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M. Rizzo, L. Grazzini, L. Grilli, P. Lattarulo, M. Macchi

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DISEI, Università degli Studi di Firenze
Via delle Pandette 9, 50127 Firenze (Italia)
www.disei.unifi.it

Do Community Health Centers Improve Territorial Healthcare?

Michel Rizzo,[*]Lisa Grazzini,[†]Leonardo Grilli,[‡]
Patrizia Lattarulo,[§]Marika Macchi[¶]

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Abstract

The aim of this paper is to analyse whether Community Health Centers have improved territorial healthcare in the Tuscany region, in Italy. A fixed effect model is used to test whether Community Health Centers have improved two health outcomes: inappropriate accesses to hospital Emergency Departments and hospitalizations caused by complications for chronic diseases (diabetes, chronic obstructive pulmonary disease and heart failure). Our main results show that per-capita expenditure for Community Health Centers slightly reduces inappropriate accesses to hospital Emergency Departments; the number of General Practitioners working in a Community Health Center slightly reduces hospitalisations due to complications related to chronicity while the latter tends to increase when there is at least a facility in the healthcare district, presumably for the Community Health Center's ability to catch a latent demand. Such results seem to show that, up to now, territorial primary healthcare provided through Community Health Centers has only had a moderate impact on improving the quality of care in Tuscany, and lessons should be learned from such experience in view of a recent health reform passed in Italy in 2022, that will change the organization and governance of Community Health Centers.

Keywords: Primary care, Community health centers, Inappropriate ED, Hospitalizations for chronicity.

JEL: H51, I10, I18.

[*]IFEL - Istituto per la Finanza e l'Economia Locale - Fondazione Anci, Italy.

[†]Corresponding author. Department of Economics and Management, University of Florence, via delle Pandette 9, 50127 Florence, Italy, lisa.grazzini@unifi.it.

[‡]Department of Statistics, Computer Science, Applications, University of Florence, Italy.

[§]IRPET-Istituto Regionale per la Programmazione Economica della Toscana, Italy.

[¶]PIN, University of Florence, Italy.

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1 Introduction

Primary healthcare represents a central issue in the current policy debate: the World Health Organization has stressed its priority by pointing out that models of care should evolve on the basis of changing health needs and demographic necessities "with the aim of ensuring that all people receive the right care, at the right time, by the right team, and in the right place" (WHO (2020)).[1] To favour access to health care services closer as much as possible to the citizens' place of residence, territorial care should be promoted and one possibility is to rely on Community Health Centers which, as first points of contact on the territory, can provide multidisciplinary team-based care supported by the use of a wide variety of tools, such as diagnostic instruments, ICT technologies, etc..

Community Health Centers are now common in many EU countries (but also in Canada and UK) after they were firstly introduced in the United States, at the beginning, with the aim to contain the increase in health care spending and, then, to improve the quality of health care on the territory. In Italy, Community Health Centers are called Case della Salute (CdSs) and were introduced with a first reform in the years 2000s' to enhance the quality of territorial health care with more appropriate and effective medical treatments especially for patients suffering from chronic diseases and multimorbidity, and in so doing to reduce overcrowding at the Emergency Departments (EDs). Recently, within the framework of the European Recovery Plan (Next Generation EU), their importance has been remarked by the National Recovery and Resilience Plan (NRRP) adopted by the Italian government to reform the governance of the National Healthcare System (NHS). Indeed, the focus of this second reform occurred in 2022 has been to strengthen the development of territorial care especially through the creation of new Community Health Centers, re-named Case di Comunità (CdCs), which should not only replace the "old" CdSs but also enrich the variety of healthcare services to be offered to the population within the future CdCs.

Given the ongoing transition from the "old" CdSs to the "new" CdCs, it seems important to evaluate the performance of the CdSs in order to learn policy lessons that will be useful for designing the activities of the future CdCs and, thus, improving primary healthcare. Building the architecture of the CdCs can indeed benefit from the past experience carried on by the CdSs which can work as a laboratory case offering insights on how to ameliorate the organization and the types of healthcare services provided to the population.

To pursue such an aim, the present paper proposes an evaluation of the performance of CdSs in Tuscany, one of the regions that has been more successful in implementing the first reform introduced in the years 2000s', and

[1] See also the Declaration of Astana on Primary Health Care (WHO, 2018) and the corresponding agreement on primary health care achieved during the seventy-second World Health Assembly (WHO, 2019).

which can be considered a pioneering laboratory to examine the effectiveness of CdSs in providing good quality healthcare to the population. To examine the impact of CdSs on some specific aspects of territorial healthcare in Tuscany, we consider a balanced panel dataset including information on the Tuscany Healthcare System at a district level, for a 6-year period (2017-2022), and we identify two outcome indicators of the regional healthcare system that are related to territorial care, i.e. the number of inappropriate accesses to hospital EDs, and the number of hospitalizations caused by complications for chronic diseases. To test the impact of CdSs on each indicator, we use a fixed effects model which has the advantage of isolating and controlling for territorial and structural district differences that are unobservable. As explanatory variables, we use the district per-capita expenditure for CdSs and the number of GPs operating in a CdS, in each district, to investigate the role that GPs may have in boosting or mitigating the overall effect.

