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THE SOCIOECONOMIC AND HEALTH EFFECTS OF GREEN INFRASTRUCTURE ON THE VRACAR MUNICIPALITY, CITY OF BELGRADE

SUMMARY

Green spaces are the important components of the green infrastructure of cities that provide a wide range of services. Recent demographic reports have shown that the most people live in urban areas and that quality of living and work environment directly affects the physical and mental health of city residents. Health-promoting areas and elements within urban areas such as green spaces are recognized to support the residents' possibilities to cope with morbidity and to have a beneficial effect on general health. The Vracar municipality represents one of the three central municipalities in the territory of the Belgrade, with the low percentage of green areas and the high population density. This paper examines the relation between the socioeconomic and health characteristics of the residents with a quality of a green infrastructure of the Vracar municipality. According to the results of the survey, on one side a high number of the Vracar residents visit local parks less than 3 times a week and stay less than 30 minutes, while on the other, 69% of the residents suffer from the respiratory infections and have frequent annual visits to a doctor. The results of this study indicate that exposure to the green environment and spending free time outdoors in local parks, have a clear influence on the general health and the degree of urbanity and the higher proportion of green space affect a life quality of the Vracar residents.

Keywords: green infrastructure, socioeconomic and health characteristics, urban residents, the Vracar municipality, city of Belgrade

INTRODUCTION

Recent demographic statistics have shown that the most people live in cities, and this trend will likely continue in the future (Dye, 2008; Arnberger and Eder, 2015). Urban green spaces are essential and consciously influence on the experience and emotions of the city residents, while the factors that evaluate the quality of these areas affect the physical and mental health, as well as the living and work environment (Mitchell and Popham, 2007). The quality of urban areas is increasingly recognized to benefit to human health and wellbeing (Nilsson et

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al, 2007). The supply and maintenance of health-promoting areas and elements within urban areas such as green spaces are recognized to support residents' possibilities to cope with morbidity and to have a beneficial effect on general health (Tyrväinen *et al.*, 2014). The terms "open spaces", "urban green" and "green spaces" according to general understanding are related to the design elements intended for recreation or to the improvement of urban spaces. Public and private areas, city parks, trails, streets, squares, school yards and other surfaces planted trees, shrubs and other plants can function as elements of green infrastructure and can influence in the heat reduction, air pollution and affect the aesthetics values (Konijnendijk, 2008; Lee and Maheswaran, 2010). However, there is also another benefit of green infrastructure and it is related to the resource that contributes to the improvement of public health (Williams *et al.* 2000, Girardet 2004). Concern over the quality of urban environments, including noise levels and declining quality of green space, has grown over the past decade with increasing emphasis on assessing everyday physiological health and economic values of urban residents (Irvine *et al.*, 2009).

There is a growing interest in the relation between the environment and human health, followed by investment and efforts to preserve the natural environment by organizations and sectors of public health (Stiglitz *et al.*, 2009; Bowler *et al.*, 2010). Such initiatives can promote the importance of urban green infrastructure for the benefit of the public health and wellbeing, by pointing to many benefits of preserving nature and green areas. The physical benefits are reflected in the reduction of physical illness and positive effects on the cardiovascular system, respiratory diseases, diabetes, obesity and reduced blood pressure (Bowler *et al.*, 2010). They also observed positive effects on psychological morbidity including anger reduction and stress and feeling of depression, which is the main cause of suicide (Lee & Maheswaran, 2010). Recent studies have demonstrated a positive relationship between the amounts of green space in people's living environment and their perceived general health (Maas *et al.*, 2006; Mitchel and Popham, 2007). Variations between living environments are in relation to social and financial capabilities of individuals. The conclusions reached on the basis of tests carried out in the Netherlands on a large number of samples obtained by testing in the general population provide an interesting picture of the impact and presence of green space on the psychological experience (de Vries *et al.*, 2003; Maas *et al.*, 2009; Van den Berg *et al.*, 2010). Comparing the responses of people who live in different locations that each has a different level of the greenery, it is possible to estimate how their life in these areas reflected their wellbeing (White *et al.*, 2013).

