Net Benefits of Hospital-Sponsored Health Care for the Homeless: Cost-Benefit Analysis of a Demonstration Project

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Abstract

Homeless and transitionally housed persons face substantial barriers to obtaining medical care. Consequently, many of their medical needs remain unmet and the care they do receive is often through emergency department (ED) visits and hospitalizations resulting in substantial uncompensated hospital expenses. Using a propensity-score matched comparison group, we assess how Helping Educate and Link the Homeless (HEALTH), a hospital-based outreach program, affected the overall utilization of hospital services by participants over a two-year period. Our findings suggest that HEALTH offers net savings to the hospital and even larger net benefits to society when quality-of-life benefits for participants are imputed.
The homeless often face high barriers to obtaining medical care. In a national survey of the homeless, 73 percent of respondents reported unmet health needs (Baggett, O’Connell, Singer, & Rigotti, 2010). Another national survey found that over the prior year 32 percent visited emergency rooms, 23 percent had been hospitalized, 25 percent were unable to obtain necessary care, and 32 percent who had been prescribed drugs were unable to adhere to the treatment plan (Kushel, Vittinghoff, & Haas, 2011). The high rates of emergency room use and hospitalization impose large costs on medical care providers that ultimately contribute to higher medical costs for everyone as providers eventually pass along most uncompensated care costs to all patients via increased health insurance premiums. The health conditions and barriers to effective medical care are further complicated by high rates of mental illness and substance abuse among the homeless (Larimer et al., 2009) as well as high rates of functional vision impairment (Gelberg, Andersen, & Leake, 2000). Compared to housed persons, the homeless have higher rates of hospitalization, longer average hospital stays, and higher rates of re-hospitalization (Levy & O’Connell, 2004). In view of these health conditions and limitations to medical care it is not surprising that the homeless have a substantially higher mortality risk than the general population (Morrison, 2009). Providing accessible and more effective medical care to the homeless thus has implications not only for their morbidity and mortality, but also for the costs of medical care borne initially by providers and ultimately by all health care consumers.

In 2009, two Madison, Wisconsin physicians and community partners created an outreach program to address some of the barriers to accessing healthcare among the homeless and transitionally housed (Helping Educate and Link the Homeless, or HEALTH). Staffed by a part-time physician medical director (30 hours/month), a full-time nurse, and 45 volunteers, the program offered basic health screening, case management, and referrals to primary or acute care
providers. The HEALTH nurse, employed by the affiliated hospital’s home health agency, captures enrollment and contact actions in the patient’s electronic health record.

The HEALTH program began by rotating through the city’s primary homeless shelters three evenings per month, and making numerous visits to sites where daytime meals are provided to the homeless population. Critical to the success of enrolling and treating homeless individuals with medical needs was the fact that the HEALTH nurse was available each weekday at a primary site located in donated space adjacent to the city’s largest food pantry and daytime drop-in shelter (an old Quonset hut known simply to clients as “The Hut”). The nurse, assisted by rotating nursing students, volunteer physicians, and staff, provides the following services: basic health screenings, assessment, and treatment of acute and chronic illnesses that are non-emergent, mental health assessment and treatment, influenza vaccinations, assistance with Medicare and Medicaid applications, prescription updates, health counseling and education, basic health supply provision, advance medical directives, primary care provider coordination, and assistance with housing applications. In particular, brief encounters at the shelters could be followed up with more extensive help in acquiring insurance or other services, rechecking blood sugars or blood pressure, wound care, and other routine medical care.

Patients self-select or are referred to the program by hospital discharge planners, shelter managers, or case workers. As the program matured, the primary point of contact with new clients shifted from the shelter-based rotating clinics to patients arriving at the Hut on their own initiative, often directed by other homeless individuals or shelter personnel.

Homelessness presents unique challenges for scheduling appointments and ensuring compliance with care plans. HEALTH address these barriers to care by providing transportation vouchers to medical appointments, accompanying patients to the free pharmacy for low-income
patients, and involving homeless advocates in follow-up efforts. While the program focuses on treating patients with chronic conditions, first patient contact is typically a response to an acute or emergent health need. There is no limit on the number of HEALTH visits per patient.

