three demonstration states: Michigan, Arkansas, and Indiana. In Michigan and Arkansas, monthly payments were in effect for partial years. Because the observations in this model are yearly, for Michigan, our main model defined the period for which monthly payments were in effect as 2015 through 2017, even though many people would have owed monthly payments beginning in October 2014. For Arkansas, our main model defined the period for which monthly payments

were in effect as 2015 and 2017, but not 2016, even though some beneficiaries would have owed monthly payments in 2016 before Arkansas stopped collecting Independence Account payments in April 2016. As a sensitivity analysis, we coded Michigan as having monthly payments in 2014 and Arkansas as having monthly payments in 2016. We then estimated a model with only the variable reflecting residence in a state with monthly payments. The estimated marginal effect of the recoded variable was slightly larger (a 3.5 percentage-point reduction in the probability of enrollment in Medicaid versus a 2.7 percentage-point reduction) and was similarly statistically significant.

In the case of Indiana, the state previously operated a section 1115 demonstration (HIP 1.0) that charged monthly payments and provided coverage to caretaker and noncaretaker adults with incomes up to 200 percent of the FPL, but it imposed enrollment caps for noncaretaker adults. We estimated the effect of living in a state with monthly payments in a model that included only the subset of adults in single-person households, which better isolates the effect of expansion in Indiana under HIP 2.0. Both caretakers and noncaretakers could enroll and owe monthly payments under HIP 1.0, but enrollment of noncaretakers was capped, making the February 2015 expansion a more significant event for this population. The estimated marginal effect of the recoded variable was slightly lower (a 2.2 percentage-point reduction in the probability of enrollment in Medicaid versus a 2.7 percentage-point reduction) and was similarly statistically significant as estimates for which we used the original coding.

We conducted a sensitivity test to assess the extent to which high monthly payments might be affecting our estimates. Although most people in the data set were estimated to have monthly payments below $50, about 0.4 percent of the people in demonstration states who were subject to monthly payments had estimated amounts greater than $75. To ensure that a few people with very high estimated payments were not coloring our estimates of the effect of different payment amounts, we truncated our observations by dropping anyone who was estimated to have monthly payments above $75. The results were similar to those based on the original specification.

We also conducted a sensitivity test to assess the extent to which our definition of the likely eligible population might be affecting our estimates. The results were very similar when we excluded all noncitizens and when we used the family income variable in IPUMS-ACS to estimate MAGI rather than income for the HIU.

C. Specifications for regression models of Medicaid enrollment among key demographic groups

To estimate the effect of monthly payments on enrollment in key demographic groups (Question 1b), we used the same years of IPUMS-ACS data (2012 through 2017) and the same demonstration and comparison states, but we segmented the likely eligible population into demographic groups by age, sex, race, Hispanic/Latino ethnicity, education level, employment status, presence of at least one child under age 18 in the household, and disability status. The general model took the following form, where person-years are the unit of analysis:

$$y_{ist} = \alpha + \beta_1 Exp_{st} + \beta_2 Premindivid_{ist} + \theta State_s + \mu Year_t + \delta X_i + \varepsilon_{ist}$$

and where the key variable is $Premindivid_{ist}$, which reflects individual eligibility for monthly payments, regardless of the amount. $Premindivid_{ist}$ is an indicator equal to 1 if person *i*'s income given state *s* makes him or her subject to monthly payments in year *t*. This variable bundles all payment amounts in the different amount categories coded for Amt_{ist}.

D. Descriptive statistics for IPUMS-ACS data

Table D.1 shows the frequencies for variables included in IPUMS-ACS regressions.

Table D.1. Descriptive statistics for data used in IPUMS-ACS models

Variable	Percent
Estimated eligibility	
People reporting enrollment in Medicaid	32.6
State with monthly payments	15.4
People eligible for monthly payments based on income	7.7
Estimated monthly payment amounts:	
$0	92.3
$1–$5	2.1
$6–$10	1.1
$11–$20	1.4
$21–$30	1.9
$31+	1.3
Age	
19–26	40.4
27–35	19.3
36–45	15.0
46–55	13.8
56–64	11.4
Sex	
Female	51.2
Male	48.8

Table D.1 (*continued*)

Variable	Percent
Race	
White	74.7
Black	15.0
Other	10.3
Ethnicity	
Hispanic	9.6
Non-Hispanic	90.4
Education	
Less than high school	13.4
High school	46.0
Some college	30.4
4+ years of college	10.2
Employment status	
Employed	46.0
Unemployed	12.4
Not in labor force	41.6
Children in household	
Yes	26.9
No	73.1
Disability	
Yes	17.9
No	82.1
Total in weighted sample	68,733,280

Source: Mathematica analysis of IPUMS-ACS data, 2012–2017.

Appendix E

Behavioral Risk Factor Surveillance System: Measure Construction, Modeling Specifications, and Descriptive Statistics

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To address questions in Domains 1 and 3, we used 2012–2017 data from the Behavioral Risk Factor Surveillance System (BRFSS). We conducted logistic regression analyses, limited to people ages 18 to 64 at the time of the survey who reported annual household incomes of less than $35,000. This group likely includes demonstration beneficiaries and beneficiaries of other Medicaid programs and low-income nonbeneficiaries, enabling us to examine the population-level effects of Medicaid expansion via demonstration models.

A. Domain 1: Measure construction, modeling specifications, and descriptive statistics

We used BRFSS analyses to assess population-level changes in unmet need for care following the implementation of premium assistance demonstrations. We used Arkansas, Iowa, and New Hampshire as demonstration states and used Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, and West Virginia as comparison states.

1. Construction of outcome measures

We used BRFSS variables to create binary indicators of whether a respondent had a routine checkup within the past year, reported having a personal doctor or health provider, or had a medical need that was unmet because of cost.

2. Specifications for regression models of unmet need for medical care among BRFSS survey respondents with low incomes

The primary model took the following form, where person-years are the unit of analysis:

$$y_{ist} = \alpha + \beta_1 Year_t + \beta_2 State_s + \delta X_{ist} + \theta Post_{st} * State_s + \varepsilon_{ist}$$

where:

- y_{ist} is the outcome *(y)* for a person *(i)* in state *(s)* in year *(t)*, which for all included outcome measures equals 1 if the person reported having a personal doctor, having a need that is unmet because of cost, or having a checkup within the last year; otherwise, it equals 0.
- α is a constant term.
- $Year_t$ is a set of dummy variables for each year after 2012.
- $State_s$ is a set of dummy variables for each demonstration state.
- $Post_{st}$ is an indicator equal to 1 if state *(s)* has expanded Medicaid in year *(t)*.

- X_{ist} is a set of sociodemographic characteristics of person *(i)*, including age, sex, race/ethnicity, education, marital status, employment status, income, and indicators for disability and for the presence of a child in the household.[16]
- ε_{ist} is a random error term.

This logistic model allows for a flexible secular trend by including year dummies, and it includes an indicator for expansion to reflect staggered implementation. The interaction between the $State_s$ dummies and the $Post_t$ dummy allows for differential effects of expansion in each demonstration state, which is important because of the differences in states' implementation experiences.

We calculated average marginal effects (one for each treatment state) to assess the expected effect of each of the three demonstrations, controlling for individual characteristics. If premium assistance affects beneficiaries' unmet need for medical care, we would expect to see average marginal effects that are statistically significant. But because the sample includes all people with low incomes (many of whom are not enrolled in Medicaid), we could fail to detect a real effect that exists for those enrolled in qualified health plans because that effect would be diluted when considering population-level outcomes.

3. Descriptive statistics for BRFSS data

Table E.1 presents demographic characteristics of the BRFSS sample included in the analyses. The profiles of respondents in demonstration and comparison states were largely similar—only the distribution of race/ethnicity groups differed by more than five percent of a standard deviation.

However, the differences between demonstration states were often larger than the differences between the pooled demonstration states and the comparison states. For example, respondents in Arkansas were more likely to be married than respondents in Iowa or New Hampshire or those in comparison states, whereas respondents in Iowa were more likely to be employed than respondents in Arkansas, New Hampshire, or comparison states. Respondents in New Hampshire were also more likely to be non-Hispanic White than respondents in Arkansas or Iowa.

[16] We created a proxy measure of disability, in which respondents were considered disabled if they indicated that they were limited in their activities; used special equipment; were blind or had cognitive limitations; or had difficulty walking or climbing stairs, dressing or bathing, or doing errands alone.

Table E.1. Demographic characteristics of Domain 1 BRFSS sample

Characteristic	Arkansas %	Iowa %	New Hampshire %	Demonstration states %	Comparison states %	Standardized difference
Female	53.8	53.3	54.0	53.7	53.1	0.01
Married	33.7	27.7	24.0	30.4	28.4	0.04
Employed	48.2	57.7	52.4	52.1	50.1	0.04
Has child(ren)	43.5	39.7	36.7	41.3	40.5	0.02
Disabled[a]	43.2	34.5	41.0	39.9	38.8	0.02
Race						
White, non-Hispanic	63.6	76.3	86.3	70.8	63.7	0.15
Black, non-Hispanic	22.9	6.4	1.8	14.5	12.7	0.05
Hispanic	9.0	10.7	4.9	9.1	15.5	-0.20
Other	4.6	6.6	7.0	5.6	8.1	-0.10
Age						
18–24	19.0	23.1	20.5	20.6	18.3	0.06
25–34	22.4	22.5	22.6	22.4	23.7	-0.03
35–44	20.0	17.1	15.3	18.4	17.7	0.02
45–54	19.7	17.4	20.1	18.9	19.2	-0.01
55–64	18.9	19.8	21.5	19.6	21.0	-0.04
Education						
Less than high school	22.4	16.7	17.3	19.8	21.7	-0.05
High school	39.8	36.2	40.3	38.6	37.6	0.02
Some college or technical school	30.7	36.7	29.9	32.7	30.8	0.04
College or technical school degree	7.1	10.4	12.5	8.9	9.8	-0.03
Income						
Less than $15,000	32.6	27.5	26.9	30.1	29.5	0.01
$15,000–$24,900	43.3	40.6	43.3	42.3	43.2	-0.02
$25,000–$35,000	24.1	31.9	29.9	27.5	27.3	0.01
Unadjusted sample size	6,947	7,334	5,675	19,956	92,595	
Weighted sample size	4,672,656	3,122,560	1,075,705	8,870,920	55,137,174	

Source: Mathematica analysis of 2012–2017 BRFSS data for Arkansas, Iowa, and New Hampshire (treatment states) and for Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, and West Virginia (comparison states).

Notes: The difference between demonstration and comparison groups as a percentage of a standard deviation is shown in the standardized difference column.

[a] "Disabled" is a proxy measure of disability; respondents were considered disabled if they indicated that they were limited in their activities; used special equipment; were blind or had cognitive limitations; or had difficulty walking or climbing stairs, dressing or bathing, or doing errands alone.

B. Domain 3: Measure construction, modeling specifications, and descriptive statistics

To estimate the effect of beneficiary engagement policies on self-reported receipt of preventive services, cancer screenings, and other health behaviors and on the management of chronic conditions, we analyzed BRFSS data on several outcome measures. Because the analysis likely included nondemonstration beneficiaries, we were able to test whether we can detect population-level behavior changes after the implementation of beneficiary engagement demonstrations. Treatment states included Indiana, Iowa, and Michigan. Comparison states included Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, and West Virginia.

1. Construction of outcome measures

For some outcomes, the measures we used came from survey questions not fielded in every state and every year. To be included in our analyses, a state must have fielded the question in at least one year before the expansion and one year after the expansion. Preventive behaviors included having a checkup in the last year, having a cholesterol test, receiving a flu shot, stopping tobacco use, and engaging in physical activity. States fielded questions on these topics every year except the cholesterol questions, which were fielded in 2013, 2015, and 2017 only.[17] Self-reported receipt of cancer screenings included receipt of a mammogram, Pap test, prostate-specific antigen test, blood stool test, or sigmoidoscopy or colonoscopy in the past year. All states fielded questions on these screenings in 2012, 2014, and 2016, and some states also fielded these questions in 2013 and 2015. Chronic care behaviors included managing high blood pressure and diabetes. All states fielded questions on high blood pressure, but only in 2013, 2015, and 2017. States asked about diabetes as part of an optional module, so we have data from a subset of states on diabetes care.

Table E.2 lists the outcome measures used in the population-level analyses.

2. Specifications for regression models of preventive care, cancer screening, and management of chronic conditions among BRFSS survey respondents with low incomes

The primary model is the same as the model used to analyze unmet need under Domain 1 (Section E.A.2).[18] In this case, the outcomes were use of preventive care, receipt of cancer screenings, and management of chronic conditions. We calculated average marginal effects (one for each treatment state) from this logistic regression analysis to assess the expected effect of each of the three demonstrations, controlling for individual characteristics. If beneficiary

[17] 2013 is a pre-expansion year in all included states, and 2015 and 2017 are post-expansion years in all included states.

[18] The Domain 3 model for breast cancer screening, Pap tests, and prostate cancer screening excludes sex as a control variable because only female or male respondents were asked about the applicable screenings.

engagement policies encourage beneficiaries to actively participate in their care, we would expect to see average marginal effects that are positive and statistically significant.

Table E.2. Outcome measures in the analysis of BRFSS data, with states and years included in analysis

Measure	Definition	Included states	Included years
Preventive care			
Checkup within last year	Respondent reports having had a checkup in the past year.	All	2012–2017
Cholesterol check within one year	Respondent reports having had his or her cholesterol checked in the past year.	All	2013, 2015, 2017
Flu shot	Respondent received a flu vaccine in the past year.	All	2012–2017
Current smoker	Respondent has smoked more than 100 cigarettes in his or her life and currently smokes all or some days.		
Quit attempt	In the past 12 months, respondent stopped smoking for one day or longer because he or she was trying to quit smoking.		
Physical activity	Respondent engaged in physical activity in the last month.		
Cancer screening			
Received mammogram in past year	Respondent reports having had a mammogram in the past year.	All	2012, 2014, 2016
		Ohio, Oregon, Washington	Also 2015
Received Pap test in past year	Respondent reports having had a Pap test in the past year.	All	2012, 2014, 2016
		Ohio, Oregon, Washington	Also 2015
Had prostate-specific antigen test in past year	Respondent reports having had a prostate-specific antigen test in the past year.	All	2012, 2014, 2016
Had blood stool test in past year	Respondent reports having had a blood stool test in the past year.	All	2012, 2014, 2016
		Michigan, Nevada, Washington	Also 2013, 2015
		Ohio	Also 2015
Had sigmoidoscopy/ colonoscopy in past year	Respondent reports having had a sigmoidoscopy or colonoscopy in the past year.	All	2012, 2014, 2016
		Michigan, Nevada, Washington	Also 2013, 2015
		Ohio	Also 2015

Table E.2 (*continued*)

Measure	Definition	Included states	Included years
Care of chronic conditions			
Blood pressure medication	Respondent is taking medication to control high blood pressure (limited to respondents who report having high blood pressure).	All	2013, 2015, 2017
Insulin	Respondent is taking insulin (limited to respondents who report having diabetes).	Indiana	2012–2015, 2017
		Iowa	2013–2015, 2017
Diabetes doctor visit	Respondent has seen a doctor in the past year about respondent's diabetes (limited to respondents who report having diabetes).	Kentucky	2012–2013, 2015, 2017
		Michigan	2012–2013, 2015, 2017
		Nevada	2012–2013, 2015, 2017
HbA1c check	Respondent has had an HbA1c check in the past year (limited to respondents who report having diabetes).	New Mexico	2012–2015, 2017
		North Dakota	2012–2014, 2017
		Ohio	2012–2014, 2017
		Pennsylvania	2012–2013, 2015, 2017
		West Virginia	2012–2014

3. Descriptive statistics for BRFSS data

Table E.3 shows the demographic characteristics of BRFSS respondents in each of our three treatment states and in the comparison states. The demonstration states varied most substantially in their racial/ethnic composition and, to a lesser extent, in educational attainment. The characteristics of respondents in the comparison states generally resembled those of respondents in the treatment states, although differences in racial/ethnic distribution were larger than five percent of a standard deviation.

Table E.3. Demographic characteristics of Domain 3 BRFSS sample

Characteristic	Indiana %	Iowa %	Michigan %	Demonstration states %	Comparison states %	Standardized difference
Female	54.6	53.3	52.3	53.2	53.1	0.00
Married	30.0	27.7	26.3	27.8	28.4	-0.01
Employed	50.8	57.7	46.6	49.6	50.1	-0.01
Child in household	43.4	39.7	38.9	40.6	40.5	0.00
Disabled[a]	36.9	34.5	42.6	39.4	38.8	0.01
Race/ethnicity						
White	69.8	76.3	64.2	67.9	63.7	0.09
Black	14.5	6.4	23.1	17.8	12.7	0.14
Hispanic	11.4	10.7	6.8	9.0	15.5	-0.20
Other	4.3	6.6	5.9	5.4	8.1	-0.11
Age						
18–24	19.6	23.1	19.1	19.8	18.3	0.04
25–34	23.2	22.5	22.4	22.7	23.7	-0.02
35–44	17.8	17.1	17.1	17.4	17.7	-0.01
45–54	19.2	17.4	19.3	19.0	19.2	-0.01
55–64	20.1	19.8	22.1	21.1	21.0	0.00
Education						
Less than high school	24.0	16.7	19.8	20.9	21.7	-0.02
High school	39.4	36.2	36.0	37.2	37.6	-0.01
Some college	28.4	36.7	35.0	32.9	30.8	0.04
College	8.1	10.4	9.2	9.0	9.8	-0.03
Income						
$0–$15K	29.5	27.5	31.4	30.2	29.5	0.02
$15K–$25K	43.8	40.6	41.2	42.1	43.2	-0.02
$25K–$35K	26.7	31.9	27.3	27.7	27.3	0.01
Unadjusted sample size	12,700	7,334	12,788	32,822	92,595	
Weighted sample size	8,323,311	3,122,560	11,758,854	23,204,725	55,137,174	

Source: Mathematica analysis of 2012–2017 BRFSS data for Indiana, Iowa, and Michigan (demonstration states) and for Kentucky, Nevada, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Washington, and West Virginia (comparison states).

Notes: The difference between demonstration and comparison groups as a percentage of a standard deviation is shown in the standardized difference column.

[a] "Disabled" is a proxy measure of disability; respondents were considered disabled if they indicated that they were limited in their activities; used special equipment; were blind or had cognitive limitations; or had difficulty walking or climbing stairs, dressing or bathing, or doing errands alone.

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Appendix F

Medicaid Take-Up by Demographic Subgroups

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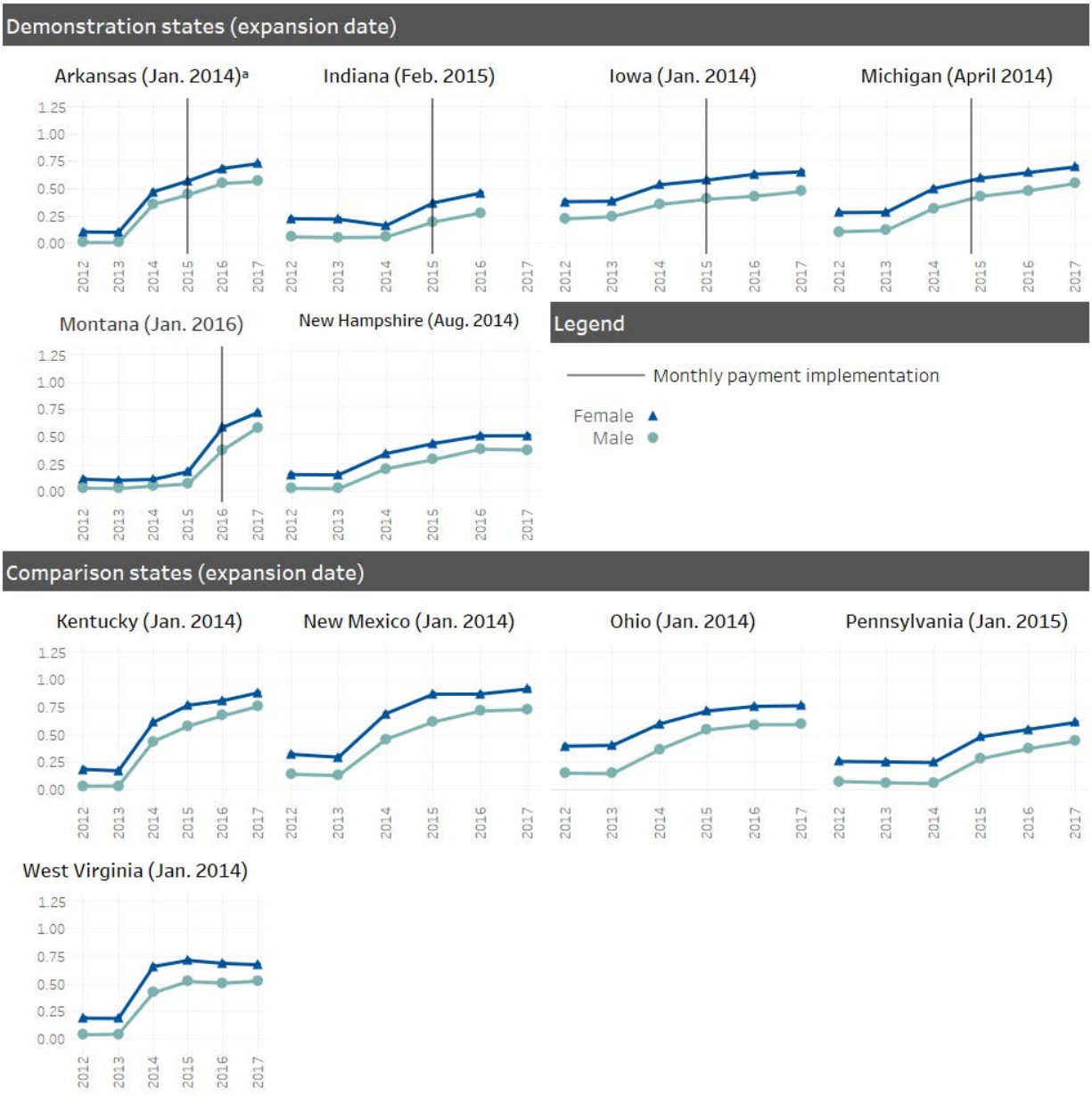
Figure F.1. Medicaid coverage take-up by sex



Source: Mathematica analysis of take-up estimates, calculated by using Medicaid administrative data to compute average monthly enrollment in the numerator and Integrated Public Use Microdata Sample-American Community Survey (IPUMS-ACS) data to estimate likely eligible population in the denominator.

Note: Take-up estimates in expansion years exclude the first three months post-expansion from the calculation of average monthly enrollment in the numerator. For Indiana, Michigan, and New Hampshire, expansion occurred midyear, so take-up estimates in expansion years also exclude pre-expansion months. New Hampshire expanded traditional Medicaid coverage in August 2014 before the state implemented its section 1115 demonstration in January 2016.

Arkansas and Iowa are demonstration (treatment) states for both Domain 1 (premium assistance) and Domain 2 (monthly payments) analyses. New Hampshire is a demonstration (treatment) state for Domain 1 only. Indiana, Michigan, and Montana are demonstration (treatment) states for Domain 2 only.

[a] Numerators for Arkansas include the expansion population only. Arkansas stopped requesting monthly payments of beneficiaries in April 2016 and implemented a new monthly payment policy in January 2017.

Figure F.2. Medicaid coverage take-up by age

Source: Mathematica analysis of take-up estimates, calculated by using Medicaid administrative data to compute average monthly enrollment in the numerator and Integrated Public Use Microdata Sample-American Community Survey (IPUMS-ACS) data to estimate likely eligible population in the denominator.

Notes: Take-up estimates in expansion years exclude the first three months post-expansion from the calculation of average monthly enrollment in the numerator. For Indiana, Michigan, and New Hampshire, expansion occurred midyear, so take-up estimates in expansion years also exclude pre-expansion months. New Hampshire expanded traditional Medicaid coverage in August 2014 before the state implemented its section 1115 demonstration in January 2016.

Arkansas and Iowa are demonstration (treatment) states for both Domain 1 (premium assistance) and Domain 2 (monthly payments) analyses. New Hampshire is a demonstration (treatment) state for Domain 1 only. Indiana, Michigan, and Montana are demonstration (treatment) states for Domain 2 only.

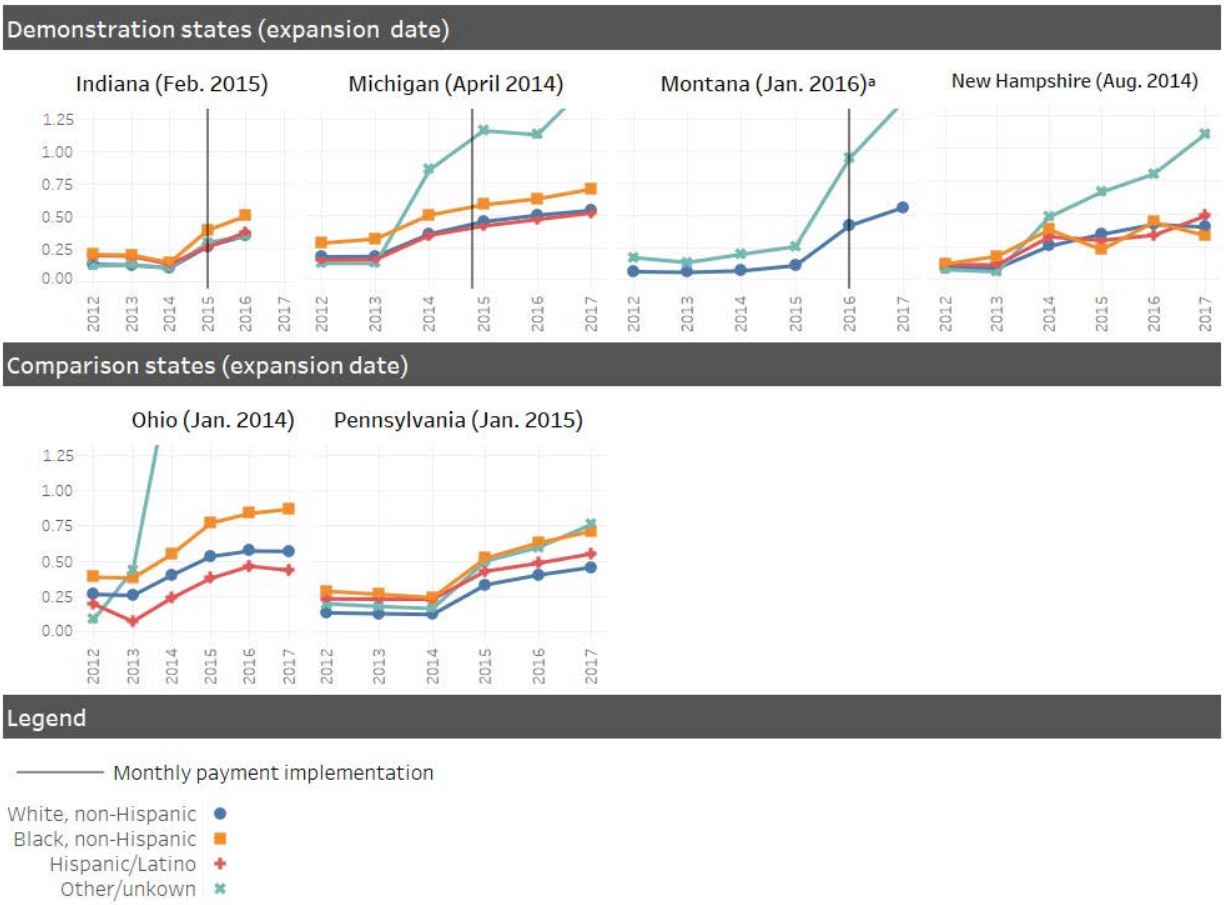
Because total enrollment cannot be higher than the number of likely eligible people in a demographic group, take-up rates of over 1.0 indicate that there is some error in the survey-based estimate of the number of individuals likely eligible for Medicaid or in the count of people enrolled in Medicaid as

Figure F.2 (*continued*)

computed from administrative data. Some degree of measurement error exists for every state, although the error is particularly apparent in the take-up estimates by age for Ohio.

[a] Numerators for Arkansas include the expansion population only. Arkansas stopped requesting monthly payments of beneficiaries in April 2016 and implemented a new monthly payment policy in January 2017.

Figure F.3. Medicaid coverage take-up by race/ethnicity



Source: Mathematica analysis of take-up estimates, calculated by using Medicaid administrative data to compute average monthly enrollment in the numerator and Integrated Public Use Microdata Sample-American Community Survey (IPUMS-ACS) data to estimate likely eligible population in the denominator.

Notes: Take-up estimates in expansion years exclude the first three months post-expansion from the calculation of average monthly enrollment in the numerator. For Indiana, Michigan, and New Hampshire, expansion occurred midyear, so take-up estimates in expansion years also exclude pre-expansion months. New Hampshire expanded traditional Medicaid coverage in August 2014 before the state implemented its section 1115 demonstration in January 2016.

New Hampshire is a demonstration (treatment) state for Domain 1 only. Indiana, Michigan, and Montana are demonstration (treatment) states for Domain 2 only.

Arkansas, Iowa, Kentucky, New Mexico, and West Virginia are excluded from this analysis because the quality of the race variable in administrative data was not sufficiently high in those states.

Because total enrollment cannot be higher than the number of likely eligible people in a demographic group, take-up rates over 1.0 indicate that there is some error in the survey-based estimate of the number of individuals likely eligible for Medicaid or in the count of people enrolled in Medicaid as computed from administrative data. Errors are particularly apparent for the "Other/unknown" category for Michigan, Montana, New Hampshire, and Ohio.

[a] Race/ethnicity is defined as "White, non-Hispanic" and "Other/unknown" for Montana because there were not enough people in other categories to create separate groups for analysis.

