

# MAPPING OF GROCERY STORES IN SLOVAK COUNTRYSIDE IN CONTEXT OF FOOD DESERTS

Kristína Bilková<sup>1</sup>, František Križan<sup>1</sup>

<sup>1</sup>Department of Regional Geography, Protection and Planning of the Landscape, Faculty of Natural Science, Comenius University in Bratislava, Mlynská dolina, Ilkovičova 6, 842 15 Bratislava, Slovak Republic

## Abstract

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The paper is focused on mapping grocery stores in the Slovak countryside with an emphasis on identifying potential food deserts in rural areas. Grocery stores are analyzed in the time period 2001–2011. Food deserts in rural areas are identified by two accessibility measures. The results show the development of food retailing in the Slovak countryside and in potentially threatened localities which can be defined as food deserts.

Keywords: grocery stores, food deserts, countryside, Slovakia, FUR Bratislava

## INTRODUCTION

Services and retail are an integral part of the daily life of the inhabitants of rural areas. Serviceability of countryside represent an equally important role in the quality of life of the rural population's stability and social cohesion as agriculture and other economic functions (Szczyrba *et al.*, 2013). We can observe close relationship between retail network and settlements in spatial context. Incidence, capacity and degree of amenities of retail stores proportionally increases with the population of the municipality and its function in the settlement system. Rural municipalities can be considered as gravitational hinterland of urban retail network. The tasks and characteristic of rural retail can be summarized according to Szczyrba (2005) in three points:

- i) to satisfy the local little concentrated demand;
- ii) there are realizing only part of the demand of the rural population which does not create conditions for the effective range of product offer;
- iii) sales in rural retail are associated with high costs in comparison with urban retail.

Additional factor affecting the development of rural retail is a transformation from a central planned to a free market economy. The rapid rise of retail industry in the 1990's during the atomization

phase (Mitríková, 2008; Trembošová, 2012) was reflected also in the rural areas. The consequent impact of globalization processes significantly affected the retail network in rural areas (Križan and Lauko, 2014). Consumers began to focus on large scale stores and shopping centers typical for urban retail (Kita and Grossmanová, 2014).

Food security is often associated with hunger and food accessibility. In terms of food deserts, attention is given to the accessibility of food, and can discuss the three main barriers affecting food accessibility: information, economic and geographical (McEntee and Agyeman, 2010). Information barriers consist a wide range of factors relating to the social, cultural and especially educational factors affecting access to food. As an example, lesser degree of consumption of fruit and vegetables is typical for consumers with lower levels of education (Wrigley *et al.*, 2002). Economic barriers are focused on evaluation of the factors of poverty, food prices and transportation costs and it can also be considered as an important factor to food accessibility. The geographic barriers are focused on the issues of food accessibility or accessibility of large grocery stores.

The aim of this paper is to evaluate the food retail sector in the Slovak countryside in spatiotemporal contexts. Emphasis is placed on identifying food deserts in the case study of functional urban region of Bratislava and respectively in Slovak countryside.

### Food Deserts Issue

Relatively frequently discussed issue in retail geography (Spilková, 2012) is the issue of food deserts. It is an interdisciplinary issue in retailing with significant representation of geographic studies. For the first time the term food desert occurs in the study for the British Government (1996) in addressing issues relating to people with low income. This study defined food deserts as areas of relative exclusion where people experience physical and economic barriers to accessibility of healthy food (Reisig and Hobbiss, 2000, p. 138).

There are many definitions of food deserts. Cummins and Macintyre (2002, p. 2115) defined the food deserts as: „[...] area, where foods are expensive and relatively unavailable.“ Other authors define them as „[...] areas of poor access to the provision of healthy affordable food, usually related to lack of large retailers.“ (Gregory *et al.*, 2009, p. 259).

The food deserts become object of many studies in recent years and the issue maintains interdisciplinary character (Walker *et al.*, 2010). These results to enriched of multi-criteria approach on one hand and the fragmentation of issue on the other.

### MATERIALS AND METHODS

Applied methods can be divided into two groups. The first group of methods is focused on mapping the grocery stores in the Slovak countryside. It is about processing of grocery stores location database which is recorded by the Statistical Office of the Slovak Republic (SO SR). Comparative analysis was applied to data in period 2001–2011.

