Contract Choice and Patient Outcomes in Colombia's Health System

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Abstract

In this paper we develop an empirical analysis in the health market that relates contracts to patient outcomes through the effort of the health service provider. Using panel data of a sample of enrollees and their claims in Colombia's statutory health system, we show that users in capitation contracts are readmitted to the ER and to emergency medical consultations at lower rates than users in fee-for-service contracts and this result holds even after conditioning on specific patient and insurer profiles. We also find significant differences in the users' annual cost but there are no differences in the users' average length-of-stay.

Keywords*: Incentives, contracts, health outcomes, capitation, fee-for-service.*

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Abstract

En este artículo desarrollamos un análisis empírico del mercado de salud colombiano que relaciona los contratos entre aseguradores y prestadores con los resultados en salud de los pacientes. Usando datos de panel de una muestra de afiliados del régimen contributivo y los servicios que reciben, mostramos que los usuarios en contratos de capitación son readmitidos a tasas más bajas que aquellos en contratos de pago por servicio. Este resultado es robusto a diferentes especificaciones donde controlamos por la heterogeneidad individual y de las aseguradoras. También encontramos diferencias significativas en el costo anual de los usuarios pero no hay diferencias en los días de estancia promedio.

Keywords*: Incentivos, contratos, resultados en salud, capitación, pago por servicio.*

1 Introduction

Studying the moral hazard problem between health insurers and health service providers contributes to a better understanding of contracts and their relation with patient health outcomes. The evidence is scarce in relation to the endogeneity of contracts and outcomes. If contracts are endogenous, the expected health condition will determine the resulting contract of the bargaining between insurers and providers, everything else equal. If outcomes are endogenous, contract choice will generate incentives to the provider that affect patient outcomes. In this paper we show the second holds even after conditioning on specific patient and insurer profiles.

Colombia's health system consists of a contributory and a subsidized regime. The most common contracts between insurers and providers in both regimes are capitation and fee-for-service. Capitation is a prospective (fixed) payment from the insurer to the provider per enrollee, while fee-for-service is a retrospective payment from the insurer to the provider per service delivered. Each of them imply different incentives for providers. For example, capitation induces providers to reduce the number of readmissions by providing high quality services or exerting high effort in order to avoid additional costs and reduce the insolvency risk. On the contrary, fee-for-service induces providers to over-provide services to their patients because they can charge the insurer for each service delivered.

We model the problem of the provider under each type of contract as a function of the level of effort. The model rationalizes the intuition about the incentives under each type of contract. It predicts that capitation induces providers to exert higher levels of effort in treating patients compared to fee-for-service contracts, and that the quantity of services provided under capitation is lower than under fee-for-service conditional on the level of effort.

Using panel data of the claims of a sample of enrollees in the contributory regime in Colombia, we estimate the effects of capitation and fee-for-service contracts in different measures of patient health outcomes. We use the propensity score matching technique and a matching procedure that does not require parameterizing observed characteristics into a score. In line with the predictions of our model, our findings indicate patient outcomes are different between capitation and fee-for-service.

The study of patient outcomes and incentives has motivated some of the literature on health service provision and insurance. However empirical studies on how contracts impact patient outcomes are scarce to the best of our knowledge due to data accessibility issues. Most studies are built around theoretical frameworks instead of empirical approaches. Some focus on the endogeneity of contracts: Eggleston (2000), for example, derives the optimal contract under risk selection. Individual heterogeneity is modeled through the probability of becoming ill or being a high-risk individual. If the provider cares about patients' outcomes then the probability of dumping high-risk individuals will be lower than if the provider does not care. In the context of high risk selection, the authors show capitation contracts are not optimal. Siciliani (2006) also uses a measure of severity to model patient heterogeneity. Depending on the diagnosis, the provider can give the patient a high-intensity service (surgical) or a low-intensity service (medical). If the hospital has private information on the average severity per patient, then it would have incentives to over-provide high-intensity services to low-severity patients. The optimal contract with asymmetric information is such that "hospitals that provide a higher share of surgical treatments receive a higher price for the surgical treatment and a lower price for the medical treatment" (pp. 479).

The degree to which providers care about their patients' outcomes can be thought of as a measure of altruism. Jack (2005) uses this measure to model hospital heterogeneity. Insurers or purchasers have imperfect information about the level of altruism, effort and service quality of the hospital, and they need to design a contract that induces providers to reveal their types. The model shows that the optimal contract under non-contractible effort and service quality is concave both in quality and effort. Higher budget leads to higher quality but crowds out some effort, quality has diminishing marginal returns, and the higher the level of altruism the larger the effect of quality and effort on profits.

Other studies focus on the endogeneity of outcomes. For example, Grabowski et al. (2011) study the effects of Medicare Prospective Payment System on the number of Medicare residents in a facility, their length-of-stay, and the time per week devoted to rehabilitation therapy. They model the problem of a nursing home that has to maximize its profits choosing the optimal length-of-stay and the intensity of the services. The model predicts that prospective reimbursement pushes skilled nursing facilities to "hold patients past the point at which the marginal benefit of an extra day falls to zero" (pp. 678) and this goes in line with some of our findings. Using facility-level data of all U.S nursing homes between 1996 and 2005, the authors find that the adoption of prospective reimbursement has no effect on the number of discharges within 20 nor 90 days and the result is robust to other cutoffs.

We devote the rest of this paper to the analysis of contracts and patient outcomes in Colombia's statutory health system. Our ideas revolve around the moral hazard theory in the sense that contracts generate different incentives for treating patients and different levels of risk-sharing. Our theoretical approach differs from the ones described earlier in that we do not model the optimal contract but focus on eliminating the endogenous movements of users from one contract to another. So conditional on the type of contract we study the incentives of providers and insurers and their relation with health outcomes. Our panel database allows us to test accurately the predictions of our model. Section 2 describes Colombia's statutory health system, section 3 describes our panel data, section 4 presents our theoretical model, section 5 shows a descriptive analysis, section 6 shows the econometric approaches to test the predictions of our model, section 7 presents the results of the econometric analysis, and in section 8 we draw some conclusions.

2 Colombia's statutory health system

Colombia's statutory health system consists of two regimes: contributory (CR) and subsidized (SR). The cost of enrollment for individuals in the CR is 4.8% of their monthly income.[1] Those with lower income belong to the SR and the government finances their enrollment with contributions of people in the CR, with resources administered by local authorities. Being insured guarantees that every enrollee can demand any service, procedure, or medication included in the benefits package (POS). The POS includes a large list of emergency services, medical consultations with general practitioners and specialists, essential medication on its generic denomination, maternity services, services for newborns, and prevention programs.

The CR has 24 insurers or EPS (by its Spanish acronym) and the SR has 48. Insurers have to provide all services in the POS to their enrollees whenever they demand them. To do so, EPS can use their own facilities or subcontract a network of health service providers also known as IPS by its Spanish acronym. Insurers can only use up to 30% of their capital in providing services, in other words they can vertically integrate up to 30% of their capital.

EPS and IPS negotiate long-term contracts bilaterally but the *menu* of contracts is fixed. The Decree 4747 of 2007 of the Ministry of Health and Social Protection (MSPS) establishes three fixed types of contracts between insurers and providers: capitation, fee-for-service and fee-for-diagnose. *Capitation contracts* consist of a prospective payment from the EPS to the IPS for each enrollee that receives services over certain period of time, usually a year. The fee varies between enrollees but not between services, and it is not adjusted to the clinical characteristics of the enrollee during the year. Then, under capitation the IPS bears all financial and health risks, and it could be overcompensated or undercompensated depending on how wide or reduced is its service portfolio. Capitation can generate an incentive to cure users rapidly because the IPS wants to avoid additional costs.

Fee-for-service contracts consist of retrospective payments per service, procedure, or medication from the EPS to the IPS over certain period of time. These tariffs include medical fees and input costs and they do not vary between enrollees but between services. In this case, the perverse incentive of the IPS is to provide unnecessary services or misdiagnose their

[1] Or 12% of the enrollee's Contributory Base Income (CBI), where the CBI is 40% of their monthly income.

patients in order to charge higher bills to the insurer.

The *fee-for-diagnose contracts* are the ones where the EPS pays a tariff that is specific to a diagnose related group (DRG). It is prospective in the sense that the tariff does not vary with the amount of services a patient receives; and retrospective in the sense that it occurs after the patient is diagnosed, hence it varies between diagnoses. In this case EPS and IPS share health and financial risks more equally compared to capitation and fee-for-service contracts. Also, IPS have less incentives to register unnecessary services under this type of contract.

Another type of contract not contemplated in the decree but allowed by the law is the *fee-for-bundle*. In this contract the EPS pays a tariff that is specific to a group of services related to a major surgical or non surgical procedure or intervention. The parties negotiate which services will be included in each bundle and many bundles could in fact be included within a diagnose-related contract.

The financial information the MSPS gathers from insurers also contains the following "contracts": *fee-for-service without details*, where the EPS recognizes the cost of each of service without including medical fees or input costs; *direct fee* where the EPS compensates only for medical fees, leases and other costs; and the *authorized fee* that is a technical reserve the EPS has to maintain for those services that were not billed during the year they were provided and neither within the three months following that year. Strictly speaking, these categories are not contracts themselves but ways of reporting the financial information, so we do not focus on them.

In the case of insurers, income comes from the government. The government segments the national population of enrollees based on age group, sex, and location as defined by the National Administrative Department of Statistics (DANE), and calculates the mean cost of each group or risk pool.[2] The government then pays each insurer a price per enrollee that is equal to the mean cost of the risk pool to which he belongs. The payment is also known as "Unidad de Pago por Capitación" (UPC). The UPC is calculated using the information of all enrollees in year t and adjusting it with the consumer price index to pay insurers during $t + 1$. This payment is prospective in the sense that it is paid at the beginning of the year

[2]The mean cost is a weighted average using the total number of enrolled days in each risk pool.

and does not vary with the amount of services demanded by the enrollee during the current year.

Before 2012 the legislation allowed insurers to contract not only the primary levels of health care using capitation contracts but also the secondary and tertiary levels. This explains the prevalence of capitation in our panel data that goes from 2009 to 2011. During these years we also observe a large share of fee-for-service contracts. We will focus on these two types contracts throughout the paper and dedicate to the study of their effect on patient outcomes.

3 Data

To study patient outcomes and the trade-off between incentives and risk-sharing in Colombia's statutory health system we have panel data of approximately 5.6 millions of individuals of the contributory regime observed during 2009, 2010 and 2011. This represents approximately the fourth part of total enrollees in the contributory regime. For each individual we observe: EPS to which he is enrolled, services he receives and IPS where he receives them, cost of each service, date in which he receives each service, medical diagnosis associated to each service, age, sex, municipality of residence, and type of contract between EPS and IPS.

We matched the municipality of residence to one of the three payment geographic areas defined by the DANE: urban (coded 1), normal (coded 2), and special (coded 3). The first includes metropolitan areas and its adjacent municipalities, the second includes small municipalities around metropolitan areas, and the third includes peripheral municipalities. We also catalogued medical diagnosis into one of the 29 long-term diseases defined by Alfonso et al. (2013).[3] Finally the age variable was categorized by creating 12 non-overlapping age groups following the MSPS: 0, 1-4, 5-14, 15-18, 19-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75 or older. After creating the variables we analyzed the distribution of enrollees, contracts and cost over several dimensions. For the 5.6 millions of individuals there are about 460 millions of services. For ease of computation, we selected a random sample of 30% of the individuals, which leaves us with approximately 1.5 millions of individuals observed during three years and associated to a total of 85 millions of services.