Appendix G

Descriptive Analyses of Administrative Data

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A. Domain 1: Descriptive analyses of access to care and expenditures and summary statistics for enrollment analysis

1. Descriptive analyses of access to care

Summary statistics. Using the variables for any receipt of service, we calculated the percentage of beneficiaries receiving the services within the first six months of a span. For the count variables, we calculated the mean utilization within each six-month span for each state (Table G.1). We included all demonstration beneficiaries in Arkansas, Iowa, and New Hampshire in utilization analyses of Medicaid administrative data, even though not all beneficiaries were enrolled in qualified health plans (QHPs). This approach makes comparison to traditional expansion states more straightforward, although it has the potential to dilute the effect of QHP enrollment in descriptive analyses. This is especially true in Iowa, which enrolled only adult expansion beneficiaries with incomes above 100 percent of the federal poverty level (FPL) into QHPs.[19] In sensitivity analyses of service use reported in Appendix C, we restricted the set of beneficiaries in demonstration states to those enrolled in QHPs.

Unadjusted rates of service use that do not control for different beneficiary characteristics suggest that demonstration beneficiaries were less likely than beneficiaries in comparison states to have physician office visits, prescription drugs, vision services, dental services, or non-emergency medical transportation services, but were more likely to use family planning services (Table G.1). When accounting for the intensity of service use, however, demonstration states used similar amounts of physician office visits but fewer amounts of prescription drugs, vision services, dental services, family planning services, and non-emergency medical transportation services (Table G.2).

[19] Among beneficiaries included in our analysis of service use during a first Medicaid expansion enrollment span of at least six months, 83 percent of Iowa beneficiaries and 21 percent of Arkansas beneficiaries were not in QHPs (Appendix Table C.4.a).

Table G.1. Summary of any service utilization for beneficiaries included in analyses of receipt of services during first Medicaid expansion enrollment span of at least six months (unadjusted values)

Any visit within 6 months	Demonstration states						All demonstration states %	All comparison states %	Difference
	Arkansas (entire state) %	Arkansas (QHP only) %	Iowa (entire state) %	Iowa (QHP only) %	New Hampshire (entire state) %	New Hampshire (QHP only) %			
Physician	45.53	53.44	69.34	70.60	59.11	58.80	52.94	58.88	-5.94
RX	55.50	56.07	64.68	59.51	57.74	56.65	58.15	61.08	-2.93
Vision	8.24	7.06	13.50	8.65	9.84	9.48	9.78	11.75	-1.97
Dental	5.30	3.84	23.48	19.07	8.27	7.87	10.45	17.75	-7.3
Family planning	9.38	9.64	12.22	12.98	11.76	12.06	10.31	9.07	1.24
NEMT	2.61	2.80	5.07	0.61	2.05	2.38	3.24	7.98	-4.74
Total beneficiaries in sample	940,333	800,898	388,110	27,193	97,528	69,064	1,425,971	5,428,429	

Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in this table includes adult expansion beneficiaries with a first span of at least six months and where covariates other than the CDPS score were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

CDPS = Chronic Illness and Disability Payment System; NEMT = non-emergency medical transportation; QHP = qualified health plan.

Table G.2. Summary of service utilization counts for beneficiaries included in analyses of receipt of services during first Medicaid expansion enrollment span of at least six months (unadjusted values)

Count of visits within 6 months	Demonstration states						All demonstration states mean (s.d.)	All comparison states mean (s.d.)	Difference
	Arkansas (entire state) mean (s.d.)	Arkansas (QHP only) mean (s.d.)	Iowa (entire state) mean (s.d.)	Iowa (QHP only) mean (s.d.)	New Hampshire (entire state) mean (s.d.)	New Hampshire (QHP only) mean (s.d.)			
Physician	2.29 (4.17)	2.69 (4.40)	3.60 (4.88)	3.53 (4.62)	2.64 (4.32)	2.74 (4.50)	2.67 (4.43)	2.67 (4.20)	0
RX	7.35 (12.11)	7.43 (12.45)	8.74 (13.64)	7.40 (12.42)	6.69 (11.13)	6.60 (11.10)	7.68 (12.50)	8.90 (14.33)	-1.22
Vision	0.10 (0.36)	0.09 (0.33)	0.16 (0.42)	0.10 (0.35)	0.12 (0.39)	0.12 (0.39)	0.12 (0.38)	0.15 (0.43)	-0.03
Dental	0.09 (0.45)	0.06 (0.35)	0.44 (0.93)	0.33 (0.81)	0.13 (0.52)	0.13 (0.50)	0.19 (0.64)	0.33 (0.82)	-0.14
Family planning	0.19 (0.76)	0.20 (0.77)	0.32 (1.03)	0.32 (1.00)	0.33 (1.09)	0.34 (1.12)	0.24 (0.86)	0.27 (1.02)	-0.03
NEMT	0.03 (0.22)	0.04 (0.23)	0.08 (0.39)	0.01 (0.11)	0.04 (0.28)	0.04 (0.29)	0.05 (0.28)	0.13 (0.50)	-0.08
Total beneficiaries in sample	940,333	800,898	388,110	27,193	97,528	69,064	1,425,971	5,428,429	

Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

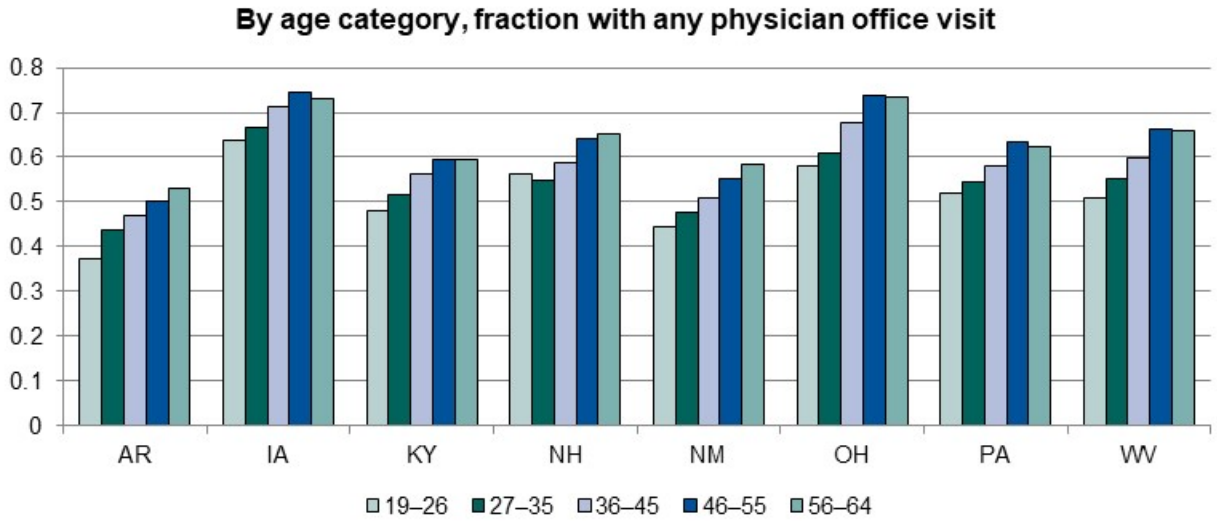
Note: The population reflected in this table includes adult expansion beneficiaries with a first span of at least six months and where covariates other than the CDPS score were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

*** Significantly different from zero at the .01 level.

CDPS = Chronic Illness and Disability Payment System; NEMT = non-emergency medical transportation; QHP = qualified health plan; s.d. = standard deviation.

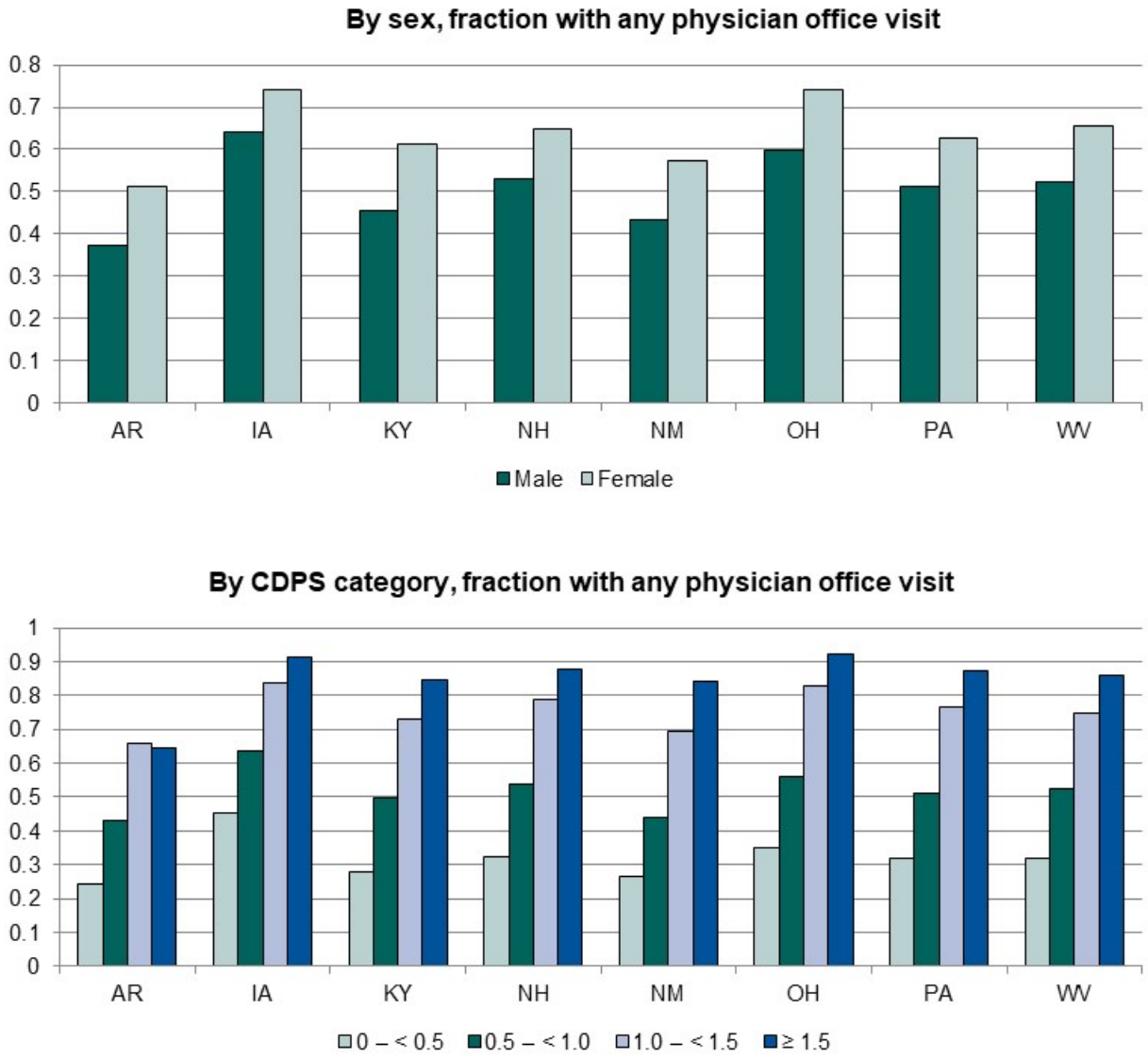
Summary statistics by demographic groups. To analyze whether beneficiaries in different demographic groups had different care patterns in the demonstration states than in the comparison states, we reviewed the percentage of beneficiaries receiving the services for which we report rates of any service use within six months (Figures G.1 through G.6) and the mean service utilization within six months (Figures G.7 through G.12), by demographic characteristics. The demographic groups included age, sex, and health status as measured by the CDPS score.[20] Demographic patterns of service use generally conform to our expectations. For example, the use of any services and the mean number of services generally increased with age and the CDPS score.

Figure G.1. Fraction of beneficiaries with any physician office visit within six months, by demographic characteristic



[20] The CDPS score is a diagnostic classification system based on the Chronic Illness and Disability Payment System algorithm developed by the University of California, San Diego. See http://cdps.ucsd.edu/ for more information.

Figure G.1 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System.

Figure G.2. Fraction of beneficiaries with any prescription within six months, by demographic characteristic

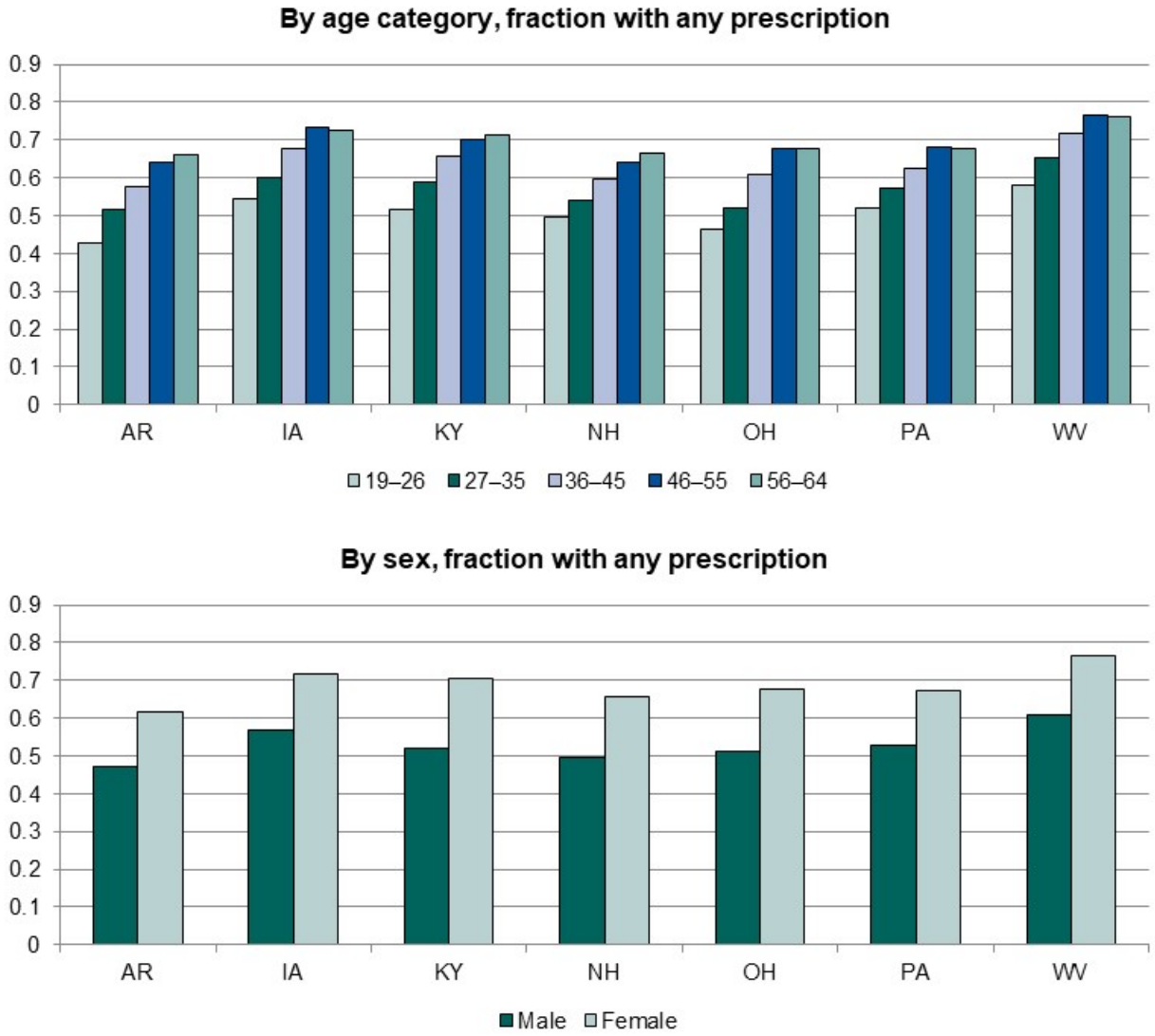
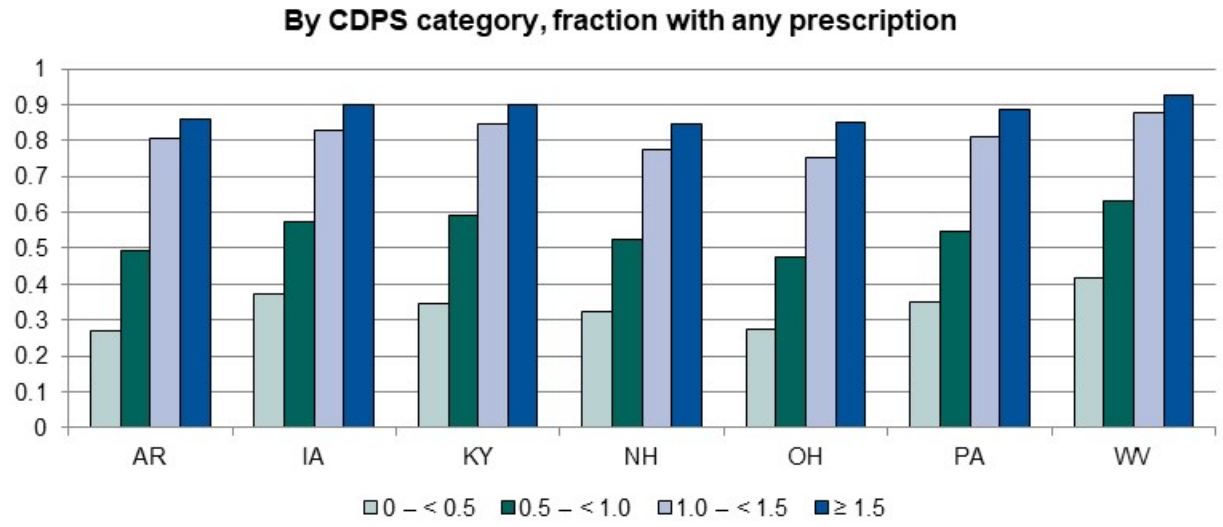


Figure G.2 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: New Mexico was excluded from prescription drug analysis because of data limitations. The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System.

Figure G.3. Fraction of beneficiaries with any vision service within six months, by demographic characteristic

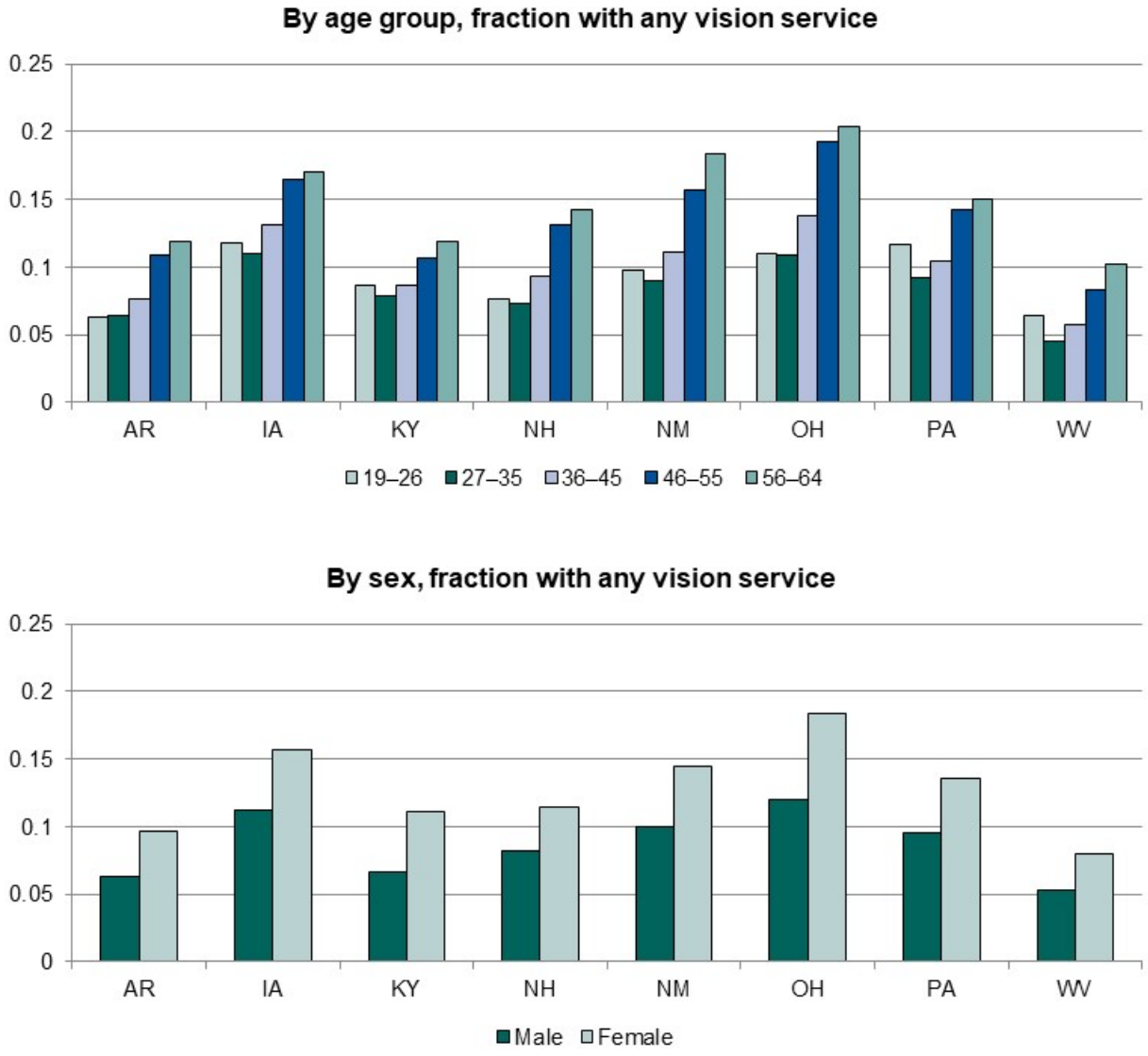
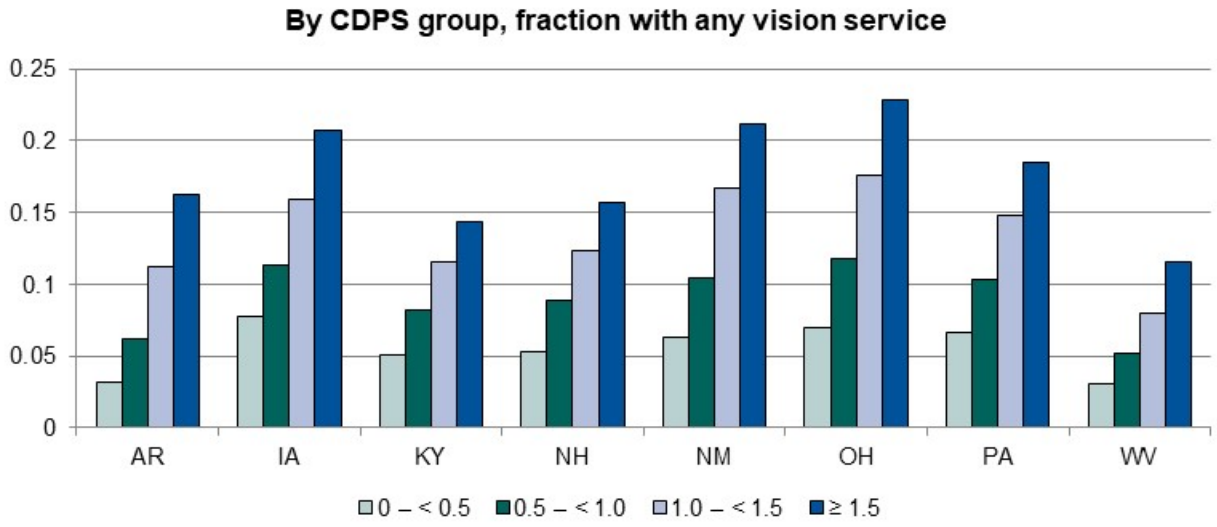


Figure G.3 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System.

Figure G.4. Fraction of beneficiaries with any dental service within six months, by demographic characteristic

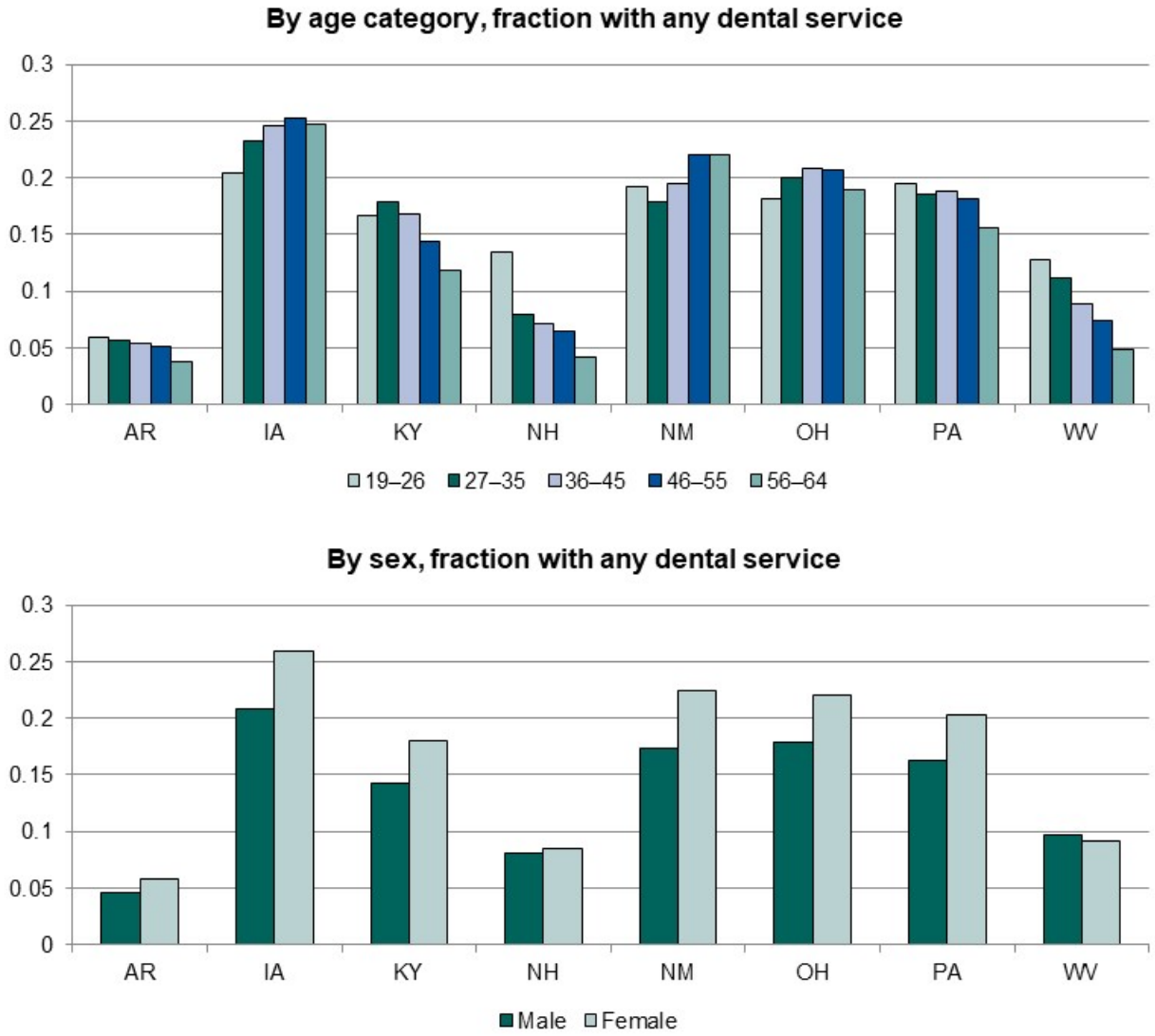
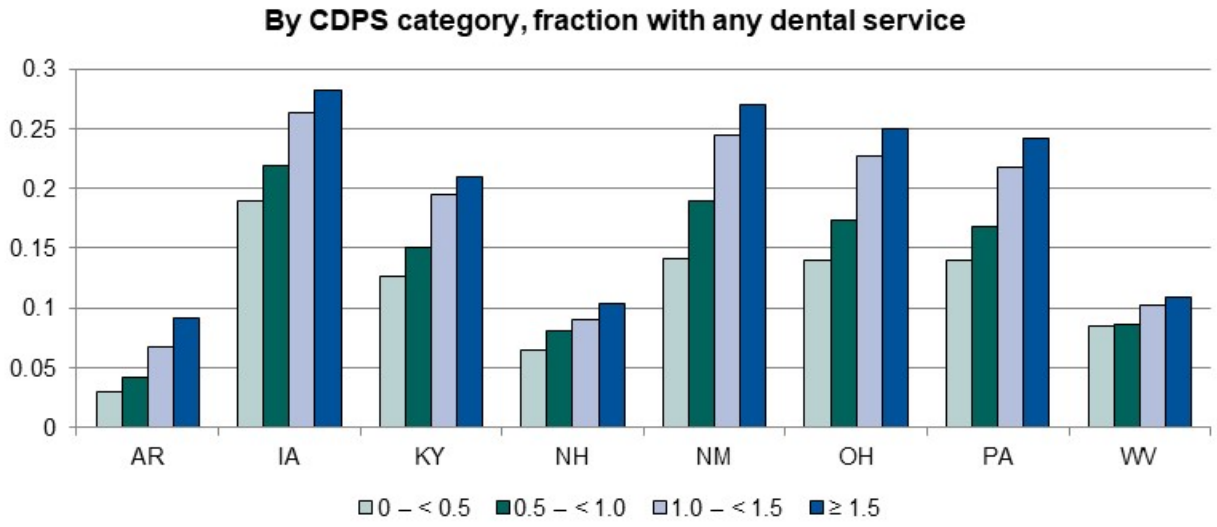


Figure G.4 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System.

