Original Article

INFLUENCE OF THE SIZE OF THE CITIES OF BIRTH AND RESIDENCE IN THE SPORTS CAREER: AN ANALYSIS THROUGH THE BOLSA-ATLETA PROGRAM

INFLUÊNCIA DO TAMANHO DAS CIDADES DE NASCIMENTO E RESIDÊNCIA NA CARREIRA DESPORTIVA: UMA ANÁLISE POR MEIO DO PROGRAMA BOLSA-ATLETA

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RESUMO

O presente estudo teve por objetivo verificar se o tamanho dos municípios em que os atletas brasileiros de rendimento nascem ou residem gera influência na obtenção de subsídio pelo governo federal, além de apontar se fatores como índices de desenvolvimento humano, densidade demográfica e investimento municipal no esporte também exercem influência. A amostra consistiu em 2033 municípios brasileiros que apresentaram atletas nascidos ou residentes contemplados pelo programa de incentivo brasileiro Bolsa-Atleta. Por meio da análise, pode-se verificar que o tamanho dos municípios influência na quantidade e no nível de bolsa obtido, demonstrando que quanto menor o tamanho da população, menor a chance de se obter um nível mais alto de bolsa. Além disto, pode-se notar que fatores como índices de desenvolvimento humano, densidade demográfica e investimento no esporte exercem influência na aquisição de bolsas pelos atletas, principalmente, por parte de atletas residentes, o que evidencia uma migração esportiva interna no país.

Palavras-chave: Esporte; Atletas; Investimento financeiro; Performance; Migração esportiva.

ABSTRACT

This study aimed to verify whether the size of municipalities in which Brazilian high-performance athletes are born or live influences the federal government subsidy, in addition to pointing out whether factors such as human development index, demographic density and municipal investment in sports also exert influence. The sample consisted of 2,033 Brazilian municipalities that had athletes, born or resident, receiving the Brazilian incentive Bolsa-Atleta program. The size of municipalities influences the amount and level of grant obtained, demonstrating that the smaller the population size, the lower the chance of obtaining a higher grant level. In addition, factors such as human development index, demographic density and investment in sport influence the acquisition of grants by athletes, mainly by resident athletes, which shows an internal sports migration in the country as a result.

Keywords: Sport; Athletes; Financial investment; Performance; Sports migration.

Introduction

There are several actors involved in the process of training and developing athletes in a country, such as financial[1-6], psychological[7], social[8], environmental[9], or even geographic factors[10,11,12]. Regarding geographic factors, several studies seek to set parameters and correlations between the characteristics of birthplaces and the achievement of sports results[10,11,12]. As a result of the relationship between the characteristics of the municipalities and sports development, some athletes tend to migrate from their hometowns to other municipalities in search of training possibilities. Sometimes, geographic factors have been characterized as a decisive item in the training and career of athletes[13,14,15], articulating a network of relationships that involves athletes, administrators, among other sports agents[16].

Geographic aspects have been widely studied in the literature, with the aim of diagnosing when and what are the reasons that contribute to the change in the location of athletes during their sports career, in addition to mapping the social and economic challenges found from these actions[13-18]. Thus, seeking to understand the influence of geographic characteristics on the results of athletes is characterized as a determining item, seeking to test which factors could influence this change, in addition to seeking to understand the existence of other factors related to the difference in performance of athletes from different municipalities.

As a way to assist in the process of developing sports talents, mapping the characteristics of places where there is an apparent propensity for the emergence of high-performance athletes is one of the challenges faced by nations. This challenge becomes even greater when we deal with countries with specific dimensions and characteristics, whose total number of inhabitants represents expressive values, such as are distributed by municipalities with different characteristics, from large metropolises to municipalities with less than a thousand inhabitants. Therefore, this study aimed to verify, based on the example of the Brazilian sports public policy Bolsa-Atleta, whether the size of municipalities in which Brazilian high-performance athletes are born or live influences the obtainment of a subsidy from the federal government, in addition to pointing out whether factors such as human development index, demographic density and investment in sports also have influence.

Method

Study design and sample

This study is characterized by an ex post facto descriptive study, that is, it sought to report a certain event through documentary research, using comparative methods for analyses[19].

