Health Insurer Responses to Market Exit: Impacts on Provider Networks, Congestion, and Patient Mortality*

Giancarlo Buitrago Paul Rodríguez-Lesmes Natalia Serna

Marcos Vera-Hernández

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Abstract

We leverage the abrupt exit of Colombia's largest health insurer to assess its effects on incumbent insurers' network of covered providers, congestion, and patient mortality. This termination caused a 10% decrease in the breadth of provider networks and led to a 22% increase in mortality rates among patients who never switched their insurer. Our analysis suggests two key mechanisms drove the increase in mortality: the reduced provider network breadth and the increased congestion stemming from a surge of enrollees at incumbent insurers. These findings suggest that the way health insurers organize healthcare delivery through their provider networks plays a crucial role in patient health. Consequently, there may be a need for policies mandating minimum network coverage to ensure patient well-being.

Keywords: Mortality, Provider networks, Health insurance, Insurer competition.

JEL codes: I10, I11, I13, I18.

*Buitrago: Universidad Nacional de Colombia and Fundación Cardioinfantil-Instituto de Cardiología, gbuitragog@unal.edu.co, Rodríguez-Lesmes: Universidad del Rosario, paul.rodriguez@urosario.edu.co, Serna: Stanford University, nserna@stanford.edu, Vera-Hernández: University College London, IFS, and CEPR, m.vera@ucl.ac.uk. We are deeply grateful to the Colombian Ministry of Health for providing the data for this research. We thank Jason Abaluck, Panle Jia Barwick, Zarek Brot, Michael Dickstein, Eli Liebman, Alex McKay, Grant Miller, Maria Polyakova, Maggie Shi, Alan Sorensen, Amanda Starc, and Chris Sullivan for their useful feedback and comments. We thank seminar participants at Chicago Harris School of Public Policy and Georgetown, and conference participants at the California Health Economics Conference, Stanford Health Policy Seminar, 2024 NBER IO spring meeting, 2024 Junior Health Economists Summit, and 2024 Health Economics and Policy Innovation Collaborative. The findings of this paper do not represent the views of any institution involved. All errors are our own.

1 Introduction

Insurers play a key role in the operation of health systems. Their basic function consists of pooling the financial risk associated with their enrollees' medical costs to protect them against unexpected medical bills. However, more recently, with the expansion of managed care, insurers also play an active role in the delivery of health care, establishing the network of providers that their enrollees can use, the procedures to approve expensive treatments, and even integrating vertically with providers. Governments heavily regulate competition between insurers to guarantee adequate insurance and health care access to the population, for example, by subsidizing premiums, penalizing insurer exit, or establishing minimum capital requirements.

The strict regulation of health insurance systems makes the abrupt exit of major health insurers unlikely. Consequently, we know very little about the potential impacts of such exits on market and health outcomes, as well as the possible costs associated with loosening these regulations. In this paper, we leverage a natural experiment in Colombia's health insurance system where the *largest* health insurer, SaludCoop, which covered 20% of the country, was abruptly terminated in December 2015 due to political considerations and engagement in illegal activities unrelated to its overall performance. The government maintained individuals' insurance access by transferring SaludCoop's enrollees to a small incumbent insurer, called Cafesalud, which covered 5% of the country. SaludCoop's enrollees were required to remain in Cafesalud for 90 days after which they were allowed to switch. Given the managed care nature of Colombia's health system, we focus on how incumbent insurers (other than SaludCoop or Cafesalud) react to SaludCoop's termination and the downstream effects of these strategic supply responses on patient mortality.

The novelty of our study lies in quantifying these equilibrium effects of abrupt insurer exits in a setting where access to insurance did not change, but access to health care did, and in investigating whether subsequent responses by incumbent insurers matter for health outcomes. In doing so, we build on research that has used health plan terminations to

quantify impacts on mortality but has not delved into the supply-side responses or the mechanisms explaining why the private provision of public insurance matters for patient health. (e.g., Abaluck et al., 2021). We also extend research that has examined the impacts of insurance coverage on health outcomes (e.g, Currie and Gruber, 2001; Ghosh et al., 2019; Miller et al., 2021; Duggan et al., 2022), by demonstrating that, in addition to coverage itself, non-financial characteristics of health plans are also significant.

Similar to Medicaid managed care and Medicare Advantage in the U.S. or the Netherland's health system, insurers in Colombia compete for enrollees by offering one insurance plan. In this plan, insurers can design their network of covered providers, but other elements such as premiums, cost-sharing, and service coverage are regulated.[1] Colombia's health system has achieved almost universal coverage, with insurers receiving a risk-adjusted capitated payment per enrollee from the government. The strong regulation of the insurance plan—except for insurers' network of covered providers—suggests that the main way in which incumbent insurers can react to SaludCoop's termination is through their provider networks.

We combine our unique natural experiment with rich administrative data encompassing health claims, enrollment records, and mortality for the entire country from 2013 to 2019. In addition, we utilize detailed information on insurers' provider listings, which outline the hospitals, clinics, and physician practices included in their networks. We use a difference-in-differences framework to compare outcome trends between incumbent insurers in municipalities where SaludCoop operated (treatment group) versus municipalities where it did not operate (control group), before and after the termination.

Defining provider network breadth as the fraction of providers in a market that are covered by the insurer, we first find that incumbent insurers in treated municipalities reduced provider network breadth by around 10% relative to baseline. The reduction in network breadth is consistent with incumbent insurers engaging in strategic behavior to discourage enrollment from potentially unprofitable switchers from SaludCoop after the 90-day grace

[1] Insurance premiums are zero and copays, coinsurance rates, and maximum out-of-pocket amounts are indexed to the enrollee's monthly income but are standardized across insurers and hospitals.

period. For example, we find that reductions in network breadth are larger in markets where SaludCoop's enrollees had relatively worse health status at baseline and that consumers with worse health status are in fact the ones with stronger preferences for network breadth. We also find that incumbent insurers tended to drop high-volume, outpatient care providers where patients with chronic health conditions receive most of their disease management services. Our results on provider networks are robust to excluding the main capital cities and persist under alternative ways of calculating provider network breadth.

Then, we compare health outcome trends among non-SaludCoop enrollees in treated versus control markets. We estimate a persistent 22% increase in individual mortality after the termination among patients who never switched their insurer nor moved across municipalities. The mortality increase remains even when we do not impose restrictions on non-SaludCoop enrollees' switching behavior, suggesting that the sample of inertial patients is not selected in a way that biases our estimate of the mortality effect. Results are also robust to excluding the main capital cities and to excluding low-income individuals whose enrollment is fully subsidized by the government. Most of the impact on mortality comes from individuals with chronic health conditions who are likely to be affected by the exclusion of outpatient care providers. This indicates that the impacts of exogenous insurer exits on health are heterogeneous across the population and disproportionately affect those who need healthcare the most.

We investigate several potential mechanisms behind this increase in mortality. Given that insurers compete mainly on their provider networks and these networks become narrower after the termination, we start by exploring how mortality effects vary based on network changes. Our findings reveal that mortality increased substantially among consumers who had a high share of pre-termination claims at providers that were later dropped from the network, whereas those with a low share of claims at these providers experienced no change in mortality. The finding that provider network exclusions hurt patient health is significant, especially when narrow-network health plans have proliferated in different in health

systems (such as Medicaid managed care and Medicare Advantage in the U.S.). Insurers can effectively limit access to essential health services by structuring the delivery of healthcare through a provider network, even when health systems have universal insurance coverage.

Provider network exclusions not only directly impact patients who seek care from these providers but also potentially create congestion externalities that affect those visiting other providers within the network. SaludCoop's termination may exacerbate these congestion externalities as enrollees switch out of Cafesalud to join one of the incumbent insurers. To explore this possibility, we investigate congestion as an additional mechanism influencing mortality outcomes. One challenge with quantifying the impact of these externalities is measuring congestion accurately. To address this, we use the overlap in provider networks between the incumbent insurer and SaludCoop as a proxy for congestion. If both insurers cover the same providers, then the switch of SaludCoop's enrollees to the incumbent insurer following termination is unlikely to alter the patient volume for those providers. Evaluating the heterogeneity in mortality effects by incumbent insurers with above- or below-median network overlap with SaludCoop we find that mortality increased among the latter but not among the former, consistent with congestion externalities impacting patient health.

Finally, we are able to rule out other potential mechanisms for changes in patient health brought by the termination, such as changes in insurer market concentration and thinning of healthcare labor markets. Changes in market concentration may impact insurers' relative bargaining power with providers, resulting in higher health care prices (Serna, 2024b). Price increases may in turn disincentivize patients from seeking essential care. However, we show that mortality effects do not vary between markets with different levels of predicted insurer concentration. SaludCoop's termination may have also pushed doctors to retire or move to different locations. Nonetheless, we show that healthcare labor supply did not change after the termination. Moreover, the mortality effects of the termination are invariant to the baseline number of doctors per capita.

Given the crucial role that health insurers play in health outcomes through the organi-

zation and structure of their provider networks, our findings indicate that policies shaping network design or insurer competition—such as network adequacy regulations—can have important downstream effects on health outcomes. Ensuring broad network coverage can help preserve continuity of care following an insurer termination and strengthen incumbent insurers' resilience to competitive disruptions.

Contributions and relation to the literature. This paper contributes to the growing literature analyzing the causal effects of narrow provider networks in managed care health systems, which has focused on outcomes like utilization, spending, and premiums (e.g., Wallace, 2023; Shepard, 2022; Atwood and Sasso, 2016). It also relates more broadly to the study of how health insurance affects health outcomes (e.g., Conti and Ginja, 2023; Das and Do, 2023; Balsa and Triunfo, 2021; Goldin et al., 2020; Miller et al., 2021; Bauernschuster et al., 2020; Sood and Wagner, 2018; Wherry and Miller, 2016; Gruber et al., 2014; Sommers et al., 2014; Baicker et al., 2013; Miller et al., 2013; Sommers et al., 2012; Card et al., 2009) and of the impacts of managed care (e.g., Macambira et al., 2022; Aizer et al., 2007; Cutler et al., 2000). We show that in managed care systems, health insurers play an active role in the provision of health care by establishing their provider networks, and thus, network breadth is a mechanism through which insurers may impact patient mortality.

Our paper is also related to the literature analyzing interruptions in health care due to involuntary patient switches of insurer or provider (e.g., Bonilla et al., 2024; Chamorro et al., 2024; Sabety, 2023; Politzer, 2021; Barnett et al., 2017; Lavarreda et al., 2008). We contribute to this literature by studying a large insurer termination that was politically motivated (due to corruption scandals) and unrelated to its quality. In addition to quantifying effects on patient health as this previous literature, we provide estimates of the equilibrium effects by analyzing market outcomes such as provider networks and congestion externalities. We document how incumbent insurers react strategically to a competitor's termination and then how these decisions may hurt patient health.

Finally, this paper contributes to the literature studying insurer competition on provider

networks and its regulation. Several papers examine the relationship between provider network breadth, premiums, and negotiated health service prices (e.g., Ghili, 2022; Liebman, 2022; Ho and Lee, 2019; Ho, 2009; Dafny et al., 2017, 2015). Other papers analyze insurers' incentives to establish narrow networks (e.g., Shepard, 2022; Ho and Lee, 2017; Serna, 2024a). Yet, to date, evidence on whether provider network breadth affects the production of health is limited. We bridge the literature on industrial organization of health care markets and health outcomes research by providing evidence that insurers' strategic interactions may have downstream health effects.[2]

The rest of this paper is structured as follows. Section 2 introduces the institutional background, section 3 describes our data, section 4 presents the results of the impact of the termination on provider networks and mortality, section 5 discusses potential mechanisms behind the mortality effect, and section 6 concludes.

2 Institutional Background

The Colombian healthcare system is divided into two schemes: contributory and subsidized. The contributory scheme covers approximately half of the population, consisting of formal workers and their families who pay payroll taxes, while the subsidized scheme is fully funded by the general budget. As of 2020, nearly 95% of the population was covered by this system.[3]

Both contributory and subsidized scheme enrollees have access to the same national health insurance plan through a range of private and public insurers, creating a managed care system. Almost all aspects of the national insurance plan—including premiums, patient cost-sharing, and service coverage—are regulated, with the exception of provider networks. Insurers in Colombia have the flexibility to choose which providers to include for each health

[2]There are a few papers in this area, such as Gaynor et al. (2013), Cooper et al. (2011), and Propper et al. (2008) who estimate the impact of hospital competition and market power on patient outcomes in the context of the National Health Service in the UK.

[3]See https://www.minsalud.gov.co/Paginas/Colombia-sigue-avanzando-en-la-cobertura-universal-en-salud-.aspx

service covered by the national insurance plan and can freely establish contracts with them through bilateral negotiations.

Enrollees do not pay insurance premiums; instead, at the beginning of each year, insurers receive per-capita transfers from the government that are risk-adjusted based on the enrollee's sex, age, and municipality of residence. At the end of each year, insurers are also compensated for the health conditions of their enrollees based on a coarse list of diagnoses known as the High-Cost Account. However, these risk adjustment mechanisms are imperfect and do not fully eliminate incentives for risk selection (Riascos, 2013).