Figure G.5. Fraction of beneficiaries with any family planning services within six months, by demographic characteristic

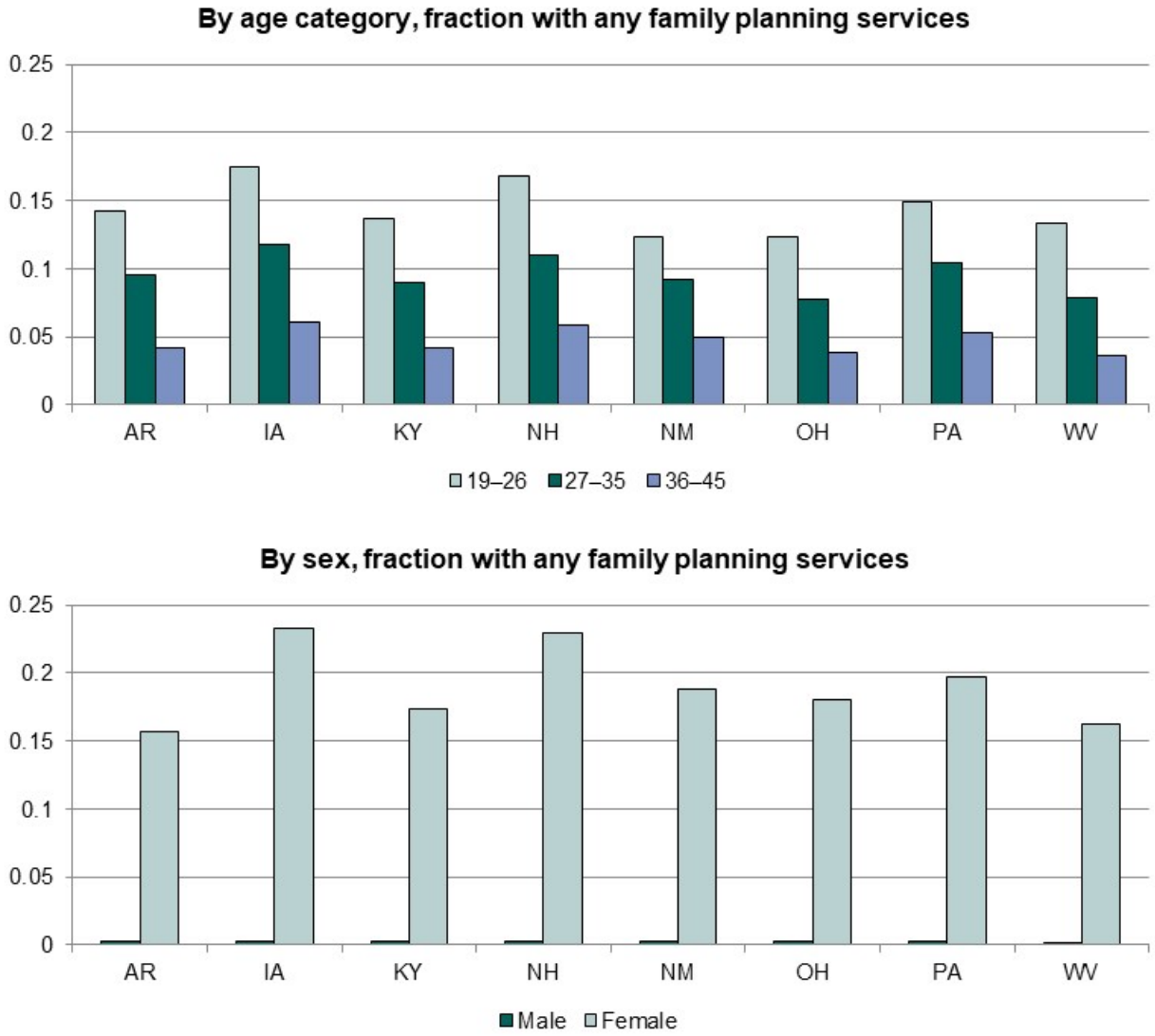
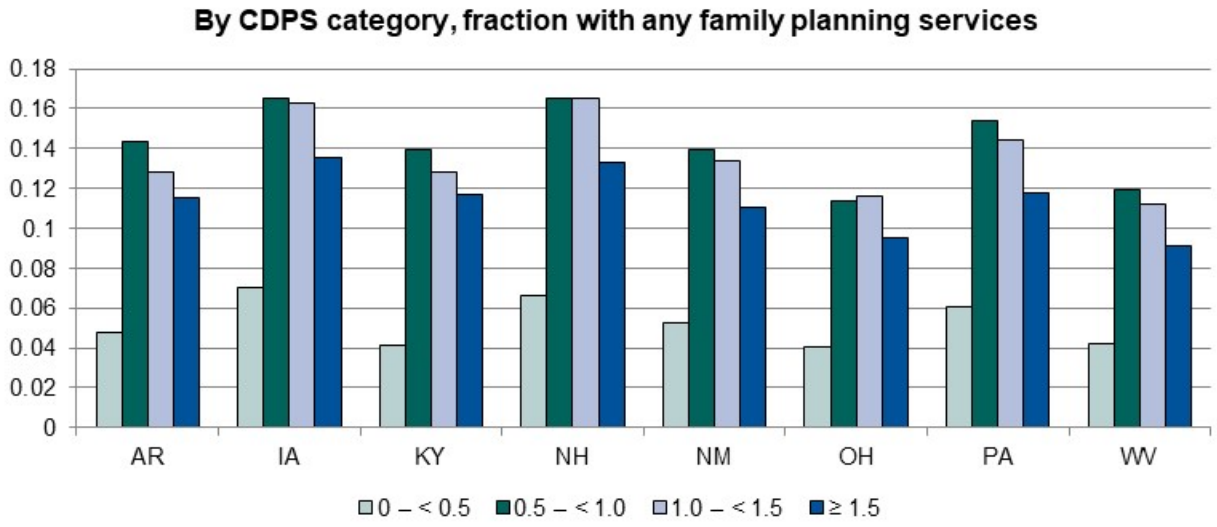


Figure G.5 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: Family planning services measure was limited to beneficiaries age 44 and younger. The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System.

Figure G.6. Fraction of beneficiaries with any NEMT service within six months by demographic characteristic

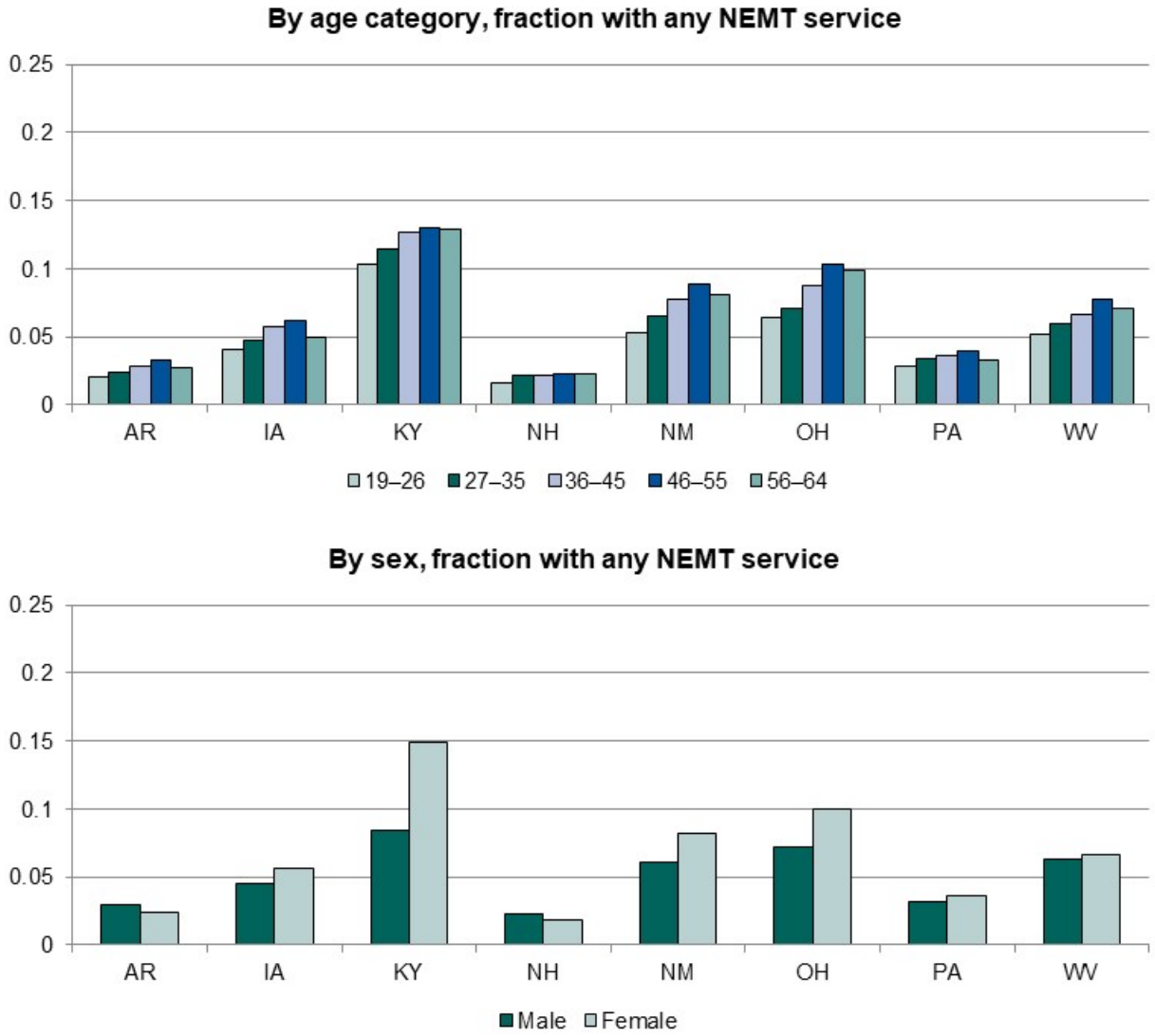
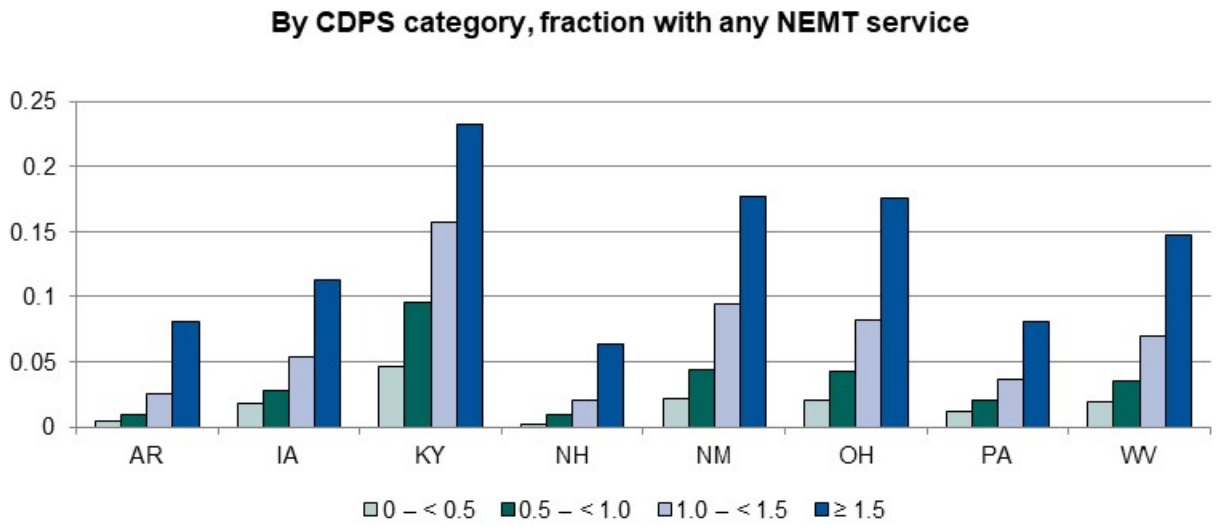


Figure G.6 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System; NEMT = non-emergency medical transportation.

Figure G.7. Mean physician office visits within six months, by demographic characteristics: All expansion spans of at least six months

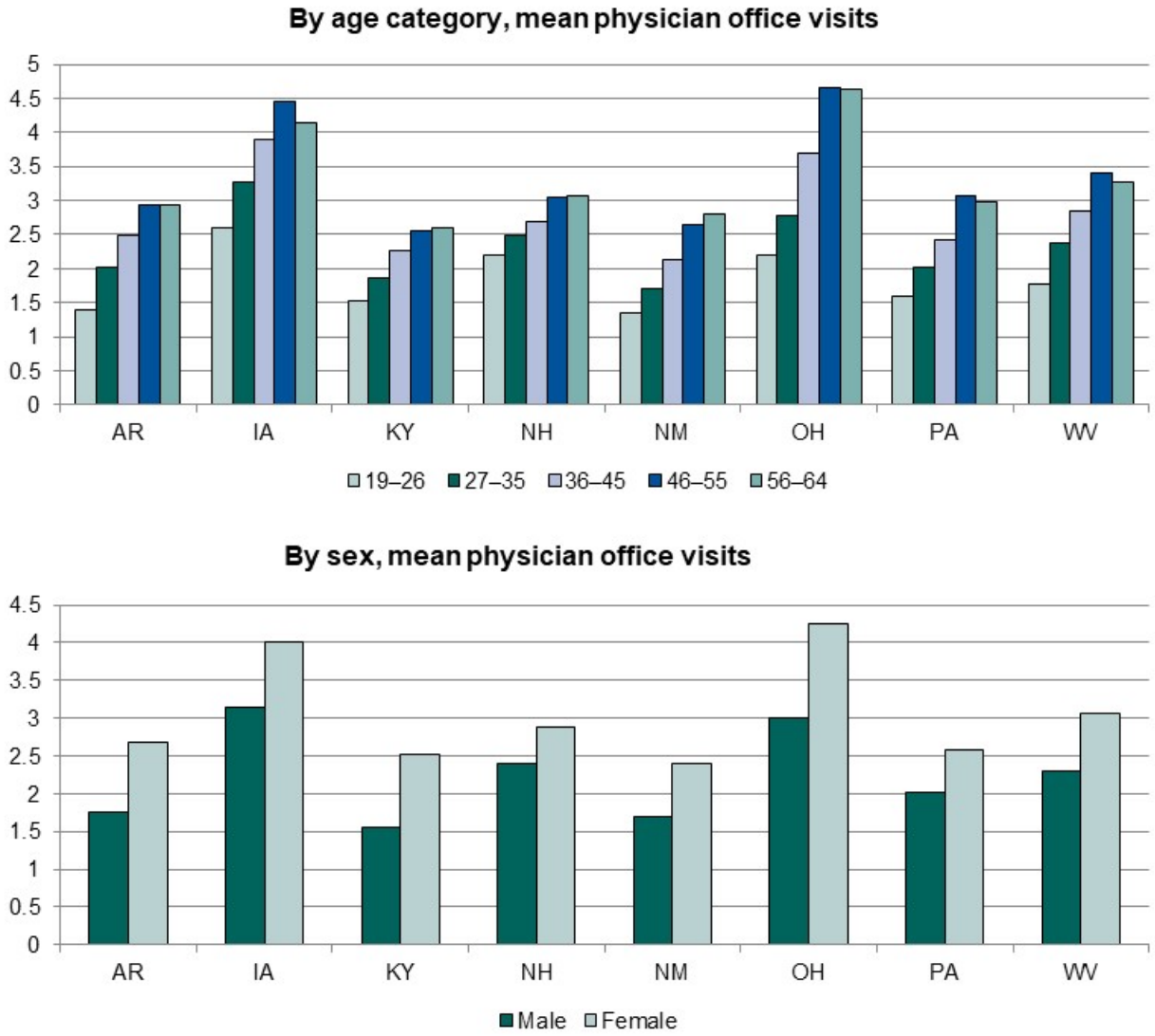
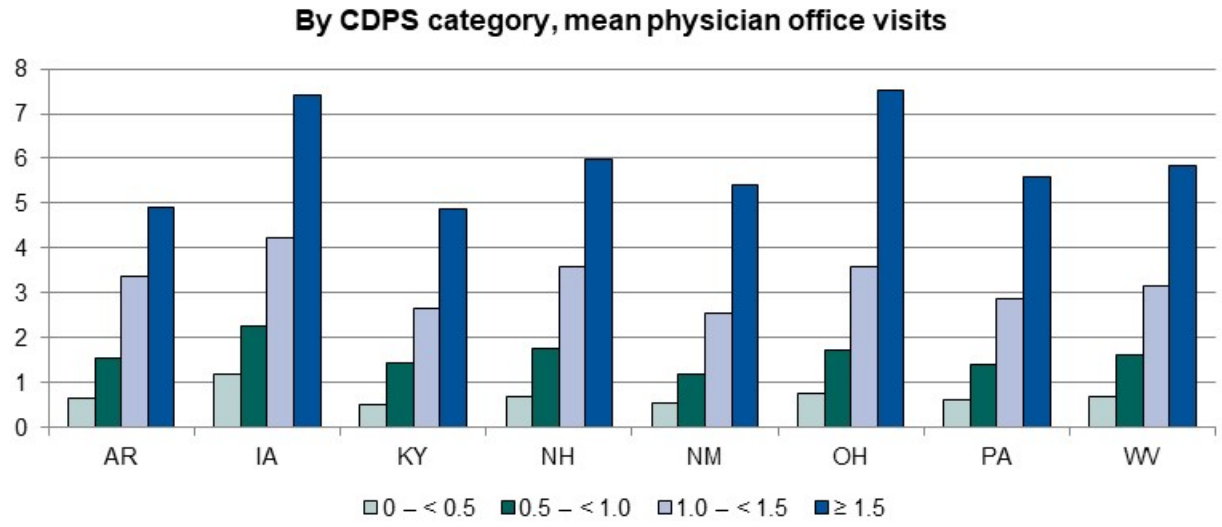


Figure G.7 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System.

Figure G.8. Mean prescriptions within six months, by demographic characteristics: All expansion spans of at least six months

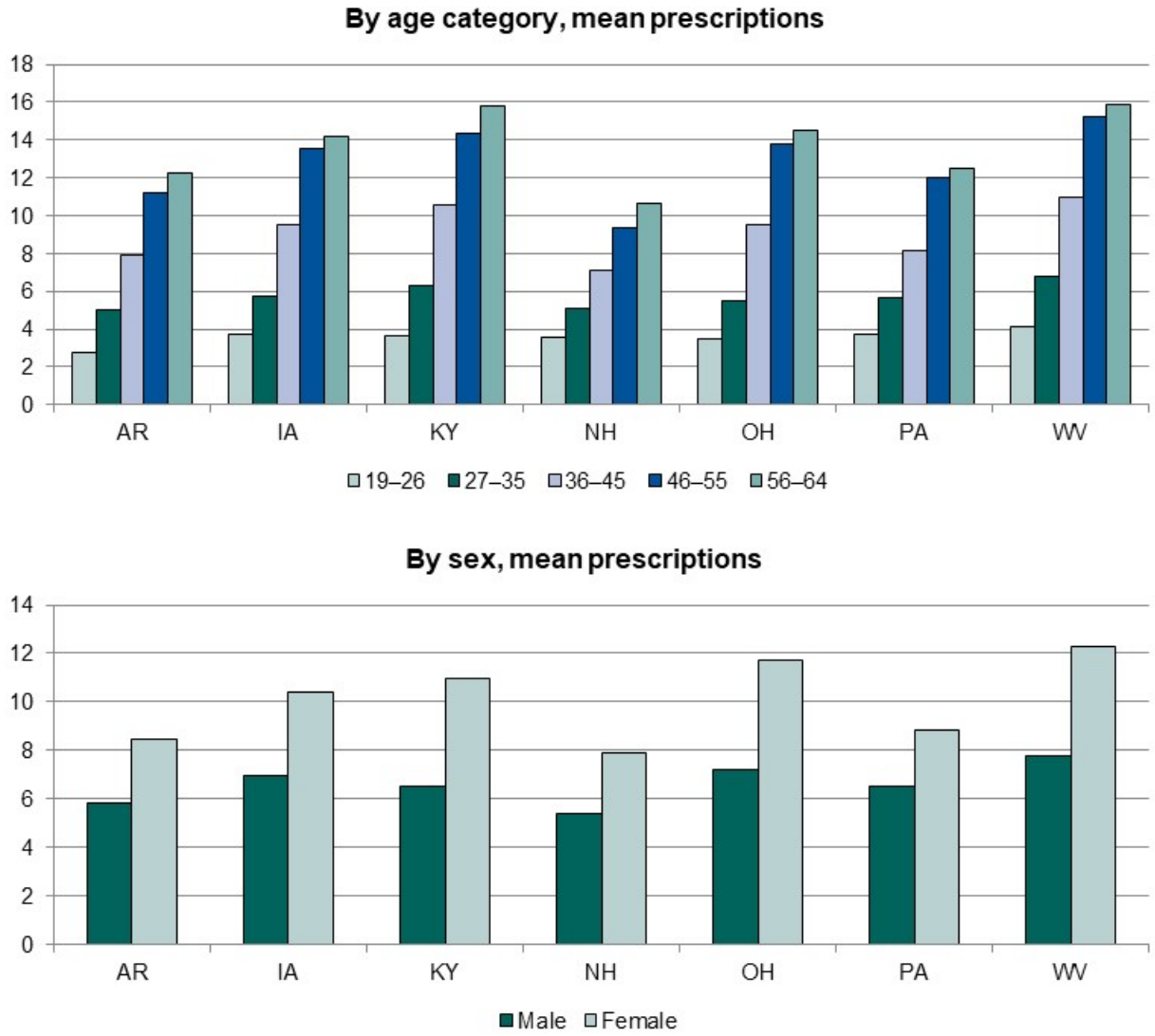
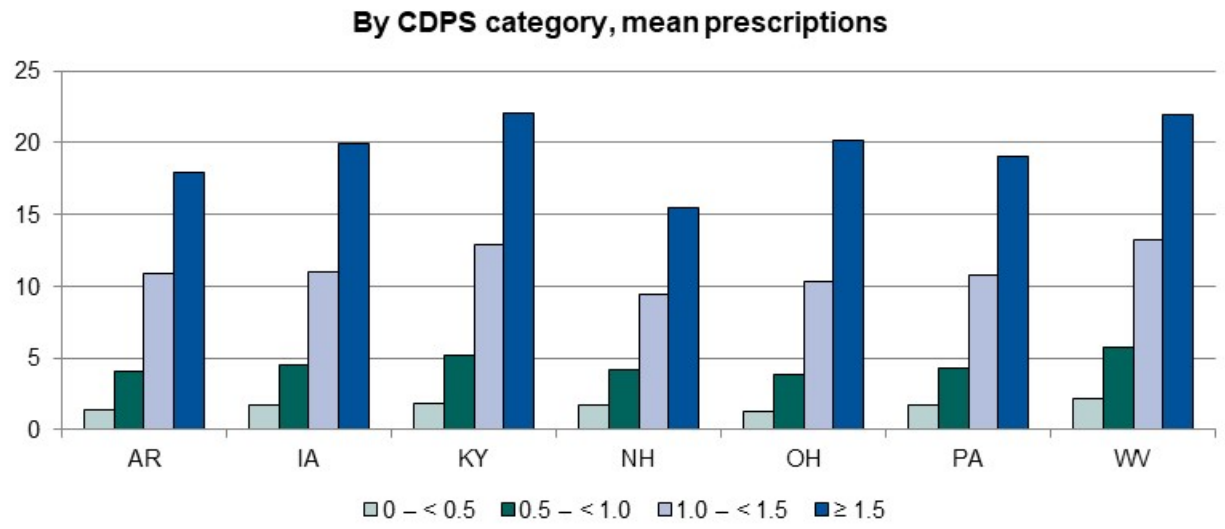


Figure G.8 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: New Mexico was excluded from prescription drug analysis because of data limitations. The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System.

Figure G.9. Mean vision services within six months, by demographic characteristics: All expansion spans of at least six months

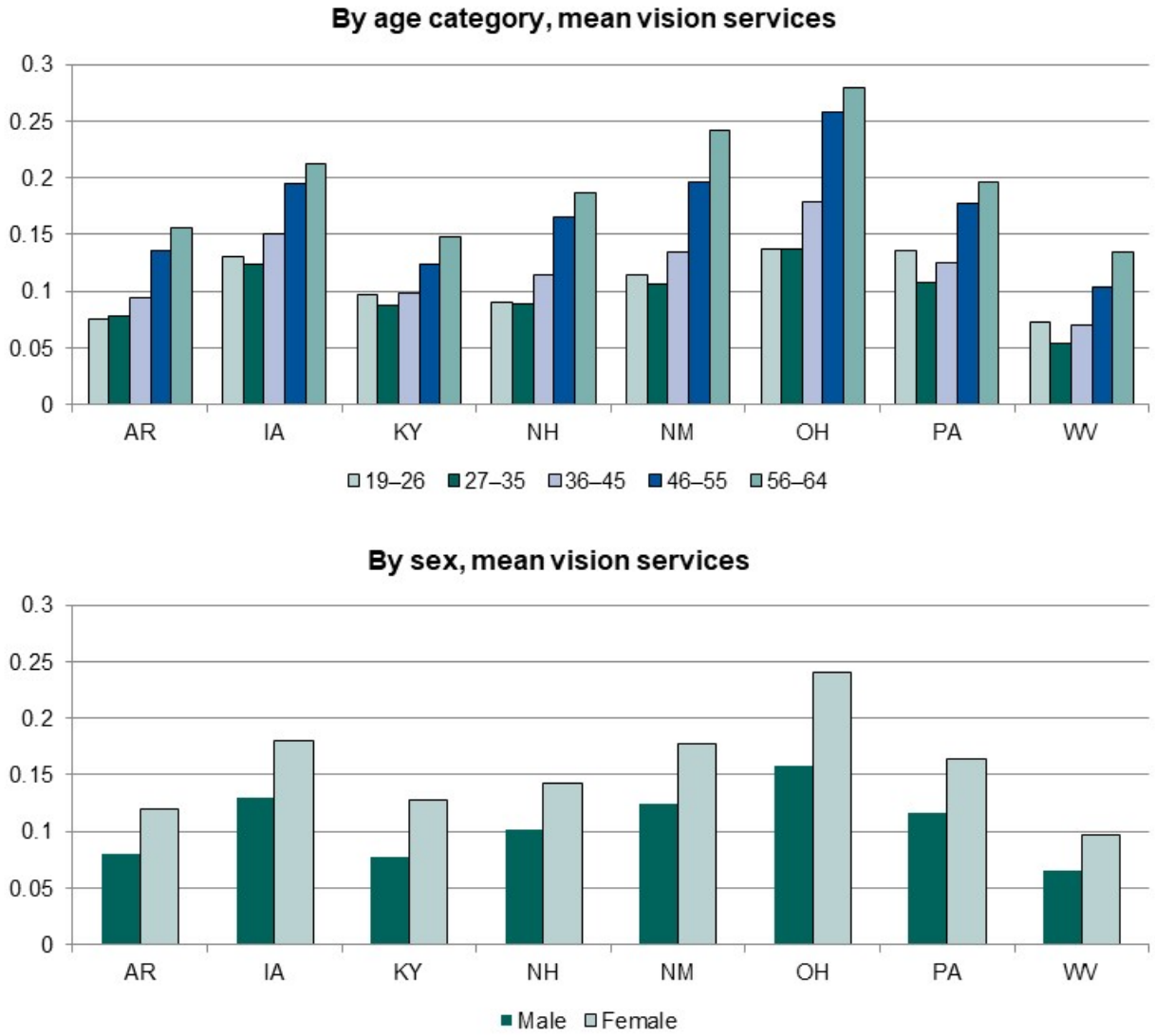
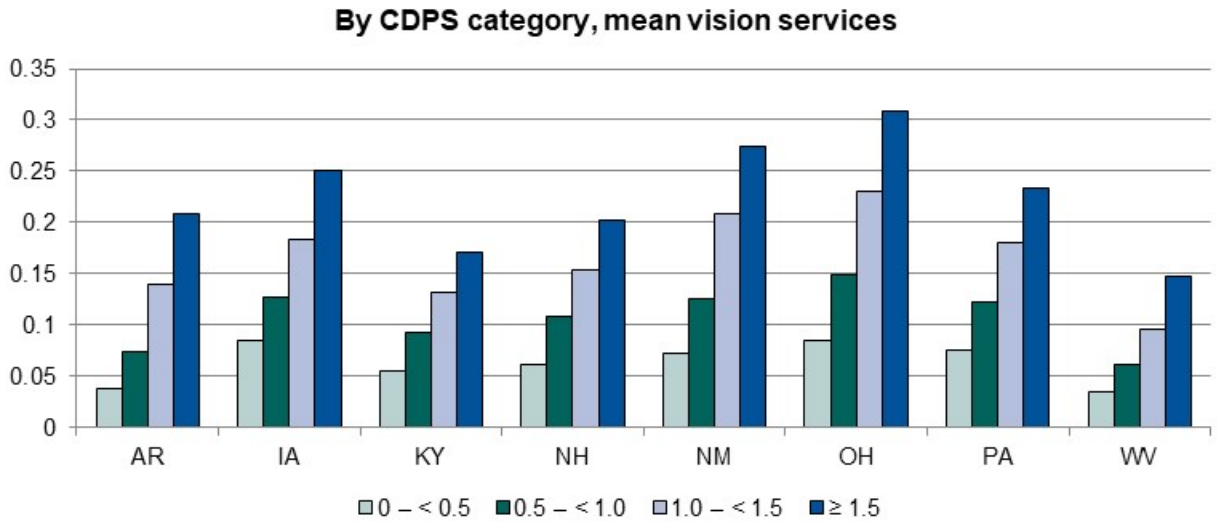


Figure G.9 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System.