The second group of methods is focused on identifying food deserts. Analysis of the food deserts cannot argue by uniform methodological approach in terms of a mathematical formula or set of indicators (Shaw, 2006). There is a variety of methods for analyzing and evaluating of food deserts (Cummins and Macintyre, 1999; Donkin *et al.*, 1999; Furey *et al.*, 2001; Smoyer-Tomic *et al.*, 2006; Zenk *et al.*, 2005).

Generally an appropriate method to analyze food deserts is the accepted measure of accessibility of selected grocery stores in the region (Moore and Diez Roux, 2006; Križan *et al.*, 2008). The most commonly applied measures of the accessibility include accessibility of the nearest large grocery stores (Acc1) or the accessibility of all/selected number of stores within a specified distance (Acc2).

$$\text{Acc1} = (\min |c_{ij}|),$$

where Acc1 is the accessibility of node  $i$  quantified as minimum distance between node  $i$  and supermarket  $j$ ,  $c_{ij}$  is the distance between the origin  $i$  and destination  $j$ . The accessibility measure is based on a binary accessibility (Tolmáči, 2002). In this case, we can discuss the distance of the delimitation of

food deserts (Jiao *et al.*, 2012). Distances of 10 and 15 minutes were used for the delimitation of food deserts in rural area was.

$$\text{Acc2} = \sum_{j \in S} S_j,$$

where Acc2 is the accessibility of the node  $i$  quantified by the number of supermarkets  $j$  accessible within  $n$  meters or minutes for node  $i$ ,  $S$  are all the supermarkets in the analyzed region,  $S_j$  is the number of supermarkets within  $n$  meters or minutes. For delimitation of food deserts in rural area was used 0 or 1 accessible supermarket within  $n$  meters or minutes.

Data on grocery stores were transformed into a geographic information systems (GIS) and cartographic evaluated by applying several tools (e.g. Network Analyst).

## RESULTS AND DISCUSSION

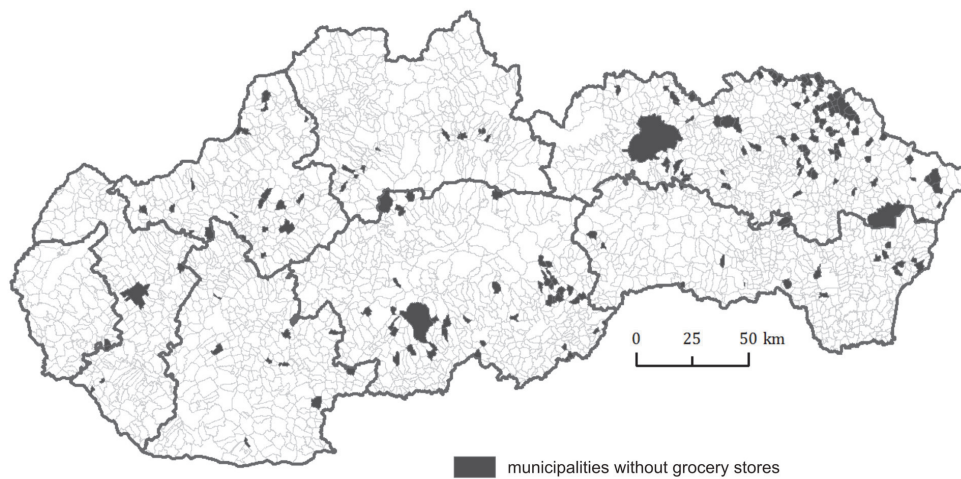
### Grocery Stores in Slovak Countryside

There are 198 municipalities (6.8%) with no grocery stores in Slovak countryside. These municipalities can be clearly marked as food deserts. Significant concentration of these municipalities is characteristic for eastern Slovakia (Fig. 1). The least thus defined food deserts are located in Bratislava region, the most numerous in the Prešov region. In this case the absence of stationary stores cannot be replaced by seasonal ambulant sale of additional products. Consumers are forced to buy conventional food products outside their residence.

In dynamic economic sectors such as retail, there are significant changes not only in space but also in time. In the last decade the conditions in the rural food retail have significantly changed. In this sense, the municipality may be divided into three groups. The first group represents the municipalities with no changes during the analyzed period. Municipalities that had no grocery stores in both years (2001 and 2011), compose 15.6% of the municipalities of the group. They are relatively evenly distributed throughout Slovakia.

