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Effects of inadequate coverage on healthcare utilization

A regression discontinuity analysis

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Abstract

To examine the impact of inadequate health insurance coverage on physician utilization among older adults using a novel quasi-experimental design in the time period following the elimination of cost sharing for most preventative services under the US Affordable Care Act of 2010.

The Medical Expenditure Panel Survey full year consolidated data files for the period 2010 to 2017 were used to construct a pooled cross-sectional dataset of adults aged 60 to 70. Regression discontinuity design was used to estimate the impact of transitioning between non-Medicare and Medicare plans on use of routine office-based physician visits and emergency room visits.

For the overall population, gaining access to Medicare at age 65 is associated with a higher propensity to make routine office-based visits (2.94 percentage points [pp]; $P < .01$) and lower out-of-pocket costs (−23.86 pp; $P < .01$) Similarly, disenrollment from non-Medicare insurance plans at age 66 was associated with more routine office-based visits (3.01 pp; $P < .01$) and less out-of-pocket costs (−8.09 pp; $P < .10$). However, some minority groups reported no changes in visits and out-of-pocket costs or reported an increased propensity to make emergency department visits.

Enrollment into Medicare from non-Medicare insurance plans was associated with increased use of routine office-based services and lower out-of-pocket costs. However, some subgroups reported no changes in routine visits or costs or an increased propensity to make emergency department visits. These findings suggest other nonfinancial, structural barriers may exist that limit patient's ability to access routine services.

Abbreviations: ACA = Affordable Care Act, CHDS = coronary heart disease and stroke, ED = emergency department, MEPS = Medical Expenditure Panel Survey.

Keywords: healthcare utilization, medicare, underinsurance

1. Introduction

In recent years, there has been a significant push at the federal level in the United States to increase the number of individuals covered by health insurance, which not only has the advantage of providing universal access to comprehensive health insurance, but such access also contributes to reductions in costs as a financial barrier to care, increased utilization of healthcare services, and improved health outcomes.[1–7] This is especially important for the population of Americans that struggle with chronic disease, as the passage of the US Affordable Care Act (ACA) represents an important public policy goal of expanding healthcare coverage and improving the quality of healthcare to previously underserved groups. However, it is important to note that the positive results stemming from coverage expansions are misleading, as the effects of coverage expansions on health outcomes are only generalizable to the aggregate population. When narrower subgroups are examined, such as adults with chronic disease, there is limited evidence that coverage expansions are always associated with improved outcomes.

In a study using data from the pre-ACA period of elderly patients with coronary heart disease and stroke (CHDS), researchers found that after controlling for coverage expansions, there remained significant utilization disparities across socioeconomic groups.[8] In particular, Hispanics and highly educated adults with CHDS reported the highest propensity to utilize physician care at a level necessary to routinely monitor cardiovascular disease risk factors. However, blacks with CHDS reported a decline in their propensity to utilize the appropriate levels of preventative care at a level necessary to monitor cardiovascular disease risk factors. Other researchers have documented similar disparities in utilization and health outcomes, without offering clear explanations for their findings.[9–11]

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The datasets generated during and/or analyzed during the current study are publicly available.

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One possible explanation is that these individuals have inadequate levels of health insurance coverage that limited their ability to fully finance their medical needs. For example, the US Medicare program – a federal government-run health insurance program for older adults – allows persons who are age 65 and older to enroll in 2 different parts of Medicare that cover medical services: Part A hospital insurance and Part B medical insurance. Within the Medicare program, the government covers Part A premiums, but beneficiaries are responsible for paying Part B premiums and 20% of Part B expenditures. For those who are poor or suffering from a chronic disease, the costs of treating the disease could quickly add up to unaffordable levels without the presence of a secondary supplemental insurance plan.

In recent years, the US Affordable Care Act of 2010 reduced and eliminated the copayments and deductibles for clinical preventative services (e.g., cardiovascular disease screenings, cancer screenings, diabetes screenings, metabolic risk factor screenings). The theoretical and empirical economic literature suggests that this elimination of copayments for medical services should lead to increased use of healthcare services[12–14]; however, it is unclear the extent to which these changes in copayment have impacted the relationship between Medicare eligibility and utilization of physician services among elderly adults.[15] A lack of knowledge of the effects of inadequate insurance subsequently puts many elderly households at risk of exacerbating existing chronic health conditions.