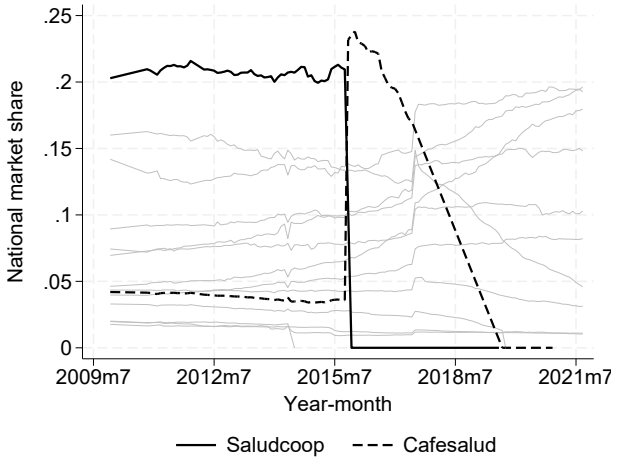
Insurers in Colombia respond to these selection incentives through their provider networks. Serna (2024a) demonstrates that while all consumers prefer broad networks, those with chronic diseases—who may be unprofitable—exhibit a significantly higher willingness to pay for network breadth. Consequently, to deter enrollment from these potentially unprofitable patients, insurers tend to offer narrower networks for services that such patients are likely to need. Additionally, the degree of insurer competition may influence the incentive to establish broader networks. In line with models predicting that product quality increases with the number of firms (e.g., Shaked and Sutton, 1982), insurers are likely to create broader networks in more competitive markets.

Given the active role insurers play in shaping healthcare delivery through their networks, governments impose stringent regulations on insurer competition, market presence, and product quality, including network adequacy standards and minimum capital requirements. These regulations make it difficult to observe exogenous shocks to competition, such as abrupt insurer exits, and hinder the assessment of their effects on both insurance markets and patient outcomes.

In this paper, we leverage an exogenous insurer termination in Colombia to analyze how incumbent insurers respond and the implications for patient health. The Colombian government can terminate insurers if they divert resources away from the health care system

or if they cannot maintain their risk-based capital requirements.[4] In December 2015, the government terminated the *largest* health insurer in the country, SaludCoop, due to engagement in illegal activities.[5] Its board of directors diverted nearly 1.3% of total health care spending in 2015 to investments outside the health system, engaged in financial malpractice, and submitted false health claims to the government for reimbursement. The CEO and board of directors were fined 50 monthly minimum wages, prohibited from working in public office, and prohibited from participating in public auctions for at least 18 years. Appendix B provides a timeline of the termination.[6]

FIGURE 1: National Market Share



Note: Figure shows monthly national market share per insurer from 2009 to 2021 using publicly available enrollment counts for both the contributory and subsidized schemes.

SaludCoop's enrollees were transferred to an incumbent insurer called Cafesalud. The government chose Cafesalud as the reassignment insurer because (allegedly) it operated in almost the same municipalities as SaludCoop (see Appendix Figure 1). SaludCoop's enrollees

[4]Another reason for termination includes low enrollee satisfaction scores based on surveys conducted by the Ministry of Health and Social Protection. See Decree 780 of 2016.

[5]More recently, other health insurers that operate in the subsidized regime have filed for bankruptcy and have been terminated by the government as a result (see e.g., Bonilla et al., 2024). These terminations have been made on the basis of insurers being unable to maintain their risk-based capital requirements and receiving enrollee complaints about their quality of care. This is unlike SaludCoop's termination, which was a profitable company when the government decided to terminate it.

[6]More description of the termination process, fines, and investigation can be found in Resolution 002414 of 2015 and Bulletin 1103 of 2012 from the *Procuraduría General de la Nación.*

had to remain in Cafesalud for 90 days, from January to March 2016, after which they were allowed to switch their insurer. During the reassignment period, Cafesalud had to guarantee access to health care for SaludCoop's enrollees at the providers that SaludCoop used to cover in its network, in addition to those already in Cafesalud's network. The government made a $70 million loan to Cafesalud to facilitate this transition.

Figure 1 shows the national market share per insurer in the contributory scheme. We emphasize SaludCoop and Cafesalud in black, and the rest of the insurers are illustrated in gray. SaludCoop (solid black line) covered on average 20% of enrollees in the years before its termination.[7] SaludCoop and Cafesalud participated in both the contributory and the subsidized schemes. Cafesalud had a national market share under 5% before the termination, 23% in the first three months of 2016, and was itself terminated in 2019.[8]

SaludCoop's termination resulted in significant changes to the provision of health insurance and healthcare in Colombia, with repercussions that continue to this day in the form of ongoing fines and debts. This termination not only decreased the number of available insurers but also impacted the country's hospital capacity. As part of the termination, SaludCoop was forced to sell the hospitals and clinics that it owned or was vertically integrated with. These hospitals were not allowed to operate until they were sold to other providers, which did not happen during our sample period from 2013 to 2019.

In 2014, SaludCoop owned 38 hospitals and clinics, which accounted for 2,354 out of the approximately 80,000 hospital beds nationwide. SaludCoop operated hospitals in 31 municipalities (out of 1,120 in the country), and in 12 of those, insurers other than SaludCoop and Cafesalud covered SaludCoop hospitals. Additionally, beyond these 31 municipalities, SaludCoop operated in 452 others without having its own hospitals.

[7] On average, SaludCoop's market share in a municipality was 50%.

[8] Cafesalud was terminated due to consistent patient complaints about the quality of care and flailing profits after the reassignment of SaludCoop's enrollees.

3 Data

3.1 Data sources and definitions

Our enrollment data comprises all enrollees to the contributory and subsidized schemes, nearly the entire population in the country. We have a snapshot of enrollment data for every June from 2013 to 2019, corresponding to three years before and four after SaludCoop's termination. Because we do not see enrollment every month, we assume that if an individual is enrolled with insurer A in June 2013, they remain with this insurer every month until June 2014 when we see the next enrollment snapshot.[9] The enrollment files contain the individual's sex, age, municipality of residence, and insurer.

At the end of every year, insurers in the contributory and subsidized schemes report all of their enrollees' health claims to the government. The government uses this data annually to update the risk-adjusted transfers and imposes several data quality filters. We have health claims data only for insurers in the contributory scheme that passed these quality filters from 2013 to 2019, which represent 88% of enrollees in this scheme by the end of the sample period. We do not have claims data for individuals in the subsidized scheme. The health claims data report the date the claim was filed, enrollee identifier, associated International Classification of Diseases Code 10 (ICD-10), provider that rendered the claim, insurer that reimbursed the claim, and negotiated service price between the insurer and the provider. We do not observe the patient's residence address but their municipality of residence.

From the Ministry of Health and Social Protection, we obtain individual-level mortality from 2013 to 2019. Anonymous individual identifiers are the same across datasets, allowing us to merge mortality with enrollment and health claim information. The mortality data report date of death, cause of death or associated diagnosis, manner of death (fetal, violent, or natural), indicator for whether the individual died at the hospital or elsewhere, provider

[9] Conditional on staying within the same insurance regime and having continuous enrollment spells, the assumption that individuals remain enrolled with their insurer during the 12 months from June to June is consistent with the low switching rate reported in Serna (2024a).

identifier, and insurer identifier.

We merge the enrollment and mortality data based on the individual identifier. Because the enrollment data has information of June of every year, if we observe a death in any other month, we append this individual to the enrollment file. This way our mortality variable reflects the annual mortality from January to December. The mortality indicator takes the value of zero if the person is alive that year and takes the value of one if they die that year. After the individual dies, they disappear from our data, hence mortality rates are measured relative to the population who is alive at the beginning of the year. We exclude fetal deaths from the analysis since there is no patient identifier associated with this type of death.

Finally, we have data on insurers' network of covered providers from 2013 to 2017 from the National Health Superintendency. These data report the hospitals, clinics, and physician practices that insurers in the contributory scheme include in their networks. We do not have a corresponding dataset for insurers that operate in the subsidized scheme. The provider listings report the Colombian Tax Identification Number (TIN) of every in-network provider. Each TIN has multiple facility locations within a municipality. The Colombian Ministry of Health and Social Protection assigns a unique provider ID to each of these locations. The provider ID matches the health claims data and the National Registry of Health Care Providers (REPS, by its Spanish acronym), which includes the universe of providers in the country, along with characteristics like the number of beds.

We match the TINs in the provider listing with provider IDs from the national registry and compare this network to the providers reporting claims in the health claims data. Around 16% of insurer-provider pairs appear in the claims data but not in the provider listings. We incorporate these pairs into our final provider network dataset.

3.2 Sample restrictions

For our analysis, we compare outcome trends among non-SaludCoop enrollees between municipalities where SaludCoop operated at the time of the termination (treatment group)

against municipalities where it did not operate (control group). We restrict our data in several ways to guarantee that treated and control groups are similar before the termination. These restrictions help control for differential adverse selection patterns across treatment status before the termination—although our results are robust to these sample restrictions.

First, *we exclude individuals who are enrolled with SaludCoop or Cafesalud* before SaludCoop's termination, thus our results are reflective of changes in outcomes at the rest of incumbent insurers. Second, we keep individuals with continuous enrollment spells, who did not switch their insurer while they were enrolled, and who did not move across municipalities before the termination. Third, we keep a balanced panel of insurer-municipalities to avoid changes in sample composition among our treatment and control groups. Lastly, we drop special insurers such as those that cover indigenous populations, railroad workers, and those that offer services outside of health care (known as *Cajas de Compensación Familiar*).[10]

These sample restrictions limit selection on insurer choice that is endogenously caused by changes in insurer characteristics such as the breadth of their provider network. However, the restrictions may come at a cost in terms of the representativeness of our results. Individuals who do not switch insurers are exposed for as long as possible to any disruption of care induced by SaludCoop's termination, maximizing the adverse effects on patient health. In any case, those who did not switch their insurer represent around 70% of observations and our results are robust to imposing these restrictions on non-SaludCoop enrollees' switching behavior. Appendix Table 1 shows the number of observations that result after imposing each sample restriction.

3.3 Summary statistics

Summary statistics for our final sample of insurers and enrollees are provided in Tables 1 and 2. In both tables, we report each variable's mean and standard deviation separately

[10] We also drop individuals for whom we see enrollment data after they die as well as those with ages over 95 years.

for treated and control municipalities in the pre- and post-termination periods. In Table 1, an observation is an insurer-municipality-year. We measure provider network breadth as the fraction of providers in a municipality that are covered by the insurer. We also assume that if an insurer includes a provider in its network, it incorporates all the beds available at that provider. Hence, the same number of beds at a provider will be counted multiple times, depending on the number of insurers that include the provider in their networks. Treated markets see a relative decrease in average provider network breadth and in the in-network number of beds in the post-period relative to control municipalities. Baseline levels of coverage are similar between treated and control markets. For reference, the average change in annual provider network breadth in the pre-period was 6 percentage points (p.p).

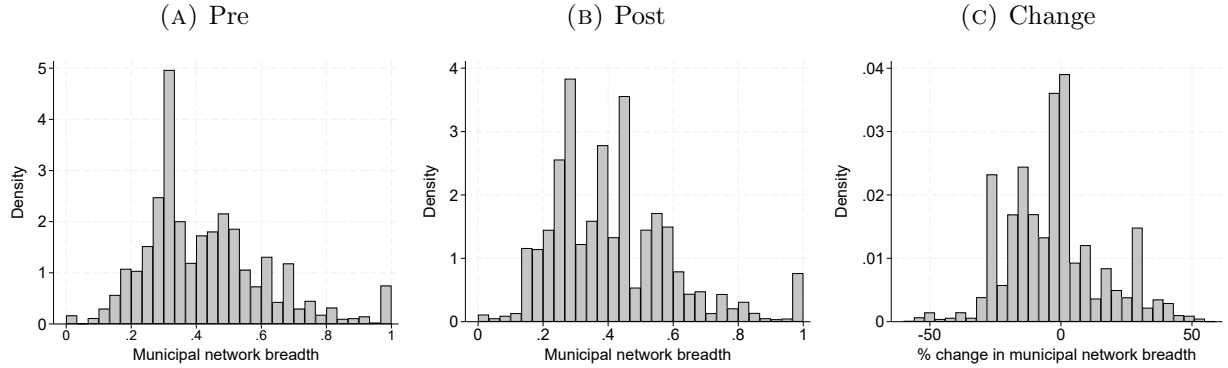
TABLE 1: Summary Statistics of Insurer Sample

Variable	Treated		Control	
	Pre	Post	Pre	Post
Provider network breadth	0.465	0.501	0.428	0.498
	(0.405)	(0.389)	(0.470)	(0.475)
Beds per 1,000 enrollees	443.3	326.5	328.9	344.6
	(1650.5)	(1665.1)	(1827.0)	(1979.0)
Market share	0.096	0.148	0.226	0.311
	(0.144)	(0.194)	(0.281)	(0.360)
Insurers	11	11	11	10
Municipalities	483	483	627	627
Insurer-Municipality-Year	6,291	3,152	7,473	3,314

Note: Table presents the mean and standard deviation in parenthesis of insurer characteristics. Summary statistics are presented separately for treated and control municipalities, in the pre- and post-termination periods. Treatment is defined as municipalities where SaludCoop operated in 2015. The data are from 2013 to 2017. An observation is a combination of insurer, municipality, and year. The sample of insurers excludes SaludCoop and Cafesalud as well as those with less than 0.005% market share in the municipality. Provider network breadth is the fraction of providers in a market that are covered by the insurer. Market share is the insurer's share in the number of total enrollees in a municipality (without imposing sample restrictions).