We have information of 16 out of the 24 EPS in the contributory regime and we observe nearly 20.000 IPS distributed along the national territory. Observed contracts are: capitation (C), fee-for-service (S), fee-for-bundle (P), fee-for-diagnose (D), fee-for-service without details (T), authorized fee (A), and direct fee (I). In the case of fee-for-bundle, the cost that appears registered in our database is the total cost of the bundle matched to the major procedure in it. The rest of services in the bundle are registered with zero cost. The same happens with fee-for-diagnose contracts. In the case of capitation, all services have the same cost for one enrolle but this cost varies between enrollees.

[3] See www.alvaroriascos.com\research\healthEconomics for details on the construction of these groups.

In table (1) we show the proportion of users in each year under each type of contract. Evidently capitation and fee-for-service are the most recurrent types of contracts among providers and insurers, representing nearly 80% of enrollees per year. Our analysis will focus on these two contracts.

Table 1: Percentage of enrollees or users per contract

Contract	**2009**	**2010**	**2011**
A	3.565%	5.082%	7.699%
C	41.18%	45.24%	45.56%
D	0.001%	0.001%	0.033%
I	11.23%	8.47%	8.05%
P	3.952%	2.045%	1.657%
S	36.90%	35.37%	34.74%
T	3.164%	3.790%	2.263%

Table (2) shows the number of users per insurer under each contract and the percentage of total enrollees per EPS in each contract. 80 to 90% of total enrollees per insurer are under capitation or fee-for-service.

For the EPS D, J, and L the percentage of enrollees in fee-for-bundle contracts is larger than for the rest of insurers. And only the EPS B and K have fee-for-diagnose contracts in our sample. The total number of enrollees is greater than 1.5 million in this table because a user can be in different contracts during the year, so we can be counting twice the same individual. We will explain the implications of this feature of our data in the analysis we develop further.

Table 2: Number of users per insurer under each type of contract

	A		**C**		**D**		**I**		**P**		**S**		**T**	
EPS	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
A	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	11	84.62%	2	15.38%
B	10816	11.79%	31540	34.38%	33	0.04%	22515	24.54%	324	0.35%	15385	16.77%	11130	12.13%
C	39244	8.73%	151105	33.62%	0	0.00%	115563	25.72%	21930	4.88%	121546	27.05%	0	0.00%
D	428	0.47%	41114	45.49%	0	0.00%	0	0.00%	7423	8.21%	41407	45.81%	11	0.01%
E	95	0.05%	91964	52.79%	0	0.00%	0	0.00%	2249	1.29%	78044	44.80%	1863	1.07%
F	0	0.00%	67447	44.38%	0	0.00%	0	0.00%	75	0.05%	46042	30.30%	38398	25.27%
G	0	0.00%	2852	54.72%	0	0.00%	0	0.00%	0	0.00%	2360	45.28%	0	0.00%
H	18200	6.81%	113620	42.51%	0	0.00%	0	0.00%	12585	4.71%	83123	31.10%	39729	14.87%
I	0	0.00%	3431	36.02%	0	0.00%	2497	26.22%	0	0.00%	2499	26.24%	1097	11.52%
J	1723	0.38%	195339	43.24%	0	0.00%	0	0.00%	51311	11.36%	203172	44.98%	177	0.04%
K	119392	17.12%	173426	24.86%	781	0.11%	159442	22.86%	6293	0.90%	205440	29.45%	32705	4.69%
L	22827	9.91%	97729	42.42%	0	0.00%	0	0.00%	24380	10.58%	85440	37.09%	0	0.00%
M	7697	6.46%	51131	42.89%	0	0.00%	0	0.00%	0	0.00%	39422	33.06%	20976	17.59%
N	251	0.40%	29415	46.42%	0	0.00%	0	0.00%	4309	6.80%	29384	46.38%	2	0.00%
O	61184	11.06%	265718	48.03%	0	0.00%	0	0.00%	6085	1.10%	208556	37.70%	11696	2.11%
P	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	309	100.00%	0	0.00%

4 Theoretical framework

The problem of the provider under each type of contract will determine the incentive to exert high or low levels of effort and services. If effort is high, patient health outcomes improve, while if effort is low, the contrary occurs. Let h be a measure of the patient's health outcomes, so that the greater the value of h the better the outcome. Let e be the level of effort the provider exerts and q the quantity of services that the provider offers to its patients.

h is concave in the level effort such that $h'(e) > 0, h''(e) < 0$, and $q(e)$ captures the substitution between quantity and effort and it is a convex function such that $q'(e) < 0, q''(e) > 0$. Let R denote the reimbursement from the insurer to the provider under a capitation contract. This payment is prospective and does not vary between the services the user demands. The cost of effort is $\gamma(e)$ which we assume is convex ($\gamma'(e) > 0, \gamma''(e) > 0$) and the marginal cost of a service is constant and equal to c.

The provider's utility under a capitation contract (C) is:

$$U^C = R + \alpha h(e^C) - cq(e^C) - \gamma(e^C) \tag{1}$$

where $\alpha > 0$ is a measure of the provider's altruism. The greater α the higher the provider's concern for its patients' health outcomes. The problem of the provider is

$$\max_e U$$

The first order condition with respect to the level of effort under capitation is:

$$\alpha h'(e^C) = cq'(e^C) + \gamma'(e^C) \tag{2}$$

Now let p be the price of a service that the provider charges the insurer under a fee-for-service contract. The utility of the provider under a fee-for-service contract (S) is:

$$U^S = (p - c)q(e^S) + \alpha h(e^S) - \gamma(e^S) \tag{3}$$

The FOC with respect to the level of effort under fee-for-service contracts is:

$$\alpha h'(e^S) + pq'(e^S) = cq'(e^S) + \gamma'(e^S) \tag{4}$$

Overall, equations (2) and (4) show that the provider will exert effort until the marginal cost equals the marginal utility of an additional amount of effort. Since $q'(e) < 0$ we can rewrite the first order conditions as:

$$\begin{aligned} \alpha h'(e^C) &= \gamma'(e^C) - c|q'(e^C)| \\ \alpha h'(e^S) - p|q'(e^S)| &= \gamma'(e^S) - c|q'(e^S)| \end{aligned} \tag{5}$$

The marginal cost function under both types of contracts is the same, but the marginal benefit of an additional amount of effort is greater under capitation than under fee-for-service. Exerting effort decreases the utility because $\gamma(e)$ increases but utility also increases because the greater the effort the lower the quantity of services which lowers the total cost of provision. Utility also increases because conditional on $\alpha > 0$ providers prefer having healthier patients than sick ones. But under fee-for-service, utility decreases further because the greater the effort the lower the amount of services provided, which lowers the total income of provision.

If we subtract the equations in (5) we obtain the following expression:

$$\alpha\left(h'(e^C) - h'(e^S)\right) + p|q'(e^S)| = \left(\gamma'(e^C) - \gamma'(e^S)\right) + c\left(q'(e^C) - q'(e^S)\right) \tag{6}$$

If $e^C > e^S$, because of the concavity of $h(e)$ the term $\alpha(h'(e^C) - h'(e^S))$ is negative and because of the convexity of $\gamma(e)$ and $q(e)$ the terms $\left(\gamma'(e^C) - \gamma'(e^S)\right)$ and $c\left(q'_{is}(e^C) - q'_{is}(e^S)\right)$ are both positive. Therefore, the assumption of e^C being greater than e^S requires $\alpha h'(e^C) > \alpha h'(e^S) - p|q'(e^S)|$ for the expression in (6) to hold, which means no other thing that the marginal income under capitation should exceed the marginal income under fee-for-service conditional on their respective levels of effort.

On the other hand, if $e^C < e^S$, the concavity of $h(e)$ implies $\alpha(h'(e^C) - h'(e^S))$ is positive and the convexity of $\gamma(e)$ and $q(e)$ implies $\left(\gamma'(e^C) - \gamma'(e^S)\right)$ and $c\left(q'(e^C) - q'(e^S)\right)$ are both negative. This is a contradiction since the left-hand side of equation (6) is always positive under $e^C < e^S$ but the right-hand side is always negative.

Figure 1: Implications of the theoretical model on effort

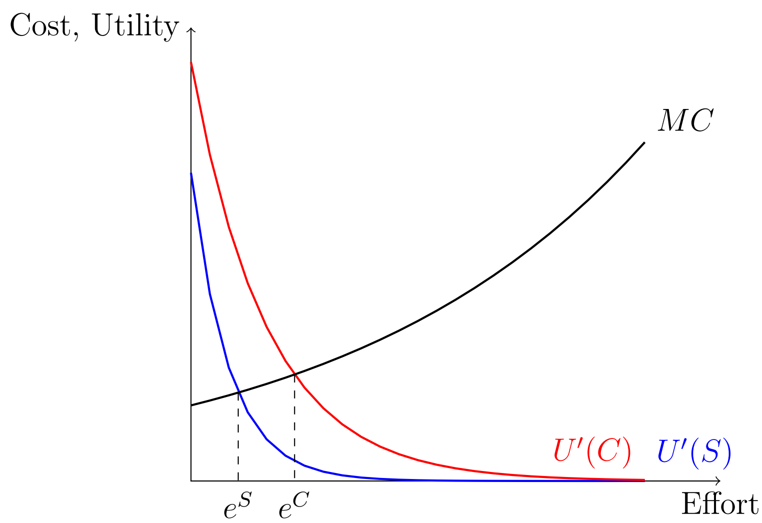
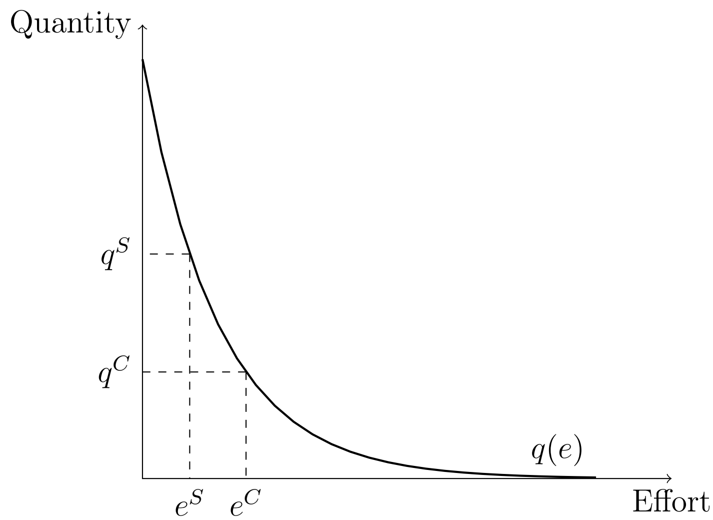


Figure (1) shows the implications of our model: providers face the same marginal cost function under both types of contract but the marginal benefit of an additional amount of effort is greater under capitation than under fee-for-service. In equilibrium providers under capitation will exert more effort in treating their patients than under fee-for-service. Moreover, the relation between quantity and effort implies that providers under fee-for-service will over-provide some services to its patients as figure (2) shows.

Figure 2: Implications of the theoretical model on quantity



In this framework we do not model the Nash bargaining game between insurers and providers. The bargaining makes contract choice endogenous to variables such as the patient's expected health outcomes and the relative bargaining power of the parties. We abstract from this refinement of the model and take advantage of the fact that the menu of contracts is exogenous in Colombia's statutory health system.

5 Description of patient outcomes

In this section we describe the users' health condition using three measures: readmission rates as measured by visits to the ER, readmission rates as measured by emergency consultations with general practitioners and specialists (EMC), and length-of-stay or hospital days. These measures allows us to capture the users' health condition because ER visits or emergency consultations occur when there are unpredictable health complications, so the greater the number of visits to the ER and emergency consultations the worst the health condition. And because long lengths-of-stay at the hospital happen when the health condition is relatively bad, however it is not clear whether keeping individuals in the hospital means the provider is exerting more effort in treating them given that hospitalizations are expensive. We extend the analysis to measures of the number of individuals with Acute Myocardial Infarction (AMI), Cerebrovascular Accident (CA), and Hip Fracture (HF) following most of the literature on the subject.

