HEALTH CONDITION PERFORMANCE INDEX OF TWO CITIES IN THE BRAZIL/BOLIVIA BORDER REGION

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Carlos Alberto Paraguassú-Chaves
PhD in Health Sciences - University of Brasília - UnB, Brazil; PhD in Science - University of Havana (Cuba); Post-Doctor in Health Sciences - UnB and Degli Studi D'Aquila University - IT. Professor at the Federal University of Rondônia, Brazil

Fábio Robson Casara Cavalcante
PhD and researcher linked to the graduate program in administration and the academic Department of Social and Environmental Sciences (DACSA) - Federal University of Rondônia, Brazil

Fabrício Moraes de Almeida
PhD in Physics (UFC), with post-doctorate in Scientific Regional Development (DCR/CNPq). Researcher of the Doctoral and Master Program in Regional Development and Environment (PGDRA/UNIR). Leader — Technological and Systemic Development, and Researcher of GEITEC — Federal University of Rondonia, Brazil

Dorosnil Alves Moreira
PhD in Education (Curriculum) from the Pontifical Catholic University of São Paulo. Professor at the Federal University of Rondônia, Brazil

ABSTRACT: The general objective of this study is to analyze the Health Conditions Performance Index in two border cities, seeking to identify the efficiency, efficacy and effectiveness of public health policies in the border region between Brazil and Bolivia. Factor analysis was used to create the health index based on the correlation of environmental, sociodemographic and administrative financial indexes. The tool for tabulating and generating the indices was SPSS. All indices performed bad, with no improvement over a period corresponding to 10 years. It is concluded that the cities of Guajará-Mirim and Guayaramerín face great difficulties to provide and guarantee complete environmental, social and economic well-being. Therefore, it is imperative that border municipalities develop specific public policies to promote, protect and recover the health of the population.

KEYWORDS: Health conditions. Performance Index. Brazil/Bolivia. border region.

INTRODUCTION

The Brazilian city included in this study, located on the border of Brazil, has had great difficulty in providing its citizens with comprehensive health care. The lack of specialized human resources, the insufficiency of equipment to perform medium and high complexity procedures, and the distance between the municipality and the reference centers are the main justifications presented. In addition, the difficulty in planning the provision of these policies, due to the floating population that uses the system and which, in the Brazilian case, is not accounted for in the financial transfers of the Unified Health System (SUS), has been generating several difficulties whose main victim is the border citizen. In the case of the Bolivian city, the situation is much more complicated, due to the absence of a public health policy, in the format of the SUS model in Brazil. The authors Gadelha and Costa [1] analyze the health situation at the border and corroborate the statements pointing out the difficulties of providing comprehensive health care to this population. And, that the health system interferes in the economic, financial and political-administrative development of society in its fullness.

The aim of this research is to investigate the political and institutional situation in relation to health care in the border region. These areas are marked by the interaction and separation of cultures, economies and environments, which motivates the analysis of the way in which health systems respond to these complexities.

Thus, when one observes the scenario of the cities of Guajará-Mirim (Brazil) and Guayaramirín (Bolivia), separated by the Mamoré River in the Western Amazon region, from the perspective of public health services, it becomes evident that the performance of the sector presents significant variations between them. The question then arises: do these disparities reflect isolated cases or do they represent a common pattern of performance in border areas? The general objective of this study is to analyze the Health Condition Performance Index in these locations, seeking to identify the efficiency, efficacy and effectiveness of public health policies in the border region between Brazil and Bolivia.

In order to deepen the understanding of the research problem, we resorted to fundamental terms and concepts to understand the formulation of the Health Condition Development Index, especially the information system. According to Maranhão [2], this type of research encompasses four distinct phases: the collection of raw data, followed by the processing of these data, known as “processed data”; next, the formulation of indicators; and, finally, tabulation in indexes.

According to RIPSA [3], indicators are synthetic measures that encompass relevant information on specific attributes and dimensions of health status, as well as on the performance of the health system. For Brazil [4], indicators are metrics that offer insights into the performance of an object (be it government, policy, program, organization, project, etc.), aiming at control, communication, and improvement.

