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Research Article

Multivariate Analysis of Health Indicators in the State of Rondônia, Western Amazon, Brazil

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Abstract

The research aims to analyze the significance of epidemiological, socioeconomic and health service coverage indicators, applying the multivariate statistical technique and to compare indicators with statistical significance compared to the indicators agreed by the State Secretariat of Health of Rondônia, Western Amazon, Brazil, in the period corresponding to one year. This is a descriptive exploratory study applied to epidemiological, socioeconomic and health service coverage indicators in the State of Rondônia, with a territorial coverage of 52 municipalities. The adopted procedure was to apply the Factor Analysis Technique (PA) and the statistical method of Principal Component Analysis (PCA) in 121 variables, grouped, and after, only, in the group of variables with explanation above 95%, divided two scenarios. In Scenario (1) the epidemiological variables had an explanation above 70%, whereas in Scenario (2) they influenced the set of variables with an explanation between 99.66% - 99.99%. In Scenario (1) Porto Velho (Capital) contributed with 72.84% cases, maintaining the trend in Scenario (2) with 75.67%. In the comparison between surveyed indicators (121) and agreed indicators (39), it was noticed that of the 39 indicators, 33 (thirty-three) are included among the indicators with statistical significance in the study.

Keywords: Indicators; Meaningfulness; Multivariate Analysis; Health; Rondônia

Introduction

The Unified Health System - SUS was consolidated as a model of primary health care from 1988 when, based on articles 194, 196, 198 and 200 of the 1988 Constitution of the Federative Republic of Brazil, the citizen's right was guaranteed and the State's duty to promote comprehensive health. These Magna Carta articles are considered basic, as they establish principles, guidelines and competencies of the National Health System. The regulation of constitutional notes came through Law No. 8,080 of 9/19.90 (Organic Health Law/LOS) which fundamentally was born to give visibility and structuring to SUS, together with Law 8,142, of 12/28/90 that regulates the social control within the scope of SUS, enabling the creation of forums for debates, workshops, seminars and conferences, in a space for the exercise of democracy. This is characterized by a design consisting of three arrangements that make up the Unified Health System (SUS) in Brazil: the municipal, state and national systems. The consolidation of SUS involved the implementation of Basic Operational Norms (NOBs - norms that deal with the financing policy of the Unified Health System - SUS, that is, norms that define the criteria for the transfer of financial resources from the federal government of Brazil to States, Municipalities and the Federal District) and the Operational Health Assistance Norms (NOAS - norms that aim to guarantee access to all health actions and services, optimizing the available resources and further promoting the process of holding state and municipal managers accountable for completeness attention to its citizens). These legal provisions are the main regulatory instruments. The SUS financing logic was implemented through NOBs 91, 92 and 93 and 01/96, constituting a dynamic process that regulated the production payment system, redefined resource allocation criteria and established a participation financing mechanism and decentralization of health actions and services. In 2006, the Ministry of Health of Brazil launched the Pact for Health, which proposed to strengthen the capacity to respond to current challenges in the management and organization of the system in order to give concrete answers to the health needs of the Brazilian population and to do health a state policy more than a government policy [1]. This was divided into three dimensions: Pact for Life, Pact in Defense of SUS and Management Pact.

One of the main critical points in public administration is to guarantee access with equality and equity. One of the theories that most applies to the principle of equity is Rawls's Theory of Justice [2], which proposed that: a) Everyone has the right to an entirely satisfactory project of equal basic rights and freedoms for all, a project compatible with everyone else; and, in this project, political freedoms, and only these, must have their equitable value guaranteed. b) Social and economic inequalities must satisfy two requirements: first, they must be linked to positions and positions open to all, under conditions of equal opportunities; and second, they must represent the greatest possible benefit to the least privileged members of society.

For Porto [3] based on Brazilian legislation, the equity principle must be understood as the one that governs distributive functions, which aim to compensate or overcome existing inequalities, considered socially unjust, and that equitable results presuppose unequal redistributions of resources, product of adjustments made according to the biological, social and political-organizational factors that determine existing inequalities.

