research

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Effects of Medicaid coverage on cardiovascular health outcomes

SPECIAL PAPER Secondary analysis of randomised controlled trial

Heterogeneous effects of Medicaid coverage on cardiovascular risk factors

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Study question Does health insurance lead to improvements in cardiovascular risk factors (blood pressure levels and glycated haemoglobin (HbA_{1c}) concentrations) for identifiable subpopulations?

Methods Data for 12 134 participants from a randomised controlled trial, the Oregon health insurance experiment,

Overall population versus high benefit group for the effect of Medicaid coverage on blood pressure and glycated haemoglobin (HbA_{1c})

Outcome	Overall population	High benefit group for systolic blood pressure	High benefit group for HbA_{1c}
No of individuals	12 134	9158	7212
Take-up rates (%)	42.5	40.0	40.8
Systolic blood pressure:			
Mean (SD) in control group	119 (17)	119 (16)	117 (16)
Local average treatment effect (95% CI)	−0.62 (−3.16 to 1.73)	−4.96 (−7.80 to −2.48)	−2.82 (−5.65 to −0.04)
Difference *v* overall population (95% CI)	—	−4.34 (−6.04 to −2.74)	−2.20 (−4.37 to −0.02)
Diastolic blood pressure:			
Mean (SD) in control group	75.9 (12.1)	75.4 (12.0)	74.7 (11.6)
Local average treatment effect (95% CI)	−1.00 (−2.86 to 0.70)	−3.91 (−6.03 to −1.94)	−3.03 (−5.44 to −0.80)
Difference *v* overall population (95% CI)	—	−2.91 (−4.10 to−1.79)	−2.03 (−3.80 to −0.43)
HbA_{1c} (%):			
Mean (SD) in control group	5.33 (0.62)	5.30 (0.58)	5.30 (0.56)
Local average treatment effect (95% CI)	0.00 (−0.10 to 0.10)	−0.01 (−0.12 to 0.09)	−0.12 (−0.25 to −0.01)
Difference *v* overall population (95% CI)	—	−0.02 (−0.08 to 0.05)	−0.13 (−0.22 to −0.04)

The 95% CI was calculated by 1000 bootstrapped samples.
CI=confidence interval; SD=standard deviation.

launched in 2008 to examine the effects of Medicaid (a public health insurance programme for low income individuals) coverage on a wide range of outcomes, were analysed. The conditional local average treatment effects of Medicaid coverage on systolic blood pressure and HbA_{1c} were estimated by using a machine learning causal forest algorithm (with instrumental variables). The characteristics of individuals were compared with positive predicted benefits of Medicaid coverage based on the algorithm and the characteristics of others. Additionally, the effect of Medicaid coverage on blood pressure and HbA_{1c} was calculated among individuals predicted to benefit highly.

Study answer and limitations The causal forest model showed heterogeneity in the effect of Medicaid coverage on systolic blood pressure and HbA_{1c}. Individuals with lower baseline charges for healthcare costs, for example, had higher predicted benefits from gaining Medicaid coverage. Medicaid coverage significantly reduced systolic blood pressure (−4.96 mm Hg (95% confidence interval (CI) −7.80 to −2.48)) for people predicted to benefit highly. HbA_{1c} concentrations significantly reduced based on Medicaid coverage for people predicted to benefit highly, but the size was not clinically meaningful (−0.12% (95% CI −0.25% to −0.01%)). As baseline characteristics were self-reported, the findings might be affected by measurement error and misclassification bias.

Medicaid coverage significantly reduced systolic blood pressure and glycated haemoglobin levels for certain groups of adults

What this study adds Although Medicaid coverage did not improve cardiovascular risk factors on average, substantial heterogeneity was noted in the effects within that study population. Individuals predicted to benefit highly were more likely to have no or low previous charges for healthcare, for example.

