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The Effect of Primary Care Visits on Health Care Utilization: Findings from a Randomized Controlled Trial

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ABSTRACT

We conducted a randomized controlled trial, enrolling low-income uninsured adults to determine whether cash incentives are effective at encouraging a primary care provider (PCP) visit, and at lowering utilization and spending. Subjects were randomized to four groups: untreated controls, and one of three incentive arms with incentives of $0, $25, or $50 for visiting a PCP within six months of group assignment. Compared to the untreated controls, subjects in the incentive groups were more likely to have a PCP visit in the initial six months. They had fewer ED visits in the subsequent six months, but outpatient visits did not decline. We also used the exogenous variation generated by the experiment to obtain causal evidence on the effects of a PCP visit. We observed modest reductions in emergency department use and increased outpatient use, but no reductions in overall spending.

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A randomized controlled trials registry entry is available at ClinicalTrials.gov (NCT02922855)

INTRODUCTION

Increasing access of the low income population to good quality and lower-cost health care is a national priority. Low-income adults below age 65 who neither have access to employer-based health insurance nor qualify for Medicaid rely on the safety net system to meet their health care needs. Often, patients seen in the safety net system have preventable health conditions that escalate to a crisis, requiring high-cost emergency department (ED) and inpatient care. These health care settings are associated with expensive utilization, poor coordination and follow-up care, and reduced well-being (Asplin et al. 2005, Johnson et al. 2015). In contrast, the primary care setting is viewed as an efficient means to diagnose and treat conditions before they reach a severity level requiring expensive procedures and hospitalization (Peterson et al. 2011). Historically, however, low-income patients have limited access to PCPs and do not routinely seek preventive care (Sommers et al. 2017, Pitts et al. 2010).

In a prior study, we compared the effect of a randomized controlled trial that offered cash incentives to low-income uninsured patients, treated in a safety net setting, to seek initial primary care visits. All patients were assigned to a community-based PCP and provided free or low-cost health care. The trial found that small cash incentives (i.e., $25, $50) encouraged primary care visits and that subjects were more responsive to higher incentives. Relative to the groupreceiving no cash incentive, the odds of a PCP visit increased by 36% for the $25 incentive group and 56% for the $50 incentive group. This study is described in more detail elsewhere (Bradley and Neumark 2017).

In the present paper, we expand that analysis to pursue two complementary lines of investigation. First, we examine how the incentives affected health care utilization beyond the initial PCP visit. We study whether the incentives also led to establishing an ongoing PCP

relationship, and estimate whether the incentives influenced other types of utilization (e.g., emergency department, outpatient) and spending within 12 months after study enrollment. Second, we assess whether an initial PCP visit changes utilization and spending, using the random assignment from the experiment to provide exogenous variation in PCP visits. This exogenous source of variation is important, because otherwise correlations between unobserved determinants of health care utilization and costs and whether one visited a PCP could drive the relationship between PCP visits and utilization and spending. We thus provide new evidence on whether a low-cost investment in incentives can encourage desired health care utilization, and whether primary care alters utilization patterns and reduces high-cost care in a low-income safety net population. This study is relevant given the financial strain on the safety net system to provide care, and a low-income population that has considerable health care needs (Gold et al. 2014, Bazzoli et al. 2014, Pickens et al. 2017). By capitalizing on a randomized controlled trial, the study provides more convincing evidence than observational studies.

Our incentive program was effective at encouraging initial and subsequent PCP visits, and modestly reducing ED utilization relative to untreated controls, in the second six-month period that follows the initial six-month period when PCP visits were incentivized. The incentives were also associated with an increase in outpatient and specialty care visits during the initial six-month period. These findings suggest that cash incentives, which can be manipulated by policymakers, encourage the desired behavior of PCP utilization, but may also have unintended consequences for other types of health care utilization. Total spending increases during the initial six-month incentive period, but the increase generally is not statistically significant among most incentive groups during the second six-month period. The one exception is for the $25 group, which also had statistically significantly higher outpatient and specialty care

utilization in the post-incentive, second six-month period. Our results were not driven by relatively healthy subjects who could more easily avoid the ED than those who were in poor health. Rather, the incentive program had the greatest impact on stimulating a PCP visit among less healthy subjects.

We estimate the effects of PCP visits, using the random assignment in the experiment to provide exogenous variation, which considerably improves upon how the effects of PCP use have been examined in prior studies. In this analysis, we generally do not find that PCP visits induced by the assignment to incentive groups change ED visits, except in one case where there is evidence that the initial PCP visit reduced non-emergent ED visits. PCP visits induced by the experiment were associated with increased outpatient utilization in the first six-month period, and, in one case, in the second six-month period; correspondingly, PCP visits were also associated with higher spending in the first six-month period. We conclude that although an initial PCP visit can be effectively incentivized, and although there is evidence that a PCP relationship has been established as observed through subsequent visits, overall health care utilization may not be reduced, and may even increase in the short-run.

UTILIZATION FOLLOWING HEALTH INSURANCE COVERAGE

The best method for controlling costs once insurance coverage is provided, particularly to low-income previously uninsured adults, is vigorously debated among policymakers, insurers, and health care providers. Often, primary care is touted as the solution for cost control, but our assessment of the available studies suggests that we need to learn more about this relationship, and we need more rigorous evidence. Corresponding to the outcomes in our study, in reviewing this literature we focus on utilization and spending; we do not address potential health benefits, quality of life improvements, or improvements in satisfaction with health care providers.

Many studies find that, in the first year of health insurance coverage following a period of uninsurance, health care utilization increases (Cunningham et al. 2016, Finkelstein et al. 2016, O'Malley et al. 2016, Finkelstein et al. 2012). Following Oregon's 2008 Medicaid expansion, for example, overall health care encounters increased by 35% and PCP encounters increased by 22% for those newly insured (Gold et al. 2014). Likewise, those newly insured following health care reform in Massachusetts increased utilization during the first year of coverage, including emergency care (Lee et al. 2015). Enrollees with no prior public insurance had a 12% higher odds of an ED visit within 12 months following enrollment in the Massachusetts Medicaid program. Increased utilization following insurance coverage was also reported in patients newly insured by private health insurance plans (Franks et al. 2003). Some researchers hypothesize that higher utilization following coverage is attributable to pent-up demand for health care services, suggesting that the newly insured make up for forgone health services once insured (Heintzman et al. 2014, Buchmueller et al. 2005).

Researchers propose that primary care may be a way to reduce overall utilization once a population obtains health insurance coverage (Heintzman et al. 2014), as PCPs provide preventive care and treat chronic conditions, and thereby help patients avoid the ED (Hadley and Cunningham 2004, Hadley 2007). This hypothesis received considerable attention from safety net providers that care for low-income uninsured adults—often uncompensated. In the absence of insurance options, many safety net providers devised their own coverage programs based on managed care principles to improve health and reduce costs in the populations they serve. During the 1990s and early 2000s, prior to the Affordable Care Act, these programs were widespread. Many programs offered access to community-based primary care providers, including access to medical homes that provide comprehensive and coordinated care through a team of affiliated

providers.[1] The various approaches we describe highlight the critical need to reduce costs and the willingness of institutions to make large investments to do so.