The sample of this study consisted of Brazilian municipalities that had athletes, born or resident, receiving the Brazilian incentive Bolsa-Atleta program (Athlete Grant Programme), in the Base, Student, National, International, Olympic/Paralympic or Podium categories between 2013 and 2019 (Research Ethics Committee, Information removed for peer review, CAAE 88770618.4.0000.0102, Opinion 2.748.001). This program is a public policy carried out by the Brazilian government since 2005, which benefits high-performance athletes with monthly grants, according to the athletes' sporting performance, having benefited more than 29 thousand athletes since its creation, with more than 80 thousand grants, serving athletes from all units of the federation, serving, therefore, as an adequate means of analyzing the Brazilian high-performance sport.

The total number of the sample was 2,033 municipalities. Based on previous studies, municipalities were grouped into categories according to population size[10,11,12] as follows: Category 1 (municipalities with population > 500,000); Category 2 (100,001 – 500,000); Category 3 (50,001 – 100,000); Category 4 (20,001 – 50,000); Category 5 (<20,001).

Procedures

Documentary information related to Brazilian municipalities such as territorial area, estimated population, demographic density, budget and GDP per capita were obtained through data collected and made available by the Brazilian Institute of Geography and Statistics - IBGE, collected from the Cities and Municipalities portal[20]. Sport-specific budgets at the municipal level were obtained through research on the Treasury Transparency portal, of the National Treasury[21].

In addition, the 2010 Demographic Census conducted and made available by the Brazilian Institute of Geography and Statistics - IBGE[20] was consulted, which is the last source of official data, considering the failure to carry out the 2020 Demographic Census as expected[22]. Thus, the use of estimated data published by the IBGE is justified, as a way of bringing the data closer to the reality portrayed.

The survey of the number of grant holders of the Bolsa-Atleta program born or living in each municipality covered between the years 2013 to 2019 was obtained together with the Special Secretariat for Sport (SEE), in partnership with the Instituto Inteligência Esportiva[23]. The information was provided by the Special Secretariat for Sport (SEE) through Excel spreadsheets, and these data were compared with the publications of athletes included in the Official Gazette of the Union for data standardization.

The choice of the time frame from 2013 to 2019 considered the period comprised by two Olympic cycles (Olympic Games in Rio 2016 and Tokyo 2020), noting that the postponement of the Tokyo Olympic Games added another year to the cycle of those games, which was disregarded in the sample. It is also important to highlight that there was no publication of a notice and, consequently, a list of those awarded by the Bolsa-Atleta in 2020, as a result of the Coronavirus pandemic, with only renewal of grants for athletes in the Podium category.

Data analysis

For statistical analysis and data presentation, the software IBM SPSS Statistics 25 (IBM Corp, Armonk, New York) and GraphPad Prism 8.2.1 were used. Initially, the Kolmogorov-Smirnov test (n > 50) was applied to check the assumption of normality of the data, obtaining $p<0.005$. In addition to descriptive statistics, the following statistical tests were employed: Spearman's rho (ρ), Ordinal Logistic Regression, Kruskal-Wallis H, Mann-Whitney U, in addition to post hoc analyses with pairwise comparisons and Bonferroni correction[24]. Finally, the magnitude of the effect was calculated from Cohen's d (0.20, low; 0.50, medium; and 0.80, high).

The significance level of the tests was kept at $p < 0.05$. Subsequently, the results obtained were analyzed and discussed in conjunction with the theoretical framework, in order to meet the objective of this study.

Results

The sample consisted of 2,033 municipalities, thus, no subject was excluded from the analysis. Of the total number of municipalities, 49 belong to category 1 (2.41%), 274 to category 2 (13.48%), 303 to category 3 (14.90%), 650 to category 4 (31.97%) and 757 to category 5 (37.24%). The distribution is illustrated in Figure 1.
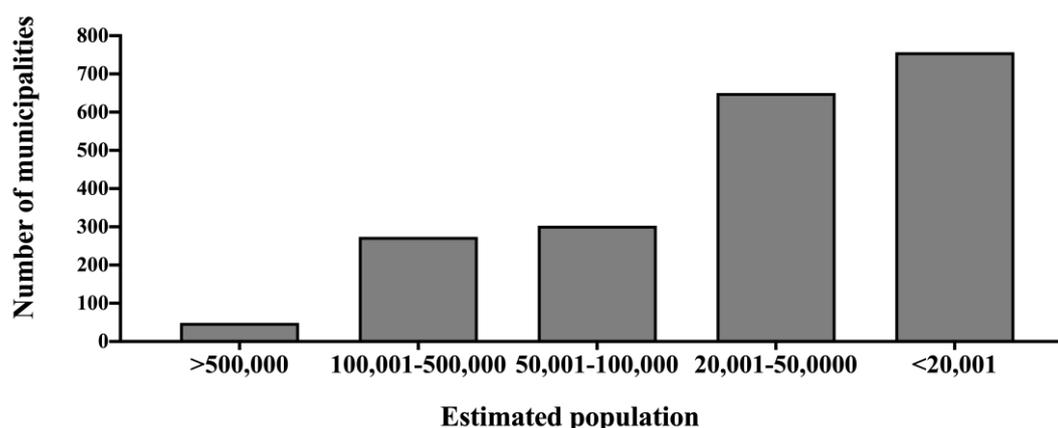

