HHS Public Access

Author manuscript

Health Aff (Millwood). Author manuscript; available in PMC 2023 March 01.

Published in final edited form as:

Health Aff (Millwood). 2022 March ; 41(3): 406–413. doi:10.1377/hlthaff.2021.00449.

Evaluating a Non-Emergency Medical Transportation Benefit for Accountable Care Organization Members

Seth A. Berkowitz, MD MPH[1,2], **Katharine Ball Ricks, PhD, MPH**[2], **Jingyan Wang, MBA, MSEE, MSIE**[3], **Morgan Parker**[2], **Ram Rimal, MS**[3], **Darren A. DeWalt, MD, MPH**[1,2]

[1] Division of General Medicine and Clinical Epidemiology, Department of Medicine, University of North Carolina at Chapel Hill School of Medicine, Chapel Hill, NC

[2] Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill, Chapel Hill, NC

[3] Enterprise Analytics and Data Sciences, UNC Health Care System, Morrisville, NC

Abstract

Non-emergency medical transportation benefits, often using app-based ridesharing services, are increasingly being offered as part of population health management programs. However, the impact of these programs on healthcare use and costs remains understudied. We conducted a mixed methods evaluation of a non-emergency medical transportation benefit offered to members of a Medicare Accountable Care Organization within a large academic health system. Participation in the transportation program was associated with greater per person per year outpatient visits (9.2, 95% confidence interval [CI] 0.2 to 18.2), and outpatient spending ($4420, 95% CI $722 to $8119). However, there was no difference in inpatient admissions or emergency department visits, and the program was not cost saving. Qualitative analyses revealed that participants were highly satisfied with the program, reporting that the program eased financial burdens, made them feel safer, more empowered, and better able to take control of their health. These findings suggest that though transportation programs are commonly introduced to contain healthcare spending, it may be better to think of them as programs to improve healthcare access for individuals facing difficult circumstances.

Healthcare is frequently fragmented for many individuals in the U.S.[1] For example, individuals may have difficulty seeing the same set of providers, or attending regularly scheduled follow-up appointments. A commonly reported cause for this is transportation barriers, which prevent patients from attending scheduled outpatient medical appointments.[1–4] Prior research demonstrates that transportation barriers are associated with worse continuity of care, less use of regular outpatient care, more use of the emergency department, and more readmissions—all of which may result in higher cost to individuals and third-party payers.[3,5,6]

While non-emergency medical transportation (NEMT) is frequently offered through Medicaid, increasing recognition of transportation barriers faced by individuals with other types of insurance coverage, such as Medicare, has led to innovative programs that seek to overcome these barriers.[7] These programs often use smartphone application-based (or “app-based” for short) ridesharing programs, which are marketed as offering more affordable

and scalable implementation than traditional transportation services.[8] The premise for many of these programs is to increase attendance for outpatient medical appointments. As the conventional wisdom is that many inpatient admissions and emergency departments can be prevented through outpatient medical care[9–11], improving outpatient visit attendance could reduce inpatient admissions, emergency department visits, and healthcare costs.

Whether the elements of this premise are supported in practice is unclear. A prior study that examined a transportation program not targeted to those with transportation barriers found no effect on clinic attendance.[12] However, there is little systematic evidence regarding the impact of transportation programs for Medicare beneficiaries.[13] Given their growth in use and potential benefits, it is important to understand if the programs are having their intended effect. If they are not, resources may be better spent on different types of programs that could also overcome transportation barriers, such as telemedicine, home visiting, or cash assistance.

To inform healthcare benefit design, we sought to understand the changes in healthcare use and cost associated with a transportation benefit offered to members of a Medicare Next Generation Accountable Care Organization (ACO), and obtain participants' perspectives on the program.

Methods

Setting and Participants

This was a mixed methods study that used two cohorts of Medicare beneficiaries who were empaneled within the UNC Health Alliance ACO. For quantitative analyses, eligible participants were those who were members of the ACO from Jan 1, 2017 to December 31, 2019. Those who used the ACO's transportation benefit were considered the intervention group, while members who did not utilize the program during the same time period were the comparison group. For qualitative analyses, participants were those who were active ACO members and transportation program users between June 1 and August 31, 2020.