This study contributes to the literature by examining the impact of adequate levels of health insurance on healthcare outcomes among Medicare eligible adults using data from the Medicare Expenditure Panel Survey (MEPS) from 2010 to 2017. This study is innovative because it not only builds on previous analyses that measure the impacts of Medicare eligibility at age 65 on utilization of physician services,[5,6,8] but it also estimates the impact of non-Medicare insurance disenrollment at age 66 using a quasi-experimental research design. It is this disenrollment at age 66 that allows for the identification of the potential effects of inadequate health insurance coverage as persons disenroll from previously held insurance plans. As such, it is hypothesized that demand for office-based visits used for routine monitoring of risk factors will increase and out-of-pocket costs will decrease as patients transition into the Medicare program from non-Medicare plans or an uninsured status.

The structure of the article is as follows. First, the data sources, primary outcomes and control variables, and quasi-experimental approach used to identify the effects of health insurance on physician utilization are described. Next, the results of the main analysis are presented. Last, the article's results are discussed and placed into context along with concluding remarks.

2. Methods

2.1. Data source

The MEPS, administered by the Agency of Health Care Research and Quality within the US Department of Health and Human Services, is a large-scale, nationally representative survey of US household's medical utilization and expenditures. Data from the 2010 to 2017 MEPS consolidated data files were used to create a dataset of adults with a major chronic disease between the ages of 60 and 70 (Fig. 1). The period 2010 to 2017 was selected, as this period represents the post-ACA healthcare environment where the cost-sharing for preventative services across for major chronic diseases were eliminated. Major chronic disease includes diabetes, cancer, and cardiovascular disease. Respondents were identified as having been diagnosed with cardiovascular if the respondent was informed by a doctor or other health professional that they had hypertension, angina pectoris, a myocardial infarction, coronary heart disease, or stroke. These major disease diagnoses were selected because these patient groups possess a disease diagnosis that require them to utilize medical services at a specific threshold to ensure that the risk of future acute events related to their diagnosis is minimized. After making these sample restrictions, the final analysis sample was N = 20,474.

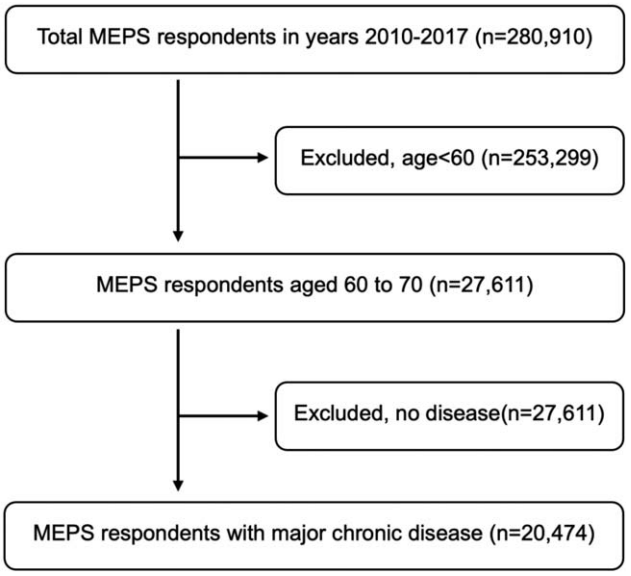

Figure 1. Sample selection.

2.2. Measures

The primary outcomes of this study are routine office-based physician visits and the corresponding out-of-pocket costs associated with these routine visits. In the MEPS, respondents were asked to self-report the number of office-based visits they made in the last 12-months of being surveyed. This continuous measure of office-based visits is used to calculate an indicator identifying whether an individual has made 2 or more routine visits. The propensity for some to make 2 or more routine office-based visits was chosen to proxy for a schedule of physician monitoring required to routinely monitor risk factors to avoid future acute events. (8) Out of pocket expenses for office-based visits are converted into 2017 dollars using the Consumer Price Index for Hospital and Related Services. Out-of-pocket expenses for office-based visits are included in this analysis to measure how the financial burden associated with accessing routine care changes with insurance status.