Our main results show that per-capita expenditure for CdSs slightly reduces inappropriate accesses to hospital EDs, while the presence of at least a CdS in the healthcare district rises hospitalisations due to complications related to chronicity, presumably for their ability to catch a latent demand. However, the number of GPs working in a CdS has a light negative impact on such hospitalizations, suggesting that they can treat patients affected by chronic diseases in a more effective way, thus avoiding complications and subsequent hospitalizations. Such results seem to show that, up to now, territorial primary healthcare provided through CdSs has only had a moderate impact on improving the quality of care in Tuscany, at least for inappropriate accesses to EDs and hospitalizations for chronic diseases. Our analysis can thus be useful as a first step to understand how to improve the design of the new CdCs introduced in Italy with the recent 2022 reform, for example, by identifying which activities of the CdCs should be prioritized in order to supply primary healthcare services which are effective alternatives to hospital services and accordingly which type of resources should be granted to the CdCs by the national and regional government to allow them to satisfy the population's demand.

The plan of the paper is as follows. Section 2 provides a brief description of the role played by Community Health Centers in the Italian set-up while Section 3 presents a short review of the related literature. Section 4 describes the dataset and Section 5 illustrates the econometric methodology used to perform our analysis. Results are discussed in Section 6 and, finally, Section 7 contains some concluding remarks.

2 The Italian set-up

In Italy, the NHS is financed through general taxation and provide universal coverage largely free of charge at the point of delivery. The NHS is region-

ally organized on the basis of national guidelines. At the national level, the Ministry of Health i) sets the general objectives of the healthcare system, ii) distributes national funds to the regions, and iii) establishes the minimum package of health services which must be guaranteed to citizens by regions. These are in charge for organizing and delivering healthcare through local health authorities (Aziende Sanitarie Locali) which supply healthcare services directly or via public providers or accredited private ones. Given the highly decentralization of the NHS, the introduction of Community Health Centers, occurred in 2006 (Law no. 296, December 27, 2006 and Ministerial Decree July 10, 2007), was under the responsibility of regional governments. However, the implementation of such reform was not homogeneous on the national territory because of large differences in regional funding and infrastructures. Some regions succeeded in creating a facility network of CdSs while in some other regions no CdS was even opened. In 2020, the largest number of CdSs were in Emilia-Romagna (124), Veneto (77), Tuscany (76), and Piedmont (71) and no CdS was available in Valle d'Aosta, Lombardy, Friuli-Venezia Giulia, Trentino Alto Adige, Campania, and Apulia.

The general objective pursued through CdSs was to improve primary healthcare and to favour its continuity, especially for chronic patients, by concentrating services in a single access point for citizens and by strengthening the collaboration among different healthcare professionals. Within each CdS, a main role was assigned to General Practitioners (GPs) who, according to the Italian legislation, are self-employed physicians acting as gatekeepers, and mostly paid on a capitation basis by the public sector. GPs have their own list of patients, and can choose where to set their premises even if incentives exist to operate in group practices, e.g. to share the same premise, the costs of secretary and nursing services.[2] The introduction of CdSs granted to GPs a supplementary option, i.e. to operate within a CdS, thus taking advantage of a multidisciplinary teamwork, advanced equipments, and digital devices to possibly solve less acute cases without resorting to hospital services. Being part of a CdS does not change the fact that GPs continue to be responsible for their patients and have to plan the type of healthcare services they should receive. On top of that, patients of a GP working in a CdS may benefit from all the activities that can be carried on by a CdS such as prevention programmes, primary and specialist care integration especially for chronic diseases, nursing services, social assistance, diagnostic services, blood sample services, rehabilitation care, screening care, mental care, addiction care, etc..

Nonetheless, not all Italian patients could benefit from the healthcare services offered by the CdSs because, as mentioned above, not all regions have been able to establish them and even in those regions where they were

[2] For an analysis of the impact of team practice on chronic disease management process indicators in six Italian regions see Visca *et al* (2013).

set up, their availability on the territory has not been uniform. Basically, the reform that, in the early 2000s, introduced CdSs, has been only partially put into effect leading to an urgent politically sensitive need to rethink the all project in order to ameliorate the performance of primary healthcare for all citizens irrespective of their region of residence. Beyond that, more recently, the necessity to improve territorial healthcare services has gained new attention in the political debate especially after the outbreak of the COVID-19 pandemic which has made clear the shortcomings of the Italian territorial healthcare architecture and the need for an overall re-organization in view of the future healthcare scenarios.

In order to solve such shortcomings of the Italian primary healthcare, within the framework of the European Recovery Plan, the Italian government has adopted a NRRP to reform the governance of the NHS by reinforcing the development of territorial healthcare through the creation of proximity networks, the opening of new facilities and the employment of telemedicine.[3] In many respects, this reform (implemented through the Ministerial Decree no.77, May 23, 2022) is in line with the previous one based on CdSs. Basically the "old" CdSs have been replaced by the "new" CdCs which have to be created for about 40-50.000 residents within health districts of about 100,000 residents.[4] As CdSs, CdCs are confirmed in their role of first point of contact on the territory for non-urgent healthcare needs thanks to multidisciplinary teams of GPs, pediatricians, specialists, community nurses, social workers, etc. However, unlike the previous set-up, CdCs should be further organized in hub and spoke units where the hub units provide more extensive and complex healthcare services with a 24/7 assistance.[5]

According to the reform, the territorial healthcare organization should be completed thanks to the opening of Community Hospitals (Ospedali di Comunità) for health treatments of medium/low clinical care intensity and short hospitalisation. They should act as intermediate healthcare facilities between the CdCs and the hospitals in order to avoid unnecessary hospitalizations and inappropriate access to the latters. Finally, in each health district, a Territorial Operative Room (Centro Operativo Territoriale) should have the task to coordinate the joint management of patients through the local delivery of healthcare services by different health professionals and to monitor them at their place thanks to e-health devices.