Figure 2, Panels A and B show that provider network breadth is substantially heterogeneous across insurers in treated municipalities in the pre- and post-termination periods, respectively. Panel C also shows substantial heterogeneity in percentage changes in provider network breadth after the termination. These histograms have densities given by the number of enrollees in the pre-period. Thus, Panel C shows that most individuals were enrolled with

FIGURE 2: Distribution of Provider Network Breadth in Treated Municipalities



Note: Panel A shows the distribution of network breadth across insurers in treated municipalities in the pre-termination period. Panel B shows the distribution in the post-termination period. Panel C shows the distribution of percentage changes in network breadth in the post-period relative to the pre-period. In panels A and B, the number of enrollees determines the density. In Panel C, the density is determined by the number of enrollees in the pre-period.

insurers that narrowed the network in their municipality of residence. For example, 5.8 million individuals were enrolled with insurers that narrowed their network by more than 10%, and 1.7 million were enrolled with insurers that narrowed their network by more than 25%. We also see that some insurers expanded their network in the post-period. This increase can be rationalized by the fact that not only sick, unprofitable consumers value broad networks but also healthy, profitable ones. We will return to this point in Section 4.2.

In Table 2 an observation is an enrollee-year. The table shows an increase in the average mortality rate and the Charlson index among treated municipalities in the post-period.[11] Control municipalities see no change in the average mortality rate but have a similar increase in the Charlson index. Treated municipalities have a higher prevalence of chronic conditions at baseline than controls, perhaps raising concerns about the comparability of the two groups. In Appendix Figure 3 we corroborate that these are only level differences in characteristics that do not threat our identification assumptions in the next sections. Treated and control groups have parallel trends in baseline characteristics. We will also conduct robustness checks excluding the largest cities in the country where SaludCoop operated with its own hospitals.

[11]The Charlson index is a measure of health status, with a higher index denoting a sicker individual (see https://healthcaredelivery.cancer.gov/seermedicare/considerations/comorbidity.html). We constructed it using the claims data following Oliveros and Buitrago (2022).

Appendix Table 3 reports summary statistics in that sample, where we see that treated and control groups are more similar in terms of baseline levels of comorbidities.

TABLE 2: Summary Statistics of Enrollee Sample

Variable	Treated		Control	
	Pre	Post	Pre	Post
Mortality	0.003	0.005	0.002	0.002
	(0.055)	(0.070)	(0.039)	(0.047)
Charlson index	0.254	0.312	0.232	0.297
	(0.786)	(0.913)	(0.712)	(0.839)
Male	0.466	0.462	0.490	0.484
	(0.499)	(0.499)	(0.500)	(0.500)
Age	34.40	35.40	31.50	32.68
	(22.42)	(23.00)	(22.56)	(23.18)
AMI	0.001	0.002	0.000	0.000
	(0.034)	(0.042)	(0.015)	(0.017)
COPD	0.016	0.017	0.002	0.002
	(0.125)	(0.131)	(0.045)	(0.049)
Hepatic disease	0.0004	0.0005	0.00005	0.0001
	(0.020)	(0.022)	(0.007)	(0.008)
Renal disease	0.011	0.015	0.002	0.003
	(0.104)	(0.120)	(0.040)	(0.052)
Cancer	0.008	0.013	0.001	0.002
	(0.089)	(0.114)	(0.033)	(0.046)
Individuals	17,232,780	18,164,555	3,226,028	3,310,372
Municipalities	482	482	624	624
Individual-Year	44,576,996	62,010,285	8,156,334	10,998,400

Note: Table presents the mean and standard deviation in parenthesis of the sample of enrollees for the mortality analysis. Summary statistics are presented separately for individuals living in treated and control municipalities, in the pre- and post-termination periods. Treatment is defined as municipalities where SaludCoop operated in 2015. An observation is an individual-year and the data are from 2013 to 2019. The sample of enrollees is restricted to those who never switched their insurer during the years where we observe them, who never moved across municipalities before the termination, and who were enrolled with insurers other than SaludCoop and Cafesalud. Our final sample of enrollees does not constitute a fixed cohort. AMI stands for acute myocardial infarction and COPD for chronic obstructive pulmonary disorder.

4 The Impact of an Insurer Termination

4.1 Provider Networks

We start our analysis by using a difference-in-differences design to estimate the effect of SaludCoop's termination on measures of provider network coverage among incumbent in-

surers. We compare municipalities where SaludCoop operated during 2015 (treated group) against municipalities where SaludCoop did not operate (control group) before and after the termination. The unit of treatment is, therefore, a *municipality*.

Our regression of interest is:

$$H_{jmt} = \sum_{\substack{k=-3 \\ k\neq -1}}^{3} \beta_k 1\{t - 2016 = k\} \times T_m + \gamma_m + \eta_t + \varepsilon_{jmt} \tag{1}$$

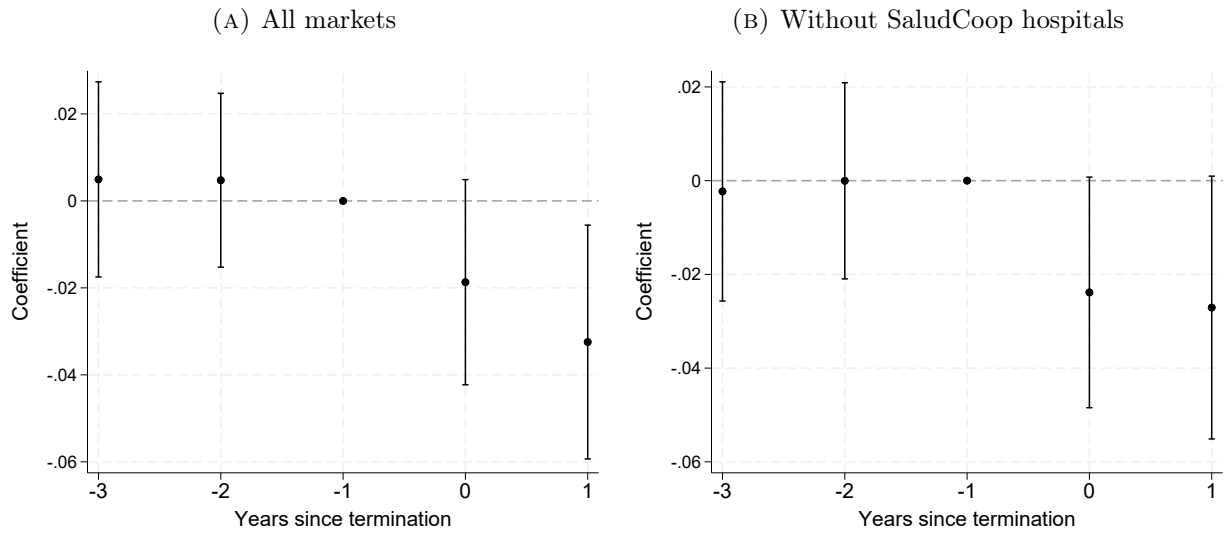
where H_{jmt} is insurer j's provider network breadth in municipality m during year t, T_m is an indicator for treated municipalities, and γ_m and η_t are municipality and year fixed effects, respectively. Given the information in the provider listing data, providers can be either hospitals, clinics, or physician practices. Whenever we use the term "provider," we refer to these health care provider organizations.

SaludCoop's termination ocurred in December 2015, which is visible on the 2016 enrollment data. The relative time indicators in equation (1) are thus constructed relative to 2016, and the omitted category is 2015. The coefficients β_k measure the average treatment effect in year k relative to 2015. Because the termination happens simultaneously for all municipalities in our treated group, we do not worry about the identification challenges from staggered treatment implementation. We cluster standard errors at the municipality level.

Identification of the dynamic treatment effect relies on the assumption that outcomes in the treated group would have evolved in parallel to the control group had the termination not occurred. Identification can be threatened if there are unobserved variables related to SaludCoop's location decisions and post-termination provider network trends. A violation of this assumption would likely result in significant pre-trends.

Figure 3 presents the results and Appendix D presents associated coefficients and standard errors. First of all, we see evidence of parallel pre-trends in network coverage in line with descriptive patterns presented in Appendix Figure 3. Panel A shows that provider network breadth in treated markets decreased between 2 and 4 p.p after the termination, a 10%

FIGURE 3: Impact on Provider Networks



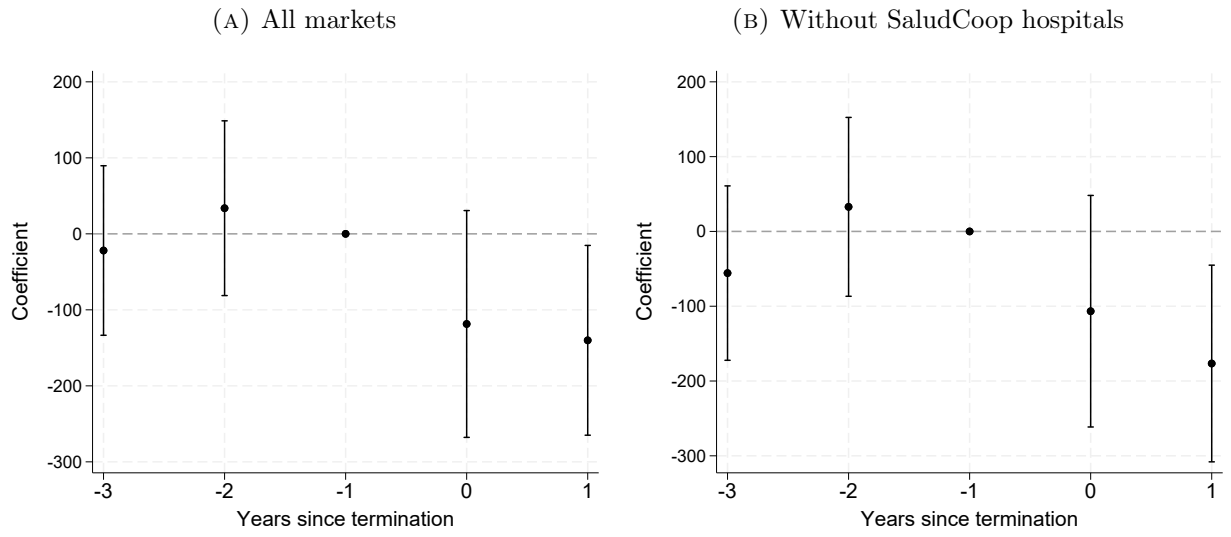
Note: Figure shows event study coefficients and 95% confidence intervals using as outcome variable the share of providers in a municipality that are covered by the insurer. This regression uses data at the insurer-municipality-year level and conditions on insurers that have more than 0.005% market share in the municipality. Specification includes insurer, municipality, and year fixed effects. Panel A uses the full sample of municipalities and Panel B excludes municipalities where SaludCoop hospitals operated. Standard errors are clustered at the municipality level. Treatment is defined as municipalities where SaludCoop operated during 2015.

reduction relative to baseline. These results are robust to excluding municipalities where SaludCoop owned hospitals as seen in Panel B, which means that the reductions in network breadth are not merely a mechanical consequence of SaludCoop hospitals closing, nor are they driven by the inherent characteristics of highly urban markets where these hospitals operated. Figure 4 shows that reductions in provider network breadth also hold when we take into account provider size. In these regressions we use as outcome variable the number of beds per 1,000 enrollees. Panel A shows that the number of beds fell 21% relative to baseline. Panel B shows similar results when we exclude markets where SaludCoop hospitals operated.

4.2 Adverse selection

Why would the average incumbent insurer respond to SaludCoop's termination by narrowing its network? Shepard (2022) and Serna (2024a) have shown that insurers respond to adverse selection by narrowing their networks because broader networks are more attrac-

FIGURE 4: Impact on Beds per 1,000 Enrollees



Note: Figure shows event study coefficients and 95% confidence intervals using as outcome variable the number of beds per 1,000 enrollees. This regression uses data at the insurer-municipality-year level and conditions on insurers that have more than 0.005% market share in the municipality. Specification includes insurer, municipality, and year fixed effects. Panel A uses the full sample of municipalities and Panel B excludes municipalities where SaludCoop hospitals operated. Standard errors are clustered at the municipality level. Treatment is defined as municipalities where SaludCoop operated during 2015.

tive to sicker consumers. Given that insurers distort their contracts to avoid unhealthy consumers, equilibrium contracts are not first-best (Glazer and McGuire, 2000). However, all consumers remain insured because enrollment is mandatory and because insurance with narrow networks dominates uninsurance.

To determine whether adverse selection can explain why provider networks become narrower after the termination we proceed in three steps. First, we show that there was a relatively high switching rate out of Cafesalud among individuals previously enrolled with SaludCoop. Second, we show that individuals with chronic diseases have a stronger preference for broader networks than those without chronic diseases. Third, we show that municipalities with sicker SaludCoop's enrollees at baseline saw larger reductions in provider network breadth and that excluded providers were those in which enrollees had high baseline utilization levels.

Using the raw data, Table 3 shows that 76% of individuals who were enrolled with SaludCoop during 2015 remained in Cafesalud during 2016, but 24% switched to other insurers in that year after the 90-day grace period. An additional 23% of SaludCoop's

enrollees moved to other insurers during 2017, which may reflect a large influx of "new enrollees" to these incumbent insurers. Of those enrolled with Cafesalud during 2015, 82% were inertial in 2016, but 41% switched out by 2018 perhaps as a preemptive response to Cafesalud's termination. Finally, individuals enrolled with incumbent insurers in 2015 were fully inertial throughout the post-termination period, which serves as evidence of either consumers being inattentive or facing high switching costs when choosing insurers. This pattern also serves as a sanity check that our sample restriction requiring that individuals do not move across incumbent insurers is not overly restrictive.