The Brazilian health model has as its constant search the applicability of the principle of equity, which is added to all others: universality and integrality, this only takes place in proportion to the equality of access to health goods and services and provides assistance in an assistential way.

The configuration of the SUS access network was consolidated through ordinances and technical standards, which passed after the conquest of the constitutional and infraconstitutional instruments to guide the implementation, organization and operationalization. The construction took place concretely in spaces constituted as: Tripartite Intergovernmental Commission (CIT), Bipartite Intergovernmental Commission (CIB), Health Council and Health Management Councils (CONASS and COSEMS) [1].

As proposed by the Pact for Health, responding to the needs of the population [1], in the view of Viana., *et al.* [4], overcoming the inequity patterns in which the health system is inserted is one of the challenges for the expansion of social protection in Brazil.. Socioeconomic and health inequalities in the country have a strong territorial expression, indicating the importance of regional public policies in various areas, including health.

In the context of territoriality, Santos [5] defines and starts to emphasize the geographical space as a social instance. The author proposes the concept of used territory, a hybrid of materiality and action, of form and content, of the built environment and the movement of society, generated by men, institutions and companies. Silveira [6], on the other hand, in the notion of geographical situation, says that it deals with a division of the geography of the world in subtotalities, which become significant structures for each set of events. A split of the totality is a new totality with a meaning, a structure in a more comprehensive set, a structure and a system because its reality is through movement. (...)

However, it reinforces once again the understanding of territoriality as an organization of the network of access to health services, clearly explained in the objective of the Management Pact [7], which points to the decentralization of the Ministry of Health's attributions to the States, and to the Municipalities, accompanied by the reduction of bureaucracy in the normative processes; and, Reinforces the territorialization of health as a basis for the organization of systems, structuring health regions and instituting regional management collegiate bodies.

The systematic analysis of the health situation requires the monitoring of standardized indicators, capable of measuring, in a synthetic way, relevant aspects of the population's health status and its correlation with conditioning and determining factors [8]. According to Rouquayrol [9], health indicators are parameters used internationally with the aim of assessing, from a sanitary point of view, the health of human aggregates, as well as providing subsidies to health planning, allowing the monitoring of fluctuations and historical trends in health. health pattern of different collectivities considered at the same time or of the same collectivity in different periods of time.

Indicators are summary measures that contain relevant information about certain attributes and dimensions of health status, as well as the performance of the health system. Taken together, they should reflect the health status of a population and serve to monitor health conditions [10]. According to Rouquayrol's view [9], the concept of "science that studies the health-disease process in human collectivities behaves to the concept of epidemiology, analyzing the distribution and determining factors of illnesses, damage to health and events associated with collective health, (...) ".

For social epidemiology, the strong association between the distribution of health problems and social factors [11] explains that the field of social epidemiology brings the focus of attention previously focused mainly on health risk factors, to examine in more depth, the social context in which they occur.. Thus being able to identify and describe the various social conditions that seem to influence the health status of the populations.

Jannuzzi [12] defines that "social indicator is a generally quantitative measure endowed with substantive social meaning, used to replace, quantify or operationalize an abstract social concept, of theoretical interest (for academic research) or programmatic (for policy formulation)".

On the recommendation of the Third Interagency Workshop (OTI), in December 1997, the source institutions undertook to prepare a first version of the qualification sheets, based on a script provided by the Technical Secretariat of RIPSA containing eight topics [10]:

- **Conceptualization:** Characteristics that define the indicator and the way it is expressed, if necessary adding information to understand its content.
- **Interpretation:** A brief explanation of the type of information obtained and its meaning.
- **Uses:** Main ways of using the data, which must be considered for analysis purposes.
- **Limitations:** Factors that restrict the interpretation of the indicator, referring both to the concept itself and to the sources used.
- **Sources:** Institutions responsible for producing the data that are adopted for the calculation of the indicator and the information systems to which they correspond.
- **Calculation method:** Formula used to calculate the indicator, precisely defining the elements that compose it.
- **Suggested categories for analysis:** Levels of data disaggregation that can contribute to the interpretation of information and that are effectively available, such as sex and age.
- **Statistical data and comments:** Summary and commented table, which illustrates the application of the indicator based on the actual situation observed. Whenever possible, data should be disaggregated by major regions and for selected years of the previous decade.