[3] The general goal of the NRRP has been to address the economic crisis due to the COVID-19 pandemic by designing reforms and providing investments in six areas (digitalization, innovation, competitiveness, culture and turism; green transiction; infrastructures for a sustainable mobility; education and research; inclusion and cohesion; health).

[4] Such proportions can however vary depending on population density and specific orographic features of the territory.

[5] See also Mauro *et al* (2023).

3 Related literature

The role of primary healthcare in advancing population health has garnered substantial scholarly recognition. The World Health Organization's Global Report on Primary Health Care (WHO (2024)) provides compelling empirical evidence proving the long-term strategic benefits of primary care investments. The report points out how long-lasting patient-provider relationships can significantly improve healthcare resource allocation by mitigating unnecessary institutional interventions and facilitating judicious service utilization.[6] Within such a framework, a pivotal role for implementing primary healthcare may be played by Community Health Centers through their capacity to supply comprehensive healthcare services delivered to the patients to ensure continuity of care, to address multifaceted health requirements, and to promote equitable healthcare access.

For such reasons, Community Health Centers have been largely analysed in the economic literature and a special focus has been put on trying to understand how they can affect patients' outcome and ED use. For the sake of our analysis, we refer to the specific literature that evaluate the impact of Community Health Centers on ED use in order to understand whether primary care practices offered by them can improve the quality of care received by patients and avoid that they need to access EDs especially when such accesses could be avoidable. Of course, ED use is of particular interest because the cost of ED visits tend to be higher with respect to clinic visits for similar diseases, and also because it can signal that patients have difficulties in accessing primary healthcare which instead should be favoured by the implementation of the Community Health Centers model.

Even if nowadays Community Health Centers are common in many EU countries (e.g. France, Netherland, Finland, Sweden, Spain, Portugal and Italy) economic literaure on them is still quite limited for Europe while it is large for the US where empirical analyses tend to present mixed results.[7] For example, David *et al.* (2015) find that the adoption of Community Health Centers was associated to a reduction in ED utilization for chronically ill patients (especially those with diabetes and hypertension), but not for patients without chronic illness. The same positive result is also found by Pines *et al.* (2015) which shows that care coordination through Community Health Centers can reduce ED use (outpatient ED payments and ED visits) in comparison to patients not included in such centers. More recently, Saynisch *et al.* (2021) confirm that Community Health Centers adoption is associated to significant reductions in ED use, and that such result is driven by those patients treated by practices emphasizing adoption of enhanced electronic

[6] See also Rajan *et al.* (2024) for a comment that stresses the importance of prioritizing investments in primary healthcare for ameliorating population health outcomes.

[7] For a survey see, for example, Veet *et al.* (2020). For a paper finding that Community Health Centers are not associated with reduction in EDs, see Friedberg *et al* (2014).

communications.[8]

For other countries, some papers have tried to analyse whether the reorganization of primary care delivery in team forms could have had a reduction in ED use. For example, for the case of the UK, Dolton and Pathania (2016) discuss the impact of a 7-days opening of GPs facilities, finding a reduction of attendances in the Accident and Emergency units of hospitals and similarly, Pinchbeck (2019) shows that improving the access to convenient primary care services reduces hospital ED visits. On the other side, for the case of Quebec (Canada), Strumpf *et al.* (2017) study the impact of organizational changes in primary care carried on through Family Medicine Groups which guarantee extended hours and multidisciplinary teams. They find that enrolment in such Family Medicine Groups is associated with a decrease in outpatient services utilization but without effects on ED visits and hospitalization.

For Italy, few quantitative analyses have been performed with several studies concentrating on the case of the region Emilia Romagna. Lippi Bruni *et al.* (2016) point out that increasing primary care accessibility reduces inappropriate ED admissions by 10-15% while Lippi Bruni *et al.* (2023) estimate the impact of CdSs on inappropriate hospital emergency visits among diabetics from 2010 to 2016 and show that the probability of inappropriate admissions to ED decreases when the patient is registered with a GP working in a CdS. Still for the case of Emilia Romagna, Nobilio *et al.* (2020) perform a similar analysis using individual data collected from 2017-2019 and for a wider range of outcome indicators. Results underline that CdSs have reduced inappropriate access to hospital emergency visits by 16% and hospital admissions for ambulatory care sensitive conditions by 2.4%, while they have increased home healthcare by 9.5%.