The formulation of an indicator begins with the collection of raw data, which is then processed and associated with other existing ones, producing information that connects the scientific basis with reality, guiding sustainable decisions and generating knowledge - a long and laborious journey.

This is what Maranhão [2] calls the three basic functions of indicators – quantification, simplification of information and communication. Soligo [5] states that it constitutes a contribution of great utility and considerable acceptability when making use of a series of indicators in the planning and execution of public policies.

According to Brazil [4], the role of the indicator includes, among other aspects: - Measuring results and managing performance. – Subsidize the critical analysis of the results obtained and the decision-making process. – Contribute to the continuous improvement of organizational processes. – Facilitate performance planning and control. – Enable the comparative analysis of the performance of the organization and other organizations operating in similar areas or environments. For its part, OPAS [6] emphasizes that indicators are powerful tools to assist in the planning of public policies, by providing data on social, economic, political, environmental, and health realities. The table below highlights the roles of the indicators.

The complexity underlying the theme leads us to reflect on the very concept of health. As observed by the author Praça [7], conceptualizing health represents a challenging task, given its multidisciplinary nature that encompasses several fields of knowledge, such as social, economic, political, cultural and human.

In addition, this conceptualization varies according to the temporal, geographical, and socioeconomic context, and is influenced by individual values, scientific, religious, and philosophical conceptions, as pointed out by Scliar [8]. Capra [9] adds that health is the result of the dynamic balance between the physical and psychological aspects of the organism, as well as interactions with the natural and social environment. The definition of the World Health Organization (WHO) goes beyond the mere absence of disease, encompassing the state of complete physical, mental and social well-being [10].

According to the WHO's conception, the fields of health, idealized by Marc Lalonde in 1974, as described by Grisotto [11], include human biology, which encompasses genetic inheritance and the biological processes inherent to life, including aging factors; the environment; lifestyle; and the organization of health care.

The breadth of this concept of health demands a change in the organization and delivery of health services. It is not only a matter of considering the biological causes of disease, but also the social causes, such as hunger, lack of basic sanitation, inadequate housing, lack of access to education, unemployment, violence, environmental degradation, income inequality, among other conditions that are essential for a healthy and productive life [12].

The cities that make up the border region studied are: Guajará-Mirim, in the State of Rondônia, Brazil, and Guayaramirín, in the Department of Beni, in the Republic of Bolivia. Both municipalities have a population ranging from 40 to 45 thousand inhabitants.

METHOD

This research is characterized as exploratory, following three distinct phases. In the first stage, we conducted a comprehensive bibliographic survey of the concepts, principles and norms pertinent to the theme. In the second stage of the research, we focused on gathering information on health conditions, which include material resources, human resources, availability of medium and high complexity care, as well as basic care. In addition, we also collected quantitative data on the population of the cities of Guajará-Mirim and Guayramerín.

To conclude, we developed the Health Condition Performance Index (SDI), which is derived from the analysis of informational data collected over a 10-year period. This index results from the correlation between environmental, sociodemographic, and financial-administrative indicators, aiming to evaluate the efficacy, efficiency, and effectiveness of health conditions in the two cities located on the border between Brazil and Bolivia.

The tool adopted for tabulation and generation of the indices was the SPSS (Statistical Package for the Social Sciences), according to Santana [13]; [14]; Cavalcante [15].

A factor analysis model can be presented in matrix form as in Dillon; Goldstein [16] to:

$$x = aF + \varepsilon$$

Being

X = is the transposed p-dimensional vector of the observable variables, denoted by X = (x1, x2,..., xp);

F = is the q-dimensional transposed vector of unobservable variables or latent variables called common factors, denoted by F = (f1, f2,..., fq), where q < p;

ε = is the p-dimensional vector transposed from random variables or single factors, denoted by ε = (e1, e2,..., ep);

α = is the matrix (p,q) of unknown constants, called factor loadings.