The adhesion of the State Secretariat of Health of Rondônia, in the Western Amazon (SESAU/RO) to the Health Pact is part of the incorporation of health policies. The agreement of the health indicators is a requirement for the signing of the term of commitment that becomes a contract between the Union and the Federated State. According to the Strategic Directorate of Integrated Health Care (DEAIS/SESAU) the document must be signed by the end of each year.

In the light of current technology, with the resources available in information technology or computer science, it is clear that the evolution has occurred in real time. The research assistance is phenomenal in view of the gains in the analysis of statistical data Knowledge, associated with statistical methods and techniques, contributes to the advancement of the knowledge and information production process, enabling institutions and researchers to make new knowledge more appropriate. The first concept of multivariate analysis deals with "analysis of multiple variables in a single relationship or set of relationships" [13].

Reis [14] defines how a set of statistical methods that allows the simultaneous analysis of multiple measures for each individual or object under analysis, that is, any method that allows the simultaneous analysis of two or more variables can be considered as belonging to this scientific group. And, he proposed that, one of the objectives of Multivariate Statistics is to simplify the data, describing the information through a reduced number of dimensions of analysis.

Multivariate Analysis is seen as a set of techniques for data analysis that is always expanding. This set comprises the following techniques [13]: analysis of main components and analysis of common factors; multiple regression and multiple correlation; multiple discriminant analysis; multivariate analysis of variance and covariance; joint analysis; canonical correlation; cluster analysis and multidimensional scaling.

Prior to the choice of the Multivariate Analysis technique, it is necessary to know basic concepts that aim to guide the choice of the technique. Hair., *et al.* [13] points out that the researcher must rely on the theoretical and conceptual basis for choosing the safe

technique, and proposes guidelines to assist the researcher's decision. The guidelines for multivariate analysis and interpretations are: to establish practical significance, as well as statistical significance; the sample size affects all results: the results must be evaluated in the light of the sample used in the analysis; know the data: the researcher must "know where to look", strive for parsimonious models: irrelevant variables can mask the real effects because of multicollinearity; examine errors: the researcher must examine whether there is a prediction error and from then on validate the results, and validate the results: the researcher must guarantee sufficient observations for each estimated parameter.

Fundamentally, the previous steps led us to the decision to use in the study in question the techniques of principal component analysis and analysis of common factors, since the joint use includes a statistical approach that makes it possible to analyze interrelationships between a large number of variables in terms of dimensions, whereas the objective is to reduce the number of original variables in a set of smaller variables represented by factors.

From the perspective of data reduction, "factor analysis provides the researcher with a clear understanding of which variables can act together and how many variables can really be considered to have an impact on the analysis" [13]. When using factor analysis, the researcher must adopt percentage of variance criteria in order to obtain practical significance for the determined factors. What is desirable is that the level of explanation of variance is 95% [13]

In the analysis of Principal Components (PCA) based on Reis [14] it is possible to understand that, from a set of partial indicators that characterize a certain phenomenon, identify the main relationships underlying the totality of the multiple relationships between the indicators. (...) it is based on the assumption that q variables that are not statistically correlated can be defined from linear combinations of the initial p indicators - main components.

The qualification of these components, as well as the measure of the contribution of each one to the explanation of the behavior of the initial indicators, constitute the most important results of application of methods of factor analysis of the main components.

It is understood from the teachings of Reis [14] and Hair., *et al.* [13] that it is not possible to treat Principal Component Analysis (PCA) without first understanding factor analysis, and, above all, from the perspective of the exploratory perspective. The objectives of the two techniques share the same intentions and needs: to reduce the sample size and to allow a better understanding of the dimension of the variables.

However, it is important to take Reis's definition [14] on Principal Component Analysis (PCA) which "is a multivariate statistical method that allows transforming, a set of initial variables correlated with each other, into another set of non-correlated (orthogonal) variables, the so-called main components, which result from linear combinations of the initial set ".

PCAs are presented in decreasing order, in which the first explains as much of the variance as possible from the original data, the second as much as possible of the unexplained variance, the third and so on. The mathematical representation of linear combinations does not imply the imposition of any causal model, but it also does not allow the detection of any cause/effect relationships between the initial variables, even if they exist [14].