Meriter Foundation, the charitable arm of Meriter-UnityPoint Health, funded the first four years of the program. HEALTH is now included in the hospital’s care coordination operating budget. This analysis drew attention to the number of discharged patients served through HEALTH and underscored the need for a more robust connection to this vulnerable population upon discharge. Today, discharge planners proactively connect hospitalized homeless patients to HEALTH. With the patient, the HEALTH nurse develops a plan for maintaining contact upon discharge, applying for health insurance, and connecting the patient to a permanent medical home. The HEALTH nurse maintains an active presence in shelters, meal sites, the HEALTH Hut and other sites where homeless individuals congregate. Meriter-UnityPoint Health provides care through a 448-bed nonprofit hospital, home health services, and a primary and specialty care group practice that provides care at eight community clinics.

Our goal was to evaluate the impact of HEALTH. We estimated the net social benefits of HEALTH and its fiscal impacts for the sponsoring hospital. Specifically, we assess the costs and benefits of HEALTH for the two-year period from November 2009 through November 2011. During this period, an estimated 550 homeless and unstably housed persons participated in the program beginning at various times and remaining in the program for varying lengths of time.

Our analysis proceeds as follows. First, we assess the benefits of HEALTH. To do so, we estimate monthly savings per participant in hospital costs based on a sample of HEALTH participants and a propensity-score matched comparison group. We also infer and monetize improvements in quality of life for participants based on better management of hypertension,
diabetes, and depressive disorder, which are common chronic conditions of homeless persons, as well as predicted reductions in criminal behavior resulting from mental health care. Second, we assess the costs of HEALTH in terms of hospital-funded operations, volunteer time, donated facilities, and increased utilization of primary care. Third, we estimate social net benefits and fiscal impacts HEALTH. As is common in the comprehensive assessment of the costs and benefits of health and social policy interventions, our assessment of HEALTH involves many uncertain parameters including the impacts and the shadow prices used to monetize them. To take account of these uncertainties, our cost-benefit analysis is structured as a Monte Carlo simulation that provides a predicted distribution of net benefits (Vining & Weimer, 2010). Fourth, we address the limitations of our analysis both in terms of limitations in data and excluded benefits. Finally, we discuss the implications of the analysis for improving health care for the homeless.

**Benefits of HEALTH**

The primary benefits of HEALTH are avoided costs of emergency and inpatient services utilized by HEALTH participants, improved quality of life of HEALTH participants, and avoided costs of crimes committed by HEALTH participants.

**Reductions in Hospital Utilization: Data and Inference**

In order to estimate changes in hospital utilization, we constructed treatment and comparison groups to estimate the monthly change in hospital expenditures per HEALTH participant.

The treatment (HEALTH) group is made up of homeless or transitionally housed Meriter-UnityPoint Health patients (aged 18–64 years) who enrolled in the HEALTH program during the period between January 1, 2008 and December 31, 2011. We chose this four-year study period
because this was the period for which Meriter data were available both before and after HEALTH’s initiation in November 2009. To be included in the treatment group, patients had to have at least one Meriter visit record with associated charges before their enrollment in HEALTH. The comparison group is made up of homeless or transitionally housed Meriter patients (aged 18–64 years) who did not enroll in the HEALTH program between January 1, 2008 and December 31, 2011. To be included in the comparison group, patients had to have at least one Meriter visit record with associated charges before January 1, 2011. January 2011 is the mean HEALTH enrollment month for the treatment group. For the treatment group, the difference in hospital expenditures for each patient was measured before and after his or her participation in HEALTH. For the comparison group, the difference in hospital expenditures was measured before and after January 201. For both groups, "homeless and transitionally housed" patients were selected if their electronic patient record listed their address as a known homeless shelter or temporary housing facility in the Dane County area, or as "no known address" at any time during the period between January 1, 2008 and December 31, 2011. Insurance status for both the treatment and comparison groups were similar. Approximately 55 percent were enrolled in Medicaid or Medicare and 7 percent were privately insured. The remainder (38 percent) had no health coverage.

