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Reducing Frictions in Healthcare Access: The ActionHealth NYC Experiment for Undocumented Immigrants

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ABSTRACT

In 2016, New York City designed and implemented an intervention reducing frictions in accessing safety-net care: randomly making initial primary care appointments for 2,428 undocumented immigrants. We leverage a novel survey-administrative data linkage to show that the program resulted in a more efficient allocation of care. The program increased self-reported access to primary care, leading to a 21% fall in emergency department (ED) use. This effect was driven by high-risk individuals whose ED visits fell by 42% on average. Among those visiting sponsored clinics, chronic condition diagnoses and preventive screens increased, positively affecting long-run health.

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1 Introduction

In America, uninsured individuals face large frictions to accessing healthcare. As a result, the uninsured have fewer outpatient visits, inpatient visits, receive less preventive care, and have higher rates of undertreated illness than their insured counterparts (Liang et al., 2019; McMorrow et al., 2014; Cole et al., 2018; Seo et al., 2019; Zhou et al., 2017). This has long been one of the major motivations for expanding insurance coverage, including through the Affordable Care Act (ACA) (Blumenthal et al., 2015).

At the same time, there are a variety of means through which uninsured individuals can access healthcare. Under federal law, hospitals must provide emergency department (ED) care regardless of individuals' insurance status; in theory, individuals are responsible for the costs, but costs are typically absorbed by the hospital as "charity care." Moreover, in many cities, public hospitals provide subsidized care for low-income individuals (Adams et al., 2022); for instance, New York City (NYC) residents can access highly subsidized care at Health+Hospital (H+H), the largest public hospital system in the country (H+H, 2022). There are also 1,400 federally qualified health centers (FQHCs) across America that provide primary care on a sliding fee-scale based on individuals' ability to pay (HRSA, 2022).

The low levels of care used by the uninsured suggests they underutilize safety-net resources. For example, the literature on insurance expansions suggests that the uninsured have a pent-up demand for care; expanding health insurance to uninsured populations increases their use of medical services and improves health outcomes (Miller et al., 2021a; Miller, 2012; Goldin et al., 2020; Finkelstein et al., 2012; Miller et al., 2021b; Duggan et al., 2022).

One group excluded from access to health insurance under the ACA, and from most other proposals to expand health insurance in America, are undocumented immigrants (Brownstein, 2019). Undocumented immigrants make up 23% of the uninsured but have no immediate prospects for gaining insurance coverage (KFF, 2021). Their fragmented healthcare options include EDs, safety-net providers, and, in specific, narrow circumstances, insurance.[1] Undocumented immigrants also face financial and psychological barriers to healthcare access, which are often rooted in structural inequities (Sommers, 2013; Page and Flores-Miller, 2021; Maddox and James, 2021). Further, access to care may not only positively affect undocumented immigrants' health and human capital but also spillover onto their citizen

[1]States like New York allow pregnant women to obtain Medicaid coverage, whereas other states provide no such options (Wherry et al., 2017).

children, who arguably benefit the most from health capital investments (Watson, 2014; Goodman-Bacon, 2018).

As a result, undocumented immigrants are a natural group for which to consider an alternative to expanding insurance: reducing frictions to establishing primary care with safety-net clinics. This is notable because it provides a path to healthcare for undocumented immigrants and also addresses the potentially inefficient allocation of care that some have found associated with insurance expansions.[2] We follow the literature and define an efficient allocation of care as substitution from the ED to the primary care setting (Krämer and Schreyögg, 2019; Flores-Mateo et al., 2012).

We consider a relatively straightforward intervention: working with undocumented immigrants to make initial primary care physician (PCP) appointments at low-cost, safety-net clinics. In partnership with NYC's Mayor's Office and the Department of Health and Mental Hygiene (DOHMH), we designed a 14-month pilot program from May 2016–June 2017 (Sood, 2016). We randomly enrolled 2,428 undocumented immigrants with incomes below 200% of the federal poverty level (FPL) residing in NYC. We surveyed individuals at baseline and follow-up and linked individuals to administrative data to measure utilization at our nine primary care clinics as well as ED and inpatient use across the state of New York.

The intervention reduced frictions to obtaining primary care resulting in a more efficient allocation of care. Within the program's first three months, 57% of treated individuals and 16% of control individuals visited one of our nine clinics for primary care. Over the 14-month program period, self-reported access to care increased by 29% and doctors' office visits increased by 17% in response to program enrollment. ED visits simultaneously decreased by 21%, largely driven by the intensive margin, causing ED spending on non-admitted visits to decrease by $195.60 per individual.

We show that the aggregate reduction in ED use is driven by high-risk individuals: those with one or more chronic conditions as self-reported on the baseline survey. High-risk individuals decreased their use of the ED by 42%, leading to a $477.98 decrease in ED charges among non-admitted visits (68% reduction). Low-risk individuals were not significantly affected, with point estimates showing small, mixed effects.

[2]On the one hand, the Oregon Health Insurance Experiment found that ED visits for both urgent and non-urgent care increased in response to being randomly enrolled in Medicaid (Finkelstein et al., 2012). On the other hand, the Massachusetts coverage expansion led to a decrease in ED use (Miller, 2012; Kolstad and Kowalski, 2012; Akosa Antwi et al., 2015).

We show suggestive evidence that health improved, although 14-months is likely too short to detect meaningful changes. Individuals visiting our clinics were 16.2 percentage points (pp) more likely to receive a chronic condition diagnosis, 33.8 pp more likely to receive a diabetes screen, and 45.4 pp more likely to receive a blood pressure screen. This likely decreased long-run mortality. For instance, the increase in diabetes and blood pressure screens translates into a 12% reduction in long-run mortality from cardiovascular disease (Alsan et al., 2019; Kahn et al., 2010; Dehmer et al., 2017).

These results add to the body of work conceptualizing how to expand access to healthcare in the United States. We show that directly connecting individuals to PCPs can overcome frictions in establishing primary care, improve healthcare system efficiency, and potentially improve health long-term. Given the ongoing political resistance in America to extending formal health insurance coverage to undocumented immigrants, it is particularly valuable to assess alternative approaches to effectively providing healthcare to these vulnerable populations (Millman and Eilperin, 2014).

We add to at least two literatures. First, our novel data allows us to significantly add to the literature describing undocumented immigrants' demographics, healthcare utilization, and health status.[3] The baseline survey covers 75 questions translated into 32 different languages. For instance, we document that 25% of individuals have access to a PCP at baseline, far below the 60% of Medicaid eligible individuals with access to care (Sommers et al., 2016).

Second, in addition to NYC, San Francisco and Los Angeles have also created similar programs targeting individuals ineligible for standard health insurance. The programs have proven popular with high take-up and satisfaction rates, yet it is unclear how they affect the efficiency of care (Katz and Brigham, 2011; Sood et al., 2021). We significantly add to this body of work by using a randomized design to study the impact of providing direct access to a PCP on ED utilization, showing that the decrease is driven by high-risk individuals.

[3]Most work focused on undocumented immigrants imputes documentation status from surveys as foreign-born, non-citizens (Rodríguez et al., 2009; Artiga et al., 2016; Goldman et al., 2006; Barcellos et al., 2012). This definition includes documented groups who qualify for insurance, such as H-1B workers who tend to be well educated and work in relatively high-paying jobs (Capps et al., 2013). Work using administrative data focuses on specific kinds of ED care, like pregnancy related care delivered through Medicaid or emergency care delivered through Emergency Medicaid (Dang et al., 2011; Wolff et al., 2008; Atkins et al., 2017).

2 Experimental Design

2.1 Background

NYC has 1.1 million undocumented immigrants, the metropolitan area with the most undocumented immigrants nationwide (Passel and Cohn, 2019). Undocumented immigrants do not qualify for insurance in NYC, apart from Medicaid for pregnant women or conditions that are life-threatening.

Undocumented immigrants can access care through a safety-net healthcare system anchored by H+H, the nation's largest public hospital system. H+H provides inpatient, outpatient, and home-based services to more than one million New Yorkers yearly. H+H facilities are located in more than 70 locations across NYC's five boroughs and include 11 acute care hospitals (H+H, 2022). In addition, NYC has 70 FQHCs with 800 sites, community-based healthcare providers that provide primary care services to underserved groups (United Healthcare, 2019). H+H facilities and FQHCs offer primary care on a sliding fee-scale based on ability to pay and regardless immigration status.

Against this backdrop, Mayor Bill de Blasio launched a Task Force on Immigrant Healthcare Access in June 2014. The Task Force recommended that NYC establish a "direct access" program to directly connect individuals to PCPs to increase primary care utilization for uninsured, undocumented immigrants residing in NYC. Thus was born the randomized control trial, pilot program ActionHealthNYC.

2.2 Design

ActionHealthNYC targeted 345,000 undocumented NYC residents, over age 19, under 200% of the FPL, ineligible for typical insurance options. The enrollment window was May 1, 2016–July 31, 2016, the follow-up survey occurred May 2017, and the program ended June 1, 2017 (see Figure A3 for a timeline).

ActionHealthNYC reduced frictions to initiating care with safety-net, primary care clinics by making an initial PCP appointment for members at the time of enrollment. ActionHealthNYC did not provide additional financial protection for the treatment group, apart from a modest reduction in copays at a small subset of FQHCs.

