IMPACT OF SPORTS INFRASTRUCTURE ON PUBLIC HEALTH: QUANTITATIVE ANALYSIS

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Abstract. This paper presents a quantitative analysis of the relationship between the number of sports infrastructure in the federal districts of the Russian Federation and the health of the population of these regions in 2010-2015. The promotion of a healthy lifestyle is one of the priorities of the social and economic policies of any state. Sport policy in Russia, aimed at increasing the mass participation in the sport, is built around the interdependence of the sports infrastructure and the health of the population. The research question of this paper is whether there is a growth in physical activity of the population and a decrease in the incidence rate in the Russian Federation against the background of an increasing number of sports facilities? The interrelation of the number of sports facilities, the share of the population engaged in physical culture and sports, the general incidence of the population and the incidence of flu and cold were analyzed in Russia in general and in eight of its federal districts in particular. Although the correlation analysis does not allow us to judge the cause-effect relationship, we can still clarify the model of the influence of the sports infrastructure on these important indicators for human development. The study revealed a strong positive correlation between the growth in sports infrastructure and the level of involvement of the population in sports practices. The differentiation of Russian regions according to the degree of influence of the sports infrastructure and sports participation on the incidence is shown.

Keywords: sports infrastructure, public health, sports policy, sports participation, physical culture

1. INTRODUCTION

The promotion of a healthy lifestyle is one of the priorities of the social and economic policies of any state. Achievement of this task is impossible without the developed sports infrastructure and creation of conditions for physical training and sports for all population groups. At the same time, preserving and improving the health of the nation also has a positive economic effect. As noted by the authors of a large-scale study on health analysis in Eastern Europe and Central Asia (Suhurcke, Rocco, & McKee, 2007), any government is interested in strengthening their public health, even from a strictly economic point of view. The research data show that the set economic goals can be achieved much sooner if investing in the concern for the national health. Earlier it was assumed that health is only a consequence of economic development, but the research reveals the existence of a causal relationship between health and economic indicators. Public health as a factor of long-term economic growth is an area that needs constant investments aimed at improvement of the quality of human capital. One of such investments is the expansion of the sports infrastructure for the population.

The influence of sports participation and sports infrastructure on the public health becomes the object of research in many countries of the world for example, (Bohm, 2013). Many studies in this area represent a qualitative analysis of the reasons for participation or refusal to participate in sports and physical activity of different population groups. For instance, the paper by S. Allender et al. (Allender, Cowbur & Foster, 2006) gives an overview of qualitative studies of this motivation among adults and children in Great Britain for 1990-2004. According to the research, young girls are motivated by their fears about keeping their body slim, and older people see the importance of sports and physical activity in preventing the aging effects and ensuring a social support network. Many studies mainly analyze the impact of individual social factors (age, income, etc.) on physical activity and the use of sports infrastructure.

German researcher P. Wicker et al. (Wicker, Hallmann & Breuer, 2013) notes that although some studies consider the influence of sports facilities on participation in sports, yet there are methodological disadvantages associated with the inclusion of analysis of sports infrastructure in the study project. For example, subjective assessments of infrastructure are often analyzed, leading to biased results (e.g., inactive people are less aware of the real offer of sports facilities and cannot adequately assess it). According to the authors, it is important to measure the existing sports infrastructure objectively, using a quantitative approach.

Sports policy in Russia, aimed at increasing the mass participation in sports, emphasizes the importance of sports infrastructure for the health of the population. Opinion polls in recent years have recorded a positive dynamics of interest in fitness and sports among Russians, as well as improvement of the relevant conditions (Kolpina, Iliin, Lazareva, & Shkolina, 2013). According to the public assessment, the accessibility of physical education and sports has increased (All-Russia Public Opinion Research Institute, n. d).

In this paper, we tried to assess the relationship between the number of sports infrastructure in various federal districts of the Russian Federation and the health of the population of these regions in 2010-2015. We used a quantitative analysis of the relationship between such indicators as: a) the number and dynamics of the number of sports facilities; b) the proportion of the population engaged in fitness and sports; c) general incidence rate of flu and colds. The research question of this paper is whether there is a growth in physical activity of the population and a decrease in the incidence rate in the Russian Federation against the background of an increasing number of sports facilities? Thus, the tasks of this study do not include a subjective assessment of the accessibility and quality of the sports infrastructure by the population, but only the analysis of statistical indicators of incidence and the level of sports infrastructure of the federal districts of Russia.