Thus, the present study proposed to analyze the significance of the epidemiological, socioeconomic and health service coverage indicators, applying the multivariate statistical technique and to compare indicators with statistical significance compared to the indicators agreed by the State of Health of Rondônia in the period corresponding to a year.

Materials and Methods

The study in question had as a methodological approach an exploratory descriptive study applied to epidemiological indicators (morbidity and mortality by municipalities), socioeconomic indicators (education, income, living conditions, etc.) and health service coverage indicators (consultations, home visits, doctor and nurse/1000/inhab, etc.) in the State of Rondônia. The purpose was to explore the statistical significance through the application of the Factor Analysis Technique (PA) and the Principal Component Analysis (PCA) method, and later comparison of the indicators that showed statistical significance compared to the indicators agreed by the State Secretariat of Health of Rondônia in one year.

The choice of indicators for the study was based on the notes of Mingoti [15] to ensure the quality of the sample data "most of the multivariate statistical techniques use only the complete observations, that is, if for a sample element, if the value of any variable has been lost, it is eliminated from the analysis process ". Thus, we considered the indicators that presented the time of data collection continuous information in the online information systems.

The 52 municipalities in the state of Rondônia were considered as study material and the variables were grouped by factors so named: Factor 1 - epidemiological indicators, Factor 2 - socioeconomic indicators and Factor 3 - health service coverage indicators.

From the territorial delimitation and the materials in question, the next step was to identify with the existing databases the variables that were presented, continuously, in the online information systems. In order to establish fidelity, data collection was concentrated in the main databases considered to be official in the operationalization of the Health System at the national level, being: National Registry of Health Establishment (CNES), Department of Informatics of SUS (Datasus), Integrated Pacted Programming (PPI), Integrated Health Information Network (RIPSA); Public Health Budget Information System (SIOPS), Brazilian Institute of Geography and Statistics (IBGE) and United Nations Program for the Development (UNDP).

The construction of the database took place by capture in an isolated way in each information system through online access via Asymmetric Digital Subscriber Line (ADSL) with connectivity and domestic accessibility. Each variable presented was extracted from the main system and isolated, and grouped in a table in the Microsoft Excel program. The data capture period was approximately 6 (six) months due to the large number of variables. It is worth mentioning that ADSL was adopted by the Rondônia State Health Department for this type of service, as it has a connection with an intense flow of information, a high capacity for agility and ease of quick exchange of information.

The first procedure to arrive at the statistical method was to carefully observe the data collected in order to identify distortions in the data collected, thus ensuring continuity of the information contained in the variables in the 52 municipalities.

In view of the above, the data were treated statistically using the Factor Analysis (PA) technique and the Principal Component Analysis Method (PCA) and the Softwer Statistic 7 was used as a statistical tool. The procedure at the first moment was to apply the technique and the statistical method to 121 grouped variables and after, only, to the group of variables with explanation above 95%, divided, thus, in two scenarios: Scenario 1: 121 variables; epidemiological, socioeconomic and health service coverage in the State of Rondônia; and, Scenario 2: 42 variables; epidemiological, socioeconomic and health service coverage with explanation above 95% in the State of Rondônia.

Results and Discussion

Scenario 1 = 121 epidemiological, socioeconomic and health service coverage variables in the State of Rondônia

Statistically in the context of factorial exploration it was found that the factor (1) epidemiological indicators showed a variance of 69.90%, the factor (2) socioeconomic indicators of 14.47% and factor (3) indicators of health service coverage 6,46%. The set of factors accumulated eigenvalues of 92.84% of explanations extracted, from the Principal Component Analysis (PCA). Considering what Mingoti points out [15] "the eigenvalues are ordered in decreasing order, the first component is the one with the greatest variability and the bad one is the one with the lowest", the first main component is revealed in the study as the epidemiological indicators, the second the socioeconomic indicators and the third the health service coverage indicators. Considering the author's notes, the first main component is placed in the multivariate analysis as the most representative, and, for contextualization of greater importance in view of the object of study. Table 2 shows the statistical findings.