Figure 1. Distribution of municipalities according to population size
Source: authors

Most municipalities in the sample (37.24%) had a population of less than 20,001 inhabitants. It is noteworthy that, despite being smaller in number, municipalities with a population greater than 500,000 inhabitants concentrate 31.89% of the Brazilian population, while municipalities in category 4 (20,001 - 50,000) and category 5 (<20,001) together represent 30.99% population.

When observing the distribution of grants by the respective categories of municipalities,

the distribution logic appears inverted, considering that municipalities with a population greater than 500,000 inhabitants had the highest number of grants (Figure 2).
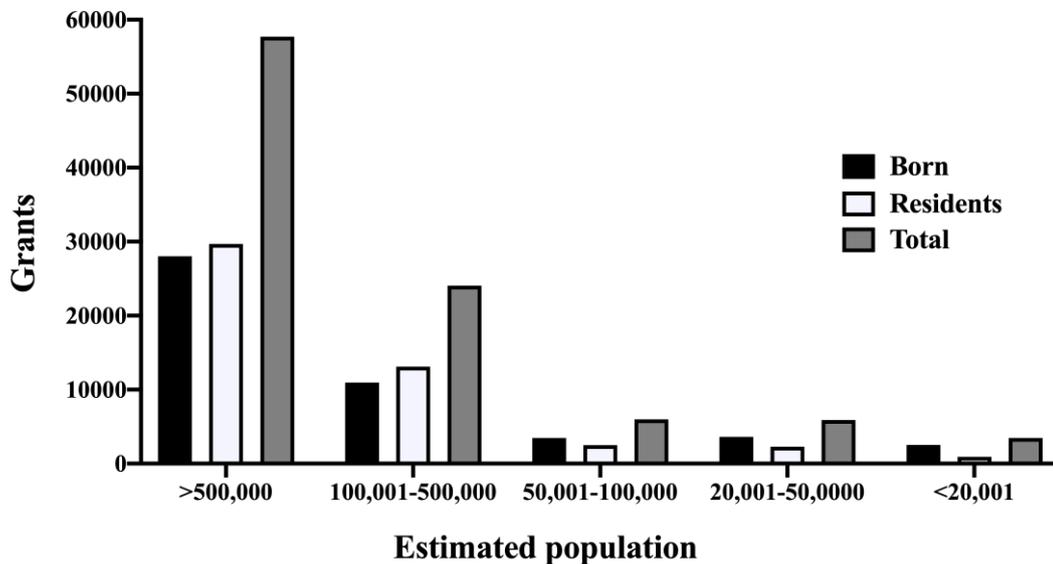
Figure 2. Distribution of grants according to population size
Note: The total number of grants from athletes born in this period was 48,616. Regarding the number of grants distributed to residents, the total was 48,515 (due to the absence of the place of residence of some grants, some grants were not identified). Source: research data
Source: authors

To determine whether there is an effect of the estimated population on the total number of total grants of athletes born and living in the municipalities, the Kruskal-Wallis test for independent samples was applied. Through the test, it can be verified that there was an effect of the estimated population groups on the total number of grants [$X2(4) = 789.152$; $p < 0.001$], grants of born [$X2(4) = 620.309$; $p < 0.001$] and residents [$X2(4) = 728.588$; $p < 0.001$].

Subsequently, to identify which groups there were differences, post hoc tests were applied with pairwise comparisons using the Mann-Whitney U test (with Bonferroni correction), followed by the calculation of the effect size (Cohen's d) (Table 1).