We employed two exclusion conditions. First, HEALTH participants who had fewer than three months of contact with the hospital before or after entering the program were excluded. Similarly, those in the comparison group who did not have three months of data before and after January 1, 2011, were excluded. These exclusions helped guard against including those who either left the Madison area or changed status so that they were not at risk for health services provided through the sponsoring hospital. Second, members of both groups who had large
expenditures in the before period were excluded because of concern that they were outliers who would show reduced expenses simply because of regression toward the mean. Specifically, those patients who had the 5 percent highest gross costs in the before period were eliminated.

The resulting sample consisted of 160 HEALTH participants and 594 comparisons. Table 1 describes the groups in terms of gender, age, and chronic disease conditions. As the comparison group has smaller percentages of patients with chronic conditions, propensity scoring was used to balance the samples. That is, scores for inclusion in the treatment group were estimated using the independent variables so that cases with comparable scores in the comparison and treatment groups could be matched in the statistical analysis. The propensity score was estimated using the variables age, sex, indicators for hypertension, alcohol abuse, diabetes, asthma, and mental condition, and the first and last months of contact. To achieve balance, the square and cube of age were also included.

To assess the effects of HEALTH on utilization, a simple difference-in-difference design was employed. For each patient, the difference between per month utilization in the after period and per month utilization in the before period was computed. Measures were constructed for emergency department visits, hospitalizations, days of hospitalization, and gross hospital charges. The impact of HEALTH on these measures was estimated using radius matching based on the propensity scores.

Table 2 summarizes the results. The table suggests offsetting effects on health care utilization. While emergency room visits per month increased for HEALTH participants relative to the comparison group, the number of hospitalization per month and number of hospital days per month decreased for HEALTH participants relative to the comparison group. The net effect on gross hospital charges per month, which reflects both emergency department visits and
hospitalizations, decreased for HEALTH participants relative to the comparison group. The decrease in gross charges per month was $209 larger for HEALTH participants than for the comparison group. As the mean gross charges per month for the entire sample in the before period was $482, this difference is substantively meaningful.

This estimate is somewhat imprecise, yielding a one-sided p-value of .07, which by convention would not result in rejecting the hypothesis that there was no difference in decreased charges per month between the HEALTH and comparison group participants. However, the relevant hypothesis in this analysis is not about this particular impact, but rather whether or not net benefits are positive. Consequently, the estimated reduction, along with its standard error, are employed in the Monte Carlo simulation to estimate the distribution of net benefits, which is preferable to assuming that both the reduction and its standard error are zero. Specifically, we draw values for per month savings for participants from a normal distribution centered at $209 with a standard error of $135. The value of monthly saving drawn from this distribution is applied to the 550 HEALTH participants assuming an average participation period of 12.1 months as estimated from the participant sample.

**Improvement in Quality of Life: Imputed Values and Shadow Prices**

The HEALTH program has potential to alleviate some degree of suffering and reduce impediments to stability and independence, improving the overall quality of life of participants. A primary mechanism for improved quality of life is the better management of chronic diseases through access to primary care—HEALTH personnel estimate that the 80 percent of participants who are connected to a primary care provider after entering the program visit the provider on average four times per year.
The quality of life improvement to participants is difficult to measure and monetize. In this analysis, we measure improvement in quality of life in terms of quality-adjusted life-years (QALYs). The use of QALYs facilitates the monetization of the impact of improvement in health on quality of life over the period of one year. We estimate the number of HEALTH patients affected by three conditions commonly found in homeless populations—hypertension, diabetes, and depressive disorder (as representative of mental illness more generally) and calculate the potential benefits (in terms of increased utility) of disease management to improve health. We assume the following gains in QALYs from disease management: hypertension, .83 to 1.0 (Carlos, Axelrod, Ellis, Fendrick, & Fendrick, 2003); diabetes, .57 to .91 (Huang, Brown, Ewigman, Foley, & Meltzer, 2007); and depressive disorder, .33 to .78 (Sapin, Fantino, Nowicki, & Kind, 2004). For each of these conditions, we assume that the 80 percent of HEALTH participants who receive primary care have their conditions managed and that the effectiveness of this management ranges uniformly from zero to one. Thus, we assume that on average about half of those receiving primary care realize utility gains from disease management. Multiplying the percentages of HEALTH participants with each condition, times the utility change from management, times the 80 percent, times the average 12.1 months of participation yields an average gain of approximately 49 QALYs.