Figure G.10. Mean dental services within six months, by demographic characteristics: All expansion spans of at least six months

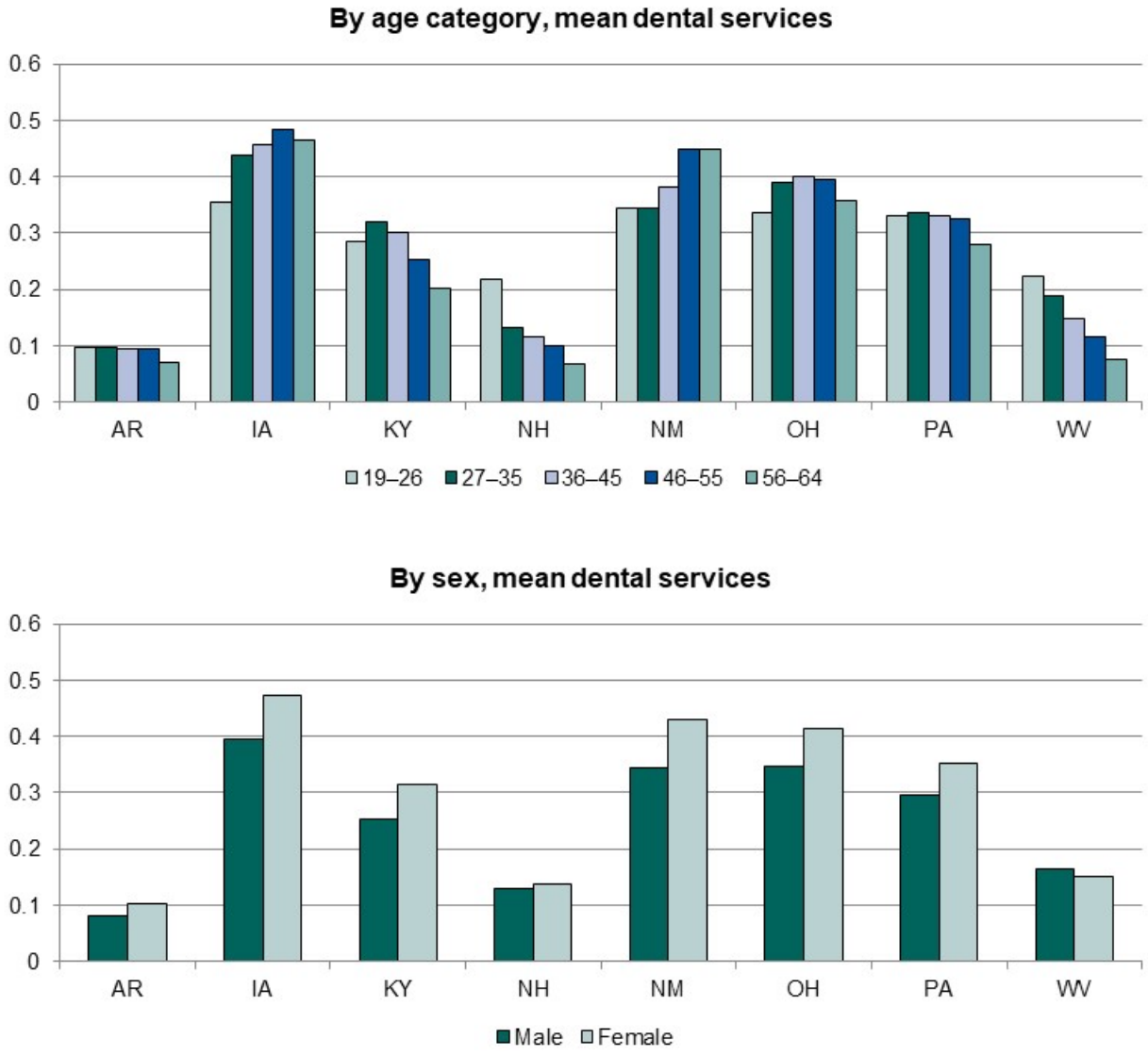
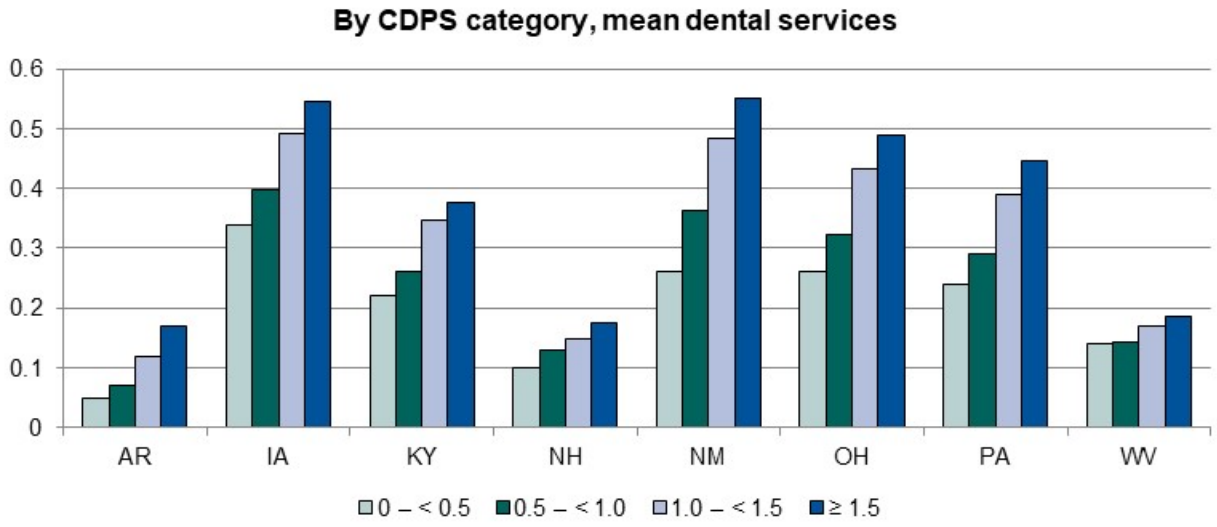


Figure G.10 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System.

Figure G.11. Mean use of family planning services within six months, by demographic characteristics: All expansion spans of at least six months

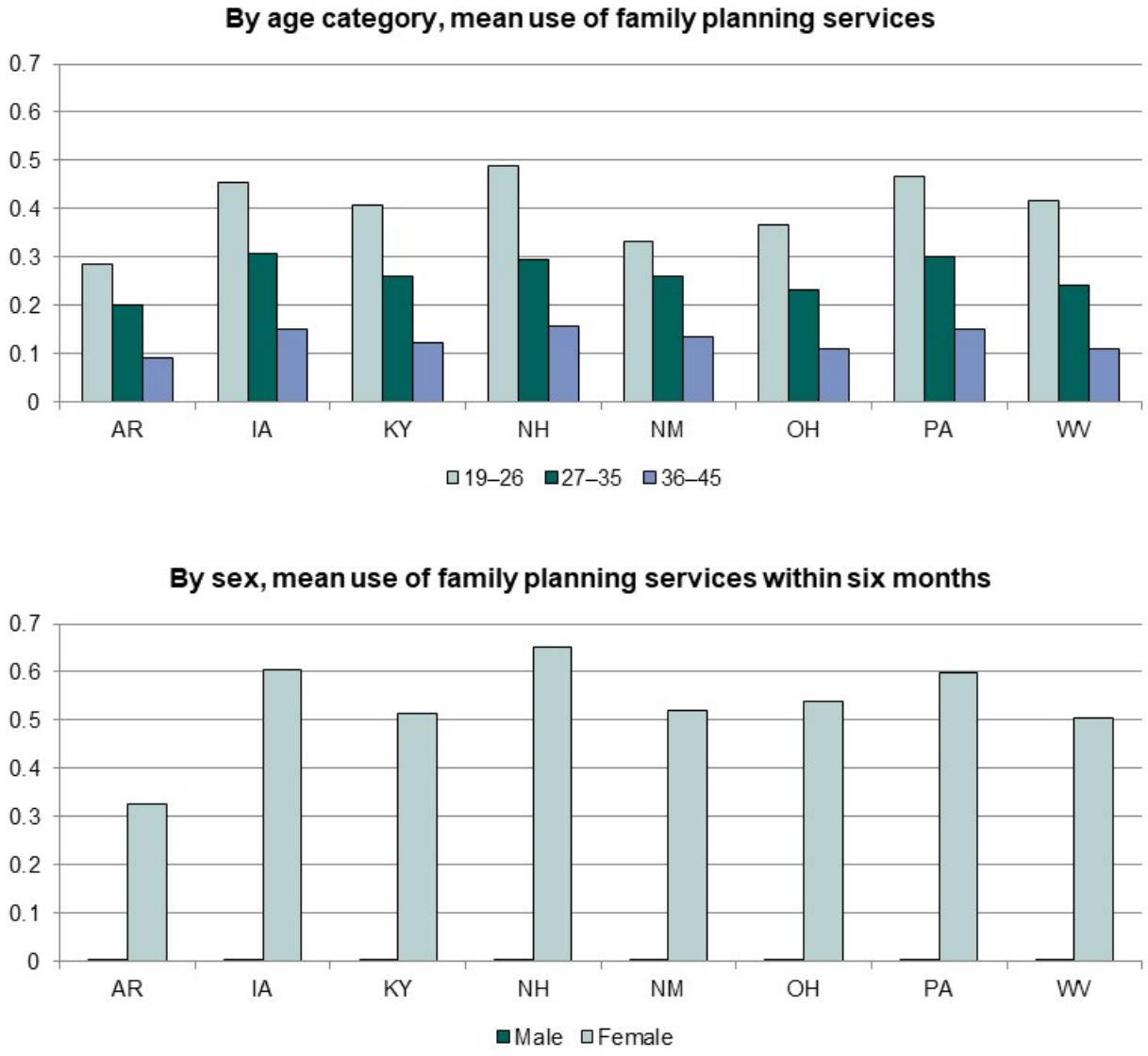
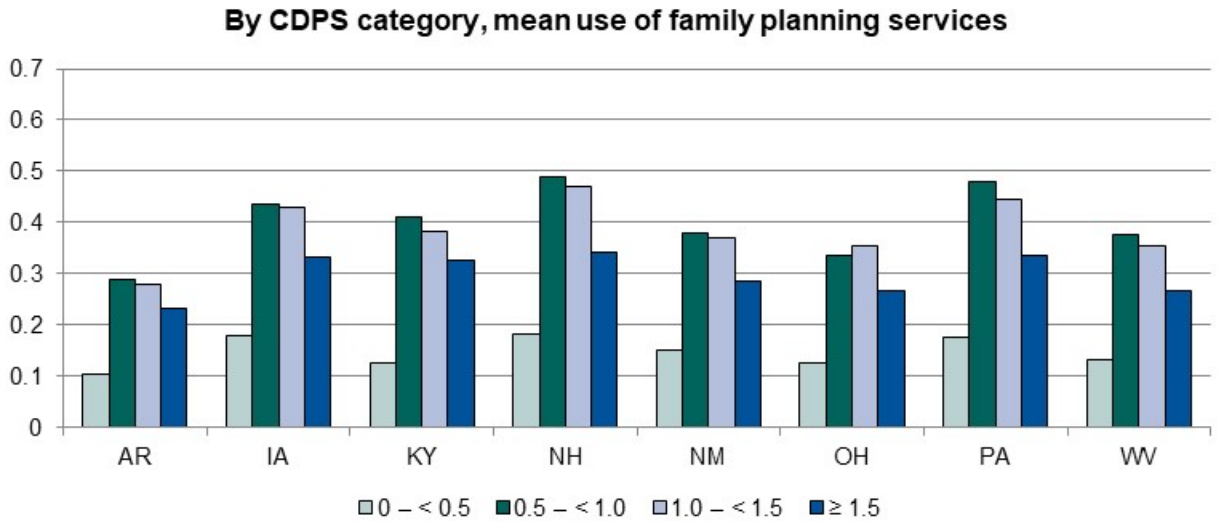


Figure G.11 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: Family planning services measure was limited to beneficiaries age 44 and younger. The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics. Data for the CDPS score stratification come from the population with 12-month-spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System.

Figure G.12. Mean NEMT services within six months, by demographic characteristics: All expansion spans of at least six months

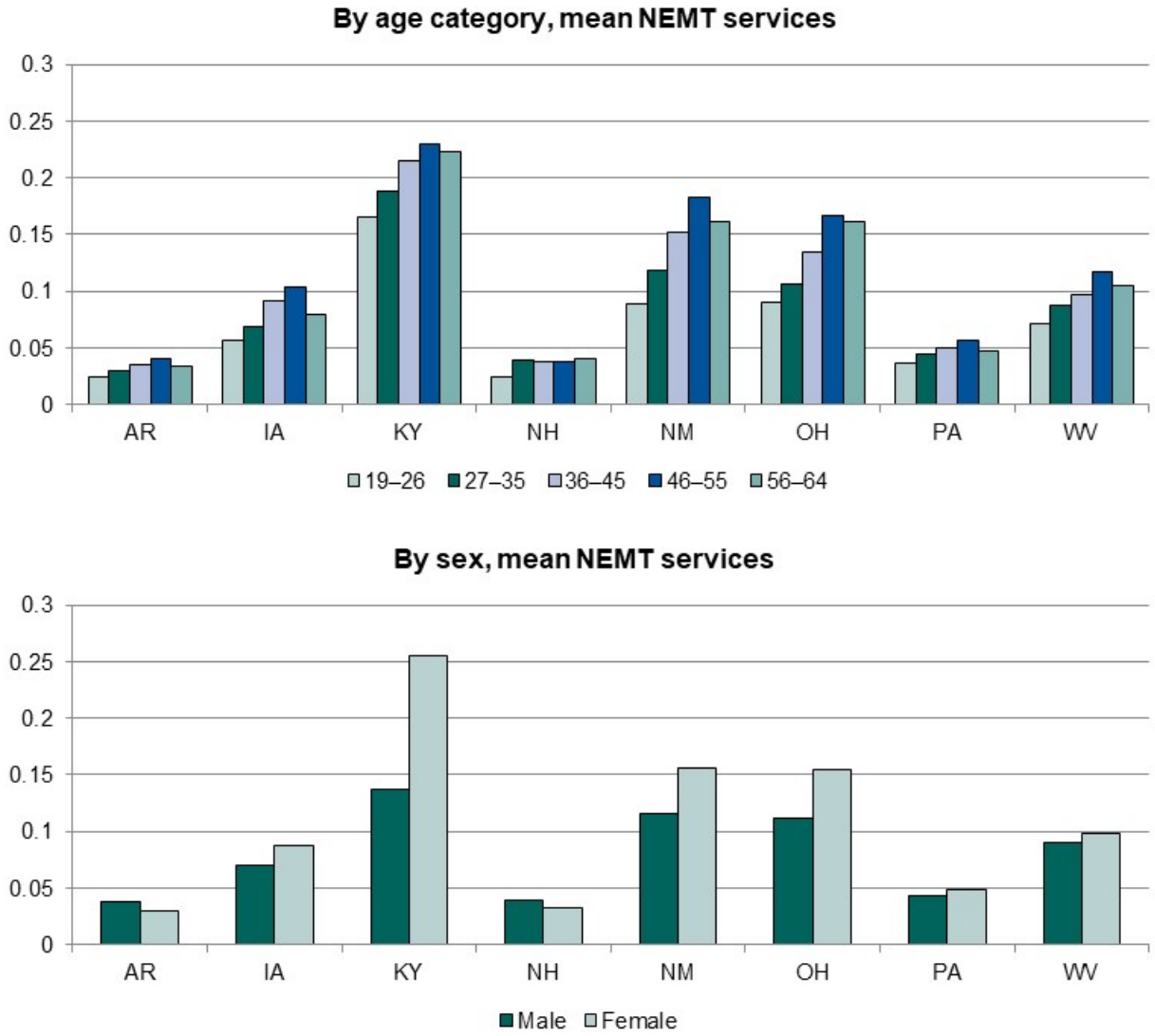
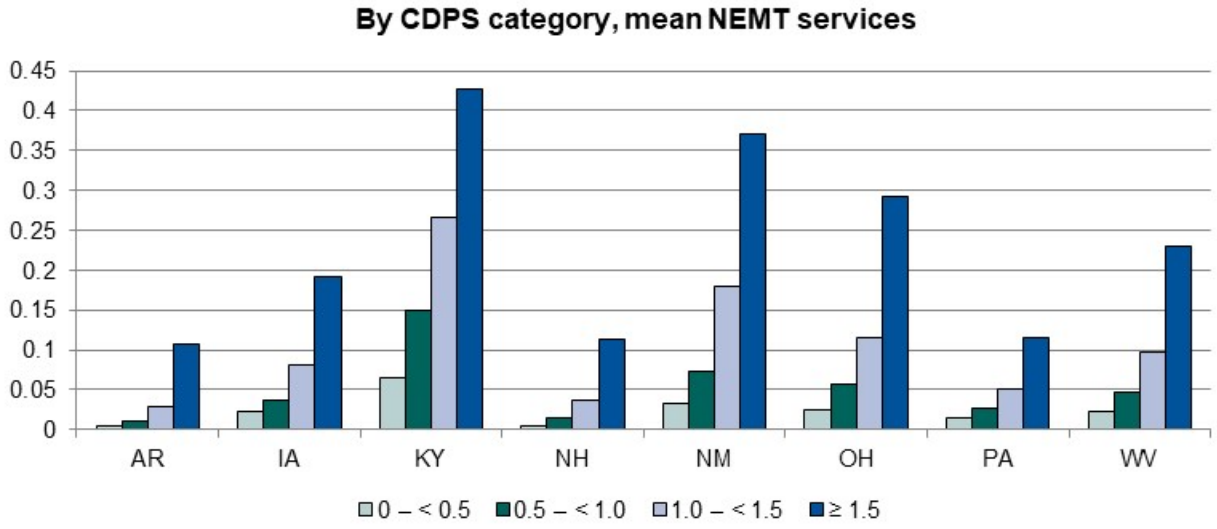


Figure G.12 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a first span of at least 6 months and where covariates other than the CDPS score were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics. Data for the CDPS score stratification come from the population with 12-month spans because 12 months of data are required to calculate CDPS scores.

CDPS = Chronic Illness and Disability Payment System; NEMT = non-emergency medical transportation.

2. Descriptive analyses of beneficiary expenditures

Summary statistics by demographic groups. We explored how mean per-member per-month (PMPM) spending varied for beneficiaries by age and sex (Table G.3). In both demonstration and comparison states, there was a relationship between mean spending and age group, with the mean spending amount increasing with age. In Iowa and all four comparison states, females had higher mean spending levels. In New Hampshire, males had higher spending levels.

Table G.3. Mean PMPM expenditures, by demographic characteristics: All adult expansion beneficiaries

Variables	Demonstration states		Comparison states			
	Iowa mean (s.d.)	New Hampshire mean (s.d.)	Kentucky mean (s.d.)	New Mexico mean (s.d.)	Ohio mean (s.d.)	West Virginia mean (s.d.)
Age						
19–26	276.84 (425.52)	360.88 (343.09)	478.98 (302.58)	381.86 (197.19)	363.08 (318.66)	240.78 (174.66)
27–35	319.53 (454.97)	417.60 (362.18)	524.16 (266.81)	420.03 (208.02)	372.22 (287.59)	316.84 (196.14)
36–45	384.39 (501.64)	451.45 (380.56)	645.38 (324.30)	478.35 (243.41)	422.56 (269.48)	434.88 (229.64)
46–55	477.51 (564.76)	636.86 (443.81)	777.37 (331.32)	619.13 (257.72)	643.62 (324.75)	529.33 (253.46)
56–64	498.39 (572.72)	823.84 (487.16)	792.79 (332.58)	680.27 (223.69)	697.20 (364.28)	554.00 (285.82)
Sex						
Male	315.16 (466.48)	495.65 (422.54)	528.24 (331.54)	468.36 (247.98)	402.66 (326.26)	367.63 (264.17)
Female	391.18 (507.90)	470.59 (405.13)	636.85 (312.86)	487.60 (243.76)	472.61 (324.07)	399.57 (231.80)

Source: Mathematica analysis of administrative data from 2014–2017 for Iowa and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: Expenditures include capitation payments and direct payments for medical services by Medicaid. The population reflected in this table includes adult expansion beneficiaries where covariates other than the CDPS score were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

Arkansas is excluded from the analysis because APCD data were missing information on capitation payments at high rates and we could not link APCD data to administrative data. Pennsylvania was excluded because of high rates of missing data for capitation payments.

APCD = All Payer Claims Database; s.d. = standard deviation; PMPM = per-member per-month.

3. Summary statistics for monthly enrollment analysis

We calculated counts of monthly enrollment for adult expansion beneficiaries (Table G.4).

Table G.4. Summary statistics: Counts of monthly enrollment for adult expansion beneficiaries

	Demonstration states			Comparison states				
Month	Arkansas	Iowa	New Hampshire	Kentucky	New Mexico	Ohio	Pennsylvania	West Virginia
Jan 2014	**191,087**	**74,737**		**163,918**	**88,723**	**138,831**		**91,786**
Feb 2014	**197,855**	**85,108**		**200,712**	**107,754**	**187,506**		**101,348**
Mar 2014	**202,271**	**99,019**		**252,126**	**126,537**	**264,797**		**114,898**
Apr 2014	205,334	105,931		274,318	138,928	252,522		122,207
May 2014	208,975	110,694		294,643	145,584	271,257		127,348
Jun 2014	210,932	115,289		311,612	151,355	282,048		133,356
Jul 2014	217,332	117,818		317,818	158,972	381,873		141,078
Aug 2014	224,488	120,202	16,725	332,415	164,869	400,135		146,441
Sep 2014	230,931	123,016	22,412	345,655	171,119	416,143		152,533
Oct 2014	237,561	125,384	26,028	357,322	176,944	484,365		157,071
Nov 2014	**244,111**	**127,610**	**29,158**	**369,240**	**182,449**	**504,840**		**153,620**
Dec 2014	**253,414**	**133,034**	**34,208**	**383,261**	**189,465**	**531,015**		**156,727**
Jan 2015	**260,354**	**133,720**	**36,934**	**397,156**	**196,642**	**556,639**	**236,249**	**156,399**
Feb 2015	**269,460**	**137,160**	**39,228**	**409,710**	**203,593**	**583,323**	**292,410**	**158,849**
Mar 2015	275,039	136,962	40,522	418,006	207,166	603,322	332,466	161,241
Apr 2015	280,471	138,905	40,954	426,555	215,256	622,431	369,968	163,539
May 2015	284,939	141,579	41,684	427,639	217,930	631,774	402,548	164,648
Jun 2015	289,415	144,200	42,109	429,250	220,450	642,476	429,126	166,578
Jul 2015	295,175	146,464	42,977	434,190	222,967	654,511	495,427	168,462
Aug 2015	291,449	148,734	43,856	439,964	225,680	666,903	515,827	170,547
Sep 2015	291,771	150,718	43,957	445,943	227,890	678,508	532,347	171,578
Oct 2015	295,728	152,782	44,880	451,728	229,249	686,532	546,595	157,004
Nov 2015	**301,158**	**153,515**	**46,204**	**457,570**	**232,003**	**690,852**	**565,835**	**158,149**
Dec 2015	**307,846**	**155,485**	**48,188**	**463,686**	**236,288**	**697,038**	**591,320**	**160,026**
Jan 2016	**311,734**	**147,858**	**50,039**	**469,402**	**239,434**	**702,550**	**609,922**	**161,897**
Feb 2016	316,559	147,185	50,095	472,629	242,281	712,281	621,287	163,694

Table G.4 (*continued*)

Month	Demonstration states			Comparison states				
	Arkansas	Iowa	New Hampshire	Kentucky	New Mexico	Ohio	Pennsylvania	West Virginia
Mar 2016	318,617	146,560	49,965	474,925	244,099	718,270	672,717	164,610
Apr 2016	317,410	146,427	49,475	481,447	244,097	716,707	668,191	165,251
May 2016	323,495	147,111	49,477	483,629	246,402	716,571	673,285	165,661
Jun 2016	325,551	147,288	49,575	488,531	248,629	719,690	679,656	166,222
Jul 2016	328,505	147,131	50,143	491,644	250,717	723,852	683,750	166,412
Aug 2016	331,000	147,872	50,579	493,351	253,270	728,210	691,262	167,201
Sep 2016	335,350	147,873	51,078	494,607	254,993	732,272	696,327	167,361
Oct 2016	335,265	148,551	51,665	497,094	256,867	734,074	698,322	167,776
Nov 2016	**333,449**	**149,830**	**52,363**	**499,028**	**259,065**	**736,444**	**708,708**	**167,846**
Dec 2016	**333,831**	**150,832**	**53,632**	**501,990**	**262,038**	**736,800**	**721,339**	**167,932**
Jan 2017	337,973	154,497	54,240	505,604	265,847	738,782	729,900	168,101
Feb 2017	340,130	152,470	53,699	506,129	267,417	740,744	731,493	167,472
Mar 2017	332,040	151,276	53,416	506,781	268,341	739,971	767,507	167,663
Apr 2017	333,284	150,099	52,950	507,848	268,398	736,780	763,374	166,630
May 2017	330,177	150,204	52,563	509,275	266,886	735,564	761,565	166,689
Jun 2017	321,016	149,713	51,944	510,913	264,749	718,884	758,125	165,849
Jul 2017	320,309	149,718	51,693	512,449	261,834	716,813	755,422	165,643
Aug 2017	321,686	148,601	51,645	513,881	257,641	719,037	756,844	165,535
Sep 2017	320,729	146,178	51,896	515,016	251,127	708,977	747,891	164,487
Oct 2017	321,134	144,558	51,792	516,229	252,208	703,183	743,806	163,908
Nov 2017	**326,910**	**146,766**	**52,561**	**519,224**	**253,323**	**700,655**	**748,687**	**164,139**
Dec 2017	**318,132**	**150,959**	**53,822**	**521,579**	**255,171**	**705,058**	**750,991**	**163,980**

Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: Shading indicates that premium assistance was in effect in that month. **Bolded** numbers indicate open enrollment months.

4. Sensitivity analyses of access to care

As noted in Appendix C, Section C.2, we also explored an alternative definition of the demonstration group in both the difference-in-differences (DD) and cross-sectional models. The definition included only those enrolled in QHPs and not those enrolled in traditional Medicaid in a state with an active demonstration. The alternative definition had the benefit of isolating the effect of enrolling in a QHP but was biased by the fact that QHP beneficiaries were different from both within-state beneficiaries enrolled in traditional Medicaid and Medicaid beneficiaries in other states without demonstrations in ways that we could not easily identify in the data, such as income and medical frailty. Because of exemptions for those who were medically frail or pregnant in Arkansas and New Hampshire, and non-eligibility for those earning less than 100 percent of the federal poverty line in Iowa, QHP beneficiaries were systematically different from both those not enrolled in QHPs during active demonstrations and those in the comparison groups.

In analyses where the demonstration group was restricted exclusively to QHP beneficiaries, we found similar effects as in the main DD and cross-sectional analyses (Tables III.1 and III.2 in the main text), which included beneficiaries in traditional Medicaid who resided in states with active premium assistance demonstrations. One noticeable difference was in Iowa, where QHP beneficiaries accessed vision and dental services at lower rates than did other adults in Iowa's expansion population. QHP beneficiaries in Iowa were 4 percentage points less likely to use vision services and 3 percentage points less likely to use dental services within six months than were comparison populations (Tables G.5 and G.6). In main text analyses that included non-QHP beneficiaries in Iowa, the results were similar, but smaller in magnitude.

We also checked the sensitivity of our results to an alternative specification that required the beneficiary to be enrolled in a QHP for at least 50 percent of the months in a span. The results (not shown) were consistent with those presented in Tables G.5 and G.6.

Table G.5. Difference-in-differences regression results for service utilization: Demonstration group includes only QHP beneficiaries

Outcome variable	Comparison group mean	Average marginal effect for Iowa	Standard error	*p*-value	Percent change	Average marginal effect for New Hampshire	Standard error	*p*-value	Percent change	N
Any use of services										
Any physician office visit										
Within 2 months	42.58	15.46***	0.31	.000	36.3	0.33	0.35	.340	0.8	5,689,846
Within 6 months	58.91	13.73***	0.29	.000	23.3	3.44***	0.34	.000	5.8	5,694,322
Within 12 months	73.08	9.18***	0.26	.000	12.6	4.83***	0.29	.000	6.6	5,694,322
Any prescription										
Within 2 months	47.03	10.61***	0.31	.000	22.6	-8.54***	0.35	.000	-18.2	5,068,919
Within 6 months	61.24	3.81***	0.29	.000	6.2	-7.66***	0.32	.000	-12.5	5,068,919
Within 12 months	73.93	-0.90***	0.28	.001	-1.2	-2.05***	0.30	.000	-2.8	5,068,919
Any vision service										
Within 6 months	11.79	-3.69***	0.16	.000	-31.3	-0.66***	0.23	.004	-5.6	5,694,322
Within 12 months	20.93	-6.39***	0.21	.000	-30.6	-0.38	0.29	.189	-1.8	5,694,322
Any dental service										
Within 6 months	17.91	-3.11***	0.16	.000	-17.4	-1.55***	0.27	.000	-8.7	5,694,322
Within 12 months	28.51	-4.12***	0.20	.000	-14.5	-1.67***	0.31	.000	-5.9	5,694,322
Any family planning services										
Within 6 months	9.17	1.98***	0.28	.000	21.6	-1.28***	0.27	.000	-14.0	3,684,324
Within 12 months	12.79	0.42	0.28	.141	3.3	-0.50	0.30	.090	-3.9	3,684,324
Any NEMT service										
Within 6 months	7.98	-1.81***	0.05	.000	-22.7	2.60***	0.27	.000	32.6	5,694,322
Within 12 months	13.79	-2.66***	0.07	.000	-19.3	6.17***	0.33	.000	44.7	5,694,322
Number of services or encounters										
Physician office visits										
Within 6 months	2.67	1.85***	0.04	.000	69.2	0.95***	0.03	.000	35.5	5,694,322
Within 12 months	5.44	3.78***	0.07	.000	69.5	2.81***	0.07	.000	51.7	5,694,322

Table G.5 (*continued*)

Outcome variable	Comparison group mean	Average marginal effect for Iowa	Standard error	*p*-value	Percent change	Average marginal effect for New Hampshire	Standard error	*p*-value	Percent change	N
Prescription										
Within 6 months	8.93	4.67***	0.17	.000	52.3	-2.99***	0.12	.000	-33.5	5,068,919
Within 12 months	19.64	6.16***	0.29	.000	31.4	-4.00***	0.22	.000	-20.4	5,068,919
Vision services										
Within 6 months	0.15	-0.04***	0.00	.000	-29.8	-0.01***	0.00	.002	-6.3	5,694,322
Within 12 months	0.31	-0.08***	0.00	.000	-24.9	0.00	0.00	.794	-0.4	5,694,322
Dental service										
Within 6 months	0.33	-0.07***	0.00	.000	-19.8	-0.03***	0.01	.000	-7.7	5,694,322
Within 12 months	0.68	-0.12***	0.01	.000	-17.8	-0.06***	0.01	.000	-8.6	5,694,322
Family planning services										
Within 6 months	0.27	0.18***	0.02	.000	67.0	-0.11***	0.01	.000	-40.5	3,684,324
Within 12 months	0.58	0.19***	0.03	.000	32.9	-0.14***	0.02	.000	-24.6	3,684,324
NEMT services										
Within 6 months	0.13	-0.03***	0.00	.000	-23.9	0.04***	0.01	.000	31.9	5,694,322
Within 12 months	0.30	-0.07***	0.00	.000	-23.2	0.10***	0.01	.000	34.2	5,694,322

Source: Mathematica analysis of administrative data from 2014–2017 for Iowa and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Notes: Demonstration group contains only QHP beneficiaries. Marginal effects were estimated by using logistic and negative binomial regressions. We calculated the average of the estimated difference in outcomes by using the covariate distribution of the demonstration group.

