Questions d'économie de la Santé

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Do Primary Care Teams Attract Young GPs to Medically Underserved Areas?

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Geographical accessibility to general practitioners (GPs) is decreasing and territorial inequalities are increasing. The areas in which accessibility is decreasing the most are also those that are the furthest away from employment centres, facilities, and services. The location of GPs is therefore part of a more general territorial problem. In view of the importance of health issues for the population, it is also a key element of France's spatial planning policy.

In this context, this study assesses the impact of Primary Care Teams (PCTs, *Maisons de santé pluriprofessionnelles*) on the evolution of the density of GPs by distinguishing the effects according to the areas and doctors' age groups. In areas with poor accessibility to healthcare services, does the opening of PCTs encourage new GPs to establish and remain in practices over the long term? Does the opening of PCTs consolidate and maintain GP services?

The study compares the evolution over time of the density of GPs in areas with PCTs and areas with similar characteristics but without PCTs. The results show that living areas (*territoires de vie*) with poor accessibility to healthcare services and where PCTs are located have better healthcare supply and are more likely to attract young GPs aged under 40 or 45. Hence, in suburban areas with less access to primary care, the number of GPs setting up new practices is greater than the number of GPs leaving these areas and the PCTs therefore help to rebalance the distribution of healthcare supply. In unattractive rural areas with fragile populations, they have a positive effect by offsetting the decrease in healthcare supply due to retirements, but this effect is not in itself sufficient to reverse the unfavourable demographic trends. Other additional measures are therefore required in these areas.

Over the past few years, accessibility to GPs –in terms of availability and spatial accessibility– has decreased, while accessibility to other primary care health professionals, such as nurses and masseur-physiotherapists, has improved (Legendre et al., 2019; Legendre, 2020). However, GPs, most of whom are their patients' family doctors, not only provide various primary care services, but also coordinate care by referring their patients to specialists or paramedics.

In the future, the availability of GPs could continue to decline due to a general decline in private healthcare supply: the number of full-time equivalent private practice doctors in proportion to the population could drop by 18% between 2016 and 2040 (Bachelet and Anguis, 2017). This decrease, which would be more pronounced in the case of private GPs, would not be offset by the healthcare provided

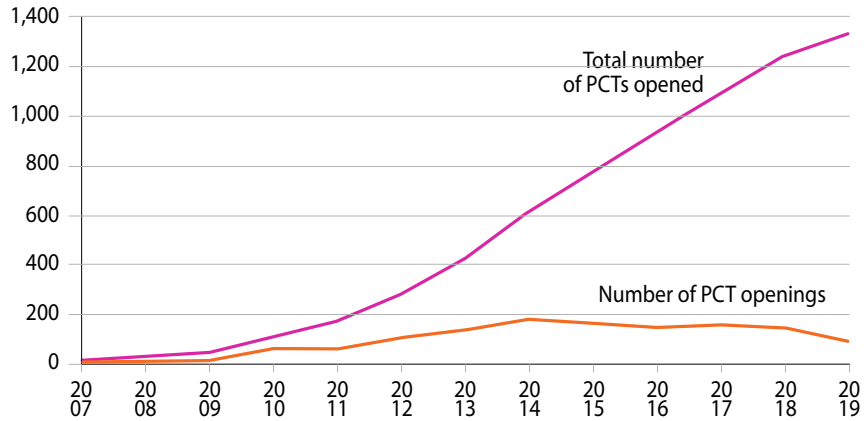
by salaried GPs, whose proportion is in fact growing. This situation is due to a decrease in available healthcare –linked to a decrease in the number of GPs and their activity– and an increase in healthcare needs due to population growth and longer life expectancy. The consequences of a decline in healthcare supply are, for example, shortened consultation times and appointments that are further apart, longer waiting times, greater difficulty in enrolling with a family doctor, and gaining ready access to unscheduled treatment (Chaput et al., 2020). Above all, this general situation is exacerbated by the unequal geographic distribution of doctors in France, whose effects vary according to the type of area. Indeed, the various areas do not have the same level of healthcare supply, the same healthcare needs, or the same general level of attractiveness. This adverse development in healthcare supply in general practice could further affect certain areas that are already fragile in terms of the available healthcare services (Chevillard and Mousquès, 2018).