At the time of enrollment, individuals chose one of nine safety-net clinics to provide their care.[4] The nine clinics included two H+H facilities and seven FQHCs (Figure A4). Program clinics provided comprehensive primary care, including USPSTF A+B recommended preventive screenings and specialty care. For FQHCs that did not offer specialty care in-house, FQHCs referred individuals to H+H. Beyond these nine clinics, individuals could access care at 46 different clinics if they obtained a referral from their main clinic.

Each FQHC adopted H+H's sliding fee-scale for members. Table A1 shows out-of-pocket costs across our nine clinics before the program started for individuals with incomes under 150% of the FPL (94% of our population is at this income level). The modal primary care copay is $15 across sites. The two FQHCS not already offering care at this rate—Charles B. Wong and Ryan-NENA Community Health Center—reduced their copay to $15 for the treated population.[5] Individuals can also visit H+H EDs for a copay of $15, receive an outpatient surgery for a copay of $150, and be admitted to the hospital for a copay of $150.

As part of the ActionHealthNYC screening process, all individuals, irrespective of treatment status, were pre-enrolled in Emergency Medicaid (EM) to support inpatient related care. EM covers services necessary for the treatment of an emergency medical condition placing the patient's health in jeopardy, serious impairment to bodily function, or serious dysfunction of any bodily organ or part. It does not cover follow-up care (NYDH, 2022). Since we enrolled both treatments and controls in EM, it does not bias the estimated impact of the intervention.

2.3 Enrollment and Randomization

Our outreach strategy relied on partnering with community-based organizations (CBO), targeting potentially eligible individuals with mailings (e.g. individuals enrolled in EM), social media outreach (e.g. Facebook and Twitter), as well as paid and earned media coverage (e.g. Univision and Korea Daily). CBOs were our most effective outreach partner: individuals referred by CBOs made up 30% of our population.

Individuals called NYC's hotline, 311, to schedule an initial intake appointment. Enroll-

[4]The nine clinics have experience caring for undocumented patients and are in neighborhoods with large undocumented populations, as determined by the American Community Survey.

[5]This difference is unlikely to be economically meaningful because a minority of individuals visited these two clinics: 8% of treated individuals and 7% of control individuals. Of those who did visit, the share of visits is similar between treatment and control individuals.

ment consisted of two appointments: an intake and follow-up appointment. Intake appointments were completed by 6,094 individuals and follow-up appointments were completed by 2,428 individuals (Figure 1).

At the first intake appointment, certified application counselors (CAC) determined if individuals met program requirements. To determine documentation status, we attempted to enroll applicants in insurance through New York's insurance marketplace. If the individual was ineligible for insurance through the marketplace they were not insurable, undocumented, and therefore eligible for random assignment to ActionHealthNYC. In this way, we could minimize the potential adverse effects of asking directly about documentation status, like decreased turnout and engagement, and determine documentation status indirectly through process of elimination (Sommers, 2010). CACs made second appointments for eligible individuals.

During the second follow-up appointment, individuals completed the baseline survey and were subsequently randomized to treatment (1,286 individuals) or control arms (1,142 individuals). We lost 21 treatment surveys and 3 control surveys due to processing and technological errors. As a result, we consider 2,404 individuals to be our total sample throughout the paper. We randomized couples into the same arm to minimize within family spillover effects: we randomized 598 individuals with a partner and 1,806 individuals alone. Enrollers offered to make initial appointments for treated individuals at one of our nine clinics at the end of the appointment. For those that declined, we gave clinics individuals' contact information and clinics continually attempted to schedule an initial visit. We gave control individuals information about safety-net services, but did not proactively support their ability to access services.

The institutional review boards at NYC's DOHMH and the National Bureau of Economic Research approved the research protocol. Trial participants provided written informed consent before primary data collection. The trial was pre-registered and publicly archived at clinicaltrials.gov. DOHMH implemented the protocol and administered the intervention for individuals in the treated group, but were unaware of the results until the trial's completion.

3 Data

Our survey and administrative data identify the effect of ActionHealthNYC on healthcare utilization and health status. We linked data sets using individuals' date of birth, sex, and first and last name. We use four data sources outlined in Figure A3.

First, we administered an in-person baseline survey to all individuals who signed up for the program. We translated the survey into 32 languages and asked 75 questions covering demographics, utilization, self-reported health, and financial burden. We compensated individuals for their time with an $11 MetroCard. We defined "high-risk" individuals to have one or more chronic conditions based on baseline survey responses. Chronic conditions included a diagnosis of hypertension, diabetes, asthma, mental illness, cardiovascular disease, chronic obstructive pulmonary disease, congestive heart failure, atrial fibrillation, cancer, HIV+, hepatitis C, or substance abuse disorder.[6] High-risk individuals include 477 treated individuals (38%) and 427 control individuals (37%).

Second, we administered a follow-up survey May 2017. The 23 questions covered utilization, self-reported health, and financial burden with a 9-month retrospective look back. We administered surveys via phone in individuals' preferred language and we compensated individuals $30 for their time. Our response rate was 43% for the controls (486 responses out of 1139) and 46% for the treated (581 responses out of 1265). We show below, in Section 4.2, that the differential response rate did not cause any imbalance across the experimental samples. We use the follow-up survey to quantify the program's effect on individuals' primary care access. We define self-reported access to primary care as the percentage of participants with a PCP and the percentage of participants who visited a doctor's office at least once (Liu, 2007).

Third, our primary administrative data source was the New York State Department of Health's Statewide Planning and Research Cooperative System (SPARCS) hospital discharge database covering visits to short-term non-federal hospitals in New York State. The data contain rich, claim level information on each ED visit and inpatient admission, including name, date of birth, race, sex, ICD-9/10 diagnosis codes, procedure codes, charges, primary payer, and out-of-pocket costs. SPARCS has two main limitations: it does not capture care delivered outside of New York State and charges for ED visits resulting in an admission

[6] Appendix B.2 contains more details on how we defined high-risk versus low-risk individuals from the baseline survey questions.

cannot be separated from the inpatient component of the claim. (See Section A.1 for more details.)

We categorize several ED utilization-related variables in SPARCS data. Our primary dependent variable is the number of ED visits, which includes individuals who did not visit the ED. We also separately identify extensive and intensive margins. Individuals with at least one visit captures the extensive margin through a binary indicator. The number of visits conditional on one ED visit captures the intensive margin. ED charges sum up the allowed amounts on each non-admitted ED visit, which includes charges of zero for individuals who did not visit the ED over the 14-month period. We also break our primary dependent variable, the number of ED visits, into less urgent ED visits in two ways: (1) ED visits that do not result in an admission and (2) "ED visits for PCP treatable" conditions based on ICD-9/10 diagnosis codes (definition first introduced by Billings et al. (2000) and updated by Johnston et al. (2017), see Finkelstein et al. (2012) for an application).

Fourth, we use visit-level administrative data from participating clinics to understand the quantity and type of care delivered to individuals visiting our nine clinics over the program period. Data include the count of PCP visits as well as rich information about preventive screens, chronic condition diagnoses, and referrals to specialists for both treatment and control individuals. Given we made initial appointments for individuals at program clinics as part of the intervention, the sample is skewed towards capturing a higher number of treated relative to control individuals. (See Section A.1 for more details.)

4 Empirical Strategy

4.1 Estimating Equations and Identification

We measure the causal effect of enrollment in ActionHealthNYC on healthcare utilization and health status. We randomize individuals into eligibility, so the intent to treat (ITT) and treatment on the treated (TOT) are equivalent. We assume that the local average treatment effect is also equal to the ITT and TOT by assuming that outcomes are only affected through ActionHealthNYC enrollment and its subsequent effect on utilization.

Our preferred specification captures the overall effect of randomization into treatment, where i denotes an individual:

$$y_i = \beta_0 + \beta_1 \text{Enrolled}_i + V_i\beta_2 + \epsilon_i$$

β_1 captures the effect of the program, the average difference in means between the treatment and control group over the 14-month program period. It can be interpreted as the causal impact of being enrolled in ActionHealthNYC. In all analyses we use linear probability models (LPMs) and cluster at the couple level to account for randomizing couples together.

V_i includes covariates that potentially improve statistical power by accounting for differences between the treatment and control group from the pre-period, although they are not required for an unbiased estimate of β_1, and our results are similar when they are excluded (see Table A4). For administrative outcomes, V_i includes lagged outcomes from 15-1 months before the intervention start-date. Analyses of spending outcomes control for 100 quantiles of lagged spending over the 15-month pre-period. For follow-up survey outcomes, V_i includes baseline survey responses.

We also modify the main specification to identify heterogeneous treatment effects between high- and low-risk individuals. We include (1) a dummy variable for being high-risk to capture baseline differences between groups and (2) two interactions capturing the main effect: Enrolled_i interacted with a dummy variable for high- or low-risk.

4.2 Sample Characteristics

Balance by treatment status. Table 1 compares treatment and control individuals at baseline. We show that treatment and control groups are well balanced with standardized mean differences less than 0.10 across outcomes. Joint tests show that means are not systematically different. We therefore assume that treatment is as good as randomly assigned. We consistently estimate the causal effect of interest under the assumption that potential outcomes are independent of treatment assignment conditional on stratification variables.