The comparison group mean is the unadjusted comparison sample mean, presented for reference. The average marginal effect should not be added to the comparison group mean to calculate use by QHP enrollees.

Arkansas is excluded from the difference-in-differences model because the premium assistance demonstration was in effect for all four years of the study, 2014–2017. New Mexico was excluded from all regressions involving prescription drug use because of data issues with the RX file. We controlled for beneficiaries' individual characteristics (sex, age, living in a rural location, and CDPS score). CDPS score was created only for, and included in, the 12-month models.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

CDPS = Chronic Illness and Disability Payment System; NEMT = non-emergency medical transportation; QHP = qualified health plan.

Table G.6. Cross-sectional regression results for service utilization: Demonstration group includes only QHP beneficiaries

Outcome variable	Comparison group mean	Average marginal effect for Arkansas	Standard error	*p*-value	Percent change	Average marginal effect for Iowa	Standard error	*p*-value	Percent change	Average marginal effect for New Hampshire	Standard error	*p*-value	Percent change	N
Any use of services														
Any physician office visit														
Within 2 months	42.58	-5.03***	0.06	.000	-11.8	14.28***	0.00	.000	33.5	-1.19***	0.18	.000	-2.8	6,490,076
Within 6 months	58.91	-3.75***	0.06	.000	-6.4	14.69***	0.00	.000	24.9	2.63***	0.18	.000	4.5	6,495,220
Within 12 months	73.08	-0.13**	0.06	.021	-.2	11.48***	0.00	.000	15.7	2.72***	0.16	.000	3.7	6,495,220
Any prescription														
Within 2 months	47.03	-3.95***	0.07	.000	-8.4	8.46***	0.00	.000	18.0	-6.98***	0.18	.000	-14.8	5,869,817
Within 6 months	61.24	-4.36***	0.07	.000	-7.1	5.46***	0.00	.000	8.9	-4.25***	0.19	.000	-6.9	5,869,817
Within 12 months	73.93	-4.26***	0.06	.000	-5.8	1.81***	0.00	.000	2.5	-3.40***	0.17	.000	-4.6	5,869,817
Any vision service														
Within 6 months	11.79	-4.65***	0.03	.000	-39.4	-3.08***	0.00	.000	-26.1	-1.75***	0.12	.000	-14.8	6,495,220
Within 12 months	20.93	-8.42***	0.05	.000	-40.2	-5.64***	0.00	.000	-26.9	-2.54***	0.16	.000	-12.2	6,495,220
Any dental service														
Within 6 months	17.91	-13.87***	0.03	.000	-77.4	2.14***	0.00	.000	12.0	-9.71***	0.11	.000	-54.2	6,495,220
Within 12 months	28.51	-22.09***	0.04	.000	-77.5	4.22***	0.00	.000	14.8	-15.18***	0.14	.000	-53.2	6,495,220
Any family planning services														
Within 6 months	9.17	-0.97***	0.05	.000	-10.5	4.10***	0.00	.000	44.7	2.08***	0.17	.000	22.7	4,212,619
Within 12 months	12.79	-0.72***	0.06	.000	-5.6	2.92***	0.00	.000	22.9	2.45***	0.19	.000	19.2	4,212,619
Any NEMT service														
Within 6 months	7.98	-5.04***	0.02	.000	-63.1	-6.97***	0.00	.000	-87.4	-5.35***	0.06	.000	-67.0	6,495,220
Within 12 months	13.79	-7.96***	0.03	.000	-57.8	-11.76***	0.00	.000	-85.3	-7.84***	0.09	.000	-56.9	6,495,220
Number of services or encounters														
Physician office visits														
Within 6 months	2.67	0.42***	0.01	.000	15.6	2.11***	0.04	.000	79.0	0.76***	0.03	.000	28.6	6,495,220
Within 12 months	5.44	1.89***	0.02	.000	34.8	4.57***	0.08	.000	84.0	2.36***	0.06	.000	43.4	6,495,220

Table G.6 (*continued*)

Outcome variable	Comparison group mean	Average marginal effect for Arkansas	Standard error	*p*-value	Percent change	Average marginal effect for Iowa	Standard error	*p*-value	Percent change	Average marginal effect for New Hampshire	Standard error	*p*-value	Percent change	N
Prescription														
Within 6 months	8.93	-1.63***	0.03	.000	-18.2	3.03***	0.15	.000	34.0	-1.83***	0.08	.000	-20.5	5,869,817
Within 12 months	19.64	-3.30***	0.06	.000	-16.8	4.16***	0.29	.000	21.2	-2.94***	0.17	.000	-15.0	5,869,817
Vision services														
Within 6 months	0.15	-0.06***	0.00	.000	-40.1	-0.04***	0.00	.000	-30.0	-0.02***	0.00	.000	-14.0	6,495,220
Within 12 months	0.31	-0.13***	0.00	.000	-41.1	-0.09***	0.00	.000	-29.3	-0.04***	0.00	.000	-11.6	6,495,220
Any dental service														
Within 6 months	0.33	-0.26***	0.00	.000	-80.1	0.02***	0.01	.000	6.4	-0.19***	0.00	.000	-58.8	6,495,220
Within 12 months	0.68	-0.57***	0.00	.000	-83.0	0.18***	0.01	.000	25.9	-0.42***	0.00	.000	-61.0	6,495,220
Family planning services														
Within 6 months	0.27	-0.10***	0.00	.000	-38.2	0.13***	0.01	.000	47.4	0.04***	0.01	.000	14.3	4,212,619
Within 12 months	0.58	-0.24***	0.00	.000	-41.7	0.14***	0.02	.000	24.1	0.10***	0.01	.000	17.9	4,212,619
NEMT services														
Within 6 months	0.13	-0.11***	0.00	.000	-81.4	-0.13***	0.00	.000	-99.5	-0.10***	0.00	.000	-74.7	6,495,220
Within 12 months	0.30	-0.27***	0.00	.000	-88.1	-0.32***	0.00	.000	-105.5	-0.21***	0.00	.000	-68.4	6,495,220

Source: Mathematica analysis of administrative data from 2014–2017 for Arkansas, Iowa, and New Hampshire (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Notes: Marginal effects were estimated by using logistic and negative binomial regressions. We calculated the average of the estimated difference in outcomes by using the covariate distribution of the demonstration group.

The comparison group mean is the unadjusted comparison sample mean, presented for reference. The average marginal effect should not be added to the comparison group mean to calculate use by QHP enrollees.

New Mexico was excluded from all regressions involving prescription drug use because of data issues with the RX file. We controlled for beneficiaries' individual characteristics (sex, age, living in a rural location, and CDPS score). CDPS score was created only for, and included in, the 12-month models.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

CDPS = Chronic Illness and Disability Payment System; NEMT = non-emergency medical transportation; QHP = qualified health plan.

5. Sensitivity analyses of beneficiary expenditures

As noted in Appendix C, Section C.2, we also explored an alternative definition of the demonstration group that was restricted to beneficiaries enrolled in QHPs. Results were similar to those from the main analysis, which included beneficiaries in traditional Medicaid who resided in states with active premium assistance demonstrations (Tables III.5 and III.6 in the main report). The estimated impacts on expenditures were similar in sign and statistical significance, but smaller in magnitude (Tables G.7 and G.8).

In addition, we used an alternative definition of demonstration that required the beneficiary to be enrolled in a QHP in all three months of the quarter. The results were consistent with those reported in Tables G.7 and G.8.

Table G.7. Regression results for expenditures (difference-in-differences model) for QHP-enrolled beneficiaries in New Hampshire, 2014 through 2017

Outcome variable	Comparison group baseline mean	Average marginal effect for New Hampshire	Standard error	*p*-value	Percent change	N
PMPM expenditures	523	63***	1	.000	12	23,569,819

Source: Mathematica analysis of administrative data from 2014–2017 for New Hampshire (demonstration state); and Kentucky, New Mexico, Ohio, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Notes: We controlled for beneficiaries' individual characteristics (sex, age, living in a rural area, and length of enrollment span). We also controlled for the dips in per-member per-month expenditures around the transitions to Transformed Medicaid Statistical Information System (T-MSIS) Analytic File (TAF) data.

Marginal effects were estimated by using a generalized linear regression model. We calculated the average of the estimated difference in differences by using the covariate distribution of the demonstration group.

*** Significantly different from zero at the .01 level, two-tailed test.

Table G.8. Regression results for expenditures (cross-sectional model) for QHP-enrolled beneficiaries in Iowa and New Hampshire, 2014 through 2017

Outcome variable	Comparison group baseline mean	Average marginal effect for Iowa	Standard error	*p*-value	Percent change	Average marginal effect for New Hampshire	Standard error	*p*-value	Percent change	N
PMPM expenditures	539	-82***	1	.000	-16	83***	1	.000	16	23,569,819

Source: Mathematica analysis of administrative data from 2014–2017 for New Hampshire and Iowa (demonstration states); and Kentucky, New Mexico, Ohio, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data.

Notes: We controlled for beneficiaries' individual characteristics (sex, age, living in a rural area, and length of enrollment span). We also controlled for the dips in per-member per-month expenditures around the transitions to Transformed Medicaid Statistical Information System (T-MSIS) Analytic File (TAF) data.

Marginal effects were estimated by using a generalized linear regression model. We calculated the average of the estimated difference in differences by using the covariate distribution of the demonstration group.

*** Significantly different from zero at the .01 level, two-tailed test.

B. Domain 3: Descriptive analyses of incentivized services, preventive services, and chronic condition management

1. Descriptive analyses of incentivized services

Summary statistics. In Tables G.9 through G.11, we show the average probability of utilizing the services included in our analyses by state for the three demonstration states.

Table G.9. Summary statistics: Use of preventive services (unadjusted values)

Preventive service	Demonstration states			All demonstration states	All comparison states	Difference
	Indiana %	Iowa %	Michigan %	%	%	
Wellness visit	77.3	80.3	73.3	75.1	70.7	4.4
Mammogram	39.0	35.8	37.6	37.4	30.7	6.7
Cervical cancer screening	22.5	18.0	22.6	21.7	17.0	4.8
Chlamydia screening	53.4	45.8	57.3	54.4	43.7	10.7
Colorectal cancer screening	16.4	14.17	15.8	15.5	11.3	4.2
Any preventive services	77.7	80.58	73.5	75.4	71.0	4.5
All preventive services	29.9	34.29	33.3	33.0	29.6	3.4
	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Difference
Percentage of recommended preventive services for age and gender completed	53.1 (36.7)	56.2 (37.0)	52.6 (39.3)	53.4 (38.6)	49.0 (39.1)	4.3
Time to complete wellness visit (days)	98.0 (88.2)	94.5 (86.2)	95.9 (87.6)	95.9 (87.4)	102.6 (93.7)	-6.7
Time to complete all preventive services (days)	144.1 (103.6)	125.8 (99.3)	130.6 (100.8)	131.4 (101.0)	135.0 (103.7)	-3.6
Total spans in sample	296,984	388,110	1,391,813	2,076,907	5,428,429	

Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: Table shows preventive service outcomes of demonstration or expansion enrollees in each state and by treatment condition. The population reflected in this table includes adult expansion beneficiaries with a twelve-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

s.d. = standard deviation.

Table G.10. Summary statistics: Chronic condition management (unadjusted values)

Measure	Demonstration states			All demonstration states	All comparison states	Difference
	Indiana %	Iowa %	Michigan %	%	%	
HbA1c	84.5	73.0	85.8	83.1	76.7	6.4
Diabetes admissions	1.5	2.2	1.7	1.8	1.7	0.1
Heart failure admissions	0.1	0.1	0.1	0.1	0.1	0.0
Asthma admissions (ages 19–39)	0.1	0.0	0.1	0.1	0.1	0.0
COPD admissions (ages 40–64)	0.3	0.3	0.4	0.4	0.4	-0.0
Follow-up (any)	54.2	67.5	61.8	61.6	58.1	3.5
Follow-up (mental health)	45.9	26.7	22.0	28.8	23.6	5.1
Total spans in sample	296,984	388,110	1,391,813	2,076,907	5,428,429	

Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Notes: Table shows chronic condition management outcomes of demonstration or expansion enrollees in each demonstration state and by treatment condition. The population reflected in this table includes adult expansion beneficiaries with a twelve-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

Table G.11. Summary statistics: Use of emergency department and urgent, primary, and specialty care (unadjusted values)

Measure	Demonstration states			All demonstration states mean (s.d.)	All comparison states mean (s.d.)	Difference
	Indiana mean (s.d.)	Iowa mean (s.d.)	Michigan mean (s.d.)			
Any ED visits (%)	45.6	40.3	38.85	40.0	41.9	-1.9
Number of ED visits	1.2 (2.4)	1.0 (2.3)	1.0 (2.4)	1.0 (2.4)	1.1 (2.5)	-0.1
Non-emergency ED visits (% with any)	29.2	17.8	17.8	19.5	20.4	-1.0
Number of non-emergency ED visits	0.5 (1.3)	0.3 (0.95)	0.3 (0.96)	0.3 (0.9)	0.3 (0.9)	-0.0
Urgent care visits (% with any)	8.2	1.5	4.5	4.59	8.56	-4.0
Number of urgent care visits	0.1 (0.7)	0.0 (0.3)	0.1 (0.5)	0.1 (0.5)	0.1 (0.7)	-0.1
Primary care visit (% with any)	41.3	42.3	54.9	50.6	43.7	7.0
Number of primary care visits	1.4 (2.6)	1.3 (2.5)	2.0 (3.0)	1.8 (2.9)	1.6 (3.0)	0.2
Specialty care visit (% with any)	68.7	63.8	60.1	62.0	56.96	5.2
Number of specialty care visits	4.1 (6.2)	3.1 (5.46)	3.2 (5.6)	3.3 (5.7)	3.2 (6.5)	0.1
Total in sample	296,984	388,110	1,391,813	2,076,907	5,428,429	

Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: Table shows utilization of emergency department and urgent, primary, and specialty care of demonstration or expansion enrollees in each demonstration state and by treatment condition. The population reflected in this table includes adult expansion beneficiaries with a twelve-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

ED = emergency department; s.d. = standard deviation.

Descriptive analyses of wellness visits. We explored whether the proportion of people who had a wellness visit varied by age, sex, rural residence, and the CDPS score for adult expansion beneficiaries in the demonstration and comparison states. The data are from January 2014 through December 2017.

Figure G.13 illustrates our findings. In all included states, the likelihood of a wellness visit increased with age, and women were more likely than men to have had a wellness visit. Rural beneficiaries were slightly more likely than urban beneficiaries to have had a wellness visit, but the differences in all states were small. Finally, the strongest association we observed was that beneficiaries with higher CDPS scores (a proxy for poorer health) were much more likely than beneficiaries with low CDPS scores to have had a wellness visit.

Figure G.13. Fraction of beneficiaries with a wellness visit within twelve months, by demographic characteristic

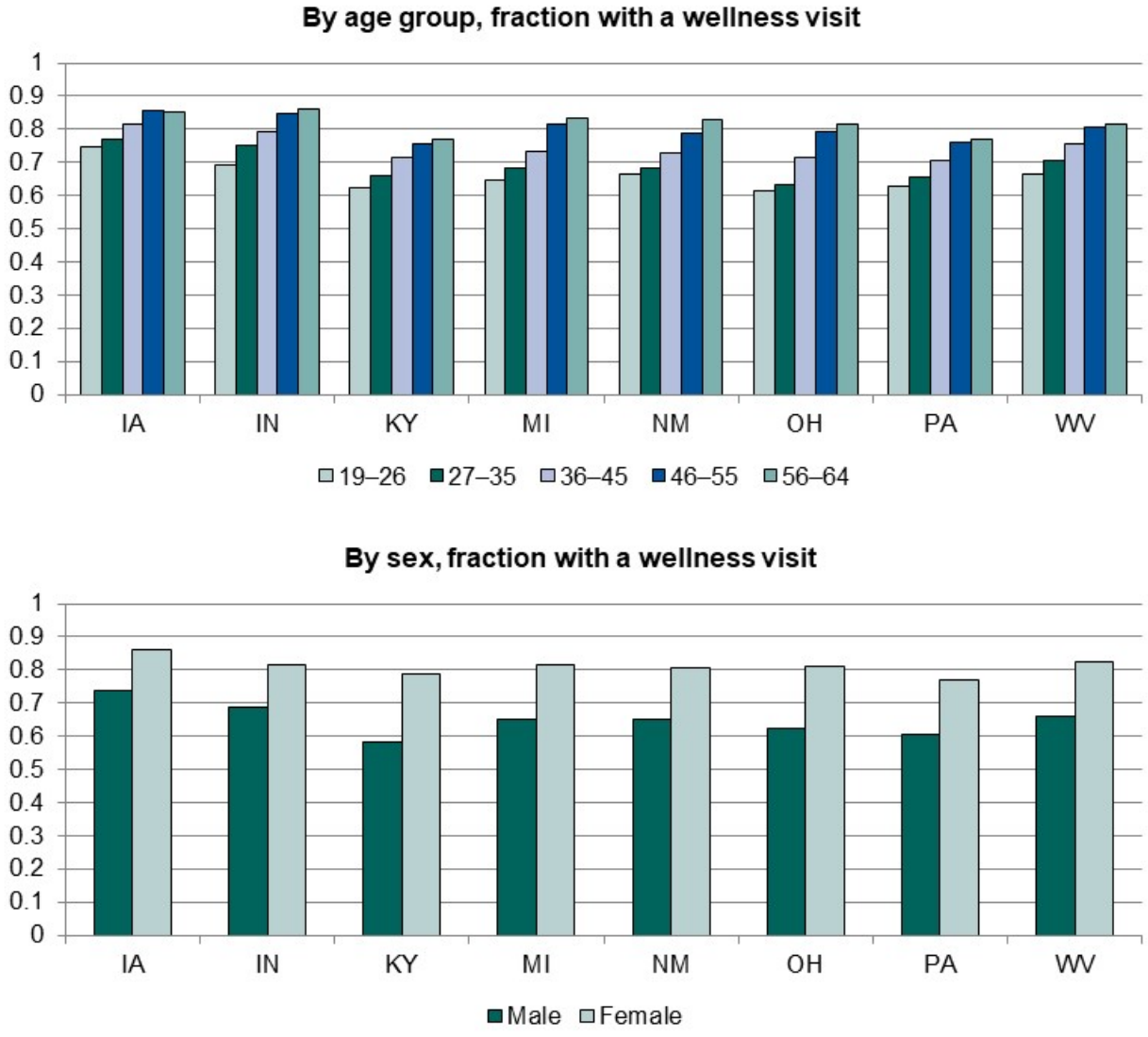
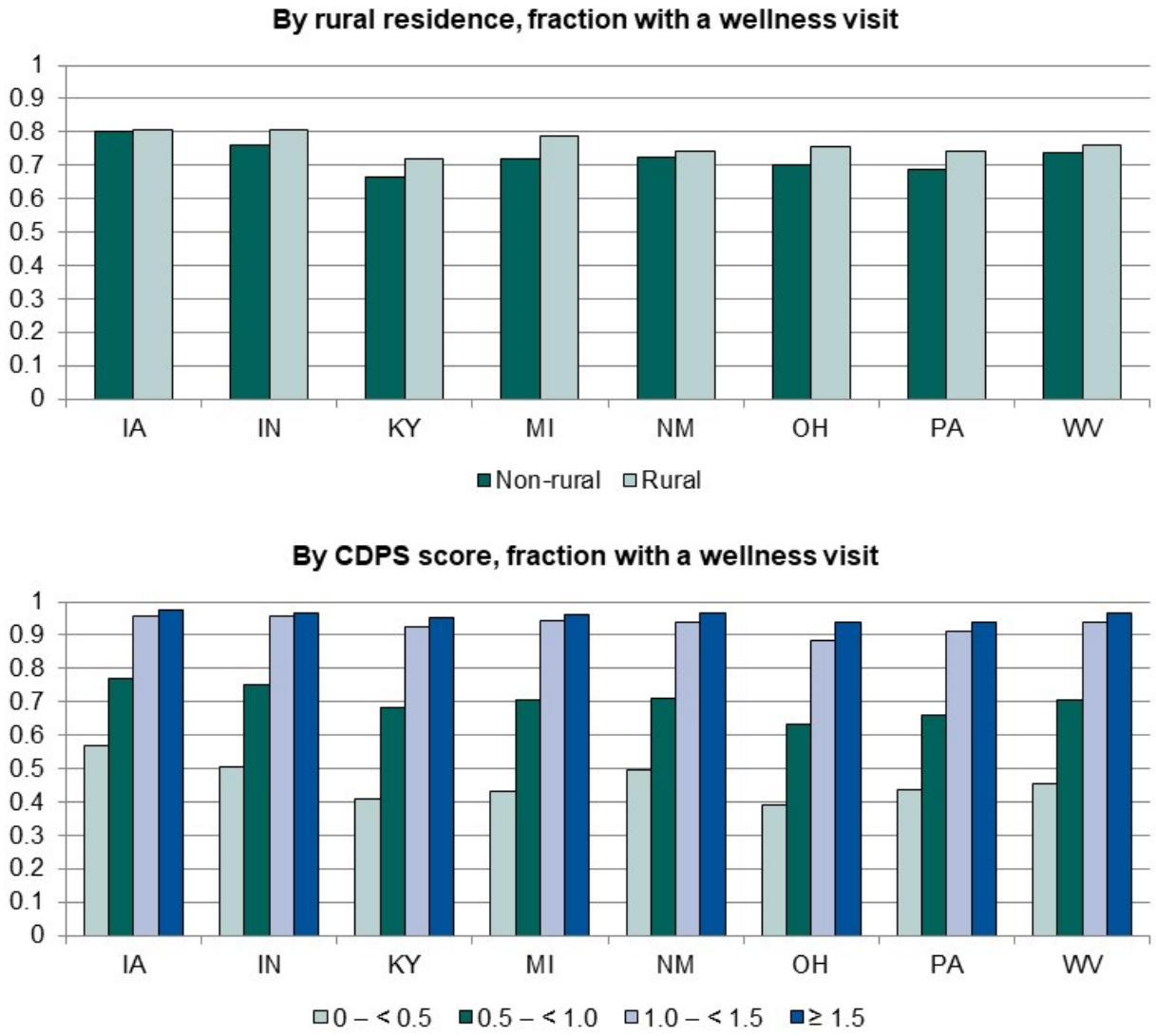


Figure G.13 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a 12-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

CDPS = Chronic Illness and Disability Payment System.

2. Descriptive analysis of preventive services

We explored how receipt of a preventive service varied among adult expansion beneficiaries in the demonstration and comparison states by age, sex, rural residence, and CDPS score. The data are from January 2014 through December 2017.

a. Mammograms

Figure G.14 shows our findings on mammography, which is a recommended preventive service for women age 50 through 64. Mammography rates were slightly higher in all three demonstration states than in the comparison states. Rates did not differ greatly by age group or by rural residence. Women with higher CDPS scores were more likely to get a mammogram than were women with lower CDPS scores.

Figure G.14. Fraction of women ages 46-64 receiving a mammogram within twelve months, by demographic characteristic

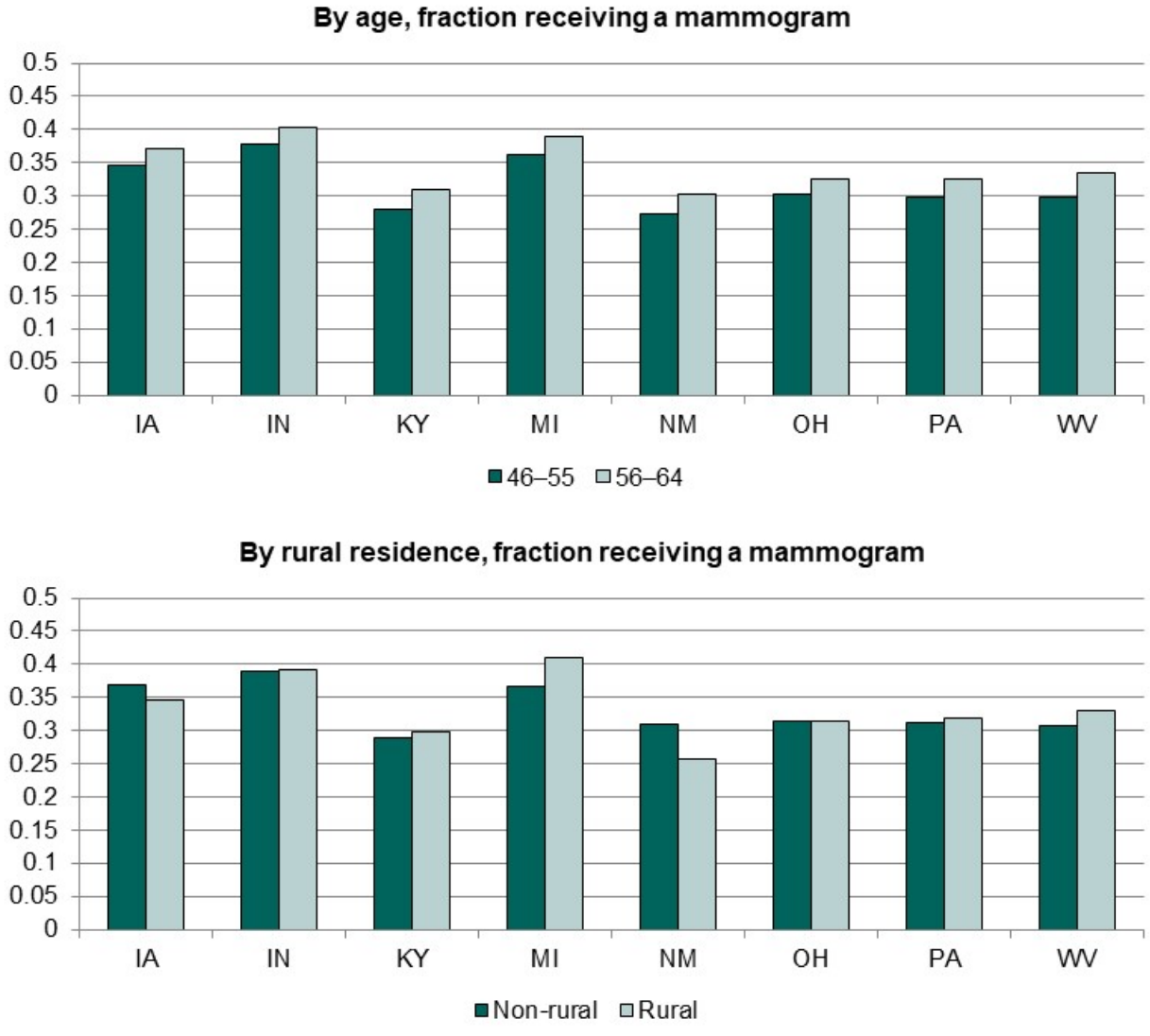
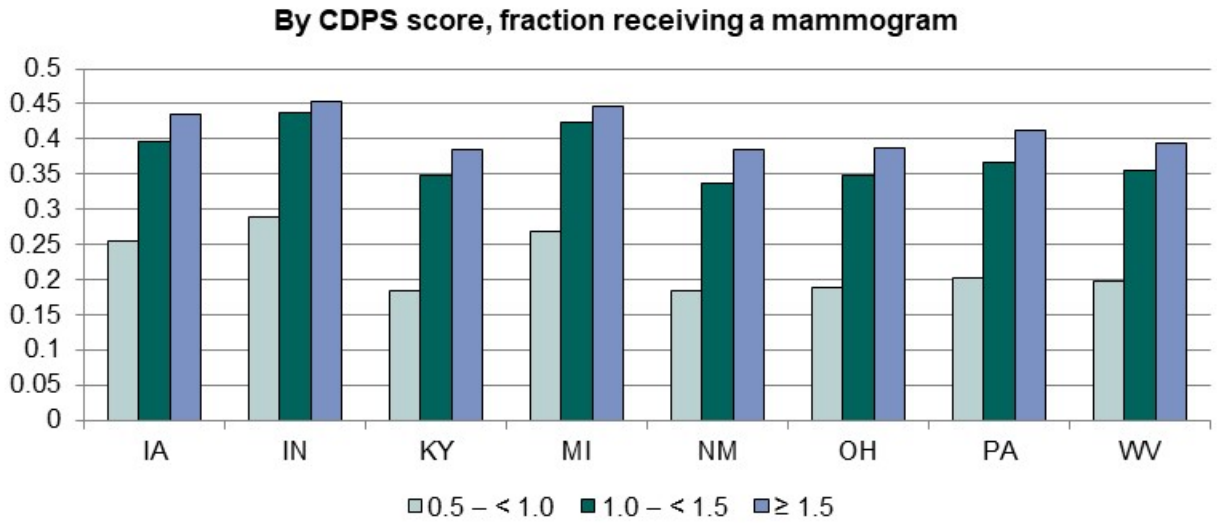