2. MATERIALS AND METHODS

Since the aim of the study is to conduct a quantitative analysis of the relationship between the number of sports facilities, the proportion of sports and health in the regions of Russia, which differ significantly in socioeconomic and environmental terms, the empirical basis of the study was as follows: A. State statistics on quantity and dynamics
of the number of sports facilities, the share of those engaged in fitness and sports for 2010-2015 in the federal districts of the Russian Federation (Ministry of Sport of the Russian Federation, 2015); B. State statistics on the general incidence rate and incidence rate of respiratory diseases among the population in the federal districts of the Russian Federation for 2010-2015 (Ministry of Health of the Russian Federation, 2015).

The analysis of statistical data is aimed at a comprehensive understanding of the context of the problem under study. The analysis of statistical data on the federal districts of the Russian Federation included:

1) Characteristics of the geographical and socio-demographic portrait of the federal districts of the Russian Federation;

2) Determining the indicators of general incidence and respiratory diseases in the population of federal districts and analysis of their dynamics;

3) Determining the level of the sports infrastructure development in the federal districts and the proportion of the population actively using this infrastructure;

4) Evaluating the strength of the relationship between the four indicators (total incidence rate, incidence rate of respiratory diseases, the share of people involved in sports practices, and the number of sports facilities) using both correlation and regression analysis.

3. RESULTS AND DISCUSSION

The structure of the Russian Federation includes 8 federal districts that differ in socio-economic indicators, their population composition and territory. These are the Central, North-Western, Southern, North-Caucasian, Volga, Ural, Siberian and Far Eastern federal districts. The quality of life, the level of development of the sports infrastructure and incidence rate of the population can vary significantly not only in different federal districts, but also between regions that are part of one federal district.

If we consider the Russian Federation as a whole, then for 2010-2015 the following trends are revealed. First, there is a steady increase in the number of sports infrastructure facilities (from 173.7 units per 100,000 population in 2010 to 207.1 in 2015). Secondly, the share of the population systematically engaged in fitness and sports almost doubled (from 18.5% in 2010 to 31.9% in 2015). Thirdly, the overall incidence rate of the population remains at approximately the same level, characterized by an increase until 2013 (799.4 cases per 1,000 population) and further decline. Fourthly, the incidence of respiratory diseases (including flu and colds) increased from 324 cases per 1,000 population in 2010 to 337.9 in 2015 (Table 1).

<table>
<thead>
<tr>
<th>Year</th>
<th>Incidence rate per 1,000 population</th>
<th>Incidence rate of respiratory diseases per 1,000 population</th>
<th>Proportion of people engaged in sports, %</th>
<th>Number of sports facilities per 100,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>780</td>
<td>324.0</td>
<td>18.5</td>
<td>173.6</td>
</tr>
<tr>
<td>2011</td>
<td>796.9</td>
<td>338.8</td>
<td>20.6</td>
<td>177.7</td>
</tr>
<tr>
<td>2012</td>
<td>793.9</td>
<td>330.9</td>
<td>22.5</td>
<td>182.8</td>
</tr>
<tr>
<td>2013</td>
<td>799.4</td>
<td>338.4</td>
<td>27.5</td>
<td>206.8</td>
</tr>
<tr>
<td>2014</td>
<td>787.1</td>
<td>333.4</td>
<td>29.0</td>
<td>206.2</td>
</tr>
<tr>
<td>2015</td>
<td>778.2</td>
<td>337.9</td>
<td>31.9</td>
<td>207.1</td>
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</tbody>
</table>

Analysis of these data shows a strong positive relationship between the indicators such as the number of sports facilities and the proportion of the population systematically engaged in sports (r=0.96253 at p<0.01), that is, during the expansion of sports infrastructure the share of the population engaged in sports increases. It should be noted that the presence of a correlation does not mean a causal relationship between these phenomena, since the growth of these indicators can result from another common cause for them.

Statistically significant correlations between these indicators are observed for all federal districts, although the share of the population engaged in sports practices and the availability of sports infrastructure is different. Although the average rate of participation in sports practices is close to one-third of the population, six of the eight federal districts have indicators below the Russian average, and only in the Ural and Volga federal districts they are higher and reach 33.3% and 33.9% for 2015, respectively. The lowest share was recorded in the Far Eastern federal district (28.1%). As for the
sports infrastructure, the North Caucasus (134 sports facilities per 100 thousand population in 2015) and the Southern (188.7) federal districts are among the outsiders. The indicators of the remaining districts exceed the Russian average, and the leaders in sports infrastructure availability are Central, Volga and Ural federal districts.