We show two additional balance tables. First, Table A2 shows the 1,067 follow-up survey respondents, where 486 control (43%, out of 1139) and 581 treated (46%, out of 1265) individuals responded. Treated individuals seem slightly more likely to have responded to the follow-up survey, but covariates across treated and control respondents look similar, with the largest difference being health status. We therefore control for baseline health status

in robustness checks, showing it does not change our main estimates (Table A5). Apart from health status, standardized differences are below 0.11 across outcomes, suggesting that response rates are not associated with differential sample characteristics.

Second, we compare treated and control individuals categorized as high-risk on the baseline survey in Table A3. The imbalances largely follow Table 1, giving us confidence that our high-risk definition does not differentially select one group over the other. There is one exception: treated individuals seem to be slightly less likely to visit the ED on the intensive margin (2.4 visits v. 1.9 visits), which may bias treatment effect estimates to the null. We address this by controlling for baseline levels of the outcome in our preferred regression specifications.

Baseline survey results. To our knowledge, most information on undocumented immigrants in America imputes documentation status from surveys. These methods may make immigrant groups look healthier by mistakenly including documented individuals in the undocumented group, such as H-1B workers who tend to be well educated and work in relatively high-paying jobs (Capps et al., 2013). Undocumented immigrants also face real fears of deportation, lowering response rates, and biasing estimates further towards documented immigrants. This only compounds the fact that surveys often suffer from non-reporting, misreporting, and poor coverage, especially among low-income groups (Meyer et al., 2015).

This presents a challenge when comparing our population to national surveys—differences could be due to survey inaccuracies or because ActionHealthNYC captured a selected population. Recognizing this issue, we take a first step by comparing our population to a nationally representative, imputed undocumented group from the 2015-2016 National Health and Nutrition Examination Survey (NHANES) survey (Table 2). NHANES does not directly ask about documentation status, so we follow the literature and define "undocumented" as foreign-born, non-citizens (Barcellos et al., 2012). We focus on an uninsured group over age 18 to match the ActionHealthNYC sample. We further refine the NHANES population to individuals with incomes below 100% of the FPL, since 82% of the ActionHealthNYC sample is in that income group.

As Table 2 shows, our population is older, more likely to have completed high school, and less likely to be Hispanic than the NHANES population on average. For instance, 48% of our population immigrated from Central or South America and 27% of our population immigrated from China or Korea. In comparison, NHANES reports that 93% of the $\leq 100\%$

of the FPL population are Hispanic.[7]

Self-reported health is similar between the ActionHealthNYC and NHANES samples. Our sample has a higher share in better self-reported health and a smaller share having chronic conditions; on the other hand, our sample has higher reported rates of depression. Utilization of healthcare is similar, with more physician visits but fewer hospital visits.

What is most noticeably different is having a regular PCP: 60% of those in NHANES report having a regular physician, while only 25% of ActionHealthNYC individuals do. The 60% NHANES figure is similar to the 60% of Medicaid eligible citizens with a PCP reported in Sommers et al. (2016). This points to the potential value of ActionHealthNYC services to our population, even in a city with a widely available and affordable healthcare safety-net.

We also report new information on undocumented immigrants' housing security. We find that 12% of individuals are housing insecure, whereas nationally 0.2% of individuals are homeless (Cox et al., 2017). This suggests that housing insecurity is an important determinant of undocumented immigrants' health (Cutts et al., 2011).

5 Experimental Results

5.1 Program Metrics

We begin by documenting that the intervention worked as intended. Figure 2 shows (a) PCP visits to our nine clinics and (b) referrals to specialists over the program window, May 2016–July 1, 2017. The solid green line captures visits by treated individuals normalized by the total number of individuals in the treated group (1,265) and the red dashed line captures control individuals normalized by the total number of individuals in the control group (1,139). The black vertical line represents the end of the enrollment window, July 31, 2016.

Within the first three months of treatment, August-October 2016, 57% of treated individuals (725 out of 1,265) and 16% of control individuals (185 out of 1,139) visited one of our clinics for primary care. Over the 14-month program window, 873 treated individuals (69%)

[7]The Migration Policy Institute reports that 75% of undocumented immigrants in America immigrated from Central or South America and 34% immigrated from China or Korea (Capps et al., 2020) suggesting that our population may be more similar to national averages than NHANES seems to suggest.

visited our clinics an average of 3.9 times. Clinics referred 433 treated individuals (34%) to a specialist an average of 5.6 times. Clinic visits were lower among controls: 243 individuals (21%) visited our clinics for primary care, with an average of 3.5 visits among those visiting at least once. Clinics also referred 133 control individuals (12%) to a specialist an average of 6.5 times.

5.2 Survey and Administrative Data Outcomes

We now turn to our experimental results in Table 3. The first two rows quantify measures of access from the follow-up survey. We find that program enrollment increased the percentage of individuals with a PCP by 29.2% and doctors' office visits by 16.9%, within the nine months after July 31, 2016. Effects are large—at a minimum the program seemed to reduce frictions in accessing office-based care.

The remaining rows focus on the full experimental sample to measure ED utilization in SPARCS administrative data over the 14-month program window. Our most all-encompassing definition of ED visits includes individuals with zero ED visits, which decreased by 20.6%. Both the odds of having an ED visit (extensive margin) and the number of ED visits (intensive margin) decrease. However, only the decrease in the number of ED visits is significant suggesting that intensive margin reductions drive our main result.

The next two columns of the Table divide our sample into high- and low-risk populations. Bolded high- and low-risk estimates indicate that estimates are significantly different at the 5% level. Both high- and low-risk individuals see an increase in access, although the odds of having at least one PCP visit goes up more for the low-risk sample. This suggests that high-risk individuals have more baseline exposure to the healthcare system, which is in line with the larger control mean. Turning to ED utilization, the high-risk sample drives the reduction in ED visits: ED visits decrease 41.7% driven mainly by the intensive margin.

The last four rows of the Table further establish the link between increased use of primary care and reduced ED use. We subsample the set of ED visits that are "primary care treatable." We also compare ED visits that did and did not result in hospitalization. We find that ED visits for primary care treatable conditions and visits that did not lead to an admission are proportionally larger for high-risk individuals. On aggregate, there is a significant $195.60 reduction in ED charges for non-admitted visits, which is driven by a large $477.98 average reduction among high-risk individuals. There is no significant impact on ED

visits that result in admission. ED utilization is not meaningfully impacted among low-risk individuals and the coefficients reveal small, mixed effects. This suggests that the reduction in ED visits is due to the high-risk sample visiting the ED less for non-urgent care, visits that are most responsive to increased PCP care among a sample who likely needs primary care the most.

The reduction in ED expenditures for non-admitted visits is sizable among high-risk individuals. For comparison, the program cost DOHMH $794 per individual. Benchmarking program savings against costs suggests that the program offset 25% of program costs among all individuals and 60% among high-risk individuals. These savings are likely lower-bounds given that we do not quantify health impacts beyond the 14-month program period, and we assume the program had a negligible impact on long-run inpatient related care.

Robustness and Sensitivity Analysis. These conclusions are robust to different models and measurement decisions. Table A4 reports estimates excluding baseline controls. Table A5 reports estimates controlling for baseline, self-reported health status. Table A6 shows additional outcomes, such as inpatient visits and charges (which include ED charges admitted through the ED), log charges and winsorizing the top 1000th quantile of charges. Each of these specifications provides qualitatively similar conclusions.

The impact of the intervention on self-reported access is measured through the follow-up survey, which had a 43% response rate for the controls (486 responses out of 1139) and 46% response rate for the treated (581 responses out of 1265). We model sensitivity to attrition by bounding treatment effects in Section D.1. Classical "Lee bounds"—that trim distributions—only correct for differential attrition by treatment arm, so we instead implement a method in the spirit of Manski bounds (see Blattman et al. (2020) for an application). We make fairly extreme assumptions about non-responders and recalculate treatment effects, finding qualitatively similar results. Therefore, even if selective attrition is present, it is unlikely to affect our conclusions.

5.3 Impacts on Health Metrics

We face two limitations when measuring the impact of ActionHealthNYC on long-run health. First, we only have data on individuals visiting our nine clinics. Second, we only have short-run indicators of better care (e.g. preventive screens). To make progress towards understanding the impact of ActionHealthNYC on long-run health, we start with the 13.0

percentage point (pp) increase in individuals' likelihood of visiting a doctor (Table 3). We then measure the likelihood an individual receives a preventive screen conditional on visiting a doctor in our clinic data and apply this to the 13.0 pp increase in treated individuals' doctors' visits. We translate the proxied increase in preventive screens into long-run health following the medical literature, as done in Alsan et al. (2019).

We require two assumptions. First, we assume that treated and control individuals were treated similarly by our clinics. We support this assumption by showing that the timing of visits, rate of referrals, and likelihood of receiving a preventive screen or chronic condition diagnosis is similar between control and treatments visiting our clinics (Table A8). Second, we assume that every clinic visited by individuals had the same likelihood of delivering screens and diagnosing chronic conditions as our nine program clinics. Given our nine clinics were hand-picked for their expertise at caring for this population, they were likely more skilled at delivering screens and chronic condition diagnoses, biasing our estimates to the null.