Figure G.14 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: Receipt of a mammogram is a recommended preventive service for women age 50 through 64. Women of this age always have a CDPS score greater than 0.5, which is why the lowest CDPS category is missing from the figure. The population reflected in these figures includes adult expansion beneficiaries with a 12-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

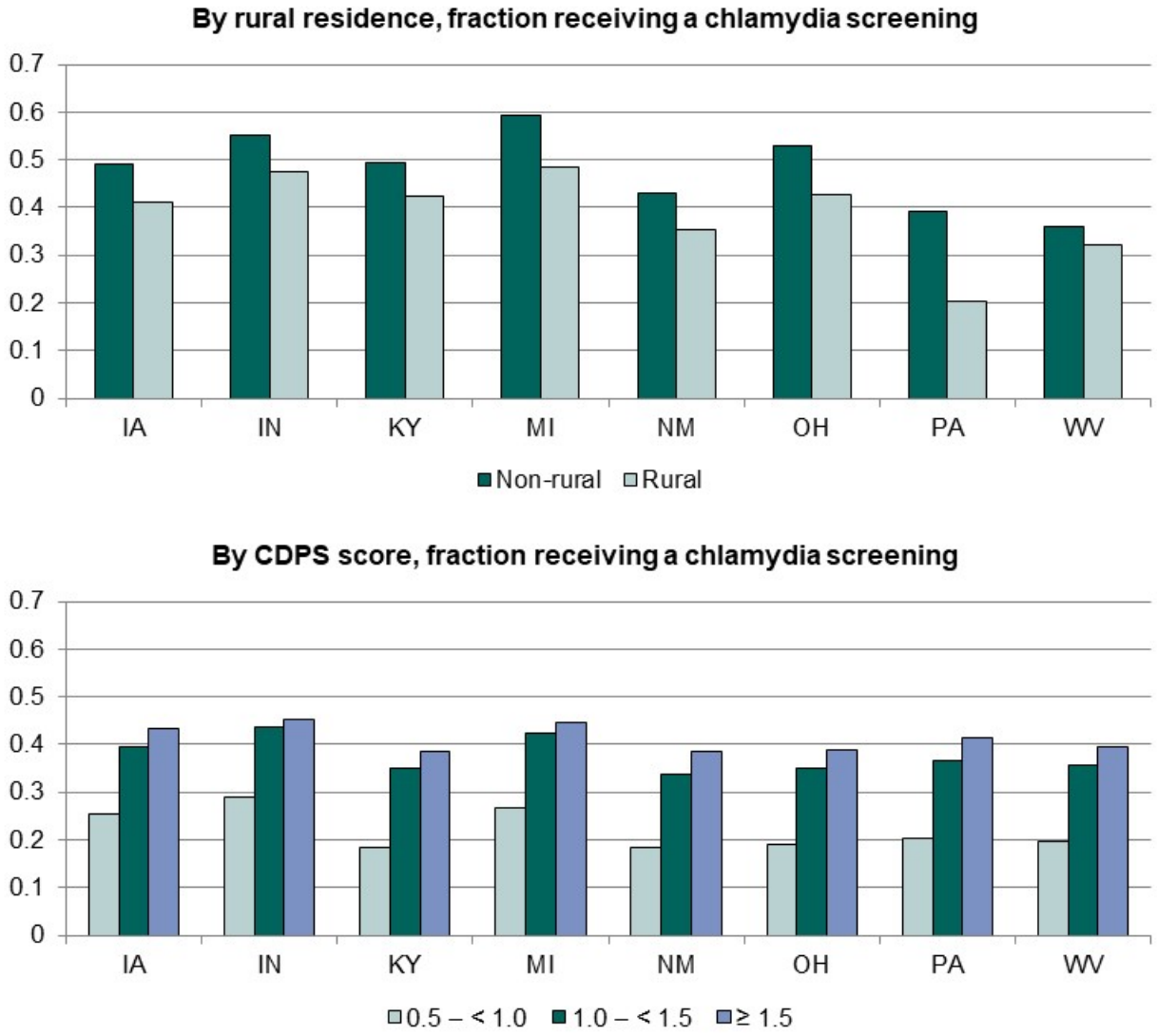
CDPS = Chronic Illness and Disability Payment System.

b. Chlamydia screening

Figure G.15 reveals our findings on chlamydia screening, which is a recommended preventive service for sexually active women age 19 through 24.[21] In all states, urban women were more likely than rural women to have a screening. In most states, women with higher CDPS scores were more likely to have a screening.

[21] Only the youngest age group is therefore represented; hence, we do not present findings by age.

Figure G.15. Fraction of sexually active women ages 19-24 receiving a chlamydia screening within twelve months, by demographic characteristic



Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: Chlamydia screening is a recommended preventive service for women age 19 through 24 who are sexually active. Women of this age always have a CDPS score greater than 0.5, which is why that category is missing from the figure. The population reflected in these figures includes adult expansion beneficiaries with a 12-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

CDPS = Chronic Illness and Disability Payment System.

c. Cervical cancer screening

Figure G.16 shows breakdowns on cervical cancer screening, which is a recommended preventive service for all adult women. Cervical cancer screening rates were relatively low among women age 19 through 26, were generally highest among women between the ages of 27 and 35, and decreased with increasing age thereafter. There were only small differences in cervical cancer screening rates among women in urban and rural areas. As with other services, cervical cancer screening was more likely to be used by women with high CDPS scores than by women with low CDPS scores.

Figure G.16. Fraction of women receiving a cervical cancer screening within twelve months, by demographic characteristic

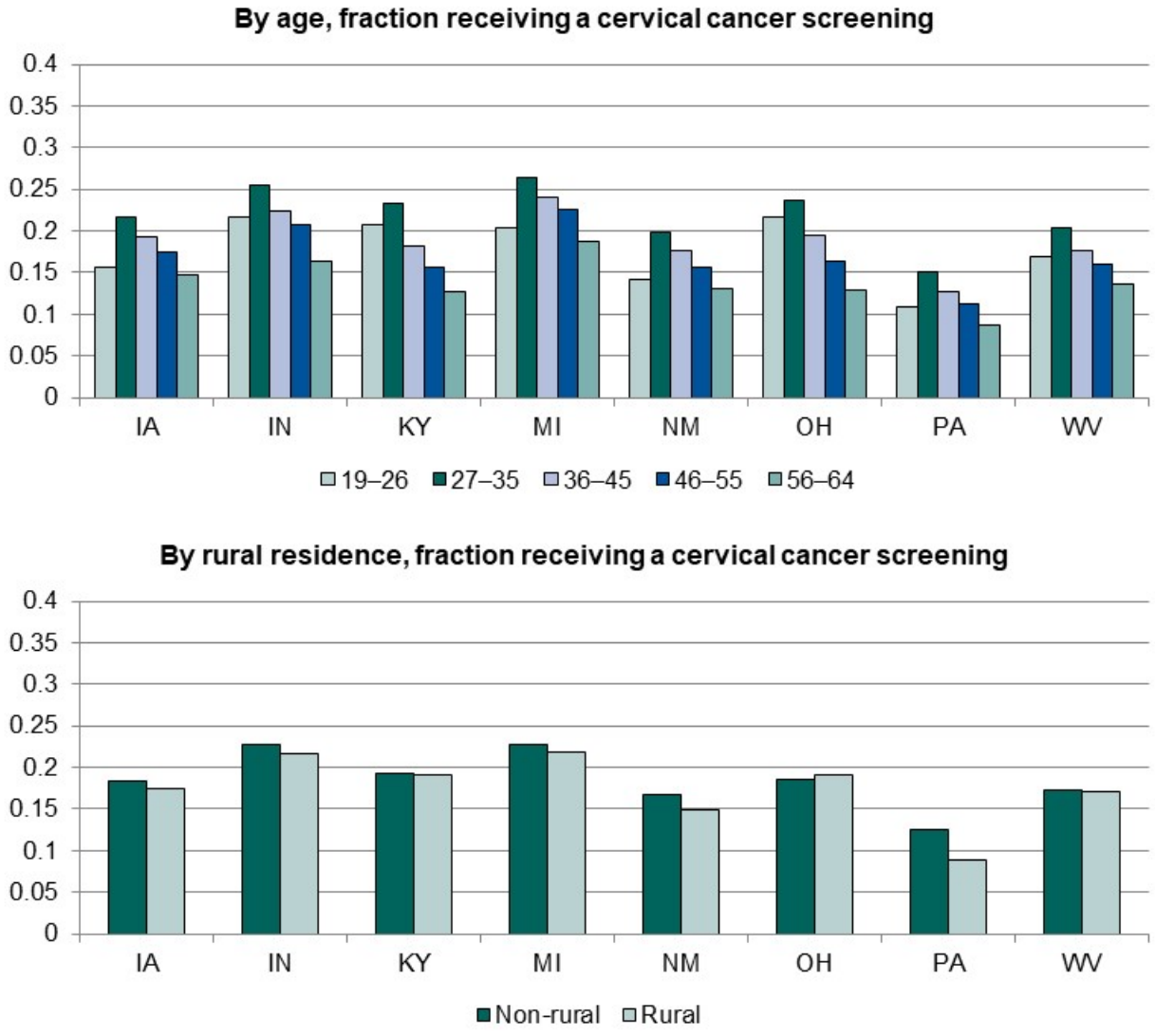
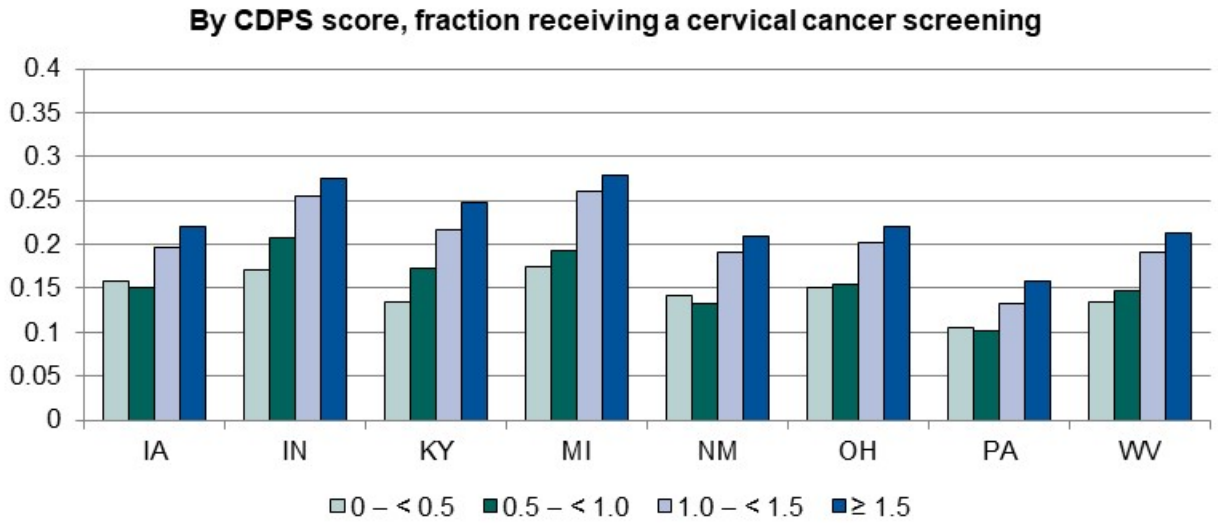


Figure G.16 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: Cervical cancer screening is a recommended preventive service for all women. The population reflected in these figures includes adult expansion beneficiaries with a 12-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

CDPS = Chronic Illness and Disability Payment System.

d. Colorectal cancer screening

Figure G.17 illustrates our findings on colorectal cancer screening, which is a recommended preventive service for all individuals over age 50.[22] Individuals age 46 through 55 and 56 through 64 were similarly likely to have a screening, but women were more likely than men to be screened. In some states, colorectal screening was more common in urban areas, but, in many cases, rates were similar between rural and non-rural areas. Finally, rates of colorectal cancer screening increased markedly with CDPS scores.

[22] The denominator for all colorectal cancer screening figures is all individuals age 50 through 64.

Figure G.17. Fraction of beneficiaries ages 50-64 receiving a colorectal cancer screening within twelve months, by demographic characteristic

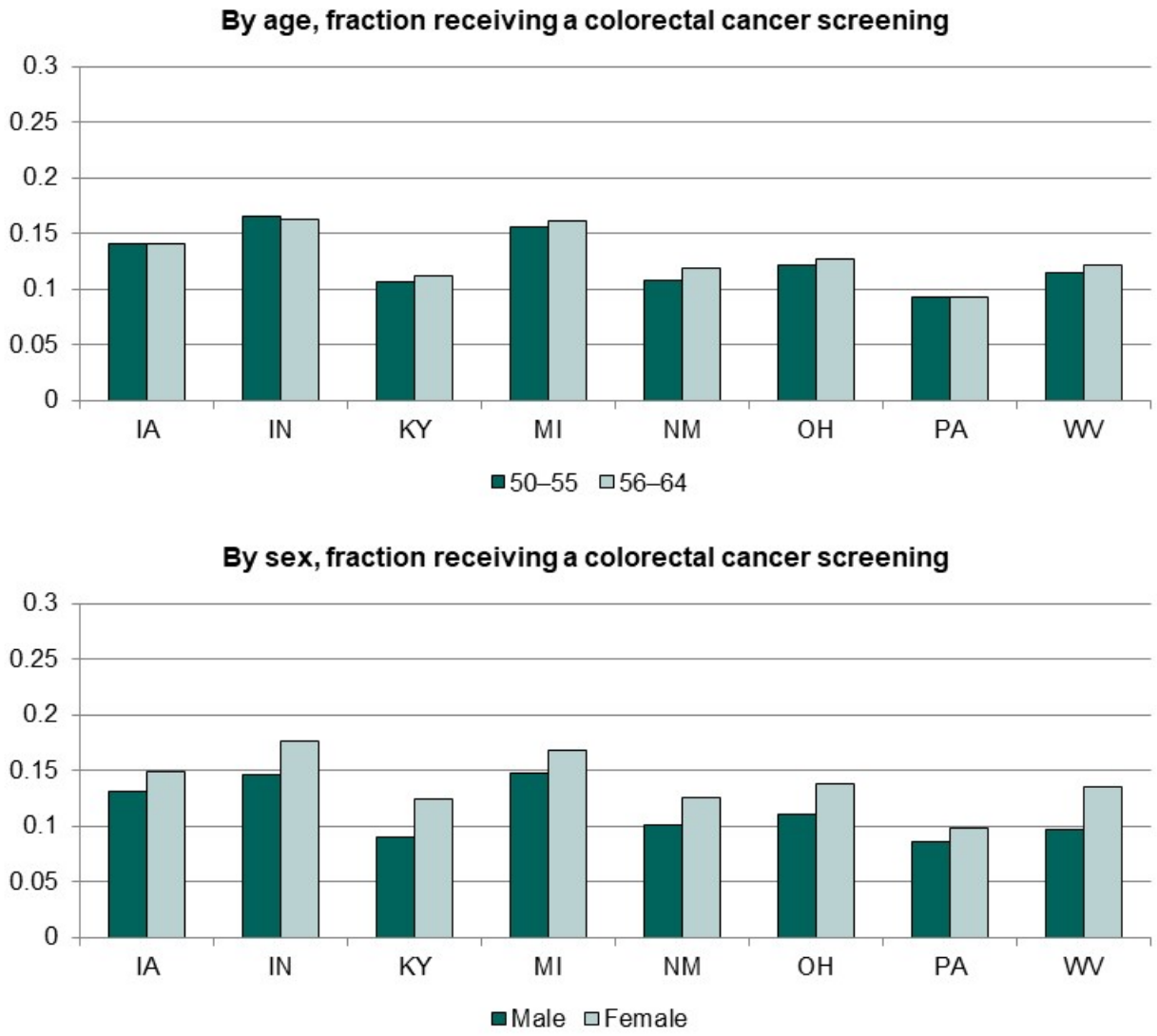
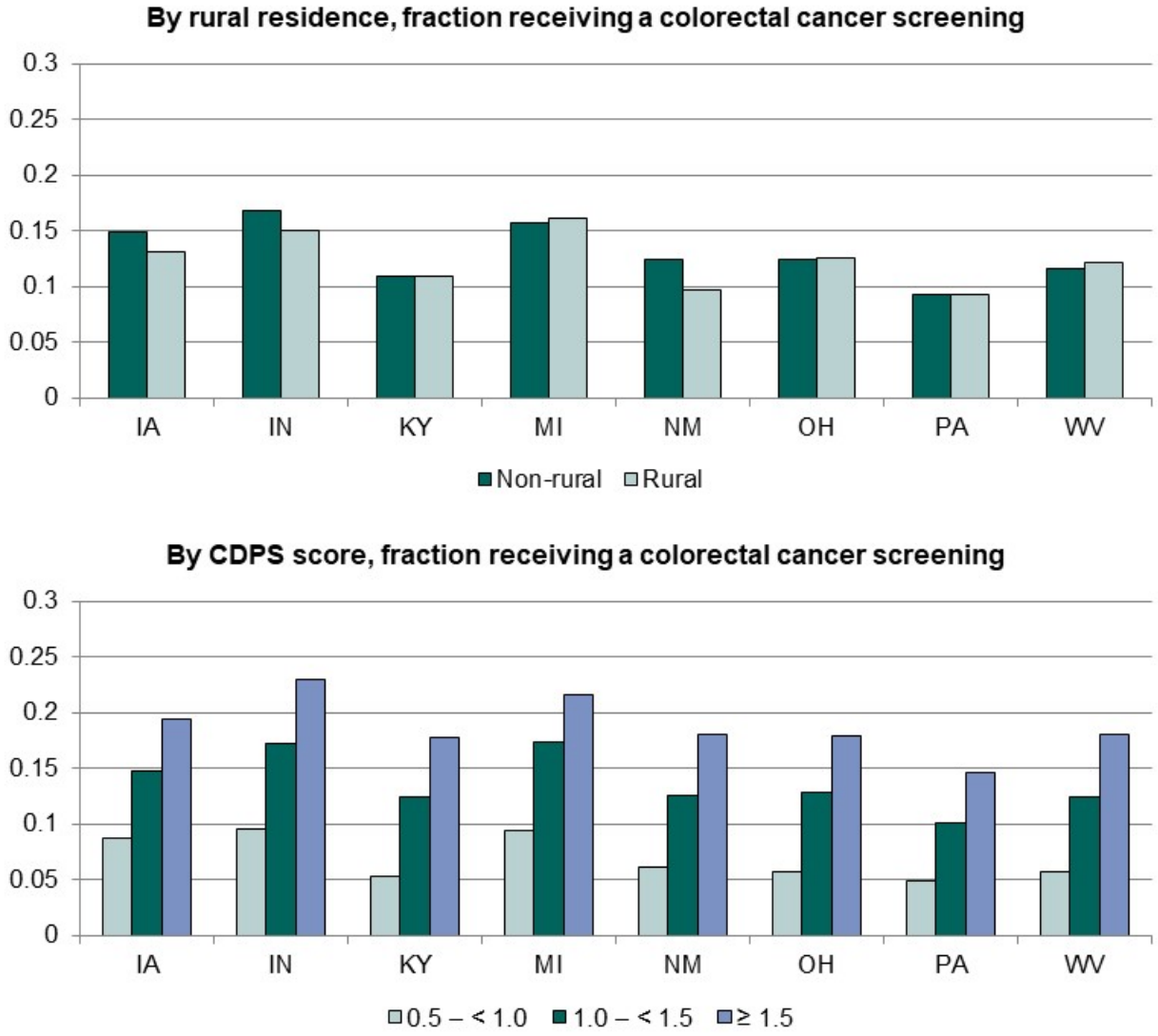


Figure G.17 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: Colorectal cancer screening is a recommended preventive service for all individuals age 50 through 64. Individuals of this age always have a CDPS score greater than 0.5, which is why the lowest category is missing from the figure. The population reflected in these figures includes adult expansion beneficiaries with a 12-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

CDPS = Chronic Illness and Disability Payment System.

e. Overall receipt of preventive services

Figure G.18 illustrates our findings on preventive service use. In all four states, the probability of having any preventive service increased with age, but the probability of having all preventive services recommended for an individual's age and sex peaked between ages 36 and 45. This may be due to the greater number of preventive services recommended for older individuals. Women were more likely than men to have had any preventive service, but men were far more likely than women to have had all preventive services.[23] In all age groups, men had fewer recommended preventive services than did women, which may explain this difference. Individuals in rural and urban areas had similar rates of preventive service completion overall, with rural residents slightly more likely to have had any preventive service. In all states, the overall rate of having any preventive service increased with CDPS score.

[23] It is possible that the higher rate of any preventive care among women reflects higher utilization of primary care rather than a higher probability of receiving preventive services at primary care visits.

Figure G.18. Fraction of beneficiaries receiving any or all preventive services within twelve months, by demographic characteristic

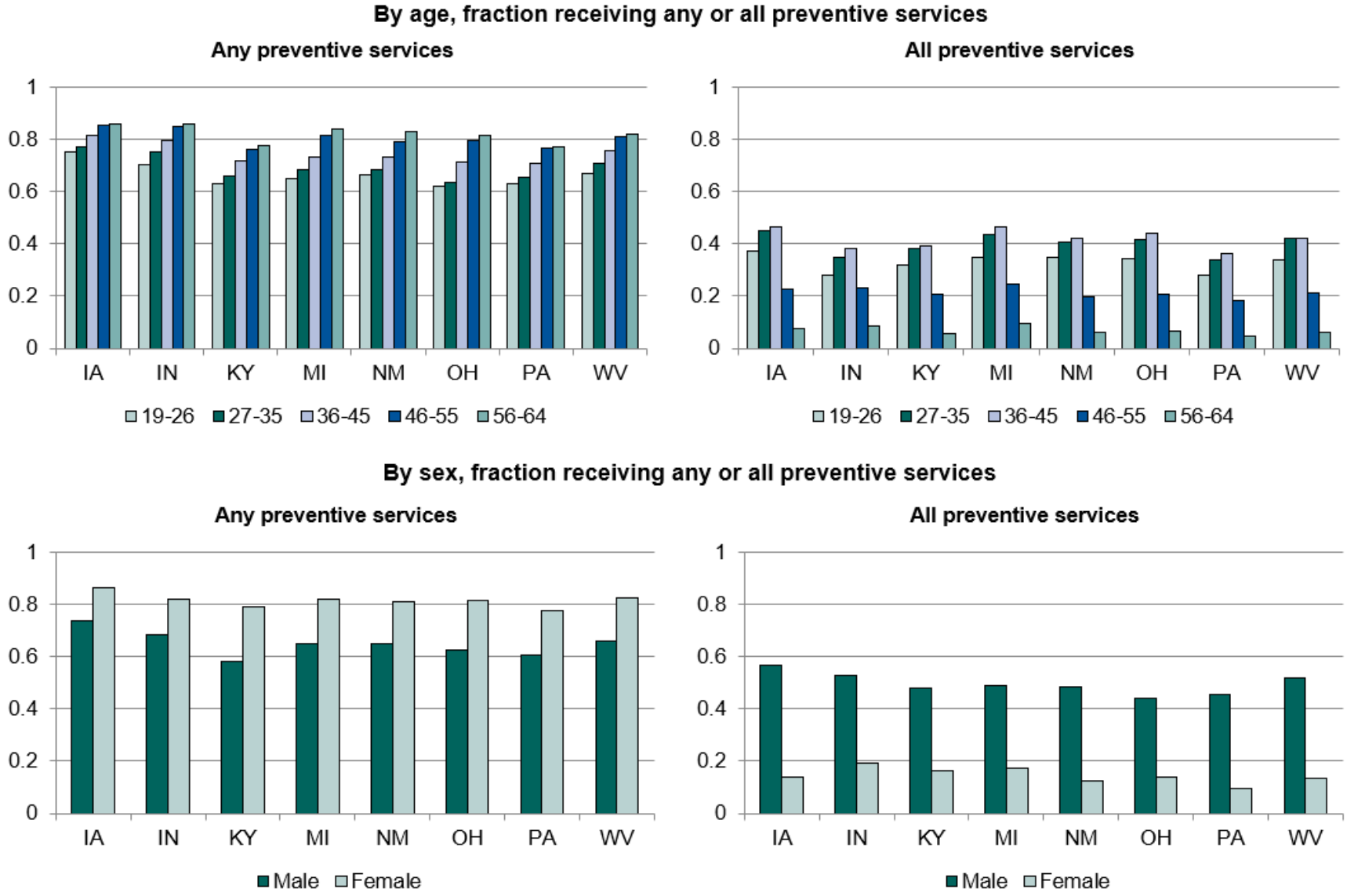
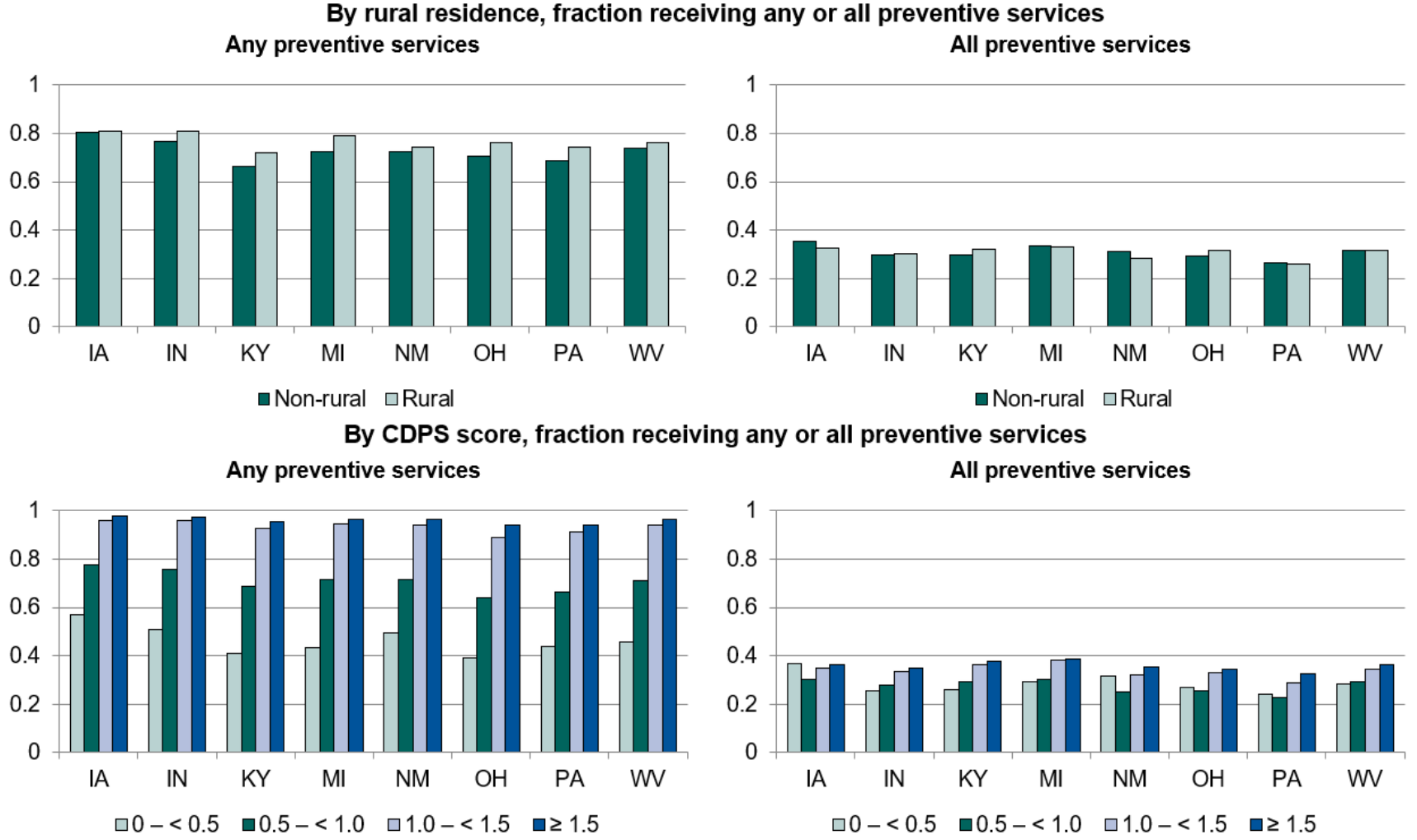


Figure G.18 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a 12-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

CDPS = Chronic Illness and Disability Payment System.

3. Descriptive analysis of chronic condition management

We explored how chronic condition management varied in the demonstration and comparison states by age, sex, rural residence, and CDPS score. The data are from January 2014 through December 2017.

a. Diabetes management

We looked at all adults with a diabetes diagnosis. Figure G.19 illustrates our findings. Pennsylvania and New Mexico had lower HbA1c testing rates than other states, although they did not have higher hospitalization rates. HbA1c testing rates increase with age. Hospital admission rates decrease sharply with age, possibly because younger adults with diabetes are more likely to have Type 1 diabetes rather than the relatively milder Type 2. HbA1c test rates did not differ by sex, but hospital admission for diabetes was much more prevalent in men than in women. Urban and rural beneficiaries had similar rates of HbA1c testing (except in Pennsylvania and New Mexico), but urban beneficiaries were more likely to be hospitalized for diabetes. In all states, beneficiaries with higher CDPS scores were more likely to have had an HbA1c test, but hospitalizations were almost exclusively concentrated among beneficiaries with CDPS scores above 1.5.