The effectiveness of these approaches at intercepting the tendency for low-income patients to seek care in the ED and ultimately reduce costs to the safety net system is unclear. A randomized trial to evaluate utilization of uninsured patients assigned to Milwaukee Cares, a coordinated care coverage program administered by the Medical College of Wisconsin, did not find reduced utilization for its beneficiaries in the first year following enrollment (Mackinney et al. 2013). Similarly, The Access Program in East Baltimore did not change ED utilization, although fewer ED visits resulted in an inpatient admission (Block et al. 2013). Only one published study reported reduced utilization in the first year of enrollment; patients participating in Project Access Dallas reported fewer ED visits and hospital days than similar patients who were not enrolled in the program (DeHaven et al. 2012). However, this study did not focus directly on the effects of PCP visits on health care utilization, and it is unclear whether those assigned to the program were systematically different from the control population, raising concerns about potential selection bias.

Our own assessment of data from the Virginia Coordinated Care program, a community-based primary care program, found that newly enrolled recipients used more health care services than those who had been enrolled for two or more years even though recipients had access to free primary care within the community (Bradley et al. 2012). However, in the second and third years following enrollment, health care utilization declined, perhaps because beneficiaries' health status improved during the initial period. The study, like many others, suffered from the lack of a control group.

[1] See, for example, http://www.cjaonline.net/project-access/.

Many of these coordinated care programs continue to exist, particularly in states that did not expand Medicaid. In states that expanded Medicaid, a number of methods to control costs have been pursued, including PCP assignment. Moreover, some states went so far as to disincentivize ED use by instituting penalties in the form of high co-pays on beneficiaries who used the ED for non-emergent needs (Cunningham et al. 2016, Sabik and Gandhi 2016).

As this review indicates, there is little rigorous evidence on whether these approaches are effective at controlling costs. We overcome this limitation by implementing a randomized controlled trial of cash incentives to visit an assigned PCP among patients newly provided coverage through a community-based PCP program. Using assignment to incentive groups, we then disentangle the influence PCPs have on utilization apart from the cash incentive. This approach advances what is known about whether low-cost incentives encourage desired health seeking behavior (i.e., PCP visits), and whether PCPs are an effective mechanism through which incentives can steer health care utilization away from expensive EDs and inpatient care.

THE EXPERIMENT

Our experiment allows us to test two potential mechanisms for influencing utilization. The first is through the incentives that can be manipulated to encourage an initial PCP visit, which is widely believed to reduce more costly ED visits and inpatient stays. We also test how incentives influence other types of utilization (e.g., ED, outpatient visits), as well subsequent PCP visits, which would suggest an ongoing relationship. The second mechanism we test is whether exogenous variation in PCP visits—induced by the experiment—influences ED utilization and other utilization and costs.

Subjects were identified and enrolled through a community-based primary care program established by the Virginia Commonwealth University Medical Center (VCUMC), the state's

largest safety net provider (Bradley and Neumark 2017). The primary care program, known as Virginia Coordinated Care (VCC), provided access to primary care for uninsured subjects who had household incomes below 100% of the federal poverty level, had no other health insurance coverage, and resided within a 30-mile radius of VCUMC. Once enrolled in the VCC, patients were assigned to a community-based PCP and provided free or low-cost care (Bradley et al. 2012).

Eligibility criteria for the randomized controlled trial were: no prior VCC coverage in the past 12 months, or were a VCC re-enrollee with no PCP or specialist visit in the prior 9 months; aged 21-64; spoke English; and resided in the community (e.g., not homeless or living at a drug or alcohol rehabilitation facility). Subjects also had to have a phone number where they could be reached. We randomized subjects to groups so that there were equal distributions by gender, race, and 5-year age bands. Subjects were randomized to either the incentive group or a group of untreated controls.

The untreated controls comprised 415 subjects who were not contacted by study interviewers, but for whom subjects' medical claim files were collected. The untreated controls allow us to observe behavior in the absence of activities associated with the randomized controlled trial. It is possible that the experiment has an independent effect, which would be underestimated if we only compared the $25 and $50 incentive groups to the $0 group. There were 1,228 subjects who were randomized to the incentive arm and completed the baseline interview. Following the baseline interview, 413 subjects were assigned to the $0 group, 407 to the $25 group, and 408 to the $50 group. Subjects had to see the PCP within six months of enrollment in the study to receive the incentive.

Health care claims were collected for a 12-month period following study enrollment. VCUMC claims for laboratory, diagnostic, other outpatient services, specialty care visits, ED visits, and inpatient stays were collected. Institutional review boards at Virginia Commonwealth University and the University of Colorado approved the study protocol. The trial was registered with ClinicalTrials.gov (NCT02922855).

Outcomes

We separate the analysis into the first six-months period (when PCP visits were incentivized), and the subsequent six-month in which we can get the clearest evidence of how the earlier PCP visit influenced utilization and costs. We are most interested in whether the incentives are associated with a reduction in ED visits, which is where we expect PCP visits to have the greatest impact. The experiment may also have affected other categories of utilization, and it is not clear a priori that other types of utilization will decline. For example, due to diagnosis and treatment, follow-up visits to the PCP may occur along with referrals and visits to outpatient and specialty care providers. For this reason, we also study these services. In the short-run these visits may increase health care spending, but over time, these visits, including expensive ED and inpatient utilization, should diminish. Therefore, we also estimate effects on utilization and spending for the first and second six months.

We measure utilization in different ways, to capture what occurred, when it occurred, and intensity. PCP visits were estimated as days until the first visit during the initial six-month incentive period, because the incentive applied to the first six months. Therefore, stronger incentives may lead to quicker visits following study enrollment. We also specify PCP as any visit, number of visits, and two or more visits. Similarly, we estimate ED and outpatient and specialty visits as any visit, number of visits, and two or more visits. Among ED visits, we

conducted a separate analysis on visits identified as non-emergent, based on the primary diagnosis code being an Ambulatory Care Sensitive Condition.[2]

Billed charges that reflect the amount VCC paid for beneficiary services were available for study. Actual costs were not consistently reported. For this reason, we refer to the amount charged as spending, and estimate the total from the perspective of the payer—the VCC program. We report estimations for total spending summed across each category of utilization. Total spending was skewed to the right, so we use the natural logarithm.[3,4]

Utilization and spending were estimated for all four groups—the three groups randomized to the incentivized arm and the untreated controls. In some estimations, we combine the incentive groups into a single category ($0, $25, $50 vs. untreated; $25, $50 vs. $0). In addition, we estimate models for the three incentivized groups alone, providing comparisons across the levels of cash incentives.

Control variables

We had data from administrative records on sex, age, race/ethnicity, and marital status for all subjects who participated in the study. Subjects enrolled in the incentivized arm were interviewed, with additional information collected on: education (high school diploma or less, some college degree, and Bachelor's degree or better); employed (yes/no); monthly income

[2] These are defined by the Centers for Medicare & Medicaid Services 2015 ACSC Measure Information Form (https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeedbackProgram/Downloads/2015-ACSC-MIF.pdf) and adapted from the Prevention Quality Indicators developed by the Agency for Healthcare Research and Quality. All remaining ED visits were classified as emergent.