This allows us to focus on the likelihood an individual receives a preventive screen and chronic condition diagnosis conditional on visiting a doctor's office, regardless of treatment status. Table A9 shows that, conditional on visiting a clinic, 82.4% of individuals had a diabetes screen and 92.7% of individuals had a blood pressure screen, two of the most significant chronic illnesses for adults (Fang et al., 2021). Applied to the 13.0 pp increase in doctors' office visits, this translates to a 33.8 percentage point (pp) increase in diabetes screens, a 45.4 pp increase in blood pressure screens, and a 16.2 pp increase in the likelihood of having a chronic condition diagnosis among the treated group, relative to the control group.

We then follow Alsan et al. (2019) and do a back-of-the-envelope calculation to quantify how the increase in screens affects long-run mortality (See Section E.2). We find that the increased probability of a blood pressure or diabetes screen would reduce mortality from cardiovascular disease by 4.8 deaths per year, or a 12% mortality reduction (Kahn et al., 2010; Dehmer et al., 2017). These estimates are likely lower bounds because they only focus on cardiovascular disease and do not account for the higher incidence of chronic illness found during clinic visits, relative to baseline.

6 Discussion and Conclusion

While insuring the remaining 30 million uninsured Americans is the public policy of choice of many, it has proven to be politically challenging, especially for undocumented immigrants (Brownstein, 2019). At the same time, individuals can access low-cost, safety-net healthcare in America. However, utilization among the uninsured may be inefficiently low. For example, in NYC we find that only one-quarter of the sample of undocumented immigrants has a PCP at baseline.

We use a randomized control trial in NYC to overcome frictions in accessing services by setting up initial PCP visits for the treatment group. The intervention increased access and doctors' office utilization and simultaneously reduced use of the ED, a marker for inefficient use of healthcare (Krämer and Schreyögg, 2019; Akosa Antwi et al., 2015; Flores-Mateo et al., 2012). This reduction was sizable—for the full sample, ED use fell by 21%, while for the high-risk sub-sample, it fell by 42%. We confirm that the reduction was driven by less serious ED visits that are avoided through better access to primary care.

There are at least three limits on the generalizability of our results. First, we focus on a city with an exceptionally large, accessible, and affordable healthcare safety-net. Our intervention may be of lower value in areas with less well established safety-nets or in cities that do not prioritize creating a safe environment for undocumented immigrants (e.g. NYC is a sanctuary city).

Second, our outreach and enrollment strategy may have selected less healthy and more engaged individuals than the average NYC undocumented immigrant. That being said, comparing the ActionHealthNYC population to a similar NHANES population shows that the two groups are fairly comparable across many outcomes, where differences are just as likely to be driven by NHANES not fully capturing the intended undocumented, low-income group.

Third, our results may not generalize to low-income, American citizens, who already have fairly high baseline levels of access and knowledge about safety-net care. For example, 60% of Medicaid citizens report having access to a PCP (Sommers et al., 2016). Among the ActionHealthNYC population, 25% of individuals had a PCP at baseline, a number that rose nearly to the citizen rate (59%) in response to the intervention.

Formally insuring undocumented immigrants remains politically untenable; direct access

programs may be a more politically palatable method for expanding access outside of the typical "insurance" framework. Expanding access to undocumented immigrants is even more relevant in the context of the COVID-19 pandemic, which has had a disproportionate impact on low-income and immigrant populations, exacerbating longstanding healthcare disparities.

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Results

Figure 1: Enrollment Flow Chart

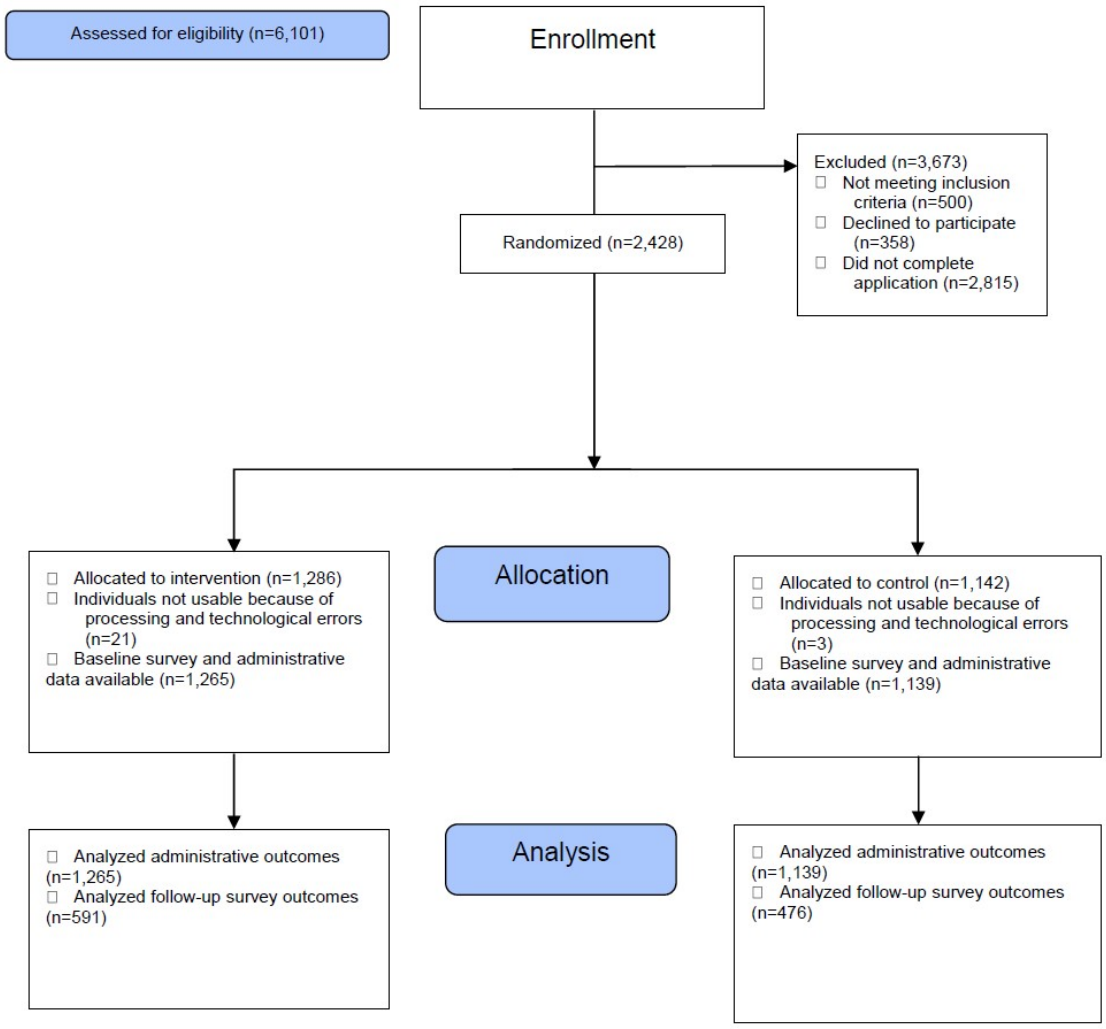
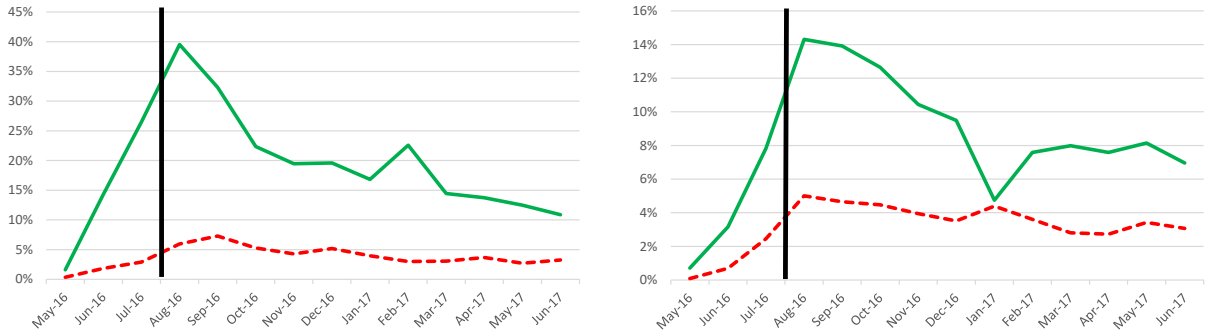


Figure 2: ActionHealthNYC Clinic Utilization Data

(a) Rate of Primary Care Visits at Clinics
Treated v. Control

(b) Rate of Specialty Visits Referred by PCPs
Treated v. Control



Notes: The green solid line represents visits by the treated group normalized by the total number of individuals in the treated group (1,265) and the red dashed line represents visits by the control group normalized by the total number of individuals in the treated group (1,139). The black solid vertical line indicates the end of the ActionHealthNYC enrollment period, July 31, 2016. Clinic visits were made by 873 treated (69% of 1,265) individuals an average of 3.9 times. Clinics referred 433 treated individuals (34% of 1,265) to specialists, with an average of 5.6 referrals per individual. Clinic visits were made by 243 control individuals (21% of 1,139) an average of 3.5 times. Clinics referred 133 control (12%) individuals to specialists an average of 6.5 times. See Figure A5 for figures normalizing by the total number of control and treated individuals visiting our clinics. See Table A8 for administered screens and chronic condition diagnoses among individuals visiting clinics.

