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Local Potential Accessibility (LPA): A New Measure of Accessibility to Private General Practitioners

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This study proposes an innovative and enriched indicator to measure spatial accessibility to healthcare, in this case applied to private general practitioners. The Local Potential Accessibility (LPA) indicator measures the supply of and demand for general practice (GP) services by taking into account practitioners' volume of activity on the one hand, and service use rates differentiated by population age structure on the other. Although this is a local indicator calculated at municipal level, it also takes into consideration supply and demand factors in neighbouring municipalities.

The Local Potential Accessibility (LPA) to private GPs indicator reveals a greater degree of variability than the traditionally used accessibility indicators (travel time, level of GP density in living areas...). In 2010, the LPA indicated an average 71 full-time equivalent (FTE) GPs per 100,000 inhabitants in France, but less than 31 FTE per 100,000 inhabitants for the 5% of the population with the lowest accessibility to GPs, and over 111 FTE for the 5% of the population with the highest accessibility.

The Local Potential Accessibility (LPA) to private GPs indicator is on average higher for populations living in urban municipalities. Within these municipalities, the inhabitants of small or average urban centres have better accessibility (81 FTE per 100,000 inhabitants) than those living in large urban centres (75 FTE per 100,000 inhabitants). Among rural municipalities, those 'isolated' have higher accessibility (63 FTE per 100,000 inhabitants) than outer suburb municipalities (52 FTE per 100,000 inhabitants).

Determining the spatial balance between private GP service supply and demand at area level is a difficult task demanding accurate definitions of the supply and demand in question and a relevant territorial grid. This study proposes an indicator inspired by academic literature (notably Radke and

Mu, 2000; Luo and Wang, 2003; Luo and Qi, 2009) similar to the density and distribution indicator characterising access to healthcare establishments (Mizrahi and Mizrahi, 2011). This indicator, referred to as the Local Potential Accessibility (LPA) indicator responds to the main criticisms of traditional healthcare access indicators

whilst remaining relatively easy to calculate in that the necessary data is readily available. It notably integrates a better definition of healthcare supply and demand by taking into account health professionals' volume of activity and the age structure of the population

Insert1: **Calculation of the indicator of Local Potential Accessibility (LPA) to private general practitioners in 2010**

Calculation method

The Potential Accessibility indicator is calculated in two phases.

Phase 1: Identification of patient group zones and physician densities

Firstly, a patient group zone is defined around GPs established in a same municipality. We thus determine for each municipality *j* all the physicians' municipalities *i* accessible by road at a distance of less than a reference distance *d0*. We thus calculate a ratio *Rj* that matches the supply of physicians in *j* to the population situated in a radial catchment area *d0* centred on the municipality *j* (patient group zone).

$$R_j = \frac{m_j}{\sum_{d_{ij} < d_0} p_i * w(d_{ij})}$$

Where:

- *m_j* measures the supply of GPs in the municipality *j*;
- *p_i* measures the number of inhabitants in municipalities *i* situated at a distance from *j* inferior to *d0*,
- *d_{ij}* is the distance between municipality *i* and municipality *j*
- *w(d_{ij})* is the weighting relative to distance.

Phase 2: Identification of GP services use zones and the sum of GP densities calculated in phase 1.

Secondly, we define for each municipality *i*, all the physicians' municipalities *j* accessible at a distance *d0* (use zone). We then total the corresponding ratios *Rj* by weighting them according to distance. The result obtained represents the Local Potential Accessibility *APL_i* to general practitioners indicator for the population situated in *i*.

$$APL_i = \sum_{d_{ij} < d_0} w(d_{ij}) R_j$$

Variables used

Private GP healthcare service supply

So as to take into account physicians' real volume of activity that can vary considerably between GPs, we opted for full-time equivalence (FTE) to define GP density (variable *m_j*) calculated by the number of acts (consultations and visits) as presented in the table below. GPs' volume of activity is partially endogenous: in zones with an abundant supply of GPs, volume of activity is lower as demand is lower. Taking into account volume of activity thus leads to slightly reducing disparities in LPA.

The data used are taken from the National Health Insurance database of private general practitioners. It includes all general practitioners in activity on December 31st 2010. Salaried GPs working in health centres were therefore not included in the construction of the indicator.

Correlation between the number of acts and the FTE for main and secondary practices.

Distribution deciles	Annual number of acts	FTE
< 5%	< 273	0
5 à 10%	[273 - 1,028[0,2
10 à 25%	[1,028 - 2,643[0,5
25 à 50%	[2,643 - 4,252[0,7
> 50%	≥ 4,252	1

Note: For GPs who opened their practice in 2010, 1 FTE is attributed whatever the number of acts carried out.
Field: Private general practitioners, France, 2010. Source: Sniir-am.