Public authorities have implemented measures over various time frames in order to improve the availability of GPs and their geographic distribution (Chevillard et al., 2018). Firstly, the principal measure consisted of increasing the numerus clausus at the beginning of the 2000s, that is to say the number of doctors accepted for passage into the second year of medical studies. Introduced in 1971, doctors saw it as a way of controlling the selection of medical students and training, and limiting competition; the State and the French National Health Insurance saw it as a way of controlling health expenditure by limiting the risk of induced demand, while purporting to adapt to the population's healthcare needs (Déplaude, 2015). This long-term lever –doctors' medical training takes at least nine years– can be considered a failure. On the one hand, the management of the numerus clausus, characterised by an excessive reduction in the number of second-year medical students in the 1980s and 1990s, has resulted in the current and future decline in the number of GPs. It was primarily determined by short-term professional, institutional, and political issues. On the other hand, the regulation of the number of doctors does not in itself make it possible to reduce the unequal geographic distribution of doctors on a infra-regional scale. Secondly, since 2005, the identification of areas lacking in general practitioners has served as a framework for the implementation of measures to attract and maintain GPs in these areas via individual financial incentives and, more recently, through the improvement of working conditions, notably in the form of Multiprofessional Group Practices (Primary Care Teams, PCT). These healthcare structures are run by a minimum of two GPs and a paramedic, who have developed a health project based on inter-professional coordination. PCTs, driven by the impetus of health professionals, are attractive for younger generations of doctors and are supported by public authorities (financial aid for construction or operating costs). The number of PCTs has therefore increased rapidly: there are more than 1,300 in 2020 compared with less than 20 in 2008 (see Graph 1). Operating aid began in the form of trials and was then generalised in 2015 within the framework of a conventional inter-professional agreement (CIA) on local multidisciplinary health structures, signed by the French National Health Insurance (*Assurance Maladie*) and the private primary care health workers' trade unions (*Syndicats des Professionnels de Santé Libéraux de Premiers Recours*). This aid is paid on the basis of the achievement of objectives to improve accessibility to healthcare, inter-professional coordination, and information systems. At the end of 2018, two thirds of the PCTs opened participated in conventional inter-professional agreements (CIA): 735 out of the 1,153 PCTs opened (65%) were signatories.

The location of PCTs and their impact on the evolution of the density of GPs were studied by distinguishing the effects according to various types of area and doctors' age groups. The aim of the study was to identify whether the opening of PCTs encouraged new GPs to establish and remain in practices in areas with poor accessibility to healthcare services. In addition, does the opening of PCTs consolidate and maintain GP services? Since the national date on the history of various private GP practices was not available for this study, these questions were addressed by analysing the impact of the opening of PCTs on the evolution, on the one hand, of the density of private GPs aged less than 45 (while testing a variant with an age limit of 40) and, on the other hand, the global density of private GPs. The analysis of the evolution of the density of GPS aged less than 45 (or 40) made it possible to assess the attractiveness of PCTs in terms of the establishment of young and new doctors in a particular area. Indeed, the average age at which doctors begin practising as private GPs is estimated to be around 37, bearing in mind the average age (34) at which private doctors first enrol on the register of the French National Medical Council (*Ordre des Médecins*), the frequency of their activity as a stand-in doctor without a practice at the beginning of their career, and the duration of this period, which is

G1

Evolution of the number of Primary Care Teams (PCT) and annual openings



Sources: The Observatory on Healthcare Restructuring (*Observatoire des Recompositions de l'Offre de Soins*), General Directorate of Healthcare Supply (DGOS)

estimated to be a maximum of three years according to a recent survey of house officers, stand-in doctors, and doctors with practices (CNOM, 2019). The analysis of the evolution of the global density of private GPs also made it possible to assess the impact of the opening of PCTs on the consolidation and maintenance of general medical supply in an area.

This study is part of a programme of evaluative research on the impact of Multiprofessional Group Practices (Primary Care Teams, PCT) and the associated conventional inter-professional agreements (CIA) (see "Context"). It does not take into account the number of salaried GPs or its evolution, in particular in more long-established healthcare centres.

The growth and geographic location of Primary Care Teams

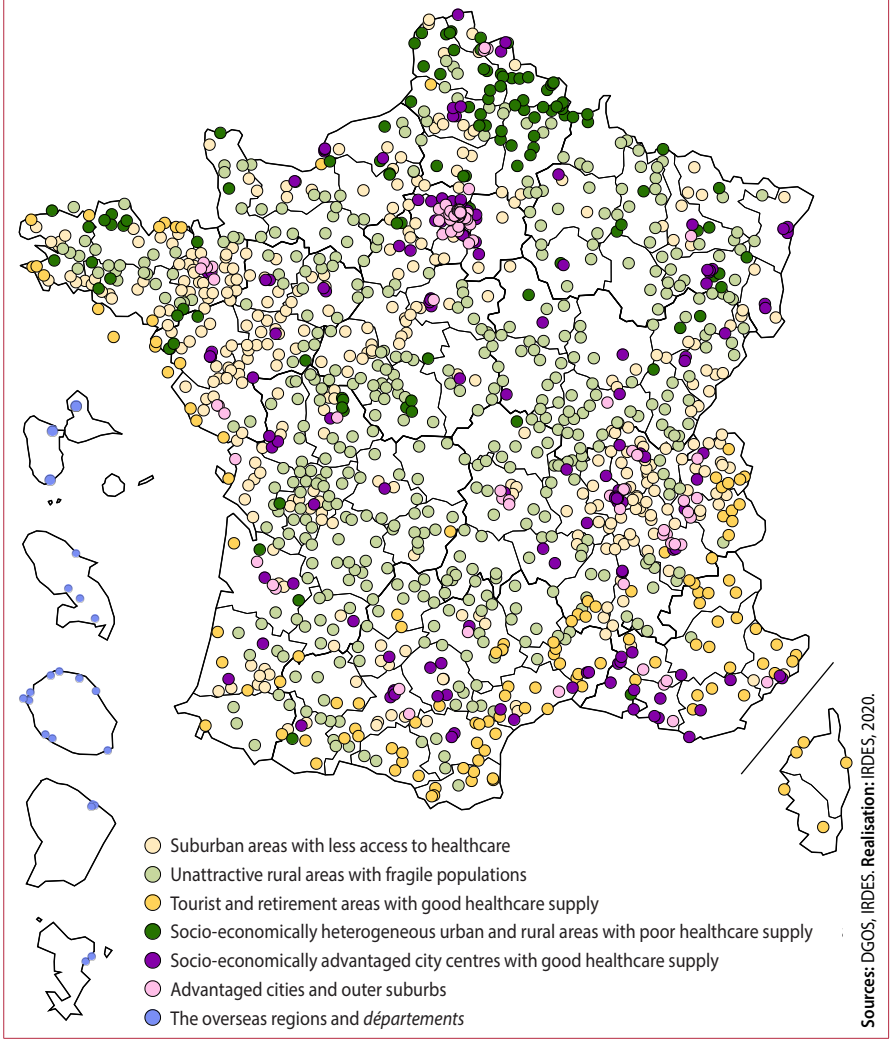
The analysis of the growth of PCTs was based on a register that contains a record of the PCTs opened, and their geographic location is classified according to a socio-health typology on a living area scale (see Inset on p. 4). The latter corresponds to the smallest area in which the inhabitants have access to everyday services and employment. The living areas served as a baspris for the living and health areas ("*Territoires de vie-santé*", TVS), which are used to define the priority areas from which they marginally differ. Mainland France is divided into 2,677 living areas.