The mismatch of these two ratings (Figure 1) causes a different force of connection between the indicators of the sports infrastructure and sports participation in individual districts. This may serve as the basis for the hypothesis that the increase in the number of sports facilities in the federal district has different effects, that is why there is no sense in equalizing policy concerning the expansion of the sports infrastructure.

Figure 1. Ratings of the federal districts for the share of the population engaged in sports, and the number of sports facilities.

A more contradictory situation has come about the relationship between these two indicators and the incidence rate of the population. Although many studies confirm the role of physical culture in strengthening health, a statistically significant increase in the number of sports facilities and the proportion of those engaged in sports in Russia generally is not accompanied by a decrease in the overall incidence rate. However, the picture varies significantly in different federal districts. For example, in the economically developed Central federal district with a high quality of life for the population, there are significant negative correlations between the number of sports facilities and incidence \((r=0.73582 \text{ at } p<0.01)\) and between the proportion of those engaged in sports and incidence \((r=-0.96245)\). This means a reduction in morbidity with the growth of sports infrastructure and participation in sports. On the contrary, there is a significant positive correlation \((r=0.99565)\) between these indicators observed in the economically prosperous Volga federal district having a sports infrastructure and higher sports participation rates, which implies an increase in the number of diseases with a growing number of sports facilities and the share of the population engaged in sports.

Incidence rate of the population of federal districts has a greater range of values than sports infrastructure and the level of the population engaged in sports practices. Figure 2 shows the ratings of districts for the overall incidence rate and incidence of the respiratory diseases (including flu and colds). High incidence (according to 2015) is observed in the North-Western and Volga federal districts (877.3 and 870.7 cases per 1,000 population, respectively), although they occupy a leading position in sports infrastructure and the share of the population engaged in sports. The North Caucasus federal district, on the other hand, shows the lowest rates in terms of both overall incidence and incidence of respiratory diseases, although it has the worst sports infrastructure.

Figure 2. Ratings of the federal districts for total incidence rate and incidence rate of respiratory diseases.

Thus, due to the large differentiation between the regions of Russia, there is no question of the unequivocal role of the sports infrastructure in the improvement of public health. Obviously, the incidence is a complex indicator, influenced by a variety of factors (quality of life and income, sports infrastructure, climatic conditions etc.). However, the statistical analysis of the relationship of the indicators makes it possible to clarify the role of these factors. Examples of regions are the basis for building a multifactor model, where the sports infrastructure is one of the factors. This can contribute to a more thoughtful and differentiated policy in the field of sport and health care in certain federal districts subject to their specificity.

4. CONCLUSION
The assessment of the interdependence of such indicators as the proportion of the population involved in physical activity, the number of sports facilities, the overall incidence rate of the population and the incidence rate of respiratory diseases in particular (including flu and colds, which are the main cause of temporary disability of the population and, therefore, may have economic consequences) is an important element for the formation of the socio-economic policy of the state. Although the correlation analysis does not allow us to judge the cause-effect relationship, we can still clarify the model of the influence of the sports infrastructure on these important indicators for human development.

Analysis of Russian statistics for 2010-2015 shows a strong positive relationship between the indicators such as the number of sports facilities and the proportion of the population systematically engaged in sports, that is, during the expansion of sports infrastructure the share of the population engaged in sports increases. Statistically significant correlations between these indicators are also observed in the analysis of individual federal districts being part of the Russian Federation. The presence of a correlation does not mean a causal relationship between these phenomena, since the growth of these indicators can result from another common cause for them.

A more contradictory situation has come about the relationship between these two indicators and the incidence rate of the population. Although the positive role of physical culture in maintaining and strengthening health is generally known, the growth in the number of sports facilities and the proportion of the population engaged in sports in Russia generally is not accompanied by a decrease in the overall incidence. At the same time, the situation in different federal districts may vary greatly (there may be a significant positive or negative correlation).

Obviously, the incidence is a complex indicator, influenced by multiple factors (quality of life and income, sports infrastructure, climatic conditions etc.) with various degree of their effect in different regions. However, correlation and regression analysis make it possible to clarify the role of these factors. Due to the large differentiation between the regions of Russia, there is no question of the unequivocal role of the sports infrastructure in the improvement of public health. At the same time, the examples of individual regions serve as a good basis for building a multifactor model, where sports infrastructure will be one of the factors. This can contribute to a more thoughtful and differentiated policy in the field of sport and health care in certain federal districts subject to their specificity, since the increase in the number of sports facilities has different effects in the regions. That is why, in our opinion, there is no sense in the equalization policy regarding the expansion of the sports infrastructure. The solution is a flexible, comprehensive policy that presupposes an individual approach and takes into account the demographic, national and cultural features of the population of the region.

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