5.1 Readmissions to the ER

In table 3 we show the odds ratio of being readmitted to the ER under each type of contract using fee-for-service as the base category. The event of readmission is defined as 1 if the user goes to the ER at any moment during the three years and 0 otherwise. The odds ratio is the probability of being readmitted under contract x relative to the probability of being readmitted under fee-for-service. There is a difference of almost 73 percentage points between the probability of being readmitted under capitation and under fee-for-service. This indicates capitation contracts probably generate incentives to provide adequate services to cure patients, or the inverse, the healthiest patients are contracted under capitation. The odds ratio of being readmitted under fee-for-diagnose and fee-for-bundle contracts is also lower than that of fee-for-service, there is a difference of almost 70 to 100 percentage points.

Table 3: Odds ratio of being readmitted to the ER under each type of contract

Contract	Odds ratio
A	52%
C	27%
I	46%
D	0%
P	34%
S	100.0%
T	136%

Base category fee-for-service

The relation between the odds ratio of being readmitted to the ER under capitation and fee-for-service contracts is robust after considering differences between insurers (table 4). The probability of being readmitted under the former is lower relative to the latter and the difference is of 90 percentage points for the EPS O and 14 percentage points for the EPS G. However, for the EPS B the probability of being readmitted in capitation relative to fee-for-service exceeds by 11 percentage points the odds ratio under fee-for-service. The high differences between capitation and fee-for-service in the case of the EPS M are probably due to registration errors since it highly deviates from the population distribution.

The negative correlation between users' health condition and fee-for-service contracts could be explained by factors for which we do not control so far. For instance, fee-for-service contracts could prevail in IPS located at peripheral municipalities where geographical conditions or the lack of medical inputs increase the probability of being readmitted. In that case it is not the contract what explains the differences in readmission rates but the user's location.

Table 4: Odds ratio of being readmitted by EPS

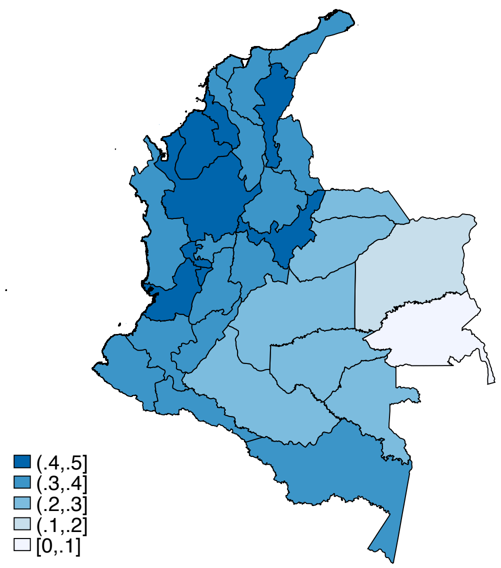
EPS	**A**	**C**	**I**	**P**	**S**	**T**
A	0%	0%	0%	0%	0%	0%
B	307%	111%	88%	0%	100%	546%
C	26%	56%	119%	11%	100%	0%
D	0%	28%	0%	2%	100%	0%
E	0%	46%	0%	0%	100%	0%
F	0%	0%	0%	0%	0%	0%
G	0%	86%	0%	0%	100%	0%
H	69%	11%	0%	3%	100%	735%
I	0%	0%	0%	0%	0%	0%
J	0%	19%	0%	2%	100%	0%
K	5%	9%	0%	0%	100%	0%
L	140%	66%	0%	175%	100%	0%
M	191%	100495%	0%	0%	100%	342028%
N	0%	28%	0%	1%	100%	0%
O	108%	10%	0%	1%	100%	0%
P	0%	0%	0%	0%	100%	0%

Base category fee-for-service

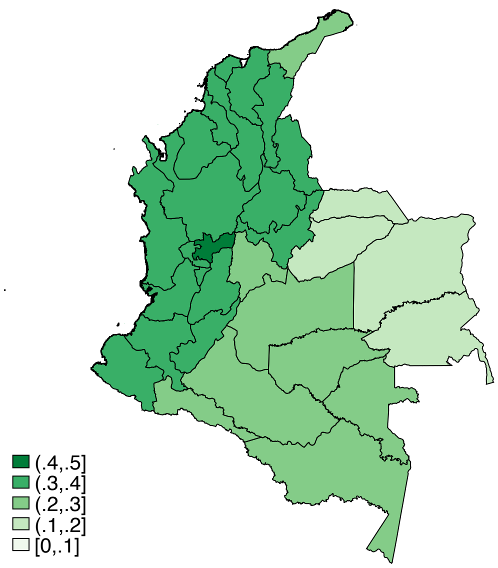
Figure (3) shows the distribution of individuals with chronic illnesses by department and year. Any evidence of prevalence of long term diseases in certain areas could indicate that readmission rates are being explained by the enrollees' location. Overall the figures show that the departments at western regions have a higher proportion of individuals with chronic diseases compared to the rest on the country. 40 to 50% of the enrollees living in Valle del Cauca in 2009 suffer from long term diseases, 30 to 40% in 2010, and the same in 2011. Meanwhile, only 10 to 20% of the enrollees living in eastern regions suffer from chronic illnesses. However, the departments with the highest proportions of chronic enrollees during 2009 to 2011 are the ones with the best provision and higher access to health services such as Antioquia, Cundinamarca and Valle del Cauca. The higher proportion of chronic users in such departments could be due to migrations of the most ill from the rural to the metropolitan areas. This may pose a problem for our analysis since insurers in Antioquia, Cundinamarca and Valle del Cauca will have higher incentives to use capitation contracts just because they receive more patients and the most ill.

Figure 3: Proportion of individuals with chronic diseases by department

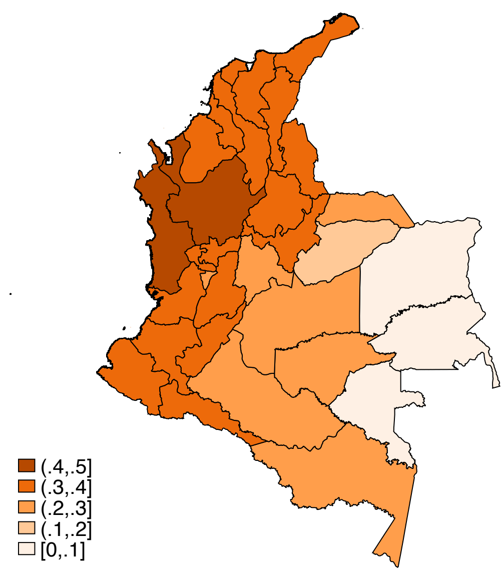
(a) 2009



(b) 2010



(c) 2011



We could think of many other reasons why the relation between health condition and type of contract is spurious. However, in tables (A1) to (A4) we show the odds ratio of being readmitted to the ER using fee-for-service as base category for certain risk pools. The risk pools are a combination of sex, location, age group and long-term disease. Each enrollee belongs to one and only one of the pools, which are homogeneous within but heterogeneous between.

The correlation between contracts and outcomes hold even after conditioning on all these dimensions and they are consistent between different risk pools. This rules out the problem of location we mentioned earlier because conditional on the municipality of residence (captured by the UPC location) capitation is associated to lower readmissions to the ER compared to fee-for-service contracts. Table (A1) in the appendix shows the risk pools for "Cancer-other cancer". The probability of being readmitted under capitation is significantly lower than that of fee-for-service contracts. For example, for women between 19 and 44 years old living in metropolitan areas, the probability of being readmitted to the ER is 19% under capitation relative to the probability under fee-for-service, and for males between 70 and 75 years old living in metropolitan areas the odds ratio of readmission under capitation relative to fee-for-service is 29%.

Users with diabetes that are contracted under fee-for-service also present higher readmission rates compared to capitation (table A2). For example, the odds ratio of readmissions under capitation relative to fee-for-service for men between 45 and 50 years old living in metropolitan areas is 88%. In the case of hypertension (table A3), the odds ratio of being readmitted under capitation relative to fee-for-service does not exceed 12% in any risk pool.

Table (A4) is particularly important because renal failure is one of the diseases for which the government compensates the EPS ex-post using the High-Cost Account. The risk adjustment is ex-post in the sense that the High-Cost Account compensations are made after the EPS has born all the health risks of the year and after it receives the UPC. In this case we can see that the odds ratio of readmissions to the ER under capitation and fee-for-bundle contracts is lower than in fee-for-service contracts. For example, women between 19 and 44 years old living in normal municipalities are readmitted with a probability of 29% under capitation relative to the probability under fee-for-service. And, men between 70 and 75 years old living in normal municipalities are readmitted with a probability of 12% under capitation relative to the probability under fee-for-service.

5.2 Readmissions to emergency medical consultations (EMC)

In table 5 we show the odds ratio of being readmitted to emergency medical consultations under each type of contract using fee-for-service as the base category. Once again the probability of being readmitted under capitation is significantly lower than in fee-for-service contracts. There is a difference of nearly 97 percentage points between these two contracts.

Table 5: Odds ratio of being readmitted under each type of contract

Contract	**Odds ratio**
A	19.5%
C	12.0%
D	0.0%
I	33.0%
P	20.5%
S	100.0%
T	143.9%

Base category fee-for-service

Table 6: Odds ratio of being readmitted by EPS

EPS	**A**	**C**	**D**	**I**	**P**	**S**	**T**
B	0.0%	217.6%	0.0%	282.0%	0.0%	100.0%	2613.9%
G	0.0%	79.8%	0.0%	0.0%	0.0%	100.0%	0.0%
L	76.0%	50.9%	0.0%	0.0%	162.0%	100.0%	0.0%
E	0.0%	42.5%	0.0%	0.0%	0.0%	100.0%	0.0%
C	20.1%	33.4%	0.0%	119.9%	2.1%	100.0%	0.0%
D	0.0%	16.5%	0.0%	0.0%	0.0%	100.0%	0.0%
N	0.0%	15.1%	0.0%	0.0%	0.0%	100.0%	0.0%
J	0.0%	11.0%	0.0%	0.0%	0.0%	100.0%	0.0%
K	3.9%	3.6%	0.0%	0.0%	0.0%	100.0%	0.0%
O	23.1%	3.2%	0.0%	0.0%	0.0%	100.0%	0.0%
H	119.6%	0.3%	0.0%	0.0%	19.1%	100.0%	1510.3%
A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
F	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
I	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
M	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
P	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%

Base category fee-for-service

This evidence holds after considering differences between insurers (table 6). There is a difference of almost 97 percentage points between the odds ratio of capitation and the odds ratio of fee-for-service in the case of the EPS O and 20 percentage points in the case of the EPS G.

The odds ratio of being readmitted to EMC by risk pool is shown in appendix (B). Results still hold after conditioning on type of illness, location, sex and age. Table (B1) for "Diabetes" indicates for example, that men between 45 and 50 years old living in metropolitan areas have a readmission probability of 21% under capitation relative to the probability under fee-for-service. In the case of hypertension (table B2), the odds ratio of being readmitted under capitation relative to fee-for-service does not exceed 15% in any risk pool.

5.3 Length-of-stay or hospital days

Because of the legislation before 2012 insurers had incentives to push for capitation contracts in the case of special health care because they avoid bearing the financial and health risks associated to the most ill patients. The policy before 2012 partially explains the prevalence of capitation contracts in our data and some of the findings we will describe in this section.