[3] We compared baseline characteristics of these subjects to those of subjects with claims. Among those interviewed, subjects without claims had fewer chronic conditions, greater social role function, lower pain interference, and lower satisfaction with health care providers, suggesting that they were in better health than other subjects and may have had a lower need (or desire) to seek a PCP visit. We tested the sensitivity of the results to excluding these subjects from the sample and found that results were virtually unchanged (results not shown).

[4] Because 187 observations had no claims (and thus, no charges), we add 1 to all observations. We also identified five subjects who had claims with no charge. These claims were for services where payment was denied, but subjects utilized health care nonetheless. Therefore, we counted the visits in the analysis of utilization but excluded these subjects from the analyses of spending.

(<$1500, $1500 to $2000, and $2001+); smoking status (yes/no); whether the subject had health insurance prior to enrollment in VCC (yes/no); whether subject's usual source of care was in the ED; and health status. We elicited additional information about the frequency of ED utilization in the 12 months prior to enrollment. Visits were categorized as 0 to 1, 2 to 5, and 6 or more. We calculated respondents' composite scores on a subset of the PROMIS domains (e.g., depression, anxiety, social role, pain interference). PROMIS is a psychometrically sound instrument that measures patient reported physical, mental, and social domains (http://www.healthmeasures.net). Higher scores for the depression, anxiety, and pain interference domains indicate worse health status, and a higher score for social role indicates better status.

We also measured satisfaction with the health care system, referring back to their last health care visit regardless of provider type, using the Patient Satisfaction Questionnaire (PSQ)-18 (https://www.rand.org/health/surveys_tools/psq.html). The PSQ measures satisfaction with medical care by addressing six aspects of care: technical quality, interpersonal manner, communication, financial aspects of care, time spent with doctor, and accessibility of care.

Analytical approach

The incentive groups and untreated controls were descriptively analyzed using χ^2 tests for categorical variables and *t*-tests for difference in means. To study the effects of assignment to incentive groups, we estimated Ordinary Least Squares (OLS) regressions for the outcomes of interest, including our controls, estimating the effects of group assignment ($0, $25, $50, and untreated controls in estimations that included all four groups). These estimations test the effect of different levels of cash incentives to which subjects were randomized. We use models of the form:

$$PCP_{it} = \alpha_{PCP} + GRP_i\beta_{PCP} + \gamma_{PCP}X_i + \varepsilon_i^{PCP} \quad (1)$$

PCP_{it} is a binary variable that equals one if subject *i* saw a PCP in period *t*. The coefficients in β_{PCP} capture the effect of group assignment—whether to untreated controls, $0, $25, or $50, or, in some specifications we estimate, a combination of cash incentives. X includes dummy variables for each PCP, to control for differences in PCP characteristics that might affect access or other outcomes (e.g., ease of getting an appointment). We estimate equation (1) for the first six-month period, and for the second six-month period. When we estimate equation (1) for PCP visits; it is a linear probability model. We use the same procedure for estimating PCP visits specified as days until the first visit, number of visits, and two or more visits, estimating either standard linear regressions or linear probability models as appropriate. We then estimate similar linear regression models for outpatient and specialty visits, and for spending.

Our analyses of the effects of PCP visits use two-stage least squares (2SLS) to estimate the effects of PCP visits on utilization and total spending. The analysis addresses whether PCP visits incentivized by the experiment changed health care utilization and costs, using the experimental assignment to cash incentive groups or the untreated control group as an exogenous source of variation in PCP visits. In the first stage, we estimate a model for the probability of a PCP visit, using:

$$PCP_{i1} = \pi_0 + GRP_i\pi_1 + \pi_2 X_i + \upsilon_{i1} \qquad (2)$$

where PCP_{i1} is the likelihood of a PCP visit during the first six months. (We also use other metrics of PCP visits.) We estimate equation (2) using a linear probability model. In the second stage, we estimate the effects of PCP visits on measures of utilization, and on spending, using the predicted PCP visits from equation (2) as an instrumental variable for PCP_{i1} in the equation:

$$Y_{it} = \alpha_Y + \beta_Y PCP_{i1} + \gamma_Y X_i + \varepsilon_{it}^Y \qquad (3)$$

where Y can represent each of the dependent variables we study (e.g., ED use).[5] Analyses were conducted using SAS version 9.3 (SAS Institute) and Stata version 14.0 (Statacorp).

RESULTS

Descriptive statistics

Table 1 reports descriptive statistics for health care utilization and spending. In the first six months—when PCP visits were incentivized—subjects randomized to the cash incentive arm visited a PCP more often than subjects in the untreated controls ($p<0.01$), and the subjects in the $25 and $50 groups saw a PCP more often than subjects in the $0 group ($p<0.10$, $p<0.05$, respectively). In the second six-month period, after the incentives for a PCP visit in the first six-month period, PCP utilization was also statistically significantly higher for the $25 and $50 groups individually, and combined, relative to the untreated controls and relative to the $0 group, suggesting that an ongoing relationship with the PCP may have been established following the initial incentivized visit.

Table 1 also shows that subjects in the incentive arm had fewer ED visits than the untreated controls in the initial six-month period, although the differences were not statistically significant (except for non-emergent ED visits for the $25 group relative to the $0 group, in the first six months, $p<0.10$). However, the overwhelming majority of ED visits were for emergent conditions, suggesting that without improvements to health as opposed to changing patterns of care, ED visits are not likely to decrease much in the short-term. ED utilization in the second six-month period was not statistically different between any of the groups, except in one case (for the $50 group, for emergent visits, relative to untreated controls, $p<0.10$).

[5] 10 subjects were missing information on a few variables. We used multiple imputation methods with 10 imputations to impute missing data in the regressions. Results from the regressions using imputed data were nearly identical to those obtained when subjects with missing data were dropped.

Inpatient visits were uncommon among all subjects and did not differ between the groups in the first or second six-month periods.[6] Outpatient and specialty care visits declined for all groups from the initial six-month period to the second six-month period. This is most likely because once subjects obtained coverage through the VCC because they were seeking medical care, and then had less need for care in the second six-month period. There is evidence that outpatient and specialty visits were higher in the incentivized groups, in both periods (for both relative to the untreated controls, and relative to the $0 incentive group). One might expect these visits to increase along with an increase in PCP utilization, at least in the short run, because diagnostic tests are performed and referrals are made for treatment.

Median total spending six months following study enrollment ranged between $2,398 and $4,070 across the groups. In the second six-month period, median spending was considerably lower for all groups. In both periods, the $25 and $50 incentive groups had the highest spending; but the differences were not statistically significant.

Table 2 reports demographic and health characteristics. Recall that many of these are measured from the interviews, which were administered only to the cash incentive groups. The groups were generally well balanced, although the $50 group reported slightly lower social function ($p<0.10$), less satisfaction with financial aspects of receiving health care ($p<0.05$), and more ED visits than observed in the $0 and $25 group ($p<0.10$).