Despite the importance of primary healthcare, analyses on Tuscany are few, except some works that, however, are more related to monitoring the CdSs' project rather than assessing their impact.[9] For example, Bonciani *et al.* (2017) find a positive association between the presence of GPs in a CdS and patient satisfaction especially for frequent health service users, probably because they can thus benefit from its multidisciplinary team. To fill in such a gap, our paper tries to evaluate the performance of CdSs in Tuscany on

[8] See also Roby *et al.* (2010) for a paper showing that uninsured, low-income patients assigned to Community Health Centers for longer time periods had a lower probability of any ED visit or multiple ED visits. Along the same line, Rust *et al.* (2009) find that rural counties without a Community Health Center show an excess in uninsured ED visits (but not for insured) and a similar result is also found by Myong *et al.* (2020). Similarly, Bruckner *et al.* (2019) find a reduction in psychiatric ED visits associated to an increase in the involvement of underserved patients in Community Health Centers while Carey and Cole (2024) show that mental health care provided in Community Health Centers may decrease ED use but the effect is small. A decrease in ED utilization has been also shown by Chaiyachati *et al.* (2014) for the case of veterans.

[9] See Barsanti *et al.* (2016), Marini *et al.* (2024, 2025).

two outcome indicators of the regional healthcare system that are related to territorial care: the number of inappropriate accesses to hospital EDs, and the number of hospitalizations caused by complications for chronic diseases. Such analysis can be useful from a policy-maker perspective because it can help in understanding which activities could be ameliorated to improve primary healthcare on the territory, and thus in better designing the new CdCs which will substitute the old CdSs.

4 Data

To focus on social health indicators and the different activities carried on by CdSs, we have collected data from open sources provided by the websites of Agenzia Regionale di Sanità Toscana (ARS). The starting dataset contains 168 observations divided into 28 clusters, corresponding to the Tuscany health districts, for a 6-year period, from 2017 to 2022. However, in 5 districts (Fiorentina Sud-Est, Mugello, Pisana, Colline dell'Albegna and Amiata Grossetana-Colline Metallifere-Grossetana) no CdS resulted activated[10] and for other 3 districts (Casentino, Aretina and Valtiberina) data abuot the number of GPs that were active in CdSs where unavailable from 2019 to 2022. As a consequence, the final dataset contains 23 districts and 126 observations. Variables included in the dataset are listed and described in Table 1.

[insert Table 1 here]

As dependent variables we choose outcome indicators which are usually used by institutions to assess the performance of a Healthcare System in specific sectors. Given the aim of this paper, we concentrate our attention on those that are more connected with territorial care, i.e. those involving healthcare services that are expected to be more affected by the development of a network of Community Health Centers (Nobilio *et al.* (2020)): the number of inappropriate accesses to EDs and the number of hospitalisations due to complication for the three principal chronic diseases (diabetes, chronic obstructive pulmonary disease and heart failure).

Explanatory variables describe the CdS activity: we focus on the level of a CdS expenditure in each district being related to the volume of health services provided; the number of CdSs distributed on the territory; and the number of patients served. We also include the average number of GPs with an ambulatory in a CdS since GPs are a key figure for primary care services and their integration in the territorial care network could affect in a significant way the impact of the CdSs on health indicators (Bonciani *et*

[10] We consider active only CdSs for which expenditure data are present.

al. (2017)). Further, we include a dummy that signals if a CdS is active or not in the district during any year of observation.

As a further control variable, we include the number of in-home care takeovers (adi), defined as the number of episodes wherein a comprehensive, multidisciplinary home-care intervention is systematically activated. This variable serves as a crucial methodological control, potentially capturing the relationship between integrated care provision and subsequent healthcare utilization patterns, particularly concerning potentially inappropriate EDs accesses and hospitalizations related to chronic condition complications. Indeed, in Italy, integrated home care (Assistenza Domiciliare Integrata, ADI) represents a comprehensive healthcare model designed to provide personalized, multidisciplinary medical and social support to patients — particularly elderly, chronically ill, or individuals with complex healthcare needs — within their domestic environment. This type of care involves coordinated interventions from multiple healthcare professionals, including physicians, nurses, physiotherapists, and social workers, who collaborate to deliver healthcare tailored to individual patient requirements.

Finally, to further enhance methodological rigor, we introduce dummy variables for calendar year, thereby facilitating the isolation and statistical control of potential annual temporal effects that might systematically influence our analytical outcomes. This is particularly relevant in our case, since our time horizon covers the COVID-19 pandemic period: controlling for annual effects may allow us to isolate the estimation distortions caused by this extraordinary exogenous event.

Table 2 reports the descriptive statistics of the continuous variables included in the dataset where the standard deviation is decomposed into between-district and within-district components (StataCorp, 2023).

[insert Table 2 here]

5 Econometric Methodology

Our model choice depends on the characteristics of the dataset: it is a two level panel dataset, where our unit of observation is the healthcare district, which is annually observed for a 6-years period, from 2017 to 2022. Since we need to manage the variability of data between and within the clusters, we have decided to adopt a fixed effects model. In this way, the unobservable heterogeneity between clusters is represented by specific fixed effects for each unit of observation, and it is possible to estimate the relation within groups, with each cluster that acts as its own control. This model eliminates the cluster-level disturbance, which is very convenient as healthcare districts are

not homogeneous: the use of fixed effects allows to isolate their structural differences, and to calculate reliable estimates (Rabe-Hesketh and Skrondal (2008)). More specifically, the model takes the following form, with each variable measured for the i-th healthcare district at time t:

$$y_{it} = \alpha + \delta_t + \beta_1 spc_{it} + \beta_2 mgin_{it} + \beta_3 cds_{it} + \beta_4 adi_{it} + u_i + e_{it} \qquad (1)$$

where

- δ_t are year fixed effects;
- y_{it} is the outcome indicator; we use ps, the number of inappropriate accesses to EDs per 100,000 inhabitants, and osp, the number of hospitalisations due to complications of chronicity per 100,000 inhabitants;
- spc_{it} is the per-capita district expenditure for CdSs;
- $mgin_{it}$ is the mean number of GPs that are active in a CdS;
- cds_{it} is a dummy that signals that at least 1 CdS is active;
- u_i are district fixed effects.