Table 1. Post hoc tests with pairwise comparisons between different population sizes.

| Groups[a]	Total grants			
Group 1 – Group 2	U	z	p*	d
Categoria 5 - Category 4	213,692	6,837	0.000**	0.18
Category 5 - Category 3	580,236	14,602	0.000**	0.48
Category 5 - Category 2	977,432	23,718	0.000**	0.73***
Category 5 - Category 1	1287,078	14,938	0.000**	0.53***
Category 4 - Category 3	366,544	9,015	0.000**	0.37
Category 4 - Category 2	763,739	18,140	0.000**	0.59***
Category 4 - Category 1	1073,386	12,396	0.000**	0.46
Category 3 - Category 2	397,196	8,151	0.000**	0.33
Category 3 - Category 1	706,842	7,854	0.000**	0.41
Category 2 - Category 1	309,646	3,415	0.006	0.19

Note: [a]Category 1 (municipalities with population> 500,000); Category 2 (100,001 – 500,000); Category 3 (50,001 – 100,000); Category 4 (20,001 – 50,000); Category 5 (<20,001). *Significance values were adjusted by Bonferroni correction for multiple tests. ** Statistically significant differences. *** Moderate effect (Cohen's d)
Source: authors

A moderate effect was detected between municipalities with a population of $0 - 20,001$

and municipalities with a population greater than 500,000 inhabitants (d=0.53), in addition to the moderate effect between municipalities with a population between 100,001 – 500,000 inhabitants and others two categories of population, being 0 – 20,001 (d=0.73) and 20,001 – 50,000 inhabitants (d=0.59). Thus, the Kruskal-Wallis and Mann-Whitney U tests evidenced an effect of the size of municipalities on getting grants, especially when comparing municipalities with more inhabitants in relation to those with less.

Of the total grants distributed, about 3.7% were base grants, 5.1% were student grants, 63.2% were national grants, 19.7% were international grants, 4.5% were Olympic/Paralympic grants and only 3.6% were podium grants2. It can be seen that about 41.6% migrated from one municipality to another during their sports career. To verify which sizes of municipalities had the highest number of migrations, the following distribution was analyzed in the Figure 3.

Grants of athletes who migrated
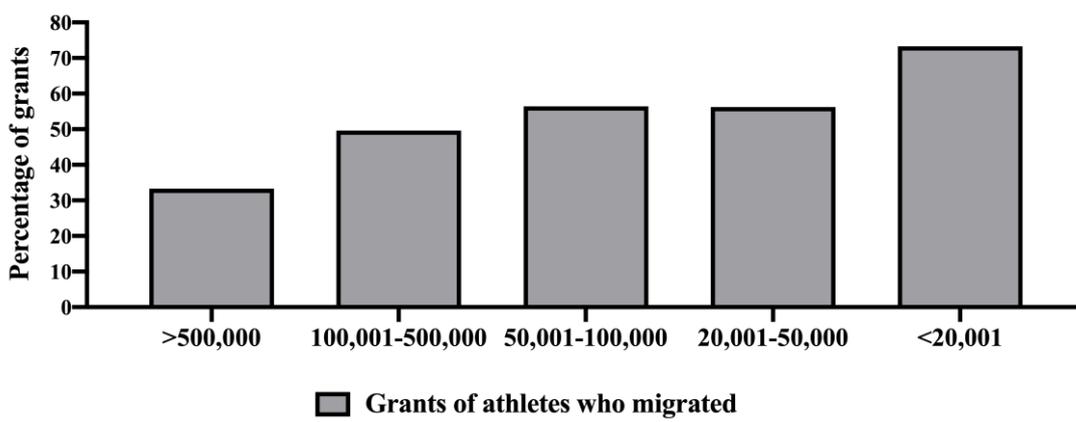
Figure 3. Distribution of the relative frequency of grants of athletes who migrated according to the municipality size
Source: authors

Most of the grants from athletes who have already migrated in their career belong to smaller municipalities. The Figure 4 shows the distribution of the relative frequencies of grants of athletes who performed the migration according to the grant category.