To monetize changes in QALYs the dollar value of a life year (VLY) is needed. Although not commonly used in the assessment of alternative health interventions, VLY is used by federal regulatory agencies in the cost-benefit analyses of proposed rules. For example, the Food and Drug Administration previously used $100 thousand (Evans, Tavakoli, & Crawford, 2004) and for the last six years has used $200 thousand (in 2006) as its estimate of VLY (C. Nardinelli, personal communication, November 26, 2012). An amount closer to $250 thousand would be
more consistent with economists’ estimates of the value of a statistical life for a middle-aged U.S. adult of median income. Within the cost-benefit framework, VLY should be based on individuals’ willingness to pay for reductions in mortality risk. As this willingness to pay depends on income, using an estimate from the general population would not be appropriate for the very low-income homeless population. Therefore, we take the following approach to estimating VLY for HEALTH participants. First, we estimate annual income from all sources for the homeless and transitionally housed to be $6,120 based on an Urban Institute study (n.d.). Second, we use a range of estimated income elasticities for people’s willingness to pay for reductions in mortality risk ranging from 1.0 to 2.0 (Hammitt & Robinson, 2011). These assumptions imply a VLY for the HEALTH population between $3,550 and $29,790. In the Monte Carlo analysis, we monetize the QALYs gained from disease management by drawing from a uniform distribution over this VLY range.

**Reduced Costs Associated with Crime**

A benefit of HEALTH is a lower rate of incarceration due to mental health treatment for participants who would potentially commit crimes in the absence of treatment. Indeed, it is not uncommon for HEALTH to be the first point of health care contact for recently released inmates because in Wisconsin they are provided a very limited supply of medications (be it for mental health or other diseases) upon release and frequently do not have the means to obtain stable health care. In addition to the reduced costs of incarceration, there are general costs to society associated with crime that could also be avoided. For example, quality of life improves for citizens as the crime rates decrease and costs are avoided for potential victims. These benefits are monetized in our analysis using the Washington State Institute for Public Policy’s estimate of the
ratio of crime-reduction benefits to society for every dollar spent on evidence-based mental health care treatment of $0.26 (Aos, Mayfield, Miller, & Yen, 2006).

Thirty-five percent of HEALTH participants were diagnosed with mental health conditions. Eighty percent of these participants received primary care. We assume that the fraction of care they receive that is evidence-based treatment for mental conditions is drawn from a uniform distribution between 0.5 and 1. The product of these fractions is then applied to the estimated amount spent on primary care to get the fraction of primary care expenditures devoted to evidence-based treatment of health conditions. To estimate the value of reduced crime, we multiply this amount by .26.

**Costs of HEALTH**

Costs accrued by HEALTH fall into four categories: operating costs, the value of volunteer time, the value of donated items, and the cost of increased utilization of primary care resulting from program referrals. All of these categories involve opportunity costs for society and are thus appropriately included in net social benefits even though only the operating costs are directly borne by the sponsoring hospital.

**Program Operations**

Administrative costs for HEALTH include salaries and fringe benefits for a full-time registered nurse, part-time medical director, and part-time administrative assistant. The operations budget also includes laboratory and imaging expenses, the cost of medications that are not donated, and transportation vouchers for patients. Start-up expenses for HEALTH include the cost of computers and medical equipment (amortized over ten years) and office supplies. We estimate the direct HEALTH program operating costs to be $403 thousand dollars for the two
years of operation. We allow this estimate to vary plus or minus 10 percent over a triangular distribution in the Monte Carlo analysis.