We use robust standard errors to deal with potential heteroskedasticity. Furthermore, we conduct an analysis of the residuals to check for outliers.

We are now in a position to analyse the impact of CdSs. As already mentioned above, the first outcome indicator is ps, the per-capita annual number of inappropriate accesses to ED during working days (hours 8:00-20:00) at district level, multiplied by 100,000 inhabitants.[11] This measure is preferred to the total number of accesses, as it is reasonable to think that the CdS project should have exclusively impacted on those cases that do not represent real emergencies. We define as inappropriate accesses to an ED all admissions that result in a white or green code according to the Italian 5-level triage system, i.e. the less severe cases which could be treated in ambulatory care facilities without burdening the hospital activity.[12] The hypothesis to test is whether the presence of CdS facilities reduce the ED inappropriate accesses over the considered period, thanks to their capacity to autonomously manage them.

[11] The time frame considered reflects standard GP availability hours in Italy.

[12] The Italian Ministry of Health sets up a triage criteria that need to be followed to sort out admissions to EDs in each Regional Health System, although regions are granted some flexibility. All patients admitted to an ED are classified on the basis of a triage assessment: depending on a first preliminary evaluation at the moment of the patient's arrival and on a more accurate subsequent assessment, each admitted patient receives a code, where green and white codes correspond to the lowest priority classification in the acuity scale, i.e. minor health problems that can be treated without resorting to an ED.

Unfortunately, the use of such a measure entails a difficulty related to the way the indicator is computed. Until 2019 the count of white and green codes was made with respect to four levels of the triage priority scale while from 2020, following the new rules established by the Ministry of Health, it was made with respect to five levels. For this reason, we have decided to perform a first analysis on the whole sample (2017-2022) and a second analysis on a reduced sample (2017-2019). The second analysis excludes the pandemic period and its potential related distortions. Of course, reducing the sampe decreases the informative power of the analysis, but it turns out that it allows to obtain statistically more reliable estimates, that can be compared to the first analysis on the whole sample to further support or deny its results.

The second outcome indicator is *osp*, the per-capita annual number of hospitalizations caused by complications due to three main chronic diseases (diabetes, obstructive pulmonary chronic disease and heart failure), multiplied by 100,000 inhabitants. Our starting hypothesis follows the idea that the existence of CdS facilities allows a reduction in these type of hospitalisation: indeed, the CdS project is a part of a broader regional health reform plan with the aim at improving the management of chronic diseases in Tuscany.

6 Results

In what follows we present our results relating to the impact of CdSs on the two outcome indicators that we have described above: inappropriate admissions to EDs and hospitalizations due to complications for chronicity.

6.1 Inappropriate accesses to EDs

Results for inappropriate admissions to EDs are presented in Table 3. The first column refers to the whole sample analysis (2017-2022) while the second column refers to the reduced sample (2017-2019).

[insert Table 3 here]

Let us start to analyse the whole sample specification. Per-capita expenditure of CdSs shows a negative and significant coefficient for inappropriate admissions to EDs: a rise of 10 euro reduces inappropriate admissions to EDs by 46 episodes per 100,000 inhabitants. This result shows that increasing the CdSs' expenditure and accordingly the healthcare services that they provide to the population allows to decrease inappropriate accesses to EDs. Such

finding seems to confirm also for Tuscany that the model based on Community Health Centers may reduce the burden of the healthcare demand on EDs, as already highlighted in most of the economic literature.

The positive effect of CdSs on inappropriate admissions to EDs is in line with the negative coefficient associated to the existence of at least one CdS in the healthcare district, even if such coefficient is not significant.

The coefficient associated to the mean number of GPs who work in a CdS is positive but not significant. This result is counter-intuitive and goes against what one could expect, but it could be linked to distortions due to the COVID-19 period included in the analysis given that such coefficient is positive in the reduced sample which excludes the COVID-19 period and will be discussed below.

The estimated coefficient for integrated home care is slightly positive and not significant, and thus it does not support the hypothesis that managing chronic patients outside the hospital facilities may reduce inappropriate accesses to EDs.

Finally, let us analyse the role played by the temporal dummies. During the pre-pandemic period, year dummies show an increase of accesses: 283 more episodes per 100,000 inhabitants in 2018 and 1,483 in 2019, compared to 2017 (baseline). This result can be ascribed to the effect of the recent austerity measures adopted in Italy, that have led to a deterioration in the access to primary healthcare services (Borsoi *et al.* (2023), Doetsch *et al.* (2023)). Indeed, there is some consensus that the latter may be one of the causes for EDs crowding, as it may induce individuals to use them in an inappropriate way (Pearce *et al.* (2023), Giamello *et al.* (2023)).

