



# ORIGINAL ARTICLE

# Health situation of Vitória / ES through electronic records of primary care: an epidemiological study

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Keywords	Abstract
Diagnosis of Health Situation; Health Profile; Primary Health Care; Health Transition; Electronic Health Records	This research aims to describe the health situation in Vitória / ES, in 2014, based on electronic records of primary care. As a methodology, it were checked the frequency of care and the average number of visits per inhabitant according to sex, age group, income from the neighborhood of residence and cause groups / subgroups proposed by the WHO, as well as the average number of visits per case, according to the group / subgroup of Cause. The results indicated a predominance of female patients and the older age groups. Non-communicable diseases were 71.98% of the cases; Infectious / parasitic, maternal, perinatal and nutritional 27.51% and injuries 0.5%, with differences in the distribution according to sex, age group and income of the neighborhood of residence. It was concluded that care in primary care in Vitória / ES reflects the epidemiological transition, with a double impact of chronic diseases in the elderly and infectious diseases in young people. The results obtained are profitable to identify the health profile, as well as discrepancies of attendance in relation to gender, age and income class.

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## INTRODUCTION

Developing countries have large counties that are truly complex systems with health problems that are not limited to the patterns characterized in the traditional model of epidemiological transition: population aging. morbidity predominating over mortality and non-communicable chronic diseases with a higher prevalence than the transmissible ones. In these counties, it is possible to observe a combination of infectious and chronic diseases added to the specific conditions of varied urban environment<sup>1-3</sup> where socioeconomic inequality turns out to be an important factor for health differences among neighborhoods<sup>4</sup>, contributing towards the epidemiological complexity which knowledge is necessary for the health services administration.

Unified Health System (SUS) has primary care as a gateway in Brazil<sup>5-6</sup>. This way, the data produced at this level of attention are useful for the health situation diagnosis as well as the epidemiological pattern definition of the population <sup>7-10</sup>.

Vitória, the capital of Brazilian State of Espírito Santo, located in the southeastern region of the country, ranks fourth in the Human Development Index (HDI)<sup>11</sup>, and its public health system is located in the first group in terms of quality, among the Country's counties<sup>12</sup>. The municipal health care network is totally computerized through the Welfare Network (RBE). In 2014, the city registered a population of 352,104 inhabitants<sup>13,14</sup>, 78 neighborhoods and 30 basic health units, which offered 90% population coverage<sup>12</sup>.

This article consists in an exploratory investigation of the attendances realized in the primary attention services in Vitória, in 2014, for the main goal of the study is to describe the city health situation.

## **METHODS**

In this descriptive cross-sectional study, data were extracted from all electronic records of

the visits performed by doctors and nurses at the basic health care center inVitória in 2014.

The records accessed included the fields: patient registration number (personal and non-transferable), patient name, gender, age, date of care, patient's primary health care unit (that is, where the registration was done), patient's neighborhood of residence, code of the procedure performed and cause of care, identified and coded according to the International Classification of Diseases - 10th edition (ICD-10)<sup>15</sup>. Fields were created for the kind of professional attendant who performed the care, and basic health unit where the patient was treated, information was also available in the system. The names of the patients were deleted and their registration numbers were reencoded, guaranteeing anonymity. The names of the professionals who performed care were not collected

The 2010 Demographic Census data for Vitória were obtained from the Brazilian Institute of Geography and Statistics (IBGE)<sup>13</sup>, covering each neighborhood population by sex, age and average monthly household income value, with respect to minimum wage, of permanent private households in the neighborhood of residence.

In a database with 523,745 records, the general completeness and of each field was initially measured. The empty fields, unknown or with not compatible information were considered without information. Call services with IDC-10 not specified were not considered just as they were not those without information on home address, those of residents in three neighborhoods in Vitória where health actions do not take place - the reason for that is because they are in an under litigation area and its population of 8,638 inhabitants is referenced to another city - and the nonresidents in the city were not specified either. A total of 109.648 calls were excluded, but 414,097 calls remained at the database.

The variable age was classified in age groups: 1-4, 5-9, 10-14, 15-19, 20-29, 30-

39, 40-49, 50-59, 60-69, 70+. The variable 'neighborhood of residence' was altered into classes according to the average household income of each neighborhood, simply expressed as 'income class' and categorized as: low income (more than 1 to 3 minimum wages), middle-low income from 3 to 5), middle-high income (more than 5 to 10) and high income (more than 10).