Description of the Transportation Program

The transportation benefit is only available to members of the ACO, which is the primary eligibility criterion. ACO members are Medicare beneficiaries not currently participating in a Medicare Advantage program. The transportation benefit was designed to be utilized by ACO members who develop a combination of clinical and social circumstances such that they need to attend healthcare appointments but, without provided transportation, would be unable to do so. Clinical conditions the program was designed to help users address included asthma, cancer, COPD, dental problems, depression, diabetes, end-stage renal disease, heart disease, or hypertension. However, any ACO member could have needed to use the program. Of note, while Medicaid does provide NEMT for full beneficiaries, some individuals dually eligible for Medicare and Medicaid have only partial Medicaid benefits that do not include NEMT.[14] Thus some dually eligible individuals may have needed the ACO transportation benefit.

The program facilitates non-emergency transportation to and from ambulatory settings, outpatient settings, and pharmacies. Transportation coordinators work with enrolled patients, who can request transportation by phone, email, or electronic health portal. Transportation requests can be made the same day ('stat') or scheduled in advance. In addition, clinical staff and case managers can request or arrange transportation for enrolled patients, and transportation coordinators will work with the patient to ensure they are informed. Transportation is available between 8am and 5pm Monday through Friday, and is not available outside of those hours or on scheduled holidays that result in outpatient clinic closures. There is no maximum number of rides an enrolled patient may receive, although for more than 4 trips greater than 20 miles per month, physician approval is required. There is no patient cost-sharing. Most rides are accomplished in standard vehicles by ride-share drivers, but for patients with medical needs that cannot be accommodated in these vehicles (e.g., wheelchair use), alternative arrangements are made.

Quantitative Methodology and Analyses

More technical methodological details and a study design schematic (eExhibit 1) for quantitative analyses are given in the appendix.[15] The transportation benefit began on July 1, 2017. To ensure sufficient pre-intervention data, we restricted study eligibility to those with at least 6 months of continuous ACO membership prior to use of the transportation benefit. We included all intervention participants who were enrolled in the program by June 30, 2019, and follow-up ended December 31, 2019. Data came from Medicare claims[15] and healthcare system data. From these sources we extracted data including sociodemographics, ICD-10 diagnostic and CPT procedure codes, healthcare use (inpatient, emergency department, outpatient visits), and cost of care. Cost of care includes both payments made to the ACO by CMS and what patients are asked to pay to the ACO.

Quantitative outcomes were counts of outpatient visits, inpatient hospitalizations, and emergency department visits, costs associated with each of these visit categories, and total costs related to healthcare utilization. We express these outcomes on a per person per year basis.

For analysis, we categorized all ACO members as either transportation benefit users or non-users. Individuals were analyzed according to their group categorization, regardless of whether they subsequently stopped using the program. Next, we assigned all participants an index date that demarcated pre- and post- intervention periods. For those who received the benefit, their index was the date of their first ride. Those who did not use the benefit were assigned a random index date. Next, in order to account for potential confounding, we used pre-index date data to estimate each participant's probability of using the transportation benefit (the propensity score). To summarize the large volume of data contained within the healthcare claims (e.g., ICD-10 diagnostic and CPT codes), we used the high-dimension propensity score approach of Schneeweiss et al.[16,17] This approach uses a machine learning algorithm to create indicator variables of ICD-10 and CPT code occurrence and frequency, and select those variables most likely to lead to bias if not accounted for.

The high dimensional propensity score model included both predetermined variables and algorithm-selected variables. The predetermined variables were: age, gender, race/

ethnicity as potential indicators of the experience of racism, clinical comorbidities (end stage renal disease, congestive heart failure, asthma, hypertension, depression, diabetes, chronic obstructive pulmonary disease, dental problems, and cancer diagnoses [constructed based on ICD-10 codes, and erring on the side of sensitivity]), indicators of disability status and Medicare/Medicaid dual eligibility, hierarchical condition category (HCC) score, and separate counts of pre-index date hospitalizations, emergency department visits, and outpatient visits.