**Value of Program Volunteer Time**

Volunteers are an integral part of HEALTH operations. HEALTH volunteers have a wide variety of skills and provide a variety of services to HEALTH participants. The HEALTH volunteer pool includes physicians, nurses, social workers, case managers, nurse practitioners, administrators, optometrists, dentists, information systems specialists, physician assistants, physical therapists, occupational therapists, and students (Helping Educate and Link the Homeless Program, 2011). Even though the services of volunteers do not result in a direct expenditure by the HEALTH program, volunteered time has an opportunity cost for the volunteers themselves, and time donated to HEALTH probably results in less time donated to other volunteer activities. The volunteers’ contributions to the program would also have to be accounted for if the program were replicated.

Over the two-year period, 1,654 hours of labor were donated. We were able to value the donated hours in terms of occupational wage rates available from the Bureau of Labor Statistics for 2012. Assuming that the fringe benefit cost rate is 30 percent and that the distribution of occupations was similar during the prior year, we estimate of the opportunity cost of volunteered time to be $110,220. However, this should be viewed as an upper bound estimate because some volunteers likely place a positive value on their participation that offsets their opportunity cost. To allow for this possibility, we assume that the opportunity cost of volunteer time is uniformly distributed between this upper bound and one-half that amount.
**Value of Program Donations**

HEALTH receives donations from various organizations and individuals. Donated items include medical equipment, medications, and office supplies. The building space, cost for utilities, and insurance costs are also donated by the Society of St. Vincent De Paul. Similar to volunteer hours, these items have an opportunity cost, and they would have to be accounted for in the budget if the program were replicated. We estimate the value of HEALTH program donations to be $86,760 over the two years. This is a cost of the program from the perspective of society. We allow this estimate to vary plus or minus 10 percent around this mode according to a triangular distribution in the Monte Carlo analysis.

**Increased Utilization of Primary Care**

HEALTH patients increase utilization of primary care to treat and gain knowledge about their illnesses. The HEALTH program facilitates patients’ use of primary care by making referrals to clinics in the Madison area. The costs associated with primary care are represented by the charges incurred by HEALTH patients at primary care visits. These charges are paid by private insurers, federal and state insurers, primary care facilities in the form of uncompensated care, or by the HEALTH patients themselves. No matter the source of these expenditures, they represent a cost to society.

HEALTH personnel estimate that the 80 percent of participants who are connected to a primary care provider after entering the program visit the provider on average four times per year. Assuming an office-based visit involves costs of $77 on average (Machlin, 2006), we estimate the cost of the increased utilization of primary care to be $257,500 over the two years. In the Monte Carlo analysis, we assume a triangular distribution with this mode over the range of $128,750 and $386,250, corresponding to two and six visits, respectively.
Monte Carlo Simulation of the Distribution of Net Benefits

To estimate the distribution of net social benefits, 10,000 Monte Carlo trials were conducted. In each trial, values for the various categories of costs and benefits were drawn from their specified probability distributions. Figure 1 shows the distribution of net social benefits; Table 3 displays summary statistics for the cost and benefit categories and net benefits from the perspectives of society, Meriter-UnityPoint Health, and other hospitals considering replication of HEALTH for their homeless patients.

As shown in the first column of Table 3, the estimated social net benefits from HEALTH have an expected value of $1.44 million with a standard deviation of $1.05 million. The expected positive net social benefit indicates that the project would be desirable in terms of promoting the goal of efficiency. HEALTH would also appear to be a good bet in that the Monte Carlo simulation suggests that, conditional on the assumed distributions of the components of costs and benefits, there is a 92 percent chance of positive net benefits actually being greater than zero.

Does HEALTH make financial sense for Meriter-UnityPoint Health? The second column of Table 3 shows the expected net benefit of $994 thousand counting only operating cost and avoided hospital costs with an 86 percent probability of at least breaking even. This suggests that continuation of HEALTH is financially desirable for Meriter-UnityPoint Health.

Would a similarly situated hospital likely reap similar gains? To answer this question, we assume that the replicating hospital would bear all the social costs of the program. That is, a replicator would have to pay for volunteer time, donations, and additional primary care costs that do not appear in the Meriter-UnityPoint Health accounting.