Context

The assessment of the conventional inter-professional agreement (CIA) on local multidisciplinary health structures was entrusted to the Institute for Research and Information in Health Economics (IRDES) by the French National Health Insurance (Assurance Maladie). The programme of evaluative research undertaken by the Institute aims to assess the impact of Multiprofessional Group Practices (Primary Care Teams, PCT) and the contractual framework of the conventional inter-professional agreement (CIA) on a range of dimensions related to spatial accessibility —summarised in this study— as well as professional and multidisciplinary practices and dynamics, the activity and income of GPs, and patients' utilisation of healthcare and treatment programmes.

M

Location of Primary Care Teams on 1 January 2020, according to the type of living area



Sources: DGOS, IRDES. **Realisation:** IRDES, 2020.

Primary Care Teams are largely located in areas with poor accessibility to healthcare services

A mapping of the distribution of PCTs in France shows territorial specificities (see Map). Although there are PCTs in all the regions, there are substantial inter- and infra-regional disparities. Brittany and the Pays de la Loire, the Hauts-de-France, and the Auvergne-Rhône-Alpes regions are amongst those with the densest network of PCTs. This distribution is the fruit of previous regional and departmental approaches, which, on a smaller scale, echo areas that pioneered the establishment of PCTs. The old Franche-Comté, Lorraine, and Poitou-Charentes regions therefore have a denser network than their new regions. In contrast, the Provence-Alpes-Côte d'Azur and Alsace regions, and Corsica have a more diffuse network of PCTs.

An analysis of the distribution of PCTs according to the type of living area shows new specificities. On 1 January 2020, 61% of the PCTs were located in the two types of living area included in the analysis, which have the lowest levels of Local potential accessibility (LPA) to primary medical care: 35.5% of the PCTs are located in rural areas and 25.8% in suburban areas with less access to primary healthcare. They are approximately evenly distributed in the other types of area, albeit with an underrepresentation in the cities and advantaged suburbs (6.9%). Furthermore, 23 PCTs have been opened in the French overseas départements (DOM), that is to say 1.7% of the PCTs. In areas with poor healthcare supply defined by the Regional Health Authorities (*Agences Régionales de Santé*, ARS), there are 575 PCTs in 2020 according to the General Directorate of Healthcare Supply (*Direction Générale de*

l'Offre de Soins, DGOS) (out of 900 for which information is available, that is to say 64%) and the proportions are higher in rural areas (86% of the PCTs are also in areas with poor healthcare supply) and suburban areas (55% of the PCTs are in areas with poor healthcare supply).

Primary Care Teams were first established in rural areas

An analysis of the location of PCTs on different dates provided information on their spatial and temporal growth diffusion. Most of the PCTs were initially established in rural areas, whereas the most recent PCTs have increasingly been established in urban areas. Hence, between 2010 and 2015, the proportion of PCTs opened in rural areas was more than 40%; the proportion was "only" 25% for those opened between 2016 and 2019. The proportion of PCTs in suburban areas was, regardless of the period, close to 25%, while the proportion in town and city centres is nearly 17% for the most recent PCTs compared with less than 10% in 2010. This shows that PCTs were first established in areas far from towns and cities, primarily in rural areas and then in suburban areas.