Demand for healthcare

So as to take into account the fact that healthcare use rates vary according to age, *p_i* is a standard measure of the number of inhabitants. Each inhabitant is weighted by the relationship between the average use rate for the age group and the average use rate for the French population as a whole. Use rate by age group is obtained from Health Insurance data. Population data is provided by INSEE population census data corresponding to 2008, the most recent available at municipal level.

Methodological choices and constraints

For this application, all physicians and inhabitants are located at the town hall of the municipality in which they practice or reside. It is difficult to evaluate the impact of this approximation that can lead to under-estimating distances (for example when a GP and an inhabitant belong to the same municipality, the distance that separates them is considered as null) and over-estimating them (for example if an inhabitant and a GP are close to each other but located on either side of a municipal boundary).

Distance threshold and weighting

Finally, the choice of weighting *w(d_{ij})* strongly influences the value of the Local Potential Accessibility (LPA) indicator. The results presented in this study use weighting based on three distance thresholds. Thus, *w(d_{ij})* is equal 1 if *d_{ij}* is less than 5 minutes (perfect accessibility), 0.3 if *d_{ij}* is between 5 and 10 minutes (accessibility reduced by 70%), 0.1 if *d_{ij}* is between 10 and 15 minutes (accessibility reduced by 90%) and 0 at over 15 minutes. These rates of accessibility according to distances separating the patient's municipality from the GPs municipality are estimated from National Health Insurance patient-physician flow data.

The LPA has an important property for comparisons with GP density indicators: the national average LPA weighted by the population of each municipality is equal to the relationship between the number of FTE private GPs and the total population in France. The LPA to GPs has the same average as a GP density indicator (density per living area for example) that would calculate the number of GPs by FTE.

potentially using the healthcare services. In this study, the LPA indicator is calculated for private general practitioners and permits characterising the situations facing inhabitants in different types of urban or rural area. This new indicator permits reviewing data concerning the differences in medical services density and access to care between urban and rural areas.

The Local Potential Accessibility (LPA) to private general practitioners

The indicators of spatial accessibility to GPs traditionally used in France are density of physicians and travel distance to the nearest GP. Travel distance to the nearest GP determines the more or less proximate location of care but does not take into account the number of accessible GPs. The density indicator provides the aggregated healthcare supply available in a given area but has the inconvenience of not taking interactions with neighbouring geographical areas into account. The result is a uniform picture of healthcare supply for a group of municipalities located in a same zone, whether they are well served or not. Physician density therefore ignores population movements across administrative boundaries even though they are frequent for small geographical areas such as municipalities. The LPA attempts to offset these limitations by calculating an indicator for each municipality taking into account supply and demand within the municipality concerned and neighbouring municipalities.

The Local Potential Accessibility (LPA) indicator free from zoning

LPA calculation is based on the construction of 'floating sectors' instead of predefined zones. A floating sector is associated to each municipality and is defined as a zone limited by an isochronous¹ curve centred on the seat of the municipality being studied (town hall) (diagram opposite). We thus consider that the inhabitants in a given municipality have access

¹ In cartography, an isochronous curve is a geometric curve delimitating points accessible by car in a given time.

to all GPs located at a shorter distance from their place of residence than the reference distance (patients' catchment area). At the same time, each GP potentially satisfies the demand of all the inhabitants in municipalities located at a shorter distance than this reference distance (physicians' catchment area). The LPA indicator is thus constructed in two phases (insert 1) and integrates this potential 'competition' effect between municipalities as the GP services supply can be shared between different municipalities.

An indicator highly sensitive to the distance threshold used

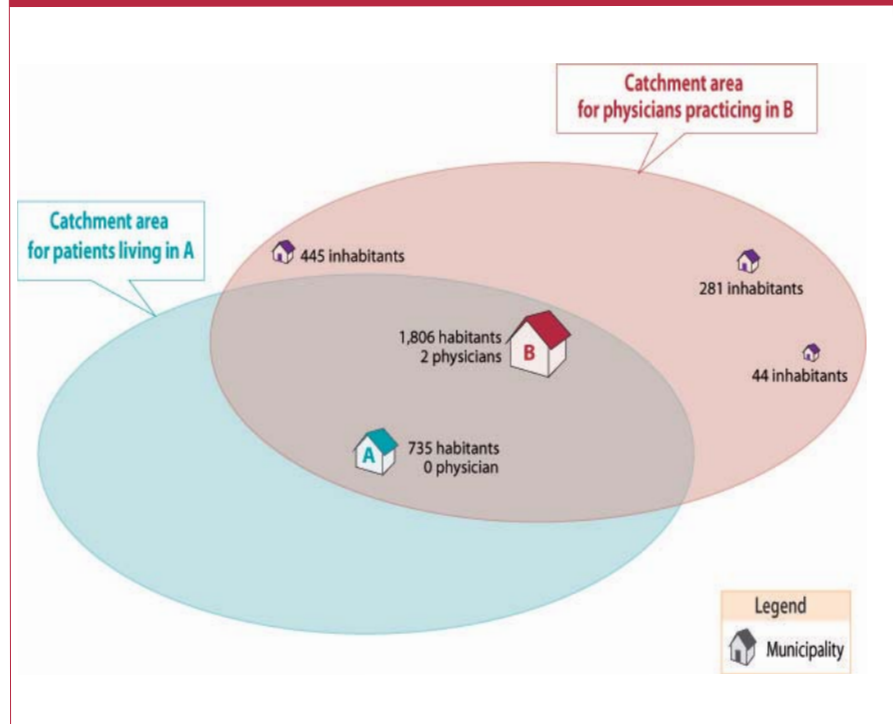
The choice of reference distance is an essential factor in the calculation and intervenes in both phases (definition of the patient group zone and the healthcare services use zone). The choice of too short a distance comes down to considering that certain inhabitants do not have access to healthcare because the closest GP is too far from their place of residence. Inversely, too long a distance leads to standardising the balance between supply and demand and hides local disparities.