2.3. Statistical analysis

Endogeneity issues complicate the establishment of a causal relationship between insurance status and healthcare utilization. For example, sicker patients who anticipate higher resource utilization are more likely to obtain insurance. Previous studies have utilized regression discontinuity (RD) model and the

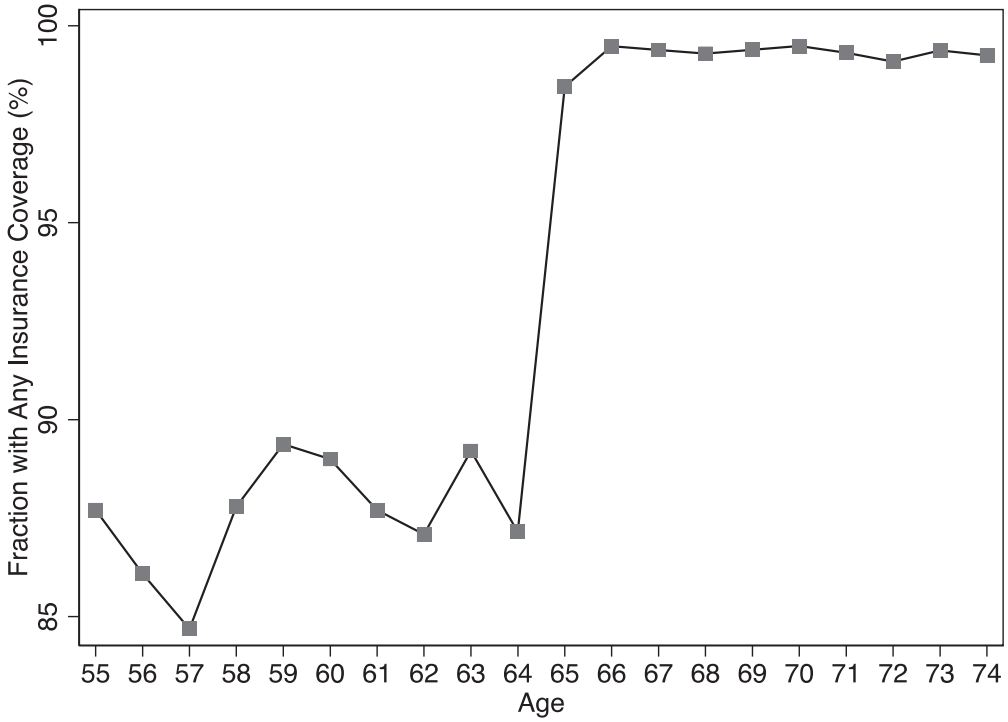

Figure 2. Health insurance coverage trends (any plans) by age.

Medicare eligibility threshold at age 65 to identify the effect of Medicare insurance on healthcare utilization.[5,7,16] Building on this previous work, the analysis contained in this paper analysis will examine the role of inadequate insurance coverage using a RD model and the enrollment thresholds at both age 65 and 66. At age 65, any individual who paid Medicare taxes for 40 quarters is eligible to receive premium-free Medicare Part A and pay a modest premium for Part B. At age 66, the substitution effect leads many individuals to drop their non-Medicare insurance plans during the next enrollment period for Medicare coverage only, thereby leaving them with a lower (and potentially inadequate) level of insurance coverage. Using an RD model, the coverage effects at age 65 and 66 are measured using 2 models.

Formally, let y_{it} be a measure of healthcare utilization or out-of-pocket expenses for individual i in survey year t:

$$y_{it} = \alpha + \beta \mathrm{R}D_{it} + \gamma X_{it} + \in_{it}$$

where α is a constant term, RD is a regression discontinuity term that indicates if a respondent is aged 65 (or aged 66), X is a set of individual covariates, and ε is an unobserved error component. The coefficient β in Eq. (1) captures either the effect of Medicare coverage or non-Medicare disenrollment (e.g., having inadequate coverage). Individual factors such as age, sex, race, educational attainment, personal income, geographic region, and survey year will also be controlled for within the RD models. Sampling weights will be used to adjust for oversampling and the standard errors will be clustered by age to account for interclass correlation arising from the degenerative effects of aging. All analysis was performed in Stata 15 and coefficients with *P* values below .10 are considered statistically significant. The socioeconomic subgroup analysis will also estimate RD models by the 3 largest racial/ethnic groups (i.e., White non-Hispanic, Black non-Hispanic, Hispanic) to examine if the impacts of the Medicare continue to vary across racial/ethnic groups following changes in ACA's copayment policy and 3 federal poverty level (FPL) categories to distinguish the differential level of premium support provided to households under the ACA: 0% to 133% FPL (e.g., Medicaid), 133% to 400% FPL (e.g., premium subsidies), and 400% + FPL (e.g., individual mandate).