Incentive program effects

We first report the results for the effects of the PCP incentives—estimates of equation (1). Table 3 reports estimates of the effects of the experiment on four measures of PCP utilization: days to first visit, any visit, number of visits, and 2 or more visits), for both the initial

[6] Given the low frequency of these visits, we do not report the estimations from regression models for inpatients visits. Estimates are available upon request.

and the second six-month periods. We start with the first six-month period, in the top panel, and report the significant results. Subjects in the $0 group visited the PCP 10 days ($p<0.05$) days sooner than the untreated controls (column 1). The effects were similar but stronger for the subjects in the $25 and $50 groups, who saw their PCP 19 ($p<0.01$) and 25 ($p<0.01$) days sooner than untreated controls, respectively. On average, the combined incentivized subjects saw the PCP 18 days ($p<0.01$) sooner. Within the incentivized group, subjects who received $25 or $50 saw the PCP approximately 9 ($p<0.10$) and 14 ($p<0.01$) days sooner than those who were randomized to the $0 group. There are similar patterns of effects (and statistical significance) for different measures of PCP visits, indicating that the cash incentives led to a higher likelihood of a PCP visit, and more visits, with the effects larger the stronger the incentive.

Taken together, these findings suggest that the incentives were not only effective at encouraging PCP visits, but also effective at getting subjects to see the PCP approximately one to three weeks earlier relative to untreated controls. In general, higher incentives led to a higher probability of a visit and earlier visits relative to the untreated controls and $0 group. These findings are encouraging for policy makers who are willing to invest in small cash incentives for low-income newly insured adults to establish a relationship with a PCP.

For the second six-month period, as reported in the bottom panel, there are generally no detectable effects of the incentives on PCP use. This is not surprising, since the incentives only applied to the first PCP visit in the initial six-month period. However, we do find significant positive effects on the number of visits, for both the $25 and $50 incentive groups relative to the untreated controls and the $0 incentive group, and for the incentive groups combined relative to the untreated controls. These findings should be interpreted as a utilization effect—likely

indicating that the cash incentives increased the likelihood of establishing an ongoing relationship with a PCP.

Table 4 reports estimated effects of the experiment on ED utilization. In the first six-month period, the signs of all 21 coefficients are negative, indicating that ED utilization decreased in the incentive groups relative to the untreated controls and $0 group. However, none of the coefficients are statistically significant. In the second six-month, when we would expect to see the effects of the PCP visits that were incentivized in the earlier period, there is statistically significant evidence of lower ED use—in particular, a lower likelihood of two or more ED visits when we compare the cash incentive groups to the untreated controls. Interestingly, we observe that, relative to the untreated controls, subjects in the $0 incentive group were 4.8 percentage points ($p<0.01$) less likely to have two or more ED visits, and this differential is not larger for the $25 or $50 groups. This evidence suggests that participation in the experiment, on its own, had an effect on behavior.

When we focus on non-emergent ED utilization, in Table 5, there is more evidence of declines in ED utilization in the first six-month period. The $25 group was about 2 percentage points less likely to have an ED visit for non-emergent conditions in the first six months, compared to the untreated controls or the $0 group ($p<.05$), and had about 0.025 fewer visits, on average. In the second six-month period, both the $25 and $50 incentive groups were 2 to 3 percentage points less likely to have ED visits for a non-emergent condition relative to the untreated controls. The number of visits also decreased for the $50 group relative to untreated controls (by 0.025, $p<0.10$, as shown in column 2). Most of the other estimated coefficients are negative, although statistically insignificant. The overall pattern suggests that the incentive program had a modest effect at decreasing non-emergent visits. Table 6 reports results for

outpatient and specialty care visits. In the initial six-month period when PCP visits were incentivized, the likelihood of any visit was approximately 7 to 8 percentage points ($p<0.05$) higher in the $25 and $50 incentive groups, relative to the untreated controls. The estimated difference is about 6 percentage points when the three incentive groups were combined relative to the untreated controls. In addition, all incentive groups were more likely to have two or more visits than the untreated controls (5 to 9 percentage points).

In the second six-month period, the estimated differentials are smaller and no longer statistically significant, except for the effect on any visit for the $25 incentive group relative to the untreated controls. Further investigation into the reason for these visits revealed that several subjects in the $25 group were receiving daily radiation treatments, leading to the continued high use of outpatient and specialty care. Nonetheless, nearly every coefficient estimate in the lower panel is positive, consistent with outpatient and specialty care visits increasing as a result of the incentive program.

Finally, Table 7 reports spending results. In the initial six-month period, we observe statistically significant coefficients for the $25 and $50 groups. The $25 group had approximately 37% ($p<0.10$) higher spending than the untreated controls ($e^{0.317}-1$) and the $50 group had about 80% ($p<0.01$) higher ($e^{0.588}-1$) spending than the untreated controls in the first six months. All three incentive groups combined had 36% higher spending than untreated controls ($p<0.10$). Among the incentive groups, the $50 group had 66% higher spending than the $0 group ($p<0.05$). In the second six-month period, after the experimental incentives for a PCP visit applied, there is less evidence of higher spending, and the estimated differentials are smaller. There is only one significant difference, for the $25 group relative to the untreated

controls (46%, $p<0.10$). Again, though, nearly all of the estimated coefficients are positive, consistent with the incentives for PCP visits raising costs.

Effects of PCP visits

We next turn to the estimates of the effects of PCP visits on utilization—the 2SLS estimates of equation (3). Recall that now we estimate the effects of PCP visits, using the experimental incentives to obtain exogenous variation. The estimates in Table 8, for each dimension of utilization and spending, are generally consistent in sign with the reduced-form evidence on the effects of incentives from Tables 4-7. Of course, the estimates are considerably larger in magnitude because they are now scaled by the effects of the incentives on PCP visits.

There is evidence that PCP visits increased the likelihood of additional PCP visits (by about 2 additional visits, $p<0.01$) and lowered the likelihood of a non-emergent ED visit in the second six-month period, for the analysis using the incentive groups and the untreated controls (approximately 19 percentage points less likely to use the ED for a non-emergent condition, $p<0.10$). Although this is the only statistically significant estimate, all of the estimated effects of any PCP visit (the behavior most strongly incentivized by the experiment) and for the number of visits are negative. There is also evidence that PCP visits incentivized by the experiment increased outpatient and specialty care visits in the first and the second six-month periods. In the first six-month period, those with any PCP visit were 56 percentage points more likely to have an outpatient and specialty care visit ($p<0.05$) and 59 percentage points more likely to have two or more visits ($p<0.01$). In the second six-month period, an additional PCP visit induced by the experiment was associated with on average 6 more outpatient/specialty visits ($p<0.10$). Spending associated with PCP visits induced by the experiment is much higher in the initial six-month

period, but the estimated effects are much smaller, and not statistically significant, in the second six-month period.

Who responds to incentives

The next set of estimations tests whether subjects who are healthier responded differently to the incentives for PCP visits than those who have health conditions that require treatment or monitoring. Policymakers and program administrators are likely to be interested in knowing whether the incentives were more effective for subjects who had health conditions and needed to see a PCP, or instead stimulated wellness visits where, to the subject's knowledge, no underlying health condition existed. In the first case, the incentives "nudge" a subject who may be delaying needed care, while in the second case, the incentives encourage preventive behavior. In addition, if unhealthy subjects were prompted to see the PCP, then changes in subsequent utilization were more likely due to improvements in health, in addition to alterations in health care seeking patterns. We define "healthy" three ways: 1) no drug or alcohol problems, no self-reported high blood pressure, diabetes, lung disease or cancer, no more than one ED visit in the past 12 months, no anxiety or depression; 2) meets the conditions for definition 1 but can report high blood pressure; and 3) self-report excellent or very good health status. Because these definitions rely on self-reported data, we cannot include the untreated controls in the analysis.