According to Gama et al. [17], in the factor analysis model, it is assumed that the specific factors are orthogonal to each other with all the common factors. Normally, E (ε) = E (F) = 0 and Cov (ε, F) = 0.

The initial structure used to determine the matrix of factor loadings, in general, may not provide a significant pattern of variable loadings, so it is not definitive. The confirmation or not of this initial structure can be done by means of various methods of factor rotation, according to Dillon; Godstein [16]; Johnson; Wichern [18].

The VARIMAX method is a process in which the reference axes of the factors are rotated around the origin until some other position is reached. The goal is to redistribute the variance from the first factors to the others and achieve a simpler and theoretically more significant factorial pattern [19]; [20]; [14]; [17].

The choice of factors was performed using the latent root technique. Thus, the matrix of factor loadings, which measures the correlation between common factors and observable variables, is determined by means of the correlation matrix, according to Dillon; Goldstein [16].

To determine the Performance Indexes, the matrix of factorial scores estimated by the process of orthogonal rotation of factorial basis was adopted, as pointed out by Santana [14]. The factor score, by definition, places each observation in the space of common factors. For each fj factor, the i-th factorial score extracted is defined by Fij, expressed as follows [16]:

$$F_{IJ} = b_1 x_{i1} + b_2 x_{i2} + b_p x_{ip}$$

Whereas:

bi = These are the regression coefficients estimated for the n common factor scores;

xij = These are the n observations of the p observable variables.

i = 1.2,...,n.

j = 1.2,...,p.

To arrive at the equation that represents the Performance Index, Gama et al. [17]; Santana [13]; [14], show the evolutionary sequence of the formulas from the previous equation. Thus, it can be seen that although the Fij variable is not observable, it can be estimated by means of factor analysis techniques, using the matrix of observations of the vector x of observable variables. In factorial notation, the equation becomes:

$$F_{(n,q)} = X_{(n,q)} b_{(p,q)}$$

In equation 3, F is the regression matrix estimated from the n factor scores, which can be affected by both the magnitude and the units of measurement of the x variables. To overcome this type of problem, the variable x is replaced by the standardized variable w, given by the ratio between the deviation around the mean and the standard deviation of x, as follows:

$$W_{ij} =$$

With these values, equation 3 is modified, making possible equation 4, as follows:

$$F_{(n,q)} = w_{(n,q)} \beta_{(p,q)}$$

Based on equation 4, the matrix of beta weights (β) with q standardized regression coefficients replaces b, given that the variables are standardized on both sides of the equation. Pre-multiplying both sides of equation 4 by the value w', where n is the number of observations and w' is the transposed matrix of w, makes it possible to arrive at the following equation.

$$\frac{1}{k} w'_{(p,n)} w_{(n,p)} \beta_{(p,q)} = R_{(P,P)} \beta_{(p,q)}$$

The 1/Kw'w matrix, therefore, constitutes the matrix of inter-correlated variables or correlation matrix between the observations of the X matrix, designated by R. The 1/k w^' F matrix represents the correlation between the factor scores and the factors themselves, denoted by Λ.

If the matrix R is non-singular, one can pre-multiply both sides of equation 6 by the inverse of R, getting:

$$\beta = R^{-1} \Lambda$$

Substituting the vector in equation 4 yields the factorial score associated with each observation, as follows:

$$F_{(n,q)} = w_{(n,p)} R^{-1}_{(p,p)} \Lambda_{(p,q)}$$

Thus, the main formula of the Performance Index (DI) is reached, where the DI is defined as a linear combination of these factor scores and the proportion of variance explained by each factor in relation to the common variance. The mathematical expression is now represented by the following formula:

$$ID_i = \Sigma_{j=1}^{a} \left(\frac{\lambda_j}{\Sigma_j \lambda_j} FP_{ij} \right)$$

Where

i = 1.2,..., n.