Since suburban areas have less access to primary healthcare and rural areas have very different territorial dynamics, the reasons for the relative decrease in general medical supply in these areas differ. In suburban areas experiencing high demographic growth with high percentages of working and young people, the relative decrease in healthcare supply has primarily resulted from the increase in the population. In contrast, in rural areas where population growth is generally sluggish and there are large numbers of older people with more extensive healthcare needs, the decrease in the number of doctors, which is the main driver of the decline in healthcare supply, is highest (see Inset opposite).

I

A socio-health typology of living areas

The analysis of the location of Primary Care Teams (PCT) was based on data from the General Directorate of Healthcare Supply (DGOS) and the French Agency for Information on Hospital Care (*Agence Technique de l'Information sur l'Hospitalisation*, ATIH), providing information, in particular, on the year in which PCTs were opened and their location: 1,332 PCTs had been opened by 1 January 2020.

The data used to classify the areas was derived from a socio-health typology of living areas in France (excluding French overseas départements), which distinguished them in terms of access to healthcare, the characteristics of the populations, and their attractiveness (Chevillard and Mousquès, 2018). There are 2,677 living areas in mainland France. A living territory corresponds to the smallest territory in which the inhabitants have access to everyday services and employment.

A complete description of the six classes in the typology is presented in the original article; below is a brief summary with a focus on the two main classes of area in which PCTs are located: suburban areas, with less access to primary care, and unattractive rural areas with fragile populations.

Class 1: suburban areas, with less access to primary care (21.2% of the population). They correspond to the second suburban ring of major conurbations or more diffuse suburban rural areas. They are characterised by the strongest population growth since 2009, a younger population, a high employment rate, a slight over-representation of unskilled workers, and individuals with average health. Local Potential Accessibility (LPA) to various primary care health professionals is lower than the average LPA in mainland France, the density of private GPs is the lowest, and the distance to healthcare establishments is slightly longer. These areas are also slightly further away from local service centres.

Class 2: unattractive rural areas with fragile populations (13.2% of the population). These areas correspond to rural areas in mainland France, located far away from cities. The populations are more underprivileged with an over-representation of elderly people and unskilled workers. The educational level and average income are lower, and the health status indicators are less favourable (premature mortality and high "all-cause" mortality rates). The LPA to primary medical care is generally lower than the average LPA and lower for GPs, nurses, masseur-physiotherapists, and dentists. The decrease in the density of GPs since 2004 is much more pronounced and there is a high number of GPs close to retirement. These areas are characterised by a high level of isolation: the distance to healthcare establishments is longer than average and the average distance to major urban centres and local service centres is much longer than in other areas. The proportion of vacant dwellings is also much higher and the proportion of premises with high-speed Internet is much lower.

The four other classes are tourist and retirement areas with good healthcare supply (Class 3 = 7.4% of the population), underprivileged urban and rural areas, in which the average health of the populations is poorer than in other areas, but whose access to healthcare is on a par with average accessibility (Class 4 = 11% of the population), city centres with good healthcare supply (Class 5 = 29.3% of the population), and socio-economically advantaged cities and outer suburbs with good healthcare supply (Class 6 = 17.6% of the population).

[1] Local Potential Accessibility (LPA) takes into account doctors' level of activity in order to measure healthcare provision and the differentiated rate of care utilisation per age of the inhabitants to assess the demand. This is a local indicator, calculated for each commune, but which also takes into account healthcare provision and demand in surrounding communes.

The impact of PCTs on the evolution of the density of private GPs

An analysis of the impact of PCTs on the evolution of the density of private GPs was carried out on a living area scale by using administrative data from the French National Health Insurance (*Assurance Maladie*) on private GPs (SNIR-PS database) and data from the National Institute of Statistics and Economic Studies (INSEE) drawn from the population census (see "Materials and Method" Inset on p. 6). To assess the causal effect of the presence of PCTs on the evolution of the density of GPs, we compared areas with PCTs ("treated areas", as of the opening date of the PCT) with areas that had similar characteristics, but without PCTs ('control areas'), adopting a quasi-experimental approach and using "difference-in-differences" analyses. It is assumed that these areas can only be distinguished by whether they do or do not have a PCT; hence, different reasons in terms of the evolution of the medical density can be attributed ("causal effect") to the presence of a PCT.

To achieve this, we used a subsample of living areas in which PCTs were opened between 2008 and 2016 in order to observe a period before (2004–2007 for PCTs opened in 2008) and after (2017 for PCTs opened in 2016) the opening of a sufficient number of Primary Care Teams (PCT) [treatment areas](see Table 1 on p. 5). The subsample comprised 2,610 living areas, including 707 with PCTs ("treated areas") and 1,903

without PCTs ("control areas"), and, more specifically, in suburban areas and rural areas, 195 treated areas versus 504 control areas and 283 treated areas versus 300 control areas respectively. The spatial distribution of the living areas according to the class resulting from a spatial taxonomy (see Inset below) and their status as treated or control areas shows a homogeneity in the various regions.

Living areas with PCTs have better healthcare supply and are more attractive for young GPs

On average and in all the living areas, the density of young private GPs (aged less than 45) evolved in a negative manner between 2004 and 2017, dropping from 25.6 per 100,000 inhabitants to 22.6, but, in a more recent period, the density of GPs has increased after dropping to 16.1 per 100,000 inhabitants in 2011. In all the living areas, the causal effect of the presence of a PCT on the density of GPs aged less than 45, evaluated using "difference-in-differences" analysis (Tables 2 and 3), is estimated to be around +3.4 young GPs per 100,000 inhabitants.