Figure G.19. Fraction of beneficiaries with a diabetes diagnosis who have diabetes management outcomes within twelve months, by demographic characteristic

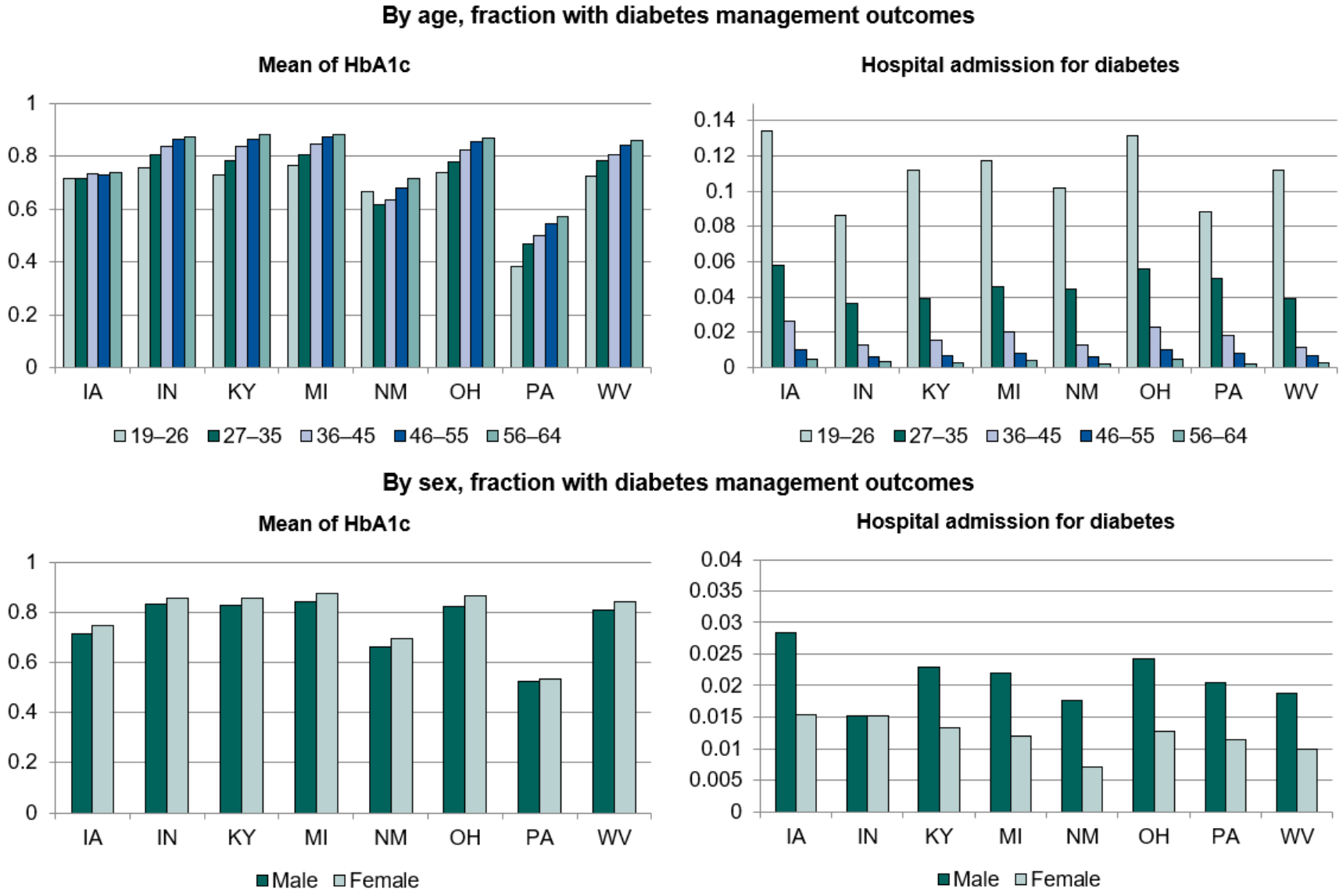
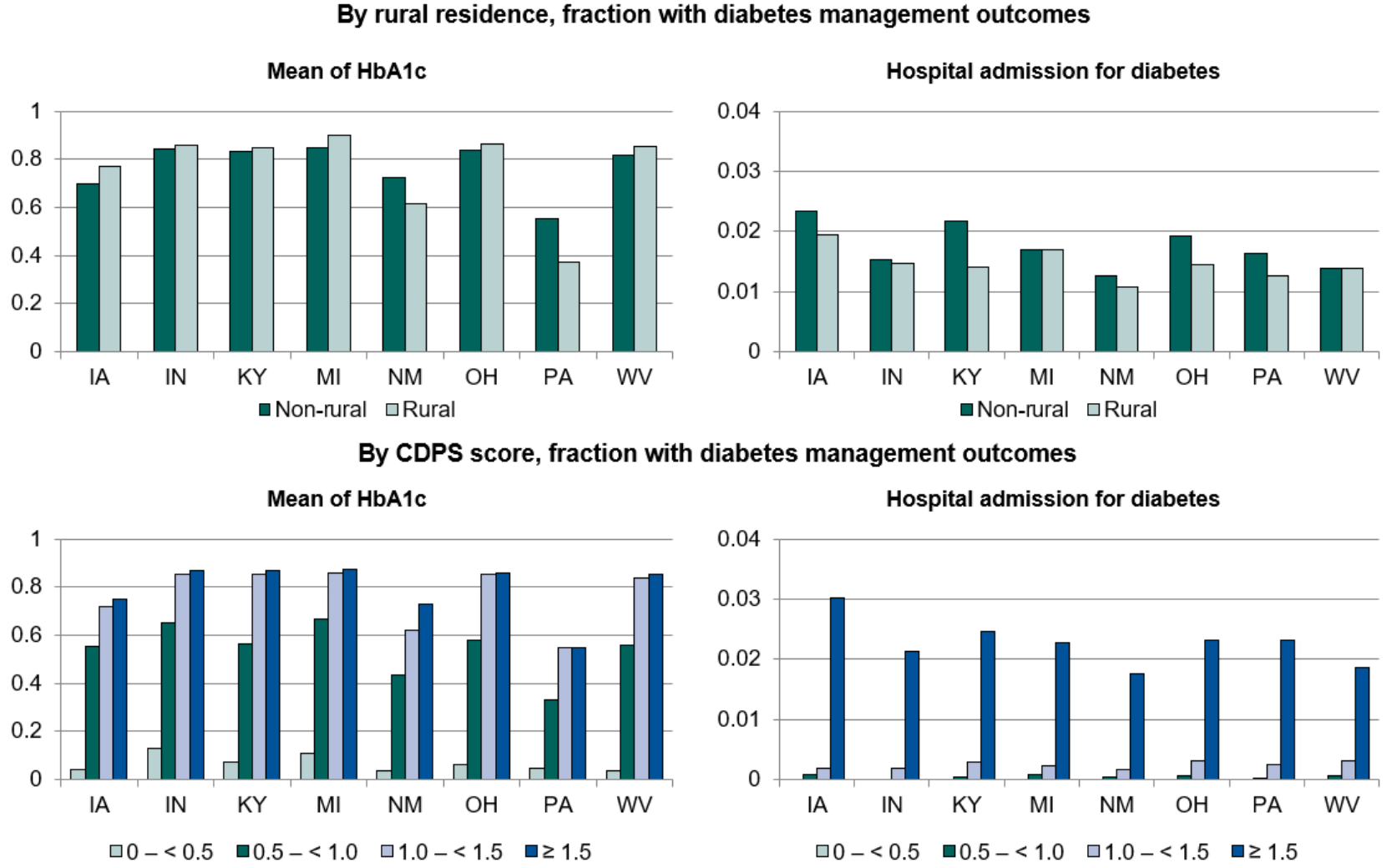


Figure G.19 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a 12-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

CDPS = Chronic Illness and Disability Payment System.

b. Cardiovascular disease management

We looked at all hospitalizations with a heart failure diagnosis. Figure G.20 illustrates our findings. Admission rates were higher with increasing age, and men were more likely than women to be admitted for heart failure in all states. New Mexico was the only state in which rural beneficiaries were noticeably more likely to be hospitalized than urban beneficiaries. Admissions for heart failure were almost exclusively concentrated among beneficiaries with CDPS scores above 1.5. This disease often exhibits substantial racial disparities. Unfortunately, because of unreliable race/ethnicity data, we were not able to assess the degree to which racial disparities in heart failure admission varies by state.

Figure G.20. Fraction of beneficiaries with hospital admission for heart failure within twelve months, by demographic characteristic

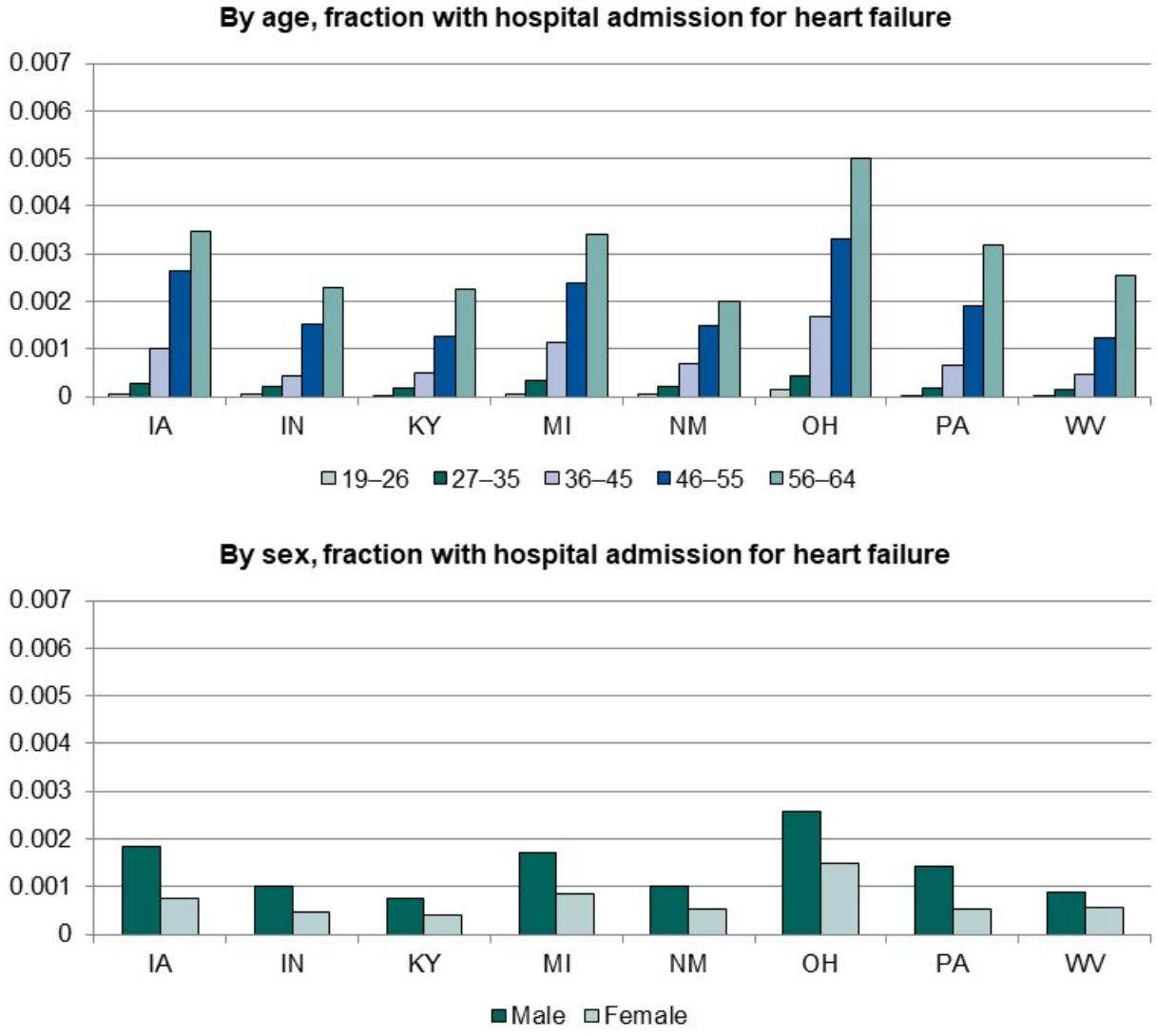
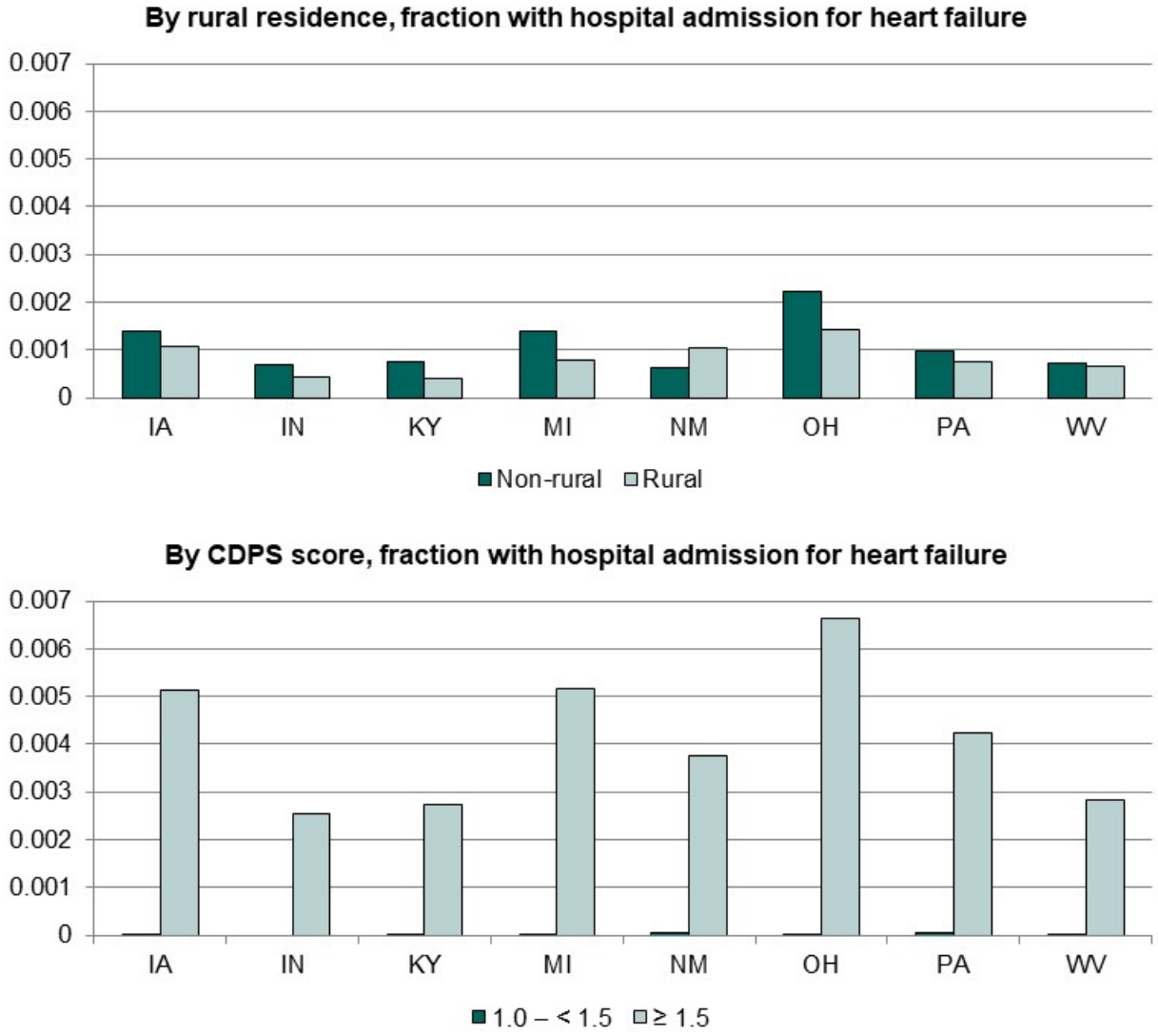


Figure G.20 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: A diagnosis of heart failure guarantees a CDPS score of 1.0 or above, which is why lower values do not appear in the figure. The population reflected in these figures includes adult expansion beneficiaries with a 12-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

CDPS = Chronic Illness and Disability Payment System.

c. Management of respiratory conditions

Figure G.21 shows findings on management of respiratory conditions. We looked at younger adults age 19 through 39 hospitalized with an asthma diagnosis and older adults age 40 through 64 hospitalized with a chronic obstructive pulmonary disease (COPD) diagnosis. Hospitalizations for COPD were substantially more common in Ohio than in other states. Rates of hospitalization for both respiratory conditions increased with age. In general, women were more likely than men to be hospitalized for respiratory conditions, particularly for COPD. Hospitalizations were more common among urban beneficiaries, especially for asthma. As with several other measures, hospitalization rates for respiratory conditions increased as the CDPS score increased.

Figure G.21. Fraction of beneficiaries with hospitalization for respiratory conditions within twelve months, by demographic characteristic

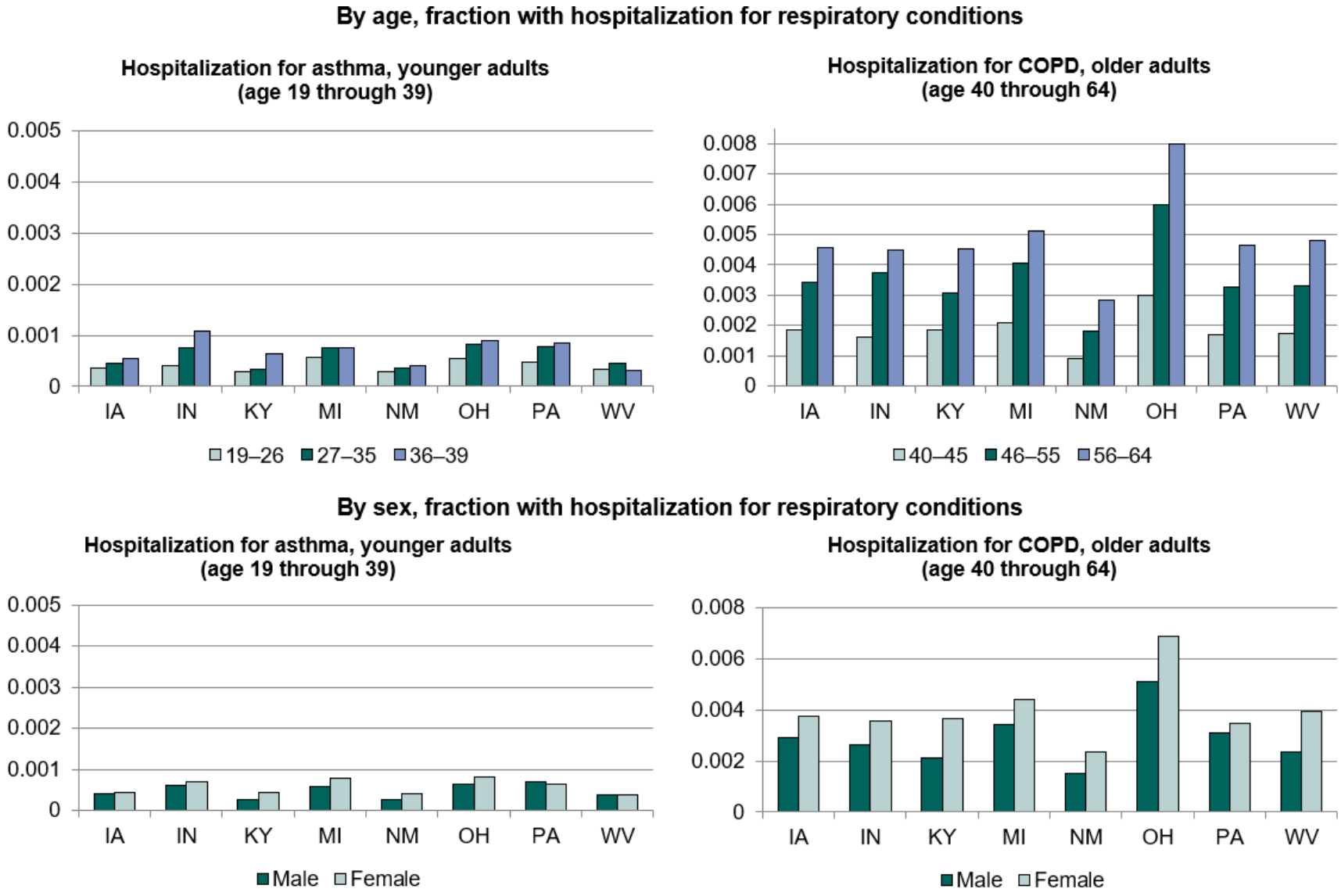
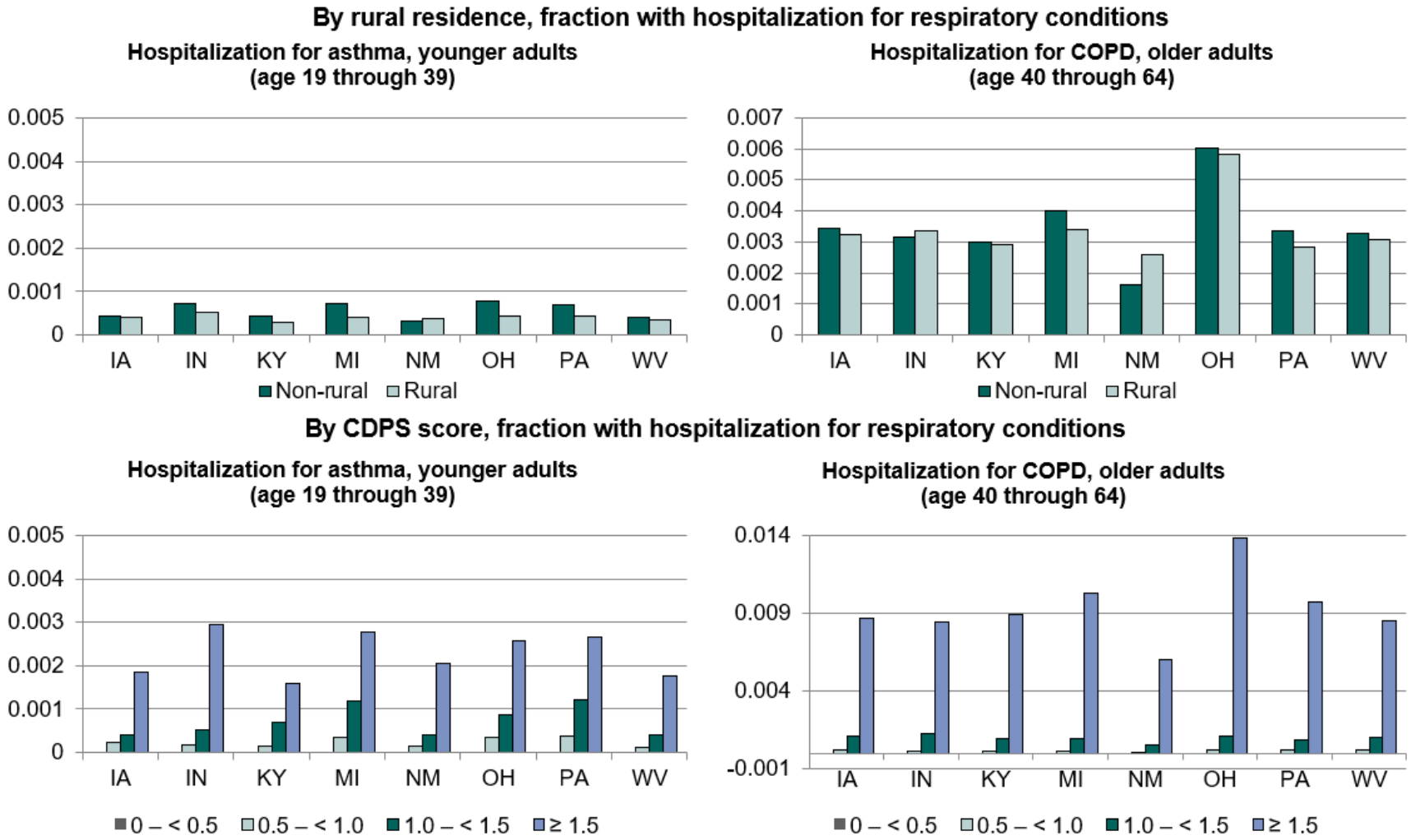


Figure G.21 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a 12-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

COPD = chronic obstructive pulmonary disorder; CDPS = Chronic Illness and Disability Payment System.

d. Follow-up after acute hospitalization

Figure G.22 shows findings on follow-up after acute hospitalization. We examined follow-up with a physician after any acute hospitalization as well as follow-up with a mental health professional after an acute hospitalization for mental health.

Rates of follow-up after any acute hospitalization were generally high and increased with age. Follow-up rates were similar for men and women, although men in Indiana were noticeably more likely to have a follow-up visit. Rural beneficiaries had higher rates of follow-up than non-rural beneficiaries. Beneficiaries with higher CDPS scores were also more likely to have a follow-up visit.

Indiana had the highest rate of follow-up after a hospitalization for mental health, possibly related to its care coordination program for mental health. Follow-up rates did not uniformly increase with age. In all states, women had higher rates of follow-up. Neither rural nor urban beneficiaries had systematically higher rates of follow-up. Rates generally increased with the CDPS score, except in Ohio where beneficiaries with a CDPS score between 0 and 0.5 had the highest follow-up rate.