We also make two assumptions about the effectiveness of the program. First, we assume that the replicator would be as effective as HEALTH in realizing avoided hospital costs. Under
this assumption, replication would yield expected net benefits of $554 thousand with a 74
percent chance of yielding net benefits greater than zero. Under this assumption about
comparable effectiveness, replication seems a reasonable bet.

Second, we take account of findings from meta-analysis research indicating that
demonstration programs appear to provide larger impacts than programs implemented as part of
routine practice. In a demonstration project such as HEALTH, key personnel often act as
champions who put in extra effort to deal with problems that arise. Efforts to replicate, especially
public policies that induce replication, may not have such champions, resulting in smaller
impacts. Based on a review of delinquency programs, Mark Lipsey (2003) found effect sizes for
non-demonstrations to be about two-thirds of the effect sizes for demonstrations.\(^3\) Column 4 of
Table 3 reduces the impact of the replication on avoided hospital costs by two-thirds. Expected
net benefits fall to $101 thousand and only 57 percent of the trials have net benefits greater than
zero. (Applying the two-thirds reduction in avoided hospital costs to the estimation of social net
benefits reduces expected net benefits to $978 thousand with 89 percent of trials having positive
net benefits.)

**Study Limitations**

The assessment of the primary impact of HEALTH relied on retrospective analysis of
administrative health records. It thus offers a less confident inference than would be the case
from a prospective evaluation with random assignment of patients to HEALTH and a control
group. The design employed required imputation of changes in quality of life based on
predictions from the literature—a prospective study would enable evaluators to assess quality of
life before and after program participation.
A prospective design would also facilitate estimating several potential benefits of HEALTH that we did not monetize. Probably the most potentially consequential of these for the estimation of net benefits is possible gains in productivity. As a result of their improved health status, HEALTH participants may enter the labor force or increase their work hours. Traditional benefit-cost analyses count only increases in earnings due to higher wages and not those due to increased hours of work because the benefit to society is counterbalanced by the opportunity cost of the workers’ time. However, earnings gains might be fully counted as gains to society if they result from health improvements for a population like the homeless facing severe barriers to regular employment. Because improved health removes barriers to employment for individuals who want to work, the opportunity cost of the workers’ time is near zero, and all the gains from their increased earnings should be counted as benefits. Anecdotally, at least some HEALTH participants have achieved gainful employment directly as a result of their improved health status. However, absent direct observation of the employment experience of HEALTH participants and a comparison group, we were unable to estimate productivity gains.

Several other beneficial impacts were also excluded. One impact is the reduction in transmission of infectious disease, including influenza, whooping cough (B. pertussis), and tuberculosis, as well as infections associated with intravenous drug and sexually transmitted diseases such as HIV, viral hepatitis, syphilis, and gonorrhea. Reductions in disease transmission could be more significant for homeless populations in larger urban areas with higher rates of intravenous drug use and the accompanying HIV and hepatitis transmission risks than in Madison. Other non-monetized impacts include reduced dependence on government programs, exit from homeless shelters, increased wages for those homeless individuals currently employed, the “peace of mind” for HEALTH participants that results from the knowledge of guaranteed
access to health care, and the exclusion of longer-run health benefits from the management of chronic diseases beyond the two-year time horizon of the analysis. Inclusion of these impacts would likely increase the estimated net benefits.

Between November 2009 and December 2011, the HEALTH mobile clinic visited numerous community service sites in the Dane County area (shelters, food assistance programs, group homes, etc.) where homeless and transitionally housed individuals had the opportunity to enroll in the HEALTH program. We assume that members of the comparison group did not enroll in HEALTH because they did not happen to encounter recruitment during use of these services, did not have access to these particular community service sites, or simply chose not to enroll. The first reason reduces the chances of bias from unobserved differences between the treatment and control group. The latter two reasons suggest some caution as the choice not to participate or the lack of access to community service sites may signal some unobserved differences between the treatment and comparison groups.