The evolution of the density of all private GPs (regardless of their age) is negative, dropping from 88.1 private GPs per 100,000 inhabitants to 77.1, that is to say a decrease of 12.4%. However, the evolution in areas with a PCT is less negative. Indeed, the global impact of the presence of a PCT, evaluated using 'difference-in-differences' models, is estimated to be +1.4 and +1.7 additional GPs per 100,000 inhabitants in living areas with PCTs (see Table 3). Overall, in all the areas, the decrease in the medical density is therefore less in areas with PCTs.

Suburban areas with PCTs are much more attractive for young doctors, which makes it possible to maintain healthcare supply

Graphs 2 and 3 on p. 6 show the evolution of the density of young private GPs (aged less than 45) and the density of all the private GPs between 2004 and 2017 in suburban areas with less access to primary care, with and without the establishment of a PCT between 2008 and 2016.

T1

Description of the sample of Primary Care Teams and living areas by year over the period 2004-2017

	All classes	Class 1*	Class 2*	Class 3*	Class 4*	Class 5*	Class 6*
Primary Care Teams (PCT): year of opening							
2004	-	-	-	-	-	-	-
2005	4	1	2	-	-	1	-
2006	-	-	-	-	-	-	-
2007	5	-	3	1	-	-	1
2008	17	5	10	1	-	1	-
2009	16	5	7	1	3	-	-
2010	63	16	20	3	9	11	4
2011	59	11	36	5	2	4	1
2012	91	30	45	7	4	3	2
2013	112	35	40	12	11	9	5
2014	144	33	66	12	12	12	9
2015	120	36	41	14	10	14	5
2016	85	24	18	8	14	14	7
2017	45	18	12	3	5	6	1
Total number of living areas ...							
- with PCT in 2008-2016 (treated)	707	195	283	63	65	68	33
- without PCT in 2008-2016 (control)	1,903	504	300	230	204	247	418
Combined	2,610	699	583	293	269	315	451

* For more details, see Inset on p. 4 and Chevillard and Mousquès, 2018.

Source: The Observatory on Healthcare Restructuring, DGOS.

Download the data

T2

Results of the difference-in-differences models' estimations of the impact of Primary Care Teams on the evolution of the density of private GPs aged less than 45

Coef.: Coefficients
SD: Standard deviations
PCT: Primary Care Teams
LT: Living areas

	All living areas		Suburban areas with less access to primary care		Unattractive rural areas with fragile populations	
	Coef.	SD	Coef.	SD	Coef.	SD
Ordinary least squares						
PCT	-1.837***	0.195	-0.100	0.368	-0.264	0.350
PCT After	3.147***	0.328	4.301***	0.622	3.159***	0.530
Random effects						
PCT	-1.866***	0.515	-0.174	0.958	-0.239	0.898
PCT After	3.352***	0.500	4.517***	1.007	3.360***	0.790
Fixed effects						
PCT After	3.365***	0.502	4.528***	1.007	3.382***	0.790
Number of observations (LT years)	36,453		9,758		8,138	
Number of LTs with PCT (treated)	761		214		300	
Number of LTs without PCT (control)	1,903		504		300	

Note: *** p<0.01; ** p<0.05; * p<0.1

Source: The Observatory on Healthcare Restructuring, DGOS.

Download the data

T3

Results of the difference-in-differences models' estimations of the impact of Primary Care Teams on the evolution of the density of private GPs

Coef.: Coefficients
SD: Standard deviations
PCT: Primary Care Teams
LT: Living areas

	All living areas		Suburban areas with less access to primary care		Unattractive rural areas with fragile populations	
	Coef.	SD	Coef.	SD	Coef.	SD
Ordinary least squares						
PCT	-1.859***	0.334	-1.590***	0.482	-0.727	0.554
PCT After	1.360**	0.532	3.984***	0.781	2.871***	0.840
Random effects						
PCT	-1.913*	0.978	-1.761	1.387	-0.434	1.593
PCT After	1.648***	0.496	4.479***	0.812	2.282***	0.757
Fixed effects						
PCT After	1.652***	0.496	4.487***	0.813	2.272***	0.756
Number of observations (LT years)	36,453		9,758		8,138	
Number of LTs with PCT (treated)	761		214		300	
Number of LTs without PCT (control)	1,903		504		300	

Note: *** p<0.01; ** p<0.05; * p<0.1

Source: The Observatory on Healthcare Restructuring, DGOS.

Download the data

In 2004, the density of young private GPs in suburban areas was slightly lower in those areas that would later have a PCT (22.1 per 100,000 inhabitants compared with 23.8). The density decreased in the two types of area up until 2011 and subsequently improved considerably in areas that would later have PCTs, with a less significant improvement in density in areas without PCTs. In 2017, the situation in suburban areas with PCTs improved (24.9 compared with 19.4). The causal effect of the presence of a PCT on the density of GPs aged less than 45 is estimated to be +4.1 and +4.4 additional young GPs per 100,000 inhabitants in areas with PCTs (see Table 2). The attractiveness of PCTs was highest for young doctors in suburban areas with poor healthcare supply (see Graph 2).