In order to overcome the difficulty of choosing the correct distance threshold, accessibility is weighted according to the distance between GPs and inhabitants (Luo, Qi, 2009). In this study therefore, rather than considering access to care as perfect and uniform within service use zones or patient group zones (whatever the distance) and null outside these zones, we use three distance thresholds. If a patient's municipality and a GP's municipality are situated at less than 5 minutes from each other (by car)², accessibility is total. If the patient's municipality and the GP's municipality are separated by 5 to 10 minutes by car, accessibility is reduced by 70% in relation to a distance of less than 5 minutes. Finally, if the patient's municipality and the GPs municipality are separated by 10 to 15 minutes travel, accessibility diminishes by 90% in relation to a distance of less than 5 minutes. For distances of over 15 minutes, accessibility is considered as being null. These rates correspond to the

² Distances are calculated using the Odomatix software (Inra). The travel times retained are the average travel times by road at off-peak and peak times.

S1

Example of a patient catchment area and a physician catchment area



diminution of GP service use rates according to distance based on national estimates calculated from the totality of GP consultations in 2010³.

Only GPs located at less than 15 minutes travel from the inhabitants' place of residence are taken into account. Certain consultations, however, can take place closer to a patient's place of work than place of residence or on a holiday location. For the year 2010, 60% of private practice GPs (excluding those with specific modes of practice) took place in a municipality situated at less than 5 minutes by car from the patient's place of residence and 84% in a municipality situated at less than 15 minutes. It does not therefore seem necessary to integrate home-to-work travel distances in the measure of accessibility to GPs.

The Local Potential Accessibility (LPA) indicator refines the quantification of healthcare supply...

The precise identification of proximate healthcare supply is difficult. General practitioners can practice their activity in

³ To estimate these rates, the Cnam-TS database of GP consultations was enriched by the travel distances between the patient's place of residence and the consulted GP's place of practice.

more than one office (main and secondary offices), specialise in specific modes of practice (MEP) that fall outside primary care (acupuncture, homeopathy, angiology etc.) and certain GPs have a low volume of private practice activity in terms of consultations and visits. Their participation in the total healthcare supply is therefore not equivalent. As a result, MEP general practitioners were excluded from the indicator calculations as it is difficult to identify the share of the activity devoted to primary care and that devoted to specialized care. Full-time equivalence (FTE) was therefore used to determine GP supply rather than the actual number of physicians. The advantage of this method is that it takes secondary offices into account if their volume of activity is judged sufficient (insert 1).

... and takes into account healthcare demand

Other than uneven distribution patterns, physician density and distance to the closest GP used to measure the balance between supply and demand are often criticised for not taking into account different healthcare needs from one individual to the next. The GP service use rate varies according to age, with elderly patients and

children aged below five recording the highest consumption rates. In order to take into account differences in healthcare demand according to territorial zones, the population was standardised according to use rates by giving greater weighting to the age ranges with the highest consumption rates. Population structure by gender was not taken into account as it did not appear necessary once the age structure was integrated.

In 2010, the average Local Potential Accessibility (LPA) indicator was 71 FTE private general practitioners per 100,000 inhabitants

In 2010, the average LPA in France was 71 full-time equivalents (FTE) per 100,000 inhabitants. The LPA to GPs is extremely variable from one municipality to the next. Only 0.20% of French population (130,000 inhabitants) have null accessibility to a general practitioner as the travel distance to the nearest GP is 15 minutes or more. At the other extreme, 0.22% of the population (140,000 inhabitants) resides in a municipality where accessibility is superior to 141 FTE GPs per 100,000 inhabitants, or double the national average. Even though high, these extreme values only concern a small minority of the population as a whole. 90% of the population resides in a municipality where the LPA ranges from 31 to 111 FTE GPs per 100,000 habitants.

