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The Impact of Financial Assistance Programs on Health Care Utilization: Evidence from Kaiser Permanente[†]

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Most hospitals have financial assistance programs for low-income patients. We use administrative data from Kaiser Permanente to study the effects of financial assistance on health care utilization. Using a regression discontinuity design based on an income threshold for program eligibility, we find that financial assistance increases the likelihood of inpatient, ambulatory, and emergency department encounters by 3.6 pp (59 percent), 13.4 pp (20 percent), and 6.7 pp (53 percent), respectively, though effects dissipate three quarters after program receipt. Financial assistance also increases the detection and management of treatment-sensitive conditions (e.g., drugs treating diabetes), suggesting that financial assistance may increase receipt of high-value care. (*JEL* G51, I11, I12, I13, I32)

In the absence of comprehensive, universal health insurance, Americans rely on a patchwork of public and private sources to finance their health care. Financing for low-income patients is particularly fragmented and includes public insurance from Medicaid, subsidized private insurance from the Marketplaces, free or discounted care from Federally Qualified Health Centers, and uncompensated care from hospitals and other health care providers in the form of charity care and unpaid bills. These sources of financing differ not only in who bears the cost of providing care (economic incidence) but may also impact the quality of health care that patients receive.

Hospital financial assistance programs, which aim to reduce financial burdens and improve health care access for low-income patients, are an important and

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understudied part of this patchwork.[1] These programs typically provide a combination of debt forgiveness of previously incurred medical bills and reduced out-of-pocket costs for future care over a limited time horizon, target both uninsured and insured patients, and are common across nonprofit, for-profit, and government-owned hospitals. In 2018, hospitals provided a total of $26 billion in charity care, of which $20 billion was provided to uninsured patients and $6 billion was provided to insured patients (Roth et al. 2021). Charity care accounted for 1.5 percent of total expenses for the median nonprofit hospital, 1.4 percent of total expenses at the median for-profit hospital, and 0.9 percent of total expenses at the median government hospital (Bai et al. 2021).

In this paper, we estimate the impact of the financial assistance program at Kaiser Permanente of Northern California (henceforth, Kaiser Permanente or Kaiser) on health care utilization. We then benchmark the size of these effects to the effects of providing Medicaid to the uninsured and discuss the implications of financing health care for low-income patients through hospital financial assistance as compared to public insurance.

The Kaiser financial assistance program is a useful setting to study for three reasons. First, the Kaiser program, which provides debt relief from all existing Kaiser medical bills and eliminates cost sharing on any health care received from Kaiser over the next 6–12 months, is fairly representative of programs at other large health care systems. Second, eligibility is determined by a strict income cutoff rule at 350 percent of the federal poverty level (FPL), which provides identifying variation in the form of a regression discontinuity (RD) design. Third, Kaiser Permanente operates a large, integrated, closed-network health system. While our data allow us to observe some instances of care received at non-Kaiser facilities, the integrated, closed-network system means that virtually all care occurs at Kaiser facilities, allowing us to observe close-to-complete information on health care utilization, drug prescriptions, and certain diagnostic tests for our study population. A distinguishing feature of our setting is that most applicants to the Kaiser financial assistance program have insurance coverage, while other providers may receive a greater share of applications from uninsured patients.

We use an RD based on an eligibility cutoff at 350 percent of FPL to estimate the causal effects of the financial assistance program at this discontinuity. We observe administrative data on income, family size, and other demographics for more than 25,000 program applicants. Using these data, we estimate a sharp 78.8 percent increase in approval for applicants below the threshold. Virtually all applicants below the threshold are approved, while a small percentage of applicants above the threshold qualify through a separate expense-based criterion. In support of the research design, we show that patient demographics and prior health care utilization trend smoothly through the discontinuity. As a placebo check, we find no effects at the discontinuity in any of the seven quarters before application. Finally, we do not detect bunching of incomes below the discontinuity, which suggests limited

[1] Examples of the stated aims of these programs include "improving health care access for people with limited incomes and resources" (Kaiser Permanente), providing "medically necessary health care to everyone, regardless of the ability to pay" (Community Healthcare System), and "providing quality health care services to all our patients regardless of their financial situation" (Mercy).

scope for income manipulation. Collectively, these results support the identification assumption that applicants immediately above and below the income eligibility threshold are similar and that the results are not driven by confounding selection into program eligibility.

We find that financial assistance increases health care utilization in the first quarter following application. Our preferred instrumental variable (IV) estimates, which scale up our estimates to account for the 78.8 percent increase in approval at the threshold, indicate that approval leads to a 3.6 percentage point (pp) increase in the likelihood of an inpatient encounter (relative to a mean of 6.2 percent), a 13.4 pp increase in the likelihood of an ambulatory encounter (relative to a mean of 67.0 percent), and a 6.7 pp increase in the likelihood of an emergency department encounter (relative to a mean of 12.7 percent). We estimate a sizeable increase in prescription drug utilization (an increase of 27.5 prescription drug days supplied relative to a mean of 131.2 days) and marginally significant increases in utilization of drugs to treat cholesterol, diabetes, and depression. The effects we observe decline in the second quarter and largely disappear three quarters after the date of the application decision.

The first quarter impacts on utilization are large in magnitude. As a benchmark, they are proportionally similar to the effects of Medicaid on health care utilization reported in the Oregon Health Insurance Experiment over the first year and a half of the program (Finkelstein et al. 2012; Taubman et al. 2014). In other words, the initial impacts of the financial assistance program on health care utilization in our insured study population are similar in magnitude to the impacts of providing Medicaid to the uninsured in Oregon. However, unlike the effects of Medicaid, which persist for at least the year-and-a-half study period, the effects of the financial assistance program fade out by the third quarter. The comparison highlights differences between hospital financial assistance programs and Medicaid coverage, which we discuss in Section V.