Table 1: Balance Table for Individuals from Baseline Survey Data

Characteristic	Overall (N=2,204)	Control (N=1,139)	Treated (N=1,265)	Absolute Standardized Mean Difference
Study Characteristics, Baseline Survey				
High-Risk Individuals, %	37.6	37.5	37.7	
Randomized Alone, %	75.1	77.1	73.4	
Sociodemographics, Baseline Survey				
Age, y, mean(SD)	44.5(12.5)	44.3(13.0)	44.6(12.1)	0.032
Single, %	53.0	53.4	52.8	0.012
Years in U.S., y, mean(SD)	13.6(8.2)	13.2(8.4)	13.8(8.1)	0.074
English, %	30.2	30.7	29.7	0.021
High School, %	53.4	53.2	53.6	0.0073
Employed, %	59.1	56.4	61.5	0.10
Female, %	50.6	50.6	50.6	0.0012
Hispanic, %	49.4	49.0	49.7	0.015
Income Under 100% FPL, %	81.6	82.0	81.2	0.021
Housing Insecure, %	12.0	10.9	12.9	0.060
Joint Test: P-Values				0.51
Healthcare Utilization, Baseline Survey				
Individuals With a PCP, %	25.3	24.9	25.7	0.018
Doctors' Office Visits, %	59.9	60.4	59.4	0.021
ED Visits, %	19.8	20.0	19.7	0.0084
Inpatient Visits, %	6.0	5.5	6.4	0.037
Joint Test: P-Values				0.71
Health Status, Baseline Survey				
Diabetes, %	8.8	8.8	8.8	0.0026
Hypertension, %	17.5	18.3	16.8	0.040
Asthma, %	4.5	4.6	4.5	0.0029
Mental Illness, %	4.2	4.0	4.4	0.020
Currently Smokes, %	11.6	12.1	11.1	0.033
Quality of Care at Least Good, %	82.2	82.1	82.2	0.0020
Health Better or Equal to Fair, %	36.1	34.3	37.8	0.074
Depressed PHQ2, %	11.1	9.9	12.1	0.071
Joint Test: P-Values				0.62
Healthcare Utilization, SPARCS Administrative Data				
ED Visits, mean	0.34	0.35	0.33	0.017
Individuals With at Least One Visit to the ED, %	0.19	0.19	0.19	0.0042
ED Visits, Conditional on One ED Visit, mean	1.85	1.9	1.8	0.047
Joint Test: P-Values				0.43

Notes: Abbreviations: y, years; SD, standard deviation; FPL, federal poverty level; PCP, primary care physician; and ED, emergency department. Outcomes are from the baseline survey, where questions were asked with a 12 month look-back, except for outcomes under the heading "Healthcare Utilization, SPARCS Administrative Data," which were from SPARCS. The randomization was done at the couple level, so couples would be randomized into the same arm. Table A2 contains balance among those who responded to the follow-up survey and Table A3 contains balance for high-risk individuals.

Table 2: Comparison of the ActionHealthNYC to the NHANES Population

	ActionHealthNYC ≤200% FPL	NHANES ≤100% FPL
Income Under 100% FPL, %	82	100
Age, y, mean	44	37
Single, %	53	43
Years in U.S., y, mean	14	10-14
English, %	30	—
High School, %	53	32
Employed, %	59	55
Female, %	51	54
Hispanic, %	49	93
Health Better or Equal to Fair, %	36	40
Depressed PHQ2, %	11	7
High Risk, %	41	—
Has One of the Following Conditions, %	27	29
Asthma, %	5	11
CHF, %	1	1
Heart Attack, %	1	1
Cancer, %	1	4
Diabetes, %	9	8
Hypertension, %	17	12
Doctors' Office Visits, %	60	54
Inpatient Visits, %	6	8
Individuals With a PCP, %	25	62
Housing Insecure, %	12	—

Notes: Abbreviations: FPL, federal poverty level; PCP, primary care physician; NHANES, National Health and Nutrition Examination Survey. We restrict the NHANES group to individuals who are uninsured and aged over age 18 to mirror the ActionHealthNYC population. We show NHANES individuals with incomes ≤100% of the FPL. "English" includes individuals who self-report speaking English very well or well.

Table 3: Treatment Effect of Enrollment in ActionHealthNYC

	All Individuals		High-Risk		Low-Risk	
Type	Mean	Impact	Mean	Impact	Mean	Impact
Measures of Access, Follow-Up Survey						
Individuals With a PCP (%)	45.3	13.2 (3.1) 29.2%	51.4	**10.8** (4.9) 23.8%	41.6	**14.7** (3.9) 32.5%
Individuals With at Least One Visit to the Doctor (%)	76.5	13.0 (2.3) 16.9%	83.1	**9.3** (3.4) 12.1%	72.6	**15.2** (3.1) 19.9%
Downstream Care, Administrative SPARCS Data						
ED Visits	0.42	-0.086 (0.041) -20.6%	0.60	**-0.17** (0.074) -41.7%	0.31	**-0.033** (0.048) -8.0%
Individuals With at Least One Visit to the ED (%)	0.22	-0.017 (0.016) -7.6%	0.28	-0.047 (0.028) -21.6%	0.19	0.0015 (0.020) 0.68%
ED Visits, Conditional on One ED Visit	1.9	-0.32 (0.15) -16.5%	2.2	**-0.50** (0.23) -26.5%	1.7	**-0.16** (0.19) -8.4%
ED Visits, PCP Treatable	0.28	-0.065 (0.031) -23.0%	0.40	**-0.16** (0.054) -55.0%	0.21	**-0.011** (0.037) -3.8%
ED Visits, Not Admitted	0.38	-0.082 (0.038) -21.5%	0.52	**-0.18** (0.065) -46.1%	0.29	**-0.026** (0.046) -6.8%
ED Charges, Not Admitted ($)	703.37	-195.60 (83.55) -27.8%	1060.05	**-477.98** (167.93) -68.0%	489.46	**-26.66** (88.84) -3.8%
ED Visits, Admitted	0.039	-0.0037 (0.0096) -9.7%	0.073	0.0067 (0.019) 17.4%	0.018	-0.010 (0.0091) -26.1%

Notes: Abbreviations: PCP, primary care physician; ED, emergency department. The Table displays results from the specification outlined in Section 4.1. Bolded estimates indicate that the low-risk and high-risk estimates are statistically different at the 5% level. The mean represents the control mean over the 14-month treatment window. Follow-up survey outcomes are measured as of nine months after treatment, whereas SPARCS outcomes are measured over the 14-month program window. All definitions include zeros except for "ED Visits, Conditional on One ED Visit." Regressions control for baseline values of the outcome less than 15 months before enrollment. We control for the total number over the period for outcomes with small ranges or, for variables with wide ranges, such as charges, fixed effects of over a hundred quantiles of the total number over the period. See Table A4 for uncontrolled results. See Table A5 for results controlling for baseline health status. See Table A6 for additional hospital utilization variables.

Appendix

Appendix A Additional Details on ActionHealthNYC

Table A1: Fee-scale across sites before ActionHealthNYC

	0-150% of the FPL				
	H+H	CHN	CBW	WR	UHP
Doctors' office visit	\$15	\$15	\$30	\$50	\$15
Dental	\$15	\$50	\$15	\$50	\$15
ED at H+H**	\$3 $\leq$ 138% FPL / \$15 $>$ 138% FPL				
Outpatient surgery at H+H	\$150				
Inpatient stay at H+H	\$150				
RX at H+H	\$2				

Notes: Abbreviations: FPL, federal poverty level; ED, emergency department; RX, prescription. We report out-of-pocket costs for our partner facilities: Health+Hospitals (H+H), Community Health Network (CHN), Charles B. Wong (CBW), Ryan-NENA Community Health Center (WR), and Urban Health Plan (UHP). Our two H+H facilities included H+H Gouverneur Health and H+H Elmhurst Hospital Center. Our seven FQHC sites included: three Charles B. Wang Community Health Centers, two Community Healthcare Network clinics, Ryan-NENA Community Health Center, and Plaza Del Sol Health Center. Cost-sharing linearly increases with income. We focus on the 0-150% FPL group to give a sense of magnitude and because 94% of the ActionHealthNYC population is below 150% of the FPL. **The \$3 copay only applies to individuals with incomes below 138% of the FPL presenting with a life-threatening condition covered under Emergency Medicaid. For those between 138%-200% who did not qualify for Emergency Medicaid, individuals saw ED costs of \$15. Information describes the landscape before ActionHealthNYC and was therefore what the control group faced during the treatment window. ActionHealthNYC standardized fee-schedules to the H+H level.