The LPA modifies the perception of accessibility to private general practitioners

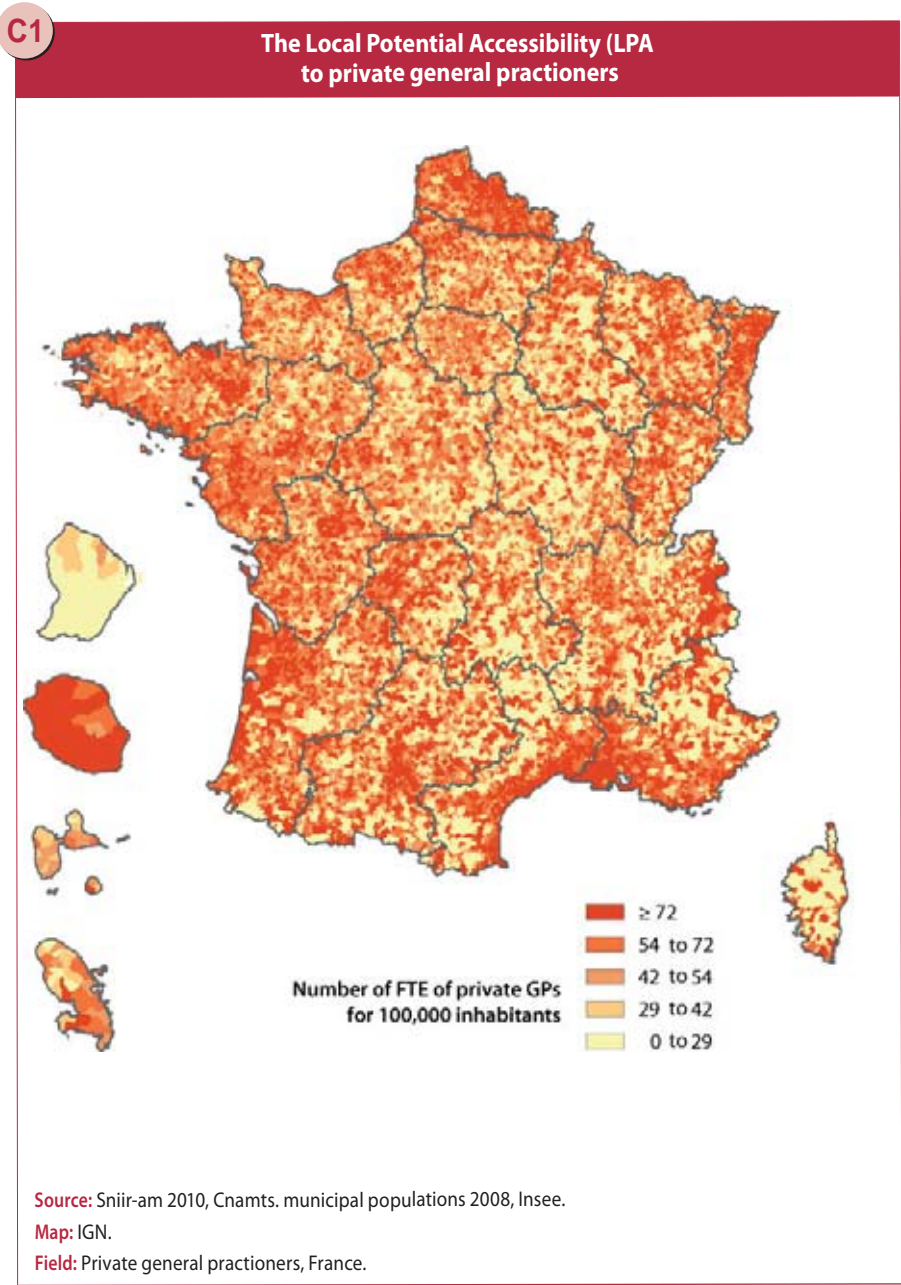
The LPA indicator is correlated to traditionally used accessibility indicators such as physician density per living area and distance to the nearest GP. The higher the density per living area, the better the LPA (correlation at municipal level is equal to 0.47). Similarly, the shorter the distance travelled to the nearest GP, the better the LPA (correlation at municipal level is equal to -0.50).

However, the LPA indicator is fairly different from the preceding indicators. The differences between the LPA indicator and physician density per living area have three main sources: the measure of GP supply on the basis of full-time equiva-

lence, the standardisation of the population taking use rate differences according to age into account, and the use of floating sectors. It is this last factor that explains the major difference between LPA and density per living area. The municipality's local environment is more effectively taken into account when floating sectors are used. The LPA notably highlights the disparities between municipalities that density per living area tends to hide. The LPA thus reveals a considerably higher variation coefficient at municipal level than that provided by physician density per living area.