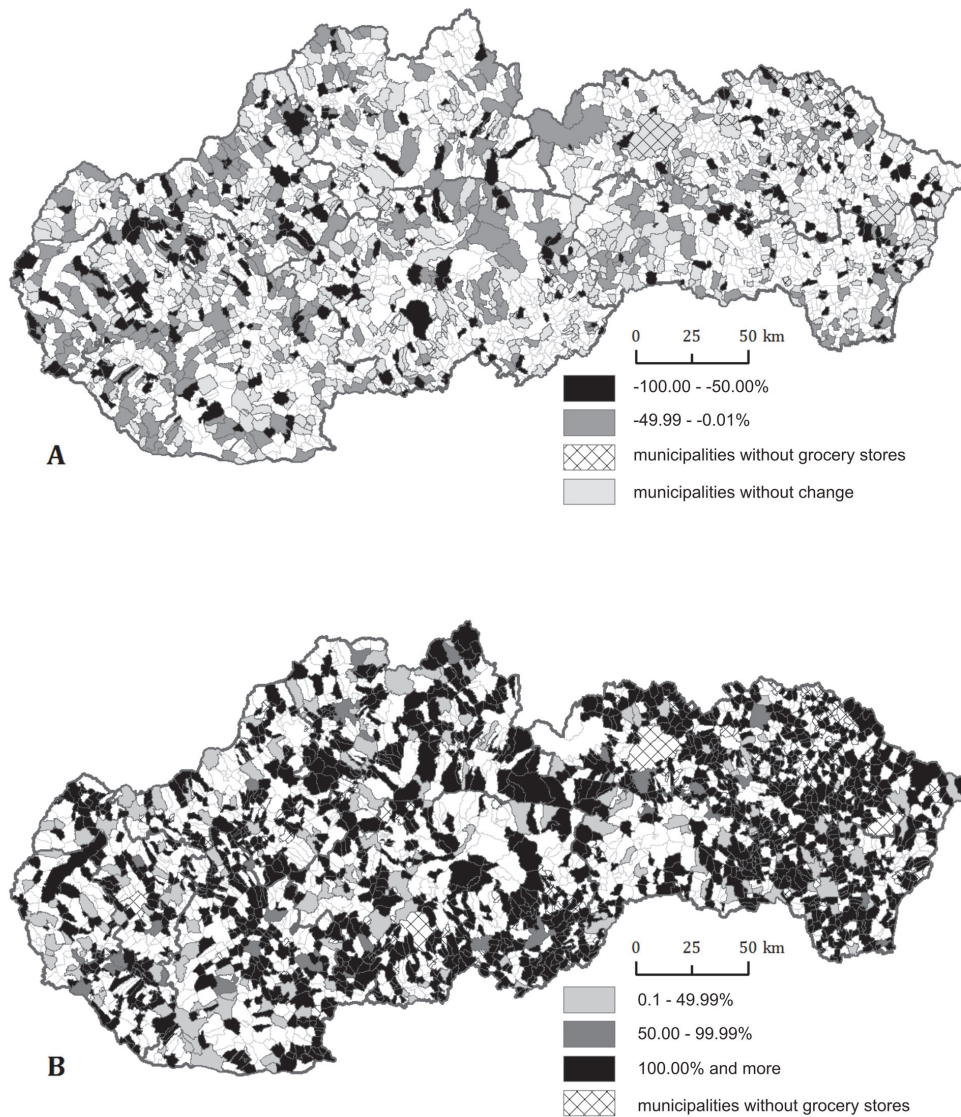
The second group represents the municipalities in which there has been a decline in the number of grocery stores. These municipalities make up more than one-fifth (20.8%) of all Slovak municipalities. In general the most significant decrease in the number of grocery stores is typical around cities which may be associated with the construction of shopping centers on the periphery of the cities. More significant concentration of these municipalities can be identified in western Slovakia and in a lesser degree in the east (Fig. 2A).