Ethnical approval was not necessary for this study since the nonidentifiable MEPS public use full-year consolidated data files from 2010 to 2017 were utilized to form the analysis dataset.

3. Results

Figure 2 presents health insurance coverage rates for any form of health insurance coverage by respondent age. The graph shows that health insurance coverage rates were well above 80% for patients before age 65, increasing discretely (sharply) at the Medicare eligibility age threshold. Figure 3 presents health insurance coverage rates for any form of health insurance that is not Medicare. The graph shows a discrete drop in non-Medicare insurance at age 65, a major transition period where patients are switching away from Medicaid and private insurance plans and into Medicare only. This disenrollment threshold is defined as a point when individuals are at risk of having an inadequate level of health insurance coverage. Overall, the most important feature of these graphs is that they demonstrate that the Medicare eligibility rule generates a discrete jump in coverage at age 65 and a substitution effect results in a discrete drop in non-Medicare coverage at age 66.

Baseline utilization of routine office-based visits and out-of-pocket costs for routine office-based visits and the RD estimates are presented in Table 1. Overall, at the baseline, 72.00% of respondents reported making at least 2 or more routine office-

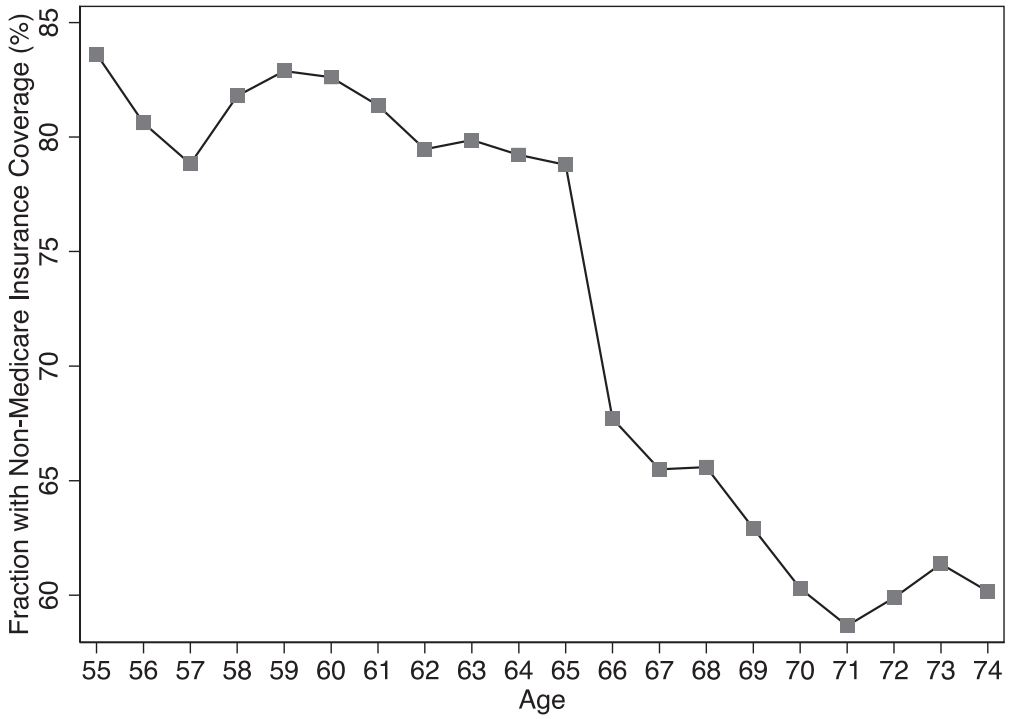

Figure 3. Non-medicare health insurance coverage trends by age.

based visits and the average out-of-pocket expenses associated with those office-based visits was $338.44. White non-Hispanics reported the highest propensity to make 2 or more office-based visits (73.87%) and the highest out-of-pocket expenditures on office-based visits ($399.10) at baseline. Blacks and Hispanics reported the lowest propensity of making 2 or more visits (68.07% and 66.11%) and also reported the lowest out-of-pocket expenditures for those routine visits ($153.33 and $172.18).