Geographic access to general practitioners is higher in urban areas

The analysis by type of municipality shows high variability for the LPA indicator according to type of area (table 1, column 1). The small and average sized urban centres (definitions in insert 2) have on average a higher LPA (81 FTE private GPs per 100,000 inhabitants). Although higher than the national average, the LPA for municipalities situated in major urban centres and their outer suburban municipi-



T1

Indicators of Local Potential Accessibility (LPA) to private GPs by type of municipality

Type of municipality	Percentage of the population	1	2	3
		General practitioners		
		FTE	Numbers	FTE < 40 years old
Standardised Population				
Municipalities within large urban centres	59%	75	93	9.6
Including the Paris urban area	16%	57	73	5.9
Excluding the Paris urban area	43%	82	100	11.0
Suburban municipalities of large urban centres	11%	75	86	11.5
Rural suburban municipalities of large urban centres	13%	52	59	7.7
Average or small urban centre municipalities	7%	81	92	8.6
Suburban municipalities of average or small urban centres	6%	53	60	6.0
Of which rural municipalities	5%	51	57	5.7
Isolated municipalities outside the influence of urban centres	5%	65	77	6.8
Of which rural municipalities	4%	63	74	6.6
France	100%	71	85	9.1
Correlation with the standard indicator (column 1)	-	-	0.94	0.51

Local indicator of Potential Accessibility (LPA) by type of area corresponds to the average weighted by the population of the LPA indicators composing these areas.

Source: Sniir-am 2010, Cnamts. Municipal population 2008, Insee.

Field: Private general practitioners, France.

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palties, (75 FTE GPs per 100,000 inhabitants), is lower than that for municipalities located in small and average urban centres. All the other types of municipality, essentially rural, have a lower LPA than the national average.

These results differ from those obtained using the physician density per living area indicator (table 2) which gives a lower GP density per population in small and average urban centres (83 physicians per 100,000 inhabitants) than in major urban centres (88 physicians per 100,000 inhabitants). This can be partly explained by the greater frequency of part-time general practice in major urban centres. If physicians' volume of activity is not taken into account (table 1, column 2), GP accessibility for municipalities situated in the major urban centres is equivalent to that for municipalities situated in small and average urban centres. If taking GPs' volume of activity into account reduces the LPA for all types of municipality, the effect is significantly greater in major urban centres (- 19% against - 13% for other types of municipality). If one excludes the Paris urban area, municipalities situated in large urban centres and small and average centres have an equivalent LPA. This last result is a very special case in terms of accessibility to private GPs (insert 3).

Isolated rural municipalities are better served than suburban rural municipalities

Isolated rural municipalities situated outside the main urban centres' sphere of influence have a considerably higher average LPA (63 FTE GPs per 100,000 inhabitants) than the suburban rural municipalities (52 FTE per 100,000 inhabitants) or those in the suburbs of small or average urban centres (51 FTE per 100,000 inhabitants). Access to primary care is thus better in isolated rural municipalities than in rural municipalities situated in the suburbs of small, medium or large urban centres. However, the situation in isolated rural municipalities taken as a whole is disparate (high interquartile gap: 46 against around 30 for the other types of municipality) indicating that certain of these isolated rural municipalities have a particularly low accessibility to GP services (table 3).

T2

Accessibility, density and travel time to access private GPs by type of municipality

Type of municipality	Local Potential Accessibility (LPA)	GP Density per living area	Distance in travel time by road
	FTE per 100,000 inhabitants	GPs per 100,000 inhabitants	In minutes and seconds
Municipalities within large urban centres	75	88	0:05
Including the Paris urban area	57	69	0:01
Excluding the Paris urban area	82	95	0:07
Suburban municipalities of large urban centres	75	83	0:21
Rural suburban municipalities of major urban centres	52	80	3:24
Average or small urban centre municipalities	82	83	0:31
Suburban municipalities of average or small urban centres	53	79	3:30
Of which rural municipalities	51	78	3:52
Isolated municipalities outside the influence of urban centres	66	88	2:52
Of which rural municipalities	63	89	3:19
Metropolitan France	71	85	0:55

As French overseas territories are not divided into living area, the table presents results for metropolitan France only.

Source: Sniir-am 2010, Cnamts. Municipal population 2008, Insee.

Field: Private general practitioners, metropolitan France.

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Insert 2: Typology of municipalities

In this study, we distinguish six types of municipality based on the 2010 urban unit zoning defined by INSEE.

The notion of **urban unit** is based on the continuity of built-up areas and the number of inhabitants. An urban unit is a municipality or group of municipalities made up of a continuous built-up area (no space measuring more than 200 metres between two buildings) counting at least 2,000 inhabitants. Municipalities are considered as being **rural** if they do not fit the definition of an urban unit: municipalities without continuous built-up areas of over 2,000 inhabitants and those in which less than half the municipal population is concentrated in a continuous built-up zone.