We then used the propensity score to construct overlap weights.[18,19] These weights equaled the propensity score for those who did not receive the intervention, and 1- the propensity score for those who did receive the intervention. In order to examine balance between the intervention and comparison group, we used the standardized mean difference (SMD)—the absolute value of the difference in the mean outcome divided by the standard deviation of the groups. An SMD < 0.10 indicated acceptable balance. The estimand produced with overlap weighting is called an Average Treatment Effect in the Overlap Population (ATO), which can be thought of as the average treatment effect among individuals at clinical equipoise with regard to use of the transportation program.[18,19]

We then fit weighted regression analyses comparing post-intervention outcomes for the intervention versus the comparison group. In addition to incorporating weights, models adjusted for the index date (to account for secular trends) and the duration of follow-up (to account for varying amounts of time that participants would have to accrue healthcare use or costs). For analyses of utilization outcomes we fit negative binomial regression models. For analyses of cost outcomes, we fit gamma regression models. To produce estimates of the absolute differences in outcomes between groups, we used the method of recycled predictions as implemented by the ‘margins’ package in R. To see if there may have been ‘pent up demand’ that led to high utilization in the intervention group in year 1 followed by declining utilization in year 2, we conducted sensitivity analyses comparing the year 2 (follow-up days 366 to 730) utilization and cost between the intervention and comparison group. Analyses were conducted in SAS version 9.4 and R version 3.5.3. We considered a two-sided p-value < 0.05 as statistically significant.

Qualitative Methodology and Analyses

To help contextualize results of the quantitative analyses, we conducted semi-structured interviews with a random sample of transportation program users, in order to engage their perspectives on the program.

We conducted 21 telephone interviews of approximately 30 minutes duration with transportation program users (75 participants contacted, response rate = 28%). Interviews were recorded with permission, transcribed verbatim, and analyzed using ATLAS.ti 8.0. Analysis occurred concurrently with data collection to ascertain when thematic saturation was reached. Two trained study staff members, working in parallel, began by open-coding the transcripts to form initial categories using an inductive approach.[20] During coding meetings, constant comparison[21] was used to iteratively refine categories, and to organize emergent major and minor themes. The qualitative data were used to enhance the understanding of the quantitative findings.

The Institutional Review Board at the University of North Carolina at Chapel Hill reviewed and approved this study (#19–3432 for quantitative analyses, and #19–2607 for qualitative analyses).

Limitations

This study has several limitations that should be considered when interpreting its findings. First, participation in the transportation program was not assigned at random. Though we accounted for a robust set of factors that could confound the association between program participation and study outcomes, residual confounding is an important consideration. Second, this was a single-site study, with an intervention targeted to traditional Medicare beneficiaries with a specific combination of clinical and social circumstances. Whether the findings of this study generalize to other sites and/or other populations is unknown. Third, mean follow-up of transportation program participants was about 19 months. We do not know whether longer follow-up would lead to different conclusions, but this is possible. In studies of Medicaid expansion, those who gained insurance coverage initially saw higher utilization of healthcare, which subsequently declined as 'pent-up demand' was met, and chronic disease management interventions had time to take effect.[22] Transportation barriers could play an analogous role in artificially reducing healthcare use, leading to high use once these barriers are removed. Fourth, the relatively low number of program users may have contributed to uncertainty in estimates of utilization and cost associated with program participation. Fifth, we did not have access to medication dispensing data.

Results

Quantitative Results

There were 197 users of the transportation program, of whom 173 met study eligibility criteria (87.8%). The most common reason for exclusion was insufficient pre-intervention observation (n = 17). 11,660 comparison group members met eligibility criteria, for an overall sample size of 11,833. Exhibit 1 and eExhibit 2[15] present selected demographic and clinical characteristics of the study sample. eExhibit 3[15] presents statistics related to use of the transportation program. The mean cost per person per year was $517 (SD: $1271), and the mean number of rides was 30 (SD: 53). eExhibit 4[15] presents data on follow-up.

In unweighted analyses, those who participated in the transportation program had significantly greater costs and utilization for all categories (Exhibit 2 and eExhibit 5[15]).

Exhibit 3 presents results from weighted regression analyses that adjust for follow-up and index date (full models are in eExhibit 6 and 7)[15]. Participation in the transportation program was associated with greater outpatient visits (9.2 visits per person per year, 95% confidence interval [CI] 0.2 to 18.2, p = 0.04), and greater outpatient costs ($4420 per person per year, 95%CI $722 to $8119, p = 0.02).

Participation in the transportation benefit program was not associated with differences in inpatient admissions (0.1 hospitalization per person per year, 95% CI −0.2 to 0.4, p = 0.71) or emergency department visits (0.3 visits per person per year, 95% CI −0.3 to 0.9, p = 0.29). Similarly, participation was not associated with differences in costs related to inpatient

admissions ($1286 per person per year, 95%CI $ −2962 to $ 5534, p = 0.55) or emergency department visits ($47 per person per year, 95%CI $ −323 to $ 418, p = 0.80).