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COMMENTARY Medicaid has potential to improve cardiovascular health for subpopulations

Cardiovascular disease is the leading cause of mortality globally, substantially impacting health and increasing healthcare costs.[1] According to a 2023 World Heart Federation report, deaths from cardiovascular disease increased worldwide from 12.1 million in 1990 to 20.5 million in 2021.[2]

In their study, Inoue and colleagues used machine learning techniques to investigate the effect of Medicaid coverage on cardiovascular health outcomes.[6] Medicaid is a US public health insurance programme for people with a low income. The authors found that Medicaid coverage significantly reduced systolic blood pressure and glycated haemoglobin (HbA_{1c}) levels for certain groups of adults, with a clinically meaningful reduction in blood pressure by approximately 5 mm Hg (−4.96 mm Hg (95% confidence interval −7.80 to −2.48)) in people with low or no previous healthcare charges.[6]

This study is commendable for several reasons.[6] Firstly, the use of a machine learning causal forest model provides a nuanced understanding of heterogeneous treatment effects, often overlooked by traditional methods that focus on average treatment effects. Secondly, this approach aligns with the growing emphasis on personalised medicine and targeted health interventions, making the findings relevant to policy makers. Thirdly, using data from the Oregon health insurance experiment, a randomised controlled trial, enhances the findings' credibility by minimising selection bias.

Next steps

However, future research should confirm that the benefits shown in the Medicaid group were not confounded by other factors. More detailed baseline characteristics and stratification, including smoking status, alcohol consumption, physical activity, mental health status, and family disease history, should be accounted for to strengthen future analyses.[7]

While the findings from the randomised Oregon

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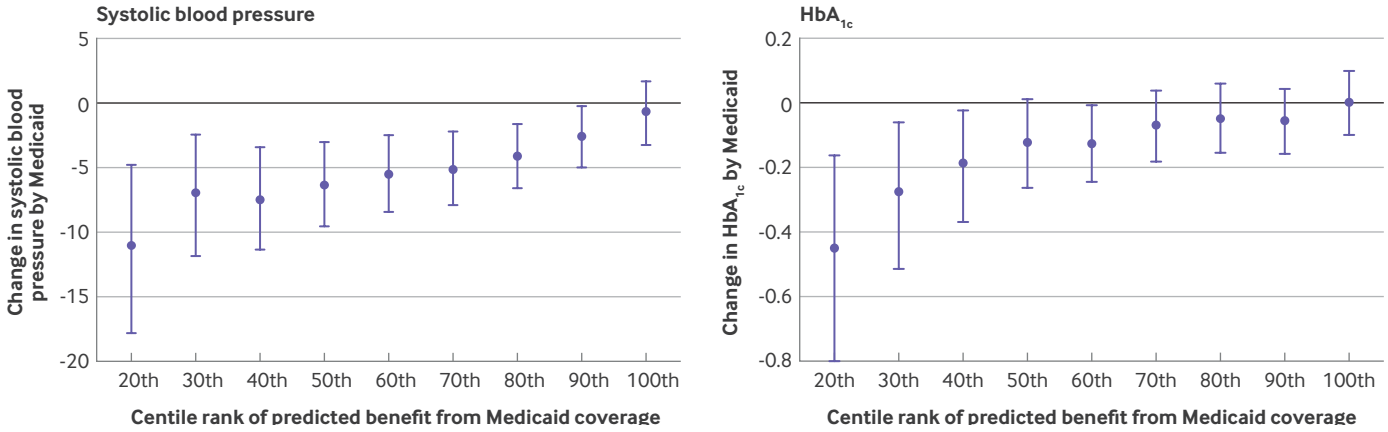