Table 9 reports the findings. There is rather clear evidence that the increases in PCP visits owing to the experimental cash incentives were driven by the unhealthy sample. In contrast, there were no significant effects for the healthy samples. (These samples are smaller and the estimates less precise, but the estimates are not consistently positive.) This evidence might be viewed positively as indicating that the incentives did not appear to encourage unnecessary visits. Furthermore, this evidence suggests that the increases in outpatient and specialty visits,

and in spending, that we found (Tables 6 and 7) was likely to have arisen from the treatment of adverse health conditions prompted by the PCP visit—consistent with the evidence of more visits and spending being stronger in the initial six-month period when the incentivized PCP visit would have occurred.

CONCLUSIONS

We test the effect of a small cash incentive program to encourage an initial PCP visits. We estimate the effects of the incentive program on PCP visits and other categories of health care utilization, and spending—most importantly, ED visits. We also use the experimentally-induced variation in PCP visits to estimate the effects of PCP visits on these other categories of health care utilization, and spending. In the latter, we use two-stage least squares estimations control for endogenous variation in the likelihood of an initial PCP visit that could be correlated with other unmeasured determinants of health care utilization or costs.

All three groups in the incentive arm, including those randomized to $0, tended to have more PCP visits, lower ED utilization, and more outpatient and specialty care visits relative to untreated controls and higher spending. Subjects who received an incentive saw the PCP sooner and more often than other subjects, and the effects on PCP visits were more apparent for less healthy subjects. There is evidence that subjects who saw the PCP continued to do so after the initial visit. Therefore, if a policymaker's goal is to increase PCP utilization and encourage low-income previously uninsured adults, particularly those who have health care needs, to establish a relationship with a PCP, small cash incentives may be effective and have other positive effects including fewer non-emergent ED visits. However, total spending is unlikely to decrease in the short-term.

More time may be required to improve health status, as opposed to altering health seeking patterns, in this population. When health conditions are severe, a PCP visit—even multiple visits—may not be sufficient to improve health status. Moreover, the evidence suggests that the incentives, by encouraging PCP visits, initially boost outpatient and specialty visits. This evidence suggests that part of the effect of the PCP visits our experiment induced is that the PCP detects heath conditions, orders diagnostic tests, and refers subjects to specialists, resulting in an increase in outpatient utilization. The frequency of these visits lessens in the second six-month period that follows the incentivized PCP visit, suggesting either resolution (or lessening) of the health care problem, or determination of a treatment course that does not require additional outpatient follow-up. Overall, we conclude that in a low-income previously uninsured sample with poor baseline health, small cash incentives are effective at encouraging a PCP visit and perhaps effective at leading to a longer-term relationship with a PCP and fewer non-emergent ED visits, but may result in higher health care costs in the short-term.

There are three main limitations to our study. First, the study is limited to a 12-month period with only six months following the incentive period. This may be insufficient time to observe whether the PCP relationships are sustained in the longer term, and if, again over the longer term, these relationships improved health status and altered long-term utilization patterns. Second, it is possible that some subjects received health care outside the VCU medical center. However, visits outside the medical center are likely to be minimal. Subjects reside within 30 miles of the medical center, which makes the center a convenient location for health care. The center is the largest safety-net provider in the region and offers comprehensive care. More importantly, when subjects received care outside the VCU medical center, VCC often received a claim, which we included in our analyses. Third, our study is specific to an urban, low-income

safety net population with many health care needs, and may not generalize outside the safety net, or to higher-income, healthier, or rural populations.

It has been hypothesized that, in addition to pent-up demand, an important source of higher utilization following Medicaid coverage among the previously uninsured is inadequate access to primary care (Heintzman et al. 2014). Arguments have been made for having both health insurance coverage and a usual source of care in the primary care setting (DeVoe et al. 2003, DeVoe et al. 2011). Using a rigorous study design and capitalizing on exogenous variation in the likelihood of an initial PCP visit, we show modest evidence that PCPs reduce ED utilization in the short-term and may, in fact, initially increase costs. In the high health needs patients we study, in which nearly two-thirds report two or more chronic conditions, PCPs may have very little ability to reduce health care utilization in the short-term. Health status, among the very sick, may take years to improve. Ultimately, however, longer-term evidence is needed to determine whether policies or programs that encourage PCP visits lead to a sustained relationship with that provider, and alter patterns of care so as to improve health and reduce costs.

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Table 1. Utilization and spending by incentive groups and untreated controls, N=1,643

	Untreated controls (N=415)	**$0 (N=413)**	**$25 (N=407)**	**$50 (N=408)**	**$0, $25, $50 (N=1,228)**	**$25, $50 (N=815)**
1st 6 months (incentive period)						
PCP visits	2.07 (0.13)	2.28 (0.12)	2.63 (0.15)+++*	2.70 (0.14)+++**	2.54 (0.08)+++	2.67 (0.10)+++**
ED visits	0.68 (0.07)	0.59 (0.06)	0.64 (0.07)	0.57 (0.05)	0.60 (0.03)	0.61 (0.04)
Non-emergent ED visits	0.05 (0.01)	0.06 (0.01)	0.03 (0.01)*	0.05 (0.01)	0.05 (0.01)	0.04 (0.01)
Inpatient admissions	0.12 (0.02)	0.11 (0.01)	0.11 (0.01)	0.12 (0.02)	0.11 (0.01)	0.11 (0.01)
Outpatient & specialty visits	2.68 (0.24)	2.92 (0.23)	3.47 (0.24)++	3.15 (0.20)	3.18 (0.13)+	3.31 (0.16)++
Median total costs ($)	2,398	3,290	4,070	3,409	3,394	3,663
2nd 6 months						
PCP visits	1.20 (0.08)	1.27 (0.08)	1.65 (0.14)+++**	1.51 (0.12)++*	1.48 (0.07)++	1.58 (0.09)++**
ED visits	0.55 (0.07)	0.45 (0.06)	0.55 (0.07)	0.46 (0.05)	0.49 (0.03)	0.50 (0.04)
Non-emergent ED visits	0.05 (0.01)	0.04 (0.01)	0.04 (0.02)	0.02 (0.01)+	0.04 (0.01)	0.03 (0.01)
Inpatient admissions	0.09 (0.01)	0.10 (0.02)	0.10 (0.02)	0.06 (0.01)	0.09 (0.01)	0.08 (0.01)
Outpatient & specialty visits	2.03 (0.19)	2.05 (0.18)	2.68 (0.22)++**	2.60 (0.23)+*	2.44 (0.12)+	2.64 (0.16)++**
Median total costs ($)	582	826	1,259	949	1,016	1,040

Notes: PCP=Primary Care Provider; ED=Emergency Department; standard errors of the mean are reported in parentheses. Tests of statistical significance relative to the untreated controls and relative to the $0 incentive group are reported using the two-sample t-test for continuous variables. For tests relative to the untreated controls, statistical significance is reported as: +p<0.10, ++p<0.05, +++p<0.01. For tests related to the $0 incentive group, statistical significance is reported as: *p<0.10, **p<0.05, ***p<0.01. ED visits were classified as "Non-Emergent" if the primary diagnosis code was considered an Ambulatory Care-Sensitive Condition (ACSC) as defined in the Centers for Medicare & Medicaid Services (CMS) 2015 ACSC Measure Information Form (https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeedbackProgram/Downloads/2015-ACSC-MIF.pdf) and adapted from the Prevention Quality Indicators (PQIs) developed by the Agency for Healthcare Research and Quality (AHRQ).