In table (7) we show the mean length-of-stay under each type on contract during 2010 and 2011. Patients under capitation during 2010 stayed 168 days on average and during 2011 266 days. This measure doubles the average length-of-stay in fee-for-service contracts (135 days in 2010 and 137 days in 2011), and suggests in general that there is a mechanism associated to the level of effort in treating patients. We also found several registration errors in the number of hospital days in our database, some exceeding 365 days a year.

Table 7: Average length-of-stay per contract

Contract	**2010**	**2011**
A	3.2	4.4
C	268.1	266.1
D	1	0
I	0	0
P	4.4	3.4
S	135.4	137.3
T	2.2	1.7

Table (8) presents the average length-of-stay per EPS. For the majority of insurers the number of hospital days under capitation exceeds those under fee-for-service contracts. For example, for the EPS C a patient under capitation stayed on average 11 days in the hospital compared to a person under fee-for-service contract who stayed 0.25 days. In the EPS I capitation is associated to 11 days at the hospital and 1.3 days under fee-for-service contracts. Significant differences are also found for the EPS E, H, K, L, and the O. However there are some exceptions. For the EPS N, users under fee-for-service stayed 10.3 days at the hospital while under capitation contracts they register no hospital days. Differences in the length-of-stay between both types of contracts for the EPS M and the EPS B are not significant either.

Table 8: Average length-of-stay per insurer

EPS	**A**	**C**	**D**	**I**	**P**	**S**	**T**
A	0.00	0.00	0.00	0.00	0.00	0.00	7.00
B	4.59	7.78	0.08	0.00	1.34	6.19	1.28
C	1.53	11.03	0.00	0.00	0.25	1.97	0.00
D	0.38	0.00	0.00	0.00	1.22	10.49	0.00
E	0.00	10.63	0.00	0.00	0.62	0.77	0.01
F	0.00	10.72	0.00	0.00	0.00	1.26	0.60
G	0.00	4.45	0.00	0.00	0.00	0.32	0.00
H	7.30	11.31	0.00	0.00	0.42	6.94	1.04
I	0.00	9.32	0.00	0.02	0.00	4.14	0.08
J	0.25	0.00	0.00	0.00	1.14	8.97	0.54
K	0.05	14.97	0.00	0.00	0.52	2.38	2.17
L	0.96	8.33	0.00	0.00	4.78	0.46	0.00
M	2.38	4.18	0.00	0.00	0.00	4.81	0.49
N	0.34	0.00	0.00	0.00	3.76	10.30	0.00
O	4.44	9.39	0.00	0.00	0.22	3.70	1.35
P	0.00	0.00	0.00	0.00	0.00	0.37	0.00

In table (9) we compute the average length-of-stay for several risk pools. The average lengths-of-stay in capitation are longer than in fee-for-service contracts even after controlling for location, sex, age group and illness. For instance, males between 19 and 44 years old with diabetes living in metropolitan areas have an average length-of-stay of 173 days in capitation contracts during 2010 and of 31 days in fee-for-service contracts during the same year. Females between 19 and 44 years old living in metropolitan areas and having hypertension stay 167 days at the hospital under capitation during 2011 and 21 days under fee-for-service during the same year. The mechanism we are describing so far suggests that during the years of our analysis providers retained patients longer in capitation contracts but then patients where less readmitted than in fee-for-service contracts.

Table 9: Average length-of-stay per risk pool

				C		S	
UPC location	**Sex**	**Age group**	**Long-term disease**	**2010**	**2011**	**2010**	**2011**
1	F	5	ARTHRITIS	53.84	68.36	32.46	11.87
1	F	5	ASTHMA	22.36	24.45	11.55	7.490
1	F	5	AUTOIMMUNE	89.85	107.4	106.1	32.24
1	F	5	OTHER CANCER	32.96	43.67	13.09	5.176
1	F	5	OTHER FEMALE GENITALIA CANCER	4.651	9.290	2.470	5.470
1	F	5	DIABETES	128.9	132.5	14.50	23.68
1	F	5	HYPERTENSION	149.1	167.3	22.79	20.83
1	F	5	OTHER CARDIOVASCULAR DISEASE	17.40	22.04	5.990	5.642
1	F	5	LONG-TERM PULMONARY DISEASE	11.53	13.65	6.008	8.473
1	F	5	CHRONIC RENAL INSUFICIENCY	73.23	105.2	50.18	32.08
1	F	5	AIDS-HIV	6.297	27.51	3.195	37.13
1	F	5	EPILEPSY	177.1	227.2	167.1	23.03
1	F	5	TRANSPLANT	287.4	210.0	214.4	122.5
1	F	5	TUBERCULOSIS	13.51	12.05	1.000	1.666
1	M	5	ARTHRITIS	49.06	83.47	20.84	3.731
1	M	5	ASTHMA	16.32	30.41	6.947	5.670
1	M	5	AUTOIMMUNE	120.0	206.9	113.9	15.32
1	M	5	OTHER CANCER	9.443	20.55	11.22	9.636
1	M	5	DIABETES	173.4	243.1	31.39	29.37
1	M	5	HYPERTENSION	184.3	220.3	36.23	23.37
1	M	5	OTHER CARDIOVASCULAR DISEASE	20.39	24.19	11.39	6.845
1	M	5	LONG-TERM PULMONARY DISEASE	16.15	20.42	4.552	6.827
1	M	5	CHRONIC RENAL INSUFICIENCY	43.12	200.6	83.40	46.60
1	M	5	AIDS-HIV	52.89	59.79	115.6	153.0
1	M	5	EPILEPSY	239.8	277.1	129.7	73.14
1	M	5	TRANSPLANT	195.3	479.3	465.2	298.2
1	M	5	TUBERCULOSIS	14.76	18.45	0.721	7.720

5.4 Other measures of health condition

The literature that relates market structure with user's health condition or hospital quality has used several other measures of health condition including death by Acute Myocardial Infarction (AMI) or simply heart attack (Gaynor et al. (2010), Bloom et al. (2010), Cooper et al. (2011), Gowrisankaran and Town (2003)), death by emergency surgery (Bloom et al. (2010)), elective hip replacement (Cooper et al. (2011), Bevan and Skellern (2011)), hernia repair (Bevan and Skellern (2011)), and cerebrovascular accident (Meltzer et al. (2002)). In this subsection we analyze some of these measures.

We catalogued the following medical diagnosis (identified with CIE10 code) as AMI:

- I210 Infarto Transmural Agudo del Miocardio de la Pared Anterior
- I211 Infarto Transmural Agudo del Miocardio de la Pared Inferior

- I212 Infarto Agudo Transmural del Miocardio de Otros Sitios
- I213 Infarto Transmural Agudo del Miocardio, de Sitio No Especificado
- I219 Infarto Agudo Del Miocardio, Sin Otra Especificacion

Cerebrovascular accidents include:

- I678 Otras Enfermedades Cerebrovasculares Especificadas
- I679 Enfermedad Cerebrovascular, No Especificada
- I688 Otros Trastornos Cerebrovasculares en Enfermedades Clasificadas en otra parte

And hip fracture includes:

- S327 Fracturas Multiples de la Columna Lumbar y de la Pelvis
- S328 Fractura de Otras Partes y de las No Especificadas de la Columna Lumbar y de la Pelvis

Tables (10) to (12) show the number of users with AMI, cerebrovascular accident (CA) and hip fracture (HF) as a proportion of the number of users with chronic illnesses in each EPS/contract. We extend the analysis in appendix (C) by showing the readmission rates to the ER and EMC for such patients. The proportion of individuals with these diagnoses is larger under fee-for-service than under any other type of contract and this is true for all insurers. For example, for the EPS C the proportion of users with AMI is 5.5% under fee-for-service relative to number of users with long-term diseases in such contract and 0.4% under capitation. The greatest difference is for the EPS O, with 11.1% patients with AMI under fee-for-service and 0.6% under capitation.

For the EPS K, the proportion of individuals with cerebrovascular accident under capitation is 0.79% versus 2.3% under fee-for-service, and for the EPS O there are 1.41% users with cerebrovascular accident under capitation and 7.6% under fee-for-service.

Table 10: Proportion of users with Acute Myocardial Infarction (AMI)

EPS	A	C	I	P	S	T
B	1.20%	0.50%	0.00%	0.00%	1.00%	0.60%
C	0.20%	0.40%	0.20%	0.10%	5.50%	0.00%
D	0.80%	0.20%	0.00%	0.10%	1.80%	0.00%
E	0.00%	3.30%	0.00%	0.10%	5.20%	0.00%
F	0.00%	0.00%	0.00%	0.00%	0.20%	0.40%
H	0.10%	0.30%	0.00%	0.10%	1.10%	0.70%
I	0.00%	0.00%	0.30%	0.00%	0.00%	0.00%
J	0.60%	0.10%	0.00%	0.10%	1.40%	0.00%
K	0.10%	0.30%	0.10%	0.00%	1.30%	0.80%
L	0.80%	0.20%	0.00%	0.40%	4.40%	0.00%
M	0.70%	0.90%	0.00%	0.00%	1.20%	0.60%
N	0.70%	0.10%	0.00%	0.10%	1.20%	0.00%
O	1.90%	0.60%	0.00%	2.00%	11.10%	3.00%

Table 11: Proportion of users with Cerebrovascular Accident (CA)

EPS	A	C	I	P	S	T
B	0.89%	1.12%	0.20%	0.49%	0.93%	0.90%
C	0.16%	0.85%	0.17%	0.06%	3.98%	0.00%
D	0.00%	0.31%	0.00%	0.19%	0.75%	0.00%
E	0.00%	0.05%	0.00%	0.00%	0.01%	0.00%
F	0.00%	0.06%	0.00%	0.00%	0.34%	0.26%
H	0.00%	0.13%	0.00%	0.00%	0.04%	0.00%
H	0.38%	0.50%	0.00%	0.02%	1.74%	0.47%
I	0.00%	0.02%	0.03%	0.00%	0.06%	0.08%
J	0.07%	0.19%	0.00%	0.12%	0.70%	0.00%
K	0.41%	0.79%	0.15%	0.00%	2.27%	0.72%
L	0.49%	0.43%	0.00%	0.31%	1.74%	0.00%
M	0.89%	0.78%	0.00%	0.00%	0.76%	0.21%
N	0.00%	0.36%	0.00%	0.24%	0.62%	0.00%
O	0.81%	1.41%	0.00%	0.36%	7.58%	0.90%

In the case of diagnoses related to hip fracture, the EPS C registers only 0.049% of its users with hip fracture under capitation and 0.12% under fee-for-service. The difference is less relevant for the EPS O, 0.10% in capitation versus 0.13% in fee-for-service.

Table 12: Proportion of users with Hip Fracture (HF)

EPS	A	C	I	P	S	T
B	0.01110%	0.02638%	0.01301%	0.00000%	0.07265%	0.02200%
C	0.01303%	0.04865%	0.03947%	0.00000%	0.11521%	0.00000%
D	0.27322%	0.02554%	0.00000%	0.00000%	0.01989%	0.00000%
E	0.00000%	0.00267%	0.00000%	0.00000%	0.00174%	0.00000%
F	0.00000%	0.00422%	0.00000%	0.00000%	0.00762%	0.00966%
H	0.00804%	0.04018%	0.00000%	0.00000%	0.01985%	0.01297%
I	0.00000%	0.04486%	0.00000%	0.00000%	0.00000%	0.00000%
J	0.06805%	0.03315%	0.00000%	0.01563%	0.06377%	0.00000%
K	0.01650%	0.00756%	0.01011%	0.00000%	0.08387%	0.04199%
L	0.02615%	0.03914%	0.00000%	0.01634%	0.07377%	0.00000%
M	0.02085%	0.02945%	0.00000%	0.00000%	0.02829%	0.00296%
N	0.00000%	0.05096%	0.00000%	0.04574%	0.09015%	0.00000%
O	0.01506%	0.10085%	0.00000%	0.00000%	0.12987%	0.04074%

Appendix (B) supports our findings. Readmissions to the ER of users with AMI, CA and HF are greater in fee-for-service than in capitation contracts. Users with AMI in EPS O are being readmitted with a probability of 28.9% under capitation relative to fee-for-service, and for the EPS K with a probability of 6.2%. However for the EPS C readmission rates under capitation are 70 percentage points above fee-for-service contracts, and for the EPS L they are 150 percentage points higher. Although there is high variation between insurers in the readmission rates of users with cerebrovascular accidents contracted under capitation, these rates do not exceed those in fee-for-service contracts in any case except for the EPS C.