Figure G.22. Fraction of beneficiaries with follow-up after acute hospitalization within twelve months, by demographic characteristic

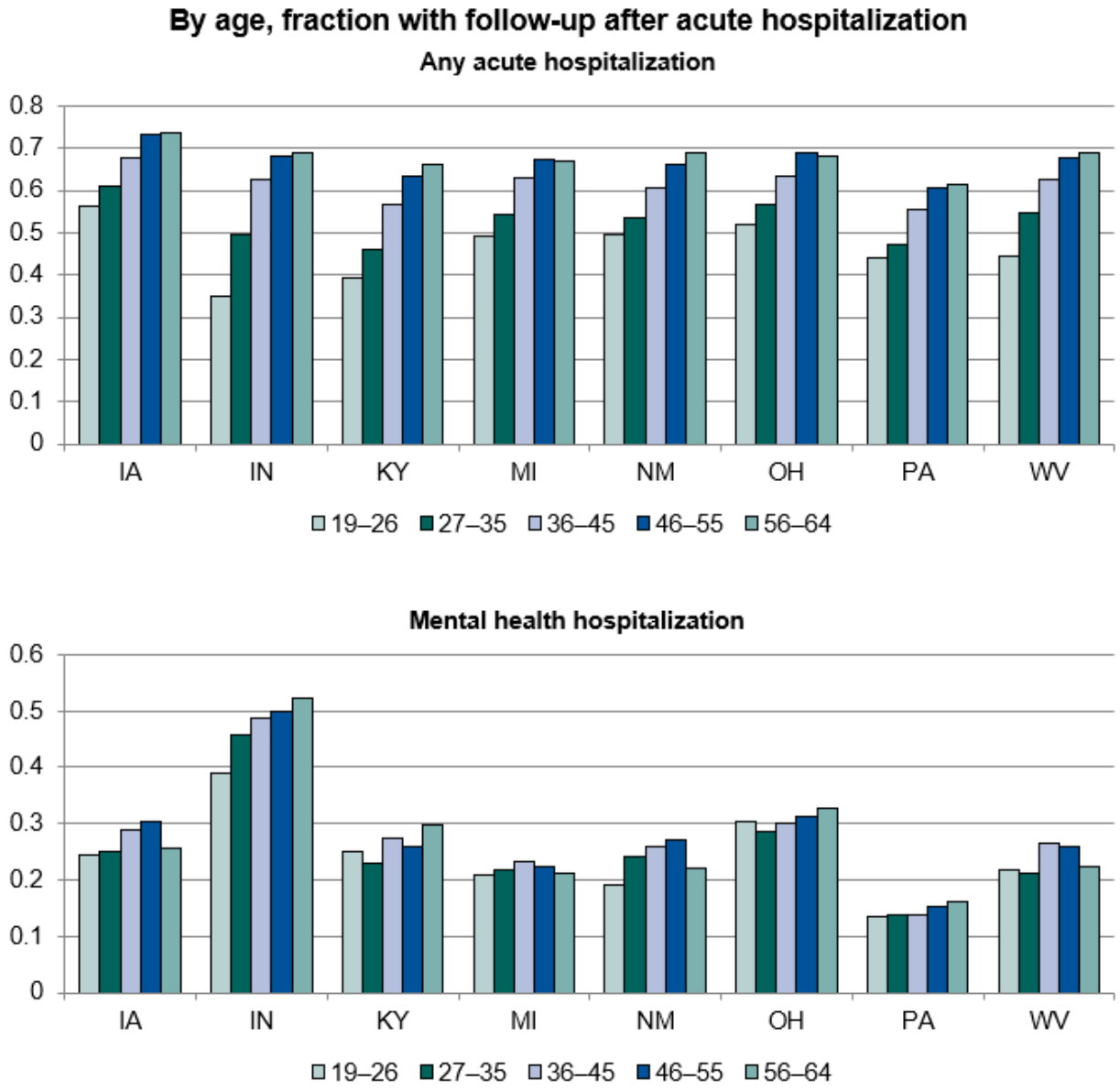


Figure G.22 (*continued*)

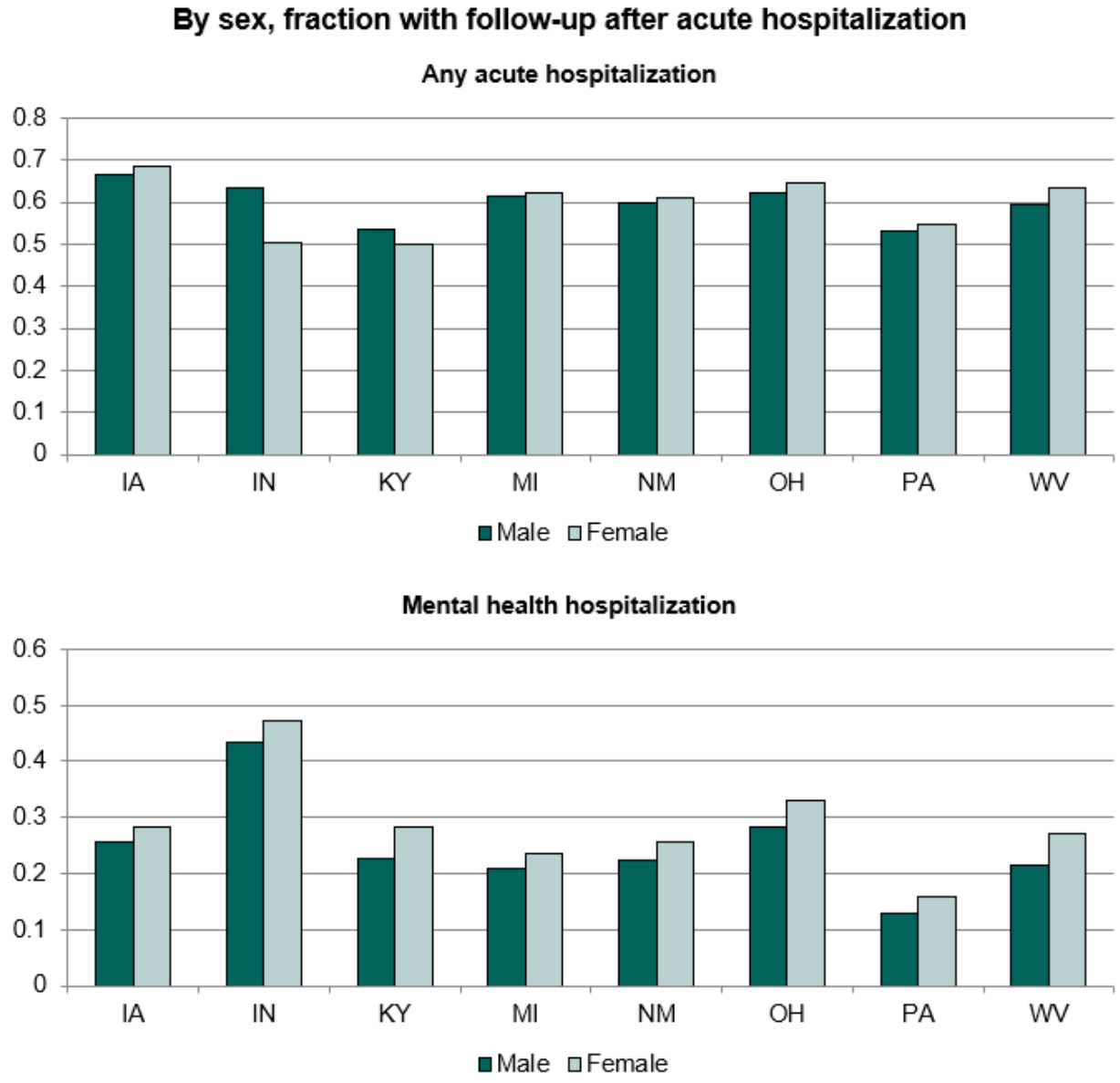


Figure G.22 (*continued*)

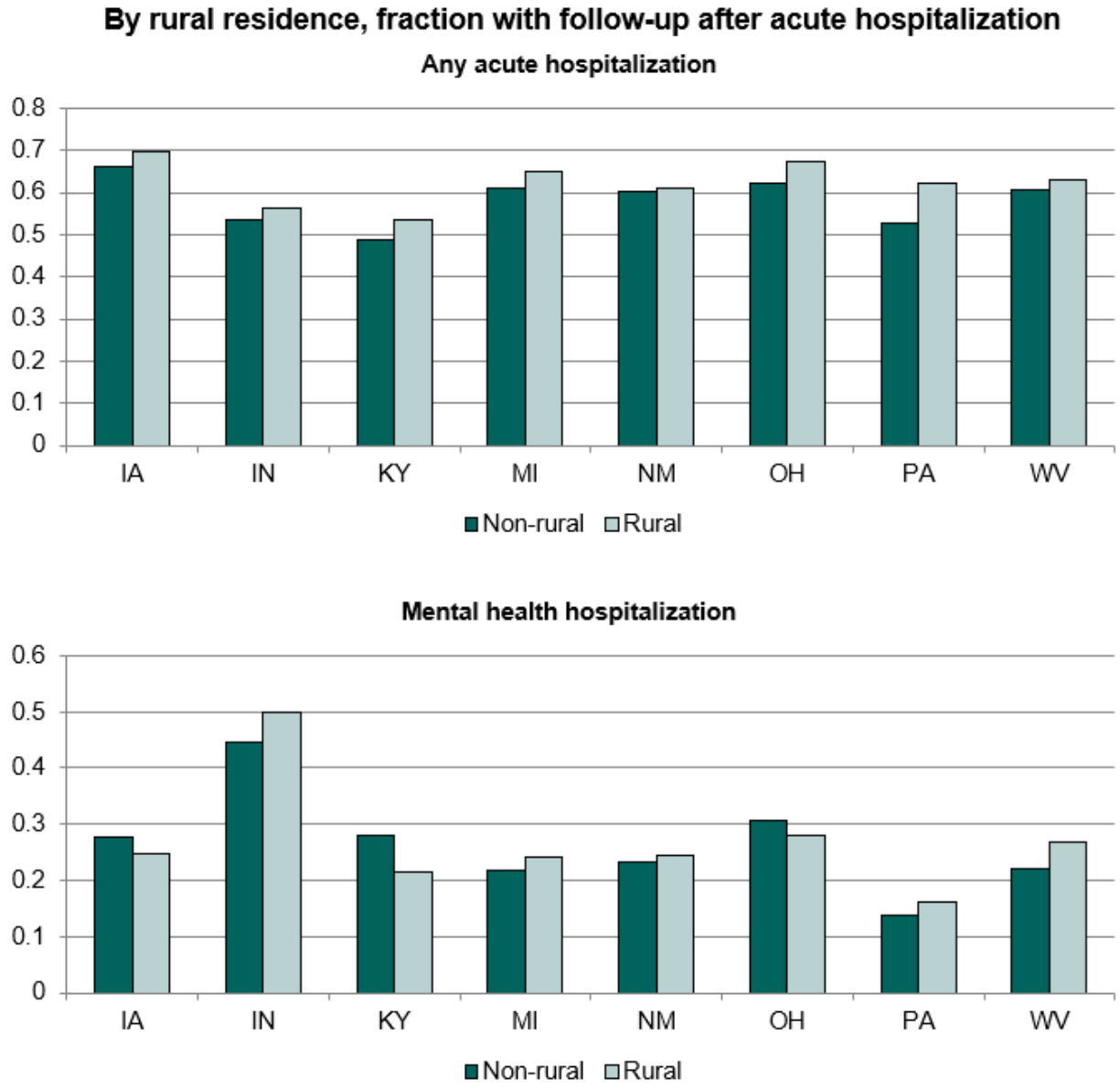
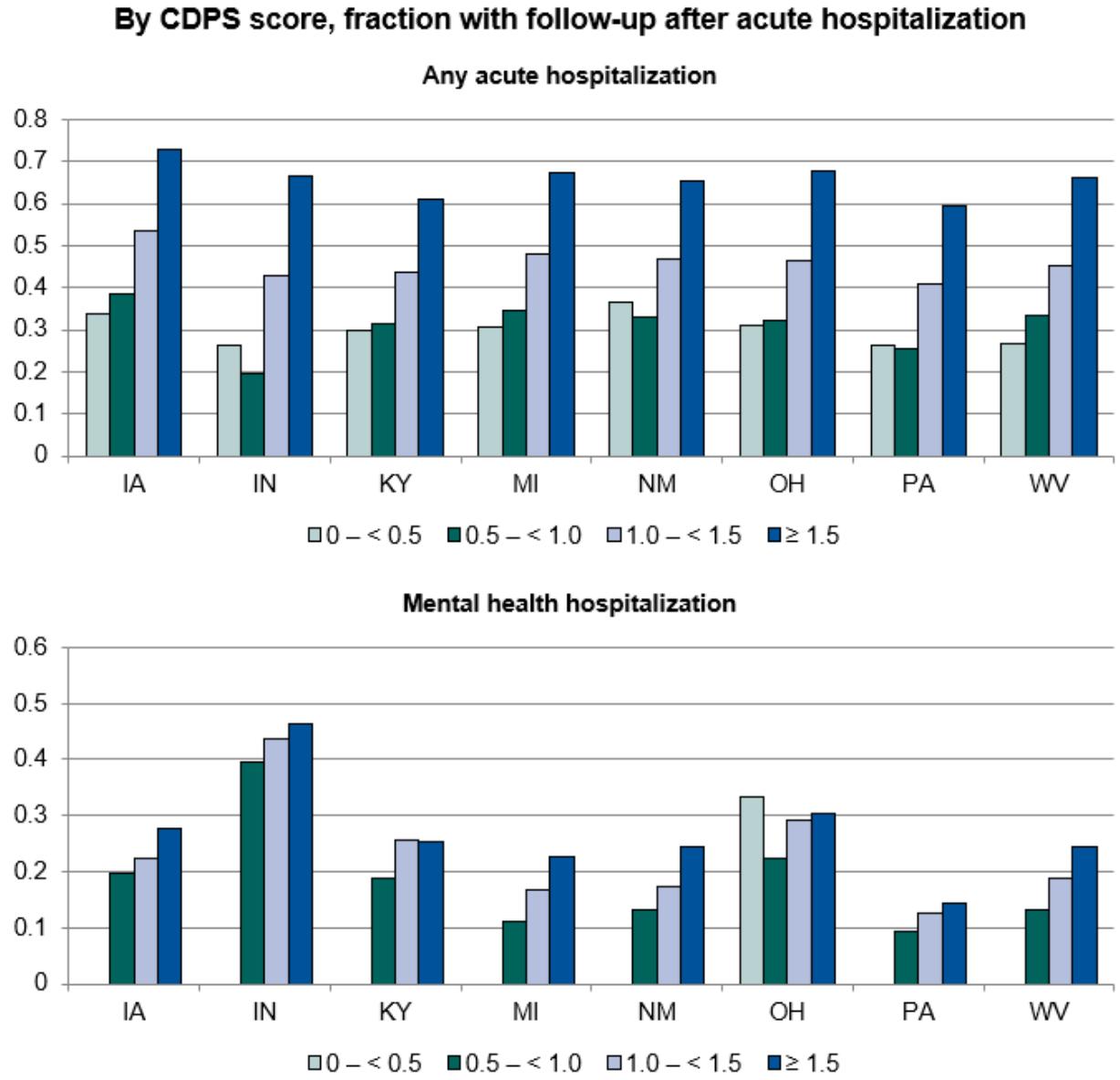


Figure G.22 (*continued*)



Source: Mathematica analysis of administrative data from 2014–2017 for Indiana, Iowa, and Michigan (demonstration states); and Kentucky, New Mexico, Ohio, Pennsylvania, and West Virginia (comparison states). Years included for each state depend on date of demonstration implementation or coverage and data availability.

Note: The population reflected in these figures includes adult expansion beneficiaries with a 12-month span and where covariates were nonmissing. However, no adjustments were made for individual characteristics in these summary statistics.

CDPS = Chronic Illness and Disability Payment System.

4. Descriptive analysis of HIP 2.0 rollovers

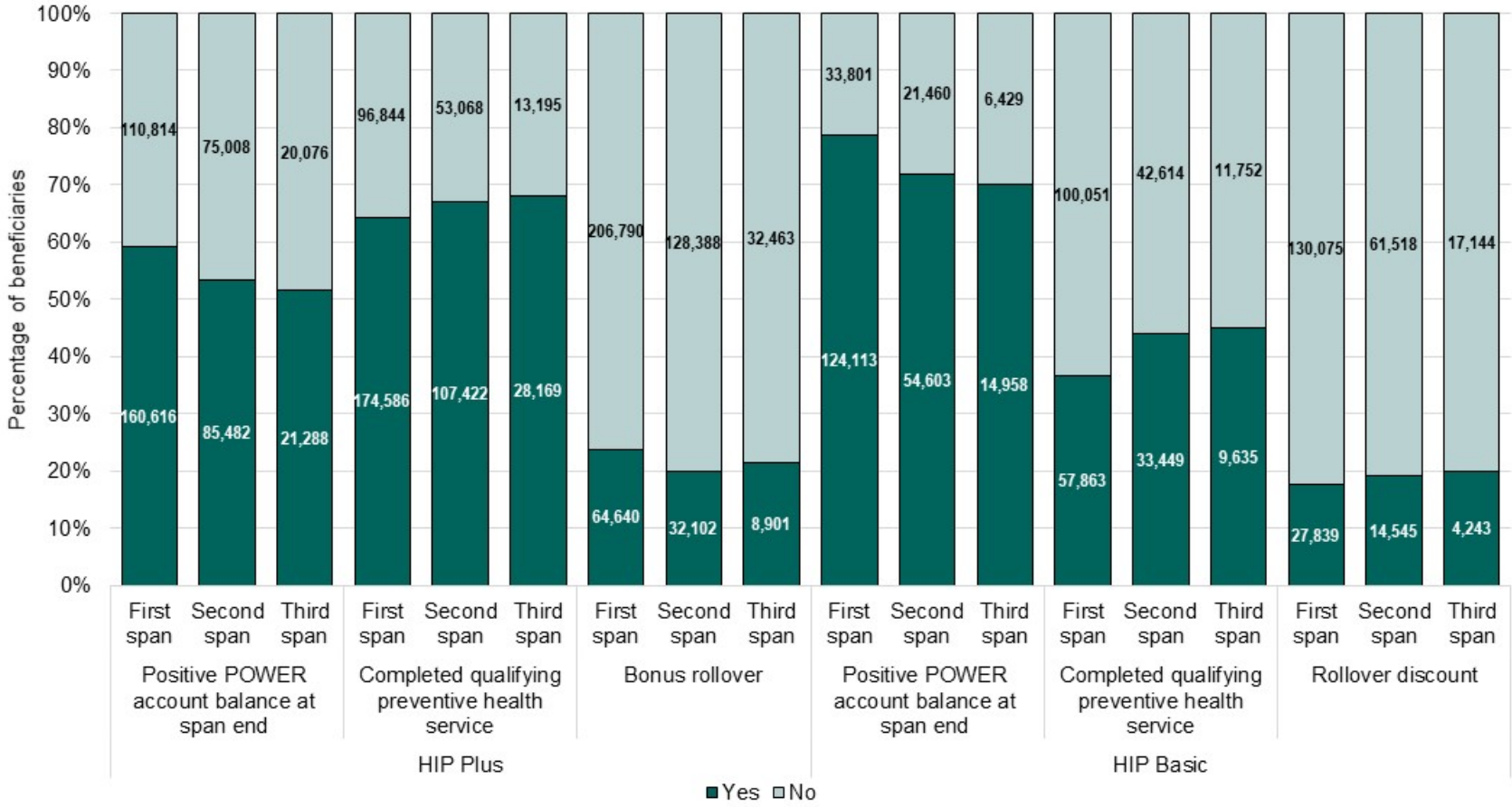
In addition to assessing bonus rollover or rollover discounts by spans in aggregate, we assessed the proportion of adults enrolled in their first, second, and third 12-month HIP 2.0 spans who met the requirements to qualify for a reward. Figure G.23 shows that the proportion of beneficiaries who maintained a positive POWER account balance at the end of a 12-month span decreased with each additional enrollment span for both HIP Plus and HIP Basic enrollees. Two potential explanations for this downward trend are (1) compositional change as high utilizers may be more likely to continue with HIP 2.0 and have multiple spans than low utilizers and (2) adults with additional enrollment experience in HIP 2.0 may prefer to obtain care rather than maintain a positive POWER account balance. These two explanations are not mutually exclusive.

To decompose the observed trend, we limited the analysis to the proportion of adults enrolled in their first, second, and third 12-month HIP 2.0 spans who were continuously enrolled for 36 months (Figure G.24), which rules out compositional change over time. Long-term enrollees were, on average, less likely to maintain a positive POWER account balance in their first 12-month span than all enrollees, in both HIP Plus and HIP Basic. The likelihood of a positive balance was fairly constant across spans. This pattern supports the explanation that decreasing likelihood of a positive POWER account balance is due to compositional changes, with higher utilizers maintaining longer enrollment than lower utilizers.

In contrast to the pattern observed in POWER account balances, the proportion of adults with a 12-month span who completed the age- and gender-specific qualifying preventive care rose with additional spans in both HIP Plus and HIP Basic (Figure G.23). When we look at long-term enrollees, however, the opposite trend holds (G.24). This result suggests that long-term enrollees are more likely than shorter-term enrollees to receive preventive care, even though their rate of receipt declines with experience. This, too, is consistent with high utilizers tending to remain enrolled for longer periods of time.

These opposing trends balance each other such that the rate of rollover bonus (or discount) remains fairly constant in first, second, and third spans (Figure G.23). Among long-term enrollees, the likelihood of receiving a rollover reward decreases with additional experience in the program, driven by the decrease in preventive service completion (Figure G.24).

Figure G.23. Number and percentage of beneficiaries with 12-month spans and a bonus rollover or rollover discount, by enrollment span and plan type



Source: Mathematica analysis of Indiana HIP 2.0 data, February 2015–January 2018.

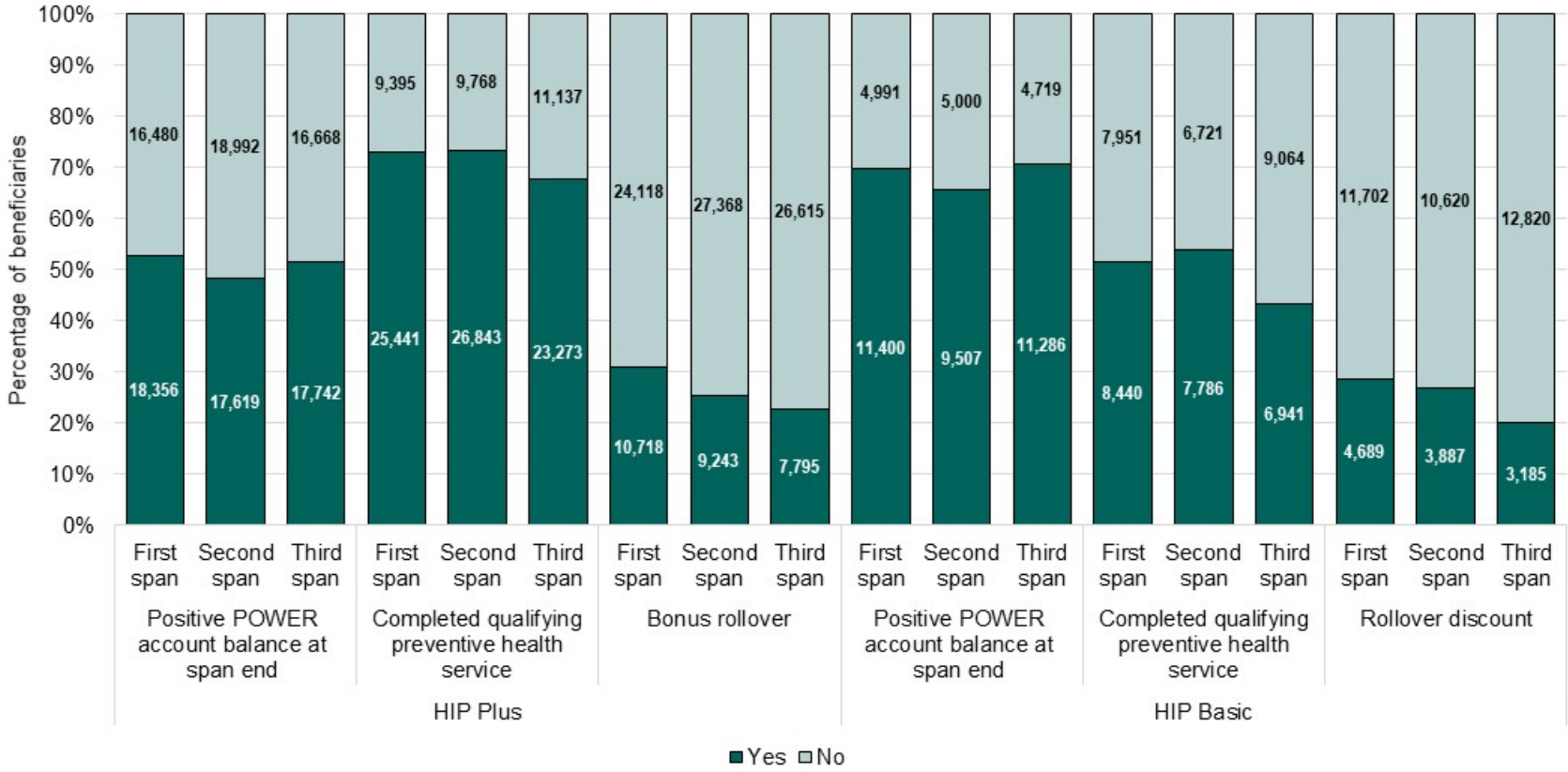
Note: Enrollees who complete age- and sex-appropriate preventive care and have a positive POWER account balance at the end of the span qualify for a bonus rollover (HIP Plus only) or rollover discount (HIP Basic only). Managed care entities had different requirements for completion of qualifying preventive care in 2016.

This analysis includes 12-month spans. Span number is based on the number of periods of enrollment, regardless of enrollment length (e.g., the second span need not follow a first span that lasted a full 12 months). Information on preventive care, POWER account balances, bonus rollovers, and rollover discounts are from POWER account reconciliation records that correspond with the last month of enrollment. In cases where there are no

Figure G.23 (*continued*)

POWER account reconciliation records at the end of the span, the information may be based on a record in the month prior to or the month after the end of the span. This figure excludes spans with missing POWER account reconciliation data within one month of the end of the span (n=2,020 HIP Plus spans and 1,282 HIP Basic spans). There are also 1,561 12-month spans that are not included in this figure because they ended in enrollment categories other than HIP Plus or HIP Basic.

Figure G.24. Number and percentage of beneficiaries with three 12-month spans and a bonus rollover or rollover discount, by enrollment span and plan type



Source: Mathematica analysis of Indiana HIP 2.0 data, February 2015–January 2018.

Note: Enrollees who complete age- and sex-appropriate preventive care and have a positive POWER account balance at the end of the span qualify for a bonus rollover (HIP Plus only) or rollover discount (HIP Basic only). Managed care entities had different requirements for completion of qualifying preventive care in 2016.

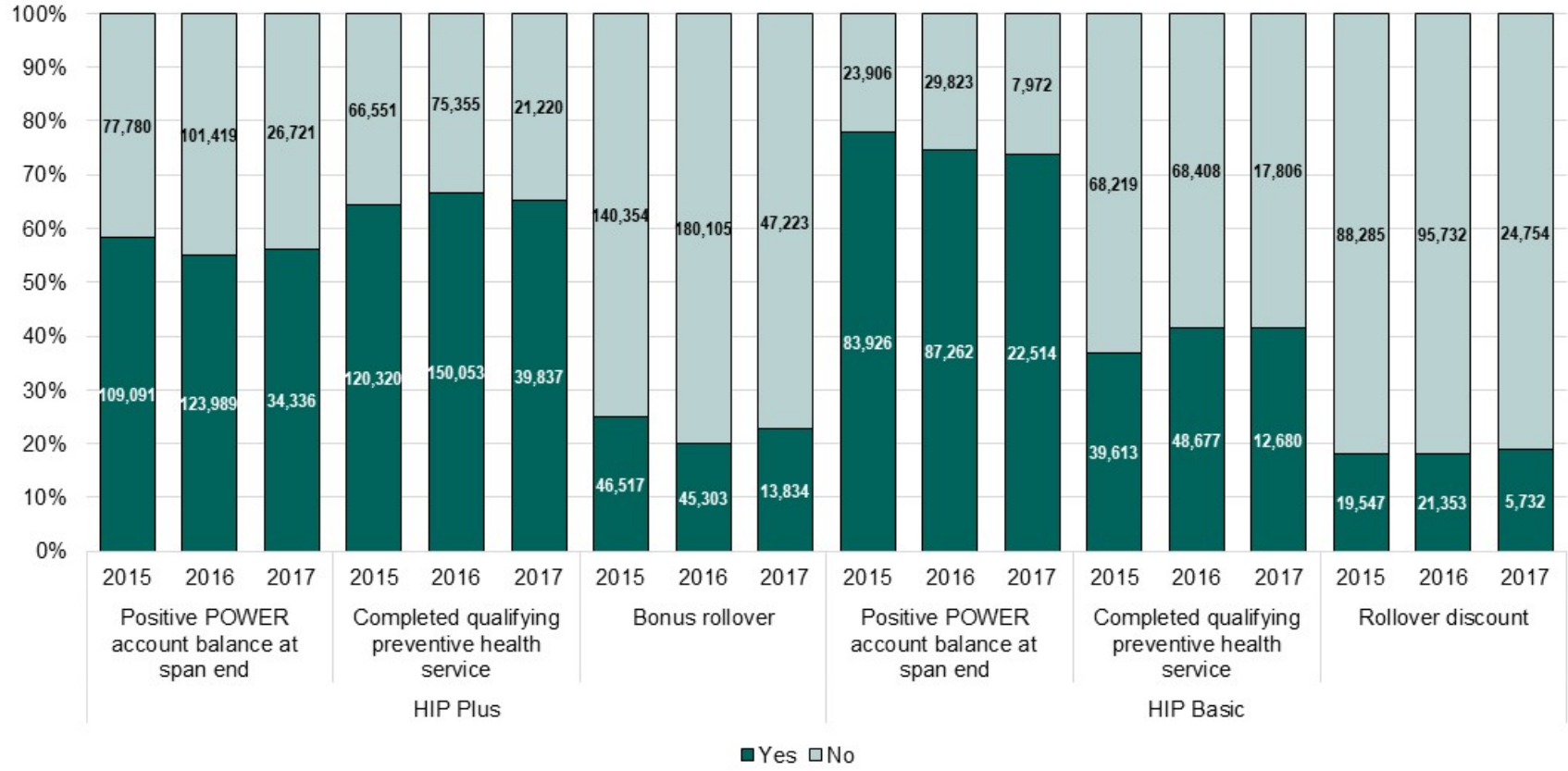
This analysis includes enrollees with 36 months of continuous enrollment. Information on preventive care, POWER account balances, bonus rollovers, and rollover discounts are from POWER account reconciliation records that correspond with the last month of enrollment. In cases where there are no POWER account reconciliation records at the end of the span, the information may be based on a record in the month prior to or the month after the end of the span. This figure excludes spans with missing POWER account reconciliation data within one month of the end of the span (n=619 HIP Plus spans and 363 HIP Basic spans). There are also 191 12-month spans that are not included in this figure because they ended in enrollment categories other than HIP Plus or HIP Basic.

POWER = Personal Wellness and Responsibility.

There were no clear trends in annual rates of retaining a positive POWER account balance or preventive service receipt among HIP Plus beneficiaries. The proportions fluctuated, as did the proportion receiving a rollover reward (Figure G.25). Among HIP Basic beneficiaries, the proportion with a positive POWER account balance slightly decreased and the proportion receiving a preventive service slightly increased, such that the proportion receiving a rollover reward remained steady.

Across all analyses, a larger proportion of HIP Plus beneficiaries—as opposed to HIP Basic beneficiaries—completed a qualifying preventive service during their span. Given that HIP Plus covers dental and vision services, a larger proportion of HIP Plus beneficiaries might use these preventive services compared to HIP Basic beneficiaries. Research suggests that HIP Basic enrollees facing out-of-pocket payment will be less likely to seek qualifying dental and vision care (Cooper et al. 2012). Furthermore, the state's summative evaluation report found that, with the exception of emergency department visits, HIP Plus beneficiaries used more health care services overall than did HIP Basic beneficiaries and thus they might be expected to use more preventive services as well. Finally, survey findings show that more HIP Plus beneficiaries than HIP Basic beneficiaries understood that receiving preventive care would affect their annual rollover. HIP Plus beneficiaries may value the bonus rollover more highly because they expect to pay monthly payments in the next enrollment year, whereas HIP Basic beneficiaries may plan to stay in HIP Basic and again not pay monthly payments, in which case the rollover discount would not benefit them.

Figure G.25. Number and percentage of beneficiaries with a 12-month span and a bonus rollover or rollover discount, by calendar year and plan type



Source: Mathematica analysis of Indiana HIP 2.0 data, February 2015–January 2018.

Note: Enrollees who complete age- and sex-appropriate preventive care and have a positive POWER account balance at the end of the span qualify for a bonus rollover (HIP Plus only) or rollover discount (HIP Basic only). Managed care entities had different requirements for completion of qualifying preventive care in 2016.

This analysis includes 12-month spans and the calendar year is based on the span begin date. Information on preventive care, POWER account balances, bonus rollovers, and rollover discounts are from POWER account reconciliation records that correspond with the last month of enrollment. In cases where there are no POWER account reconciliation records at the end of the span, the information may be based on a record in the month prior to or the month after the end of the span. This figure excludes spans with missing POWER account reconciliation data within one month of the end of the span (n=2,020 HIP Plus spans and 1,282 HIP Basic spans). There are also 1,561 12-month spans that are not included in this figure because they ended in enrollment categories other than HIP Plus or HIP Basic.

POWER = Personal Wellness and Responsibility.

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