λ = is the variance explained by each factor;

Σ λ = is the sum total of the variance explained by the set of common factors. The factorial score was standardized (PF) to obtain positive values of the original scores and to allow the hierarchization of the municipalities, since the values of the Performance Index are located between zero and one. The formula that allows this hierarchy can be seen by the following equation:

$$FP_i = \left(\frac{F_i - F_{min}}{F_{max} - F_{min}} \right)$$

Thus, it can be seen that F_min and F_max are the maximum and minimum values observed for the factor scores associated with the performance of each parameter analyzed by the research.

The indices are analyzed on a scale of 0.000 to 1.000, dispersed in five variables, demonstrating the performance of each city in the study area.

Index Scale:

0.000 to 0.200 (lousy performance)

0.201 to 0.400 (bad performance)

0.401 to 0.600 (regular performance)

0.601 to 0.800 (good performance)

0.801 to 1.000 (excellent performance).

RESULTS AND DISCUSSION

Environmental Performance Index (ADI)

Environmental analysis is the starting point of this study, aiming to organize information on basic sanitation, including water distribution, waste collection and sewage treatment. The construction of the Environmental Performance Index (ADI) is carried out through the combination of the following indicators: 1. Household access to drinking water. 2. Household waste collection. 3. Sanitary sewage system in households.

Environmental Performance Index of the City of Guajará-Mirim/Brazil

In the period in question, Guajará-Mirim has about 93% of its territory occupied by Conservation Units and Indigenous Lands. However, it faces significant challenges in the provision of health-related environmental services, as it performs very poorly according to the scale of analysis. The protection and promotion of individual and collective health in the environmental sphere are considered inefficient. Water distribution, waste collection and sewage treatment services are insufficient to meet local demand. Over the course of a decade, it has been found that there has been little or no improvement, indicating that environmental services remain precarious.

City	Reference year	10 years later	Current Table of Contents
Guajará-Mirim	0,255	0,230	Bad

Table 1: Environmental Development Index of the City of Guajará-Mirim

Source: Survey data

Environmental Performance Index of the City of Guayaramerín/Bolivia

The Environmental Performance Index of the city of Guayaramerín shows a poor performance of 0.248 in the first moment and a bad performance of 0.266 in the second moment. Territorial spaces provide their citizens with environmental and sanitary services of compromised quality, considered by the classification scale as bad.

City	Reference year	10 years later	Current Table of Contents
Guayaramerín	0,248	0,266	Bad

Table 2: Environmental Development Index of the City of Guayaramerín

Source: Survey data

Barata [21] highlights a sad and worrisome reality in the cities of Guajará-Mirim and Guayaramerin. The sanitary sewage system is practically non-existent. Sewage treatment is carried out only by black or septic tanks, or irregularly in the streams that cross the urban area, which seriously compromises the quality of local water resources. The garbage is collected and dumped in a dump without receiving any kind of treatment. Only in certain situations is contaminated medical waste incinerated, while the rest is dumped in the dump. According to research conducted by Barata [21], the proportion of households with access to the general network of treated water is still very low. The author also points out the absence of a sanitary sewage collection network in these locations. The lack of basic sanitation can result in serious public health problems, since water pollution can trigger diseases such as dysentery, dengue, yellow fever, leptospirosis, hepatitis A, among others. Another consequence of the lack of sanitation is related to environmental damage, such as floods, silting of rivers (resulting from deforestation and occupation of banks), loss of green areas, landslides and compromise of water bodies, which become garbage dumps and sewage channels. This reality is also observed in many cities, both Brazilian and Bolivian [22].

Basic sanitation plans play a crucial role, as they serve as tools for diagnosing the local situation and establishing priorities for investments and actions in the short, medium and long term. Azevedo [23], when examining the conditions and quality of life in reorganized areas, had already alerted us to the socio-environmental disparities in Amazonian cities, especially in relation to the deficiency in the supply of water for the population's consumption, the collection and proper disposal of solid waste, and, especially, basic sanitation. Paraguassú-Chaves [24], in their research entitled "Culture, Leisure and Health: A generalized (Dis)organization - a case study in Rondônia", and Paraguassú-Chaves [25], in "Social Inclusion in the Border Region", demonstrated that the municipalities located on the Brazil/Bolivia border, in this region of the Western Amazon, face extremely negative scenarios, characterized by a significant precariousness in water supply. In addition to garbage collection and sanitary sewage treatment. The data found in these studies only corroborate the analysis carried out by Paraguassú-Chaves [26] in the study "Conditions and Quality of Life in Reorganized Space". Machado [27] observes that environmental indicators, both quantitative and perceptual, are fundamental for the study of environmental performance.