Participation in the transportation program was not associated with significantly different total costs ($5941 per person per year, 95%CI $ −540 to $12421, p = 0.07). The estimated difference in outpatient costs represented 74% of the estimated difference in total costs.

There was no evidence for greater benefit of the transportation program in the second year of follow-up (eExhibit 8[15]).

Qualitative Results

Qualitative analysis revealed 5 themes (eExhibit 9[15]): financial burden, burden to others, empowerment/independence, safety and convenience, and satisfaction with the program.

Financial Burden—Participants noted that, despite being Medicare beneficiaries, healthcare was still a substantial out of pocket expense for them. Some felt that getting to the doctor's office was not only a logistical barrier but also financial barrier. However, the transportation program freed up resources that could be spent on other needs, such as food, medication, and other household bills. One participant noted:

> "Because at first when I used to go to my doctors' appointments, I had to ask people to take me and pick me up, and then I'd tell them I'd pay them later. So, when I'd get my check on the first, I'd have to pay them. So that's cutting into my bill money. And now, I was complaining because I kept missing a lot of my appointments. And I was telling my doctors, discussing, if I had a ride, I wouldn't miss none of my appointments. So, I think that transportation, so that helped me a lot."

Burden to Others—A second theme was that transportation barriers negatively affected relationships with others. Participants appreciated that the transportation program freed them from feeling like a burden on family and friends. One woman simply stated "I get tired of depending on people." Another participant noted:

> "And you know how some people don't want to do it, and then sometime they like, "Yeah, I'll do it," but after they do it, they talk about it. So, it's hard for me to get to the grocery store or to go shopping for my household stuff or go pay my rent. Sure, yeah. And then, do you think this affects your personal relationships by relying on other people like that?"

One woman spoke of how it feels not to be a burden to her family and the stress that the transportation benefit relieves:

> "Anytime you need to go somewhere and you don't have a car, my son and his wife works. I'm not invading his job, which I used to do all the time. We're able to make that appointment and go to the doctors and don't worry about nothing. Because there is nobody in house for me and my husband when they go out and work. So, it is 100 to me, I really, really appreciate it."

Empowerment/Independence—Related to freeing participants from burdening others was a feeling that the transportation program empowered individuals to better engage in their healthcare and provided a sense of independence and control over their life circumstances. One participant noted:

> "It's actually been really good for my health... I was feeling really dependent and I was getting-- I think it was really putting me in a terrible position in terms of not-- it was really bad and there were times when I could not get to the doctor because she wasn't able to take me, and that's self-neglect when I really needed to be there….So not only did it get me to the doctor when I needed to get to the doctor and took care of medical needs when I couldn't rely on my family member, not only did I do that but I got out in the community. I met really interesting people which was really good for my mood. And as a result, my energy was improved, my socialization."

Participants expressed that meeting transportation needs could have positive spillover effects to other aspects of their life. They noted that their ability to deal with emergent and chronic stressors was increased because they had more emotional reserve to deal with whatever came up next. One woman stated:

> "I noticed that once my basic needs were met I started speaking up and taking care of myself more all along."

Another participant made the point that having basic needs met allowed one to feel hope in the future, hope in her situation, she stated:

> "It takes energy to just maintain yourself if your basic needs aren't being met and to handle the stresses and stuff. And if those needs aren't being met, then you can focus your energies in other places and you can focus on being-- well, you can focus on making perhaps a contribution to society, etc., etc. So, I think it'll lift your spirits and-- an important ingredient here is hope. And I think having basic needs met gives one hope, and I think hope is an important factor. Because if you're in despair, it's hard to move forward."

When asked how having reliable transportation had changed her relationship with her healthcare providers a participant stated:

> "Because they're so happy to see me that I be coming because if I didn't make my appointments, if I didn't go to my appointments and then keep ignoring it, lagging and lagging on and on and not going, they don't know how they can help me. And then my health could be deteriorating, getting worse. So now that I have a permanent ride, I make my appointments and it seems like I'm doing good. I'm doing better. They just making sure that I'm taking my medicine, that my body is right and nothing wrong. So yeah, having a ride is good."

Safety and Convenience—A fourth theme participants articulated was the program was both convenient and offered a measure of safety as they felt like they could now get to the doctor when needed. One noted:

> "I feel like I'm safe. And I feel like … I don't feel so stupid. I actually get to the doctor. As I start to move forward, I could go to the doctor. Hopefully, I don't stress to try to find somebody that I don't even know to get to the doctor. It's just been a whole-- God has blessed me with this."

