AN ASSESSMENT OF THE IMPACT OF GREEN AREAS ON PUBLIC HEALTH INDICATORS OF TIRANA PREFECTURE

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Abstract

Public health policy in Albania should be based on evidence. Researches relevant to public health policy increasingly use a statistical technique called multilevel analysis. A quick literature search of academic literature shows that during last decade there are many studies that generally support the view that green space has positive effects on health. At any case establishing a causal relationship is difficult, as the relationship is complex. This study uses a Geographical Information System (GIS) to examine the relationships between the presence of green space and administrative unit level mortality in the prefecture of Tirana. This research shows that the percentage of green space in people's living environment has a positive association with a generally improved health situation of residents. The study concludes that the development of green space should have a more central position in urban and rural planning policy.

Key words: *green space, arcgis, public health*

1. INTRODUCTION

Parks and other green areas have played an important role in shaping the society's identity and quality of life. Green, countryside settings and the rural life have long been associated with clean living and better health. Public health is also promoted by bringing green and natural areas into the city. Some authors explain our attraction to green areas with our bio-philic or evolutionary process (Wilson, 1984). An increasing amount of empirical work is being undertaken to demonstrate the linkages between green space and conditions and behaviors that affect our physical, mental, and spiritual health and well-being (Bedimo-Rung et al. 2005; Salazar et al, 2005; Maas, et al., 2006; Coutts et al, 2010), but still epidemiological studies that link green space to illness and mortality are lacking (Lee et al, 2010). While public health professionals and planners agree that green spaces are important to the overall quality of life in a community, evidence that links green spaces to specific health outcomes, especially in Albania, are still limited.

Although parks and open space contribute to the landscape structure necessary to support the most basic of human needs for water, air (Forman, 1995; Whitford et al. 2001; Nowak et al. 2014), and food, decision makers largely takes these basic human needs for granted. In fact it is only after the natural environment providing these basic elements of life that other built environment influences can and should be considered (Coutts, 2009; Gies, 2006). In addition to our place within ecosystems, our dependence upon these systems, and the essential services they deliver, there are a number of ways that health is influenced by our access to and experience with nature. Evidence that demonstrates the positive relationship between self-reported health status and the amount of green space in one's environment gives support to belief that there are significant health benefits of everyday exposure and access to natural environments. Different literature reviews and reports published by different authors and institutions (Tzoulas, 2007; Gies 2006; Maller 2009; Rigolon et al, 2014)) reveal the many ways that exposure and access to green space and natural settings can support health. Although there is increasing evidence of the associations of land cover type and health, to date there has been little attention given to the role of the distribution and accessibility of green spaces on health outcomes (Coutts et al, 2010). Given that these are spatial issues, GIS is a useful tool for helping to model the role of distribution of land cover on health (Dennis, 2006).

The predominant pathways by which health and green space have been linked to public health outcomes rests in the ability of green space to act as a setting for the health promoting behaviors of

physical activity and social interaction (Tzoulas et al, 2007) and the mental health and mentally restorative and stress reducing benefits of these spaces. Better yet, there appear to be synergistic benefits as activity performed in natural settings may produce greater mental health benefits as compared to activity performed in common urban outdoor or indoor spaces (Hartig et al. 2003; Pretty et al. 2005). With the health-giving behavior of physical activity, there is a need for a land use environment and transportation network that supports this activity. These 'environmental supports' must be in place to support the desired behavior. We should not only consider their presence or availability, such as measured by the acreage of parks or number of trails in a community, but also the quality of these supports reflected by their accessibility.

Researches relevant to public health policy increasingly use a statistical technique called multilevel analysis. A quick literature search of academic literature shows that during last decade there are many studies that generally support the view that green space has positive effects on health. At any case establishing a causal relationship is difficult, as the relationship is complex. Some authors (Mitchell et al, 2008; Coutts et al, 2013) analyzed the relationship between green space and mortality, specifically the role of green space in moderating health inequalities. Coutts et al. extended the themes explored by Mitchell et al (2008) by not only considering the effects of green space on mortality in a new context, but by also employing GIS to allow for more refined understanding of the accessibility of these spaces. Their research question was: Is the increased accessibility of green space associated with lower mortality? The results revealed that green space accessibility as measured by the amount of green space within defined distances of all census tracts in a county had a significant association with both all-cause mortality and cardiovascular mortality.