In addition to the effects on utilization, we find that financial assistance increases testing for and detection of health conditions. Specifically, our IV estimates indicate a 3.4 pp increase in the probability of an abnormal test result (relative to a mean of 10.6 percent). This effect is driven by an extensive margin increase in testing; conditional on having a test, the probability of an abnormal result is unchanged. The result indicates that marginal testing conducted in response to financial assistance is of similar diagnostic value to inframarginal testing. We also find increased drug utilization for treatment-sensitive conditions. Taken together, the increased detection of abnormal health conditions—a precondition for appropriate treatment—along with increased drug utilization, suggest that at least some of the increase in health care utilization caused by the financial assistance program is of high value. This finding is consistent with emerging evidence of the detrimental effects of consumer cost sharing on the utilization of high-value care (Chandra, Gruber, and McKnight 2010; Brot-Goldberg et al. 2017).

Our research builds on two correlational studies that examined the effects of financial assistance programs on health care utilization. Based on a survey of 308 (insured) patients, Conner et al. (2013) find that enrollment in a financial assistance program is associated with *reduced* health care utilization and no change in self-reported physical or mental health. Chaiyachati, Qi, and Werner (2020) examine the association between nonprofit hospital community benefit spending and

hospital readmission rates for Medicare patients but find no statistically significant relationship. In contrast to these studies, our quasi-experimental evidence indicates that financial assistance causes a substantial increase in health care utilization and detection of health conditions, albeit over a limited time horizon.

Our study also complements the literature on hospital-provided uncompensated care. This includes descriptive research on patterns in uncompensated care over time and across different types of hospitals (Cunningham and Tu 1997; Mann et al. 1997) as well as research evaluating whether the amount of charity care provided by nonprofit hospitals is commensurate with the favorable tax treatment they receive (Young et al. 2013; Singh et al. 2015; Herring et al. 2018).[2] The literature also includes research on the role that hospitals play as "insurers of last resort" by providing vulnerable patients medical care that is ultimately uncompensated (Dranove, Garthwaite, and Ody 2016; Garthwaite, Gross, and Notowidigdo 2018; Camilleri 2018). We contribute to our understanding of the role that hospitals serve as safety net insurers by estimating utilization effects for a study sample comprised primarily of insured patients who increasingly face high out-of-pocket costs for using health care.[3]

I. Background

A. *Hospital Financial Assistance Programs*

The provision of discounted or free care by hospitals to indigent patients has a long history in the United States, dating back to the eighteenth and nineteenth centuries when hospitals were primarily charitable institutions (Starr 2017). In 1954, the federal government added section 501(c)(3) to the Internal Revenue Code, which provided organizations dedicated to religious, charitable, scientific, or educational purposes with an exemption from paying federal income taxes. To qualify for tax-exempt status, a hospital had to provide "to the extent of its financial ability, free or reduced-cost care to patients unable to pay for it" (James 2016, 1). Since 1969, hospitals have been able to use financial assistance to fulfill their "community benefits" requirement for tax-exempt status (Somerville 2012). While the IRS has given hospitals flexibility in determining which expenditures count toward community benefits (James 2016), recent evidence indicates that charity care and other patient care services account for about 85 percent of these expenditures (Young et al. 2013). Starting in 2015, the Affordable Care Act (ACA) imposed additional requirements on nonprofit hospitals, including establishing a written financial assistance policy (IRS, n.d.; James 2016). States also regulate financial assistance programs. As of 2019, ten states required both nonprofit and for-profit hospitals to provide free or discounted care to eligible patients (Stark and Bosco 2021).

We gathered information on the financial assistance programs offered by the 40 largest health care systems from their websites. Table 1 displays income-based

[2] A number of papers have examined financial assistance programs for cancer treatment and drug costs (Felder et al. 2011; Zullig et al. 2017; Semin et al. 2020). These correlative studies typically find that financial assistance offers imperfect protection against financial hardship (Paul et al. 2016) and are subject to substantial frictions that deter take-up (Spencer et al. 2018).

[3] See, for example, https://www.healthsystemtracker.org/brief/tracking-the-rise-in-premium-contributions-and-cost-sharing-for-families-with-large-employer-coverage/.

Table 1—Hospital Financial Assistance Policies

Health system	Number of hospitals[a]	Eligibility criteria[b]	Benefits
Panel A. Largest for-profit health systems			
HCA Healthcare	185	Income < 200% FPL	100% write-off of emergency services costs
		Income between 200–400% FPL	Cap out-of-pocket balances at 4% of annual income using a sliding scale
Community Health Systems	105	Income < 200% FPL	Receive care for free
		Income between 201–301% FPL	Receive care discounted to the amount generally billed to Medicare
Tenet Healthcare	65	Income < 200% FPL	100% charity care discount
Universal Health Services	26	Income < 200% FPL	100% discount off gross charges
		Income between 201–250% FPL	83.5% discount off gross charges
		Income between 251–300% FPL	67% discount off gross charges
Panel B. Largest nonprofit health systems			
Ascension Health[c]	151	Income ≤ 250% FPL	100% discount off patient responsibility amounts
		Income between 250–350% FPL	75% discount off patient responsibility amounts
		Income between 351–400% FPL	67% discount off patient responsibility amounts
Trinity Health	92	Income below 250% FPL	100% discount on patient financial obligations
Providence Health	51	Income ≤ 300% FPL	100% write-off on patient responsibility amounts
		Income between 301–350% FPL	75% discount off patient responsibility amounts
Atrium Health	50	Income ≤ 200% FPL	100% discount on eligible services for 180 days
		Income between 201–300% FPL	75% discount on eligible services for 180 days
		Income between 301–400% FPL	50% discount on eligible services for 180 days
Kaiser Permanente[d]	39	Income ≤ 350% FPL	100% discount on patient responsibility bills; may also include an eligibility period for follow-up services

Notes:

[a] Based on information as of July 2019. See online Appendix A for an expanded list and details on the construction of this table.

[b] The table lists income-based eligibility criteria only. The exact terms for each financial assistance program may include other eligibility requirements such as patient insurance status, medical expenditure incurred, and asset level, which in turn might be associated with different benefit terms.

[c] Eligibility criteria vary by state and by hospital. The policy here pertains to Lourdes Hospital in Binghamton, NY.

[d] Eligibility criteria vary by region. The policy here pertains to Kaiser Permanente Northern California.

eligibility criteria and benefits for the four largest for-profit and four largest nonprofit systems with available information, along with the criteria for Kaiser Permanente. Online Appendix Section A describes the methodology used to gather this information, and online Appendix Table A1 provides eligibility and benefits information for all 40 health care systems.