Among the 3 income groups, respondents making 400% + FPL reported the highest propensity of making 2 or more office-based visits (73.21%) and the highest out-of-pocket expenditures on office-based visits ($398.57) at baseline compared to other income groups. Respondents making between 133% to 400% FPL and 0% to 133% FPL reported a similar propensity of making 2 or more visits (72.00% and 72.01%); however, respondents making 133% to 400% FPL reported higher out-of-pocket expenditures for those routine visits ($338.44) than persons making 0% to 133% FPL ($205.46) at baseline. These baseline results collectively highlight significant utilization disparities that exist across sociodemographic groups before a comprehensive Medicare insurance benefit was made available to the population.

In the overall sample, the RD estimates at age 65 report an increase in the propensity to make 2 or more office-based visits (2.94 percentage points [pp]; $P < .001$) and a decline in out-of-

Table 1

Regression discontinuity analysis of office-based physician visits and out-of-pocket expenditures, 2010 to 2017.

	Office based visits (2+)			Log of out-of-pocket costs		
	Mean before age 65	RD at age 65	RD at age 66	Mean before age 65	RD at age 65	RD at age 66
Overall	72.00%	2.94*** (0.03)	3.01*** (0.05)	$338.44	−23.86*** (0.15)	−8.09* (0.74)
By income:						
0%–133% FPL	72.01%	3.76 (0.80)	−0.55 (1.07)	$205.46	−12.39 (4.23)	14.36 (8.30)
133%–400% FPL	72.00%	2.94*** (0.03)	3.01*** (0.05)	$338.44	−23.86*** (0.15)	−8.09** (0.74)
400+ FPL	73.21%	3.29* (0.40)	3.13* (0.28)	$398.57	−18.17*** (0.01)	−16.86** (0.51)
By Race/Ethnicity:						
White non-Hispanic	73.87%	3.30*** (0.05)	2.37** (0.07)	$399.10	−28.34*** (0.19)	−6.63* (0.66)
Black non-Hispanic	68.07%	3.58** (0.31)	4.83** (0.32)	$153.33	−6.64 (1.85)	−20.67 (4.80)
Hispanic	66.11%	6.09 (1.37)	−0.89 (0.65)	$172.18	−4.74 (2.16)	−7.39 (4.66)

The table reports the baseline proportion of persons making 2 or more routine office-based visits and out-of-pocket expenses for routine visits (columns 1, 4) and the regression discontinuity estimates at age 65 (columns 2, 5) and age 66 (column 3, 6). All estimates were weighted to adjust for oversampling and the standard errors were clustered by age.

FPL = federal poverty level.

*** $P < .01$.

** $P < .05$.

* $P < .10$.

Table 2

Regression discontinuity analysis of emergency room visits, 2010 to 2017.

	Emergency department visits (2+)		
	Mean before age 65	RD at age 65	RD at age 66
Overall	5.00%	−1.64*** (0.03)	−0.76** (0.06)
By income:			
0%–133% FPL	8.97%	−1.54** (0.12)	−3.53** (0.22)
133%–400% FPL	5.00%	−1.64*** (0.03)	−0.77** (0.06)
400+ FPL	3.58%	−1.97*** (0.04)	−0.49 (0.10)
By Race/Ethnicity:			
White non-Hispanic	4.68%	−1.82*** (0.03)	−1.44** (0.02)
Black non-Hispanic	6.63%	−2.21** (0.12)	2.14* (0.34)
Hispanic	5.04%	−0.06 (0.34)	−1.63** (0.06)

The table reports the baseline proportion of persons making 2 or more emergency department visits (columns 1) and the regression discontinuity estimates at age 65 (columns 2) and age 66 (column 3). All estimates were weighted to adjust for oversampling and the standard errors were clustered by age. FPL = federal poverty level.

*** $P < .01$.

** $P < .05$.

* $P < .10$.

pocket costs for those visits (−23.86 pp; $P < .01$). At age 66, respondents reported an increase in their propensity to make routine visits (3.01 pp; $P < .01$) and additional declines in out-of-pocket expenditures (−8.09 pp; $P < .10$). The income subgroup analysis revealed that the top 2 income groups (133% to 400% FPL and 400%+ FPL) reported increases in their propensity to make routine office-based visits and lower out-of-pocket costs at age 65 and 66; however, the lowest income group (0%–133% FPL) did not report any changes in routine visits or out-of-pocket costs at the discontinuity thresholds of 65 and 66. The racial/ethnic subgroup analysis revealed that White non-Hispanics and Black non-Hispanic reported increases in their propensity to make routine office-based visits at age 65 (3.30 pp and 3.58 pp) and age 66 (2.37 pp and 4.83 pp). However, Hispanics did not report any changes in utilization. Furthermore, only White non-Hispanics reported declines in out-of-pocket costs at age 65 (−28.34 pp; $P < .01$) and age 66 (−6.63 pp; $P < .10$).