Due to the rapid speed of urbanization, land cover in Albania is changing rapidly. Starting from 2007, the majority of the population of Albania lives in urban areas. Though urbanization promotes rapid social and economic development, it creates problems, such as concentration of the population, air pollution and reduction of green areas, traffic jams, housing shortages, resource shortages, biodiversity reductions, "heat island" effects, noise etc. Along with the negative environmental impacts that result from the loss of green space, this loss may also be harmful to quality of life.

The prefecture of Tirana is one of the 12 prefectures of Albania. The population according to 2011 census was 749,365, in an area of 1652 km. Its capital is the Albanian capital city of Tirana. It has the largest overall population of the region as well as the largest urban population in the country. Since the 2015 local government reform, the prefecture consists of the following 5 municipalities: Kamza, Kavaja, Rrogozhina, Tirana and Vora. The municipalities consist of 38 administrative units and about 250 towns and villages in total (Figure 1).

Tirana prefecture has seen vast changes over the last 25 years. It has been home to a growing number of families from all over the country. Tirana has become the driving force for the country's economic, cultural and social development. Improvements in infrastructure, recovering of some green spaces in central areas and around residential blocks and some upgrades in the public infrastructure have had a good impact on standards of living, although a lot of further improvements with regards to infrastructure, administration, trade, environmental quality are needed. Census data analyses suggest that these demographic changes are a direct consequence of internal and external migration. The main industrial area of Tirana prefecture is situated in the western part of the region. Agriculture on the other hand, offers self-employment opportunities to most of the rural population and partially supplies the local and national markets. The healthful relief provided by natural settings and green space has led many city dwellers to seek temporary or permanent residence in the countryside or suburban peripheral (Vokshi, et al. 2016).

The objective of this study is to investigate the strength of the relation between the amounts of green space in people's living environment and their health for Tirana prefecture. This relation is analyzed for all administrative units of Tirana prefecture. Our research shows that the percentage of green space in people's living environment has a positive association with the general health situation of residents while urban fabric in urban areas is associated with increased level of illnesses. The percentage of green space in people's living environment has a positive association with a decreased level of cardiac, pulmonary and diabetes mortality.