TABLE 3: Distribution of Enrollment Conditional on the 2015 Insurer

	Cafesalud				Other insurers			
	2016	2017	2018	2019	2016	2017	2018	2019
SaludCoop 2015	0.76	0.53	0.00	0.00	0.24	0.47	1.00	1.00
Cafesalud 2015	0.82	0.59	0.00	0.00	0.18	0.41	1.00	1.00
Other insurers 2015	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00

Note: Table reports the share of individuals enrolled with Cafesalud and other insurers according to their enrollment in 2015.

Table 4 shows how the probability of switching out of an insurer after the termination depends on its network breadth amongst individuals enrolled with SaludCoop in 2015. Independently of whether individuals suffer from chronic health conditions, those enrolled with insurers that have broader networks are less likely to switch out, indicating their preference for broad networks.[12] However, this preference is stronger for individuals with chronic conditions, whose decision to switch out of their insurer is more sensitive to network breadth. Incumbent insurers can therefore avoid SaludCoop's enrollees with worse health status by narrowing their networks. Moreover, the reduction in network breadth could happen soon after the termination because insurers and providers in Colombia negotiate service prices and network inclusions typically at the beginning of every calendar year, thus we can expect network changes to happen as soon as the beginning of 2016.

[12]We determine whether individuals have a chronic health condition by whether their Charlson index is greater than zero.

Finally, to gauge the responsiveness of insurers' network coverage decisions to unobserved health status, Figure 5, Panel A shows that municipalities with a relatively high average Charlson index among SaludCoop's enrollees in the pre-period had more substantial reductions in average provider network breadth in the post-period. Panel B also shows that the average provider that insurers excluded from their networks tended to treat a relatively high volume of patients in the pre-period compared to providers that remained in the network. Appendix Table 2 further shows that excluded providers were more likely to be public institutions, had a relatively low number of beds, and were less likely to have an emergency department, suggesting these providers mostly delivered outpatient primary and specialist care.[13] Appendix Figure 4 corroborates this by presenting event study results on our sample of inertial patients using as outcomes outpatient spending and an indicator for having an inpatient admission. We find significant reductions in the former within the first couple of years after the termination but no significant changes in the latter one year after the termination.

TABLE 4: Enrollees' Switching Decisions by Network Breadth

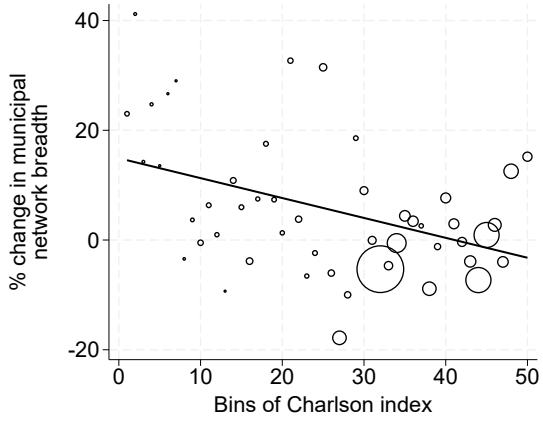
	Switch out	
	(1) Without diseases	(2) With chronic diseases
Provider network breadth	-0.0024	-0.0504
	(0.0011)	(0.0030)
Observations	3,057,795	395,464

Note: Table presents OLS regressions of an indicator for switching out of an insurer on that insurer's provider network breadth. All specifications use data from 2017 to 2019 and condition on the subsample of individuals who were enrolled with SaludCoop in 2015 and did not move across municipalities. Column (1) uses the subsample of individuals with Charlson index equal to zero and column (2) uses those with Charlson index greater than zero. Specifications include municipality fixed effects. Standard errors in parenthesis are clustered at the individual level.

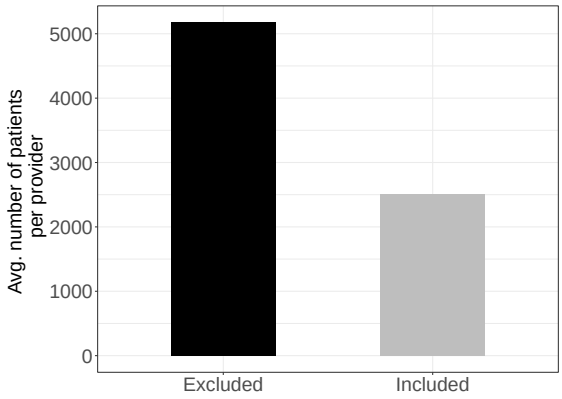
[13] In Colombia, the ongoing clinical management of patients with chronic conditions such as hypertension, diabetes, chronic kidney disease, or cancer is carried out in small healthcare centers providing outpatient services. These healthcare centers offer a high volume of follow-up medical consultations, clinical laboratory tests, diagnostic imaging, and medication dispensing for disease control. Additionally, some provide specific services that do not require hospitalization, such as dialysis and chemotherapy.

FIGURE 5: Correlation between Changes in Networks, Health Status, and Utilization

(A) Health Status



(B) Number of patients



Note: Panel A shows a scatter plot of the average percentage change in provider network breadth across insurers in treated municipalities by 50 equally-sized bins of the pre-period average Charlson Index among SaludCoop enrollees. Each circle is weighted by the number of enrollees. The solid line represents a linear fit. Panel B shows the average pre-period number of patients across providers that were excluded from the network in black and across providers that remained in the network in gray. This panel uses health claims data that is only available for individuals in the contributory scheme and for those who make claims.

4.3 Mortality

In this section, we quantify the impact of the termination on the mortality of non-SaludCoop enrollees. Our regression of interest is:

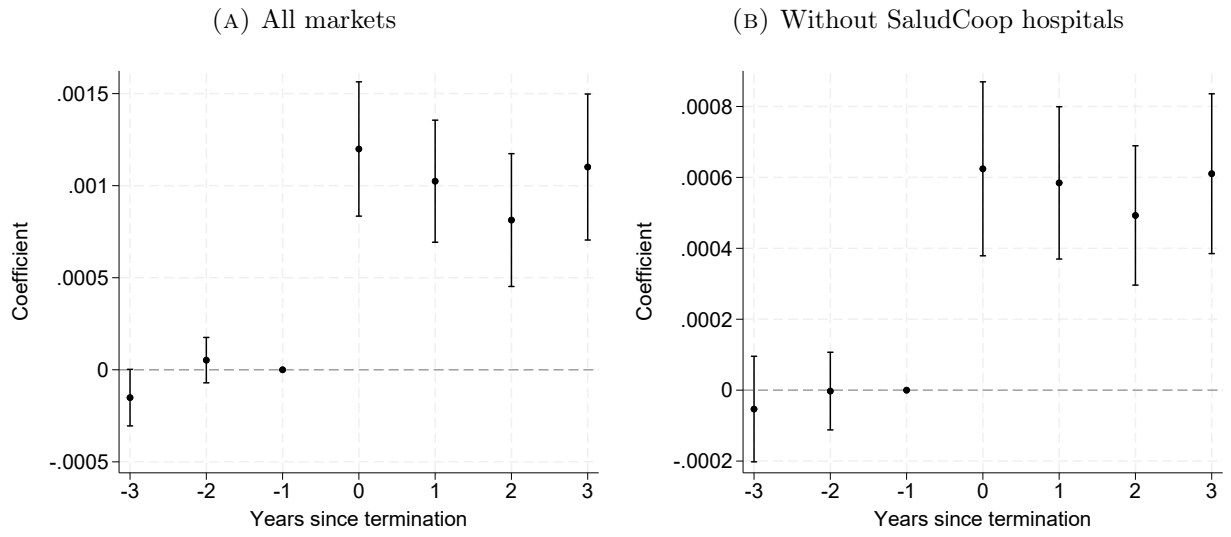
$$y_{imt} = \sum_{\substack{k=-3 \\ k\neq -1}}^{3} \beta_k 1\{t - 2016 = k\} \times T_m + \gamma_m + \eta_t + \varepsilon_{imt},$$

where y_{imt} takes the value of 1 if individual i who lived in municipality m died during year t and 0 otherwise, T_m is an indicator for treated municipalities, and γ_m and η_t are municipality and year fixed effects, respectively. We cluster standard errors at the municipality level.

Figure 6 presents the results. In Panel A, we find that before the termination, individuals in treated and control municipalities had parallel mortality trends, evidenced by statistically zero estimates in 2013 and 2014 and by descriptive trends presented in Appendix Figure 3. The year of the termination, mortality increased 1.2 per 1,000 non-SaludCoop enrollees, on average a 26% increase relative to the counterfactual mortality rate in the post-period.[14]

[14]Because our sample comprises individuals who do not switch and age during the sample period, we

FIGURE 6: Mortality Effect on non-SaludCoop Enrollees



Note: Figure shows event study coefficients and 95% confidence intervals using as outcome variable individual mortality. Panel A uses information from all markets and Panel B excludes markets with SaludCoop hospitals. Specifications include municipality and year-fixed effects. Standard errors are clustered at the municipality level. The sample is restricted to individuals who do not switch insurers, had continuous enrollment spells, and did not move across municipalities before the termination. We exclude individuals enrolled with SaludCoop and Cafesalud. Treatment is defined as municipalities where SaludCoop operated in 2015.

Appendix Figure 6 shows that the increase in mortality is likely due to diseases which are more sensitive to sudden interruptions or disruptions of care, such as cancer, renal disease, and hepatic diseases.

Although some of the increase in mortality is probably due to transitory disruptions in health care generated by SaludCoop's termination, we find that the effects on mortality are persistent over time: 3 years after the termination, we estimate a mortality increase in treated municipalities equal to 0.8 per 1,000 fully inertial non-SaludCoop enrollees. One possible explanation for this permanent effect on mortality is the decrease in hospital capacity that followed from the closure of the 38 hospitals owned by SaludCoop. However, Figure 6, Panel B shows that mortality increased permanently even in municipalities where SaludCoop did not own hospitals. In this sub-sample, we estimate an average increase in mortality equal to 22% in the post-period.

Figure 7, Panel A displays event study results in the subsample of individuals covered

calculate the appropriate counterfactual mortality rate by subtracting the *did* estimate from the average mortality rate in the treatment group each year of the post-period. Then, we divide the *did* estimate by this counterfactual mortality rate, obtaining percentage changes of 32%, 27%, 21%, and 27% from 2016 to 2019.

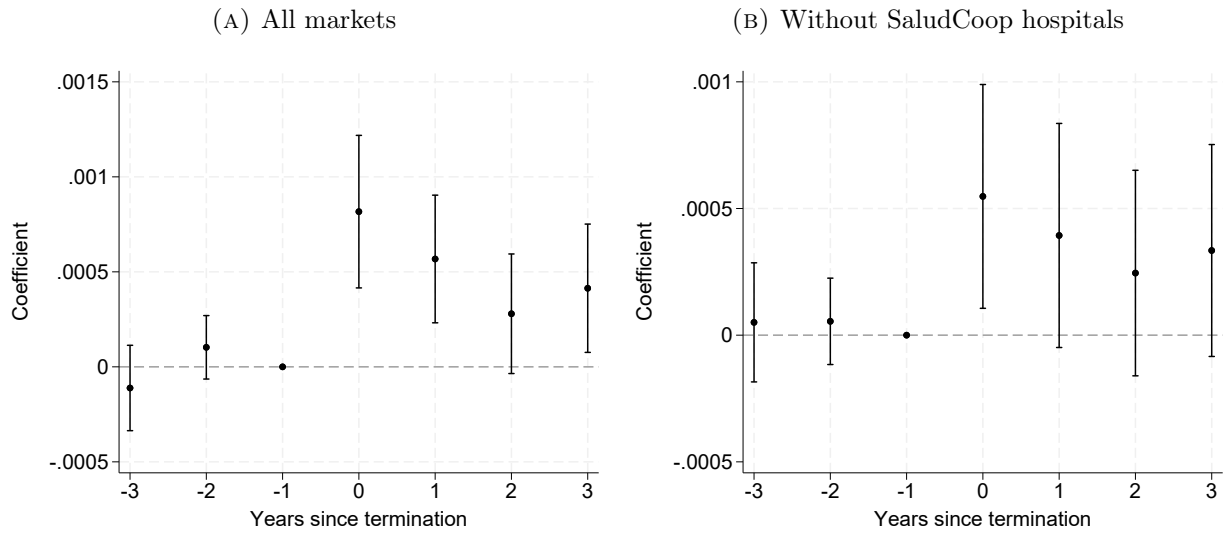
by insurers in the contributory scheme (for which we also have provider network data). In this sample, we estimate an average increase in mortality equal to 12% throughout the post-termination period. As in the full sample, Panel B shows that increases in mortality in the contributory scheme are not necessarily due to the closure of SaludCoop hospitals. Nonetheless, our estimates in this sample are noisier. Appendix Figure 9 reveals that results are largely unaffected by our sample restrictions requiring fully inertial patients who do not move across municipalities before the termination.

