

# Defining GP Practices from an Urban Versus Rural Perspective: The Case of Czechia

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## Research article

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# Abstract

**Background:** This study is an attempt to demonstrate the potential for classifying GP practices in Czechia along an urban versus rural dimension and to compare the structure of areas thus defined with the OECD territorial typology. The aim is to ascertain whether a general approach to distinguishing regions is transferrable and could be used to define GP practices in Czechia.

**Methods:** In this study two variants are considered using data supplied to the authors by the largest health insurance company in Czechia, using geographical information systems. The results were then compared with the OECD regional typology, in which areas are classified as predominantly urban, intermediate, and predominantly rural.

**Results:** The two GP practice typologies were then found to correspond closely to the OECD typology, but the most recent variant is more suitable. A high degree of similarity was evident in the categorisation of urban regions, and therefore practices, and slightly less so in the rural type areas. The most problematic aspect is defining the intermediate type, which has its own peculiarities and has to be considered within the wider context.

**Conclusions:** Despite some structural differences, we can state that the main thinking behind the OECD typology is transferrable and can be used to determine urban versus rural healthcare providers, especially primary care ones. Nonetheless, the results point to further research avenues, especially on how to best to define the intermediate category so greater accuracy can be achieved in determining the resulting urban versus rural polarity.

## Background

Differences in the provision and take-up of healthcare services in the GP (general practice) segment have been a frequent subject of discussion (1, 2, 3), particularly in relation to identifying the differences between urban and rural type practices (4, 5, 6, 7). However, before we can compare the structural and productive data, we need an accurate definition of the territorial types (e.g. 8). Rural areas should be defined not just in general terms but also in relation to the specifics of the healthcare provision (e.g. 9). The aim should be to create a territorial typology that can be used in comparative analyses.

Czechia has a dense network of healthcare service providers (HSP), but also has marked regional differences and therefore problems, and GP is no exception to this (10, 11). One of the most pressing issues is the decrease in GP capacity in rural areas. These areas have less appeal than urban regions and generational turnover is also a problem with many GPs already at pensionable age, and so there is a real risk that GP services may become inaccessible in many places (12, 13, 14).

Relevant bodies such as the Ministry of Health and the health insurance companies are responding to this. The ministry is currently engaged in primary care reform (15) and the health insurance companies are attempting to support GP activities through payment mechanisms. To help the various actors to

target their efforts to resolve this issue and direct support towards rural areas, we need to be able to define area types using a typology based on the urban versus rural polarity.

## Methods

To create the territorial typologies we used data held by the General Health Insurance Company of the Czech Republic (GHIC). This insurance company has the largest share of the Czech market, ensuring care is provided to almost 60% of insurance holders and holding contracts with almost 100% of providers, especially primary care ones, which are paid for through public health insurance (16). The data used in this research are therefore highly reliable and relevant. Two typological variants were created in an attempt to divide the territory into regions by distinguishing between GP practices along a basic urban–rural dimension.

Before going on to describe the various typologies in detail, we need to explain the basis of the administrative divisions in Czechia. In the NUTS classification Czechia is divided into eight NUTS 2 regions (administrative regions), and 14 NUTS 3 regions (regions). Below that level there are 77 LAU 1 units (districts, formerly NUTS 4) and 6,258 LAU 2 units (municipalities, formerly NUTS 5) (17). In addition to this classification Czechia is divided into local government administrative units, known as administrative units of municipalities with extended powers, and there are 206 of these. The “centres” of these are known as municipalities with extended powers (MEP). These municipalities function as local centres, partly for local government purposes (18). The MEPs are probably the most unsatisfactory level of regionalisation in Czechia, which function as basic catchment areas for local inhabitants, providing access to basic services (healthcare, social services, education etc.). In many areas the LAU 1 units are of more importance, as up until the end of the twentieth century the district towns were the main centres where all the state services were located and many specialist outpatient and inpatient healthcare services were concentrated here.

But let us return to the creation of the territorial typologies. The initial analysis, performed on the basis of the distribution of GP practices (FID – facility ID number) for 2014–2015, was undertaken from a purely geographical perspective. The basic idea was to divide the country based on size of population in the municipalities (LAU 2). Urban type centres had previously been identified along with their environs, which corresponded to the catchment area of potential insurance holders using the healthcare services in that town.