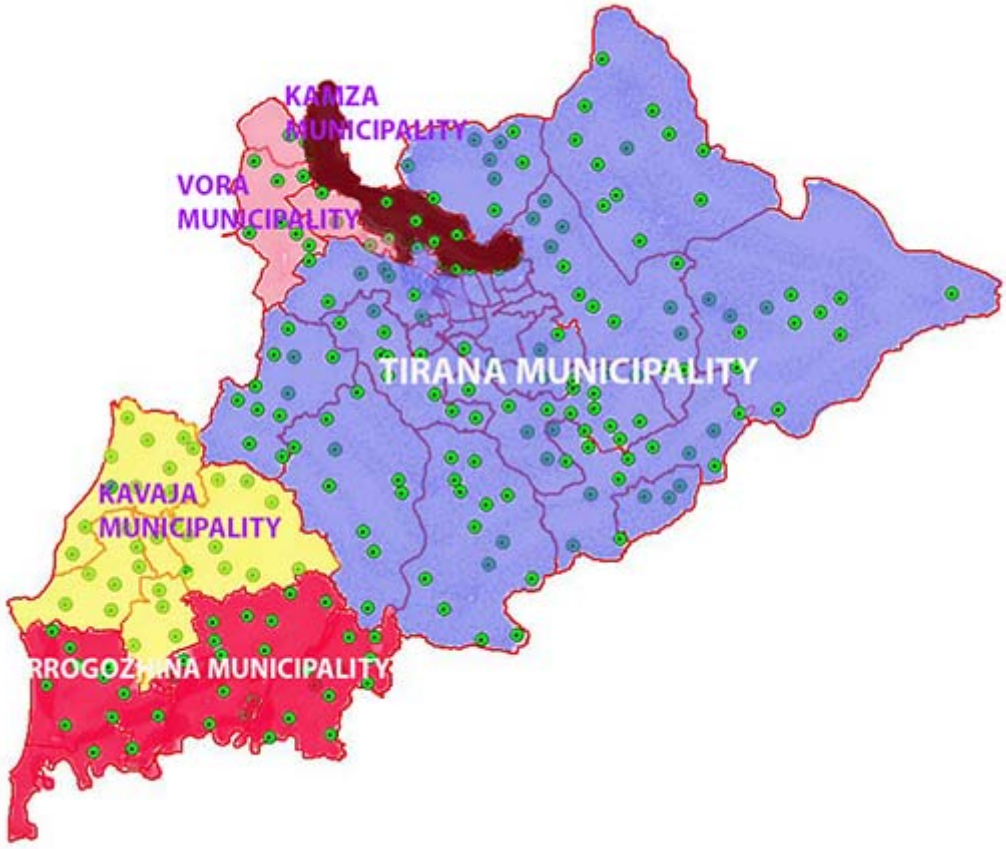


Figure 1. Tirana Prefecture and its constituent municipalities (Each municipality is divided in administrative units. The green cycles represent the geographic location of towns and villages)

Green space seems to be more than just a luxury and consequently the development of green space should be allocated a more central position in spatial planning policy. The study concludes that Public health policy in Albania should be based on evidence and the development of green space should have a more central position in urban and rural planning policy.

2. MATERIALS AND METHODS

This study uses a Geographical Information System (GIS) to examine the relationships between the presence of green space and administrative unit level mortality in the prefecture of Tirana. It includes all 38 administrative units. The percentage of urban fabric and green space (urban green space, agricultural space, and natural green space) for all administrative units is calculated through ArcGIS using Lands cover data. Furthermore, it is analyzed separately for urban and more rural areas, because the strength of the relation was expected to vary with urbanity (Coutts et al, 2010).

We analyzed the relationship between type of land cover and mortality in the following ways:

1) We analyzed the relationship between the gross amount of different land cover categories in an administrative unit and administrative unit-level all cause and cardiovascular, pulmonary, and diabetic mortality.

2) We analyzed the relationship between the percentage of different land cover categories in an administrative unit and administrative unit-level all cause and cardiovascular, pulmonary, and diabetic mortality.

Data on all-cause mortality and mortality from major cardiovascular, pulmonary, and diabetic diseases for the period 2010-2014, were obtained from the civil status offices of Tirana prefecture. A total of 32,234 deaths from all causes and 10281 from cardiovascular, 1488 pulmonary and 312 diabetes diseases occurred in Tirana prefecture during 2010-2014. Data on land cover categories was calculated through ArcGIS from the land cover map of the National Institute of Environment (Figure 2).

3. RESULTS AND DISCUSSIONS

The map in Figure 2 has resulting from the national map of Albania. Based on the land cover categories, we created four main land cover groups of interest regarding our study: Urban fabric, urban green area, natural area and agricultural area. All the groups are considered with their share in the total area of each of the administrative units.