The permanent increase in mortality, even after excluding markets where SaludCoop hospitals operated, suggests that health outcomes are influenced not only by hospital capacity but also by how insurers establish their provider networks. Further evidence of this comes from the fact that in our setting, individuals retain insurance coverage even when their insurer is terminated. This allows us to explore the role of insurers in shaping health outcomes, expanding on existing research which has largely focused on the impact of insurance coverage (e.g., Card et al., 2009; Finkelstein et al., 2012; Miller et al., 2021). Although there are studies highlighting the significance of managed care and health insurers for patient health (e.g., Abaluck et al., 2021; Aizer et al., 2007), the mechanisms driving these effects are still largely unexplored. Our unique setting provides an opportunity to delve into and investigate these mechanisms.

5 Mechanisms

Why would mortality increase among non-SaludCoop enrollees in municipalities where SaludCoop did not own hospitals? And why would this increase be permanent? There may be several explanations for this. SaludCoop was a relatively high-quality insurer whose termination forced individuals to revert to potentially lower-quality incumbents. This type of mean quality reversion can lead to worsening of health outcomes as seen in Abaluck et al. (2021). However, this can not be an explanation for mortality increases among the group of

FIGURE 7: Mortality Effect on non-SaludCoop Enrollees in Contributory Scheme



Note: Figure shows event study coefficients and 95% confidence intervals using as outcome variable individual mortality. Panel A uses information from all markets and Panel B excludes markets with SaludCoop hospitals. Specifications include municipality and year-fixed effects. Standard errors are clustered at the municipality level. The sample is restricted to individuals in the contributory scheme, who do not switch insurers, had continuous enrollment spells, and did not move across municipalities before the termination. We exclude individuals enrolled with SaludCoop and Cafesalud. Treatment is defined as municipalities where SaludCoop operated in 2015.

enrollees who did not switch their insurer over the sample period, which is the focus of our results.

Another explanation is incumbent insurers' strategic reductions in provider network breadth. Several studies in the U.S. show that provider closures or forced switches of provider are associated with worse health outcomes (e.g., Schleicher et al., 2016; Sabety, 2023; Politzer, 2021), but there is no evidence to date of whether the breadth of the network or whether insurer competition in provider network breadth matter for patient health. Provider network exclusions may affect mortality, for example, by interrupting essential services for individuals managing chronic health conditions, which the previous subsection showed evidence of. It may also be the case that even if insurers do not change their networks after the termination, they experience congestion from the surge of new enrollees. This congestion can also disrupt care, potentially leading to higher mortality.

Finally, SaludCoop's termination and the closure of its hospitals impacted the structure of health insurance, health care provision, and health care labor markets. Serna (2024b) shows

that the use of contracts that place the financial risk on the insurer, such as fee-for-service, causally increased after the termination, particularly in markets where insurer concentration was predicted to be small relative to provider concentration. If the use of fee-for-service contracts is associated with the provision of low-value care, then it is possible that mortality effects are driven by this choice of contracts. Moreover, if SaludCoop's termination resulted in doctors being laid off, delaying their employment, moving to different locations, or retiring altogether, we might expect to see changes in mortality due to the lower availability of nurses and physicians or to the change in the health care labor-capital ratio. In this section, we explore the extent to which each of these factors may explain the mortality increase after SaludCoop's termination.

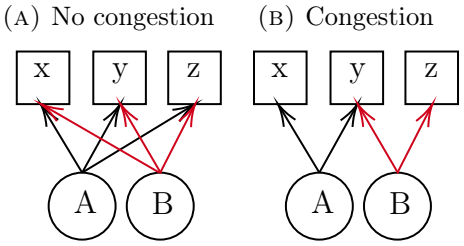
We start with provider network breadth. To do so, we investigate the heterogeneity in mortality effects by whether patients visited providers in the pre-period that were eventually excluded from the network. Figure 9, Panel A presents two sets of results for our event study specification.[15] The estimates in light gray and black compare the control group against non-SaludCoop enrollees in treated municipalities who had a below- and an above-average share of pre-period claims at providers that were dropped from the network after SaludCoop's termination, respectively. The results show evidence of provider network exclusions contributing to the mortality effects. We find no significant changes in mortality for consumers with a relatively small share of pre-period claims at providers that were dropped from the network. But, we estimate substantial increases in mortality throughout the post-period for their counterparts. Impacts of provider network exclusions on health outcomes are irrespective of the quality of the provider, suggesting that network size more broadly matters for health.

To test whether congestion factors into the mortality effects that we estimate, we first need to derive an appropriate measure of congestion that does not conflate endogenous

[15] In this analysis, we focus on the sub-sample of insurers in the contributory scheme for which we have provider network data and on the sub-sample of enrollees who made at least one claim every year (in addition to the sample restrictions from section 3.2). The latter restriction is needed to obtain the composition of providers for every consumer and this variable is not defined for consumers who do not make claims.

changes in networks that happen after the termination. Consider the toy example in Figure 8. There are two insurers $\{A, B\}$ and three providers $\{x, y, z\}$. In Panel A, suppose both insurers have *complete* provider networks. If insurer B is terminated, its enrollees will switch towards A, but in-network providers in A's network will treat the same number patients after the termination as they did before the termination because A has complete network overlap with B. Therefore, holding everything else fixed, we should not expect to see much congestion in A's network nor significant changes in mortality. In Panel B, suppose that insurers have *incomplete* provider networks. Insurer A covers providers $\{x, y\}$ and insurer B covers providers $\{y, z\}$, so that network overlap equals $1/2$. If B is terminated and its enrollees switch to A, providers $\{x, y\}$ will treat the patients that were previously treated by $\{z\}$, creating a "congestion effect" at $\{x, y\}$.

FIGURE 8: Congestion due to Network Overlap

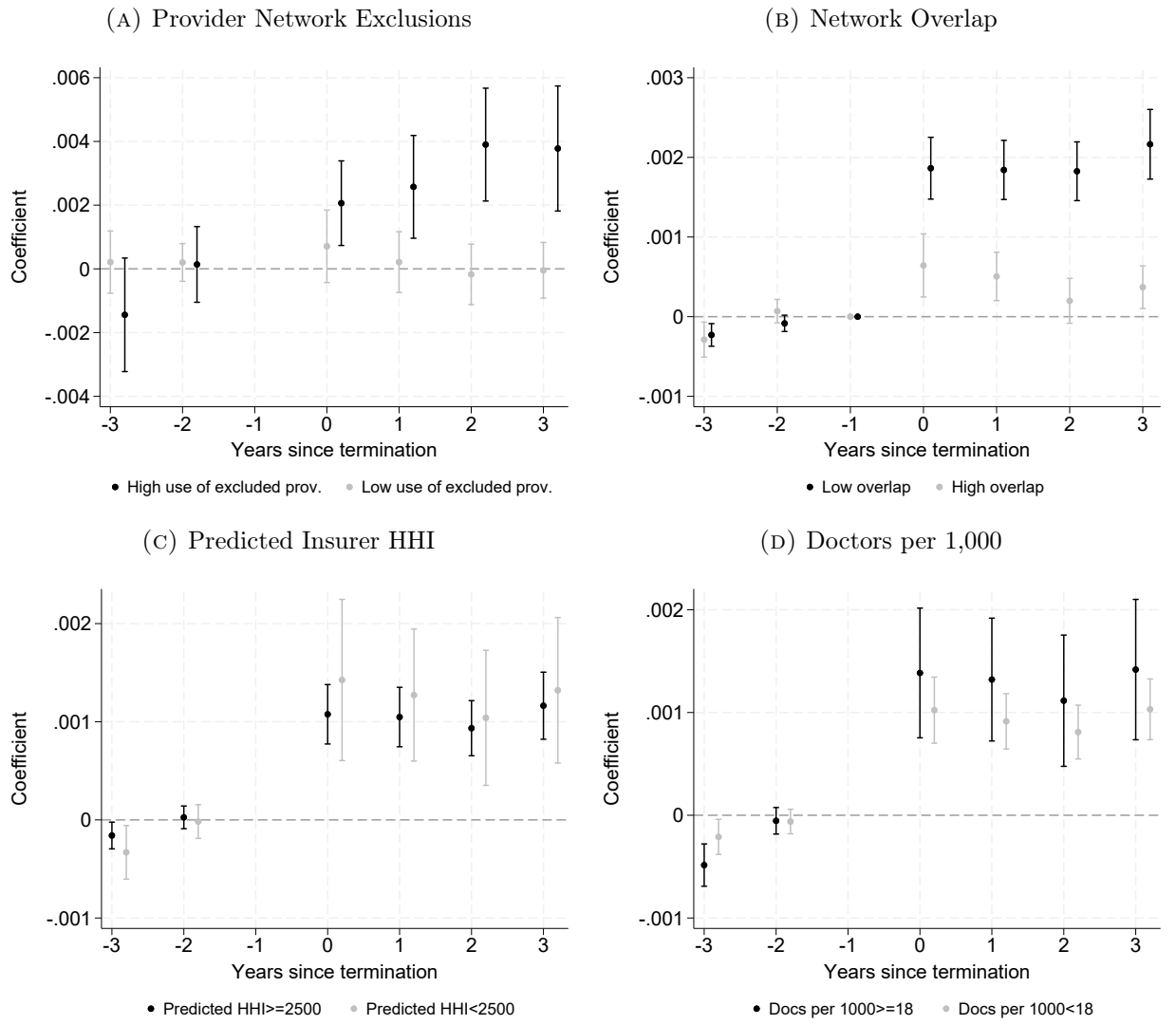


Note: Figure shows a hypothetical scenario with three hospitals x, y, z, two insurers A and B, and their network inclusions. Panel A shows a situation where B's termination does not generate congestion effects. Panels B shows a situation where B's termination would lead to a congestion in A's network.

This example illustrates that one way to measure congestion is through the pre-period network overlap between each incumbent insurer and SaludCoop. We implement this analysis in Figure 9, Panel B, which explores the heterogeneity in mortality effects by insurers in treated municipalities with above- or below-median network overlap with SaludCoop.[16] We find that mortality effects are significantly larger when overlap is relatively low than when it is relatively high, in line with our intuition. These findings indicate that congestion generated by incomplete provider networks is another mechanism for changes in health outcomes when an insurer is terminated.

[16] We construct network overlap for each insurer and municipality as the fraction of SaludCoop's in-network providers (denominator) that were also in the network of the incumbent insurer during 2015 (numerator).

FIGURE 9: Heterogeneity in Mortality Effect



Note: Figure shows coefficients and 95% confidence intervals using as outcome variable individual mortality. In all specifications, the control group are municipalities where SaludCoop did not operate. In Panel A, results light gray and black use individuals in the treated group that had a below- and above-average share of pre-period claims delivered at providers that were dropped from the network in the post-period, respectively. In Panel B, results in light gray and black use individuals enrolled with insurers in the treated group that had above- or below-median network overlap with SaludCoop in 2015, respectively. Estimation in Panels A and B use the sub-sample of insurers in the contributory scheme for which we have provider network data and the sub-sample of enrollees who made at least one claim. In Panel C, results in light gray and black use the municipalities in the treated group that had predicted insurer HHI below and above 2,500, respectively. Insurer HHI is calculated based on market shares assuming SaludCoop's enrollees were assigned to incumbent insurers in proportion to their 2014 market shares. In Panel D, results in light gray and black use the municipalities in the treated group where the number of doctors per 1,000 enrollees was below and above 18, respectively. All specifications include municipality and year fixed effects. Standard errors are clustered at the municipality level.

In Figure 9, Panel C we explore whether predicted changes in insurer market concentration, which generate changes in the types of contracts established between insurers and providers, contribute to the mortality increase after SaludCoop's termination. We use predicted insurer market shares assuming SaludCoop's enrollees are assigned to each insurer in proportion to their 2014 market share, to construct the Herfindahl-Hirschman Index (HHI). Splitting our sample by municipalities with insurer HHI above or below 2,500, we find no evidence of heterogeneous mortality effects, suggesting that shifts toward fee-for-service contracts brought by the termination and the incentives these contracts create are not large enough to explain our mortality results.

Finally, Panel D examines baseline health care labor market thickness as a mechanism for patient mortality. Here too we find no evidence of heterogeneous effects by whether municipalities had above- or below-average number of doctors (physicians plus nurses) per 1,000 enrollees at baseline. This finding goes in line with results in Appendix Figure 7 which show no changes in the number of doctors after the termination.

6 Conclusion

The strict regulation of health insurance markets make it unlikely that large insurers abruptly exit. As a result, there is limited knowledge on the equilibrium consequences of these exits or, more generally, of disruptions in insurer competition. In this paper, we use the exogenous termination of the largest health insurer in Colombia in December 2015 to investigate how incumbent insurers respond, what are the impacts on patient health, and what are the mechanisms through which these incumbent insurers affect health. Unlike other settings where insurer terminations may confound contractions in insurance coverage, ours is a setting in which everyone retains insurance access despite the termination. Thus, the novelty of our paper is two-fold: first, we show how incumbent insurers change the characteristics of their health plan, namely provider networks, in response to the abrupt exit of a competitor; and

second, we link these strategic supply responses to changes in patient mortality. We extend the current literature not only by examining the health impacts of health plan terminations, but also by investigating the supply-side responses and the underlying mechanisms that explain why the private provision of public insurance influences health outcomes.

Using a difference-in-differences methodology, we find that provider networks among incumbent insurers in treated markets (those were the terminated insurer operated) became 10% narrower after the termination relative to insurers in control markets. Incumbent insurers respond by narrowing their networks to avoid the potentially sick, unprofitable enrollees from the terminated insurer. We also find that individual mortality increased 22% among fully inertial patients enrolled with these incumbent insurers. In examining the mechanisms that may explain the rise in mortality, we find that provider network exclusions, as well as congestion caused by narrow provider networks and the influx of new enrollees following an insurer termination, contribute to the observed mortality effects.