2010 zoning into urban areas

The 2010 urban area zoning distinguishes three types of areas:

- **large urban areas** made up of a single block of several municipalities without enclaves constituted from an urban centre (urban unit) of over 10,000 jobs, and by rural municipalities or urban units (outer suburbs) in which at least 40% of the employed resident population work in the urban centre or its catchment area.

- **average urban areas**, made up of a single block of municipalities without enclaves, constituted from an urban centre (urban unit) of 5,000 to 10,000 jobs, and by rural municipalities or urban centres in which at least 40% of the employed resident population work in the urban centre or its catchment area.

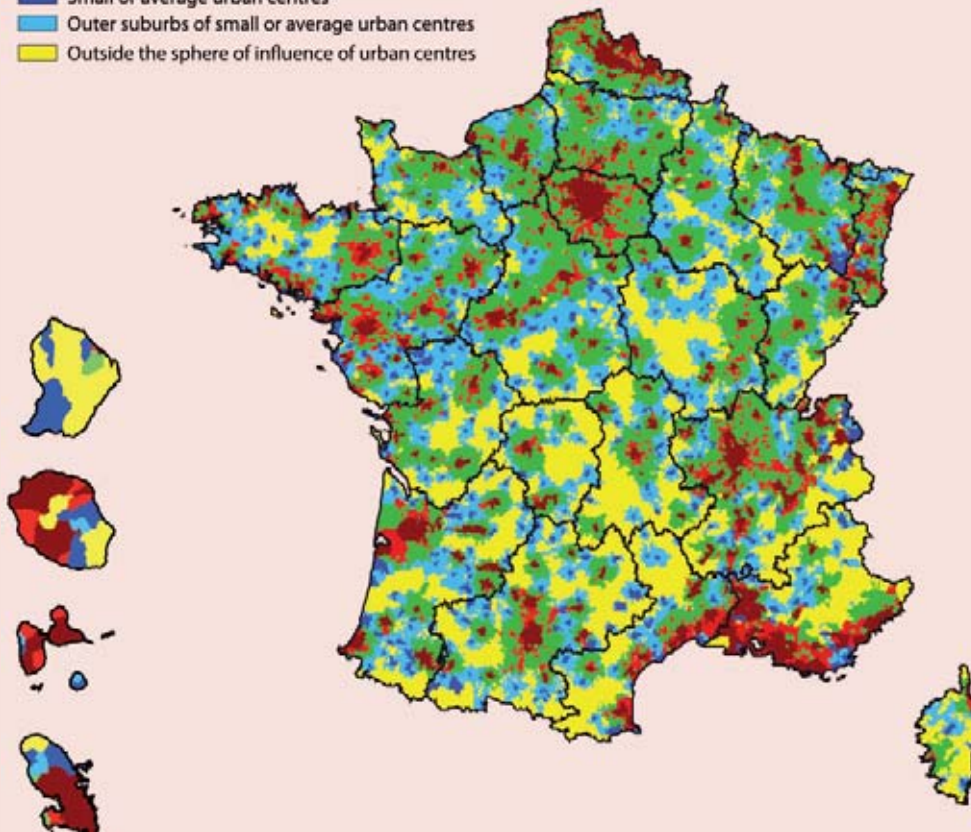
- **small urban areas**, made up of a single block of several municipalities without enclaves, constituted from an urban centre (urban unit) of 1,500 to 5,000 jobs, and by rural municipalities or urban centres in which at least 40% of the employed resident population work in the urban centre or its catchment area.

In this study, we distinguish between 'rural' and 'urban' suburban municipalities within large urban areas. For urban centres of average and small urban areas, municipalities are grouped together, as are their corresponding suburban municipalities in which 85% of the inhabitants live in a rural municipality.

Finally, we group together municipalities situated outside the sphere of influence of urban centres. 81% of inhabitants in these isolated municipalities live in a rural municipality.

Typology of municipalities

- Large urban centres
- Outer suburbs of large urban centres
- Outer suburbs of large rural centres
- Small or average urban centres
- Outer suburbs of small or average urban centres
- Outside the sphere of influence of urban centres



Source: Source: urban units, zoning into urban areas and classification of municipalities (urban or rural) 2010, INSEE. Map: IGN.

Classifying accessibility to care by type of municipality is validated when we focus on the most underserved zones. The percentage of the population living in municipalities where the LPA to GPs is 30% lower than the national average (table 3) is highest in rural municipalities in outer suburbs of small and average urban centres (52%), in rural municipalities situated in the suburbs of large urban centres (49%) and to a lesser degree once again, in rural municipalities located outside the urban centres' sphere of influence (39%).