Absolute and relative frequencies and the average number of calls per inhabitant, according to sex, age group and income class were obtained. The average attendance per inhabitant was computed by dividing the number of attendances of residents in each neighborhood by the corresponding population in 2010. The average number of visits was studied for the bivariate analyzes.

In a second stage, the cause of care was recodified in the three groups and their 22 subgroups proposed by the World Health Organization (WHO) to estimate the global burden of diseases<sup>16</sup>: (I) transmissible, maternal, perinatal and nutritional conditions, Non-communicable conditions and (III) injuries. The groups and subgroups are described in Figure 1.

For this second stage, the ICD-10 calls not included in WHO categorization and those without a patient's registry number were excluded, so that the number of cases could be obtained. 191,059 exclusions occurred, and 223,038 calls are being studied.

Absolute and relative frequencies of care were calculated by cause groups (I, II and III) and the differences by sex, age group and income class were set apart. Possible association between the cause groups and those variables was investigated using the Pearson Chi-square test, at a significance level of 5% (p<0.05). With regard to identify contingency table cells with behaviors that were significantly different from those expected between independent variables, the Adjusted Residues Analysis was also used, at a significance level of 5% (cut-off point = 1.96)<sup>17</sup>.

Figure 1 – Groups and subgroups proposed by the World Health Organization for estimating the global burden of disease.

Group I Communicable conditions, maternal, Perinatal and nutritional						
I.A. Infectious and parasitic diseases						
I.B. Respiratory infections						
I.C. Maternal conditions						
I.D. Neonatal conditions						
I.E. Nutritional deficiencies						
Group II Non-communicable diseases						
II.A. Cancer						
II.B. Benign Neoplasms						
II.C. Diabetes mellitus						
II.D. Endocrine, blood and immune disorders						
II.E. Mental and behavioral disorders						
II.F. Neurological conditions						
II.G. Diseases of the sense organs						
II.H. Cardiovascular diseases						
II.I. Respiratory diseases						
II.J. Digestive diseases						
II.K. Genitourinary diseases						
II.L. Skin diseases						
I IM. Musculoskeletal diseases						
II.N. Congenital anomalies						
II.O. Oral conditions						
Group III Injury						
III.A. Unintentional Injury						
III.B. Intentional Injury						

The average number of visits per case according to the cause groups was also obtained. Patients with ICD-10 classified in one group were represented by the 'case', and these patients could simultaneously be considered in different groups of attendance cause.

The income class was summarized, agglutinating the two highest categories in the 'high' category and the two lowest ones, in the 'low' category. This was done for the attendance analysis according to sub-groups of cause.

All variables were coded and the analyses were conducted using Statistical Package for Social Sciences (SPSS), version 23.0.

This study was authorized by the Health Department of Vitória and approved by the Research Ethics Committee of EMESCAM (CAAE 44858215.6.0000.5065). No conflicts of interest of the authors in relation to this study took place.

#### RESULTS

From all 523,745 visits without any exclusion, 385,657 (73.63%) were performed by physicians and 138,088 (26.37%) by nurses. Only the age field was filled in at all attendances. The date was not filled

in 6. Gender, neighborhood of residence, unit of origin and procedure had similar noncompliance ratios (0.15 to 0.44%), while registration number and ICD-10, respectively, were 16.67 % And 20.15%.

Table 1 shows the distribution of the 414,097 visits included in this study according to sex, age group and income class. The average attendance rate per inhabitant was 1.30, with 1.68 female calls per female and 0.87 female attendance per male<sup>13</sup>. A total of 68,61% of attendance total was of female patients.

Table 1 – Attendance and average service care by gender, age group and income class, in primary care in Vitória, 2014.

V		Attend	Average attendance		
variable		N°	%	per inhabitant	
Condor	Female	284114	68,61	1,68	
Gender	Male	129983	31,39	0,87	
Age group	0-4	55213	13,33	2,89	
	5-9	20387	4,92	1,05	
	10-14	16071	3,88	0,70	
	15-19	21581	5,21	0,87	
	20-29	45183	10,91	0,73	
	30-39	48251	11,65	0,96	
	40-49	52536	12,69	1,19	
	50-59	62432	15,08	1,65	
	60-69	49415	11,93	2,38	
	70+	43028	10,39	2,43	
Income class	Low	53574	12,94	1,77	
	Average low	217417	52,50	1,84	
	Average high	80943	19,55	1,71	
	High	62163	15,01	0,50	
Total		414097	100,00	1,30	

The proportion of visits was 13.33% in the 0 to 4 years age group, decreased in the following bands, rose again from 20-29 years and peaked in 50-59 (15.08%). The highest average attendance per inhabitant occurred in the 0-4 age group (2.89), followed by 70+ (2.43) and 60-69 (2.38). The range of 10-14 had the lowest average attendance per inhabitant (0.70).