The resulting typology (Variant 1) contains three types (see additional Fig. 1):

- Type I = town/city with a large population and its environs, where:

town/city with a large population = all municipalities of 30,000 inhabitants and over, and the remaining district towns (LAU 1 centres)

environs = municipal area (LAU 2), where the centre is within 5 km of the boundary of a town/city with a large population

- Type II = town with a smaller population and its environs, where:

town with a smaller population = municipality with extended powers (MEP), which does not belong to type I

environs = municipal area (LAU 2), where the centre is within 10 km of the boundary of a town with a smaller population (MEP)

- Type III = remaining areas, largely municipalities with smaller populations.

The results of this initial typology provoked discussion among experts and scholars, and within the research team. This led us to create a new typology that maintained some similarities to the original. We attempted to take into account not just the geographical and population aspects but also the wider context of the system of healthcare providers. In the subsequent analysis a wider spectrum of data was used, so we had to work at the provider (PID) level rather than the practice (FID) level. In Czechia a single provider (PID) may consist of one or more practices (FID), although the contractual agreement with the health insurance company for reimbursement of declared costs is at the PID level (and therefore also the available data). In cases where a PID had a FID that appeared in more than one of the types in the typology, it was decided the main FID would be used to determine which type the PID belonged to. The main FID is the location where the PID has the greatest capacity or the longest hours of work.

When the initial typologies were being modified, we decided not to take the environs into account (see Type I and Type II above). Whether the patient receiving care lives in the municipality or in the immediate environs is not important from the provider perspective. But what is important is whether there is a range of accessible outpatient and inpatient services where GPs can send their patients, as this affects GP activities. We therefore divided Type II of the resulting typology into two subtypes reflecting the existence or non-existence of a larger hospital. In addition to the three basic types, we also distinguished a further two subtypes. These contain a very specific type of GP practice and on that basis were excluded from the analysis along the urban–rural dimension. The result was the following typology (Variant 2) (see additional Fig. 2)::

- Type I = town/city with a large population, all municipalities of 30,000 inhabitants and over, and the remaining district towns (LAU 1 centres)
- Type IIa = municipality with extended powers (MEP) not included in Type I, where there is an acute care inpatient hospital for at least one of the basic specialisms (internal medicine, paediatrics, surgery, and gynaecology), and selected municipalities with 15,000 inhabitants and over that are not MEPs but that are located within the immediate proximity of a Type I municipality (municipalities in which a Type I town/city has an identifiable impact and so are a de facto type of agglomeration; five of these were identified)
- Type IIb = municipality with extended powers (MEP) that does not belong in either Type I or IIa, i.e., it has no inpatient acute care
- Type III = remaining areas, mainly consisting of municipalities with smaller populations

- Type IV = providers that are part of “chains” of providers (the nature of the work performed by these practices differs; these are bigger companies generally containing a number of practices where the doctors work closely with various specialists, they have a large laboratory, operating either locally or nationwide, and have highly developed commercial skills)
- Type V = special GP practices – military and prisons.

We excluded types IV and V when identifying the differences in population and territorial distribution as these two types do not have strong links to the area they are located in but are defined by their activities.

The two variants capture the basic differences according to the two main polarities, urban versus rural. However, they also incorporate an intermediate category, the areas that are somewhere between the two basic dimensions. We used information from the OECD regional typology from 2011 (22, 23), which divides the territories into three basic types as follows:

- Predominantly Urban (PU) = proportion of inhabitants in the region living in rural settlements is less than 15.0%
- Intermediate (IN) = proportion of inhabitants in the region living in rural settlements is 15.0–49.9%
- Predominantly Rural (PR) = proportion of inhabitants in the region living in rural settlements is 50% or more

The OECD definition of a rural settlement is one in which the population density of the units (municipality = LAU 2) is under 150 inhabitants per 1 km<sup>2</sup>. The results are then applied to NUTS 3 regions. However, the NUTS 3 regions are too large to be used to define rural versus urban areas in Czechia and to create a typology of GP practices. We therefore took the idea of defining regions as PU, IN, and PR and applied it to the LAU 1, or MEP, level, which better reflects the natural catchment areas. We also adopted a different approach to defining size of rural settlement. Instead of population density our main criterion was size of population, where rural settlements were considered to be those with fewer than 5,000 inhabitants, as most MEPs have larger populations (192 out of 206 MEPs).

If we compare the results obtained using the OECD method for defining regions and our modified version, based on OECD methodology, it is clear that there is a high level of correspondence between the two types of regional distribution at both LAU 1 and MEP level (Table 1).