Figure A3: Timeline and Data Sources

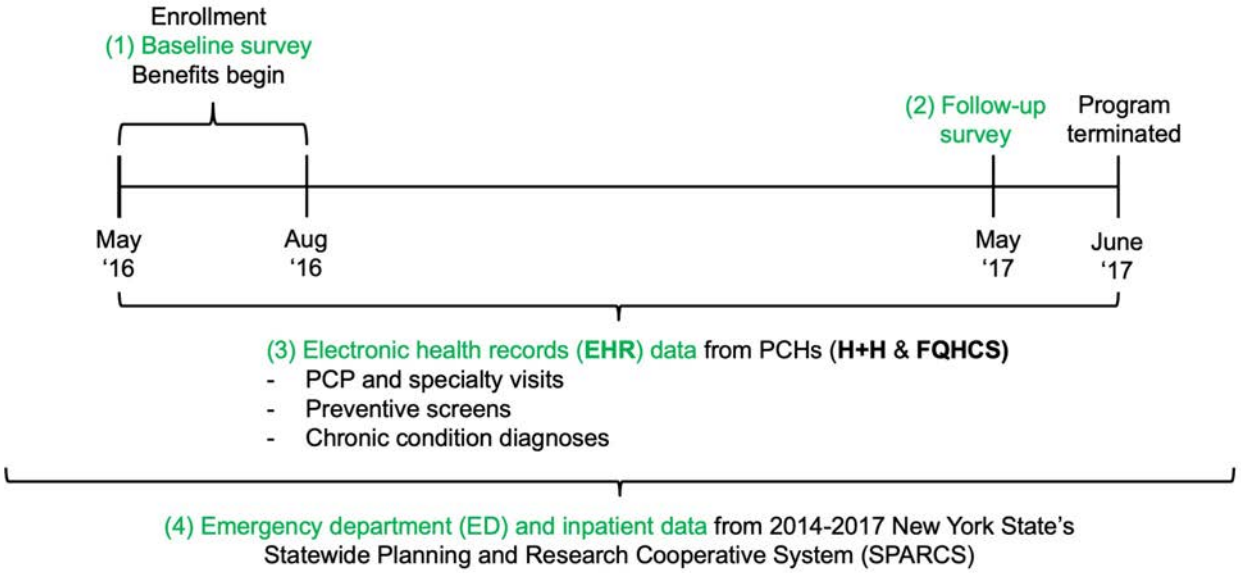
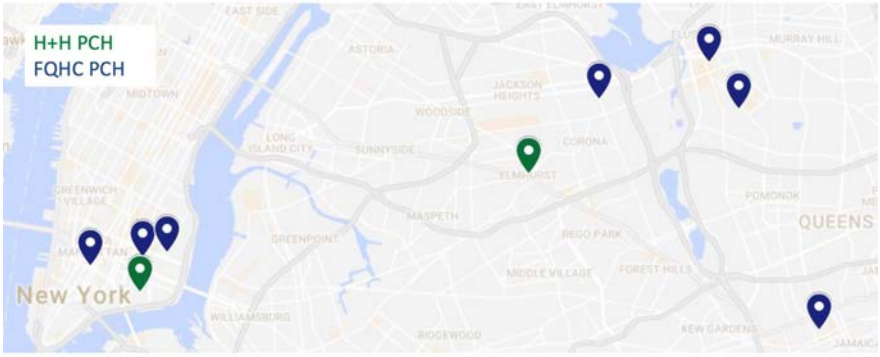


Figure A4: H+H and FQHC Network



A.1 Additional Data Details

SPARCS details. SPARCS does not capture care delivered outside of New York State. While our experiment minimized this by focusing on NYC residents, we quantify the potential magnitude of the issue by comparing the number of individuals who self-report visiting the ED on the follow-up survey to the number of individuals we observe visiting the ED in SPARCS data. We show that 28 treated individuals (2% of total 1,265) and 38 control individuals (3% of total 1,139) self-report visiting the ED on the follow-up survey, but are unobserved in SPARCS data. This suggests that we are missing a similar number of ED visits among the control and treatment groups and, if anything, the data skews us towards finding no effect on ED utilization.

Clinic data details. To give a sense of sample selection, we benchmark the number of individuals who report seeing a PCP on the follow-up survey against the number we observe visiting our clinics. We find 9% of treated individuals and 22% of control individuals self-report visiting a PCP on the follow-up survey but are not observed visiting our clinics (115 treated and 248 controls). Taken together, the controls observed in our clinics seem to be far more selected than treated individuals.

Appendix B Baseline and Follow-up Surveys

B.1 Details on Baseline and Follow-up Survey Description

The baseline survey was conducted in-person at the time of enrollment by all enrolled individuals. We administered surveys in the participant's preferred language and asked 75 questions covering socio-demographics, healthcare access, utilization, financial burden, health behaviors, and health status. Section B.2 lists the baseline survey questions used to define whether or not someone qualified as "high-risk."

B.2 Baseline Survey Questions Defining High-Risk Population

- Mental health condition

  - "In the past 6 months, have you received any counseling for a mental health problem?"
  - "In the past 6 months, was there any time when you thought you needed mental health treatment or counseling for yourself but did not get it?"
  - "Has a doctor ever told you that you have a mental health condition such as major depression, anxiety, or another condition?"

- Hypertension
  - "Has a doctor ever told you that you have high blood pressure, also called hypertension?"

- Diabetes
  - "Has a doctor ever told you that you have diabetes?"

- Asthma
  - "Has a doctor ever told you that you have asthma?"

- Alcohol substance use disorder
  - "In the past 6 months, has a doctor told you or have you felt that you needed treatment or counseling for alcohol or drug use?"

- Smoker
  - "During the last 6 months, has a doctor, nurse or other health professional advised you to quit smoking?"

- HIV+
  - "Has a doctor ever told you that you have HIV/AIDS?"

- Congestive heart failure
  - "Has a doctor ever told you that you have Congestive Heart Failure? Read if needed: Congestive heart failure happens when the heart cannot pump enough blood to the rest of the body."

- Atrial fibrillation

- "Has a doctor ever told you that you had Atrial Fibrillation? Read if needed: Atrial Fibrillation (A-tre-al fi-bri-LA-shun) is when your heart beats very fast and irregularly."

- Stroke
  - "Has a doctor ever told you that you had a Stroke or Transient Ischemic Attack (trans-ee-ent isk-eem-ick attack, TIA, also called a mini-stroke)? Read if needed: A stroke is an interruption or blockage of the blood supply to any part of the brain. A transient ischemic attack (TIA) is caused by a temporary interruption or blockage of blood supply to an area of the brain, which results in a sudden, brief decrease in brain function."

- Heart attack
  - "Has a doctor ever told you that you had a Heart Attack in the past year? Read if needed: A heart attack is caused by an interruption or blockage of the blood supply to any part of the heart."

- Cancer
  - "Do you have any cancer that was recently diagnosed by a doctor (in the past year) or that needs current treatment?"

Appendix C Balance Tables

Table A2: Baseline Balance for Individuals Completing the Follow-up Survey

Characteristic	Control	Treated	Absolute Standardized Mean Difference
Study Characteristics, Baseline Survey			
No. of Individuals	486	581	
High-Risk Individuals, %	37.7	36.5	
Randomized Alone, %	77.6	73.5	
Socio-demographics, Baseline Survey			
Age, y, mean(SD)	43.3(12.3)	43.7(11.4)	0.032
Single, %	50.8	54.8	0.080
Years in U.S., y, mean(SD)	13.5(7.8)	14.1(7.8)	0.087
English, %	32.6	26.8	0.13
High School, %	49.3	51.8	0.051
Employed, %	58.3	63.4	0.11
Female, %	51.7	55.4	0.075
Hispanic, %	47.1	51.8	0.094
Income Under 100% FPL, %	83.3	83.3	0.00036
Housing Insecure, %	12.4	11.9	0.015
Joint Test: P-Values			0.37
Utilization, Baseline Survey			
Individuals With a PCP, %	26.6	25.7	0.019
Doctors' Office Visits, %	60.7	60.6	0.0023
ED Visits, %	17.9	20.5	0.066
Inpatient Visits, %	4.4	5.0	0.032
Joint Test: P-Values			0.86
Health Status, Baseline Survey			
Diabetes, %	8.6	9.5	0.029
Hypertension, %	18.7	14.5	0.12
Asthma, %	3.7	4.8	0.055
Mental Illness, %	3.9	4.1	0.011
Currently Smokes, %	12.8	12.2	0.016
Quality of Care at Least Good, %	86.0	84.2	0.052
Health Better or Equal to Fair, %	35.9	41.9	0.12
Depressed PHQ2, %	8.3	10.9	0.088
Joint Test: P-Values			0.29
Healthcare Utilization, SPARCS Administrative Data			
ED Visits, mean	0.36	0.38	0.023
Individuals With at Least One Visit to the ED, %	0.19	0.21	0.055
ED Visits, Conditional on One ED Visit, mean	1.9	1.9	0.039
Joint Test: P-Values			0.43

Notes: Abbreviations: y, years; SD, standard deviation; FPL, federal poverty level; PCP, primary care physician; ED, emergency department; and No., number. Outcomes are from the baseline survey, where questions were asked with a 12 month look-back, except for outcomes under the heading "Healthcare Utilization, SPARCS Administrative Data," are from SPARCS. The randomization was done at the couple level, so couples would be randomized into the same arm. A higher physical or mental health PROMIS score means individuals experienced worse physical or mental health.