Most of the attendances (52.5%) were of residents from low-middle income neighborhoods and the lowest part (12.94%) from low-income neighborhoods, but the average attendance per inhabitant indicated a similar distribution among the lowest income classes (1.77 per inhabitant), low average (1.84 per inhabitant) and high average (1.70 per inhabitant). Only the highest income class (more than 10 wages) presented lower average (0.50 attendances per inhabitant).

With reference to the attendances distribution between genders by age (data not featured), in the age group 0 to 14 the female / male ratio ranged from 0.96 to 1.19. It is noticed that the attendance frequency of female patients predominated in a significant way from the 15 to 19 age range, with a female / male ratio ranging from 2.24 to 3.83. The sex ratio of the average number of visits per inhabitant smoothened the discrepancy, presenting lower values in the elderly age group: from 15 to 59 years old, ranged from 2.14 to 3.61, falling from 60 onwards (1.74 to 1.34). The average attendance per inhabitant, according to sex, was similar for the four income classes (female / male ratio between 1.92 and 2.03). Figure 2 shows the average number of attendances per inhabitant as reported by income class and age group. The high income class had the lowest average attendance per inhabitant in all age groups (range of 1.18 to 0.23). For the three other income classes, it is possible to note a ranking of the lowest to the highest income forming from the age of 40. In the range of 0-4 years, there is a reversal in this ranking, with a higher average of attendance in the upper middle class, followed by the low and low average.

Figure 2 – Average attendance per inhabitant according to income class and age group, in primary care in Vitória, 2014.



Among the 223,038 attendances included in the study of causes, the most expressive group was non communicable diseases (group II), which responded for 80.87% of the visits and 71.98% of the cases (Table 2). Infectious / parasitic, maternal, perinatal and nutritional diseases (group I) constituted 18.90% of the visits and injuries (group III), 0.23%. The average number of visits per case was higher for the causes of group II (2.65), compared to the causes of group I (1.62) and group III (1.08). The distribution of visits by attendance groups (Table 2) was significantly influenced by gender, age group and income class (p = 0.000).

The number of visits for group II causes, in females, was significantly higher than expected, if the variables were independent, while the number of visits for causes of groups I and III was significantly lower (value of the residue, respectively, higher and lower) Which is 1,96). It is noticed that the opposite was observed in males.

Variable		Group I*		Group II*		Group III*			Total		p-value		
variable		Nº	%	Residue**	Nº	%	Residue**	Nº	%	Residue**	Nº	%	(χ <sup>2</sup> )
Gender	Female	26.107	17,16	-30,88	125.776	82,65	31,43	289	0,19	-5,73	152.172	100,00	0,000
	Male	16.054	22,65	30,88	54.589	77,03	-31,43	223	0,31	5,73	70.866	100,00	
	0-4	10.129	58,19	137,87	7.191	41,31	-138,19	88	0,51	7,92	17.408	100,00	
Age group (years)	5-9	4.221	49,14	72,99	4.308	50,15	-73,81	61	0,71	9,49	8.590	100,00	
	10-14	2.911	43,94	52,84	3.673	55,44	-53,41	41	0,62	6,72	6.625	100,00	
	15-19	3.145	39,62	48,01	4.762	60,00	-48,13	30	0,38	2,81	7.937	100,00	0,000
	20-29	5.806	35,29	55,78	10.583	64,33	-56,04	63	0,38	4,27	16.452	100,00	
	30-39	5.250	23,61	18,89	16.924	76,10	-19,03	64	0,29	1,91	22.238	100,00	
	40-49	3.959	12,80	-29,54	26.924	87,05	29,79	46	0,15	-3,2	30.929	100,00	
	50-59	3.337	7,78	-65,44	39.492	92,10	65,78	52	0,12	-5,21	42.881	100,00	
	60-69	1.899	5,12	-74,23	35.145	94,79	74,62	34	0,09	-6,07	37.078	100,00	
	70+	1.504	4,57	-71,91	31.363	95,33	72,22	33	0,10	-5,31	32.900	100,00	
Income class	Low	5.442	19,18	1,27	22.859	80,56	-1,39	73	0,26	1,04	28.374	100,00	0,000
	Average low	24.593	21,01	26,75	92.137	78,73	-26,99	302	0,26	2,95	117.032	100,00	
	Average high	6.861	15,83	-18,21	36.417	84,01	18,56	68	0,16	-3,52	43.346	100,00	
	High	5.265	15,36	-18,23	28.952	84,44	18,30	69	0,20	-1,19	34.286	100,00	
Total	Attendance	42.161	18,90	-	180.365	80,87	-	512	0,23	-	223.038	100,00	-
	Case	26.057	27,51	-	68.173	71,98	-	475	0,50	-	94.705	100,00	-
	Average per case		1,62			2,65			1,	08	2,3	36	-