Table 2. Sample characteristics and health risks by incentive group and untreated controls, N=1643

	Untreated controls (N=415)	$0 (N=413)	$25 (N=407)	$50 (N=408)
Demographic characteristics				
Female	43.85	46.24	46.92	48.52
Race			++	+
White	28.67	29.29	27.27	28.43
Black	64.09	66.34	68.79	67.15
Other	6.98	3.87	2.70	3.43
Missing	0.24	0.48	1.22	0.98
Hispanic	2.65	2.18	1.97	3.19
Missing	1.20	0	0	0
Married/partnered	10.84	13.55	9.82*	12.00
Missing	0.48	0.73	0.98	0.49
Mean age	44.93 (11.20)	45.90 (11.22)	45.75 (10.95)	45.50 (11.07)
Education	N/A			
High school or less		59.32	57.73	64.95
Some college		30.75	31.69	25.49
Bachelor's degree or higher		7.99	9.82	9.31
Missing		1.93	0.73	0.24
Monthly income	N/A			
<$1500		91.76	92.38	94.60
$1500 - $2000		5.56	3.68	3.67
>$2000		2.17	3.43	1.47
Missing		0.48	0.49	0.24
Employed	N/A	27.11	29.23	24.26
Health insurance coverage prior to VCC	N/A	22.51	22.35	23.03
Health risks				
Smoker	N/A	49.15	46.68	51.96
Missing		0	0	0.49
Drug/alcohol problems	N/A	16.22	14.25	12.74
Missing		0.48	0.24	0.73
2 or more chronic conditions	N/A	60.53	65.36	62.50
PROMIS score	N/A			
Anxiety		54.32 (11.21)	53.51 (11.10)	55.46 (11.60)
Depression		54.18 (11.46)	53.51 (11.04)	55.35 (11.85)
Social role		45.67 (11.67)	45.92 (11.63)	44.19 (11.00)*
Pain interference		57.95 (11.53)	58.97 (11.40)	58.99 (11.35)
Missing		2.17	3.43	5.14
PSQ-18 score	N/A			
General satisfaction		3.45 (0.98)	3.48 (0.91)	3.44 (0.96)
Technical quality		3.51 (0.70)	3.49 (0.69)	3.44 (0.73)
Interpersonal manner		3.69 (0.77)	3.70 (0.72)	3.63 (0.71)
Communication		3.72 (0.79)	3.76 (0.78)	3.68 (0.82)
Financial aspects		3.25 (1.01)	3.26 (0.96)	3.10 (1.02)**
Time spent with doctor		3.46 (0.90)	3.51 (0.89)	3.39 (0.92)
Accessibility and convenience		3.21 (0.84)	3.21 (0.83)	3.22 (0.78)

Missing		4.35	4.17	4.41
Get most of care at the ED	N/A	37.28	33.90	40.44
ED utilization	N/A			*
0 to 1		56.66	56.01	47.06
2 to 5		35.10	35.87	44.60
6 or more		8.23	7.86	8.33
Missing		0	0.24	0

Notes: N/A = not applicable; ED=Emergency Department; standard deviations are in parentheses for age and PROMIS and PSQ-18 score. Remaining results are reported as percentages. Information on chronic conditions considered for the variable "two or more chronic conditions" was collected from the patient during the initial interview and included hypertension, angina, coronary artery disease, heart disease/heart attack, asthma, chronic obstructive pulmonary disease/emphysema, stroke, cancer, arthritis, diabetes, liver disease, kidney disease, migraines, and HIV. Tests of statistical significance relative to the untreated controls, and relative to the $0 incentive group, were estimated using the χ^2 test for categorical variables, and the two-sample *t*-test for continuous variables. For tests relative to the $0 incentive group, statistical significance is reported as: *p<0.10, **p<0.05.

Table 3. Effects on primary care provider utilization, OLS

	Days to visit	Any visit	Number of visits	2+ visits
1st 6 months (incentive period)				
N=1,643				
Untreated	Reference	Reference	Reference	Reference
$0	10.136 (4.622)**	0.046 (0.029)	0.185 (0.172)	0.031 (0.024)
$25	19.362 (5.762)***$^{+++}$	0.095 (0.031)***$^{+++}$	0.417 (0.208)*$^{++}$	0.086 (0.033)**$^{+++}$
$50	24.875 (4.176)***$^{+++}$	0.127 (0.024)***$^{+++}$	0.552 (0.181)***$^{++}$	0.090 (0.028)***$^{+++}$
Untreated	Reference	Reference	Reference	Reference
$0, $25, & $50	18.068 (3.930)***	0.089 (0.022)***	0.384 (0.161)**	0.068 (0.023)***
N=1,228				
$0	Reference	Reference	Reference	Reference
$25	8.535 (4.700)*	0.045 (0.029)	0.228 (0.147)	0.051 (0.029)*
$50	13.678 (4.358)***	0.072 (0.027)**	0.306 (0.159)*	0.053 (0.027)*
$0	Reference	Reference	Reference	Reference
$25 & $50	11.094 (3.769)***	0.059 (0.024)**	0.266 (0.123)**	0.052 (0.023)**
2nd 6 months				
N=1,643				
Untreated	N/A	Reference	Reference	Reference
$0		0.018 (0.026)	0.027 (0.130)	-0.007 (0.037)
$25		0.005 (0.040)	0.313 (0.162)*$^{++}$	0.001 (0.039)
$50		0.023 (0.035)	0.229 (0.090)**$^{++}$	0.025 (0.033)
Untreated	N/A	Reference	Reference	Reference
$0, $25, & $50		0.016 (0.029)	0.188 (0.087)**	0.006 (0.029)
N=1,228				
$0	N/A	Reference	Reference	Reference
$25		-0.021 (0.030)	0.241 (0.187)	0.003 (0.034)
$50		-0.002 (0.025)	0.146 (0.143)	0.026 (0.034)
$0	N/A	Reference	Reference	Reference
$25 & $50		-0.012 (0.019)	0.192 (0.138)	0.014 (0.028)

Notes: N/A = not applicable; Days to PCP visit are estimated from the day of enrollment to the PCP visit. Days are not reported for the 2nd six months since this period is outside the experimental window. Standard errors are reported in parentheses. Levels of statistical significance are: *p<0.10, **p<0.05, ***p<0.01. In the OLS analysis of the full sample, the statistical significance of the joint test comparing the $25 incentive group and the $50 incentive group to the untreated control group are indicated as follows: $^{++}$p<0.05, $^{+++}$p<0.01. Control variables for estimations using untreated controls and incentive groups are: age, gender, race (white, African American, and other), ethnicity (Hispanic), and marital status (married/partnered). Additional control variables for estimations using only incentive groups include: education (high school diploma or less, some college degree, and Bachelor's degree or better), monthly income (<$1500, $1500 to $2000, and $2001+), employed, health insurance coverage in the 12 months prior to VCC enrollment (yes/no), smoker (yes/no), drug/alcohol problems (yes/no); gets most of care at the ED (yes/no), visits to the ED in the 12 months prior to baseline (0 to 1, 2 to 5, and 6 or more), and having two or more of the following chronic conditions: hypertension, angina, coronary artery disease, heart disease/heart attack, asthma, chronic obstructive pulmonary disease/emphysema, stroke, cancer, arthritis, diabetes, liver disease, kidney disease, migraines, and HIV. We also controlled for PROMIS domains: anxiety, depression, social role, and pain interference and PSQ-18 scores for satisfaction with health care provider across six domains: technical quality, interpersonal manner, communication, financial aspects, time spent with doctor, and accessibility of care. Physician fixed effects are also included.