Young general practitioners are more accessible in major urban centres

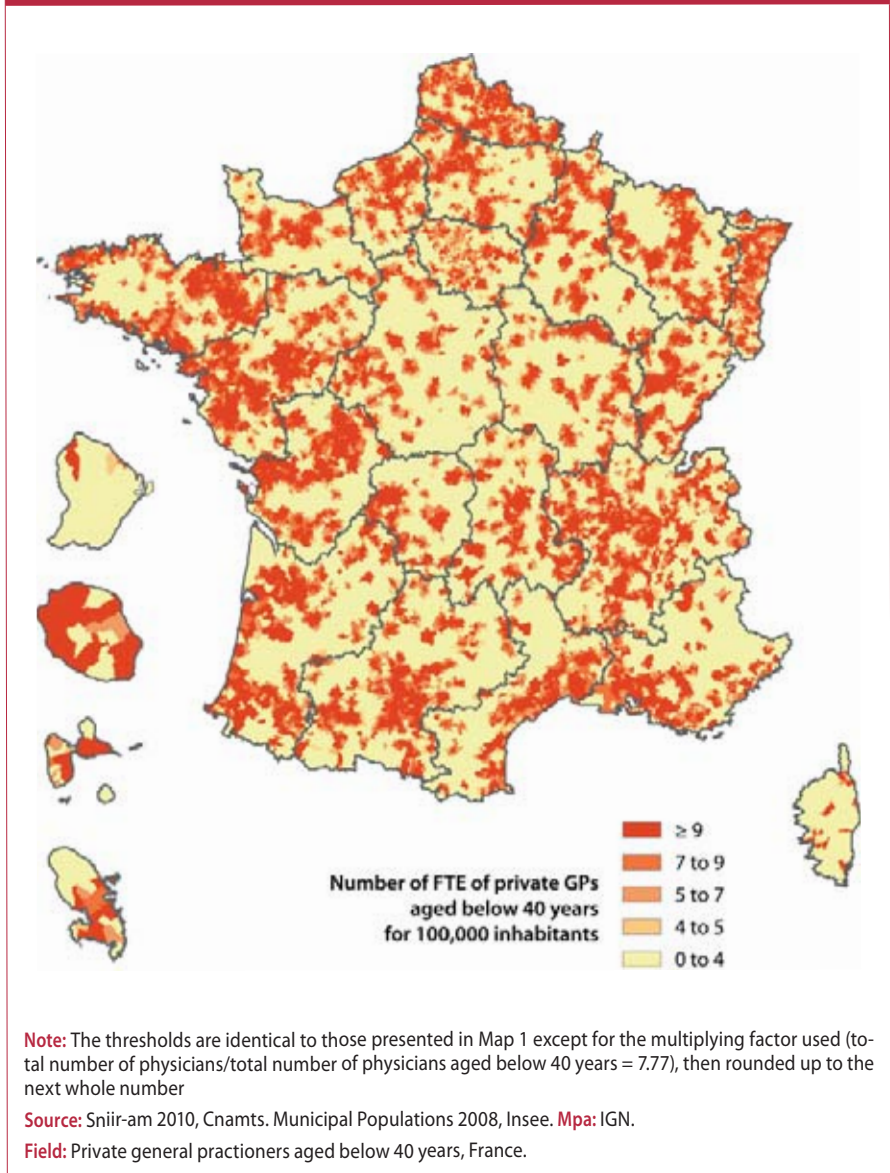
The spatial distribution of young private GPs is lower than that of older GPs (Barlet and Collin, 2010). The LPA to private GPs aged under 40 years old (map 2) is relatively different to that for GPs as a whole; the correlation between these two indicators is only 0.51.

The LPA to young GPs provides a new hierarchy of types of municipality (comparison between columns 1 and 3 in table 1). The attraction of major agglomerations seems to predominate in young GPs choice of practice area. All types of municipality situated in large urban centres are thus relatively favoured. The LPA to young private GPs (less than 40 years old) is considerably higher in large urban centres and more especially in their suburban municipalities (respectively 10 and 12 FTE GPs aged less than 40 per 100,000 inhabitants, against a national average of 9). Inversely, young GPs accessibility is relatively low for inhabitants living in the suburban municipalities of small and average urban centres and isolated municipalities (respectively 6 and 7 FTE GPs aged less than 40 per 100,000 inhabitants). In rural areas, young GPs are more accessible to populations living in the suburbs of large urban centres (8 FTE GPs aged less than 40 per 100,000 inhabitants), contrary to our observations concerning GPs as a whole.