The finding that broad provider networks influence the production of health is relevant for the design of regulations that target narrow networks in managed care health insurance systems. One such type of regulation are network adequacy rules, which may require insurers to meet minimum provider-to-enrollee ratios, minimum distance from enrollee population centroids to nearest providers, or to cover specific providers. The implementation of these rules is currently debated in health care systems such as the U.S. (Centers for Medicaid and Medicare Services, 2023; National Conference of State Legislatures, 2023) where the problem of narrow networks is particularly stark. For example, 1 in every 6 Medicare Advantage plans cover less than 30% of hospitals (Jacobson et al., 2016) and physician networks tend to be even narrower than hospital networks (Dafny et al., 2017). Our results suggest that these ultra-narrow networks may have detrimental effects on health.

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For Online Publication

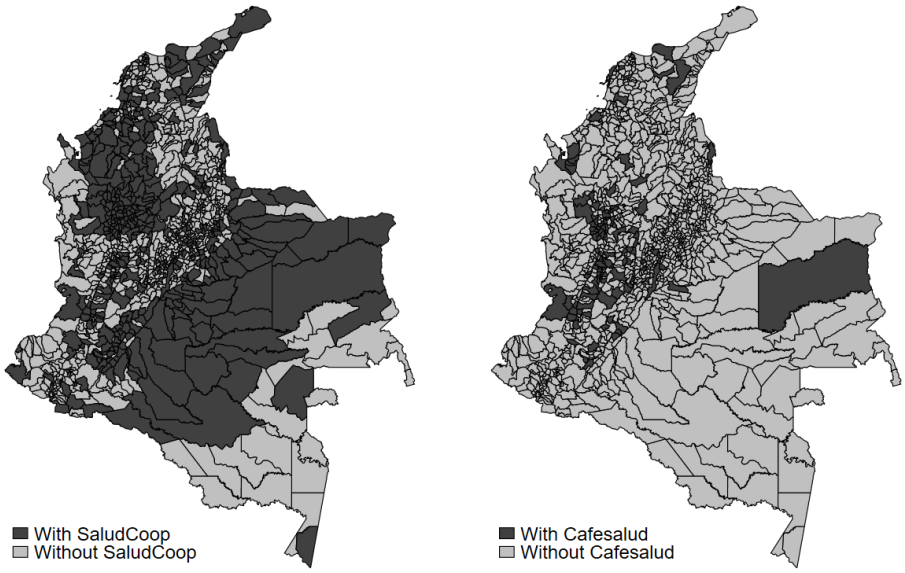
Appendix A Descriptives

Appendix Table 1: Sample restrictions

Sample Restriction	Observations
Full sample	66,498,109
Exclude SaludCoop and Cafesalud + enrollment after death	49,755,433
No insurer switching	33,772,092
No moving across municipalities before termination	31,262,574
Balanced panel of insurer-municipalities	28,295,722
Exclude special insurers + ages above 95 years	24,788,119

Note: Table reports the number of individuals left in our sample after imposing each sample restriction.

Appendix Figure 1: Municipal Presence of SaludCoop and Cafesalud



Note: The left panel shows a map of municipalities where SaludCoop was present in 2015 and the right panel shows the municipalities where Cafesalud was present in 2015 in dark gray.

Appendix Table 2: Characteristics of Excluded Providers

Variable	Included	Excluded
Admissions	0.051	0.065
	(0.221)	(0.247)
Beds	56.36	41.35
	(85.45)	(73.52)
Intensive care unit	0.271	0.216
	(0.444)	(0.411)
Private	0.402	0.369
	(0.490)	(0.483)
Emergency department	0.822	0.685
	(0.383)	(0.465)

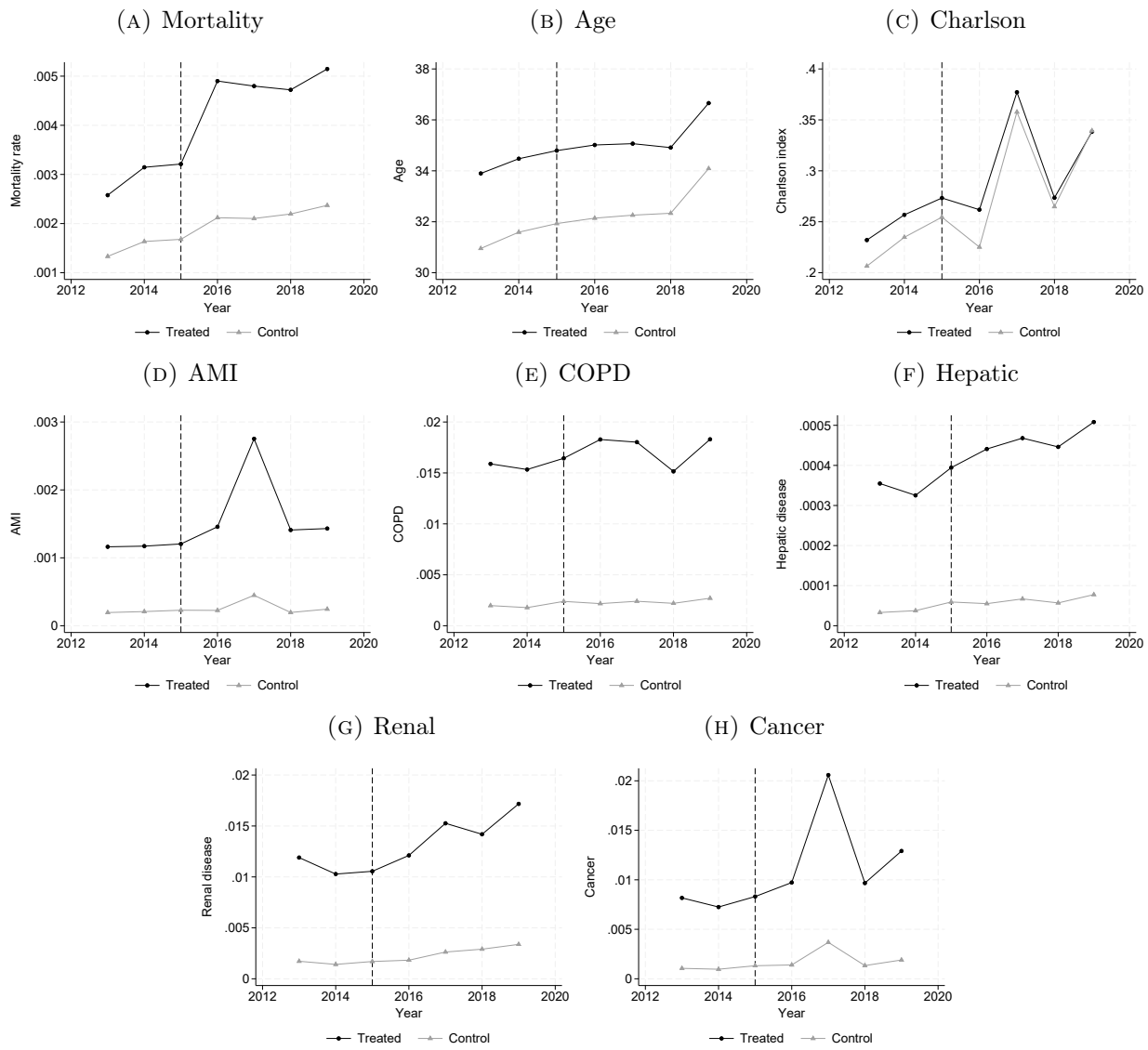
Note: Table presents the mean and standard deviation in parenthesis of healthcare provider characteristics in 2015 by whether the provider was excluded from the network after the termination or whether it remained in-network.

Appendix Table 3: Summary Statistics Excluding Markets with SaludCoop Hospitals

Variable	Treated		Control	
	Pre	Post	Pre	Post
Mortality	0.002	0.003	0.002	0.002
	(0.044)	(0.056)	(0.039)	(0.047)
Charlson index	0.238	0.287	0.232	0.297
	(0.730)	(0.834)	(0.712)	(0.839)
Male	0.475	0.469	0.490	0.484
	(0.499)	(0.499)	(0.500)	(0.500)
Age	32.019	32.926	31.504	32.681
	(22.271)	(22.879)	(22.564)	(23.179)
AMI	0.001	0.001	0.000	0.000
	(0.027)	(0.030)	(0.015)	(0.017)
COPD	0.010	0.011	0.002	0.002
	(0.101)	(0.104)	(0.045)	(0.049)
Hepatic disease	0.0002	0.0003	0.00005	0.0001
	(0.014)	(0.016)	(0.007)	(0.008)
Renal disease	0.007	0.010	0.002	0.003
	(0.085)	(0.099)	(0.040)	(0.052)
Cancer	0.005	0.007	0.001	0.002
	(0.067)	(0.085)	(0.033)	(0.046)
Individuals	6,708,551	7,039,399	3,226,028	3,310,372
Municipalities	451	451	624	624
Individual-Year	17,014,108	23,831,722	8,156,334	10,998,400

Note: Table presents the mean and standard deviation in parenthesis of the sample of enrollees for the mortality analysis excluding municipalities with SaludCoop hospitals. Summary statistics are presented separately for individuals living in treated and control municipalities, in the pre- and post-termination periods. An observation is an individual-year and the data are from 2013 to 2019. The sample of enrollees is restricted to those who never switched their insurer during the years where we observe them, who never moved across municipalities before the termination, and who were enrolled with insurers other than SaludCoop and Cafesalud. Our final sample of enrollees does not constitute a fixed cohort.

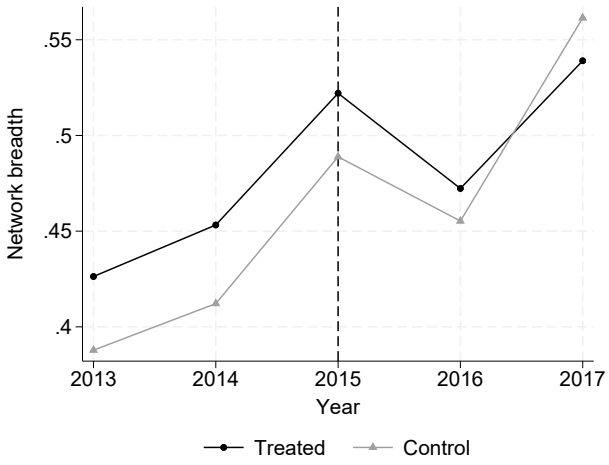
Appendix Figure 2: Trends in Individual Characteristics



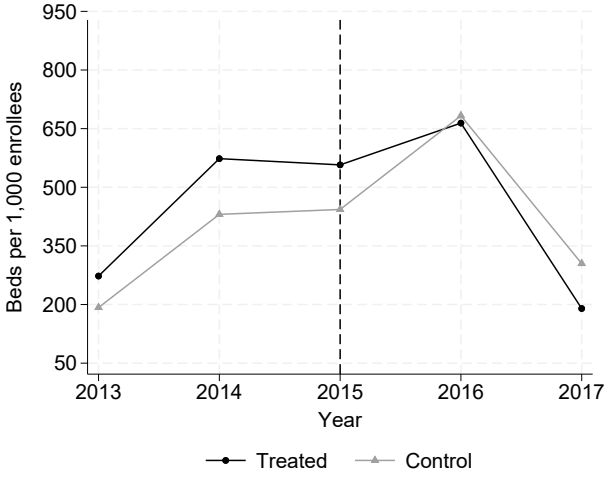
Note: Figure shows raw average characteristics in treated and control municipalities over time. Data are at the individual-year level and are collapsed at the treatment status-year level.