The correlation eigenvalues can also be explained through the total variance that has the capacity to synthesize the global variance of the multivariate distribution, since this is the sum of the variances of all the variables involved. Eigenvalues of total variances indicate greater global dispersion of the variables, Mingoti [15]. The statistical findings of the factorial exploration and application of the ACP, indicate the first group of indicators with explanation of approximately 80% of the total variation. The correlation between the factors and the cases showed that: factor (1) obtained 13 cases with negative inferences, factor (2) obtained 27 cases and factor (3) obtained 24 cases. Of these, the Health Regions stand out with the following Municipalities: Porto Velho (Capital), Ariquemes, Ji-Paraná, Cacoal, Rolim de Moura and Vilhena, only Porto Velho (Capital) presenting a negative situation in a decreasing situation in factors 1, 2 and 3. Thus, health regions are summarized in table 3.

Order	Main	Order	Main
01	- Proportion of own revenue applied to health as provided for in EC regulation 29/2000	21	- Proportion of priority municipalities for combating dengue with a contingency plan for the care of dengue patients
02	- Contracting index	22	- Leprosy cure rate in the years of the cohorts
03	- Proportion of constitution of regionally managed collegiate bodies	23	- Cure rate of new tuberculosis baculiferous cases
04	- Regular feed index of national databases	24	- Annual parasitic incidence of malaria
05	- Qualification index of the basic functioning of the health council	25	- Proportion of clinical samples for diagnosis of the influenza virus in relation to the recommended
06	- Proportion of municipalities with updated PPI	26	- Proportion of long-term care facilities for the elderly, inspected
07	- Proportion of live births to mothers with 4 or more prenatal consultations	27	- Notification rate for cases of acute flaccid paralysis - PFA in children under 15 years old
08	- Annual average of medical consultations per inhabitant in basic specialties	28	- Proportion of rash diseases properly investigated
09	- Infant mortality rate	29	- Proportion of notified cases, closed opportunely after notification, except for classic dengue fever
10	- Ratio between cervical cancer preventive exams in women aged 25 to 59 and the female population in this age group	30	- Proportion of cases of cured visceral leishmaniasis (VL)
11	- Proportion of deaths of women of childbearing age investigated	31	- Proportion of non-fetal deaths reported to SIM with defined basic causes
12	- Rate of stroke admissions (stroke)	32	- Concentration of mammography in women aged 40 to 69 years
13	- Proportion of hospitalizations for complications of diabetes mellitus	33	- Proportion of breast puncture of necessary cases
14	- Coverage of the first programmatic dental consultation	34	- Neonatal mortality coefficient
15	- Proportion of the population covered by the family health program (PSF)	35	- Infant mortality rate due to diarrheal disease
16	- Vaccination coverage by tetravalent in children under one year of age	36	- Infant mortality rate due to pneumonia
17	- Proportion of municipalities in the state with adequate vaccination coverage (95%) for hepatitis b at <1 year of age	37	- Maternal mortality ratio
18	- Proportion of municipalities in the state with adequate vaccination coverage (95%) for tetravalent in <1 year of age	38	- Proportion of municipalities that do not make payment through code 7
19	- Proportion of properties inspected for identification and elimination of aedes aegypti breeding sites	39	- Proportion of live births to mothers with 7 or more prenatal consultations
20	- Proportion of priority municipalities for combating dengue with <1% of building infestation by aedes aegyti		

Table 1: Indicators agreed in Rondônia in the year of study.

Source: Health Indicator System for Monitoring the Pact for Health. Ministry of Health.

Values	Eigenvalue	% Total Variance	Cumulative Eigenvalue	Cumulative %
F (1) Epidemiological Indicators	69,90479	57,77255	69,90479	57,7725
F (2) Socioeconomic Indicators	16,47150	13,61281	86,37628	71,3853
F (3) Health Service Coverage Indicators	6,46530	5,34322	92,84158	76,72858

Table 2: Demonstration of eigenvalues, in the application of ACP in the 121 variables, in the year of study.

Source: Prepared by the researchers using secondary data.