Change in systolic blood pressure and HbA_{1c} by Medicaid coverage according to predicted benefits. The x axis shows the coverage population of Medicaid based on the ranking of the predicted benefits (ie, conditional local average treatment effect), and the y axis shows the estimated effect among those populations. For example, among people with the top 30th centile of estimated benefits, the estimated reduction by Medicaid in systolic blood pressure was 6.76 (95% CI 2.60 to 11.55) and in HbA_{1c} was 0.28% (95% CI 0.07% to 0.50%). Change in outcomes for the scenario was not calculated among individuals in the top 10th centile owing to small sample size and insufficient statistical power . CI=confidence interval; HbA_{1c}=haemoglobin A_{1c}

health insurance experiment are robust, replication in other countries and diverse populations is necessary to ensure generalisability. For example, previous observational research suggests that Medicaid's impact varies across US states[8] and within subgroups such as children and adolescents (≤18 years) with congenital heart disease.[9] Additionally, older patients with non-ST segment elevation myocardial infarction who have polyvascular disease have a significantly higher long term risk of recurrent events or mortality within three years compared with those with coronary artery disease alone.[10] Inoue and colleagues' new analysis, based on a 17 month follow-up, might not capture Medicaid's longer term effects on cardiovascular health.[6] Further studies are needed to determine whether the observed benefits persist over time.

Clinical implications

Inoue and colleagues' study identified subpopulations with important health improvements.[6] Understanding the specific barriers these populations face, and how Medicaid addresses these barriers, would provide actionable insights for designing targeted interventions. Extending Medicaid coverage post partum could reduce cardiovascular maternal mortality, showing the importance of tailored interventions.[12]

Extending Medicaid coverage post partum could reduce cardiovascular maternal mortality

The wider implications of this study include showing the importance of personalised health interventions.[6] By identifying subpopulations that benefit most from Medicaid coverage, policy makers and healthcare providers can tailor interventions to maximise health benefits, aligning with the broader movement towards precision medicine and personalised healthcare. The Medicaid expansion under the Affordable Care Act was associated with modest improvements in cardiovascular risk factors, supporting the need for personalised approaches.[13]

Findings also highlight the need for equitable health insurance policies that address the diverse needs of different populations. Medicaid coverage offers significant benefits to individuals with low previous healthcare charges, reflecting limited access to care before coverage. Ensuring that these economically disadvantaged populations receive adequate health insurance could reduce health inequities and improve overall public health. A study using data from the 2014 behavioural risk factor surveillance system observed that Medicaid expansion reduced cardiovascular disparities, indicating the policy's potential to address health inequities.[14]

Advantages of machine learning

The application of machine learning techniques in health policy research enables the identification of varying treatment effects across different groups, showing insights that traditional methods might miss. While artificial intelligence (AI) encompasses machine learning, machine learning is specifically useful for such targeted analysis. A cross sectional study across European countries showed that data linkage is commonly used in public health activities, but AI application is less frequent. Barriers such as data regulation laws, resource limitations, and governance issues hinder the broader adoption of AI.[15]

Inoue and colleagues' study has some limitations, but its findings have implications for health policy design and implementation. Future research should build on these insights, focusing on external validation, longer follow-up periods, and a deeper understanding of the mechanisms underlying the observed benefits. Ultimately, this study underscores the potential of Medicaid coverage to improve cardiovascular health for specific subpopulations, informing more equitable and effective health policies.

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Model of integrated mental health video consultations for people with depression or anxiety in primary care (PROVIDE-C)

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Study question Can the PROVIDE model, an integrated approach using mental health video consultations, improve depression and anxiety symptoms for adults receiving primary care compared with usual care?

Methods This pragmatic, multicentre, parallel group, randomised trial was conducted in 29 general practices across Germany, with participants allocated (1:1) to either the PROVIDE intervention group or the usual care group. The study included 376 adults aged 18-81 years who visited their general practitioner because of depression or anxiety symptoms. The PROVIDE intervention group received transdiagnostic treatment for depression and anxiety through five real-time video consultations between patients at primary care practices and offsite mental health specialists. The control group received usual care provided by general practitioners with potential referrals to specialists. The primary outcome was the change in symptom severity of depression and anxiety at six months, measured by the patient health questionnaire anxiety and depression scale (PHQ-ADS).

Study answer and limitations Compared with usual care, the PROVIDE model significantly improved symptoms, with a mean difference in the PHQ-ADS score of −2.4 points ((95% confidence interval (CI) −4.5 to −0.4), P=0.02) at six months, and this effect was sustained at 12 months (−2.9 points (−5.0 to −0.7), P<0.01). Limitations include potential variability in usual care practices.