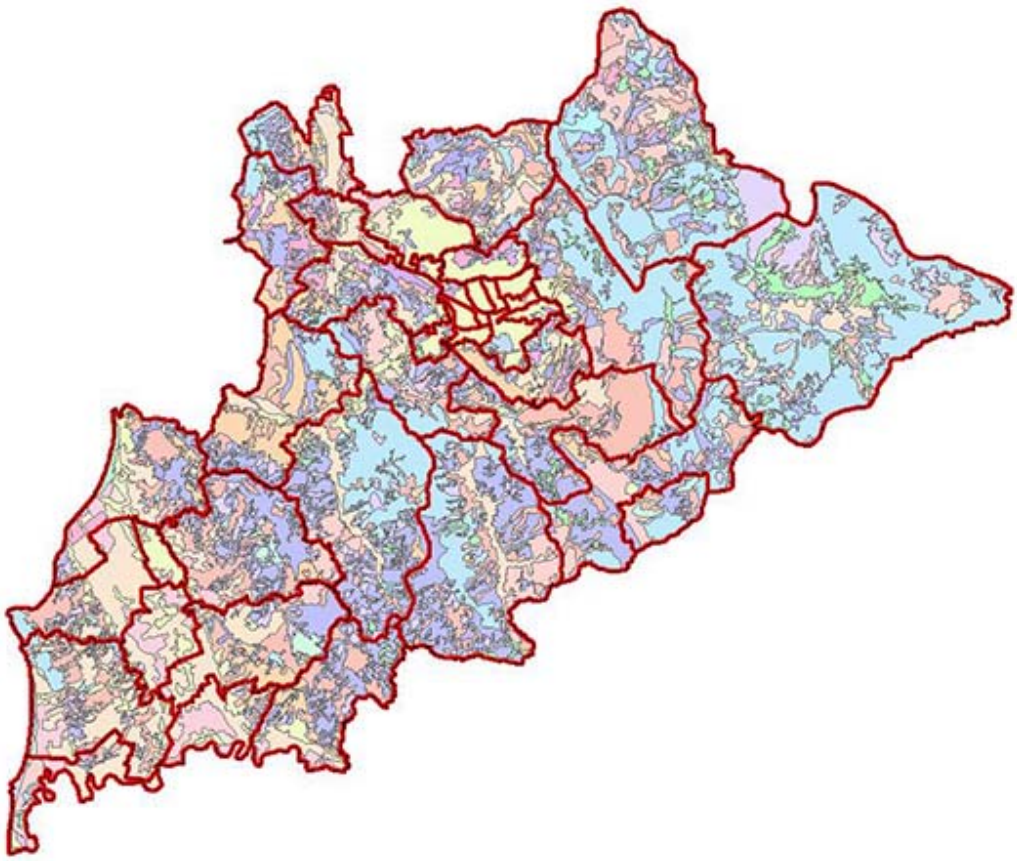


Figure 2. The map of Tirana prefecture land cover

We could not find any significant relationship between all-cause mortality and any of our land cover groups. So we continued analyzing the relationship of land cover groups and specific-cause mortality.

Because land cover data have not a high resolution it was difficult for us to have an accurate overview of all small size urban green areas so under green area we decided to create an unified group of urban green space, agricultural space, and natural green space. From the other side we could not find significant relationships between land cover categories in rural areas so our analyses is focused only in urban areas. From the mortality data it was seen that mortality caused by cardiac problems was relatively high. From our analyses it resulted that it is significantly affected by both urban fabric and share of green area, but in contrary ways of course. Figure 3 shows the regression analyses for the relationship of cardiac mortality and green areas, while figure 4 shows the regression analyses for the

relationship between cardiac mortality and urban fabric for all urban areas of Tirana prefecture. Figure 3 and 4 illustrate the need for more green areas and less urban fabric in urban areas of Tirana prefecture.