Among health systems with available information, eligibility cutoffs range from 200 percent to 400 percent of FPL. Applicants may also qualify if they have substantial health care expenses relative to their means. Qualifying patients typically receive some combination of forgiveness of previously incurred medical bills and reduced out-of-pocket costs for future care, often with more generous benefits for lower-income patients. Many systems offer multiple generosity tiers, with virtually all systems providing 100 percent benefit generosity at lower incomes and less generous benefits (e.g., 50 percent or 75 percent) at higher incomes. While for-profits do not face the same federal regulatory requirements as nonprofits, the largest for-profit health systems offer financial assistance programs that are comparable in their eligibility criteria and benefits to nonprofit health systems.

B. *Financial Assistance at Kaiser Permanente*

Kaiser Permanente is a large, integrated, closed-network health care system that operates 39 hospitals and more than 700 medical offices across eight states, serving 12.5 million patients.[4] For this study, we use data from Kaiser Permanente Northern California, a division within Kaiser Permanente serving 4.5 million people in the San Francisco Bay Area, Greater Sacramento, and the Central Valley.

Kaiser patients qualify for financial assistance if they have family income at or below 350 percent of FPL. Patients can also qualify with incomes above the 350 percent FPL threshold if they have eligible out-of-pocket medical and pharmacy expenses exceeding 10 percent of household income over a 12-month period (regardless of income). The majority of approved applicants (71 percent) apply through the income-based criterion.

Kaiser Permanente's financial assistance program eliminates existing debt previously incurred at Kaiser and eliminates cost sharing on any health care received from Kaiser for a period of time. Patients in a Medicare Advantage Plan face no cost sharing for 6 months after receipt, and patients in a non-Medicare Advantage Plan (e.g., employer-sponsored or Marketplace) face no cost sharing for 12 months. The program applies to virtually all health care delivered by Kaiser, including care provided at Kaiser hospitals and clinics, as well as drugs provided at Kaiser pharmacies.

The Kaiser Permanente financial assistance program is comparable in eligibility and generosity to those offered by other large hospital systems (see online Appendix Table A1). Kaiser's single 350 percent FPL threshold is lower than the threshold for the highest-income benefits tier at most systems (thirty-fifth percentile of the hospital-weighted distribution) but higher than the lowest-income tier (ninety-seventh percentile of the hospital-weighted distribution). Kaiser's policy of providing 100 percent benefits to those with incomes below 350 percent FPL and 0 percent

[4] Source: https://about.kaiserpermanente.org/who-we-are/fast-facts

benefits to those with higher incomes exhibits a sharper income profile than those at other health systems, which typically provide 100 percent discounts in the lowest tier and 50 percent or 75 percent discounts in the highest tier.[5]

Patients can learn about the Kaiser financial assistance program through several channels. Information on the program is included on medical bills sent to patients, as well as online. Caseworkers and caregivers can also provide patients with information in person at Kaiser facilities and assist patients in applying to the program.

II. Data

We obtained deidentified administrative data on all applicants to Kaiser Permanente's financial assistance program between January 2016 and December 2017. For each applicant, we observe income, family size, demographics, whether the patient applied via the income- or expense-based criterion, and application approval or denial (KPNC 2020).

Kaiser Permanente offers an important and useful setting to study the impacts of financial assistance on health care utilization for a number of reasons. First, it is a large health care provider, with many people affected by its program. Second, because it is an integrated, closed-network system, we observe detailed electronic medical records information for 96.3 percent of health care expenses incurred by program applicants.[6] This allows us to observe ambulatory visits, emergency department visits, and inpatient hospital stays, as well as information on prescription drug use, laboratory tests and results, and total health care costs. We observe utilization, prescription drugs, and laboratory test results for a period 24 months before to 24 months after the month of the program application decision. Recall that the cost-sharing elimination lasts 6–12 months, so our data allow us to observe effects well after the cost sharing has reverted back to its prior level. We observe costs for the 12-month period before the application decision.

Kaiser's model of care delivery, which combines an integrated, closed-network system with a focus on prevention and management, is also important for the interpretation of the estimated effects on utilization. The coordinated approach to care might provide more opportunity for patients to increase their health care utilization, since Kaiser may encourage more follow-up care and its system covers a broad range of services. On the other hand, many insured patients at Kaiser do not face significant cost sharing for recommended care, so the incremental benefits of the elimination of cost sharing might be lower at Kaiser than elsewhere.

We focus our analysis on the discontinuity created by the income eligibility cutoff at 350 percent FPL (ASPE 2016, 2017). While the expense eligibility criterion also creates a discontinuity, data on out-of-pocket bills at the time of eligibility were not available, so we cannot use this threshold as a research design. A total of 25,574 patients with available information on income and family size applied via the income-based criterion. We drop patients with incomes below 150 percent FPL

[5] While program descriptions often report generosity as a percentage discount, whether benefits apply only to previously incurred bills or also cover cost sharing for future medical expenses is often ambiguous.

[6] On average, only 3.7 percent of total expenses for individuals in our baseline sample were incurred for medical services outside of Kaiser in the 12-month period before the application decision.

or above 550 percent, yielding a symmetric window around the 350 percent FPL cutoff. Of the 18,695 applicants in the remaining sample, 23 applied more than once. We exclude these individuals because the subsequent applications may be endogenous to information concerning their likelihood of subsequent approval. The resulting baseline sample has 18,672 applicants.

For each applicant in our baseline sample, we construct a monthly panel of outcomes on health care utilization for the period from 24 months before to 24 months after the month of application decision (total of 49 months). For most of the analysis, we aggregate the data to the quarterly frequency to reduce the noise inherent in higher-frequency measures. We define quarter 0 as months 0, −1, and −2, where month 0 is the month of the application decision; quarter 1 contains months 1, 2, and 3 after application and so on.