Cases	Factor (1) Indicators Epidemiological	Factor (2) Indicators Socioeconomic	Factor (3) Health Service Coverage Indicators
5 Ariquemes	-7,8181	4,2101	2,92478
9 Cacoal	-8,8542	5,4915	2,88012
24 Ji-Paraná	-11,4610	4,6260	2,01097
37 Porto Velho	-47,8678	-11,4336	-2,23120
41 Rolim de Moura	-4,9203	6,8001	0,65169
52 Vilhena	-9,0195	8,5311	1,33950

Table 3: Demonstration of negative and positive cases (home region of health region) based on correlations, extracted from the principal component analysis (PCA), with 121 variables.

Source: Prepared by the researchers using secondary data.

Considering the contribution of cases based on correlations of variables, the largest contribution is to the Health Region of Porto Velho with 72.84% and 17.64% of the concentration of diseases in factor (1) and (2) consecutively.

This municipality, specifically, corroborates the notes of Mingoti [15], because in this case it may be associated with the quantitative component of the diseases, justified even by the characteristic of this Health Region, which tends to concentrate the procedures as it is the only reference of the State for medium and high complexity procedures.

Scenario 2 = 42 epidemiological, socioeconomic and health service coverage variables with an explanation above 95% in the State of Rondônia

From the exploration of the 121 constant variables, it was necessary to consider the notes of Hair., *et al*. [13], which proposes, in the use of Factor Analysis (PA), to adopt criteria of percentage of variance with the objective of obtaining practical significance for the determined factors, considering it desirable that the level of explanation of variance is 95%.

Regions of health	F (1) Indicators Epidemiological	F (2) Indicators Socioeconomic	F (3) Health Service Coverage Indicators
Porto Velho	72,84	17,64	1,71
Ariquemes	1,94	2,39	2,94
Ji-Paraná	4,18	2,89	1,39
Cacoal	2,49	4,07	2,85
Rolim de Moura	0,77	6,24	0,15
Vilhena	2,59	9,82	0,62
All others	15,19	56,96	90,34
Grand total	100,00	100,00	100,00

Table 4: Demonstration of contribution of cases, by factor, based on a correlation of 121 variables, Rondônia.

Source: Prepared by the researchers using secondary data.

Scenario 1 represents the findings of the application of PA and ACP in the 121 variables. Scenario 2, in turn, represents the findings of the application of PA and ACP in variables with an explanation above 95% in the State of Rondônia. It should be made clear that Scenario 2 is extracted from Scenario 1, with the objective of obtaining greater clarity in the exploration of data and envisioning a greater possibility of contributing to the situational health diagnosis in the planning area.

In this scenario of exploratory analysis the application of PCA, it was found that of the 42 variables 34 had an explanation above 70%.

Of these, the expectations of high explanation were confirmed in factor (1) epidemiological indicators with 24 variables with an explanation above 95%. Table 5 shows the concentration of variables by factor.

Factors	Explanation	Variables
F (1) epidemiological	95% - 99%	27
F (2) socioeconomic	70% - 82%	08
F (3) health service coverage	70% - 80%	03

Table 5: Demonstration of the concentration of variables by factor and percentage of explanation, in the period of one year.

Source: Prepared by the researchers using secondary data.

As for the relationship between the first and the last variable, according to Mingoti [15] "variance is used to measure the degree of linear relationship between two variables". Thus, in the application of PCA in the 42 variables above 95%, the variable with the greatest explanatory power is the first with 99.66% (% children aged 10 to 14 years with more than 1 year of school delay), from the second and onwards.

The correlation between factors (1), (2) and (3), which explains 66.53% for epidemiological indicators, 18.72% for socioeconomic indicators and 7.53% for service coverage indicators. The finding corroborates with Hair., *et al*. [13] when he states that "the first factor can be seen as the best summary of the linear relationships shown in the data".

According to Reis [14] and Mingoti [15], commonality is "the total amount of variance that an original variable shares with all other variables included in the analysis" or "the variables have a common source of variation". In Scenario (1) the set of 121 variables (epidemiological, socioeconomic and health service coverage) showed 61 variables with communalities above 70%. In Scenario (2), the set of 42 variables (epidemiological, socioeconomic and health service coverage with explanation above 95%) presented 16 variables with communalities above 95% (Table 6).