6 Econometric analysis

The description of the readmission rates (to the ER and to EMC) by risk pool showed a consistent effect of capitation contracts. The evidence indicated that even after conditioning on location, sex, and type of illness, users had different outcomes under capitation than under fee-for-service. This finding suggests health service providers exert more effort in treating their patients when they have a capitation contract than when they have a fee-for-service contract as the theoretical model suggested. The reason is that under the latter IPS have incentives to over-provide some services because they can charge for each of them. But since payment under the former does not vary with the number of services there is an incentive to provide as little services as possible but providing them appropriately.

Despite these consistent results, anyone could argue against the homogeneity of individuals in each risk pool. For instance, since risk pools are built irrespective of the insurer, one could imagine a scenario where the fact of being insured by the EPS O implies a worse outcome than if the patient is insured by the EPS H. In other words, insurer heterogeneity could explain differences in readmission rates under each contract making our descriptive analysis biased.

Our objective now is to compare very similar individuals that are diagnosed with a long-term disease during the same year but that differ only in the type of contract between the insurer to which he is enrolled and the provider where he receives the services. To do so we use a matching technique. We define the treatment T as the event of being in a capitation contract versus being in a fee-for-service contract. The propensity score follows a normal distribution as shown in equation (7). We estimate the score conditional on sociodemographic variables contained in matrix D_{ijk} such as sex (coded one for males), age (continuous), and location (one dummy variable for each of the three possible locations with special municipalities as the base category); the logarithm of the user's contributory base income S_{ijk}; a dummy variable indicating whether the diagnose corresponds to a long-term disease (H_{ijk}); and a fixed effect per insurer (γ_j) with the EPS P as the base category. All the coefficients of the score are contained in θ.

$$Prob[T = C|D_{ijk}, S_{ijk}, H_{ijk}, \gamma_j; \theta] = \Phi(D_{ijk}\alpha + S_{ijk}\beta + H_{ijk}\delta + \gamma_j) \tag{7}$$

We rely on the basic underlying assumption when performing a matching procedure: the unobservables are the same for the matched individuals in the treated and in the control groups, therefore there is no potential source of bias in our estimations due to unobservables.

Another problem may arise when estimating the propensity score matching. For the individuals that are diagnosed with a long-term disease in the first year they appear in our database we cannot know if the diagnosis actually occurred before they entered the sample. If that were the case, the type of contract would have responded endogenously to the user's health condition before we observe it. To solve this problem of endogeneity we estimate the propensity score and the average treatment effect with individuals who were diagnosed with a long-term disease during the second year they appear in our database and with the ones who were always healthy. In other words we eliminate the first year observations for each user and eliminate all the observations associated to those who were sick during the first year.

The dependent variable for the estimation of the average treatment effect on the treated (ATT) is the number of readmissions, i.e. how many times does a patient goes to the ER or to emergency consultations. Let $M(i)$ be the set of all control units matched to an observation in the treated group. Denote by N^T the number of treated and by N_i^M the number of controls matched to observation i in the treated. Define the weights $w_{ij} = \frac{1}{N_i^M}$, and let Y_i^T be the number of readmissions of individual i in the treated, and Y_j^M the number of readmissions of individual j in the control group. The ATT is equal to:

$$\begin{aligned} \tau &= \frac{1}{N^T} \sum_{i \in T} \left(Y_i^T - \sum_{j \in C(i)} w_{ij} Y_j^M \right) \\ &= \frac{1}{N^T} \left(\sum_{i \in T} Y_i^T - \sum_{i \in T} \sum_{j \in C(i)} w_{ij} Y_j^M \right) \\ &= \frac{1}{N^T} \sum_{i \in T} Y_i^T - \frac{1}{N^T} \sum_{j \in C} \frac{1}{N_i^M} Y_j^M \end{aligned} \tag{8}$$

In our exercises we restrict the number of controls matched to individual i in the treated to one, therefore $w_{ij} = 1$ in our analysis. We use the nearest neighbor algorithm to match observations. It defines the set of usable controls as the observations for which the euclidian distance between their propensity score (p_j) and the one of the treated (p_i) is minimum (see equation 9).

$$M(i) = arg \min_j ||p_i - p_j|| \tag{9}$$

The nearest neighbor algorithm has a trade-off between having a large common support and having poor matches within the support. However all matching algorithms have this same trade-off.

Since we are matching the observations based on a propensity score, one could also argue that the score does not reflect the actual differences in observable characteristics. Two observations could have the same propensity score but report significant differences in the underlying variables that enter the score. In that case the balancing property is not satisfied and the ATT will be biased undermining the causal relation between treatment and dependent variable. To account for this issue we also matched the observations conditional on their on their observable characteristics without parameterizing them into a propensity score. Our results hold throughout these approaches.

7 Results

In this section we show the results of the matching technique using the propensity score of equation (7), which we call *score 1*; and a propensity score where we add a dummy variable for each of the 29 long-term diseases with tuberculosis as the base category, *score 2*. Because our panel observations correspond to users/date-of-service and the type of contract for the same user could change during the year, then an observation could be at the same time in the treated and in the control groups. However, since we calculate the number of readmissions over each user and not over each user/contract, we are able eliminate the bias caused by endogenous movements of users from capitation to fee-for-service contracts or viceversa.

7.1 Number of readmissions

We estimate the ATT separately for 2010 and 2011. Figure (4) shows the distribution of the score for treated and control individuals during both years using the first specification and figure (5) shows the distribution of the score using the second specification for the propensity score.

The common support in each specification is sufficiently wide as to contain individuals with a 0.1% and a 99% probability of being treated. During 2010, both figures show that the distribution of the propensity score of the controls is not concentrated around zero, there is a probability of 50% on average that a control individual will be treated. However during 2011, this probability falls to 30%. In the case of the treated, both figures show that the distribution of their propensity score is concentrated around one both during 2010 and 2011. This suggests our probit model discriminates individuals properly during 2011 but not during 2010.

Figure 4: Common support for score 1

(a) 2010 (b) 2011

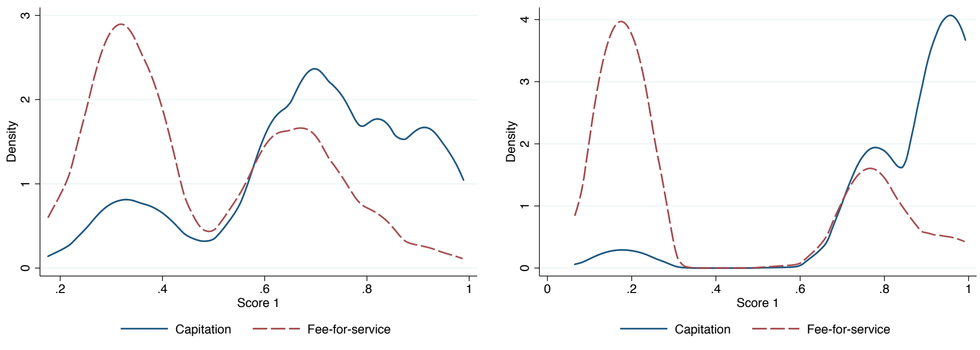


Figure 5: Common support for score 2

(a) 2010 (b) 2011

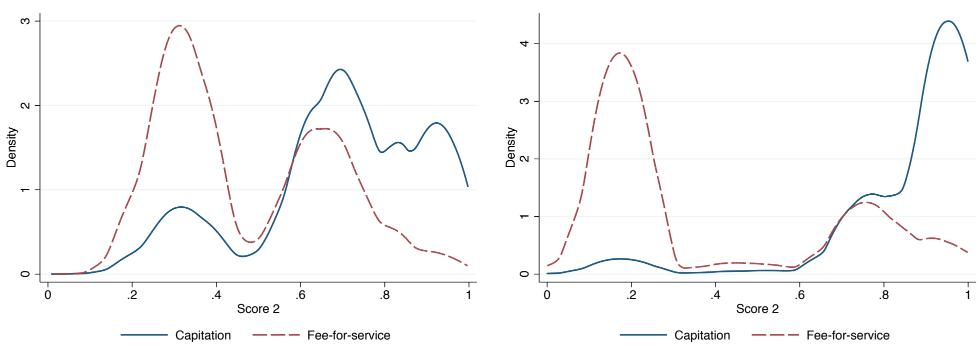


Table (13) shows the ATT for 2010 and 2011. The effect of capitation contracts on the readmissions to the ER is robust and significant at a 99% confidence level. Individuals in fee-for-service contracts go to 27% more times to the ER during 2010, and 69% more times during 2011 compared to individuals in capitation contracts. When controlling for the type of illness the effect changes only slightly. In fee-for-service, people go 26.6% more times to the ER in 2010 and 62% more times in 2011 compared to capitation.

In the case of emergency medical consultations using the first specification of the propensity score we find that individuals under fee-for-service contracts go 7.5% more times than individuals under capitation during 2010. The difference decreases to 3.6% during 2011. Again, including controls of the type of disease generates very little variations in the estimator but reduces our degrees of freedom. For this specification, patients under fee-for-service contracts during 2010 go to emergency consultations 7.8% more times than patients under capitation, and during 2011 3.3% more times.

Table 13: ATT for readmissions during 2010 and 2011

Outcome	**Specification**	**Year**	N^T	N^C	**ATT**
ER visits	**Score 1**	2010	693,335	356,240	-0.267***
		2011	1,971,384	533,323	-0.689**
	Score 2	2010	693,335	353,356	-0.266***
		2011	1,971,384	523,595	-0.619**
EMC	**Score 1**	2010	693,335	356,244	-0.075***
		2011	1,971,384	533,323	-0.036***
	Score 2	2010	693,335	353,344	-0.078***
		2011	1,971,384	523,601	-0.033**

Notes: Score 1 uses the specification of equation (7), score 2 adds dummy variables for each of the 29 long-term diseases with tuberculosis as base category. The dependent variables are the number of ER visits and the number of emergency appointments with general practitioners or specialists. ***$p<0.01$, **$p<0.05$, *$p<0.1$

This first exercise illustrates the negative correlation between fee-for-service contracts and outcomes. Nonetheless, the balancing property is not satisfied for neither of the specifications for the propensity score. Moreover, having observations at the same time in the treated and control groups could still be problematic or at least little convincing of the mechanism we are trying to depict: contracts determine the patient's health outcomes. In order to abstract from these issues we perform a different empirical exercise. Since we observe the date in which each service was provided, our analysis reaches a more disaggregated measure of the number of readmissions per user. In this case we do not calculate the number of readmissions during a year but during the eight months following the first long-term disease diagnosis. Once again we restrict our attention to those individuals who where diagnosed for the first time in the second month they appear in our database. The contract for each user and his observable characteristics will be the ones with which he was diagnosed for the first time. We matched the observations directly on their observable characteristics without using a parametric specification for the propensity score. For ease of computation we estimate the ATT and its standard error using bootstrap without replacement. If N is the number of observations to match, then we iterate $N/1000$ times over 1000-observation random samples.