Municipalities with an increase of the number of grocery stores represent the third group. This group represents more than half of all the municipalities. It points to the positive dynamics of development of the food retail sector in Slovakia with a significant



1: Rural municipalities in Slovakia without grocery store in 2011

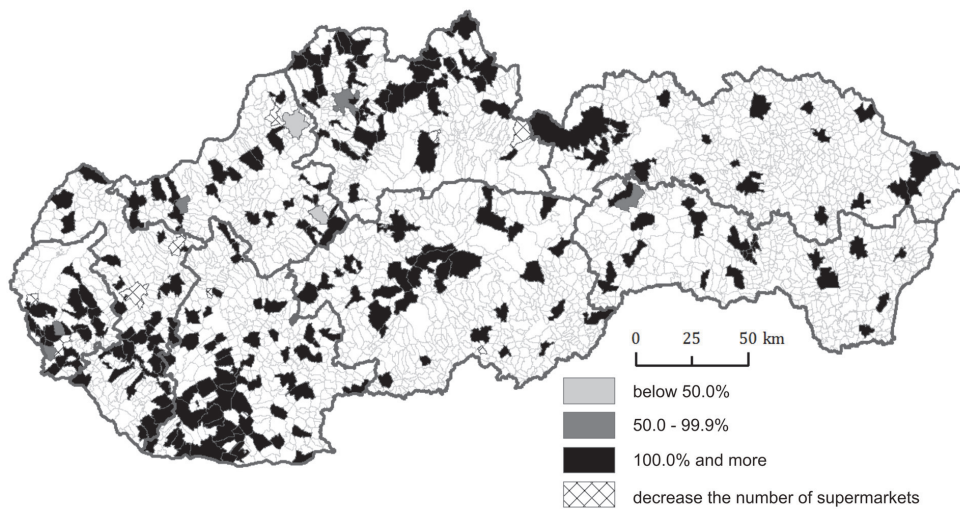
Source: Database of the Statistical Office of the Slovak Republic (2013)



2: Development of the number of grocery stores in municipalities the Slovak countryside in period 2001–2011

Source: Database of the Statistical Office of the Slovak Republic (2013)





3: Development of the number of supermarkets in municipalities the Slovak countryside in period 2001–2011  
Source: Database of the Statistical Office of the Slovak Republic (2013)

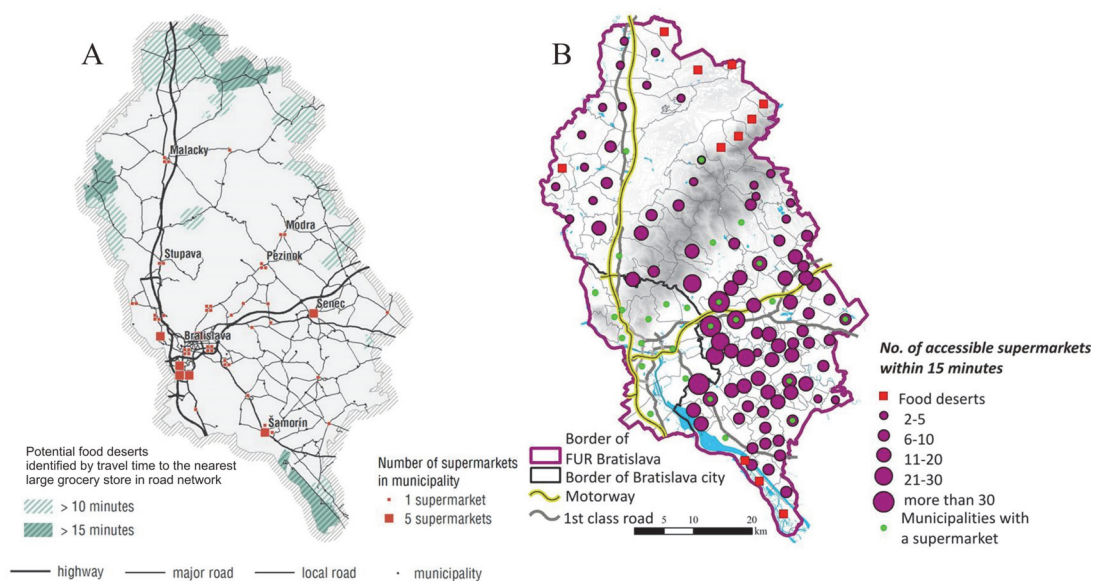
impact on the countryside. From a spatial point of view the most significant increase can be seen in eastern Slovakia (Fig. 2B). There are the most concentrated municipalities with more than 100% increase of grocery stores. One of the reasons can be the process of cooperation in rural retail and general retail development in rural areas as a result of the absence of significant regional shopping centers in nearby cities.