The cost-benefit analysis privileges one social value, namely the efficient use of society's resources. Interventions to assist the disadvantaged, especially with respect to health care, may be justified on grounds of fairness, equity, or simply respect for human dignity. Thus, although the finding of positive net benefits for hospitals may promote the voluntary adoption of programs like HEALTH, and the finding of positive net benefits for society may broaden political support for public policies to promote programs like HEALTH, the benefits to the disadvantaged may themselves be judged large enough to justify such programs even if they do not show positive net benefits.

Discussion and Conclusion
Our findings provide insight into what is possible when prevention, treatment, and care coordination are delivered to homeless patients in tandem with other valued services. Our study suggests that hospitals may be able to adapt methods used by HEALTH to reduce the utilization cost of inpatient services for homeless and transitionally housed patients—indeed, HEALTH has become part of the operating budget of the hospital's care coordination unit. Although providing health care to the homeless is costly, the net social benefits of HEALTH suggest that it is desirable purely from an efficiency perspective, ignoring any value one may place on increasing access to basic health care for this disadvantaged group. Further, although with less certainty, its replication appears to offer net financial benefits to adopters, even if they fail to achieve as favorable results as those produced by HEALTH. Thus, public policy aimed at realizing the social net benefits of improved health care for the homeless and transitionally housed does not necessarily have to subsidize replications. Rather, making hospitals aware of the opportunity and facilitating their replication through the provision of information may be appropriate.

Previous interventions providing better care to the homeless to reduce their medical care utilization costs have typically focused on subsets of the population. For example, Housing First interventions have generally targeted homeless persons who have severe mental illness or substance abuse problems; a program in Seattle aimed at homeless persons with severe alcohol abuse problems appears to yield savings in medical care expenditures that exceed the costs of providing the housing (Larimer et al., 2009). HEALTH demonstrates that programs aimed at the general homeless population can also provide positive net benefits.

Prior to the Supreme Court ruling in National Federation of Independent Business v. Sebelius (2012), the provisions of the Affordable Care Act that extended Medicaid coverage to low income single adults would have provided the opportunity for many homeless persons to
enroll in health insurance. However, this decision made state participation in the Medicaid expansion optional. Hospitals in states that opt into the Medicaid expansion would find interventions like HEALTH valuable in enrolling eligible homeless in Medicaid before they incur uncompensated costs, especially as the Affordable Care Act substantially reduces payments under the Medicare and Medicaid Disproportionate Share Hospital programs (Graves, 2012). Hospitals in states that opt out of the Medicaid expansion may find adopting programs like HEALTH crucial for dealing with the substantial reductions in payments for uncompensated care that they will face.

Beyond providing substantive conclusions about HEALTH, we demonstrated how cost-benefit analysis can be used to assess the efficiency of health interventions by monetizing all major impacts, including changes in QALYs, rather than estimating cost-effectiveness ratios and implicitly valuing by setting a dollar per QALY threshold. As this approach involves numerous assumptions, it is most plausibly done through Monte Carlo simulation that yields a distribution of predicted net benefits.
## Tables

### Table 1: HEALTH and Comparison Group

<table>
<thead>
<tr>
<th></th>
<th>Comparison Group (N=594)</th>
<th>HEALTH Participants (N=160)</th>
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<tbody>
<tr>
<td>Mean Age (years)</td>
<td>36</td>
<td>40</td>
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<tr>
<td>Male (percent)</td>
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<td>Medicare/Medicaid (percent)</td>
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<td>No Insurance (Percent)</td>
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<td>Asthma (percent)</td>
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<td>Mental Condition (percent)</td>
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<td>35</td>
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<tr>
<td>Mean Months in Before Period</td>
<td>22.9</td>
<td>20.3</td>
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<tr>
<td>Mean Months in After Period</td>
<td>11.0</td>
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### Table 2: Impact of HEALTH on Change in Medical Utilization