Satisfaction with the Program—Participants were overall very satisfied with the program and did not offer suggestions for improvement. Regarding satisfaction, one participant noted:

> "The people who were doing the task of the driving and the calling and arranging the transportation they were great. They were really great. They were helpful."

Discussion

In this evaluation of a non-emergency medical transportation program for members of a Medicare Next Generation ACO, we found participating in the transportation program was associated with greater use of outpatient services. As the intended effect of the program was to enable better access to outpatient care for those with transportation barriers, these results are consistent with the program having the intended effect. However, we did not find that transportation program participation was associated with fewer emergency department visits or inpatient admissions, and was not associated with lower healthcare costs either for these specific categories or overall. In qualitative analyses, users of the transportation program noted high satisfaction with the program, and that it eased both financial burdens and burdens on other people. Program users also reported that the program better empowered them to take part in their care and made them feel safer.

This study adds to the growing literature on the use of non-emergency medical transportation as part of population health management, particularly for Medicare beneficiaries. A prior randomized clinical trial found no change in clinic visit attendance with a rideshare program.[12] A recent systematic review highlighted the promise of transportation programs, particularly with regard to improving chronic disease management.[23] However, another review emphasized the mixed findings and low-quality evidence in the field to date.[13] This study adds both quantitative and qualitative evidence regarding a population that is commonly targeted by transportation programs.

It is important to re-think the rationale for transportation programs of the type studied here. A common justification for transportation benefit programs is reducing healthcare spending. But because transportation programs not only have costs associated with the program but also are likely to increase outpatient healthcare spending by bringing individuals to healthcare appointments they otherwise may not have attended, the programs are inherently likely to increase healthcare spending, at least in one category. It is of course possible that these costs can be offset by reducing other types of healthcare utilization (e.g., inpatient admissions and emergency department visits). However, the finding that inpatient and emergency department use was not lower despite higher use of outpatient care by the same providers, and in the same clinics, as comparison group members calls into question the premise that inpatient and emergency department healthcare use is driven by issues preventable by outpatient management. Methods for determining 'ambulatory care sensitive'

or ‘potentially avoidable’ healthcare use may be subject to measurement error that inflates expectations around how much healthcare use may be reduced. Though conceived of as ways to contain healthcare costs, the findings from our qualitative interviews make other benefits of transportation programs clear. It is likely better to view these programs as ways to improve healthcare access for individuals facing difficult circumstances, and for that goal the cost of transportation itself is modest.[24]

This study suggests several directions for future research. First, transportation program innovation should be coupled with strong plans for evaluation—particularly random assignment and use of comparisons groups, with collection of data about a range of outcomes including healthcare quality, patient-reported outcomes, healthcare utilization, and cost. Given the rise of virtual visits related to the COVID-19 pandemic, comparing a transportation program to telehealth for those with transportation barriers would be highly relevant. Another comparison condition that would be interesting to study is a cash-benchmarked condition where the comparison group is provided the value of the intervention as an unrestricted cash transfer.[25] This would help establish whether the intervention delivers benefit above and beyond the financial value of the resources provided. Finally, examining heterogeneous treatment effects, such as whether any demographic or clinical factors are associated with levels of benefit that differ from the mean, could be important for targeting transportation programs.

Conclusions

In this mixed method evaluation of a non-emergency medical transportation program for members of a Medicare ACO, we found that the transportation program was associated with greater use of outpatient services, with corresponding increased outpatient healthcare spending. We did not find lower use of emergency department or inpatient healthcare services. The per person transportation cost was modest, approximately $500 per person per year. Participants highly valued the program, and reported that it made them feel more cared for and empowered to better participate in their healthcare.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Exhibit 1:

Demographic and clinical characteristics of study sample

	Unweighted			Weighted	
	Overall N=11833	**Comparison Group N=11660**	**Used Transportation Program N=173**	**Comparison Group N=11660**	**Used Transportation Program N=173**
	Mean or %	**Mean or %**	**Mean or %**	**Mean or Weighted %**	**Mean or Weighted %**
Mean Age at Index Date, years	72.3	72.35	69.05	69.79	69.79
% Female	57.7%	57.6%	64.2%	66.6%	66.6%
% White (any ethnicity)	78.1%	78.3%	61.3%	62.1%	62.1%
% Black (any ethnicity)	13.6%	13.4%	32.4%	30.2%	30.2%
% Other (any ethnicity)	8.3%	8.3%	6.4%	7.6%	7.6%
% Hispanic (any race)	18.7%	18.7%	16.8%	15.7%	15.7%
% with ESRD Diagnosis	4.0%	3.8%	17.3%	9.9%	9.9%
% with CHF Diagnosis	7.8%	7.5%	31.8%	21.0%	21.0%
% with Asthma Diagnosis	6.4%	6.2%	17.9%	12.4%	12.4%
% with Hypertension Diagnosis	63.1%	62.8%	83.8%	81.7%	81.7%
% with Depression Diagnosis	14.8%	14.4%	43.4%	37.8%	37.8%
% with Diabetes Diagnosis	25.6%	25.3%	43.4%	37.2%	37.2%
% with COPD Diagnosis	12.3%	12.1%	30.6%	23.1%	23.1%
% with Dental Problem Diagnosis	1.4%	1.3%	4.6%	4.1%	4.1%
% with Cancer	22.2%	22.2%	22.5%	20.5%	20.5%
% with Disability	12.9)	12.6%	31.8%	30.3%	30.3%
% Dual Eligible	8.3%	8.1%	22%	22.0%	22.0%
Mean HCC_SCORE	1.21	1.19	2.29	1.99	1.99
Mean Hospitalizations in 6 months prior to index date	0.05	0.05	0.28	0.13	0.13
Mean Outpatient visits in 6 months prior to index date	6.51	6.43	12.03	10.44	10.44
Mean Emergency department visits in 6 months prior to index date	0.11	0.10	0.55	0.34	0.34
Mean Total cost of care in 6 months prior to index date, $	1741	1675	6192	3984	3984

Source: Author’s analysis of healthcare system data

Author's Note: The high-dimensional propensity score algorithm considers thousands of data elements. Thus this exhibit does not present all data elements considered by the algorithm. Instead, it presents the predetermined variables selected by the investigators.

In unweighted sample, $p < .001$ and $SMD > 0.10$ for all comparisons except Female ($p = 0.08$, $SMD = 0.134$), Hispanic ethnicity ($P = 0.58$ and $SMD = 0.05$) and cancer diagnosis ($P = 0.98$ and $SMD = .009$). After weighting, $P > .99$ and $SMD < .001$ for all comparisons. Please see full table as eTable 2 for more details.

SMD = standardized mean difference; ESRD = end stage renal disease, CHF = congestive heart failure, COPD = chronic obstructive pulmonary disease

Exhibit 2:

Unweighted and Unadjusted Healthcare Use and Cost Outcomes per Person

	Control (n=11660)	**Treatment (n=173)**	
	Mean	**Mean**	**p-value**
Total cost of care after index date, $	15123	37249	<0.001
Number of inpatient hospitalizations after index date	0.46	1.31	<0.001
Cost of inpatient hospitalizations after index date, $	5867	16817	<0.001
Number of emergency department visits after index date	0.60	2.45	<0.001
Cost of emergency department visits after index date, $	352	1440	<0.001
Number of outpatient visits after index date	50	109	<0.001
Cost of outpatients visits after index date, $	8904	18992	<0.001

Source: Author's analysis of healthcare system data

Author's Note: Please see full version as eTable 5 for more details

Exhibit 3:

Estimated Differences in Utilization and Cost Per Person Per Year in Overlap Weighted Analyses

	Difference in Cost/Use	Lower 95% CL	Upper 95% CL	P
COST				
Total Cost, $ per year	5941	−540	12421	0.07
Inpatient Cost, $ per year	1286	−2962	5534	0.55
Emergency Department Cost, $ per year	47	−323	418	0.80
Outpatient Cost, $ per year	4420	722	8119	0.02
UTILIZATION				
Inpatient Admissions, per year	0.1	−0.2	0.4	0.71
Emergency Department Visits, per year	0.3	−0.3	0.9	0.29
Outpatient Visits, per year	9.2	0.2	18.2	0.04

Source: Author’s analysis of healthcare system data

Notes Positive numbers indicate higher spending and higher utilization in the transportation group.

Differences come from marginal predictions using the fitted regression models described in the text (gamma regression models with log link for cost outcomes and negative binomial regression models with log link for count outcomes). Confidence intervals and p-values produced using delta method standard errors