Our primary measures of health care utilization are indicators for whether a patient had at least one ambulatory visit, inpatient visit, emergency department visit, visit of any kind (i.e., ambulatory, inpatient, or emergency department), and the number of prescription drug days supplied, by quarter. Our laboratory test data cover tests for cholesterol (HDL and total), triglycerides, and blood sugar (A1C). Cholesterol and triglycerides tests are used to assess risk and guide treatment of heart disease; A1C tests are used to manage treatment of diabetes. We construct an indicator for whether a patient had at least one laboratory test and whether the test returned at least one abnormal result.[7]

Table 2 provides summary statistics on our baseline sample in quarter −1 (covering months −3, −4, and −5 relative to the month of application decision). Column 1 shows means for the baseline sample with incomes between 150 percent and 550 percent of FPL. On average, applicants have a family income of $40,000, roughly halfway between the $13,000 average income of the study population in the Oregon Health Insurance Experiment and the $60,000 median household income in the United States in 2017 (Guzman 2018). The average Elixhauser comorbidity index (count of chronic conditions) is 3.5 over the 12 months before application, higher than the average of 2.2 in the US population in 2013 (Akinyemiju and Moore 2016). The average body mass index (BMI) among the applicants is 29.1, which is similar to the average for the US population for both men (29.1) and women (29.6) over the age of 20 (Fryar et al. 2018). Notably, most applicants (88 percent) are enrolled in a Kaiser health insurance plan at the time of application, of which 52 percent are covered by a Medicare Advantage Plan and 48 percent are enrolled in a commercial plan (e.g., employer-sponsored or Marketplace). This contrasts with Medicaid enrollees who are typically uninsured before receiving government coverage. As expected given the circumstances, applicants have high health care costs in the months before application. In quarter −1, average costs are slightly more than $6,000, substantially higher than the $2,686 average quarterly expenditure for Americans in 2017 (National Center for Health Statistics 2021). Applicants' health care utilization is also correspondingly higher than the US population average.

[7] We follow clinical guidelines and define an abnormal test as less than 40 mg per deciliter for HDL cholesterol level, 240 mg per deciliter or higher for total cholesterol, 150 mg per deciliter or higher for triglycerides, and 6.5 percent or higher for A1C for adults (Ma and Shieh 2006; International Expert Committee 2009). We use the corresponding thresholds from the same source for the small number of children in our sample.

Table 2—Summary Statistics and Covariate Balance

	Sample mean			Discontinuity	
	150–550% FPL	250–350% FPL	350–450% FPL	RD estimate	*p*-value
	(1)	(2)	(3)	(4)	(5)
Demographics at application					
Family income ($)	40,299.29	49,355.72	65,714.77	−197.67	0.82
Family size	2.15	2.19	2.17	−0.00	0.97
White (%)	50.65	50.99	48.24	−0.00	0.85
Male (%)	42.65	44.38	48.43	−0.04	0.13
Age	57.77	56.57	55.13	−0.42	0.71
Elixhauser comorbidity index[a]	3.52	3.45	3.36	0.13	0.43
BMI	29.05	29.27	29.23	0.34	0.35
Ever smoked (%)	42.34	41.63	41.80	−0.02	0.46
Insurance and cost in quarter −1[b]					
Insured (%)	88.12	89.48	90.47	−0.01	0.73
Medicare advantage (%)	52.40	49.76	46.23	−0.01	0.67
Total cost ($)	6,094.89	6,461.90	6,884.35	−132.03	0.92
Key outcomes in quarter −1					
Any encounter (%)	67.05	67.98	69.11	−0.00	0.93
Any ambulatory encounter (%)	65.36	66.43	67.78	−0.00	0.93
Any inpatient encounter (%)	7.30	7.45	7.72	−0.00	0.92
Any emergency department encounter (%)	15.24	14.90	14.01	0.01	0.37
Prescription drug days supplied[c]	132.50	133.83	132.60	−3.77	0.64
Any test record (%)	21.70	21.88	24.02	−0.02	0.26
Any abnormal test result (unconditional) (%)	12.00	12.43	12.87	−0.00	0.77
Any abnormal test result conditional on test (%)	55.28	56.81	53.57	0.03	0.51

Notes: Quarter –1 corresponds to event months –3, –4, and –5 relative to the quarter of application decision. The income eligibility cutoff is 350% of FPL. Column 1 shows means for the baseline sample with income between 150–550% of FPL; columns 2 and 3 show means for applicants within 100 pp of the 350% FPL threshold. Columns 4 and 5 report coefficient estimates and *p*-values on an indicator for income below the 350% of FPL threshold from our baseline RD specification (equation (1)).

[a] Calculated for the 12 months prior to program application.

[b] The insurance coverage variables are indicators for being insured in all months of quarter –1.

[c] Winsorized at the 95th percentile.

Columns 2 and 3 of Table 2 report means for applicants with incomes between 250–350 percent and 350–450 percent of the FPL threshold, respectively. The small differences indicate that applicants on either side of the eligibility threshold are similar along key characteristics and preintervention outcomes. We conduct formal tests of the validity of the RD design, described below.

III. Empirical Strategy

We use an RD design that exploits the program eligibility threshold at 350 percent FPL to estimate the causal effect of the financial assistance program on health care utilization. Let i index applicants and t index quarters relative to application. For each quarter $t \in [-7, 8]$, we estimate separate regressions of the form

$$(1) \qquad y_{it} = \beta_{0t} + \beta_{1t} FPL_i + \beta_{2t} FPL_i^2 + \delta_t \mathbf{1}(FPL_i \leq 350\%) + \epsilon_{it},$$

where y_{it} is the outcome variable and FPL_i is income as a percentage of FPL. In our baseline specification, we include a global second-order polynomial in income

to control for the relationship between income and the outcome. We use a global polynomial, rather than separate polynomials above and below the discontinuity, because the lower number of observations to the right of the discontinuity generates noise in some estimates. We show that our results are robust to estimating alternative specifications, including allowing for separate polynomials. The coefficient of interest δ_t captures the effect of having an income below the eligibility threshold on the outcome in quarter t.