Many studies underline the links between the environment, living conditions and public health. This paper examines the relation between green space and health, based on research and a systematic review of data collected from the field, in order to assess the socioeconomic and physiological benefits of green infrastructure to the residents of Vracar municipality, one of the three central municipalities in the territory of the Belgrade, with the lowest percentage

of green areas and highest percentage of residents suffering from respiratory and nervous diseases (Vujcic et al., 2015).

MATERIAL AND METHODS

Survey and Location

The research relies on the special survey that was conducted among the visitors at four sites in the Vracar municipality (Figure 1). On-site, face-to-face interviews were carried out between October and November 2015. A survey contained a combination of different types of questions highlighting the socioeconomic and health aspect with a recreational aspect (Arnberger and Eder, 2015). The participants in this research ($n=101$) were residents of the Vracar municipality with an age range between 18 and 65 years. The survey respondents were selected via systematic sampling in which every second visitor was interviewed, respecting representatives of both genders equally (Bankovic, 2003).

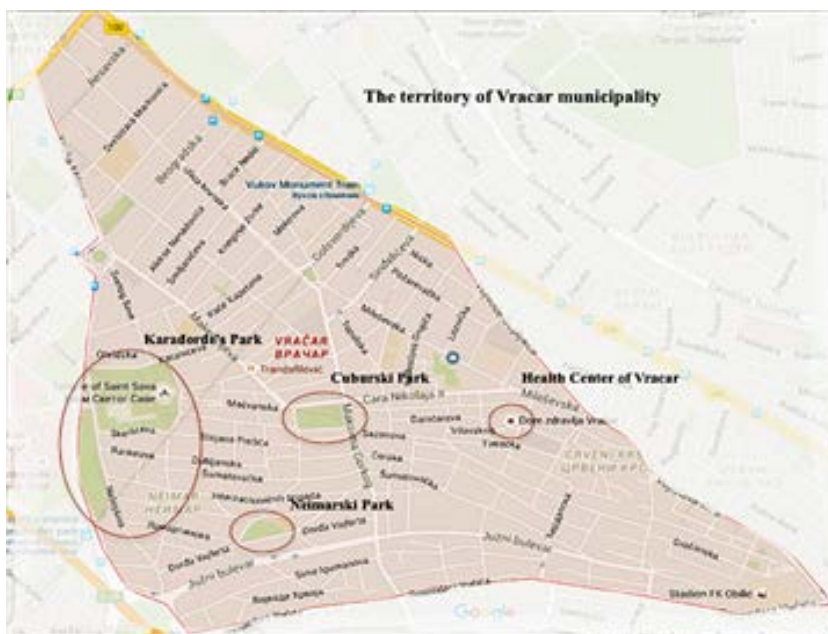


Figure. 1. The target locations for the survey at the Vracar municipality.

Locations, where the visitors were interviewed included three public parks, Karadjordje's Park, Neimarski Park, Cuburski Park and Health Center of Vracar municipality (Figure 2, 3, 4 and 5). All these parks vary in many aspects like size, function, design and location; some parks are used for daily recreation while the others are also tourist attractions. Karadjordje's Park represents a historical park and tourist attractions while Neimarski and Cuburski Parks represent smaller local parks favourite among the residents of Vracar municipality. All three green spaces are under the jurisdiction of the public utility company. The

Health Center Vracar represents a modern primary health care institution in the city of Belgrade. On one side the municipality of Vracar counts about 80 thousand residents and less than 3 km² of space and on the other, it represents the Belgrade's municipality with the highest population density. Excessive population density and urbanization at such a small area with a lack of green space, certainly have influenced a general health of the Vracar's residents (Republic of Serbia, Institute for Statistics, 2011).