Appendix Figure 3: Trends in Network Characteristics

(A) Networks

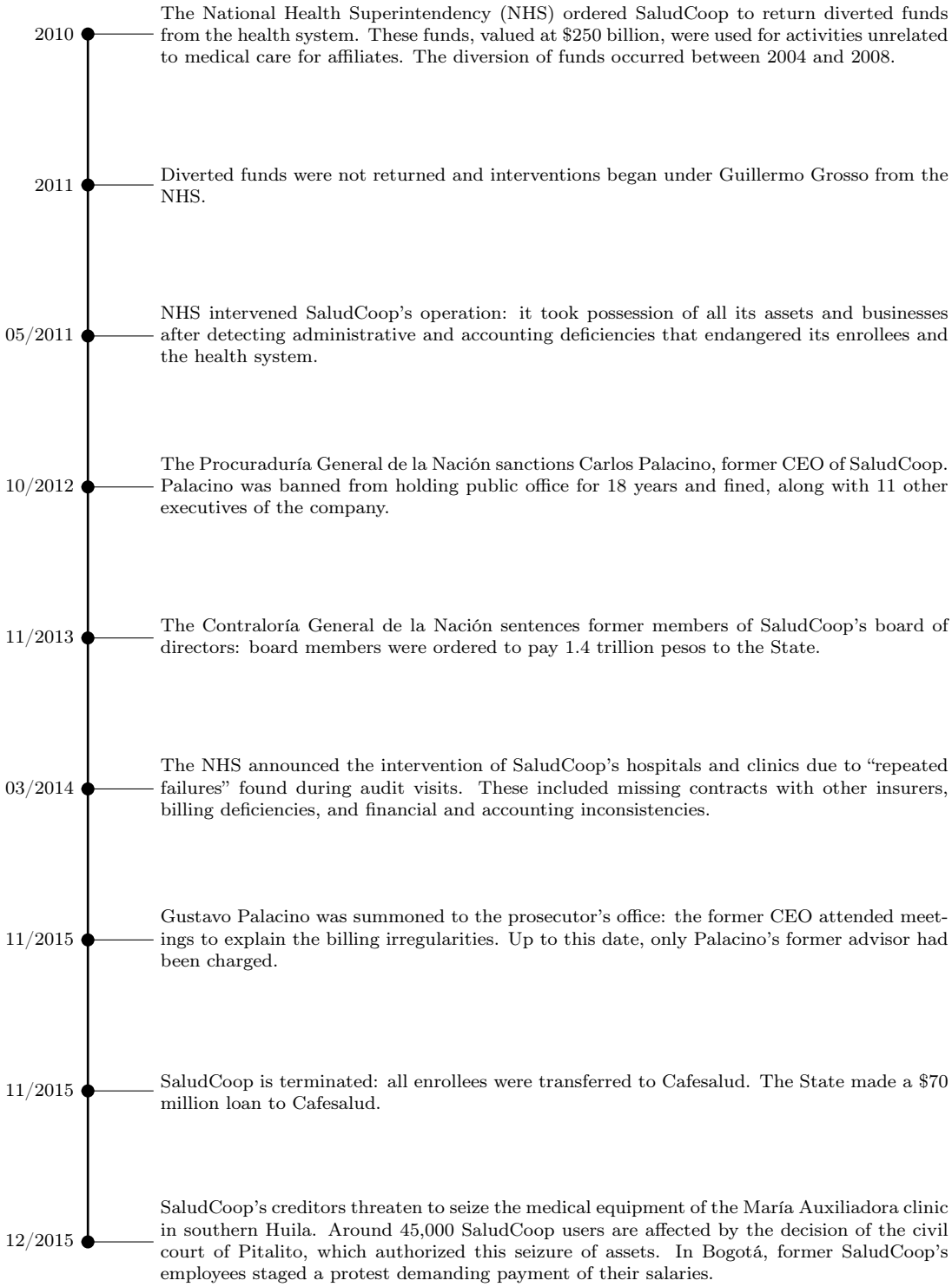


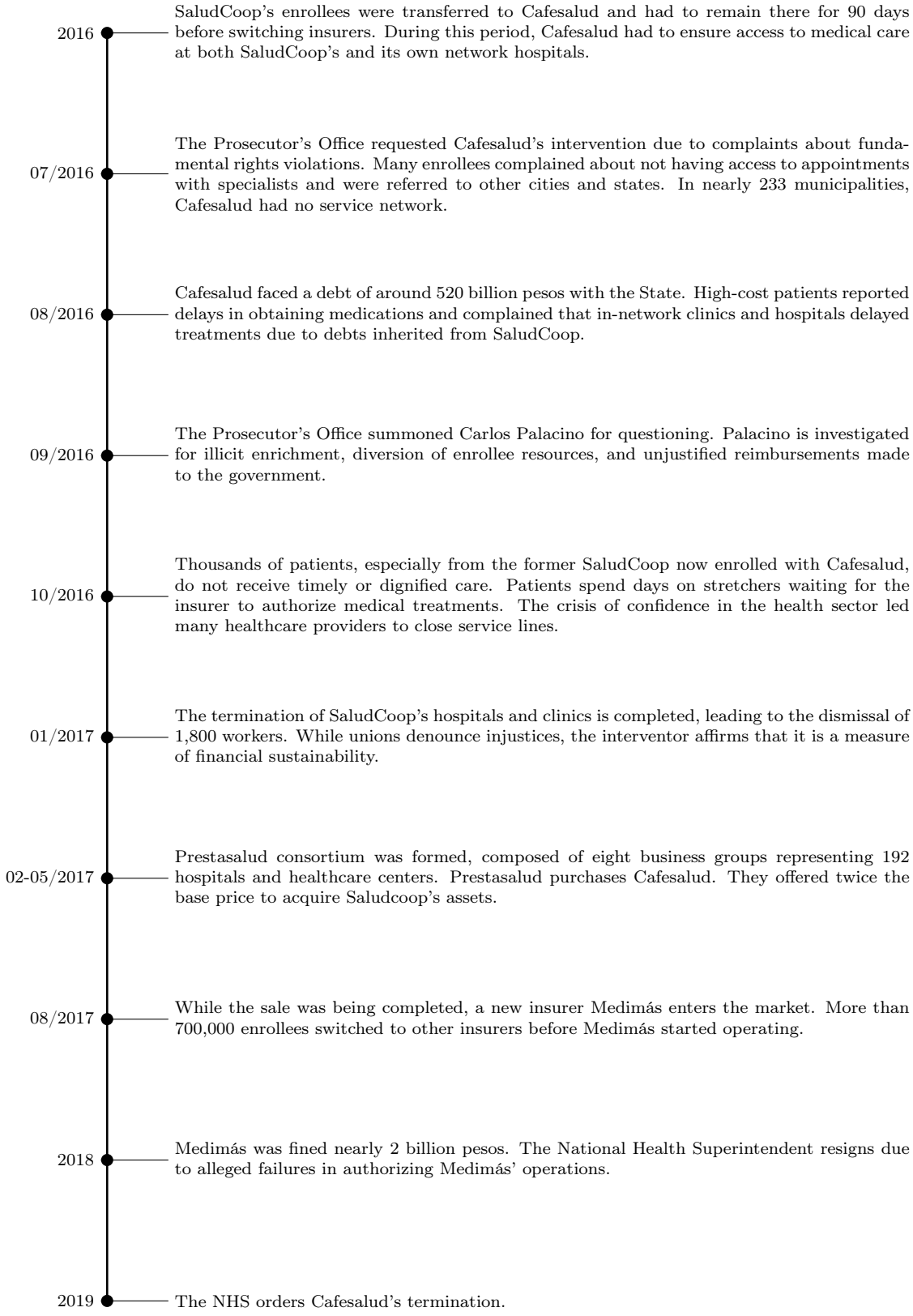
(B) Beds per 1,000 enrollees



Note: Figure shows raw average provider network breadth and average number of beds per 1,000 enrollees in treated and control municipalities over time.

Appendix B Timeline of SaludCoop's termination



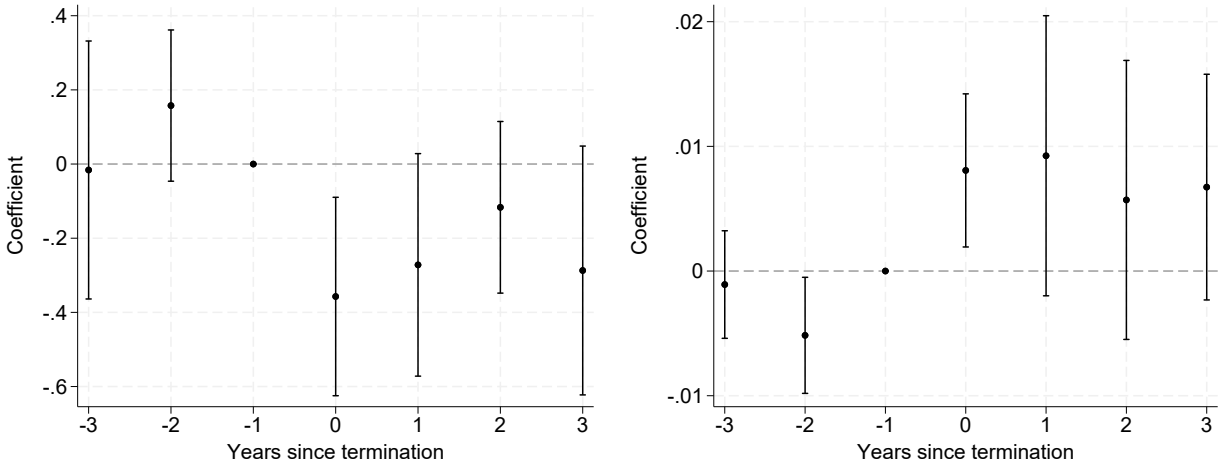

2016
SaludCoop's enrollees were transferred to Cafesalud and had to remain there for 90 days before switching insurers. During this period, Cafesalud had to ensure access to medical care at both SaludCoop's and its own network hospitals.
07/2016
The Prosecutor's Office requested Cafesalud's intervention due to complaints about fundamental rights violations. Many enrollees complained about not having access to appointments with specialists and were referred to other cities and states. In nearly 233 municipalities, Cafesalud had no service network.
08/2016
Cafesalud faced a debt of around 520 billion pesos with the State. High-cost patients reported delays in obtaining medications and complained that in-network clinics and hospitals delayed treatments due to debts inherited from SaludCoop.
09/2016
The Prosecutor's Office summoned Carlos Palacino for questioning. Palacino is investigated for illicit enrichment, diversion of enrollee resources, and unjustified reimbursements made to the government.
10/2016
Thousands of patients, especially from the former SaludCoop now enrolled with Cafesalud, do not receive timely or dignified care. Patients spend days on stretchers waiting for the insurer to authorize medical treatments. The crisis of confidence in the health sector led many healthcare providers to close service lines.
01/2017
The termination of SaludCoop's hospitals and clinics is completed, leading to the dismissal of 1,800 workers. While unions denounce injustices, the interventor affirms that it is a measure of financial sustainability.
02-05/2017
Prestasalud consortium was formed, composed of eight business groups representing 192 hospitals and healthcare centers. Prestasalud purchases Cafesalud. They offered twice the base price to acquire Saludcoop's assets.
08/2017
While the sale was being completed, a new insurer Medimás enters the market. More than 700,000 enrollees switched to other insurers before Medimás started operating.
2018
Medimás was fined nearly 2 billion pesos. The National Health Superintendent resigns due to alleged failures in authorizing Medimás' operations.
2019
The NHS orders Cafesalud's termination.

Appendix C Additional Results

This appendix presents additional results of our event study specification. Appendix Figure 4 uses as outcome variables the log of outpatient spending and an indicator for having an inpatient admission. The sample is restricted to individuals in the contributory scheme who make any claim. Appendix Figure 5 uses as outcome variable individual mortality, conditional on individuals ever enrolled with insurers in the contributory scheme, lifting any other sample restrictions (such as requiring fully inertial patients or no movements across municipalities before the termination).

Appendix Figure 4: Impact of Termination on Health Care Utilization

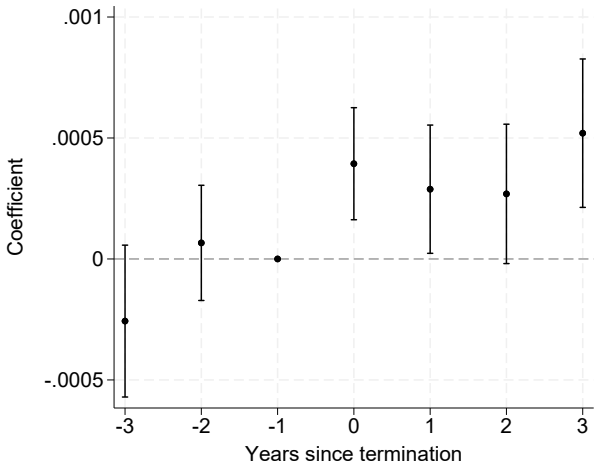
(a) Log outpatient spending (b) Any hospital admission



Note: Figure shows event study coefficients and 95% confidence intervals using as outcomes the log of outpatient spending in Panel A and an indicator for having a hospital admission in Panel B. Specifications include municipality and year fixed effects. Standard errors are clustered at the municipality level. The sample is restricted to individuals who are in the contributory scheme and made at least one health claim during the sample period. We exclude individuals enrolled with SaludCoop and Cafesalud. Treatment is defined as municipalities where SaludCoop operated in 2015.