Table 1  
Comparison of results for population structure using OECD typology and as applied to LAU 1 and MEP levels

	Share of inhabitants in region using OECD typology (%)		
	Predominantly Urban (PU)	Intermediate (IN)	Predominantly Rural (PR)
OECD typology* for Czechia	24.2	42.9	32.9
Modified OECD** typology calculated for level:			
LAU 1	22.8	42.4	34.8
MEP	23.9	38.1	38.0

\* OECD typology from 2011, based on population data from 2014

\*\* OECD typology applied to LAU 1 and MEP regions, based on population data from 1. 1. 2017.

Data source: 22, 23, 24; authors' calculations

## Results

In describing the main results we first focus on the structure of the population and GP practices using the two typological variants (Table 2). In Variant 1 (2014–2015), 64% of the population and almost 56% of GP practices are concentrated into Type I. At the other end of the scale, 10% of the population and almost 9% of GP practices are located in Type III areas. The results also show a relatively clear correspondence between the distribution of the two structures. This is largely down to the fact that the inclusion of the environs expands the urban catchment areas and includes the many suburbs, which means the rural areas account for less of the territory.

In Variant 2 (2016), 44% of inhabitants and almost 52% of GP providers are concentrated into Type I (Type IV and Type V were not included). While 43% of inhabitants live in Type III and 31% of GP practices provide services here. This typology produces a more structurally imbalanced distribution of inhabitants and providers than the first variant does; however, from the perspective of GP provision and the links to other healthcare service segments, it offers a more realistic view of the functioning of the system, and thereby seems to be a more satisfactory typology.

**Table 2: Comparison of structure of inhabitants, surface area, and number of GP practices using the two typological variants of GP**

Share (in %)	Variant 1 (2014–2015)							Total
	Type I			Type II			Type III	
	total	town/ city	environs	total	town/ city	environs		
– inhabitants	63.5	43.2	20.4	26.3	10.4	15.9	10.1	100.0
– surface area	30.2	5.9	24.3	37.5	5.2	32.3	32.2	100.0
– GP practices (FID)	55.9	52.8	3.1	35.3	23.2	12.1	8.8	100.0
Share (in %)	Variant 2 (2016)						Total	
	Type I	Type II			Type III			
		total	Type IIa	Type IIb				
– inhabitants	43.9	13.1	4.8	8.3	43.0	100.0		
– surface area	6.0	5.9	1.5	4.4	88.1	100.0		
– GP providers (PID)	52.2	16.9	5.5	11.4	30.9	100.0		

Glossary: FID = facility ID number; PID = provider ID number; a single provider (PID) may consist of one or more practices (FID).

Data source: 19, 20, 21; authors' calculations

Other factors affecting the provision and take-up of healthcare services play a big role here, so one has to be very cautious in commenting on the results. One factor is the issue of permanent versus ordinary residence. In practice many people live (and therefore use the healthcare services) tens or hundreds of kilometres away from their official permanent residence and often do so for many years (25, 10). Another problem is that ordinary residence has only been recorded once in Czechia, in 2011 during the last census. But even those data are stand-alone data and there is no way of linking them to registers held by the state or other institutions (26). A further important factor concerns natural healthcare catchment areas, which form because many people are registered with a GP in the district where they spend most of their time, where they work or study, but they themselves live in another district, frequently some distance away. Published studies have shown that in 2015 the proportion of inhabitants in Czechia who did not use the GP services in their district of permanent residence was 14%, regionally, and in the environs of large towns or cities this rose to more than a quarter (10, 12). These factors support Variant 2, in which the proportion of providers in towns or cities is higher than the proportion of permanent residents there, which may well be a more realistic reflection of the situation.

**Table 3: Comparison of structure of number of GP providers using a combination of GP typology and OECD typology (in %)**