Socioeconomic and Demographic Performance Index (SDI)

The second phase for the elaboration of the Health Performance Index is the Sociodemographic Performance Index (SDI), which provides essential information about society. The construction of the IDSD involves the combination of the following indicators: Illiteracy rate, Life expectancy at birth, Gini index of per capita household income, Expected years of study, Percentage of the population living in poverty, Average household income per capita and Unemployment rate.

Socioeconomic and Demographic Performance Index of the City of Guajará-Mirim

In the reference year, the city of Guajará-Mirim recorded a sociodemographic performance index of 0.344, indicating a poor performance. Ten years later, this index increased to 0.415, reflecting a performance considered regular. However, the number of functionally illiterate and unemployed people is still high, which highlights the lack of promotion of social rights to education and minimum income for subsistence. This demonstrates the ineffectiveness of consistent and effective public policies.

City	Reference year	10 years later	Current Table of Contents
Guajará-Mirim	0.344	0.415	Regular

Table 3: Socioeconomic and Demographic Performance Index of the City of Guajará-Mirim

Source: Survey data

Sociodemographic Performance Index of the City of Guayaramerín

The city of Guayaramerín has a Sociodemographic Performance Index (SDI) of 0.345 (indicating poor performance) and 0.379 (also considered poor), revealing the lack of satisfactory socioeconomic public policies that are adequate to local needs. It is essential to improve the process of promoting social welfare, ensuring better living conditions, such as access to a stable income, quality education, and reduction of unemployment rates, among other important variables.

City	Reference year	10 years later	Current Table of Contents
Guayaramerín	0.345	0.379	Bad

Table 4: Sociodemographic Performance Index of the City of Guayaramerín

Source: Survey data

Financial and Administrative Performance Index (IDFA)

The main objective of this index is to quantify the material, financial and human resources of health services, in order to determine whether the existing resources are sufficient to enable an effective, efficient and effective health recovery process. The formulation of the Administrative Financial Performance Index (IDFA) involves the combination of indicators, with Indicator 1 being the percentage of public expenditure on health in relation to total public expenditure. Indicator 2: Public expenditure on health per capita. Indicator 3: Number of surgeons (per 1000 inhabitants). Indicator 4: Number of general practitioners (per thousand inhabitants). Indicator 5: Number of nurses (per thousand inhabitants). Indicator 6: Number of obstetrician-gynecologists (per thousand inhabitants). Indicator 7: Number of hospital beds (per thousand inhabitants). Indicator 8: Number of dentists (per thousand inhabitants). Indicator 9: Number of mammographs (per thousand inhabitants). Indicator 10: Number of X-ray machines (per thousand inhabitants). Indicator 11: Number of CT scanners (per thousand inhabitants). Indicator 12: Number of MRI machines (per thousand inhabitants). Indicator 13: Number of ultrasound machines (per thousand inhabitants). Indicator 14: Number of dental equipment (per thousand inhabitants).

Administrative Financial Performance Index of the City of Guajará-Mirim

The financial and administrative resources allocated to health are not adequate to local needs, demanding greater investments and public policies aimed at the recovery of health. The situation is alarming, as the material, human and financial resources for health are insufficient, inadequate and ineffective in the process of recovering the health of the citizens of Guajará-Mirim.

The city of Guajará-Mirim has an Administrative Financial Performance Index (IDFA) of 0.347 (indicating a poor performance) and currently maintains this performance with an IDFA of 0.368. Therefore, public policies aimed at health recovery are ineffective, since they do not have sufficient material and human resources to meet the needs of the local population.