Table 4. Effects on Emergency Department utilization, OLS

	Any visit	Number of visits	2+ visits
1st 6 months *(incentive period)*			
N=1,643			
Untreated	Reference	Reference	Reference
$0	-0.007 (0.038)	-0.094 (0.093)	-0.021 (0.023)
$25	-0.033 (0.032)	-0.091 (0.079)	-0.031 (0.023)
$50	-0.005 (0.028)	-0.110 (0.089)	-0.017 (0.022)
Untreated	Reference	Reference	Reference
$0, $25, & $50	-0.015 (0.030)	-0.098 (0.075)	-0.023 (0.019)
N=1,228			
$0	Reference	Reference	Reference
$25	-0.028 (0.026)	-0.003 (0.061)	-0.011 (0.019)
$50	-0.009 (0.025)	-0.030 (0.071)	-0.002 (0.015)
$0	Reference	Reference	Reference
$25 & $50	-0.018 (0.021)	-0.017 (0.052)	-0.004 (0.013)
2nd 6 months			
N=1,643			
Untreated	Reference	Reference	Reference
$0	-0.001 (0.027)	-0.084 (0.090)	-0.048 (0.017)***
$25	0.024 (0.027)	-0.038 (0.059)	-0.033 (0.019)*
$50	0.014 (0.028)	-0.101 (0.075)	-0.033 (0.018)*
Untreated	Reference	Reference	Reference
$0, $25, & $50	0.012 (0.022)	-0.075 (0.058)	-0.038 (0.013)***
N=1,228			
$0	Reference	Reference	Reference
$25	0.023 (0.026)	0.031 (0.081)	0.016 (0.019)
$50	0.004 (0.030)	-0.027 (0.091)	0.015 (0.024)
$0	Reference	Reference	Reference
$25 & $50	0.013 (0.022)	0.001 (0.075)	0.015 (0.019)

Notes: The levels of statistical significance are noted as follows: *p<0.10, **p<0.05, ***p<0.01. Notes are the same as reported in Table 3.

Table 5. Effects on non-emergent ambulatory conditions Emergency Department utilization, OLS

	Any visit	Number of visits	2+ visits
1st 6 months *(incentive period)*			
N=1,643			
Untreated	Reference	Reference	Reference
$0	-0.001 (0.012)	0.007 (0.017)	0.008 (0.006)
$25	-0.024 (0.011)**$^{+++}$	-0.022 (0.011)*$^{+++}$	0.001 (0.001)
$50	-0.001 (0.014)$^{+++}$	0.004 (0.017)$^{+++}$	0.003 (0.004)
Untreated	Reference	Reference	Reference
$0, $25, & $50	-0.008 (0.010)	-0.003 (0.012)	0.004 (0.002)
N=1,228			
$0	Reference	Reference	Reference
$25	-0.021 (0.009)**	-0.027 (0.013)*	-0.006 (0.006)
$50	0.001 (0.015)	0.0001 (0.021)	-0.003 (0.007)
$0	Reference	Reference	Reference
$25 & $50	-0.010 (0.012)	-0.013 (0.016)	-0.005 (0.006)
2nd 6 months			
N=1,643			
Untreated	Reference	Reference	Reference
$0	-0.014 (0.013)	-0.015 (0.014)	-0.001 (0.003)
$25	-0.030 (0.011)***$^{++}$	-0.010 (0.030)	0.001 (0.005)
$50	-0.023 (0.011)*$^{++}$	-0.025 (0.013)*	-0.002 (0.002)
Untreated	Reference	Reference	Reference
$0, $25, & $50	-0.022 (0.009)**	-0.017 (0.015)	-0.001 (0.003)
N=1,228			
$0	Reference	Reference	Reference
$25	-0.017 (0.012)	0.002 (0.027)	0.002 (0.005)
$50	-0.010 (0.014)	-0.007 (0.017)	-0.001 (0.002)
$0	Reference	Reference	Reference
$25 & $50	-0.014 (0.012)	-0.002 (0.020)	0.001 (0.004)

Notes: Emergency department visits were classified as "Non-Emergent" if the primary diagnosis code was considered an Ambulatory Care-Sensitive Condition (ACSC) as defined in the Centers for Medicare & Medicaid Services (CMS) 2015 ACSC Measure Information Form (https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeedbackProgram/Downloads/2015-ACSC-MIF.pdf) and adapted from the Prevention Quality Indicators (PQIs) developed by the Agency for Healthcare Research and Quality. The levels of statistical significance are noted as follows: *p<0.10, **p<0.05, ***p<0.01. In the analysis performed on the full sample, the statistical significance of the joint test comparing the $25 incentive group and the $50 incentive group to the untreated control group is indicated as follows: $^{++}$p<0.05, $^{+++}$p<0.01. Notes are the same as reported in Table 3.

Table 6. Effects on outpatient and specialty utilization, OLS

	Any visit	Number of visits	2+ visits
1st 6 months *(incentive period)*			
N=1,643			
Untreated	Reference	Reference	Reference
$0	0.031 (0.024)	0.169 (0.382)	0.051 (0.023)**
$25	0.068 (0.033)**$^{+}$	0.576 (0.375)	0.072 (0.030)**$^{++}$
$50	0.078 (0.032)**$^{+}$	0.269 (0.245)	0.090 (0.028)***$^{++}$
Untreated	Reference	Reference	Reference
$0, $25, & $50	0.059 (0.024)**	0.336 (0.285)	0.071 (0.023)***
N=1,228			
$0	Reference	Reference	Reference
$25	0.027 (0.034)	0.325 (0.311)	0.012 (0.023)
$50	0.040 (0.033)	0.041 (0.301)	0.029 (0.031)
$0	Reference	Reference	Reference
$25 & $50	0.034 (0.029)	0.184 (0.267)	0.021 (0.024)
2nd 6 months			
N=1,643			
Untreated	Reference	Reference	Reference
$0	0.026 (0.031)	-0.082 (0.248)	0.011 (0.032)
$25	0.066 (0.031)**	0.414 (0.303)	0.041 (0.028)
$50	0.025 (0.035)	0.415 (0.304)	0.025 (0.036)
Untreated	Reference	Reference	Reference
$0, $25, & $50	0.039 (0.025)	0.246 (0.201)	0.026 (0.024)
N=1,228			
$0	Reference	Reference	Reference
$25	0.023 (0.035)	0.416 (0.331)	0.017 (0.034)
$50	-0.013 (0.030)	0.500 (0.349)	0.007 (0.034)
$0	Reference	Reference	Reference
$25 & $50	0.004 (0.030)	0.458 (0.285)	0.012 (0.028)

Notes: The levels of statistical significance are noted as follows: *p<0.10, **p<0.05, ***p<0.01. In the analysis performed on the full sample, the statistical significance of the joint test comparing the $25 incentive group and the $50 incentive group to the untreated control group is indicated as follows: $^{+}$p<0.10,$^{++}$p<0.05. Notes are the same as reported in Table 3.