<table>
<thead>
<tr>
<th></th>
<th>Estimated Change per Month of HEALTH Relative to Comparisons</th>
<th>Standard error</th>
<th>t-value (p-value, two sided)</th>
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<tr>
<td>Emergency Room Visits (per month)</td>
<td>.034</td>
<td>.019</td>
<td>1.81 (.07)</td>
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<tr>
<td>Hospitalizations (per month)</td>
<td>-.012</td>
<td>.007</td>
<td>-1.68 (.09)</td>
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<tr>
<td>Days of Hospitalizations (per month)</td>
<td>-.045</td>
<td>.034</td>
<td>-1.32 (.19)</td>
</tr>
<tr>
<td>Gross Charges (dollars per month)</td>
<td>-209</td>
<td>135</td>
<td>-1.54 (.13)</td>
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</table>
Table 3: Mean Costs and Benefits of HEALTH from Monte Carlo Simulation
In Thousands of 2011 Dollars (Standard Deviations in Parentheses)

<table>
<thead>
<tr>
<th></th>
<th>Social</th>
<th>Meriter-UnityPoint Health</th>
<th>Replication</th>
<th>Adjusted Replication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Cost</td>
<td>403 (16.5)</td>
<td>403 (16.5)</td>
<td>403 (16.5)</td>
<td>403 (16.5)</td>
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<tr>
<td>Value of Donations</td>
<td>87 (3.6)</td>
<td>–</td>
<td>87 (3.6)</td>
<td>87 (3.6)</td>
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<tr>
<td>Volunteer Cost</td>
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<td>83 (16.0)</td>
<td>83 (16.0)</td>
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<tr>
<td>Cost of Primary Care</td>
<td>258 (52.8)</td>
<td>–</td>
<td>258 (52.8)</td>
<td>258 (52.8)</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td>830 (57.9)</td>
<td>403 (16.5)</td>
<td>830 (57.9)</td>
<td>830 (57.9)</td>
</tr>
<tr>
<td>Avoided Hospital Costs</td>
<td>1,397 (907)</td>
<td>1,397 (907)</td>
<td>1,397 (907)</td>
<td>931 (605)</td>
</tr>
<tr>
<td>Quality of Care Benefits</td>
<td>837 (537)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Avoided Crime Costs</td>
<td>40 (11.5)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Total Benefit</strong></td>
<td>2,274 (1,049)</td>
<td>1,397 (907)</td>
<td>1,397 (907)</td>
<td>931 (605)</td>
</tr>
<tr>
<td><strong>Net Benefit</strong></td>
<td>1,444 (1,050)</td>
<td>981 (895)</td>
<td>554 (897)</td>
<td>101 (608)</td>
</tr>
<tr>
<td>Percent of Trials with Positive Net Benefit</td>
<td>92</td>
<td>86</td>
<td>74</td>
<td>57</td>
</tr>
</tbody>
</table>
Figure 1

Net Social Benefits of HEALTH

NB = 0

Net Benefits (thousands of dollars)
References


Larimer, M. E., Malone, D. K., Garner, M.D., Atkins, D. C., Burlingham, B., Lonczak, H. S.…. & Marlatt,


Sapin, C., Fantino, B., Nowicki, M., & Kind, P. (2004). Usefulness of EQ=5D in Assessing Health Status in Primary Care Patients with Major Depressive Disorder. *Health and Quality of Life Outcomes, 2*(1), 20–27.


Costs and benefits are expressed in 2011 dollars and a real discount rate of 3.5 percent is employed to convert costs and benefits to present values where appropriate.

Machlin reports $63 for an office-based visit (p.2), which we convert to $77 in 2011 dollars.

Lipsey also finds that random assignment research designs also report on average larger effects than quasi-experimental designs. However, other studies that compare designs within the same sample show little difference. See, for example, Cook, T. D., Shadish, W. R., & Wong, V. C. (2008). Three Conditions under Which Experiments and Observational Studies Produce Comparable Causal Estimates: New Findings from Within-Study Comparisons. *Journal of Policy Analysis and Management* 27(4), 724–750.

For example, Burton Weisbrod (1981) argues that all earnings gains by individuals with mental health problems may be counted as societal benefits for two reasons. First, the opportunity cost of workers’ time may be near zero given their obstacles to employment. Second, because individuals with mental illness often struggle to retain employment, an increase in hours worked resulting from individuals’ improved ability to maintain employment would not be offset by the opportunity cost of their time. This logic is easily extended to homeless individuals struggling with physical health problems.