It should be noted that the analysis of young GP accessibility is too limited to make any assumptions concerning the evolution of territorial inequalities in the access to healthcare. This will greatly depend on where future GPs will decide

C2

The Local Potential Accessibility (LPA) to private general practitioners aged below 40 years



Insert 3: Access to private general practitioners in the Paris urban area

If the indicator of Local Potential Accessibility (LPA) to general practitioners is globally favourable in the large urban centres with 75 FTE per 100,000 inhabitants (table 3), the situation for municipalities within the urban area of Paris (definition insert 2) can be surprising with only 57 FTE per 100,000 inhabitants, less than for isolated rural municipalities. Only the rural municipalities in the outer suburbs of large, average or small urban centres have a lower average accessibility to GPs. The Paris urban area is nevertheless a fairly homogeneous zone in terms of LPA to GPs (interquartile gap between municipalities is only 14 against 33 for the national average). Furthermore, the percentage of the population living in a municipality where the LPA is more than 30% lower than the national average is lower than the percentages observed for the different types of rural municipality (23% versus 40% to 49%).

The Paris urban area also distinguishes itself by the very low accessibility to young GPs (6 FTE GPs aged less than 40 against 9 for the national average). Regarding access to private GPs only, the situation in the Paris urban area is almost as underserved as the rural municipalities in the outer suburbs of average or small urban centres. One should nevertheless remember that l'Île-de-France¹ is the region in which the number of physicians (all specialties and sectors of activity combined) per 100,000 inhabitants is the highest which compensates for the low accessibility to private general practitioners, notably due to the higher number of health centres or the more frequent use of specialists.

¹ The Île-de-France region and the Paris urban area do not have exactly the same contours, but 89% of Île-de-France inhabitants live in the Paris urban area.

T3

Distribution of local potential accessibility (LPA) to private general practitioners by type of municipality

Types of municipality						Interquartile gap	Percentage of inhabitants living in a municipality with a LPA inferior to 49 FTE
	Average	1 st quartile	Median	3 rd quartile			
Municipalities within large urban centres	75	59	74	90	31	10.9	
Including the Paris urban area	57	50	56	64	14	23.4	
Excluding the Paris urban area	82	70	83	94	24	6.2	
Suburban municipalities of large urban centres	75	61	75	87	26	11.0	
Rural suburban municipalities of major urban centres	52	36	50	66	30	48.6	
Average or small urban centre municipalities	81	67	81	96	29	8.9	
Suburban municipalities of average or small urban centres	53	37	51	68	31	47.3	
Of which rural municipalities	51	35	48	64	29	51.7	
Isolated municipalities outside the influence of large urban centres	65	41	64	86	45	34.5	
Of which rural municipalities	63	37	58	83	46	39.5	
France	71	54	70	87	33	18.9	

Source: Sniir-am 2010, Cnamts; municipal population 2008, INSEE.

Field: Private general practitioners, France.

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to locate their practices, notably their propensity to set up practice in demographically dynamic population areas, and the high number of physicians going into retirement.

* * *

Finally, municipalities with the lowest access to private GPs are rural municipalities situated in the suburbs of small and average urban centres. In effect, access to GPs as a whole in these municipalities is similar to that of rural municipalities in the suburbs of large urban centres but they attract considerably fewer young GPs as a choice of location. Moreover, compared with isolated rural municipalities, those situated in the suburbs of small and average urban centres have a lower accessibility to both GPs in general and young GPs.

The LPA indicator is thus a new tool measuring the accessibility of healthcare enriching traditional perceptions of private GP supply in France founded on the traditional accessibility indicators such as physician density per living area and travel distance to the nearest GP. ◆

FURTHER INFORMATION

- Barlet M. et Collin C. (2010). « La localisation des professionnels de santé libéraux », *Comptes nationaux de la santé 2009*, Drees.
- Barlet M., Coldefy M., Collin C., Lucas-Gabrielli V., Document de travail à paraître sur ce thème.
- Coldefy M., Com-Ruelle L., Lucas-Gabrielli V. et Marcoux L. (2011). « Distances et temps d'accès aux soins en France métropolitaine », Rapport Irdes n° 1838 + annexes n° 1839, juin.
- Luo W. et Qi Y. (2009). "An Enhanced Two-Step Floating Catchment Area (E2SFCA) Method for Measuring Spatial Accessibility to Primary Care Physicians", *Health & Place*, 15(4), 1100-1107.
- Luo W. et Wang F. (2003). "Measures of Spatial Accessibility to Health Care in a GIS Environment: Synthesis and a Case Study in the Chicago Region", *Environment and Planning B: Planning and Design*, Pion Ltd, London, vol. 30(6), pages 865-884.
- Mizrahi An. et Mizrahi Ar. (2011). « La densité répartie, un instrument de mesure des inégalités géographiques d'accès aux soins », *Villes en parallèles*.
- Radke J. et Mu L. (2000). "Spatial Decomposition, Modeling and Mapping Service Regions to Predict Access to Social Programs", *Geographic Information Sciences* 6, 105-112.

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