Table A3: Baseline Balance for High-Risk Individuals

Characteristic	Control	Treated	Absolute Standardized Mean Difference
Study Characteristics, Baseline Survey			
No. of Individuals	427	477	
Randomized Alone, %	81.3	77.1	
Socio-demographics, Baseline Survey			
Age, y, mean(SD)	47.8(13.4)	48.9(12.9)	0.081
Single, %	60.2	55.1	0.10
Years in U.S., y, mean(SD)	14.8(8.9)	15.2(8.8)	0.048
English, %	34.0	29.1	0.10
High School, %	55.2	51.7	0.070
Employed, %	53.4	57.5	0.082
Female, %	48.3	49.1	0.017
Hispanic, %	50.1	49.1	0.021
Income Under 100% FPL, %	80.7	80.4	0.0061
Housing Insecure, %	15.4	17.3	0.053
Joint Test: P-Values			0.16
Utilization, Baseline Survey			
Individuals With a PCP, %	39.9	37.5	0.048
Doctors' Office Visits, %	75.6	73.0	0.061
ED Visits, %	26.9	26.2	0.016
Inpatient Visits, %	9.9	10.3	0.014
Joint Test: P-Values			0.83
Health Status, Baseline Survey			
Diabetes, %	23.4	23.5	0.0014
Hypertension, %	48.7	44.4	0.086
Asthma, %	12.2	11.9	0.0070
Mental Illness, %	10.5	11.5	0.032
Currently Smokes, %	16.7	14.1	0.074
Quality of Care at Least Good, %	86.0	86.1	0.0035
Health Better or Equal to Fair, %	45.6	49.8	0.084
Depressed PHQ2, %	16.5	21.2	0.12
Joint Test: P-Values			0.46
Healthcare Utilization, SPARCS Administrative Data			
ED Visits, mean	0.54	0.50	0.027
Individuals With at Least One Visit to the ED, %	0.24	0.28	0.087
ED Visits, Conditional on One ED Visit, mean	2.4	1.9	0.22
Joint Test: P-Values			0.43

Notes: Abbreviations: y, years; SD, standard deviation; FPL, federal poverty level; PCP, primary care physician; ED, emergency department; and No., number. Outcomes are from the baseline survey, where questions were asked with a 12 month look-back, except for outcomes under the heading "Healthcare Utilization, SPARCS Administrative Data," are from SPARCS. The randomization was done at the couple level, so couples would be randomized into the same arm. A higher physical or mental health PROMIS score means individuals experienced worse physical or mental health.

Appendix D Robustness Checks

Table A4: Treatment Effect of Enrollment in ActionHealthNYC
Uncontrolled Specification

	All Individuals		High-Risk		Low-Risk	
Type	Mean	Impact	Mean	Impact	Mean	Impact
Measures of Access, Follow-Up Survey						
Individuals With a PCP (%)	45.3	13.1**	51.4	9.0*	41.6	15.6**
		(3.1)		(5.0)		(3.9)
		28.9%		19.9%		34.5%
Individuals With at Least One Visit to the Doctor (%)	76.5	13.0**	83.1	**8.9****	72.6	**15.5****
		(2.4)		(3.4)		(3.1)
		16.9%		11.7%		20.2%
Downstream Care, Administrative Data						
ED Visits	0.42	-0.095**	0.60	**-0.19****	0.31	**-0.036**
		(0.047)		(0.094)		(0.049)
		-22.6%		-46.0%		-8.7%
Individuals With at Least One Visit to the ED (%)	0.22	-0.016	0.28	-0.037	0.19	-0.0039
		(0.017)		(0.030)		(0.020)
		-7.4%		-17.0%		-1.8%
ED Visits, Conditional on One ED Visit	1.9	-0.31*	2.2	-0.47*	1.7	-0.16
		(0.17)		(0.27)		(0.20)
		-16.4%		-24.5%		-8.6%
ED Visits, PCP Treatable	0.28	-0.065**	0.40	**-0.14****	0.21	**-0.022**
		(0.033)		(0.056)		(0.039)
		-23.1%		-48.9%		-7.7%
ED Visits, Not Admitted	0.38	-0.085**	0.52	**-0.17****	0.29	**-0.032**
		(0.041)		(0.073)		(0.048)
		-22.2%		-45.3%		-8.4%
ED Charges ($)	703.37	-205.54**	1060.05	**-437.42****	489.46	**-67.18**
		(87.26)		(173.74)		(91.31)
		-29.2%		-62.2%		-9.6%
ED Visits, Admitted	0.039	-0.010	0.073	-0.020	0.018	-0.0043
		(0.014)		(0.035)		(0.0068)
		-26.3%		-52.3%		-11.1%

Notes: The Table displays results from the specification outlined in Section 4.1. Bolded estimates indicate that the low-risk and high-risk estimates are statistically different at the 5% level. The mean represents the control mean during the treatment window. Follow-up survey outcomes are measured as of nine months after treatment, whereas SPARCS outcomes are measured over the 14-month program window. Regressions do control for baseline levels of the outcomes. See Table 3 for specification controlling for baseline levels of the outcome. Family wise p-values are denoted by asterisks as follows: $^{*}p < 0.10$ $^{**}p < 0.05$

Table A5: Treatment Effect of Enrollment in ActionHealthNYC
Controlling for Self-Reported Health Status

	All Individuals		High-Risk		Low-Risk	
Type	Mean	Impact	Mean	Impact	Mean	Impact
Measures of Access, Follow-Up Survey						
Individuals With a PCP (%)	45.3	13.2**	51.4	**10.6****	41.6	**14.8****
		(3.1)		(4.9)		(3.9)
		29.2%		23.5%		32.7%
Individuals With at Least One Visit to the Doctor (%)	76.5	12.9**	83.1	**8.9****	72.6	**15.4****
		(2.3)		(3.4)		(3.1)
		16.9%		11.7%		20.1%
Downstream Care, Administrative Data						
ED Visits	0.42	-0.086**	0.60	**-0.17****	0.31	**-0.034**
		(0.041)		(0.074)		(0.048)
		-20.6%		-41.5%		-8.0%
Individuals With at Least One Visit to the ED (%)	0.22	-0.016	0.28	-0.046*	0.19	0.0014
		(0.016)		(0.028)		(0.020)
		-7.5%		-21.1%		0.66%
ED Visits, Conditional on One ED Visit	1.9	-0.32**	2.2	**-0.52****	1.7	**-0.16**
		(0.15)		(0.23)		(0.19)
		-16.7%		-27.1%		-8.4%
ED Visits, PCP Treatable	0.28	-0.065**	0.40	**-0.16****	0.21	**-0.011**
		(0.031)		(0.054)		(0.037)
		-23.1%		-55.1%		-3.8%
ED Visits, Not Admitted	0.38	-0.082**	0.52	**-0.18****	0.29	**-0.026**
		(0.038)		(0.065)		(0.046)
		-21.5%		-46.0%		-6.8%
ED Charges ($)	703.37	-196.85**	1060.05	**-481.08****	489.46	**-26.50**
		(83.76)		(166.99)		(88.67)
		-28.0%		-68.4%		-3.8%
ED Visits, Admitted	0.039	-0.0037	0.073	0.0069	0.018	-0.010
		(0.0096)		(0.020)		(0.0091)
		-9.5%		17.9%		-26.1%

Notes: The Table displays results from the specification outlined in Section 4.1. Bolded estimates indicate that the low-risk and high-risk estimates are statistically different at the 5% level. The mean represents the control mean during the treatment window. Regressions control for baseline values of the outcome less than 15 months before enrollment as well as baseline health status. See Table A4 for uncontrolled results. Family wise p-values are denoted by asterisks as follows: $^{*}p < 0.10$ $^{**}p < 0.05$

Table A6: Treatment Effect of Enrollment in ActionHealthNYC on Additional Outcomes

	All Individuals		High-Risk		Low-Risk	
Type	Mean	Impact	Mean	Impact	Mean	Impact
Downstream Care, Administrative Data						
ED Visits, Not Admitted, Conditional on One ED Visit	1.8	-0.28** (0.14) -15.2%	2.0	**-0.48**** (0.19) -26.3%	1.6	**-0.12** (0.20) -6.4%
ED Visits, PCP Treatable, Conditional on One ED Visit	1.7	-0.27* (0.14) -15.9%	1.8	**-0.43**** (0.17) -25.3%	1.6	**-0.13** (0.20) -7.6%
ED Visits Admitted, Conditional on One ED Visit	1.5	0.098 (0.20) 6.5%	1.8	0.25 (0.32) 16.3%	1.083	-0.083 (0.083) -5.5%
Tot. ED Charges, Conditional on One ED Visit	3352.05	-743.93** (337.20) -22.2%	4041.46	**-1347.60**** (555.27) -40.2%	2744.06	**-227.57** (410.32) -6.8%
Winsorized ED Charges ($)	610.8	-143.5** (65.8) -23.5%	875.2	**-346.0**** (123.5) -56.6%	452.2	**-22.4** (74.9) -3.7%
Log ED Tot. Charges	1.6	-0.16 (0.12) -10.0%	2.0	**-0.45**** (0.21) -28.2%	1.3	**0.015** (0.15) 0.94%
Inpatient Visits	0.068	0.0067 (0.013) 9.7%	0.12	0.026 (0.029) 38.3%	0.035	-0.0053 (0.012) -7.7%
Inpatient Charges ($)	2893.8	-937.5 (1043.1) -32.4%	3699.0	277.8 (1384.6) 9.6%	2410.8	-1672.6 (1423.0) -57.8%
IP Tot. Charges Winsorized	1519.2	-204.5 (390.1) -13.5%	2762.9	-321.0 (897.8) -21.1%	773.3	-136.6 (259.9) -9.0%
Tot. Charges	15819.1	-4330.2 (4565.6) -27.4%	16388.2	51.8 (5343.9) 0.33%	15296.3	-7839.3 (7482.5) -49.6%