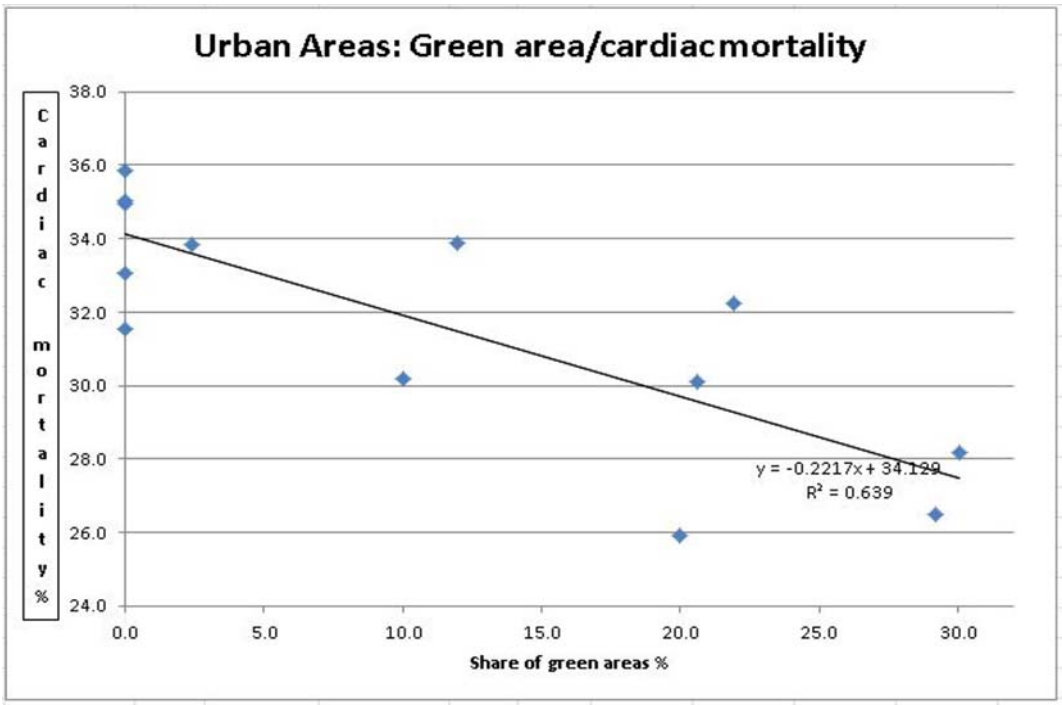


Figure 3. The relationship between cardiac mortality and green areas for urban areas of Tirana prefecture.

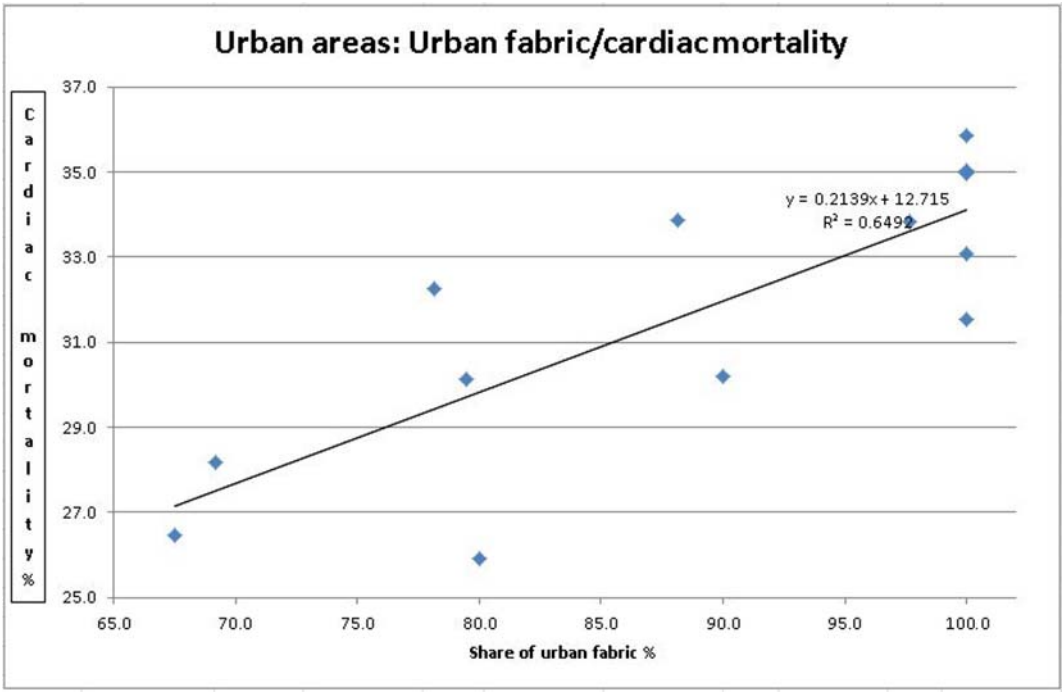


Figure 4. The relationship between cardiac mortality and urban fabric for urban areas of Tirana prefecture.

Figure 5 and 6 show the regression analyses of the relationship of diabetes mortality with green areas and urban fabric. It is seen that, though weaker the relationship is similar to cardiac mortality.