We use this technique in the following empirical exercises also. The results are presented in table (14).

The average treatment effect on the treated is negative for both outcomes. Individuals in capitation contracts go 64% fewer times to the ER than those in fee-for-service and this estimator is significant. In the case of emergency medical consultations, people in capitation go 21% fewer times than those in fee-for-service contracts.

Our findings after conditioning on the contract with which users are diagnosed for the first time suggest providers exert more effort in treating patients when they are under capitation than under fee-for-service, which goes in line with our theoretical model. As result there is consistent and robust evidence that patient health outcomes are different under the former than under the latter.

Table 14: ATT for readmissions 8 months following first diagnosis

Outcome	***N***	**ATT**	***sd***
ER visits	981,519	-0.6365	0.4055
EMC	981,550	-0.2137	0.0339

Notes: ATT matching individuals directly on D_{ijk}, S_{ijk}, H_{ijk}, γ_j.

In the previous specifications we modeled insurer heterogeneity using a fixed effect. In table (15) we estimate the ATT for the number of readmissions to the ER eight months after the first long-term disease diagnose separately for some insurers as a robustness check. The insurers in this exercise were chosen because they are known to report their information with very few registration errors. The evidence is still consistent after isolating each insurer. The effect of being in capitation contracts reduces the number of visits to the ER in 66% in the case of the EPS C, 50% for the EPS J, 178% for the EPS O, and 6% for the EPS H.

Table 15: ATT per EPS for readmissions to the ER 8 months following first diagnosis

EPS	***N***	**ATT**	***sd***
C	81,906	-0.6594	0.1206
H	100,056	-0.06221	0.0045
J	172,193	-0.49674	0.0553
O	284,855	-1.7769	0.1779

Notes: ATT matching individuals directly on D_{ijk}, S_{ijk}, H_{ijk}.

Interviews with people from the health provision market revealed that health service providers are not careful when registering the services an individual in capitation receives. But they are very careful registering the services of individuals under fee-for-service contracts. Registration problems can cause our measure of the number of readmissions to the ER or to EMC to be misleading. To give more detailed evidence of the mechanism we have described so far in the next subsection we measure the difference between capitation and fee-for-service contracts in variables for which we believe there are less registration errors according to our interviews.

7.2 Difference in the number of AMI, CA and HF

We now focus on estimating the difference in the number of heart attacks, cerebrovascular accidents and hip fractures between users in capitation and fee-for-service. The dependent variable is the number of times each user receives a diagnosis catalogued into the conditions of AMI, CA and HF during the twelve months following the first long-term disease diagnosis. We eliminate the first month observations for all users and estimate the ATT with information of only those that were diagnosed with a long-term disease during the second month they appear in our database. We eliminate the ones that were always healthy. As such, we could have for example people with arthritis, renal failure, or AIDS suffering from a heart attack. We do not focus on the individuals diagnosed with a cardiovascular disease only. The type of contract and observable characteristics of each individual will be the ones with which they were diagnosed for the first time.

Table 16: ATT for number of AMI, CA and HF

Condition	***N***	**ATT**	***sd***
AMI	1,029,909	-0.0462	0.1115
CA	1,108,791	-0.0280	0.0334
HF	1,058,493	-0.0010	0.0003

Notes: ATT matching individuals directly on D_{ijk}, S_{ijk}, H_{ijk}, γ_j. The dependent variable is the number of diagnosis of AMI, CA and HF per user.

The results are presented in table (16). The estimators are not significant for heart attacks and cerebrovascular accidents meaning the number of diagnosis of these types are the same under capitation and under fee-for-service. But the estimator is significant in the case of hip fractures and the direction indicates people under fee-for-service suffer more accidents associated to bone fractures than people under capitation. In general the direction of the ATT in the three exercises suggests that if significant the effect of capitation contracts would be negative on such outcomes. In other words capitation would induce a lower amount of such conditions in patients.

If we estimate the difference in the number of heart attacks only for those users that were diagnosed with a cardiovascular disease during the second month we observe them, the correlation between capitation contracts and health outcomes is not significant (table 17), although the direction of the effect tends to be negative following our previous results.

Table 17: ATT for number of AMI for people with cardiovascular disease

Condition	***N***	**ATT**	***sd***
AMI	625,000	-0.1034	0.2788

Notes: ATT matching individuals directly on D_{ijk}, S_{ijk}, H_{ijk}, γ_j. The dependent variable is the number of diagnosis of AMI, CA and HF per user.

7.3 Length-of-stay

In the description of user health condition we found that the average length-of-stay of users in capitation was longer than users in fee-for-service contracts even inside specific risk pools. However, registration problems indicating individuals remained more than 365 days a year in the hospital might be biasing the descriptive evidence. In this subsection we estimate the ATT to explain differences in the average length-of-stay due the type of contract. The outcome of this analysis is the total length-of-stay in the eight months following the first long-term disease diagnosis. We eliminate observations associated to individuals who were already sick in the first month we observe them and eliminate those individuals for which the length-of-stay exceeded 240 days since we are only observing them eight months forward. The contract and observable characteristics for each individual will be the ones with which the user was diagnosed for the first time.

Table 18: ATT for length-of-stay 8 months following first diagnosis

Outcome	***N***	**ATT**	***sd***
Length-of-stay	844,553	4.045736	4.486816

Notes: ATT matching individuals directly on D_{ijk}, S_{ijk}, H_{ijk}, γ_j.

The results in table (18) indicate there are no significant differences in the average length-of-stay of users in capitation and fee-for-service contracts. The mechanism we are describing so far suggests people in capitation and fee-for-service stay the same number of days at the hospital but then individuals in capitation are less readmitted to the ER and to emergency medical consultations than those in fee-for-service contracts.

7.4 Users' annual cost

The user's annual cost is endogenous to the type of contract and it is correlated to the patient's health condition in the sense that sicker patients are the costlier. If capitation contracts generate better health outcomes as we have seen so far, we would expect the cost of users under such contracts to be lower than the cost of users under fee-for-service contracts. In what follows we estimate the ATT to explain the differences in the logarithm of the annual cost of each user due to the type of contract.

We use the yearly specification where observations can be at the same time in the treated and in the control groups. The total cost of a user is the sum of the individual cost of the services he receives during a year. This way of calculating the total cost (over user/year without considering monthly variations in the type of contract) as well as eliminating the first year observations for all patients, allows us to eliminate the bias caused by endogenous movements of individuals from one type of contract to the other. Table (19) shows the results of the estimation. Overall, users in capitation have lower annual costs compared to users in fee-for-service. During 2010 the annual cost of the latter more than doubled the annual cost of the former, and during 2011 it more than triples it and the difference is highly significant.

Table 19: ATT for the difference in users' annual cost

Variable	**Year**	***N***	**ATT**	***sd***
Ln(Annual Cost)	2010	18,819,348	-0.7637	0.0430
	2011	23,575,841	-1.3245	0.0866

Notes: ATT matching individuals directly on D_{ijk}, S_{ijk}, H_{ijk}, γ_j. The dependent variable is the logarithm of the annual cost of each user.

7.5 Variations within health service providers

A health service provider can negotiate different contracts with different insurers over the same period of time. As a result a single IPS can have both capitation and fee-for-service contracts for the population of enrollees it attends. In this subsection we study the differences in health outcomes between the users of a single IPS, ones covered by capitation and others by fee-for-service contracts. We choose the four largest private IPS located in some of main cities of Colombia (Bogotá, Cali and Medellín). The institutions are: IPS W in Cali, IPS X in Cali, IPS Y in Bogotá, and IPS Z in Medellín. We estimate the ATT for each of them using the yearly specification, where we eliminate observations corresponding to the first year of every enrollee and eliminate all observations corresponding to user's that were diagnosed for the first time during the first year we observe them. The dependent variable is the number of readmissions to the ER. In order to have sufficient observations per provider we use the full sample of 5.6 millions of individuals.

Table (20) shows that controlling for provider specific profiles eliminates every significant differences between capitation and fee-for-service contracts. If any these results suggest the relation is still negative meaning individuals in capitation are being less readmitted to the ER than individuals in fee-for-service. In the pool of data the average treatment effect (ATE) is negative or null for all providers. In the case of the IPS Y, users in fee-for-service during 2010 go twice more to the ER and 57 more times during 2011 compared to users in capitation contracts. The maximum number of readmissions of control individuals in the IPS Y during 2011 is 59 while the treated ones are never readmitted, this explains why the estimator for such IPS is big in magnitude.

The ATT for the IPS W in the pool of data suggests there are no significant differences in the readmission rates between the people under capitation and under fee-for-service. During

2010 the estimator is positive and significant and during 2011 it falls down to zero. For the IPS Y, the ATT indicates differences are not significant in the pool of data and neither during 2010. However in 2011, the difference is negative and significant meaning people under fee-for-service go almost 3 more times to the ER than people in capitation.

Table 20: ATT for the number of readmissions to the ER per provider

IPS	**Year**	***N***	**ATE**	**ATT**
W	Pool	18059	-1.1034***	-0.7570
	2010	2046	-0.1299	0.6141***
	2011	1420	-1.1034**	-0.7209
X	Pool	651	0.4148	-0.0448
	2010	599	0.5910	-0.0020
	2011	52	0.0231	-0.0521
Y	Pool	1836	-30.397***	-0.7080
	2010	591	-2.9191***	-0.0690
	2011	1245	-57.627**	-2.3454***
Z	Pool	655	10.808	NA
	2010	282	-0.2018	NA
	2011	383	13.021	NA

Notes: ATE matching individuals directly on D_{ijk}, S_{ijk}, H_{ijk}, γ_j. Each row is a separate estimation per provider. ***p<0.01, **p<0.05, *p<0.1

8 Conclusions

The study of contracts between insurers and providers in the health system and patient outcomes are scarce due mainly to data accessibility issues. In this paper we are able provide detailed evidence about the effect of capitation and fee-for-service contracts on outcomes given that the menu of contracts is exogenous, which to the best of our knowledge is the first study of its kind. We rationalize our findings with a model that overall predicts that under capitation contracts or prospective payments providers exert more effort in treating their patients compared to fee-for-service contracts or retrospective payments. Using panel data with information of all the services each enrollee receives during 2009, 2010 and 2011 in Colombia's statutory health system, we find that: (i) there are no significant differences in the average length-of-stay of users under capitation and under fee-for-service, (ii) capitation induces less readmissions to the ER and to emergency medical consultations than fee-for-service contracts, (iii) individuals in capitation tend to have a lower probability of suffering from a heart attack than those in fee-for-service, and (iv) given the robust evidence indicating capitation generates better health outcomes, annual cost measures per user also respond to the mechanism, meaning individuals in capitation cost less to the system than those in fee-for-service. These results hold after conditioning on specific patient and insurer profiles, which leaves us no other choice than to conclude the relation between type of contract and health outcomes could be causal. If so, the evidence is also supportive of the vertical integration between insurers and providers for two main purposes: one is the reduction of the financial risk and the perverse incentives in the contracting process, and the other is the improvement of health outcomes. Vertical integration solves the moral hazard problem and as a consequence it eliminates the trade-off between incentives and risk-sharing. Integrating also reduces the multiple marginalization problem that causes high consumer prices, even in the presence of cost distortions. However, perverse incentives could emerge after integrating. For example, risk selection could increase leading to the rejection of patients, or service quality could decrease because of the lower competition in both markets.

The most important challenge to our study from the empirical point of view had to do with the registration errors in our database. We ruled out these problems by estimating very restrictive exercises in which our results hold. Another empirical challenge had to do with the ability of balancing the characteristics between treated and control groups in our matching procedure. We solved this problem by matching observations directly on their observable characteristics without using a score. Other techniques for grouping individuals could be applied to our analysis for example clustering or unsupervised learning, but that exceeds the objectives of this paper.