In the suburban areas, the evolution of the total density of private e GPs (regardless of their age) was more positive in

MATERIALS AND METHODS

The densities of private GPs, for the years 2004-2017 and according to living areas, were calculated using an enumeration of private GPs, excluding doctors with specific practice methods, based on data from the French health insurance system's SNIR-PS database, and population data, based on the National Institute of Statistics and Economic Studies (INSEE) data census. The density indicators do not take into account the evolution of healthcare needs or the socio-demographic structure of the population, whereas more advanced indicators, such as LPA, do take these factors into account (Lucas and Mangeney, 2020), but they were not available for the entire study period.

We then analysed, for each year of the period 2004-2017, the densities of private GPs, and, based on the years in which Primary Care Teams (PCT) were opened –the study was restricted to PCTs opened between 2008 and 2016 in order to ensure a sufficient pre- and post-observation period–, we defined the situation in each living area in terms of the presence of PCTs (living areas with or without PCTs, treated and non-control areas). We thus compared the differences in the evolutions of the densities for each class of living area (treated and control areas), before and after the establishment of PCTs (treatment areas). The double differences method made it possible to estimate the effect of the establishment of PCTs on the evolution of the densities. The parametric "difference-in differences" estimates made it possible to take into account the initial selection differences between treated living areas and constant 'control' areas over time.

Our estimation strategy can be formalised as follows, according to a general linear regression model (Imbens and Wooldridge, 2009):

$$y_{it} = \mu + \delta_1 \text{PCT}_i + \delta_2 \text{After}_{it} \cdot \text{PCT}_i + \gamma \text{Year}_t + \varepsilon_{it}$$

With:

Y_{it}, the result variable, i.e. the density of private GPs aged less than 40 or 45 (attractiveness), i.e. the total density of private GPs (maintenance of GP services) in a living area *i*, in the year_t. PCT_{it} is an indicative variable that was given the value 1 if the territory benefitted from the establishment of PCTs during the period, or 0 if it did not;

After_{it} is an indicative variable that was given the value 1 when a PCT was established in a living aera_i in the year_t and 0 if no PCT was established;

$\text{After}_{it} \cdot \text{PCT}_{it}$ is an indicative variable of the interaction term that estimated the effect of the establishment of a PCT (δ2) on the result variable according to the initial differences between treated and control living areas–the double differences estimator;

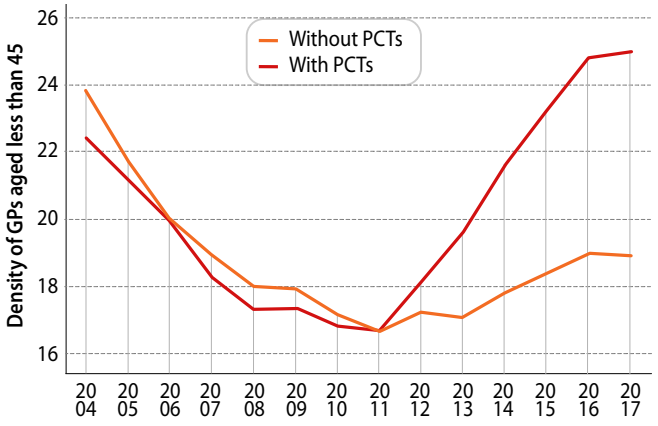
Year_t is an indicative variable that captured the temporal effect for the treated and control areas in each year, with 2004 as the reference year.

The specification of the models followed a step-by-step approach, with: (1) ordinary least squares (OLS) models, (2) random effects models, in order to take into account the heterogeneity of the living areas, and (3) fixed effects models in order to take into account the heterogeneity in the living areas.

The identification strategy was based, in particular, on a confirmation of parallel trends across treated and control living areas, before the beginning of the period during which PCTs were established. The parallel trends were confirmed using a falsification test over the period 2004-2008. Other falsification tests, with satisfactory results, were carried out over the period 2004-2017 in order to ensure that the treatment had no effect on two result variables, which in theory were not directly affected by the presence of PCTs, the number of medical acts, and a randomly generated variable, and that the densities were not affected by a randomly generated variable (placebo). Lastly, we verified that the results were stable even when the study was restricted to PCTs opened over the period 2008-2015, which was the case. It is possible that areas with PCTs benefitted from other medical services, although the falsification and placebo tests did not make it possible to detect identification problems that altered the estimation.