After 2020, temporal dummies capture the effect of COVID-19 pandemic. The strong reduction of inapproprate accesses to EDs during these years, however, cannot be totally attributed to the impact of COVID-19 since, as we stressed above, the beginning of the pandemic coincides with the changes in the triage priority scale and thus in the calculation method for the outcome indicator. Nor it is possible to separate these effects and quantify them correctly. Consequently, we can only presume the existence of a negative impact of COVID-19 on inappropriate accesses to EDs.

Let us now analyse the second specification related to the reduced sample (second column of Table 3). We exclude data collected after 2019 and those related to healthcare districts where no CdS was active, i.e. 6 observations related to two districts: Pratese and Pisana. Thus, the resulting reduced sample contains 60 observations.

As in the whole sample analysis, per-capita expenditure of CdSs shows a negative effect on inappropriate admissions to EDs, and the coefficient is now higher: an increase of 10 euro in per-capita expenditure reduces inappropriate admissions to EDs by 64 episodes per 100,000 inhabitants.[13] This

[13] Although it is not easy to understand why the coefficient is higher for the period 2017-

result allows us to get a further confirmation of our hypothesis that CdSs' activities reduce inappropriate accesses to EDs.

Estimated coefficients for GPs working in a CdS and integrated home care are still not significant, but they are now negative, in line with expectations. This suggests that both variables could have a positive effect on inappropriate accesses to EDs and that, in the whole sample analysis, their coefficients could have been distorted.

Finally, also in the reduced sample analysis, year dummies show a positive coefficient that signals an increasing trend in inappropriate accesses to EDs from 2017 to 2019.

6.2 Hospitalizations due to complications for chronicity

Results on the impact of the healthcare services provided by CdSs on hospitalisations due to complications for chronicity are presented in the third column of Table 3.

On the one hand, CdSs' per-capita expenditure has a positive effect on hospitalizations due to complications for chronicity: a 10 euro increase in per-capita expenditure rises hospitalizations by almost 3 cases per 100,000 inhabitants. This effect is very low, but significant. Moreover, the *cds* coefficient is also positive and significant: the existence of at least a CdS in the district increases hospitalisations by 65 episodes per 100,000 inhabitants. On the basis of such results, it seems that the healthcare services provided by CdSs favour an increase in hospitalisations rather than a reduction, as originally supposed. A possible explanation for this phenomenon could be ascribed to the CdSs' ability to bring care closer to the patient at a territorial level, suggesting that they may have been able to catch a latent demand for healthcare services that the pre-existing facilities were not able to satisfy.

On the other hand, the number of GPs who opted to work in a CdS, has, instead, a coefficient that is negative and significant. More specifically, hospitalisations reduce by 6 cases per 100,000 inhabitants for each additional GP that decides to work in a CdS. This result may be linked to the level of involvement of GPs in daily activities, i.e. thanks to a privileged relationship with the patient based on trust, GPs have more information about the patients' medical history and can favour a higher degree of "compliance" with prescribed care. This resul together with the previous one suggests that healthcare services carried on by CdSs entail two opposite effects: ospitalizations seem positively affected by CdSs' per-capita expenditure, but negatively affected by the number of GPs working in them. From a policymaker perspective, this result seems to point out that, in order to reduce

2019 than for the period 2017-2022, as it may occur for many different reasons related to the impact of COVID-19, the change in the calculation of the outcome indicator or just the sample observation reduction.

hospitalizations due to complications for cronicity, it is of paramount importance to provide incentives to GPs for working inside CdSs.

The effect of integrated home care is very low and surprisingly not significant. We would have expected that integrated home care should have lead to a better management of chronic diseases and thus to a reduction in hospitalisations. We are not able to support such hypothesis and more deep studies are required to understand the motivation and to provide a detailed assessment of the types of healthcare actually delivered.

Finally, temporal dummies show a negative effect and their trend seems linked to COVID-19. The first pandemic year (2020) registers a reduction in hospitalisations of 57 episodes per 100,000 inhabitants compared to the pre-pandemic period (2019) while the second and the third year show a smaller reduction: 39 less cases per 100,000 inhabitants and 50 less cases per 100,000 inhabitants, respectively.

7 Concluding remarks

In Italy, the CdS project has represented a crucial step towards the development of a new kind of primary care, centered on Community Health Centers. Such model has been recently re-confirmed by a healthcare reform occurred in 2022 which plans a re-organization of the territorial healthcare model with the transformation of CdSs in CdCs. Given the ongoing transition from a model based on CdSs towards a new one based on CdCs, our analysis on the impact of CdSs on some healthcare indicators, such as inappropriate accesses to EDs and hospitalizations due to complications for chronicity, can provide important insights on the efficacy of both the healthcare services carried on by the present CdSs and those carried on by the GPs working in them. Understanding which are the strengths and the weaknesses of CdSs may allow to better design the new primary healthcare model which will be based on CdCs.