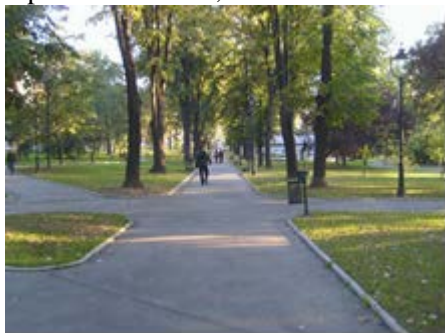


Fig. 2. Karadjordje's Park



Fig. 3. Neimarski Park



Fig. 4. Cuburski Park



Fig. 5. The Health Center of Vracar

RESULTS AND DISCUSSION

Relying on the Biophilia Hypothesis in the context of daily life situations, there is a systematic preference for natural compared to built settings and also a link between features such as biodiversity richness and human health appreciation of urban green spaces (Kaplan and Kaplan, 2011; Thompson and Aspinall, 2011). These evaluations should also be reflected in a smaller capacity of settings with lower biodiversity levels vs. settings with higher biodiversity levels, to induce community health outcomes (Scopelliti and Giuliani, 2004; Carrus *et al.*, 2013). The overview of health characteristics of the Vracar residents in the past few years (2009-2014) is presented according to the statistical report of The Health Center Vracar, based on a total number of morbidity and patients with the respiratory diseases and mental disorders (Figure 1). According to the report, in the year 2013 it was registered the highest number of the residents of Vracar municipality suffering from the acute respiratory

infections (16.2%), and in the year 2010 the highest number of the patients with the chronic respiratory infections (2.3%). Also, in the year 2012 about 11.2% of the Vracar residents suffered from the mental and behavioral disorders.

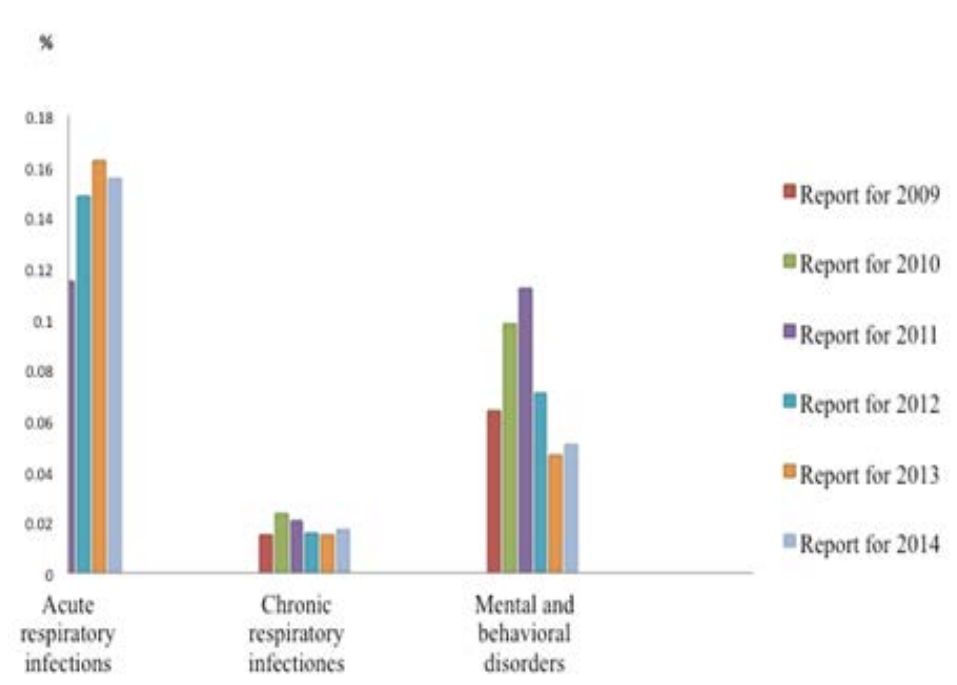


Figure 1. An overview of a total number of morbidity and patients with the respiratory diseases and mental disorders (HCV, 2009-2014)

In order to have an objective view of the situation and taking into the consideration the socioeconomic and demographic structure of the visitors on four selected survey points, a more diverse sample of the respondents was included. The main demographic and socio-economic characteristics are presented in Figure 2. The study included 101 participants (mean 40.6 years) 55 female respondents, pointing out that the larger number of the respondents had a higher level of education (58%) and single marital status (37%).

In order to measure the relation between the experiences of urban nature across the four selected locations on the Vracar municipality, with their physical health following a hypothesis that higher levels of nature exposure lead to greater health outcomes, the Vracar residents were asked about their general health condition, regarding the respiratory infections, nervous disorders and the use of medications (Kardan et al., 2015; Seresinhe et al., 2015).