There are still some limitations to our study. From the theoretical point view, we have not modeled the bargaining game between insurers and providers, however our intuition suggests that a high capitation would make providers accept capitation contracts even if their relative bargaining power is high. In other words, even if the provider always prefers fee-for-service contracts, the insurer can manage to impose capitation contracts if it offers a high value for the capitation or if its bargaining power exceeds that of the provider. Another interesting problem is to think of effort as a dynamic input that the provider has to choose each period and be able to demonstrate that under capitation providers concentrate their effort in the first periods after the visit of the patient, while in fee-for-service contracts the effort is distributed almost proportionally over each period.

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Appendix A. ER readmissions

Table A1: Odds ratio of being readmitted to the ER - Cancer-other cancer

UPC Location	Gender	Age group	A	C	I	P	S	T
1	F	5	0%	19%	31%	0%	100%	113%
1	F	6	62%	29%	0%	0%	100%	456%
1	F	7	0%	0%	0%	0%	100%	0%
1	F	8	0%	41%	0%	0%	100%	0%
1	F	9	66%	0%	0%	0%	100%	0%
1	F	10	221%	0%	239%	0%	100%	0%
1	F	11	0%	19%	0%	0%	100%	296%
1	F	12	30%	26%	0%	207%	100%	310%
1	M	5	37%	11%	10%	0%	100%	155%
1	M	6	44%	15%	0%	0%	100%	170%
1	M	7	28%	7%	0%	0%	100%	170%
1	M	8	71%	10%	0%	0%	100%	213%
1	M	9	0%	8%	49%	0%	100%	153%
1	M	10	0%	16%	57%	0%	100%	0%
1	M	11	61%	29%	0%	0%	100%	346%
1	M	12	56%	7%	0%	0%	100%	159%
2	F	5	124%	47%	0%	0%	100%	354%
2	F	6	0%	0%	0%	0%	100%	0%
2	F	7	0%	65%	0%	0%	100%	0%
2	F	10	0%	0%	0%	0%	100%	0%
2	F	12	0%	122%	0%	0%	100%	0%
2	M	5	114%	0%	0%	0%	100%	0%
2	M	6	117%	0%	0%	0%	100%	0%
2	M	7	0%	0%	0%	0%	100%	0%
2	M	8	0%	0%	0%	0%	100%	0%
2	M	9	0%	0%	0%	0%	0%	0%
2	M	10	0%	0%	0%	0%	100%	0%
2	M	11	0%	0%	0%	0%	100%	0%
2	M	12	0%	0%	0%	0%	100%	0%
3	F	5	14%	17%	59%	40%	100%	104%
3	F	6	34%	19%	64%	0%	100%	181%
3	F	7	10%	12%	57%	35%	100%	154%
3	F	8	29%	6%	52%	0%	100%	141%
3	F	9	29%	4%	52%	0%	100%	70%
3	F	10	44%	9%	49%	103%	100%	120%
3	F	11	81%	9%	67%	0%	100%	115%
3	F	12	14%	6%	35%	0%	100%	119%
3	M	5	25%	16%	54%	42%	100%	115%
3	M	6	0%	15%	53%	0%	100%	73%
3	M	7	10%	7%	36%	0%	100%	48%
3	M	8	28%	15%	36%	0%	100%	79%
3	M	9	0%	3%	39%	0%	100%	64%
3	M	10	37%	11%	29%	0%	100%	117%
3	M	11	36%	3%	49%	0%	100%	116%
3	M	12	13%	10%	23%	0%	100%	68%

Base category fee-for-service

Table A2: Odds ratio of being readmitted to the ER - Diabetes

UPC Location	Gender	Age group	A	C	I	P	S	T
1	F	5	368%	45%	18%	0%	100%	160%
1	F	6	148%	75%	0%	0%	100%	532%
1	F	7	383%	82%	7%	0%	100%	134%
1	F	8	230%	93%	16%	14%	100%	219%
1	F	9	372%	41%	11%	0%	100%	134%
1	F	10	369%	47%	0%	0%	100%	59%
1	F	11	290%	40%	0%	10%	100%	46%
1	F	12	329%	56%	0%	16%	100%	111%
1	M	5	193%	80%	9%	0%	100%	169%
1	M	6	119%	88%	9%	17%	100%	305%
1	M	7	332%	64%	5%	0%	100%	144%
1	M	8	671%	42%	6%	0%	100%	248%
1	M	9	567%	56%	3%	11%	100%	113%
1	M	10	275%	58%	0%	0%	100%	79%
1	M	11	449%	64%	6%	0%	100%	103%
1	M	12	7%	9%	0%	0%	100%	2%
2	F	5	0%	69%	0%	0%	100%	0%
2	F	6	133%	0%	0%	0%	100%	0%
2	F	7	0%	32%	0%	0%	100%	0%
2	F	8	0%	0%	0%	0%	100%	0%
2	F	9	60%	72%	0%	0%	100%	0%
2	F	10	0%	96%	0%	0%	100%	0%
2	F	11	0%	45%	0%	0%	100%	0%
2	F	12	31%	20%	0%	0%	100%	0%
2	M	5	94%	62%	0%	0%	100%	0%
2	M	6	0%	101%	0%	0%	100%	355%
2	M	7	61%	0%	0%	0%	100%	0%
2	M	8	0%	0%	0%	0%	100%	0%
2	M	9	68%	0%	0%	0%	100%	0%
2	M	10	0%	0%	0%	0%	100%	0%
2	M	11	0%	196%	0%	0%	100%	0%
2	M	12	20%	69%	0%	0%	100%	0%
3	F	5	799%	82%	30%	37%	100%	226%
3	F	6	418%	66%	41%	42%	100%	153%
3	F	7	518%	71%	19%	41%	100%	164%
3	F	8	440%	70%	12%	27%	100%	177%
3	F	9	678%	54%	17%	14%	100%	98%
3	F	10	509%	58%	8%	7%	100%	147%
3	F	11	291%	48%	16%	36%	100%	86%
3	F	12	615%	39%	9%	13%	100%	84%
3	M	5	442%	78%	42%	73%	100%	191%
3	M	6	1168%	76%	39%	85%	100%	231%
3	M	7	569%	64%	25%	19%	100%	204%
3	M	8	360%	83%	23%	68%	100%	135%
3	M	9	868%	66%	21%	42%	100%	92%
3	M	10	543%	52%	16%	0%	100%	130%
3	M	11	454%	41%	13%	24%	100%	94%
3	M	12	594%	38%	8%	28%	100%	77%

Base category fee-for-service

Table A3: Odds ratio of being readmitted to the ER - Cardiovascular disease-hypertension

UPC Location	**Gender**	**Age group**	**A**	**C**	**I**	**P**	**S**	**T**
1	F	5	29%	10%	11%	4%	100%	366%
1	F	6	19%	13%	11%	0%	100%	519%
1	F	7	18%	10%	2%	6%	100%	338%
1	F	8	5%	9%	4%	0%	100%	416%
1	F	9	18%	7%	4%	0%	100%	160%
1	F	10	19%	9%	0%	10%	100%	223%
1	F	11	25%	6%	2%	5%	100%	239%
1	F	12	20%	8%	3%	4%	100%	167%
1	M	5	5%	8%	12%	11%	100%	389%
1	M	6	21%	13%	14%	9%	100%	323%
1	M	7	26%	11%	5%	0%	100%	517%
1	M	8	20%	9%	8%	6%	100%	348%
1	M	9	14%	9%	7%	0%	100%	340%
1	M	10	27%	6%	8%	0%	100%	250%
1	M	11	40%	6%	2%	0%	100%	233%
1	M	12	27%	8%	1%	2%	100%	88%
2	F	5	0%	6%	0%	0%	100%	0%
2	F	6	0%	10%	0%	0%	100%	0%
2	F	7	0%	4%	0%	0%	100%	249%
2	F	8	28%	0%	0%	0%	100%	0%
2	F	9	32%	3%	0%	0%	100%	0%
2	F	10	21%	17%	0%	0%	100%	0%
2	F	11	40%	7%	0%	0%	100%	0%
2	F	12	33%	6%	0%	0%	100%	0%
2	M	5	10%	4%	0%	0%	100%	0%
2	M	6	10%	10%	0%	0%	100%	0%
2	M	7	22%	10%	0%	0%	100%	0%
2	M	8	0%	10%	0%	0%	100%	0%
2	M	9	32%	8%	0%	0%	100%	0%
2	M	10	22%	4%	0%	0%	100%	0%
2	M	11	50%	6%	0%	0%	100%	0%
2	M	12	137%	6%	0%	0%	100%	0%
3	F	5	14%	13%	45%	49%	100%	347%
3	F	6	10%	11%	29%	25%	100%	409%
3	F	7	8%	8%	24%	48%	100%	364%
3	F	8	7%	7%	17%	30%	100%	344%
3	F	9	4%	6%	15%	21%	100%	298%
3	F	10	8%	5%	11%	17%	100%	209%
3	F	11	8%	4%	11%	23%	100%	181%
3	F	12	10%	5%	12%	22%	100%	129%
3	M	5	14%	10%	37%	42%	100%	342%
3	M	6	7%	9%	30%	22%	100%	340%
3	M	7	9%	8%	24%	87%	100%	364%
3	M	8	7%	8%	19%	25%	100%	326%
3	M	9	8%	7%	15%	31%	100%	216%
3	M	10	9%	4%	15%	11%	100%	198%
3	M	11	9%	4%	7%	14%	100%	178%
3	M	12	13%	4%	10%	23%	100%	132%

Base category fee-for-service

Table A4: Odds ratio of being readmitted to the ER - Chronic renal failure

UPC Location	Gender	Age group	A	C	I	P	S	T
1	F	5	0%	2%	0%	0%	100%	0%
1	F	6	76%	0%	0%	0%	100%	0%
1	F	7	45%	0%	0%	29%	100%	0%
1	F	8	24%	0%	0%	0%	100%	0%
1	F	9	0%	0%	0%	0%	100%	0%
1	F	10	29%	2%	0%	0%	100%	0%
1	F	11	0%	0%	0%	0%	100%	0%
1	F	12	4%	0%	0%	0%	100%	1%
1	M	5	4%	5%	0%	0%	100%	0%
1	M	6	0%	0%	0%	0%	100%	0%
1	M	7	0%	2%	0%	0%	100%	0%
1	M	8	0%	5%	0%	0%	100%	1%
1	M	9	22%	0%	0%	10%	100%	0%
1	M	10	0%	1%	43%	0%	100%	0%
1	M	11	6%	1%	0%	0%	100%	0%
1	M	12	4%	1%	0%	0%	100%	0%
2	F	5	67%	29%	0%	0%	100%	0%
2	F	7	0%	0%	0%	0%	100%	0%
2	F	9	50%	0%	0%	0%	100%	0%
2	F	10	0%	0%	0%	0%	0%	0%
2	F	11	0%	0%	0%	0%	100%	0%
2	F	12	0%	0%	0%	0%	0%	0%
2	M	5	0%	0%	0%	0%	100%	0%
2	M	6	0%	0%	0%	0%	100%	0%
2	M	7	0%	0%	0%	0%	100%	0%
2	M	8	0%	0%	0%	0%	100%	0%
2	M	11	100%	12%	0%	0%	100%	0%
3	F	5	11%	2%	36%	6%	100%	2%
3	F	6	25%	0%	0%	0%	100%	0%
3	F	7	0%	0%	413%	4%	100%	0%
3	F	8	9%	0%	38%	0%	100%	1%
3	F	9	5%	0%	82%	0%	100%	0%
3	F	10	5%	0%	85%	0%	100%	0%
3	F	11	16%	0%	36%	0%	100%	0%
3	F	12	4%	0%	22%	0%	100%	0%
3	M	5	13%	2%	38%	14%	100%	1%
3	M	6	12%	2%	53%	0%	100%	2%
3	M	7	4%	1%	0%	0%	100%	2%
3	M	8	6%	0%	0%	0%	100%	2%
3	M	9	12%	1%	48%	0%	100%	1%
3	M	10	10%	0%	32%	1%	100%	1%
3	M	11	11%	1%	0%	1%	100%	1%
3	M	12	11%	0%	15%	1%	100%	1%