Food deserts in rural areas are identified mainly by measuring the accessibility of supermarkets. In this context can be evaluated change the number of supermarkets in region. The increase in the number of supermarkets was in 243 municipalities (including cities) in the period 2001–2011. The increase was concentrated in the western and southwestern

Slovakia (Fig. 3). The lowest increase was recorded in the Košice and Prešov region. It may be noted that there was also a decrease in the number of supermarkets. Absolute decline occurred in five rural municipalities where a supermarket was closed. A reduction in the number of supermarkets can also be observed in some cities (e.g. Púchov, Piešťany).

#### Food Deserts in Slovak Countryside

As an example of study of food deserts from Slovak countryside may be presented in the study of the functional urban region of Bratislava (Križan *et al.*, 2014). Food deserts were mapped by metric measure and opportunity based



4: Identification of food deserts in FMR Bratislava by application of metric accessibility measure (A) and opportunities based measure (B)

Source: Križan *et al.* (2014), authors' own processing

I: Accessibility of supermarkets (Acc1) in municipalities of FMR Bratislava

Accessibility of supermarkets [min]	No. of municipalities	Share of municipalities [%]	Cumulative share of municipalities [%]	Share of inhabitants [%]	Cumulative share of inhabitants [%]
to 5.0	53	42.4	42.4	87.1	87.1
5.1–10.0	50	40.0	82.4	9.6	96.7
10.1–15.0	15	12.0	94.4	2.8	99.4
over 15.0	7	5.6	100.0	0.6	100.0

Source: Authors' own processing, Statistical Office of the Slovak Republic (2012)

II: Accessibility of supermarkets (Acc2) in municipalities of FMR Bratislava

No. of supermarkets acc to 15 min	No. of municipalities	Share of municipalities [%]	Cumulative share of municipalities [%]	Share of inhabitants [%]	Cumulative share of inhabitants [%]
0–1	11	8.8	8.8	1.1	1.1
2–5	22	17.6	26.4	5.3	6.4
6–10	34	27.2	53.6	8.9	15.3
over 11	58	46.4	100.0	84.7	100.0

Source: Authors' own processing, Statistical Office of the Slovak Republic (2012)

measure of accessibility (Tolmáči, 2002). Different methodologies can be applied for food deserts mapping. Firstly, it is important to choose correct methods for identifying food deserts. Cartographic and graphic representation of food deserts is another factor. The application of geographic information systems is unambiguously an appropriate tool. Last but not least the definition of criteria for the delimitation of food deserts is also an essential factor. Definition of the boundaries of what can or can not be considered as the food deserts are more

less subjective. This may regionally (significantly) differ.

Based on the selected criteria there can be identified based 22 (Acc1), respectively 11 (Acc2) food deserts in the analyzed region (Fig. 4, Tab. I, Tab. II). In these food deserts live 3.4% (Acc1), respectively 1.1% (Acc2) of inhabitants of FMR Bratislava. Residents of these municipalities have no access to any supermarket within 15 minutes reach and are constrained to buy food in local stores that are stocked with a smaller assortment (cf. Wrigley, 2002; Morris *et al.*, 1992).

## CONCLUSION

Identification of food deserts in an urban or rural areas can be considered a suitable tool for planners and managers of government and retail companies. The findings also may be used to deal with transport situation in the region in terms of wider service functions of a regional center. Furthermore it may be used to deal with decision-making processes of mayors and competent leadership in local government and so on. The issue of food deserts may also evaluate in the social and economic context (household income, car ownership, finances spent on a trip to shopping in the supermarket, etc.) (cf. Macintyre, 2007). This collaboration of experts from various disciplines leads to the identification and mapping of food deserts more realistic with a wider importance to application. Formation of food deserts is also related with outshopping which in this sense is not typically associated only with food, but mostly with the shopping conventional food products. Outshopping can be defined as shopping goods to consumers outside their local shopping areas (Jarratt 2003, p. 287). Outshopping has several effects (Paddison and Calderwood, 2007). One of the most important is the multiplication effect. Apart from the service functions and interdependence of individual retail stores it is also about the effect on the employment in the region and the interdependence of the economy as a whole. Increasing outshopping purchases lead to the reduction of local shopping and subsequent reduction of local shops, which in turn contributes to more frequent shopping outside the rural areas.

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## Contact information

Kristína Bilková: [bilkova@fns.uniba.sk](mailto:bilkova@fns.uniba.sk)  
 František Križan: [krizan@fns.uniba.sk](mailto:krizan@fns.uniba.sk)