Table 7. Effects on spending, OLS estimations

	Ln (Spending)
1st 6 months **(incentive period)**	
N=1,638	
Untreated	Reference
$0	0.022 (0.222)
$25	0.317 (0.182)*$^{++}$
$50	0.588 (0.215)***$^{++}$
Untreated	Reference
$0, $25, & $50	0.308 (0.163)*
N=1,224	
$0	Reference
$25	0.245 (0.219)
$50	0.507 (0.195)**
$0	Reference
$25 & $50	0.376 (0.189)*
2nd 6 months	
N=1,638	
Untreated	Reference
$0	0.170 (0.245)
$25	0.422 (0.239)*
$50	0.167 (0.251)
Untreated	Reference
$0, $25, & $50	0.251 (0.179)
N=1,224	
$0	Reference
$25	0.169 (0.280)
$50	-0.078 (0.279)
$0	Reference
$25 & $50	0.045 (0.227)

Notes: The sample size is reduced by 5 subjects who had visits, but were not charged. Levels of statistical significance: *p<0.10, **p<0.05, ***p<0.01. In the OLS analysis performed on the full sample, the statistical significance of the joint test comparing the $25 incentive group and the $50 incentive group to the untreated control group is indicated as follows: $^{++}$p<0.05. Otherwise, notes are the same as reported in Table 3.

Table 8. Effects of PCP visits on utilization and spending, 2SLS estimations

	PCP visits		
	Any visit	Number of visits	2+ visits
2nd 6 months			
Incentive & untreated controls	0.104 (0.211)	2.125 (0.653)***	0.157 (0.192)
Incentive groups	-0.088 (0.256)	2.096 (1.753)	0.259 (0.360)
	Emergency Department		
	Any visit	Number of visits	2+ visits
***1st 6 months* (incentive period)**			
Incentive & untreated controls	-0.112 (0.165)	-0.667 (0.520)	-0.143 (0.133)
Incentive groups	-0.168 (0.278)	-0.307 (0.737)	-0.010 (0.165)
2nd 6 months			
Incentive & untreated controls	0.153 (0.169)	-0.487 (0.460)	-0.175 (0.147)
Incentive groups	0.109 (0.303)	-0.171 (0.987)	0.193 (0.273)
	Non-emergent ED visits		
	Any visit	Number of visits	2+ visits
***1st 6 months* (incentive period)**			
Incentive & untreated controls	-0.075 (0.104)	-0.057 (0.121)	0.003 (0.026)
Incentive groups	-0.050 (0.167)	-0.075 (0.227)	-0.054 (0.082)
2nd 6 months			
Incentive & untreated controls	-0.186 (0.101)*	-0.136 (0.143)	-0.009 (0.026)
Incentive groups	-0.153 (0.162)	-0.064 (0.214)	0.0003 (0.041)
	Outpatient/specialty visits		
	Any visit	Number of visits	2+ visits
***1st 6 months* (incentive period)**			
Incentive & untreated controls	0.564 (0.261)**	2.816 (1.787)	0.594 (0.223)***
Incentive groups	0.470 (0.427)	1.322 (3.348)	0.323 (0.342)
2nd 6 months			
Incentive & untreated controls	0.280 (0.223)	3.681 (1.981)	0.239 (0.204)
Incentive groups	-0.063 (0.373)	6.004 (3.418)*	0.124 (0.364)
		Total spending	
***1st 6 months* (incentive period)**			
Incentive & untreated controls		4.075 (1.317)***	
Incentive groups		5.685 (2.420)**	
2nd 6 months			
Incentive & untreated controls		1.804 (1.447)	
Incentive groups		-0.266 (3.002)	

Notes: N=1,643 for incentive and untreated controls combined. N=1,228 for incentive group only. For the utilization analyses, F=14.25 for incentive and untreated controls; F=5.31 for incentive groups. For the spending analyses, F=14.10 for incentive and untreated controls; F=4.93 for incentive groups. The levels of statistical significance are noted as follows: *p<0.10, **p<0.05, ***p<0.01. Probability of primary care provider visit in the 1st 6 months is used as an endogenous variable in the 2SLS regressions. Assignment to treatment and untreated control groups used for identification. Otherwise, control variables are the same as reported in Table 3.

Table 9. Effects of incentives on PCP visits in 1st six-month (incentive) period, comparisons of healthy samples to remaining sample

	Definition 1		Definition 2		Definition 3	
	Healthy N=127	Unhealthy sample N=1101	Healthy N=229	Unhealthy sample N=999	Healthy N=293	Unhealthy sample N=935
Any PCP Visits, OLS						
$0	Reference	Reference	Reference	Reference	Reference	Reference
$25	-0.094	0.053	0.034	0.048	-0.070	0.088
	(0.107)	(0.032)*	(0.067)	(0.037)	(0.069)	(0.0329)**
$50	0.118	0.067	0.102	0.065	0.036	0.081
	(0.186)	(0.028)**	(0.092)	(0.030)**	(0.067)	(0.034)**
$0	Reference	Reference	Reference	Reference	Reference	Reference
$25 & $50	-0.006	0.060	0.062	0.056	-0.023	0.084
	(0.105)	(0.026)**	(0.063)	(0.030)*	(0.058)	(0.028)***
Number of PCP Visits, OLS						
$0	Reference	Reference	Reference	Reference	Reference	Reference
$25	-0.437	0.274	0.174	0.250	-0.078	0.332
	(0.286)	(0.167)	(0.245)	(0.193)	(0.273)	(0.188)*
$50	0.300	0.287	0.378	0.288	0.679	0.241
	(0.444)	(0.179)	(0.319)	(0.197)	(0.314)**	(0.172)
$0	Reference	Reference	Reference	Reference	Reference	Reference
$25 & $50	-0.128	0.279	0.256	0.269	0.252	0.284
	(0.274)	(0.141)*	(0.195)	(0.155)*	(0.244)	(0.140)**
2+ PCP Visits, OLS						
$0	Reference	Reference	Reference	Reference	Reference	Reference
$25	-0.066	0.061	0.072	0.052	-0.019	0.077
	(0.106)	(0.033)*	(0.081)	(0.036)	(0.066)	(0.030)**
$50	0.009	0.052	0.060	0.054	0.142	0.021
	(0.159)	(0.032)	(0.094)	(0.033)	(0.091)	(0.028)
$0	Reference	Reference	Reference	Reference	Reference	Reference
$25 & $50	-0.036	0.056	0.069	0.053	0.052	0.048
	(0.112)	(0.027)**	(0.075)	(0.029)*	(0.071)	(0.023)**

Notes: Levels of statistical significance: *p<0.10, **p<0.05, ***p<0.01. Definition 1: Meets all of the following criteria: no drug or alcohol problems, none of the following conditions: high blood pressure, diabetes, lung disease or cancer, 1 or fewer ED visits in the past 12 months, no anxiety or depression. Definition 2: Meets the criteria for definition 1, but can report high blood pressure. Definition 3: Self-report excellent or very good health. Otherwise, notes are the same as reported in Table 3.