G2

Evolution of the density of private GPs aged less than 45 between 2004 and 2017, in suburban areas with less access to healthcare, according to the presence of PCTs over the period 2008-2016

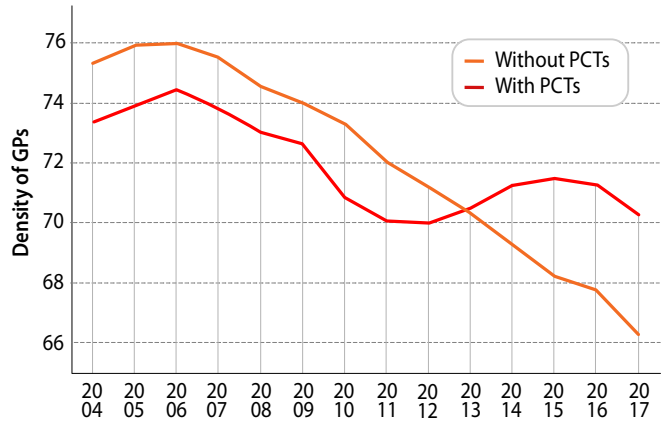


Note: To simplify the graph, the treated areas correspond to the living areas with at least one PCT opened during the period 2008-2016.

Sources: The SNIR-PS database, the French National Health Insurance (*Assurance Maladie*), the Observatory on Healthcare Restructuring (*Observatoire des Recompositions de l'Offre de Soins*), the General Directorate of Healthcare Supply (DGOS).

G3

Evolution of the global density of private GPs between 2004 and 2017, in suburban areas with less access to healthcare, according to the presence of PCTs over the period 2008-2016



Note: To simplify the graph, the treated areas correspond to the living areas with at least one PCT opened during the period 2008-2016.

Sources: The SNIR-PS database, the French National Health Insurance (*Assurance Maladie*), the Observatory on Healthcare Restructuring (*Observatoire des Recompositions de l'Offre de Soins*), the General Directorate of Healthcare Supply (DGOS).

those areas with PCTs ("treated areas") than those without ("control areas"). In 2004, the areas that would later have a PCT had a GP density that was very slightly lower than that in suburban areas with PCTs (73 versus 75.3). Until 2013, a parallel trend in the density was observed in the treated and control areas, and then a "scissors effect": the situation improved in areas with PCTs while it continued to worsen in the control areas. The "difference-in-differences" models' estimation was between +4 and +4.5 private GPs per 100,000 inhabitants in areas with PCTs (see Table 3). Hence, the effect was the same as that observed for young GPs, indicating that the effects of PCTs on the evolution of the healthcare provided by GPs are primarily driven by their attractiveness for young doctors (see Graph 3).

Rural areas with PCTs are more attractive for young GPs, but the decline in healthcare supply remains a matter of concern

In the rural areas, in 2004, the densities of young GPs were initially slightly higher in the areas that did not later benefit from the establishment of a PCT (22.2 compared with 19.9 per 100,000 inhabitants). The densities subsequently decreased in the same way in the treated areas (establishment of a PCT between 2008 and 2016) and control areas; the curves intersect in 2010 and the situation subsequently improved earlier and more rapidly in the areas with PCTs. In 2017, the situation improved in the areas with PCTs (a density of 17.2 per 100,000 inhabitants compared with 13.3). The causal effect of the presence of a PCT on the density of GPs aged under 45, is estimated to be +3.4 young GPs per 100,000 inhabitants in rural areas with PCTs (see Table 2). These findings are confirmed, but on a lesser scale, if an age limit of 40 and not 45 is used to define "young" doctors. It is also worth noting that the treated rural areas gradually caught up with suburban areas without PCTs in terms of their attractiveness for young GPs (see Graph 4).

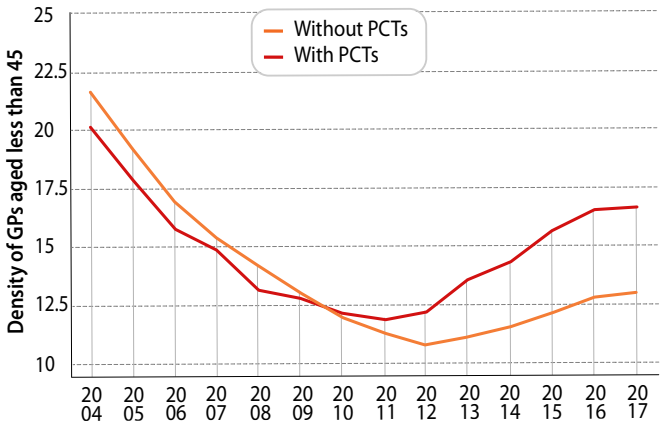
As far as the density of all GPs is concerned, regardless of their age, the evolution was distinctly negative in rural areas (see Graph 5). In 2004, the density was slightly higher in the areas that did not subsequently benefit from the establishment of a PCT. In 2017, thanks to the attractiveness of PCTs in rural areas for young doctors, the overall situation declined less in the areas that benefitted from the establishment of a PCT, so that at the end of the period the overall situation was less negative in these areas. The causal effect of the presence of a PCT on the density of GPs is estimated, according to the models, to be between +2.3 and +2.9 private GPs per 100,000 inhabitants in rural areas with PCTs (see Table 3). The PCTs seem to counteract the decline in healthcare supply in rural areas, but without bringing about a major trend reversal due to many retirements that are not offset by the attractiveness of PCTs for young GPs.