While virtually all applicants with incomes below the threshold qualify for the financial assistance program, a small share of applicants with incomes above the threshold qualify via the expense-based criterion. To account for these approvals, we estimate IV (fuzzy RD) specifications. Letting FAP_i be the indicator for financial assistance program approval, the first stage takes the form

$$FAP_i = \alpha_{ot}^{IV} + \alpha_{1t}^{IV} FPL_i + \alpha_{2t}^{IV} FPL_i^2 + \gamma_t^{IV} \mathbf{1}(FPL_i \leq 350\%) + v_{it} \tag{2}$$

and the second stage takes the form

$$y_{it} = \beta_{0t}^{IV} + \beta_{1t}^{IV} FPL_i + \beta_{2t}^{IV} FPL_i^2 + \delta_t^{IV} FAP_i + \epsilon_{it}^{IV}. \tag{3}$$

Since we have a single instrument, the IV coefficient of interest δ_t^{IV} is numerically equivalent to the RD estimate δ_t divided by the first-stage effect γ_t^{IV}.

IV. Results

A. *Validity and First Stage*

Our identifying assumption is that in the absence of the discontinuity in program approval, outcomes would trend smoothly through the discontinuity. We provide three pieces of evidence in support of this assumption. First, we test for discontinuities in preapplication patient characteristics and outcomes around the eligibility cutoff. Columns 4 and 5 of Table 2 report the coefficient and associated p-value on the indicator for having income below the 350 percent FPL threshold from our baseline RD specification (equation (1)). The top panel shows effects for patient demographics and preapplication health conditions (Elixhauser comorbidity index, BMI, ever smoked). The middle panel shows effects on measures of insurance coverage (insured and Medicare Advantage) and quarterly costs, measured in the quarter before application.

Second, we implement placebo tests for differences in the outcomes before application. The bottom panel of Table 2 shows effects of our utilization outcomes, again measured in the quarter before application. The estimated effects are quantitatively small and statistically insignificant for every variable, supporting the assumption that outcomes would have evolved smoothly through the threshold in the absence of financial assistance. Online Appendix Figure A1 displays RD plots for the quarter −1 placebo tests.

Third, we examine bunching of applications around the threshold value, which could indicate selection into the program on unobservable characteristics. Figure 1, panel A presents a histogram of applicant income as a percentage of FPL for the

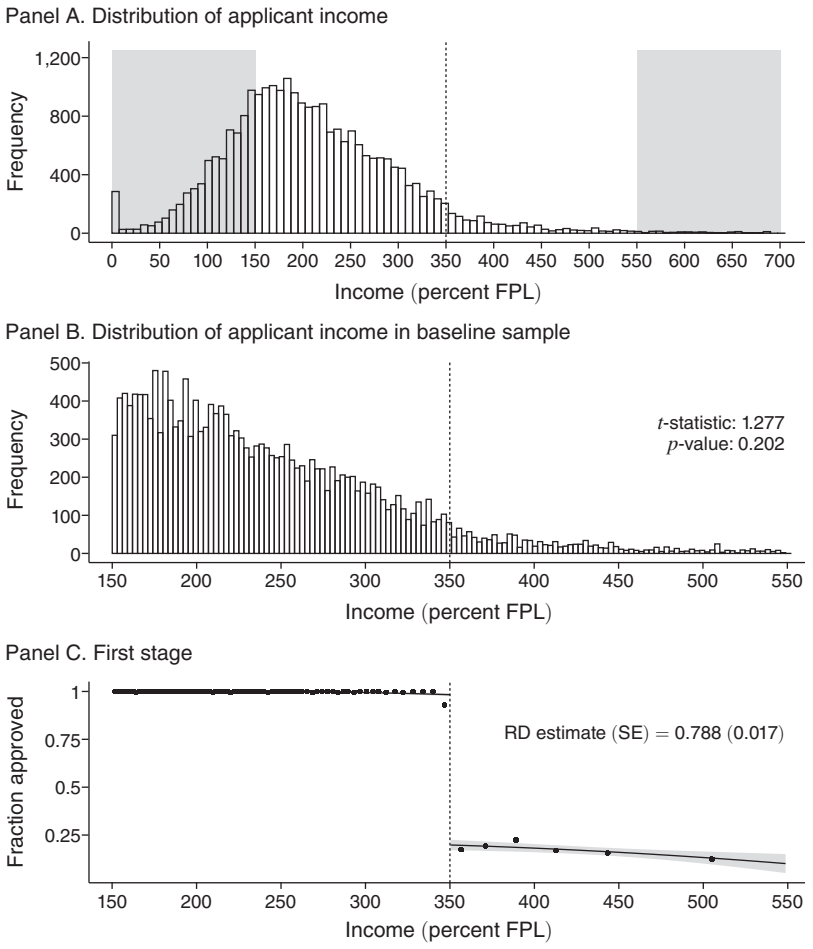


FIGURE 1. DISTRIBUTION OF APPLICANT INCOME AND FIRST STAGE

Notes: Panel A shows the distribution of applicant income, with the gray regions showing applicants outside of our baseline sample (150–550% of FPL). Panel B shows the distribution of income for the baseline sample and reports the *t*-statistic and *p*-value from the manipulation test proposed by Cattaneo, Jansson, and Ma (2020). Panel C shows the first-stage effect on approval at 350% of FPL. Dots show the mean approval rate within equal-frequency income bins. Solid lines are fitted values from a second-order polynomial; gray bands show a 95% confidence interval.

unrestricted data, and panel B presents a histogram for our baseline sample of applicants with incomes between 150 percent and 550 percent FPL. Neither histogram shows visual evidence of excess mass to the left of the threshold. Online Appendix Table A2 presents results from the manipulation test developed by Cattaneo, Jansson, and Ma (2020). The Cattaneo, Jansson, and Ma (2020) test (henceforth, CJM test) yields a *p*-value of 0.202 and fails to reject the null of no manipulation.[8]

[8] We view the CJM test as conservative since the test overrejects in a validation exercise. See online Appendix Section B for more details on this and on the commonly used McCrary (2008) test, which exhibits an even more severe overrejection problem in our setting.

The absence of bunching is not surprising given the institutional environment. Patients must document their income (e.g., by submitting pay stubs), which reduces the scope for manipulation of the running variable. Applications are typically submitted following a health event, limiting income manipulation through the retiming of applications.

We estimate a large first-stage effect of the cutoff on application approval. Figure 1, panel C plots approval rates by FPL, along with fitted values from the first stage (equation (2)). Applicants below the cutoff have a 78.8 pp (standard error 1.7 pp) higher likelihood of being approved for the program. Virtually all applicants with incomes below the cutoff are approved, while about one-fifth of applicants above the cutoff qualify via the expense-based criterion.