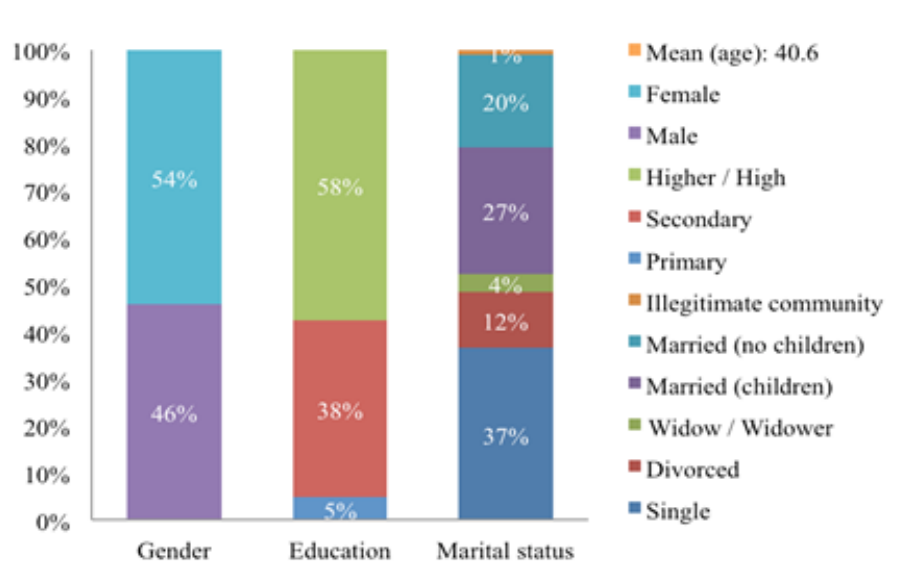


Figure 2. Demographics and the socio-economic structure of visitors

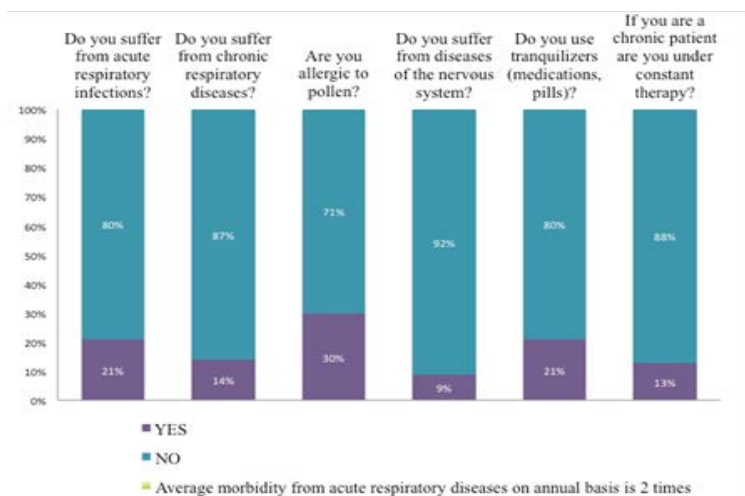


Figure 3. The health characteristics of the respondents of Vracar municipality

About 21% of the respondents reported to suffer from the acute respiratory infections and use medications, and 9% reported to suffer from the nervous disorders. Also, according to collected data about 30% of the Vracar residents reported to suffer from the allergies (Figure 3).

Evaluating the relation between the health characteristics with the usual frequency of the average duration of visits to green space across a week, the respondents were asked to estimate their everyday habits regarding spending free time outdoors in the local parks with a visit to a doctor and monthly expenses on medications (Figure 4). The average duration of green space visits was estimated based on self-reported time spent during each visit across the survey week. The chosen timeframe provided a short and recent reference period to improve accuracy (Schwarz and Oyserman, 2001). This measure of duration was necessarily linked to frequency as to achieve a duration measure the respondent must have visited a green space at least once during the survey week. Duration was selected from a time category (1–29 minutes; 30 minutes to one hour and more than one hour).