What this study adds The PROVIDE model reduced depression and anxiety symptoms in the short term and potentially in the long term. Although the effect size was small, the improvement was meaningful given the prevalence of these disorders in community settings. The PROVIDE model shows promise as a scalable intervention that can collectively benefit population health in terms of depression and anxiety disorders.

Funding, competing interests, and data sharing
The trial was funded by the German Federal Ministry of Education and Research. No competing interests declared. Data are available for the meta-analysis of individual participant data.

Study registration ClinicalTrials.gov NCT04316572.

Parameter estimates calculated with the mixed effect model for the primary outcome of patient health questionnaire anxiety and depression scale at six months. Data are mean (SD) unless stated otherwise

Outcomes	No of participants		Minimally adjusted mixed model analysis (95% CI)*	P value	Effect size (minimally adjusted mixed model) (95% CI)
	Control group (n=189)	Intervention group (n=187)			
Primary outcome					
Intention to treat	189	187	−2.43 (−4.48 to −0.38)	0.02	0.21 (0.03 to 0.39)
Intention-to-treat complete case	112	125	−1.37 (−3.60 to 0.92)	0.23	0.08 (−0.05 to 0.21)
Per protocol	85	97	−1.63 (−4.27 to 1.06)	0.23	0.09 (−0.06 to 0.24)
As treated	93	144	−0.98 (−3.28 to 1.37)	0.41	0.05 (−0.08 to 0.18)
Sensitivity dataset	124	78	−1.82 (−4.29 to 0.70)	0.15	0.10 (−0.04 to 0.24)
Secondary outcomes at 12 months					
Patient health questionnaire anxiety and depression scale	18 (9.1)	15 (10)	−2.86 (−4.99 to −0.73)	0.01	0.30 (0.08 to 0.52)
Patient health questionnaire nine item depression scale	9.5 (5.3)	8.1 (5.8)	−1.31 (−2.26 to −0.36)	<0.01	0.20 (0.06 to 0.34)
Seven item generalised anxiety disorder scale	8.2 (4.5)	7.1 (4.7)	−1.36 (−2.48 to −0.23)	0.02	0.34 (0.06 to 0.62)
Somatic symptom disorder-B criteria scale	20 (11)	17 (11)	−3.56 (−5.76 to −1.36)	<0.01	0.39 (0.15 to 0.63)
12 item short form survey:					
Physical component score†	43 (11)	46 (11)	1.85 (−0.05 to 3.75)	0.06	0.13 (0.00 to 0.27)
Mental component score	39 (11)	41 (12)	2.28 (−0.20 to 4.76)	0.07	0.14 (−0.01 to 0.30)
Personal confidence and hope‡	12 (3.9)	13 (4.2)	0.50 (−0.28 to 1.27)	0.21	0.13 (−0.07 to 0.32)
Goal and success orientation‡	5 (2.2)	5.4 (1.9)	0.16 (−0.22 to 0.53)	0.40	0.09 (−0.13 to 0.31)
Willingness to ask others for help‡	8.4 (3.1)	8.8 (3.1)	0.28 (−0.32 to 0.89)	0.36	0.07 (−0.09 to 0.23)
Reliance on others‡:	6.5 (1.8)	6.5 (1.9)	0.01 (−0.32 to 0.34)	0.97	0.00 (−0.15 to 0.16)
Chronic illness care short form	2.4 (0.85)	2.5 (0.94	0.13 (−0.07 to 0.32)	0.19	0.13 (−0.07 to 0.32)

CI=confidence interval; SD=standard deviation.
Effect size measured with Cohen's d.
*Mixed effect linear regression model, minimally adjusted for the respective baseline score and centre for intervention *v* control.
†Mixed effect linear regression model adjusted for the respective baseline score, age, gender, history of depression or anxiety, chronic medical disease, and number of days between baseline assessment and randomisation.
‡German version was used.