* * *

We have shown that medically underserved areas and with PCTs had a better evolution of private GP density than those without a PCT. In general, the positive effects of PCTs on healthcare supply are primarily due to their attractiveness for "young" GPs aged less than 40 or 45. In other words, in a context of a decline in healthcare supply, the PCTs enable more young doctors to establish themselves as GPs. Given that GPs do not tend to move once they have established themselves (Dumontet et al., 2016), these impacts are fundamental for the evolution of GP healthcare supply. This suggests that the local reconfigurations of healthcare supply mainly involve new healthcare facilities, which, in general, do not attract the GPs who are established in the surrounding living areas. This is substantiated by similar trends in the densities of doctors aged over 40 observed in areas with and without PCTs. So, the new healthcare facilities –PCTs– contribute to reducing the territorial inequalities in healthcare supply, given that suburban areas with poor healthcare supply and rural areas

G4

Evolution of the density of private GPs aged less than 45 between 2004 and 2017, in rural areas, according to the presence of PCTs over the period 2008-2016

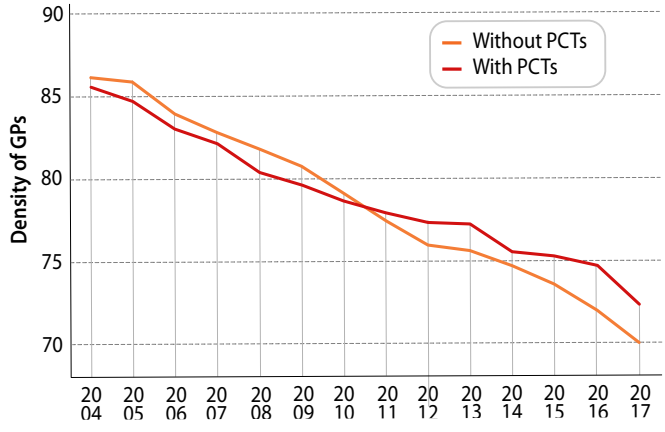


Note: To simplify the graph, the treated areas correspond to the living areas with at least one PCT opened during the period 2008-2016.

Sources: The SNIR-PS database, the French National Health Insurance (*Assurance Maladie*), the Observatory on Healthcare Restructuring (*Observatoire des Recompositions de l'Offre de Soins*), the General Directorate of Healthcare Supply (DGOS).

G5

Evolution of the global density of private GPs between 2004 and 2017, in rural areas, according to the presence of PCTs over the period 2008-2016



Note: To simplify the graph, the treated areas correspond to the living areas with at least one PCT opened during the period 2008-2016.

Sources: The SNIR-PS database, the French National Health Insurance (*Assurance Maladie*), the Observatory on Healthcare Restructuring (*Observatoire des Recompositions de l'Offre de Soins*), the General Directorate of Healthcare Supply (DGOS).

have the lowest accessibility to private GPs (Chevillard and Mousquès, 2018). Furthermore, the establishment of young GPs facilitated by the PCTs offsets the lack of attractiveness of rural areas. Young GPs now establish themselves almost as much in rural areas with PCTs as in suburban areas without PCTs, attesting to the importance of these healthcare structures as levers for regional development. However, although the positive effect of PCTs on the density of young GPs halts the decline in healthcare supply in suburban areas, it merely slows down the decline in rural areas.

These findings complement the assessments –carried out in France– of the mechanisms to improve the geographic distribution of GPs; these assessments remain incomplete and show a small improvement in the number of healthcare facilities permitted in areas lacking in general practitioners and a restricted effectiveness of financial incentives to encourage the establishment of GPs (Cardoux and Daudigny, 2017). In the rural areas, the improvement of their attractiveness for young GPs only slows down the decline in general medical supply. This requires new measures in these areas, and also, more generally, an adaptation of the measures to the characteristics of the areas. Indeed, the issues in rural areas (low attractiveness, a significant decline in healthcare supply, elderly populations, remoteness, etc.) are not the same as those in suburban areas (enhanced appeal, proximity of cities and employment centre, etc.) and, consequently, different solutions are required. In this respect, other complementary mechanisms could be tested in rural areas, knowing that bundled interventions are more efficient (Asghari et al., 2020). Taking into account medical students' social and geographical backgrounds could be a way to increase the potential of future health professionals in areas with poor healthcare supply. The expansion of rural internships, in line with mandatory internships in areas with poor healthcare supply, could also be a way of familiarising students with a doctor's work and the way of life in these areas. Lastly, irrespective of the type of living area, other measures make it possible to increase healthcare supply with less doctors. Hence, productivity gains in professional practices can be expected with greater numbers of Primary Care Teams and greater emphasis on collaboration, in particular between GPs and nurses (Loussouarn et al., 2019). The delegation of tasks to other health professionals, even the development of new complementarities (advanced practice nurses, vaccines administered by pharmacists, etc.), and a more frequent and varied use of telemedicine tools are a step in this direction. In this regard, the PCTs are a particularly interesting solution because of their capacity to attract young doctors in areas with poor healthcare supply and the fact that they are ideal places to increase healthcare supply. ♦

FOR FURTHER INFORMATIONS

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