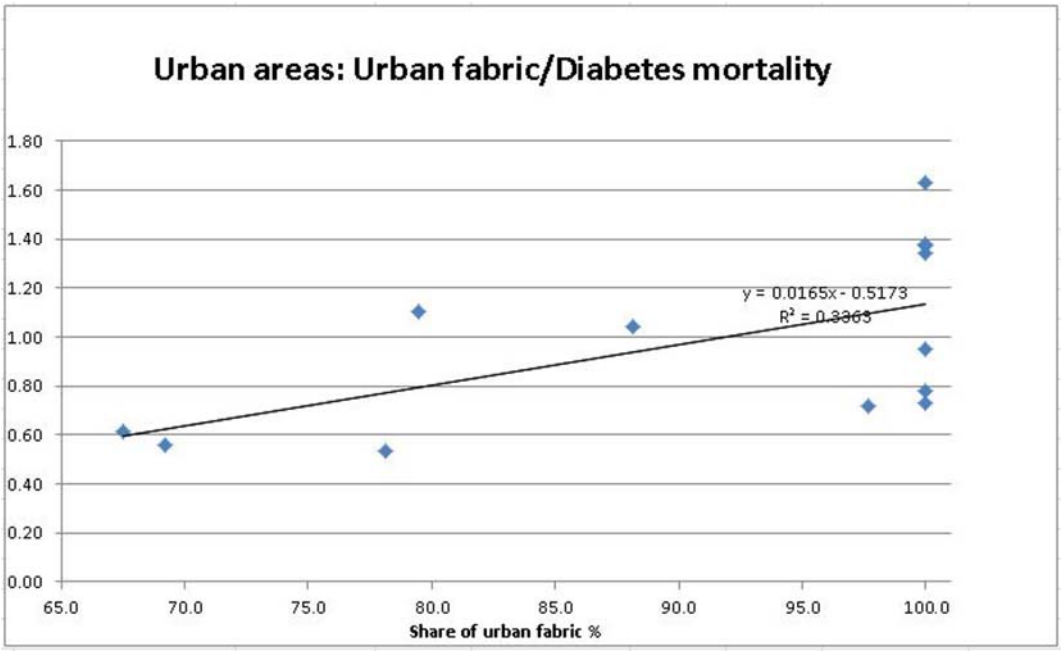


Figure 5. The relationship between diabetes mortality and green areas for urban areas of Tirana prefecture.

Figure 5 and 6 reinforce the conclusion that Tirana prefecture needs more green spaces in its urban areas. Green area and urban fabric are impacting the health situation of Tirana prefecture population in contrary direction. It means that any investment in hardscape (buildings, squares, transport infrastructure etc. should be accompanied with much more investment of green spaces.

We analyzed the relationship between pulmonary mortality and different categories of land cover also. The fact that we could not find any significant relationship between pulmonary mortality and green areas, may be is justified mainly with the fact that the resolution of our land cover data is not high enough to discover this relationship. It means that in the future more accurate data are needed for a complete study on the impact of green areas on the health situation of Tirana prefecture population. But we could identify a significant relationship between urban fabric and pulmonary mortality for Tirana city (Figure 7). This relationship shows that too much construction and hardscape is done during last decades in Tirana city.

More work should be done in the future to analyze the accessibility of green areas and their quality (Coutts et al 2010). This is important for urban areas but a more detailed assessment may unveil interesting findings for rural areas also. In rural areas more data are needed to identify the distance and type of green areas from the residences because in some cases the administrative units may result with high share of natural green areas but they might be too far to have any significant impact on the health of population of that administrative unit. Meanwhile in urban areas some other data like air pollution levels in different areas may bring more information to explain any specific situation. The problem we have with this group of data is that there are not enough data and their distribution in time and space is very limited. This situation may be overcome by using some new mobile technologies for air pollution measurement (Devarakonda et al 2013; Nowak et al. 2014). After identifying possible significant relationships the next step is the theoretical analysis of the mechanisms responsible for the relationship between people's living environment and their health and well-being.