LAU 1		VARIANT 1 (2014–2015)				MEP	VARIANT 1 (2014–2015)				
		Type I	Type II	Type III	Total			Type I	Type II	Type III	Total
OECD	PU	99.5	0.5	0.0	100.0	OECD	PU	99.5	0.5	0.0	100.0
	IN	64.8	28.3	6.9	100.0		IN	70.5	22.9	6.6	100.0
	PR	45.2	37.6	17.2	100.0		PR	40.4	42.9	16.7	100.0
	<b>Total</b>	68.4	23.4	8.2	100.0		<b>Total</b>	68.4	23.4	8.2	100.0
LAU 1		VARIANT 2 (2016)				MEP	VARIANT 2 (2016)				
		Type I	Type II	Type III	Total			Type I	Type II	Type III	Total
OECD	PU	94.2	2.5	3.4	100.0	OECD	PU	93.2	3.9	2.9	100.0
	IN	45.8	21.6	32.6	100.0		IN	52.5	15.9	31.6	100.0
	PR	28.9	21.8	49.3	100.0		PR	23.6	26.8	49.6	100.0
	<b>Total</b>	52.2	16.9	30.9	100.0		<b>Total</b>	52.2	16.9	30.9	100.0

Glossary: PU = Predominantly Urban; IN = Intermediate; PR = Predominantly Rural

Data source: 19, 21, authors' calculations

To what extent does the distribution of GP practices correspond to the results for the types based on the OECD regional typology? These are compared visually using the map (see additional Figure 3) and then in table form (Table 3), in which only the main levels of the GP typology for both variants (Type I, Type II, Type III) are shown, along with our modified regionalisation of the LAU1 and MEP regions, based on the OECD methodological assumptions (PU, IN, PR categories).

A basic visual comparison shows a relatively high degree of correspondence, mainly between the urban areas (PU vs. Type I). That also confirms the results in the tables below, which show a high degree of correspondence across the main diagonals: PU–Type I, IN–Type II, and PR–Type III.

## Discussion

The results of the two variants of GP typology at both regional levels (LAU 1 and MEP) show a high degree of correspondence among the regions, especially PU regions versus Type I. Here the level of

correspondence was over 93%, and almost 100% for Variant 1, a result of the town/city environs being included in this type (see above). By contrast at the other pole combining PR regions and Type III, there is a bigger difference between the two variants. While in Variant 1 the level of correspondence was 17%, in Variant 2 it was almost 50%. One very positive finding is that the structure of the results is similar in both types of regional division, indicating that the two types of regional division are robust, enabling greater use of the basic OECD regional typology methodological approach for analyses of this type.

The intermediary regions that are neither urban nor rural are generally problematic. These are represented by Type II, and IN in the OECD typology. The main problem is that the areas are internally heterogeneous. On the one hand there are areas with districts with a dense residential structure and a smaller number of inhabitants, which are borderline rural/urban. On the other hand there are areas that are mostly rural in character, which have one larger urban-type settlement with a larger number of inhabitants. The internal heterogeneity of this intermediate type in both typologies requires further analysis, but finding the best way to modify the typologies is not within the scope of this article.

## Conclusions

The issue of rural medicine and how it can be compared with urban practices has recently gained importance, especially with regards primary healthcare and general practice. But how should we set about defining rural practices and dividing the territory into rural and urban areas based on the actual distribution of the network of healthcare service providers? Is it possible to replace typologies created for specific cases with a more universal general typology? This study is an attempt to demonstrate the potential for classifying GP practices in Czechia along an urban versus rural dimension and to compare the structure of areas thus defined with the OECD territorial typology.

In many respects urban and rural GP has distinctive structural characteristics that relate mainly to the number of registered insurance holders and the structure of declared activities. Therefore it was important to not only design the typologies but also to subject them to a detailed analysis, check their validity, and compare them. The results indicated good definitions of urban type practices were obtained, both when using various levels of regional unit and in comparison to the OECD typologies. They also show good transferability, meaning the definitions of the urban, intermediate, and rural regions have universal application and therefore the typologies have potential practical uses, for example in contract and reimbursement policy decisions by health insurance companies.

The relevant state administration and local government bodies, health insurance companies, and other institutions should focus their attention on rural practices in particular. Especially in areas that are already affected or will soon be affected by the insufficient generational turnover of doctors. That is reflected not only in the lower appeal of non-urban areas, but also in the more demanding nature of the work there, which is linked to the wider range of services provided to patients, which could be a demotivating factor for doctors.

## Abbreviations

FID Facility ID number (practice/surgery)

GHIC General Health Insurance Company of the Czech Republic

GP general practice

HSP Healthcare service provider

OECD Organisation for Economic Co-operation and Development

PID Provider ID number (a PID may cover multiple FIDs)

## Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The data that support the findings of this study are available from GHIC CR but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the

authors upon reasonable request and with permission of GHIC CR.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

L.Š. and J. B. both contributed equally to the design and implementation of the research, to the analysis results and handwriting writing. The authors worked on the article together.

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