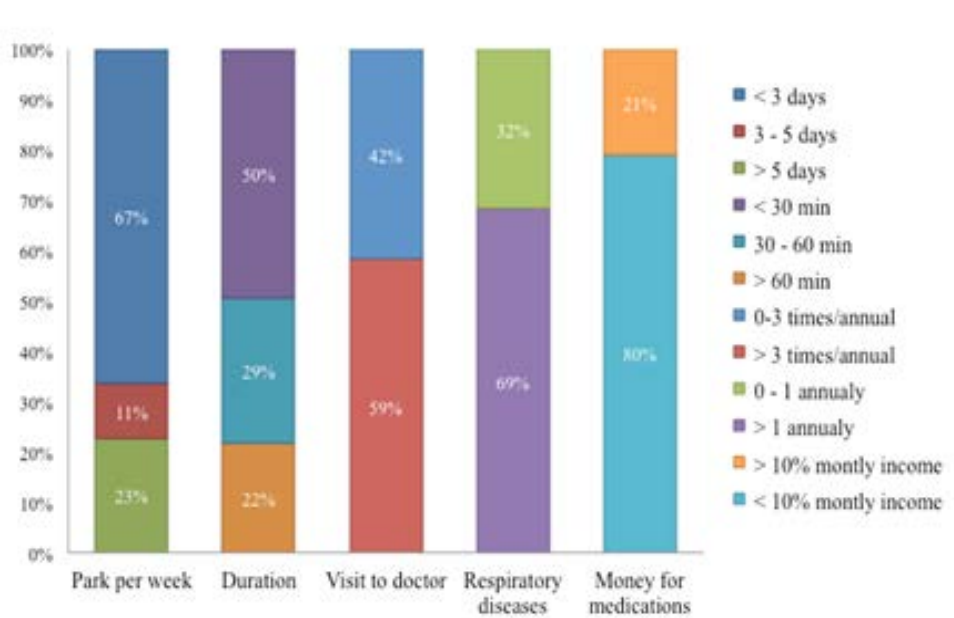


Figure 4. A relation between the health and recreational characteristics of the Vracar residents

Figure 4. has also shown that the different components of experiences of urban nature, including the frequency, duration or intensity, variously influence the health outcomes of the Vracar residents. 67% of the respondents visit the local parks less than 3 days a week and stay less than 30 minutes. It was recorded that 59% of the respondents visit a doctor more than 3 times during a one year (an average visit to a doctor is 5 times annually) and often suffer from respiratory diseases (69%). Concerning the socioeconomic aspect of nature dose effects on respondents, about 21% of the Vracar residents spent more than 10% of monthly income on medicaments and therapies. Similar studies have examined the scale of the population health benefits that could arise if the nature dose

recommendations were met and the impact of this on the public health occurred, finding that the proportion of cases of depression and high blood pressure in the city population who failed to spend an average of 30 minutes or more during a weekly green space visit. Also, studies highlighted that the efforts to unpack the nature-health relationship will be vital to combating the emerging public health challenges associated with urbanization and instrument that investment in green space provides value for money (Shanahan et al., 2016).

CONCLUSIONS

The main causes of disease and premature death in the Europe and the other urbanized parts of the world are related to the everyday habits and lifestyle with the environment in which one lives. High level of urbanization leads to air and noise pollution, which adversely affect the general health of the city residents. The presented Vracar municipality is located in the central zone of the capital of Belgrade, and as such contains a low percentage of green areas and a high population density. Reviving the relationship between the health outcomes and four selected components of nature dose, four presented survey locations, also allows for the assessment of dose-response connections, including whether there is a minimum dose where some effect of nature on health might be seen. Nature cohesion, or the distinction in the way people view their interaction with the urban nature, could both drive interactions with nature and enhance general health in its own right. This study has found that higher levels of nature cohesion could predict better socioeconomic cohesion and higher levels of positive health outcomes. The minimum dose, like 30 minutes, of everyday nature experience could provide better measurable health characteristics of the urban residents including better respiratory and nervous medical conditions. Also, the potential of green space for mental health benefits is not just to be found through physical activity. However, there is strong evidence, which demonstrates the restorative value of green space showing that more passive forms of usage, or even just access to views of green space, can have a beneficial impact on mental well-being and cognitive function. This findings support other research, which has found that people with higher nature relatedness scores, also often report better well-being, happiness, and life satisfaction and lower levels of anxiety. This study indicates that everyday exposure to the urban green spaces and spending free time outdoors in local parks has a clear influence on the general health and moderate socioeconomic aspect of the Vracar residents. Also, these facts speak volumes about how the living environment and life quality of the Vracar residents depend on the degree of urbanity, the higher proportion and quality of a green space.

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