Grants of athletes who migrated
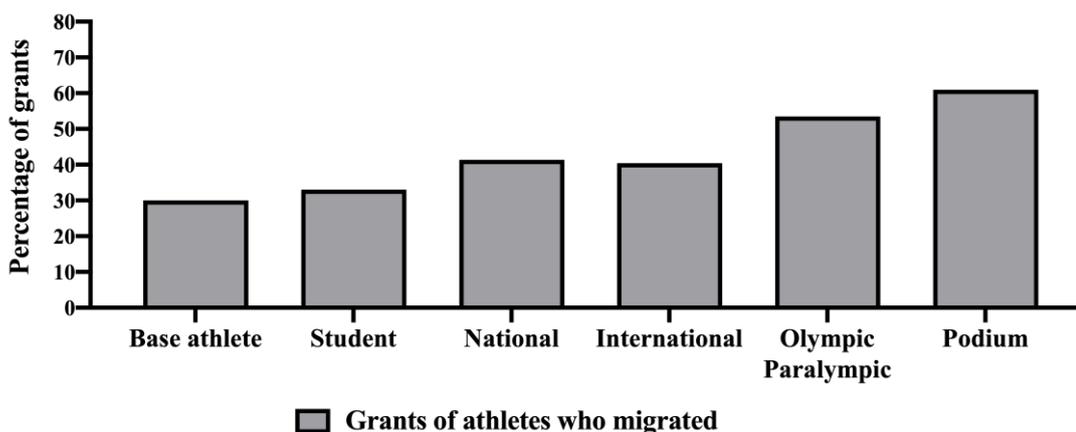
Figure 4. Distribution of the relative frequency of grants of athletes who migrated according to the grant category
Source: authors

As the program's grant category progresses, the percentage of athletes who migrated in their sports career increases. In order to verify whether the population size of the municipalities influences the type of grant gained by athletes, Spearman's rho (ρ) and Ordinal Logistic

Regression tests were performed. The correlation test indicated a positive and significant correlation between the municipality's population size categories and the grant categories (r=0.46, p<0.01), showing the existence of an association between the two variables. Data referring to the estimates of parameters of the Ordinal Logistic Regression test are listed below (Table 2).

Table 2. Ordinal Logistic Regression

Parameter Estimates

Variables	*B*	Standard error	*Wald*	*p*	I.C 95%ᵃ
Base	-3.355	.020	28370.620	.000	(.034) – (.036)
Student	-2.450	.016	24702.490	.000	(.084) – (.089)
National	.825	.012	4358.331	.000	(2.226) – (2.338)
International	2.298	.016	21963.236	.000	(9.652) – (10.258)
Olympic/Paralimpic	3.149	.020	25060.640	.000	(22.429) – (24.251)
Municipality Category	-.077	.006	157.711	.000*	(.914) – (.937)

Note: *Statistically significant association between the response variable and the term
Source: authors

Through the test, for each increase of one unit in the municipality size category, there is an expected decrease (of a certain amount) in the chances of falling to a higher level of grant (B=-0.077) - in this study, the higher the municipality size category, the smaller the population, for example: category 1 includes municipalities with a population greater than 500,000 inhabitants and category 5 includes municipalities with less than 20,001 inhabitants. Thus, it can be said that the lower the population scores, there is a lower probability of being in a higher level of grant.

To identify whether there are other associations between the characteristics of the municipalities and grants through the Brazilian public sports policy Bolsa-Atleta, Spearman's rho (ρ) test was applied to check for correlations between the number of grants obtained and the population size, the human development index and the investments in sports by the municipalities (Table 3).

Table 3. Correlations between number of grants and population, HDI and investment in ports

	Total grants of born	Total grants of resident	Total grants
Estimated population	.537**	.557**	.603**
Demographic density	.343**	.565**	.479**
Investment in sports	.457**	.550**	.551**
Human development index	.396**	.516**	.484**

Note: p<.050; **p<.001.
Source: authors

Through the test, the correlation between the number of grants from athletes born and residing in the municipalities and the estimated population (r=0.603), demographic density (r=0.479), amount of investment in sports (r =0.551) and human development index (r=0.484) was positive and significant, being higher when observing the results from residents, compared to born athletes.

Discussion

Studies related to the interference of the athletes' birthplace in achieving expressive sports results are still relatively poorly explored, especially if considering that the environmental variable can be significant for sports performance [10,11,12]. In addition to focusing on the place of birth of the athletes, this study also sought to use the place of residence of the athletes present in the sample, which enabled the opening of a different front from the commonly found studies, considering that it is possible to diagnose the movements carried out during the period analyzed.

The analyses carried out in this study revealed that although most of the sample is municipalities with smaller populations, it is the most populous municipalities that had the highest number of grants and, furthermore, it can be seen that the municipality size influences the number and the grant level obtained. This finding corroborates Sentone et al.[11], Caetano et al.[10] and Tozetto et al.[25], about the place of birth and the size of municipalities having associations with the observed sporting results. Nevertheless, it differs from what was evidenced in previous studies, such as the studies by Côté et al.[12] and MacDonald et al.[26] by stating that smaller cities have the greatest advantage, compared to larger ones on athlete development.