In Appendix Figure 6 we estimate our event study specification on individual mortality conditional on individuals who received a particular diagnosis at any point during the sample period and who had Charlson index equal to zero in 2013. This latter restriction allows us to compare patients who had the same disease severity at the start of the sample period. We obtain an individual's diagnoses using the ICD-10 codes that accompany their claims, which allow us to construct the Charlson index. We focus on the following conditions: Acute

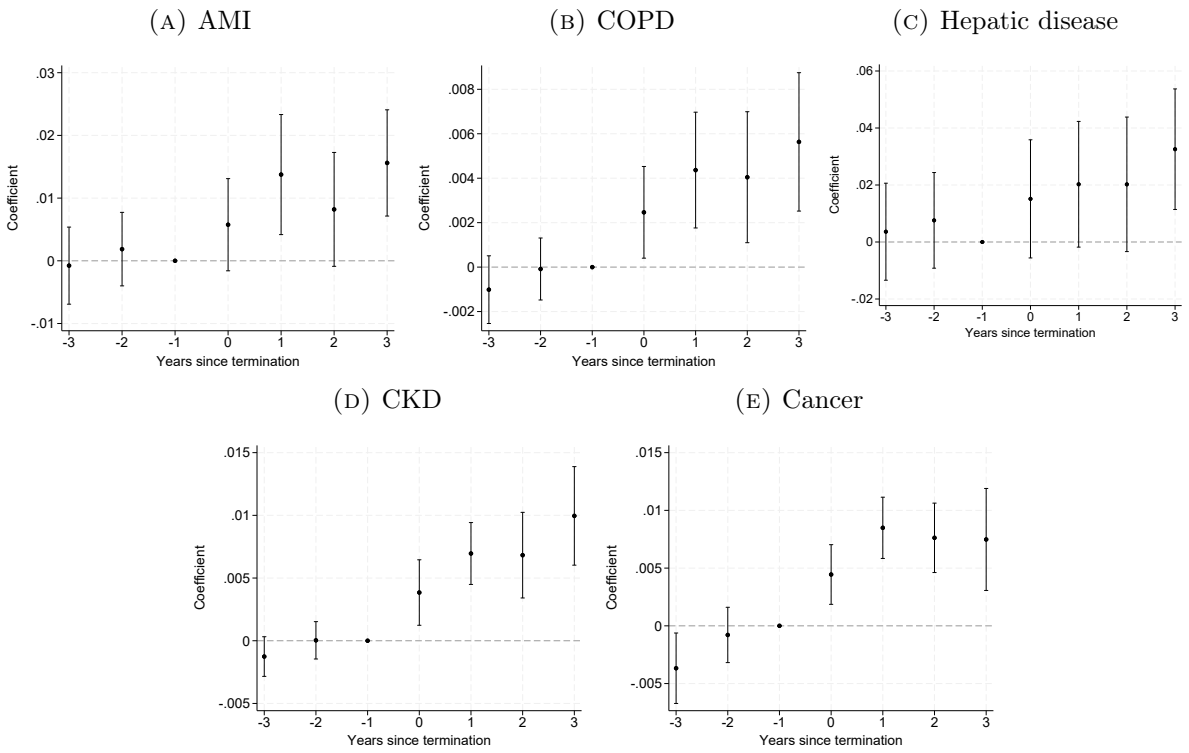
Appendix Figure 5: Mortality Effect in Contributory Scheme Without Sample Restrictions



Note: Figure shows event study coefficients and 95% confidence intervals using as outcome individual mortality. Estimation uses the sub-sample of individuals in the contributory scheme without imposing any other sample restrictions. Specification includes municipality and year fixed effects and controls for a dummy for males, age, dummy for having low income subsidy, and dummy for being a contributor (vs. a beneficiary). Standard errors are clustered at the municipality level. Treatment is defined as municipalities where SaludCoop operated in 2015.

Myocardial Infarctions (AMI), Chronic Obstructive Pulmonary Disease (COPD), Hepatic diseases, Chronic Kidney Disease (CKD), and Cancer.

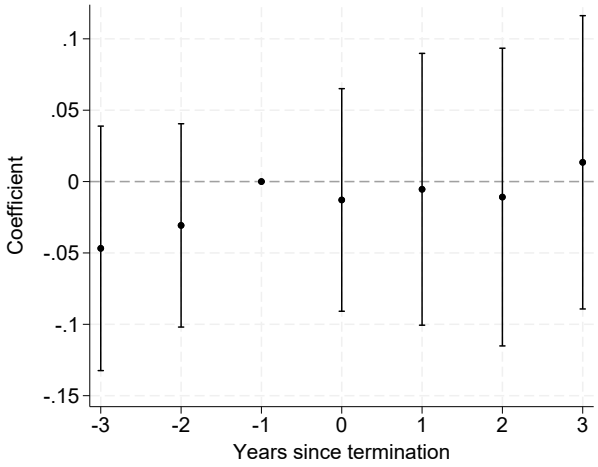
Appendix Figure 6: Mortality Effect by Diagnosis



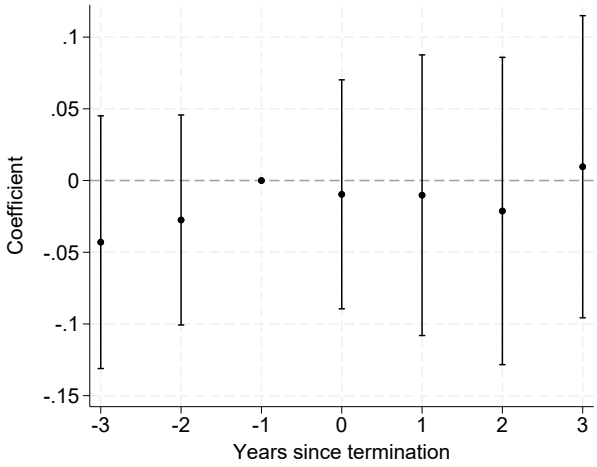
Note: Figure shows event study coefficients and 95% confidence intervals of individual mortality conditional on patients who were diagnosed at any point during the sample period with Acute Myocardial Infarction (AMI) in Panel A, Chronic Obstructive Pulmonary Disease (COPD) in Panel B, hepatic disease in Panel C, Chronic Kidney Disease (CKD) in Panel D, and cancer in Panel E. Sample is restricted to individuals who do not switch insurers, who do not move across municipalities before the termination, and who had Charlson index equl to zero in 2013. We exclude individuals enrolled with SaludCoop and Cafesalud. Treatment is defined as municipalities where SaludCoop operated in 2015.

Appendix Figure 7: Impact of Termination on Number of Doctors

(A) All markets



(B) Without SaludCoop hospitals



Note: Figure shows event study coefficients and 95% confidence intervals using as outcomes the total number of doctors and nurses. Panel A uses the full sample of municipalities and Panel B excludes municipalities where SaludCoop hospitals operated. An observation is a municipality-year. Specifications include municipality and year fixed effects. Standard errors are clustered at the municipality level. Treatment is defined as municipalities where SaludCoop operated in 2015.

Appendix D Event Study Coefficients

Appendix Table 4: Event Study on Measures of Network Coverage

	Network breadth		Beds per 1,000	
Relative time	Main	No SaludCoop hosp	Main	No SaludCoop hosp
-3	0.00495	-0.00230	-23.78	-57.58
	(0.0114)	(0.0119)	(56.76)	(59.34)
-2	0.00475	-0.00004	33.00	32.20
	(0.0102)	(0.0107)	(58.38)	(60.71)
0	-0.0187	-0.0238	-117.8	-105.9
	(0.0120)	(0.0125)	(75.97)	(78.81)
+1	-0.0325	-0.0271	-176.6	-196.9
	(0.0137)	(0.0143)	(69.72)	(73.78)
Constant	0.465	0.471	455.7	470.1
	(0.00320)	(0.00317)	(17.17)	(17.12)
Observations	20,230	19,385	20,230	19,385

Note: Table reports event study coefficients and standard errors in parenthesis using as outcomes variables provider network breadth and the number of beds per 1,000 enrollees. Table reports results in the full sample of municipalities and excluding municipalities with SaludCoop hospitals. We exclude insurers with less than 0.005% market share in a municipality. Specifications include insurer, municipality, and year fixed effects. Standard errors are clustered at the municipality level.

Appendix Table 5: Event Study Coefficients on Individual Mortality

	Full sample		Contributory	
Relative time	Main	No SaludCoop hosp	Main	No SaludCoop hosp
-3	-0.00015	-0.00005	-0.00011	0.00005
	(0.00008)	(0.00008)	(0.00012)	(0.00012)
-2	0.00005	-0.000003	0.00010	0.00005
	(0.00006)	(0.00006)	(0.00009)	(0.00009)
0	0.00120	0.00062	0.00082	0.00055
	(0.00019)	(0.00013)	(0.00021)	(0.00023)
+1	0.00102	0.00059	0.00057	0.00039
	(0.00017)	(0.00011)	(0.00017)	(0.00023)
+2	0.00081	0.00049	0.00028	0.00025
	(0.00018)	(0.00010)	(0.00016)	(0.00021)
+3	0.00110	0.00061	0.00041	0.00033
	(0.00020)	(0.00012)	(0.00017)	(0.00021)
Constant	0.00326	0.00220	0.00380	0.00238
	(0.00008)	(0.00004)	(0.00010)	(0.00011)
Observations	125,719,028	59,988,442	77,810,895	23,826,357
Individuals	24,787,324	12,424,794	15,089,894	5,035,079

Note: Table reports event study coefficients and standard errors in parenthesis of individual mortality using the full sample of individuals and the subsample covered by the contributory scheme. Table presents results in the full sample of municipalities and excluding municipalities with SaludCoop hospitals. Specifications include municipality and year fixed effects. Standard errors are clustered at the municipality level. The full sample is restricted to individuals who do not switch insurers, had continuous enrollment spells, and did not move across municipalities before the termination. We exclude individuals enrolled with SaludCoop and Cafesalud.

Appendix Table 6: Mortality Effect by Provider Network Exclusions

Relative time	High use at excluded	Low use at excluded
-3	-0.00144	0.00021
	(0.0009)	(0.0005)
-2	0.00014	0.00020
	(0.0006)	(0.0003)
0	0.00206	0.00071
	(0.0007)	(0.0006)
+1	0.00257	0.00021
	(0.0008)	(0.0005)
+2	0.00390	-0.00017
	(0.0009)	(0.0005)
+3	0.00378	-0.000045
	(0.0010)	(0.0004)
Constant	0.00758	0.00674
	(0.0003)	(0.0003)
Observations	1,875,160	25,036,755
Individuals	336,306	4,979,904

Note: Table reports event study coefficients and standard errors in parenthesis of individual mortality. Specifications control for risk adjustment group dummies and a dummy for whether the individual is a contributor (vs. a beneficiary or an enrollee in the subsidized system). Specifications include insurer, municipality, and year fixed effects. Standard errors are clustered at the municipality level. In all specifications the control group are municipalities where SaludCoop did not operate. In the "high interruption" specification the treated group are municipalities where individuals had an above-average fraction of claims from 2013 to 2015 delivered at providers that were dropped from the network in the post-period. In the "low interruption" specification the treated group are municipalities where individuals a below-average fraction of claims from 2013 to 2015 delivered at providers that were dropped from the network in the post-period. Estimations use the sub-sample of insurers in the contributory system for which we have provider network data and focus on enrollees who made at least one claim every year, did not switch insurers, had continuous enrollment spells, and did not move across municipalities before the termination. We exclude individuals enrolled with SaludCoop or Cafesalud. Treated units are municipalities where SaludCoop operated.

Appendix Table 7: Mortality Effect by Network Overlap

Relative time	High overlap	Low overlap
-3	0.00007	-0.00008
	(0.00007)	(0.00005)
-2	-0.00029	-0.00023
	(0.00011)	(0.00007)
0	0.00064	0.00186
	(0.00020)	(0.00020)
+1	0.000505	0.00184
	(0.00016)	(0.00019)
+2	0.000199	0.00183
	(0.00014)	(0.00019)
+3	0.00037	0.00216
	(0.00014)	(0.00022)
Observations	69,227,235	75,642,842
Individuals	13,807,861	15,494,861

Note: Table reports event study coefficients and standard errors in parenthesis of individual mortality. The "high overlap" specification uses the sub-sample of insurers in treated municipalities with above-median overlap with SaludCoop. The "low overlap" specification uses the sub-sample of insurers in treated municipalities with below-median overlap with SaludCoop. Specifications include municipality and year fixed effects. Standard errors are clustered at the municipality level. Sample is restricted to individuals who do not switch insurers, had continuous enrollment spells, and did not move across municipalities before the termination. We exclude individuals enrolled with SaludCoop and Cafesalud.

Appendix Table 8: Mortality Effect by Insurer HHI

Relative time	Predicted HHI≥2,500	Predicted HHI<2,500
-3	-0.00016	-0.00033
	(0.00007)	(0.00014)
-2	0.00002	-0.00002
	(0.00006)	(0.00009)
0	0.00108	0.00143
	(0.00015)	(0.00042)
+1	0.00105	0.00127
	(0.00015)	(0.00034)
+2	0.00093	0.00104
	(0.00014)	(0.00035)
+3	0.00116	0.00132
	(0.00017)	(0.00038)
Constant	0.00264	0.00348
	(0.00006)	(0.00014)
Observations	74,799,393	70,070,684
Individuals	15,194,270	13,849,818

Note: Table reports event study coefficients and standard errors in parenthesis of individual mortality by whether the predicted insurer HHI is below or above 2,500. Predicted insurer HHI is calculated based on predicted market shares assuming SaludCoop's enrollees in 2014 are assigned to incumbent insurers in proportion to their market shares. Estimation excludes individuals enrolled with SaludCoop or Cafesalud. Treated units are municipalities where SaludCoop operated.

Appendix Table 9: Mortality Effect by Number of Doctors per Capita

Relative time	Docs per 1,000≥18	Docs per 1,000<18
-3	-0.00049	-0.00021
	(0.00011)	(0.00009)
-2	-0.000054	-0.00006
	(0.00007)	(0.00006)
0	0.00139	0.00102
	(0.00032)	(0.00016)
+1	0.00132	0.00091
	(0.00030)	(0.00014)
+2	0.00112	0.00081
	(0.00033)	(0.00013)
+3	0.00142	0.00103
	(0.00035)	(0.00015)
Constant	0.00342	0.00258
	(0.00014)	(0.00006)
Observations	83,308,196	61,561,881
Individuals	16,626,596	12,718,089

Note: Table reports event study coefficients and standard errors in parenthesis of individual mortality by whether the number of doctors (physicians plus nurses) per 1,000 enrollees during 2015 is below or above 18. Estimation excludes individuals enrolled with SaludCoop or Cafesalud. Treated units are municipalities where SaludCoop operated.