The results thus far provide evidence that a significant difference in cost sharing exists across income groups caused by transitions between insurance types and that this differential cost sharing (and changes in cost sharing) for routine visits contributes to observed utilization for routine office-based visits disparities. On the other hand, it could be the case that observed utilization patterns for routine office-based visits are also driven by substitution of routine for emergency department (ED) visits under the assumption that the amount of cost sharing is lower for ED visits.

In Table 2, the presence of a substitution of routine visits for ED visits is tested by examining ED visits (2+). For the overall sample, the RD estimates demonstrate a decrease in the propensity of ED visits (−1.64 pp; $P < .001$) at age 65 and age 66 (−0.76; $P < .05$). Most sociodemographic groups reported declines in ED use at age 65 and age 66; however, Black non-Hispanics reported statistically significant increases in ED use at age 66 (2.14; $P < .10$) despite their already high baseline level of ED use.

4. Discussion

This study investigated the impact of inadequate health insurance coverage decisions on healthcare outcomes. The results show that in the overall sample, Medicare eligibility at age 65 is associated with an increased propensity to make office-based visits and non-Medicare insurance disenrollment at age 66 did not have a negative impact on the propensity to make office-based visits. This increase in utilization coincided with a decline in expenditures for office-based services, which is consistent with behavior observed in the literature.[17,18] Moreover, the finding that out-of-pocket costs declined upon gaining access to Medicare despite the historically higher cost-sharing requirement compared to other coverage options indicates that the ACA's policy of eliminating the copayments and deductibles for clinical preventative services addressed financial barriers.

Most groups in the subgroup analysis reported similar patterns; however, some sociodemographic groups did not report any changes in use of routine services or out-of-pocket costs. In particular, Hispanics reported no changes in office-based visits at age 65 and 66 and both Black non-Hispanics and Hispanics reported no changes in out-of-pocket costs at age 65 and 66. Furthermore, the analysis of ED visits revealed groups were not simply substituting routine visits for emergency room visits (except for Black non-Hispanics who reported increased ED use). On one hand, as older populations have higher rates of morbidity, comorbidity, and polypharmacy, it is possible that medical visits are being substituted for pharmaceutical drugs to manage their chronic conditions.[19–22] On the other hand, the absence of changes in routine service use among this group or changes in out-of-pockets costs suggest that other non-financial, structural barriers (e.g., poverty, income inequality, discrimination, structural racism) may exist that limit a patient's ability to access routine office-based care.[23,24]

There are several potential limitations to this analysis. First, this study relies on using discontinuities in enrollment at age 65 and age 66 to identify the impact of Medicare enrollment and non-Medicare disenrollment; however, the use of a repeated cross-sectional dataset does not allow for a longitudinal examination of how physician utilization and out-of-pocket costs evolve over time. Second, the MEPS reliance on self-reporting could lead to measurement error and recall bias that can lead to biased estimates. However, unlike other population surveys, MEPS surveyors encourage participants to utilize actual medical records to verify their responses. Last, due to small samples and data restrictions needed to consistently estimate the quasi-experimental regression discontinuity models, this study was unable to decompose the racial/ethnic subgroup analysis to include Asians, Pacific Islanders, or native American and Alaska Native as separate and distinct groups.

5. Conclusion

This study finds that in the years following the reduction and elimination of copayments and deductibles for clinical preventative services, patients reported increased access to and reduced costs of medical services when persons transitioned away from non-Medicare plans to Medicare plans. However, there is some empirical evidence that structural barriers prevent some sociodemographic populations from accessing medical services. As policymakers in the US are focused on expanding existing health insurance coverage (which currently includes a proposal under the Biden Administration to expand Medicare to older adults aged 60 and older), it is important that they also consider how inadequate levels of health insurance coverage can contribute to inequalities in care. Furthermore, these results have important

implications to any health insurance system with beneficiaries that transition between private and public health insurance plans with different benefit structures, co-payments, administration, and oversight. Future studies should focus on understanding the non-financial barriers that inhibit access to care, the potential role of essential benefits regulations, and the role expansions to existing public coverage plays in ensuring that appropriate levels of coverage are made available to all households with an elderly member diagnosed with a major chronic disease.