A possible reason for this divergence is the fact that studies usually addressing the impacts of the municipality size are more suitable for analysis in high-level athletes[27]. In this regard, it should be noted that a large part of the sample in this study refers to national grants and not just the highest grants in the program (Podium and Olympic). The larger municipalities represent the largest population portion of the sample and the most populous municipalities may have the largest number of sports practitioners, contributing to the highest number of grant possibilities - above all, national grants, which correspond to 62.1% of the total grants distributed by the Program and 63.54% of the sample used in this study. Nevertheless, even considering the fact that, in order to obtain an incentive grant, athletes must present good sporting results in the year prior to the contemplation, the sample of this analysis is not limited to high-level Brazilian athletes. This can be corroborated by Camargo[28] when pointing out that the Bolsa-Atleta Program presents characteristics of a policy focused on social well-being and not necessarily entirely on high-performance sport per se.

Some findings highlighted here reinforce what was pointed out by Sentone et al.[11], about the fact that there is a specificity in each country, municipality and modality, influencing the inference of the "ideal" size of municipalities for the sports development. Therefore, the influence of specificities of the sample on the results found is noted. In addition to having observed that population size categories influence the number of grants obtained by municipalities, it was evident that the size of municipalities also influences the type of grant obtained by athletes, demonstrating that the smaller the population size, the smaller the chance to obtain a higher grant level, such as the Podium Grant.

In this regard, it is assumed that the largest municipalities tend to have the best sports structures, a fact evidenced by Côté et al.[12]. Such structures end up helping athletes to obtain good sporting results and, consequently, the highest grant categories. This is corroborated by the fact that the variables of investment in sports and the human development index of the municipalities have shown associations with the number of grants obtained by both born and resident athletes. Previous studies demonstrate that the human development index of a location influences the achievement of sporting results[11,29]. When observing a higher correlation between these variables and the grants obtained by residents, it can be assumed that, at times, there may be a tendency on the part of athletes to live in larger cities, which have greater investment in sports and high human development indices, as they are looking for better training conditions.

However, the fact that most of the athletes did not change from one municipality to another during the years analyzed shows the importance of all municipalities providing

incentives to sports, especially given that many practitioners do not migrate during their career. When considering this fact, one can see the importance of different municipalities offering the greatest number of sports activities to their citizens, whether through schools or other proposals, especially considering that from this initial knowledge and the minimum conditions for sports practice, the design of actions and – in the future – migrations, can be carried out more efficiently.

A possible factor related to this issue arises from the difficulties an athlete may face when migrating from one place to another[30, 31], such as possible adaptation difficulties[32], social and economic challenges[17], or even the power struggles involved between athletes, administrators and sports agents in general, which involve economic, political, geographic factors, among others[16].

It is also necessary to point out that most of the grants analyzed (59.43%) are for athletes who were born or reside in municipalities with more than 500 thousand inhabitants, which lowers the need to move to possibly more developed centers, as they already have available the necessary structures.

The present study brings relevant findings for the theme in question, however, the fact of not measuring and presenting the data according to the sports modalities can be characterized as a limitation, considering that in this way the specificity of the analysis would be enhanced according to each reality. With this, paths are opened to investigate what leads athletes to migrate from the city and still seek to understand the relationship between the training of athletes in smaller municipalities with the possible displacement to larger and more developed centers. This interesting point is left open for future investigations.

Final Considerations

The present study aimed to verify, from the example of the Brazilian sports public policy Bolsa-Atleta, whether the size of municipalities in which Brazilian high-performance athletes are born or live influences the obtainment of subsidy from the federal government, in addition to pointing out whether factors such as human development indices, demographic density and investment in sports also have influence.

Through the execution of the study, it can be stated that the municipality size influences the number and level of grants obtained, demonstrating that the smaller the population size, the lower the chance of obtaining a higher level of grants, such as the Podium Grant. Moreover, it can be noted that factors such as human development index, demographic density and investment in sports influence the acquisition of grants by athletes, especially by resident athletes.

Data presented demonstrate a relationship between the number of grants by size of the municipality, and it is understandable that larger municipalities have a greater number of grants, due to the fact that they represent a greater range of the population, or they are municipalities that athletes seek when they decide to carry out a sports migration. It is understood that this study can serve as a point of comparison in specific studies that have reduced samples on the same topic, enabling the raising of other questions to be answered, such as the reasons that influence athletes' relocations.

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