City	Reference year	10 years later	Current Table of Contents
Guajará-Mirim	0.347	0.368	Bad

Table 5: Administrative Financial Performance Index of the City of Guajará-Mirim

Source: Survey data

Administrative Financial Performance Index of the City of Guayaramerín

The city of Guayaramerín has underperformed. This indicates that the health recovery system does not adequately meet the needs of society, demanding greater and better financial, material, administrative and human resources. Initially, in the reference year of the survey, the Administrative Financial Performance Index (IDFA) presented an index of 0.335. Ten years later, the index remains unsatisfactory, remaining at 0.388. This evidences a persistence in the inadequacy of the resources allocated to the health system, which have not been able to promote significant improvements over time.

City	Reference year	10 years later	Current Table of Contents
Guayaramerín	0.335	0.388	Bad

Table 6: Administrative Financial Performance Index of the City of Guayaramerín

Source: Survey data

The Administrative Financial Performance Index (IDFA) reveals that the two border cities analyzed need more effective health recovery policies. It is clear that the material, financial and human resources currently available are insufficient to fully guarantee the right to health of border citizens. More robust and targeted measures are essential to address the challenges and improve the quality of health services in these regions.

Health Condition Performance Index (CDI)

The balance between environmental, social and economic knowledge of health constitutes the instrumental basis of the process of elaboration of the Health Condition Performance Index. This is accomplished through a holistic and systematic view of problems, solutions and possibilities, as proposed by Capra (1982). The process of formulating the CDI involves the integration of environmental, socioeconomic and demographic, financial and administrative performance indices. Thus, the CDI is composed of the IDA (Environmental), IDSD (Sociodemographic) and IDFA (Financial and Administrative) indexes. The objective of the CDI is to provide essential information for the process of formulating public health policies in the border region. This comprehensive approach allows for a more complete understanding of the needs and challenges faced in this particular context, making it possible to implement more effective and targeted measures.

Health Condition Performance Index of the City of Guajará-Mirim

In the city of Guajará-Mirim, in the two research periods, respectively, it presented an IDCS of 0.315 (bad performance) and an CDI of 0.337 (bad performance).

City	Reference year	10 years later	Current Table of Contents
Guajará-Mirim	0,315	0,337	Bad

Table 7: Health Condition Performance Index of the City of Guajará-Mirim

Source: Survey data

Health Condition Performance Index of the City of Guayaramerín

The city of Guayaramerín has an CDI of 0.309 (bad performance) in the reference year and currently an IDCS of 0.344 (bad performance).

City	Reference year	10 years later	Current Table of Contents
Guayaramerín	0,309	0,344	Bad

Table 8: Health Condition Performance Index of the City of Guayaramerín

Source: Survey data

Medical or health care services were investigated by the author Paraguassu-Chaves [28]. In this research, the author sought to identify, from the perspective of health geography, the distribution and planning of infrastructure and human resources elements in the health care system.

In the analysis carried out by Paraguassu-Chaves [28], public health services have, throughout the historical process, only partially achieved their objectives. This author examines the elements that make up the health system through several indicators. Among them, the following stand out: human resources in the area of health, including training, professional experience, territorial and spatial distribution of professionals, legal attributions and competences; technological equipment and materials, considering real applications and needs; territorial and spatial distribution of health units; and hospital beds in public and private institutions, among other relevant aspects.

In its thematic maps, Paraguassu-Chaves [28] highlights the fragility of the human and infrastructural resources of the health system. Moret and Guerra [53] highlight the insufficiency of financial resources, specialized human resources, and equipment, along with the unequal distribution of these components in public health, resulting in the chaos that medical and health care services for the general population have become. According to Moret and Guerra [29], the population needs at least twice as many health units as the existing ones. These authors warn of the worsening of the pent-up demand in health, considering the shortage of doctors, specialist doctors, basic and specialized clinics, medical teams, hospital beds, equipment, devices and materials for medical use. They point out that these are urgent needs that require effective solutions.