Our study has tried to assess whether CdSs have been able to provide the population with effective community-based healthcare services, allowing less severe cases to be treated outside of hospital settings. To do this, we have tested the hypothesis on whether the existence of a CdS in a health district could provide patients with a point of access to primary healthcare capable of reducing hospital overload. This issue is of central importance for the model of healthcare organization because ED visits tend to cost more than clinic visits for similar diseases, and because patients should not have difficulties in accessing primary healthcare and EDs should not treat less severe cases that could be treated out of them.

To test such hypothesis, we have considered the case of the Regional Health System of Tuscany because it is one of the most successful examples of application of the CdS project in Italy. We have measured the health-

care services provided by CdSs using their expenditure and also referring to the number of GPs working in them. To estimate their impact on inappropriate accesses to EDs and hospitalizations due to complications of chronic diseases, we have used a fixed-effects model applied to a panel dataset including district-level information for the period 2017-2022.

Firstly, we have shown a slight positive effect of CdSs per-capita expenditure on reducing inappropriate accesses to EDs which is in line with expectations, but certainly too small compared to the ambitions of the reform. Secondly, we have shown that hospitalizations due to complications for chronicity decrease when the number of GPs working in a CdS increases. This effect is however mitigated by the fact that we have also found that hospitalizations increase in those health districts where there is at least one active CdS. The latter result is unexpected but it could be due to the capacity of CdSs to facilitate access to care and thus to capture a latent demand for healthcare services.

In conclusion, our results seem to suggest that inappropriate accesses to EDs are slightly reduced thanks to healthcare services provided by CdSs, as proxied by their per-capita expenditure, while hospitalization for complications due to cronicity are reduced thanks to the specific care services provided by GPs working inside CdSs. Actually, the more efficient management of chronic patients that should result from the activation of CdSs seems to be linked to the level of involvement of GPs in daily activities. This link may be due to the privileged relationship between the patient and her GP: GPs have more information about their patient's medical history, and they can favour patients' "compliance" with prescribed care. Healthcare services provided by CdSs, as proxied by their per-capita expenditure, have instead a positive effect on hospitalization maybe because of a latent demand that CdSs are able to capture.

These results thus suggest that the CdS project needs to be improved. The mere existence of a CdS within an area is not sufficient to ensure its usage; it needs to be recognized by citizens as a new point of reference for their healthcare needs. For this to happen, a process of adaptation is necessary: on the one hand, the population needs to change its habits and, on the other hand, CdSs need to build their reputation and thus gain credibility. It may be possible that this process has not yet been completed: in this case, it would be very useful to prepare a more effective communication strategy, which, for example, could contemplate public initiatives, with the aim of informing citizens as much as possible about the healthcare services offered by CdSs.

Further, the role played by GPs needs to be promoted. In their role of gatekeepers, they represent both the primary point of access to healthcare and the point of reference of patients who often build a trust relationship with them. Accordingly, more synergies between the activities carried on by CdSs and those by GPs should be promoted in order to overcome the limits

that our analysis has shown both in terms of inappropriate accesses to EDs and hospitalizations for complications due to cronicity. For example, it seems important that CdSs are provided with adequate instrumentation and on-site specialists, necessary to allow CdSs to represent a real alternative to the healthcare services supplied by hospitals. It would not, therefore, be a matter of simply integrating GPs' clinics into the new facilities, but of creating a truly integrated network in which the GP remains the patient's main point of reference, and the CdC represents that privileged place where a range of 'intermediate' health services, which were previously the exclusive domain of hospitals, are offered (e.g., nursing care, diagnostic tests, rehabilitation, etc.), so that they can truly be an effective alternative to hospitals. To do this, it would therefore be necessary to equip CdCs with adequate resources, both in terms of nursing staff and on-site specialists (perhaps even providing for different specializations in different centers), but also in terms of machinery and equipment. The need to define the functional relationships between the various actors in the new network should not be underestimated, and consequently, new managers should be trained to manage the system as efficiently as possible.

To conclude, as a cautionary note, notice that the effects of the explanatory variables cannot be interpreted as casual effects due to possible issues of confounding and reverse causality. Further, notice that our analysis is limited to the case of Tuscany and, at the moment, it is not possible to extend it to the national level because of lack of available data due to the absence of a well-structured national health data collection system: each Italian regional healthcare system follows its own guidelines, and data are often not compatible across different regions. Data interoperability is a crucially important issue and constitutes the basis on which to build a modern and efficient healthcare monitoring system: the absence of clean, compatible information compromises any study designed to verify the effectiveness of a given health policy. Recently, however, numerous efforts have been made towards digitization and harmonized collection of healthcare data (e.g., the Fascicolo Sanitario Elettronico 2.0). Once the database will be expanded and armonized, it will be interesting to repeat our study for the new set-up with CdCs.

8 Tables

Table 1: List of the variable used in the dataset

Name	Code	Description
Dependent Variables		
Inappropriate accesses to EDs	ps	Annual number of white or green code accesses to Emergency Departments during the working days (hour 8-20) over resident population (x 100,000 inhabitans);
Hospitalizations due to complications for chronicity	osp	Annual number of hospitalizations caused by complications of the 3 main chronic diseases (diabetes, chronic obstructive pulmonary disease and heart failure) over resident population (x 100,000 inhabitans);
Explanatory Variables		
Per-capita expenditure	spc	Total annual district expenditure for CdSs over resident population;
Number of involved GPs	mgin	Annual average number of General Practitioners working in a CdS for each structure (health district mean);
Active CdS	cds	Dummy variable that assumes value 1 if at least 1 CdS results active in the health district;
Covariates		
Integrated home-care takeovers	adi	Annual number of episodes of starting an integrated home-care process over the resident population (x 100,000 inhabitans);
Per-capita COVID-19 cases	cov	Number of COVID-19 registered cases over resident population;
Pandemic period	covid	Dummy variable that assumes value 1 if the year of observation corresponds to the pandemic period;
Year of observation	year	Calendar year from 2017 to 2022, entered in the model as a set of dummy variables (reference category: 2017).