B. *Utilization Impacts*

We next turn to estimating the effects of the financial assistance program on health care utilization. Figure 2 presents RD plots of the impact of financial assistance in the first quarter following application decision. For each outcome, dots show the mean of the outcome variable for 85 equal-frequency bins of income.[9] The solid lines show predicted values from the RD specification (equation (1)), and dashed lines show the 95 percent confidence intervals. For each outcome, we also report the RD and IV estimates, their standard errors, and the mean of the outcome for applicants with an income of 350–450 percent of FPL (i.e., the "control group" mean), also in the first quarter following application decision.

The IV estimates indicate substantial increases in utilization in the quarter after receiving financial assistance. Financial assistance increases the likelihood of any ambulatory encounter by 13.4 pp (relative to a mean of 67.0 percent for those with income between 350 percent and 450 percent FPL), any inpatient encounter by 3.6 pp (relative to a mean of 6.2 percent), and any emergency department encounter by 6.7 pp (relative to a mean of 12.7 percent). The likelihood of any encounter increases by 13.0 pp (relative to a mean of 68.4 percent), and the number of prescription drug days supplied increases by 27.5 (relative to a mean of 131.2). All of these estimates are statistically distinguishable from zero at the 5 percent level. Estimates are proportionally similar when defining the outcomes as the number of encounters instead of as binary variables (see panel D of online Appendix Table A3), which indicates that financial assistance increases utilization on both the extensive and intensive margins.

We find that financial assistance has a large proportional effect on the likelihood of undertaking a laboratory test and on the detection of abnormal health outcomes in the quarter after program decision. Specifically, the likelihood of any test increases by 7.1 pp (relative to a mean of 19.4 percent), and, unconditional on having a test, the likelihood of an abnormal test increases by a marginally significant 3.4 pp (relative to a mean of 10.6 percent; p-value of 0.08). The increase in abnormal test results is driven by the extensive margin increase in testing, given that the conditional likelihood of an abnormal test result is unchanged (point estimate of -2.2 pp and standard error of 6.6 pp relative to a mean of 54.4 percent). Hence, marginal

[9] The number of bins was chosen to achieve bins with approximately equal observation counts on both sides of the discontinuity. Panel H has 32 bins due to its smaller sample size.

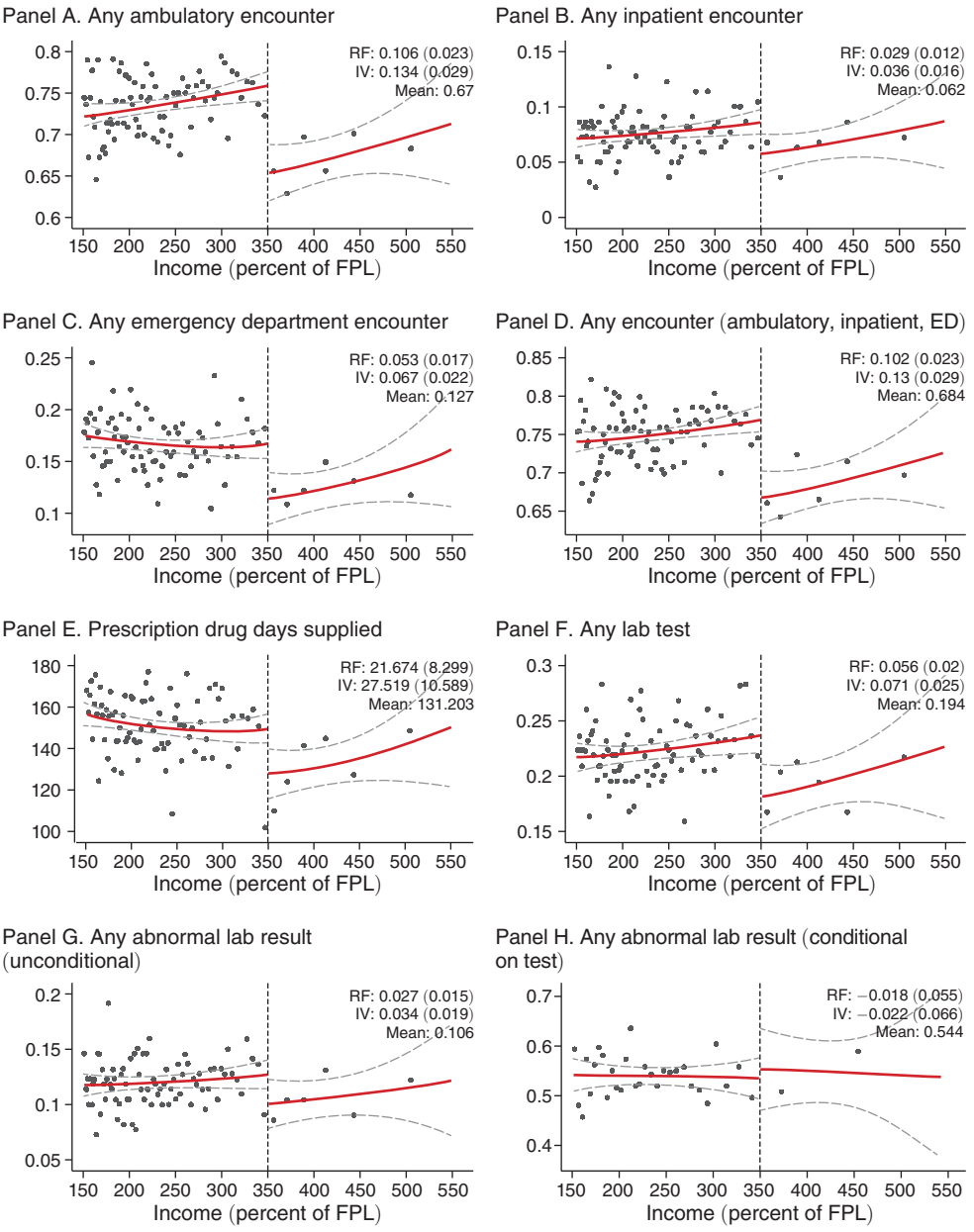


FIGURE 2. RD ESTIMATES FOR QUARTER 1

Notes: Figure shows RD plots of the impact of financial assistance in the first quarter after the application decision. Dots show the mean of the outcome for 85 equal-frequency bins (220 applicants per bin), except for panel H, where there are 32 bins (130 applicants per bin). Solid lines show fitted values from a second-order polynomial; dashed lines show 95% confidence intervals. For each outcome, we also report the RD and IV estimates, their standard errors, and the mean of the outcome for applicants with an income of 350–450% of FPL (i.e., the "control group" mean). Prescription drug days supplied is winsorized at the 95th percentile.

testing conducted in response to financial assistance leads to valuable diagnosis of abnormal health and is of similar diagnostic value to inframarginal testing.