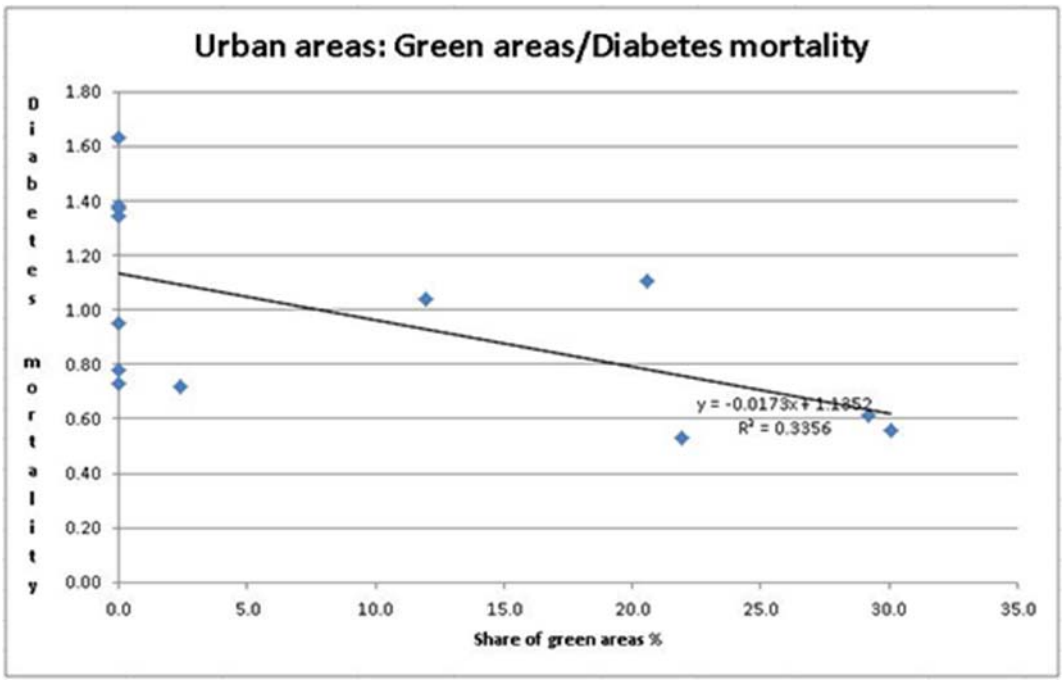


Figure 6. The relationship between diabetes mortality and urban fabric for urban areas of Tirana prefecture.

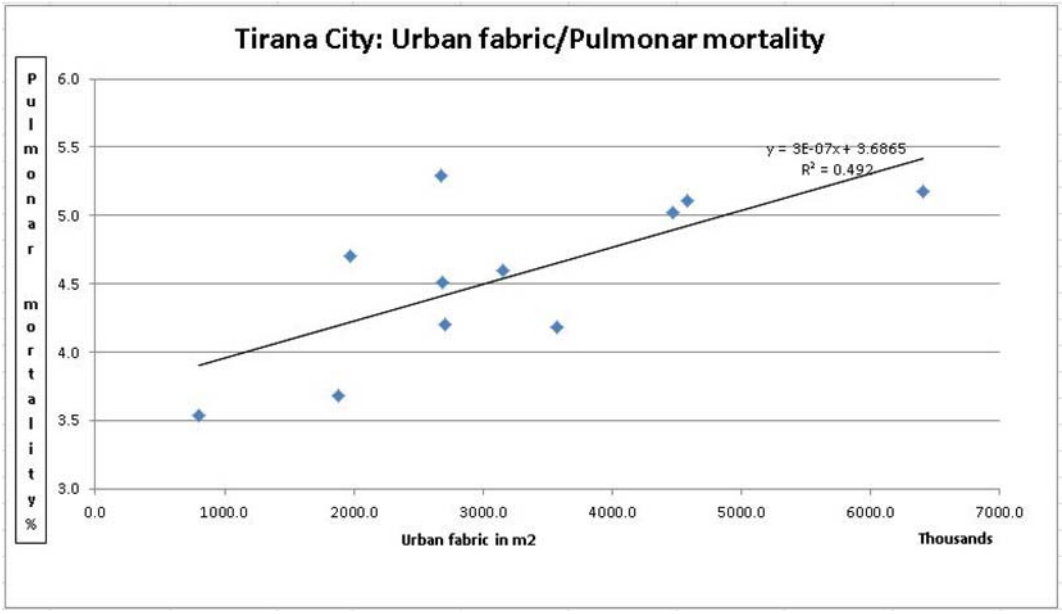


Figure 7. The relationship between pulmonary mortality and urban fabric for urban areas of Tirana prefecture.

4. CONCLUSIONS

The strength of the relation between the amounts of green space in people's living environment and their health for all administrative units of Tirana prefecture was investigated in this study. Our research shows that the percentage of green space in people's living environment has a positive association with the general health situation of residents while urban fabric in urban areas is associated with increased level of illnesses. The percentage of green space in people's living environment has a positive association with a decreased level of cardiac, pulmonary and diabetes mortality. Our findings

demonstrate that green space is more than just a luxury and consequently the development of green space should be allocated a more central position in spatial planning policy and the public health policy in Albania should be based on evidence and the development of green space should have a more central position in urban and rural planning policy.

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