According to Toda [30], the distribution of public health units presents significant inequalities, with areas lacking concentrated care [30]. According to Paraguassú-Chaves [28], the geographical distribution of health units is mainly influenced by political criteria and interests. As a result, the unequal distribution of state health services leads to a large influx of users seeking care far from their homes. In addition, medium and high complexity services are still bottlenecks in the medical care system.

There are still many barriers to access in outpatient and hospital services. Among these barriers, the unavailability of basic and specialized services to the majority of the population stands out, in addition to the geographical distribution of health units.

The following indicators were studied in the municipalities that make up the Brazil/Bolivia border by several authors: 1. Percentage of public expenditure on health in relation to total public expenditure. 2. Public spending on health per capita. 3. Number of surgeons (per 1000 inhabitants). 4. Number of general practitioners (per thousand inhabitants). 5. Number of nurses (per thousand inhabitants). 6. Number of obstetrician-gynecologists (per thousand inhabitants). 7. Number of hospital beds (per thousand inhabitants). 8. Number of dentists (per thousand inhabitants). 9. Number of mammographs (per thousand inhabitants). 10. Number of X-ray machines (per thousand inhabitants). 11. Number of CT scanners (per thousand inhabitants). 12. Number of magnetic resonance imaging machines (per thousand inhabitants). 13. Number of ultrasounds (per thousand inhabitants). 14. Number of dental equipment (per thousand inhabitants).

These studies have been conducted by several authors, including Paraguassu-Chaves in “Medical or health geography: space and disease in the Western Amazon”, Pereira in “Geoprocessing of occupational diseases in Rondônia in the last decade”, Souza Pereira in “Work and occupational disease”, Toda in “Spatial analysis of the distribution of the public health system of Porto Velho”, Paraguassu-Chaves in “Work and Occupational Diseases”, and Paraguassu-Chaves in “Conditions and Quality of Life in Reorganized Space”.

On the other hand, Silva [31], when addressing economic conditions, analyzes the city as a nucleus of economic activity and the issues arising from it, related to individual living conditions, such as income and consumption, labor market, housing and economic dynamics. Barros, Henriques and Mendonça [32] point out that inequality and poverty represent an unacceptable stability. The map of poverty and inequality in Brazilian municipalities prepared by the IBGE clearly shows the chaotic situation of the vast majority of municipalities in Brazil [33]. This scenario is also observed in the reality of Bolivian cities on the border of the Western Amazon.

The indices that comprise the illiteracy rate, life expectancy at birth, Gini index of per capita family income, expectation of years of schooling, percentage of people living in poverty, average household income per capita and unemployment rate, which are indicators of sociodemographic performance, have been studied by several researchers, including Cavalcante [15], Azevedo [23], Machado [27], Barros, Henriques e Mendonça [32],

Paraguassu-Chaves [34], Paraguassu-Chaves [35], Paraguassu-Chaves [36], Paraguassu-Chaves [37], Pacífico [38], Almeida [39], Brazil [40], Cavalcante et al. [41], Henriques [42], Herculano [43], IPEA [44], Pereira [45], Souza Pereira [46].

CONCLUSION

The Environmental Performance Index (ADI) reveals the crucial importance of environmental issues in the efficient and effective planning of health conditions. From the IDA, it is possible to conclude that the cities studied face inefficient and precarious environmental health systems.

The Sociodemographic Performance Index (SDI) shows the socioeconomic reality of cities, showing that living conditions, such as education, income, poverty and unemployment, have reached levels considered “bad”.

The Administrative Financial Performance Index (IDFA) points out that the current administrative and financial system for the recovery of the health system is inadequate to social demands, representing one of the main obstacles that significantly affect the reality of a large part of the Amazonian border cities, including Bolivian cities.

When analyzing together the performance of the previous indexes, which were part of the calculation for the determination of the Health Condition Performance Indices (IDCS) of the cities surveyed, it is observed that the performance levels are inadequate, indicating health conditions below the demands of society.

It is concluded that the cities of Guajará-Mirim and Guayaramerín face great difficulties to provide and guarantee complete environmental, social and economic well-being. Therefore, it is imperative that border municipalities develop specific public policies to promote, protect and recover the health of the population.

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