Notes: Abbreviations: ED, emergency department; PCP, primary care physician. Outcomes are measured from SPARCS data. Treatment effects are quantified after the program ended, from July-December 2017. "ED Charges" includes individuals with zero charges over the period. "ED Visits" and "ED Visits PCP Treatable" include individuals with zero ED visits over the period. "Inpatient Charges" include ED charges from visits admitted through the ED. We control for the baseline level of the outcome less than 15 months before the intervention began on May 2016. Regressions are clustered at the couple level. Bolded estimates indicate that high-risk and low-risk estimates are significantly different at the 5% level. Family wise p-values are denoted by asterisks as follows: $^{*}p < 0.10$ $^{**}p < 0.05$

D.1 Bounding Non-Response

Table A7 estimates how treatment effects would change if treated non-responders had outcomes 0.1 standard deviations below the mean and control non-responders had outcomes 0.1 standard deviations above the mean. This implies a 0.2 standard deviation gap between the outcomes of control and treatment non-responders. In this scenario, treatment effects are smaller, but still significant. Our conclusions begin to significantly change when we assume a 0.3 standard deviation gap (treated non-responders had outcomes 0.15 standard deviations below the mean and control non-responders had outcomes 0.15 standard deviations above the mean). In this case, significance across effects is maintained except for the treatment effect on high-risk individuals with a PCP, which decreases to an insignificant 6.4% increase.

Table A7: Treatment Effect of Enrollment in ActionHealthNYC
Bounding Non-Response

	All Individuals		High-Risk		Low-Risk	
Type	Mean	Impact	Mean	Impact	Mean	Impact
Measures of Access, Follow-Up Survey, ± 0.1 sd						
Individuals With a PCP (%)	48.1	7.5**	50.7	**6.0****	46.6	**8.4****
		(1.4)		(2.2)		(1.7)
		15.6%		12.4%		17.5%
Individuals With at Least One Visit to the Doctor (%)	79.0	8.9**	81.8	**7.3****	77.3	**9.9****
		(1.031)		(1.5)		(1.4)
		11.3%		9.2%		12.5%
Measures of Access, Follow-Up Survey, ± 0.15 sd						
Individuals With a PCP (%)	49.6	4.7**	52.2	3.2	48.0	5.7**
		(1.4)		(2.2)		(1.8)
		9.6%		6.4%		11.4%
Individuals With at Least One Visit to the Doctor (%)	80.2	6.9**	83.0	**5.2****	78.5	**7.9****
		(1.035)		(1.5)		(1.4)
		8.6%		6.5%		9.8%

Notes: Abbreviations: PCP, primary care physician; ED, emergency department. The Table displays results from the specification outlined in Section 4.1. Bolded estimates indicate that the low-risk and high-risk estimates are statistically different at the 5% level. The mean represents the control mean during the treatment window. Regressions control for baseline values of the outcome. Family wise p-values are denoted by asterisks as follows: $^{*}p < 0.10$ $^{**}p < 0.05$.

Appendix E Details of Health Valuation Calculation

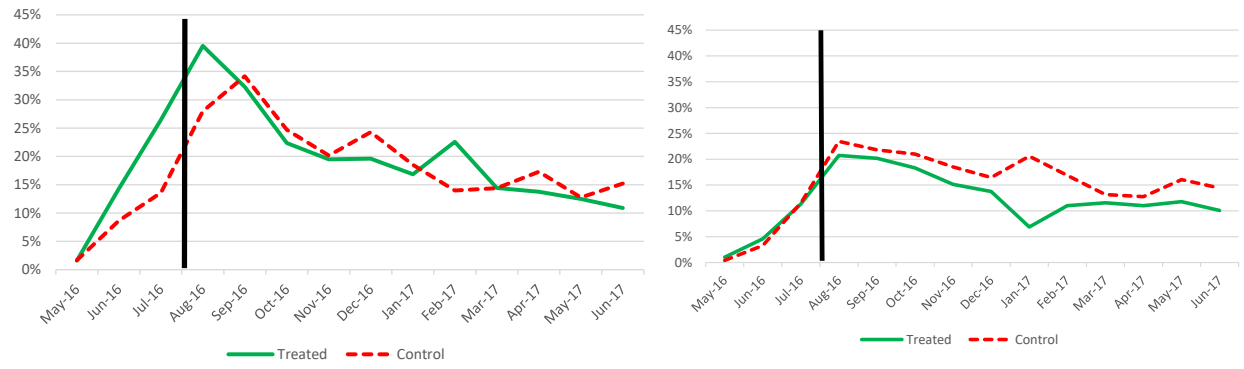
E.1 Gains in Intermediary Health Outcomes Among Clinic Visits

Figure A5 focuses on services delivered to individuals per visit by normalizing by the total number of treated and control individuals visiting clinics. The Figure shows that, conditional on visiting, the timing of visits and referrals are similar between treated and control groups. Table A8 compares treatment and control individuals visiting our nine clinics. The Table shows that the rate of screens and chronic condition diagnoses is similar among treated and control individuals, conditional on visiting one of our clinics, with both significantly increasing in response to having a clinic visit.

Figure A5: Clinic Utilization Data

(a) Rate of Primary Care Visits at Clinics Treated v. Control

(b) Rate of Specialty Visits Referred by PCPs Treated v. Control



Notes: The green solid line represents visits by the treated group normalized by the total number of treated individuals visiting a clinic and the red dashed line represents visits by the control group normalized by the total number of control individuals visiting a clinic. The black solid vertical line indicates the end of the ActionHealthNYC enrollment period, July 31, 2016. The Figure shows that treated and control individuals visiting clinics were treated similarly.

Table A8: Clinic Utilization Metrics
All Individuals Visiting One of Nine Clinics

	Treated	Control
Individuals Visiting Clinics (Count)	873	243
Preventive Screens		
Prob. Diabetes Screen, %	82.7	81.5
Prob. Blood Pressure Screen, %	92.2	94.7
Chronic Condition Diagnoses		
Any Chronic Condition Diagnosis, %	53.5	45.7
Alcohol SUD, %	19.2	9.1
Mental Illness, %	7.2	6.6
Diabetes, %	13.5	11.5
Hypertension, %	22.8	25.5

Notes: Abbreviations: SUD, substance use disorder. Underlying data only includes treated individuals visiting one of our nine clinics.

Table A9: Clinic Utilization Metrics
All Individuals

	Baseline Survey	Clinic Visit
Individuals Visiting Clinics (Count)		1,116
Preventive Screens		
Prob. Diabetes Screen, %	48.6	82.4
Prob. Blood Pressure Screen, %	47.3	92.7
Chronic Condition Diagnoses		
Any Chronic Condition Diagnosis, %	35.6	51.8
Alcohol SUD, %	0.54	17.0
Mental Illness, %	4.6	7.1
Cancer, %	0.81	1.2
Diabetes, %	9.9	13.1
Hypertension, %	18.5	23.4

Notes: Abbreviations: SUD, substance use disorder. Underlying data uses all individuals visiting one of our PCHs during the program window. Table shows that, conditional on visiting a clinic, the probability an individual had a diabetes screen increased 33.8 percentage points (pp) and that the probability an individual had a blood pressure screen increased 45.4 pp.

E.2 Number of Cardiovascular Deaths Averted

Blood Pressure:

$$.121 * (1080/0.93) = 140.5 \text{ deaths per } 100,000$$

0.121 percentage points (pp) is the increase in the probability an individual is given a blood pressure screen in response to being enrolled in ActionHealthNYC. According to Dehmer et al. (2017), 1,080 is the number of deaths averted through blood pressure screening (per 100,000) and 0.93 scales the estimate to the population (or a screening rate of 93% from Table A9).

Diabetes:

$$0.107 * (400/0.82) = 52.2 \text{ deaths per } 100,000$$

0.107 pp is the increase in the probability an individual is given a diabetes screen in response to being enrolled in ActionHealthNYC. According to Kahn et al. (2010), diabetes screens prevent 4 deaths per 1000 people and 0.82 scales the estimate to the entire population (or a screening rate of 82% from Table A9).

Therefore, in total, we estimate that ActionHealthNYC reduces cardiovascular-related deaths by 192.7 per 100,000 over a 40-year time horizon.[8] In annual terms, this translates to 4.8 deaths averted per 100,000. Applying our estimate to the base rate gives us a 12% mortality reduction in the number of cardiovascular deaths averted.

[8]We use a 40-year period as Dehmer et al. (2017) and Kahn et al. (2010) model the screenings from age 18-30.