Table 2: Descriptive statistics for the continuous variables of the dataset. Statistics between and within Tuscany health districts. Years 2017 to 2022.

Variable		*Mean*	*SD*	*Min*	*Max*	*Obs*
ps	*total*	58.15	37.90	6.28	149.68	$N = 138$
	between		21.21	33.84	103.61	$n = 23$
	within		31.67	-10.58	105.08	$T = 6$
adi	*total*	15.14	11.26	5.42	100.95	$N = 138$
	between		7.80	7.17	41.28	$n = 23$
	within		8.26	-9.28	74.80	$T = 6$
osp	*total*	274.63	108.79	19.69	533.93	$N = 138$
	between		101.51	31.50	453.27	$n = 23$
	within		43.67	157.87	445.87	$T = 6$
spc	*totale*	120.75	130.16	0	494.21	$N = 138$
	between		115.70	8.82	423.97	$n = 23$
	within		63.60	-87.72	311.15	$T = 6$
mgin	*total*	5.30	3.37	0	14	$N = 126$
	between		3.09	0	12.08	$n = 23$
	within		1.92	1.30	12.80	$T = 6$
cov	*total*	380.48	811.89	0	4736.79	$N = 138$
	between		268.52	94.48	1041.50	$n = 23$
	within		767.92	-661.02	4075.77	$T = 6$

Table 3: Estimation results of the fixed effects model. Tuscany health districts, years 2017 to 2022.

	(1) ps	(2) ps (reduced)	(3) osp
spc	-4.586**	-6.382**	0.283**
	(1.770)	(2.836)	(0.124)
mgin	89.800	-50.377	-5.895**
	(71.761)	(125.796)	(2.548)
adi	0.096	-0.242	-0.014
	(0.112)	(1.433)	(0.009)
1.cds	-799.527	-163.696	65.182*
	(673.892)	(788.828)	(31.849)
2018.anno	283.231**	260.499	-14.643
	(134.917)	(167.882)	(11.609)
2019.anno	1483.080***	1552.381***	-15.238
	(340.615)	(360.161)	(17.998)
2020.anno	-5001.468***		-71.862***
	(387.232)		(21.919)
2021.anno	-4998.211***		-54.650**
	(410.748)		(25.192)
2022.anno	-4794.846***		-65.579**
	(408.839)		(23.948)
constant	8245.282***	9548.190***	268.725***
	(275.501)	(2098.449)	(17.164)
N	126	60	126
rank	9	6	9
rmse	583.347	496.017	35.909
r2	0.963	0.551	0.331
aic	1970.086	919.623	1267.561
bic	1995.613	932.189	1293.087

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

9 Figures

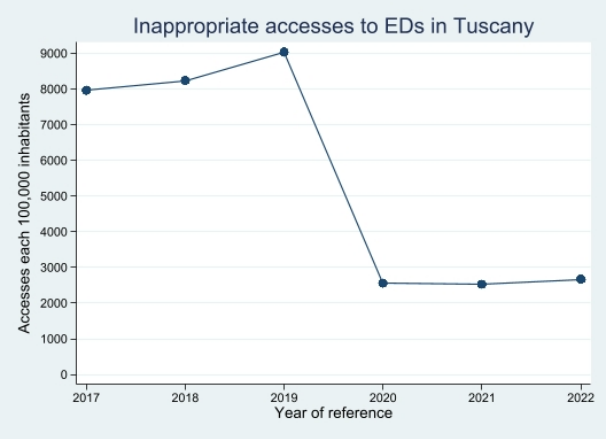

Figure 1: Average number of innapropriate accesses to EDs per 100,000 inhabitants in Tuscany health districts, annual trend (2017- 2022).

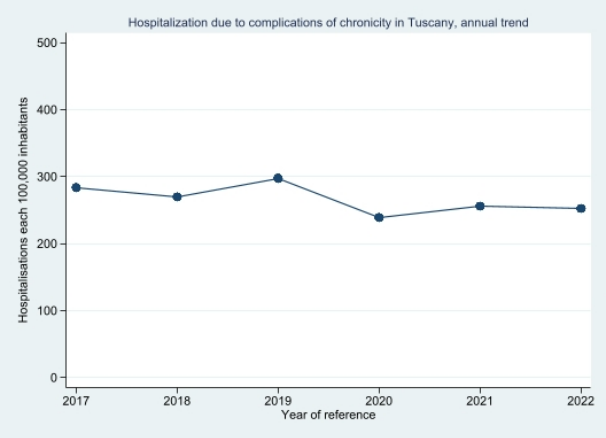

Figure 2: Average number of hospitalisations due to chronicity per 100,000 inhabitants in Tuscany health districts, annual trend (2017-2022).

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