In online Appendix Table A4, we further examine effects on abnormal test results and prescription drug utilization separately by chronic conditions that benefit from diagnosis and management. Financial assistance almost doubles the likelihood of an abnormal cholesterol test (2.6 pp increase relative to a mean of 2.7 percent; p-value of 0.007) and raises utilization of cholesterol-lowering drugs by a marginally significant 19 percent (4.9 pp increase relative to a mean of 26.2 percent; p-value of 0.08).[10] The effect on diabetes diagnoses is imprecise; however, we estimate a marginally significant 26 percent increase in prescriptions for diabetes (3.7 pp increase relative to a mean of 14.1 percent; p-value of 0.087). Financial assistance increases utilization for drugs to treat depression by about one-third (5.5 pp relative to a mean of 14.9 percent; p-value of 0.016) and has an imprecise effect on prescriptions for blood pressure.

Our baseline model controls for a global second-order polynomial in income rather than separate polynomials above and below the discontinuity. To probe the sensitivity to this assumption, panel A of online Appendix Table A3 shows estimates that control for separate second-order polynomials above and below the cutoff, and panel B controls for separate locally linear polynomials using the approach proposed by Calonico, Cattaneo, and Titiunik (2014). The estimates are similar up to some additional noise due to the relatively lower number of observations above the income cutoff. To provide further assurance that our results are not being driven by observations close to the income cutoff, we reestimate our main specification using a "donut" RD where we exclude observations with incomes between 340 percent and 360 percent of FPL (see online Appendix Table A3, panel C). Again, the estimated impacts are very similar to our baseline specification.

C. *Dynamics*

Figure 3 examines the dynamic effects of financial assistance on utilization by plotting RD estimates, and the corresponding 95 percent confidence intervals, for quarters $t \in [-7, 8]$.[11] The plots show no effect in quarters −7 to −1, supporting the validity of the research design. For some outcomes, there is a small effect in quarter 0, which is natural since program approval occurs in the last month of this quarter. Impacts of financial assistance are largest in quarter 1, half as large and not statistically significant for any of our primary outcomes in quarter 2, and small and generally not statistically significant in quarters 3 to 8.

There are a number of potential explanations for this decay. First, as discussed above, the fade-out could be explained by the limited duration (6 or 12 months) of the cost-sharing reductions, with approximately half of enrollees experiencing reductions for only 6 months.[12] Second, since patients apply during a period of high

[10] We cannot separate whether the increase in drug utilization is directly caused by the financial assistance or by the diagnostic testing.

[11] Numerical values of the RD and the IV estimates for each outcome in each quarter are reported in online Appendix Tables A5 and A6.

[12] We do not find any differential fade-out for applicants with 6- versus 12-month reductions in cost sharing, but our standard errors do not allow us to rule out meaningful differences across groups.