Author contributions

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Writing – original draft: Jerome Dugan, Layla G. Booshehri.
Writing – review & editing: Jerome Dugan, Layla G. Booshehri.

References

[1] Decker SL, Rapaport C. Medicare and inequalities in health outcomes: the case of breast cancer. Contemp Econ Policy 2002;20:1–11.
[2] Lichtenberg FR. The effects of medicare on health care utilization and outcomes. Forum Health Econ Policy 2002;5: doi: https://doi.org/10.2202/1558-9544.1028.
[3] McWilliams JM, Zaslavsky AM, Meara E, et al. Impact of Medicare coverage on basic clinical services for previously uninsured adults. JAMA 2003;290:757–64.
[4] Bhattacharya J, Lakdawalla D. Does Medicare benefit the poor? J Pub Econ 2006;90:277–92.
[5] Card D, Dobkin C, Maestas N. The Impact of nearly universal insurance coverage on health care utilization: evidence from Medicare. Am Econ Rev 2008;98:2242–58.
[6] Card D, Dobkin C, Maestas N. Does Medicare save lives? Q J Econ 2009;124:597–636.
[7] Anderson M, Dobkin C, Gross T. The effect of health insurance coverage on the use of medical services. AEJ: EP 2012;4:1–27. doi: https://doi.org/10.1257/pol.4.1.1.
[8] Dugan J, Virani SS, Ho V. Medicare eligibility and physician utilization among adults with coronary heart disease and stroke. Med Care 2012;50:547–53.
[9] Jha AK, Varosy PD, Kanaya AM, et al. Differences in medical care and disease outcomes among black and white women with heart disease. Circulation 2003;108:1089–94.
[10] Peterson ED, Shah BR, Parsons L, et al. Trends in quality of care for patients with acute myocardial infarction in the National Registry of Myocardial Infarction from 1990 to 2006. Am Heart J 2008;156:1045–55.
[11] Virani SS, Woodard LD, Landrum CR, et al. Institutional, provider, and patient correlates of low-density lipoprotein and non–high-density lipoprotein cholesterol goal attainment according to the Adult Treatment Panel III guidelines. Am Heart J 2011;161:1140–6.
[12] Aron-Dine A, Einav L, Finkelstein A. The RAND health insurance experiment, three decades later. J Econ Perspect 2013;27:197–222.
[13] Nyman JA. The income transfer effect, the access value of insurance and the Rand health insurance experiment. J Health Econ 2001;20:295–8.
[14] Paudel DR. Catastrophic health expenditure: an experience from health insurance program in Nepal. Emerg Sci J 2019;3:327–36.
[15] Fox JB, Shaw FE. Clinical preventive services coverage and the affordable care act. Am J Public Health 2014;105:e7–10.
[16] Anderson ML, Dobkin C, Gross T. The effect of health insurance on emergency department visits: evidence from an age-based eligibility threshold. Rev Econ Stat 2014;96:189–95.
[17] Rubin R, Mendelson D. Cost sharing in health insurance. NEngl J Med 1995;333:733–4.
[18] Zweifel P, Manning WG. Moral hazard and consumer incentives in health care. Handbook Health Econom 2000;1:409–59. doi: https://doi.org/10.1016/S1574-0064(00)80167-5.
[19] Dobrică E-C, Găman M-A, Cozma M-A, et al. Polypharmacy in type 2 diabetes mellitus: insights from an internal medicine department. Medicina 2019;55:436.
[20] Cho J-H, Lee T-J. The factors contributing to expenditures on over-the-counter drugs in South Korea. Value Health Region Issues 2013;2:147–51.
[21] Stuart B, Grana J. Are prescribed and over-the-counter medicines economic substitutes? A study of the effects of health insurance on medicine choices by the elderly. Medical Care 1995;33:487–501.
[22] Ai W. Participatory action research into low literates' medical needs in rural communities. Sci Med J 2019;1:176–88.
[23] Bailey ZD, Krieger N, Agénor M, et al. Structural racism and health inequities in the USA: evidence and interventions. Lancet 2017;389:1453–63.
[24] Wallace ME, Mendola P, Liu D, et al. Joint effects of structural racism and income inequality on small-for-gestational-age birth. Am J Public Health 2015;105:1681–8.