Base category fee-for-service

Appendix B. EMC readmissions

Table B1: Odds ratio of being readmitted to EMC - Diabetes

UPC Location	Gender	Age group	A	C	I	P	S	T
1	F	5	21.6%	10.1%	25.2%	0.0%	100.0%	230.0%
1	F	6	0.0%	9.3%	0.0%	0.0%	100.0%	702.9%
1	F	7	33.7%	11.9%	17.5%	0.0%	100.0%	166.3%
1	F	8	14.1%	11.4%	19.2%	16.6%	100.0%	372.7%
1	F	9	27.3%	5.3%	12.0%	0.0%	100.0%	174.3%
1	F	10	41.8%	3.8%	0.0%	0.0%	100.0%	72.1%
1	F	11	32.9%	3.9%	0.0%	12.2%	100.0%	53.6%
1	F	12	28.3%	6.9%	0.0%	9.1%	100.0%	145.7%
1	M	5	10.0%	12.8%	12.2%	0.0%	100.0%	221.7%
1	M	6	8.6%	13.2%	11.4%	21.0%	100.0%	387.2%
1	M	7	19.9%	7.4%	0.0%	0.0%	100.0%	160.6%
1	M	8	28.8%	6.1%	7.5%	0.0%	100.0%	263.9%
1	M	9	31.5%	7.2%	6.1%	12.7%	100.0%	144.9%
1	M	10	17.3%	5.2%	0.0%	0.0%	100.0%	105.0%
1	M	11	36.6%	5.0%	6.6%	0.0%	100.0%	117.7%
1	M	12	46.2%	3.9%	4.2%	0.0%	100.0%	39.6%
2	F	5	0.0%	21.0%	0.0%	0.0%	100.0%	0.0%
2	F	6	160.0%	0.0%	0.0%	0.0%	100.0%	0.0%
2	F	7	0.0%	8.2%	0.0%	0.0%	100.0%	0.0%
2	F	8	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
2	F	9	42.2%	0.0%	0.0%	0.0%	100.0%	0.0%
2	F	10	0.0%	18.2%	0.0%	0.0%	100.0%	0.0%
2	F	11	0.0%	13.3%	0.0%	0.0%	100.0%	0.0%
2	F	12	23.4%	8.0%	0.0%	0.0%	100.0%	0.0%
2	M	5	22.9%	27.8%	0.0%	0.0%	100.0%	0.0%
2	M	6	0.0%	47.8%	0.0%	0.0%	100.0%	0.0%
2	M	7	25.6%	0.0%	0.0%	0.0%	100.0%	0.0%
2	M	8	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
2	M	9	95.7%	0.0%	0.0%	0.0%	100.0%	0.0%
2	M	10	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
2	M	11	0.0%	26.8%	0.0%	0.0%	100.0%	0.0%
2	M	12	34.7%	12.5%	0.0%	0.0%	100.0%	0.0%
3	F	5	12.9%	13.3%	32.7%	50.3%	100.0%	304.0%
3	F	6	11.4%	10.5%	40.6%	64.6%	100.0%	196.6%
3	F	7	9.5%	9.6%	22.7%	47.0%	100.0%	247.6%
3	F	8	6.6%	8.9%	11.8%	40.6%	100.0%	224.3%
3	F	9	10.2%	5.9%	18.1%	15.8%	100.0%	122.3%
3	F	10	12.8%	5.1%	6.6%	7.5%	100.0%	172.4%
3	F	11	7.4%	4.4%	16.8%	40.0%	100.0%	105.8%
3	F	12	10.5%	4.5%	8.9%	23.7%	100.0%	101.8%
3	M	5	3.0%	12.6%	44.7%	83.5%	100.0%	259.3%
3	M	6	16.7%	11.4%	40.9%	146.1%	100.0%	273.9%
3	M	7	6.7%	8.5%	25.0%	22.4%	100.0%	255.7%
3	M	8	6.4%	10.6%	27.0%	92.6%	100.0%	172.2%
3	M	9	11.7%	7.5%	23.6%	54.9%	100.0%	144.0%
3	M	10	9.7%	5.1%	19.0%	0.0%	100.0%	178.6%
3	M	11	9.6%	3.6%	14.8%	13.2%	100.0%	114.7%
3	M	12	11.6%	3.9%	8.0%	38.9%	100.0%	88.9%

Base category fee-for-service

Table B2: Odds ratio of being readmitted to EMC - Cardiovascular disease-hypertension

UPC Location	**Gender**	**Age group**	**A**	**C**	**I**	**P**	**S**	**T**
1	F	5	37.7%	8.7%	12.9%	0.0%	100.0%	0.0%
1	F	6	20.5%	12.8%	10.9%	0.0%	100.0%	0.0%
1	F	7	16.9%	8.6%	2.1%	8.1%	100.0%	0.0%
1	F	8	4.2%	7.2%	4.4%	0.0%	100.0%	0.0%
1	F	9	18.0%	4.6%	6.7%	0.0%	100.0%	0.0%
1	F	10	15.1%	6.7%	1.9%	6.0%	100.0%	0.0%
1	F	11	24.8%	3.4%	1.8%	5.4%	100.0%	0.0%
1	F	12	22.7%	6.7%	4.1%	2.6%	100.0%	0.0%
1	M	5	6.8%	5.5%	15.6%	9.2%	100.0%	0.0%
1	M	6	19.8%	8.9%	15.7%	0.0%	100.0%	0.0%
1	M	7	22.0%	8.1%	6.1%	0.0%	100.0%	0.0%
1	M	8	18.7%	4.5%	12.1%	7.4%	100.0%	0.0%
1	M	9	16.8%	5.9%	8.8%	0.0%	100.0%	0.0%
1	M	10	28.0%	4.3%	9.8%	0.0%	100.0%	0.0%
1	M	11	44.5%	3.8%	2.4%	0.0%	100.0%	0.0%
1	M	12	29.9%	6.5%	1.5%	0.0%	100.0%	0.0%
2	F	5	0.0%	6.9%	0.0%	0.0%	100.0%	0.0%
2	F	6	0.0%	12.2%	0.0%	0.0%	100.0%	0.0%
2	F	7	0.0%	4.9%	0.0%	0.0%	100.0%	0.0%
2	F	8	35.1%	0.0%	0.0%	0.0%	100.0%	0.0%
2	F	9	18.8%	3.1%	0.0%	0.0%	100.0%	0.0%
2	F	10	25.2%	14.7%	0.0%	0.0%	100.0%	0.0%
2	F	11	46.2%	7.9%	0.0%	0.0%	100.0%	0.0%
2	F	12	41.2%	4.5%	0.0%	0.0%	100.0%	0.0%
2	M	5	13.9%	5.4%	0.0%	0.0%	100.0%	0.0%
2	M	6	12.3%	10.4%	0.0%	0.0%	100.0%	0.0%
2	M	7	16.7%	16.2%	0.0%	0.0%	100.0%	0.0%
2	M	8	0.0%	8.7%	0.0%	0.0%	100.0%	0.0%
2	M	9	20.2%	10.4%	0.0%	0.0%	100.0%	0.0%
2	M	10	35.9%	6.5%	0.0%	0.0%	100.0%	0.0%
2	M	11	75.2%	8.8%	0.0%	0.0%	100.0%	0.0%
2	M	12	169.7%	8.3%	0.0%	0.0%	100.0%	0.0%
3	F	5	17.2%	12.3%	53.8%	56.3%	100.0%	0.0%
3	F	6	9.7%	11.3%	34.6%	32.5%	100.0%	0.0%
3	F	7	8.2%	7.4%	26.7%	58.2%	100.0%	0.0%
3	F	8	7.8%	6.7%	23.7%	39.1%	100.0%	0.0%
3	F	9	4.4%	5.3%	19.1%	20.2%	100.0%	0.0%
3	F	10	8.9%	4.9%	15.6%	16.8%	100.0%	0.0%
3	F	11	10.3%	4.1%	12.6%	33.2%	100.0%	0.0%
3	F	12	11.0%	4.4%	14.2%	23.0%	100.0%	0.0%
3	M	5	12.8%	9.6%	43.7%	45.2%	100.0%	0.0%
3	M	6	7.7%	7.6%	35.8%	38.5%	100.0%	0.0%
3	M	7	8.4%	8.0%	29.5%	79.0%	100.0%	0.0%
3	M	8	7.7%	6.7%	21.2%	24.6%	100.0%	0.0%
3	M	9	7.4%	6.5%	20.4%	35.8%	100.0%	0.0%
3	M	10	9.7%	4.3%	18.0%	9.8%	100.0%	0.0%
3	M	11	9.9%	3.7%	8.9%	18.8%	100.0%	0.0%
3	M	12	13.6%	3.8%	11.3%	31.0%	100.0%	0.0%

Base category fee-for-service

Appendix C. AMI, CA, HF readmissions

Table C1: Readmission rates to the ER for users with AMI, CA and HF

EPS	A	C	I	P	S	T
			AMI			
B	0.0%	0.0%	0.0%	0.0%	0.0%	13.0%
C	180.1%	170.1%	1628.1%	0.0%	100.0%	0.0%
D	0.0%	61.7%	0.0%	0.0%	100.0%	0.0%
E	0.0%	52.2%	0.0%	0.0%	100.0%	0.0%
F	0.0%	0.0%	0.0%	0.0%	0.0%	4.4%
H	0.0%	0.0%	0.0%	0.0%	100.0%	7.0%
J	0.0%	26.3%	0.0%	0.0%	100.0%	0.0%
K	0.0%	6.2%	0.0%	0.0%	100.0%	0.0%
L	1181.4%	250.0%	0.0%	146.9%	100.0%	0.0%
M	0.0%	0.0%	0.0%	0.0%	0.0%	15.5%
N	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
O	441.9%	28.9%	0.0%	0.0%	100.0%	0.0%
			CA			
B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
C	0.0%	107.6%	1603.6%	0.0%	100.0%	0.0%
D	0.0%	31.8%	0.0%	0.0%	100.0%	0.0%
I	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
H	411.1%	0.0%	0.0%	0.0%	100.0%	2750.4%
J	0.0%	41.6%	0.0%	0.0%	100.0%	0.0%
K	6.9%	2.3%	0.0%	0.0%	100.0%	0.0%
L	545.2%	16.9%	0.0%	146.0%	100.0%	0.0%
M	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
N	0.0%	39.4%	0.0%	0.0%	100.0%	0.0%
O	304.1%	17.7%	0.0%	0.0%	100.0%	0.0%
			HF			
C	0.0%	0.0%	182.5%	.	100.0%	0.0%
D	0.0%	0.0%	0.0%	.	100.0%	0.0%
H	0.0%	0.0%	0.0%	.	100.0%	25.0%
J	0.0%	9.4%	0.0%	.	100.0%	0.0%
K	0.0%	0.0%	0.0%	.	100.0%	0.0%
L	0.0%	136.0%	0.0%	.	100.0%	0.0%
O	118.9%	8.3%	0.0%	.	100.0%	0.0%

Base category fee-for-service