It should be noted that the variables in Scenario (2) are included in Scenario (1).

Variables	Factor (1) Indicators Epidemiological	Factor (2) Indicators Socioeconomic	Factor (3) Indicators of Health Services Coverage	Multiple R-Square
NMAC15ANOS	0,983867	0,996511	0,996612	1,000000
MULAC25ANOS	0,985501	0,996481	0,996542	1,000000
POP1ANO	0,965979	0,994573	0,995047	0,999977
POP10-14ANOS	0,978427	0,996382	0,996495	0,999994
POPAC15ANOS	0,982552	0,995959	0,996183	1,000000
POPAC25ANOS	0,984372	0,995766	0,995977	1,000000
POP<5ANOS	0,974340	0,995863	0,996087	0,999988
POPAC65ANOS	0,979914	0,980371	0,980497	0,999872

Table 6: Demonstration of communalities in variables above 95% of explanation.

Source: Prepared by the researchers using secondary data.

Cases/County	Factor (1) Indicators Epidemiological	Factor (2) Indicators Socioeconomic	Factor (3) Indicators of Health Services Coverage
5 Ariquemes	2,15530	1,72601	0,85357
9 Cacoal	2,16431	5,03617	2,57045
24 Ji-Paraná	5,18270	0,96644	0,07120
37 Porto Velho	75,67787	10,85300	0,41854
41 Rolim de Moura	0,66104	6,52710	0,59666
52 Vilhena	1,63556	5,79697	0,00015

Table 7: Demonstration of the distribution of cases per municipality in the health region, with variables with explanation above 95%, Rondônia.

Source: Prepared by the researchers using secondary data.

Considering the Scenario (2), table 7 shows the contribution of cases per municipality in the Health Region, pointing to the same trend as Scenario (1) with a concentration of cases in the municipality of Porto Velho (Capital), consecutively in factors (1) and (2) 75.67% and 10.85%.

Conclusion

There is an almost absolute predominance of epidemiological variables in factor (1), which accounts for more than 70% of the explanation, with a total of 54 variables, 46 of which account for 66.90% of explanation. This fact, external, as well as the affinity of the object of the work in the face of being represented by the health problems, mainly the causes of hospitalizations and deaths.

As for the factor (2) of the socioeconomic variables, of the 57 variables, there was a predominance of 04 variables that tend to express the quality of the education system in Rondônia due to the presence of indicators that measure access to basic education. The factor (3) - the health service coverage variables - is not significant for the study.

For the 52 municipalities in question, the situation of the Municipality of Porto Velho (Capital) stands out, which presents a negative correlation of (-47.86%) that can be justified by the presence of common conditions, for the other municipalities, for example, dengue, tuberculosis, leprosy, injuries due to external causes etc., here only numerical values are observed.

Another important observation to make is in relation to the contribution of cases, where again the municipality of Porto Velho (Capital) contributes with 72.84% in Factor (1) and 17.64% in Factor (2). This fact can be explained by the municipality's characteristic of concentrating medium and high complexity services in health and being a reference for all municipalities in the state.

Scenario (2) aimed to stratify the result of Scenario (1), in order to ensure better clarity to the study. In the application of FA and ACP in the 42 variables with explanation above 95%, it confirmed the ability to represent the epidemiological indicators of Factor (1), pointing out that 08 (eight) variables influenced the set of variables with explanation between 99, 66% - 99.99%.

These variables serve the group of access to basic education, income, non-health public goods and services.

It can be said that the statistical attribute communality directly influences the research result, since it was highly present in Scenario (1) with 61 variables and in Scenario (2) with 16 variables. Among the variables that showed commonality for this study, the most important can be considered: number of preventive cancer exams, pregnancy complications and number of deaths in the previous 4 years.

As for the contribution of cases in Scenario (2), the same trend of concentration of cases was observed in the municipality of Porto Velho (Capital) with 75.67% in factor (1) and 10.85% in factor (2).

In the comparison between surveyed indicators (121) and agreed indicators (39), it was noticed that of the 39 indicators, 33 (thirty-three) are included among the indicators with statistical significance in the study.

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