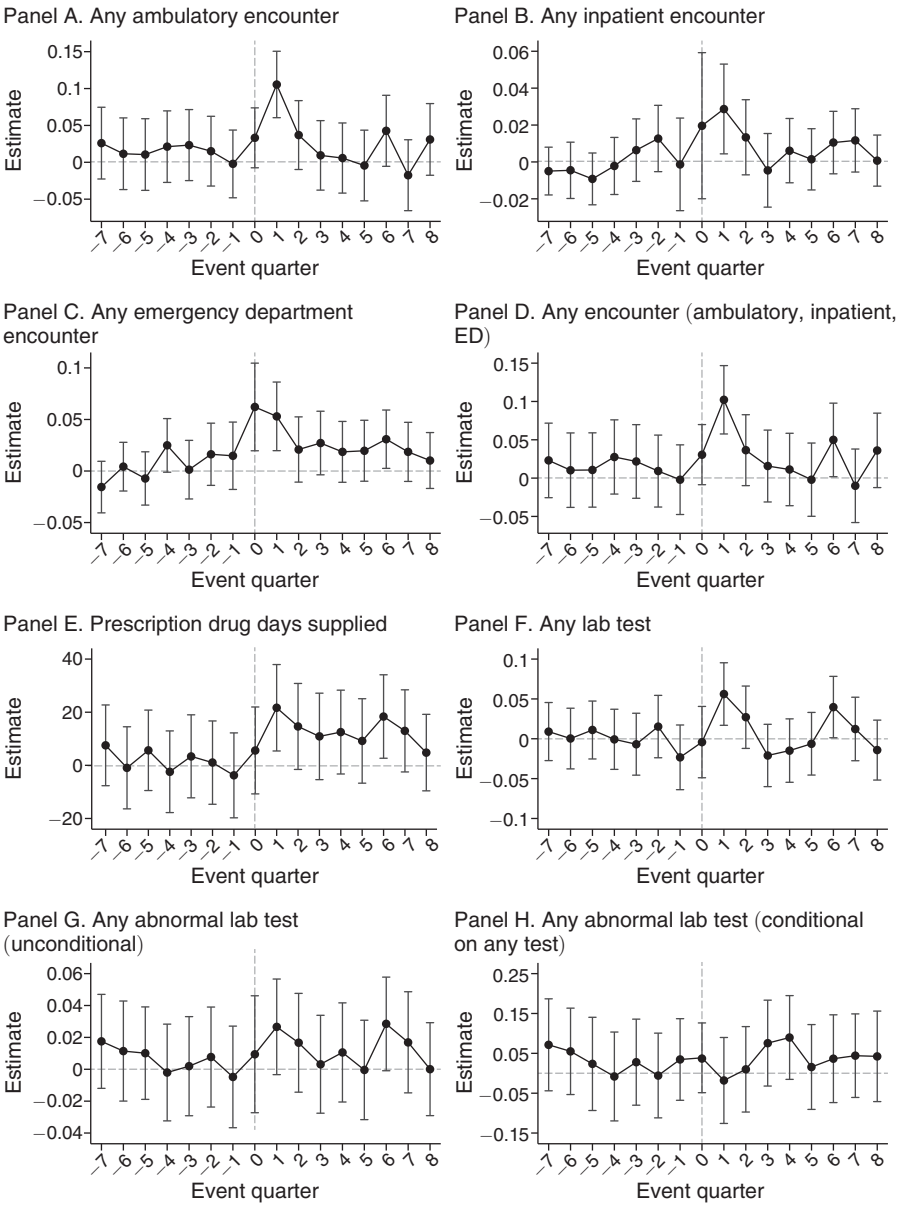


FIGURE 3. RD ESTIMATES FOR EACH QUARTER

Notes: Plots show RD estimates, and the corresponding 95% confidence intervals, of the impact of financial assistance for quarters $t \in [-7, 8]$. Event quarter 0 corresponds to event months 0, –1, and –2 relative to the month of the application decision. Prescription drug days supplied is winsorized at the 95th percentile.

medical need, patients may be particularly responsive to the cost-sharing reductions in the short run, a version of the "selection on moral hazard" documented by Einav et al. (2013). This increased responsiveness may abate as their health care needs decrease in the quarters following application. Third, decay may in part reflect a data generating process with constant proportional effects, where the declining

effects are driven by decreases in patients' health care needs following application. Online Appendix Table A7 investigates this by reporting the control means (means for FPL 350–450 percent) and IV effects as a proportion of the control means for each outcome in quarters $t \in [-7, 8]$. While control group utilization declines between quarters 1 and 7, the steeper declines in the IV estimates suggest that a constant proportional response model can only explain a minority of the decline.

V. Discussion

In this concluding section, we place our results in a broader context and discuss the implications of our findings for health care policy. We first benchmark the size of our estimates to existing estimates of the impacts of public insurance from Medicaid. We then consider differences in who bears the cost of these alternative sources of health care financing and discuss the potential implications of these differences in incidence for program take-up.

The on-impact utilization effects of the financial assistance program we study are proportionally similar to the effects of Medicaid on health care utilization, which is a natural alternative source of financing health care for low-income patients. Online Appendix Table A8 summarizes the IV effects from quarter 1 to the most closely related estimates from the Oregon Health Insurance Experiment (Finkelstein et al. 2012; Taubman et al. 2014). Relative to the mean for applicants above the threshold (350–450 percent of FPL), the financial assistance program caused a 20.0 percent increase in the likelihood of an ambulatory visit, a 58.8 percent increase in the likelihood of an inpatient encounter, a 53.1 percent increase in the likelihood of an emergency department visit, and a 21.0 percent increase in prescription drug days supplied. Based on results from the Oregon experiment, which are typically average effects taken over the first 18 months of coverage, Medicaid coverage caused a 36.9 percent increase in the number of outpatient visits (comparable to ambulatory visits), a 10.7 percent increase in the likelihood of an inpatient encounter, a 20.3 percent increase in the likelihood of an emergency department visit, and a 15.0 percent increase in the likelihood of filling a prescription.

An important difference between the two programs is that while Medicaid provides continual coverage (and effects we cite are based on an 18-month time period), the effects of the financial assistance program we study are temporary. As we discuss earlier, this likely reflects a combination of the temporary nature of the cost-sharing reduction and the fact that patients apply to the program during a period of increased need when they might be particularly responsive to the cost-sharing reduction (i.e., "selection on moral hazard").

Our findings of increased abnormal test results for treatment-sensitive conditions (heart disease and diabetes) and increased drug utilization for chronic health conditions (cholesterol and diabetes) and depression indicate that at least some of the increase in utilization caused by the financial assistance program is of high value. These results are consistent with an emerging set of evidence that consumer cost sharing has detrimental impacts on the use of high-value care (Chandra, Gruber, and McKnight 2010; Brot-Goldberg et al. 2017).

In considering the generalizability of our findings, there are a number of factors to keep in mind. First, our RD estimates are identified off of applicants at 350 percent

FPL. To the extent that lower-income patients experience greater benefits from financial assistance, effects may be larger for inframarginal recipients. Second, the vast majority of our sample (88 percent) has insurance coverage. While the effects of financial assistance on the insured is of stand-alone interest—given increasing cost sharing and the $6 billion in charity care currently provided to the insured—the effects of financial assistance may well be larger for uninsured patients. Finally, as discussed above, Kaiser has a fairly unique model of care delivery. This could lead to larger effects because Kaiser offers a broader range of services or smaller effects because Kaiser already limits cost sharing for recommended care for many of its enrollees.

From a policy perspective, a key distinction between public insurance and financial assistance programs is in who bears the incidence of financing care. Financial assistance programs, which are required of nonprofit hospitals, primarily involve a transfer from hospitals to low-income patients (Garthwaite, Gross, and Notowidigdo 2018). In contrast, Medicaid is best characterized as a transfer from taxpayers to both patients and health care providers for utilization that would otherwise have been paid for by some combination of out-of-pocket payments, uncompensated care, and unpaid debt (Finkelstein, Mahoney, and Notowidigdo 2018).

These differences in who bears the cost of care lead to different incentives that affect program take-up. Hospitals benefit when their uninsured patients sign up for Medicaid; consequently, many hospitals actively enroll patients in Medicaid coverage. In contrast, hospitals have less incentive to actively enroll patients in financial assistance programs. Indeed, while systematic evidence is limited, accounts by journalists indicate that hospitals underpromote their financial assistance programs and deter applications via burdensome documentation requirements.[13] If these barriers to take-up are large, they could exclude many patients from the beneficial impact of financial assistance programs as a form of "insurance of last resort." Better understanding the causes and consequences of these barriers to take-up of financial assistance is an important area for future research.

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[13] See, for example, https://www.wsj.com/articles/medical-debt-charity-to-buy-wipe-out-278-million-of-patients-hospital-bills-11623762001?st=pa8wazovx3vsstn&reflink=desktopwebshare_permalink.

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