Table 2 – Attendance by cause groups, by gender, age groups and income class, in primary care in Vitória, 2014.

\* Group I: transmissable, maternal, perinatal e nutritional conditions; group II:non-communicable diseases; group III: injuries.

\*\* Qui-square adjusted residue.

With respect to the age group, it was noticed a positive association with age group I - 39 years or younger - and with group III - 29 years or younger. Referring to the age group of 40 or older, the association was positive with group II.

The two highest income classes had the number of group II visits much higher than expected. On the other hand, in the low middle income class this number was higher for the causes of group I.

The proportional distribution of care for the twelve major cause subgroups, by age group is summarized in Figure 3. The nine main subgroups, together, corresponded to 87.19% (194,457) of the total number of visits (223,038). They were: cardiovascular diseases (28.98%, 64.643), diabetes mellitus (11.25%, 25.089), respiratory infections (10.94%, 24.410), genitourinary diseases (8.07%, 18.010), infectious and (6,44%, 13,924), musculoskeletal diseases (5,46%, 12,171), skin diseases (4,99%, 11,139) and mental disorders (6,78%, 15,124), endocrine, blood and immune diseases And behavior (4.46%, 9947). Respiratory diseases (3.20%, 7133), digestive diseases (3.01%, 6710) and diseases of the sense organs (2.75%, 6142) were less representative than the previous

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ones. Some subgroups had very little representation, accounting for 2.27% (5,070) of the total: nutritional deficiencies (0.80%, 1.795), cancer and benign neoplasms (0.57%,

1268), maternal and perinatal conditions %, 832), oral conditions (0.21%, 464), congenital anomalies (0.09%, 199), and intentional and unintentional injuries (0.23%, 512).





\* The maternal conditions, neonatal, nutritional deficiencies, cancer, benign neoplasms, neurological conditions, congenital anomalies, oral conditions, unintentional injuries and non-intentional injuries are not represented in the subgroups. Intentional injuries.

Respiratory infections were the diseases that most stood out from 0 to 19 years old, corresponding to 44,56% (7,757) of the attendances up to 4 years old and to 21,04% (1,670) in the range of 15 to 19. From 20 to 29 years old, Genitourinary diseases were the most important (18,00%, 2,961). From 30 years old, cardiovascular diseases predominated, reaching 50.46% (16.602) in the range of more than 70 years old.

The differences by age group between the sexes (data not featured) were small and it was possible to note focal disparities in some subgroups. Considering a female / male ratio, an average of 2.15, genitourinary diseases were the cause of more frequent

care in women aged 15 to 59 years (female / male ratio 22,19,  $\pm$  3,12), while infectious and parasitic diseases, Diseases and respiratory infections and skin diseases showed to be the most important cause in men aged 0 to 14 years (female / male ratio 0.98,  $\pm$  0.10).

Differences by income revealed even lower, with a low / high ratio of 0.14, on average. Infectious and parasitic diseases, in the 0-19 range, gave rise to grater care in the lower income classes (low / high ratio 0.21,  $\pm$  0.00), while endocrine and metabolic diseases, genitourinary diseases and respiratory infections predominated more in the classes Of the highest income, in the bands from 50 onwards (low / high ratio  $0.08, \pm 0.01$ ).

## DISCUSSION

The results demonstrated that the attendances predominate in females and in elderly people, especially females from the age of 20. Other studies present similar data with respect to difference between sexes in search for health services<sup>18,19</sup>. Possible explanations are the social aspects concerning the idea of man as being more resistant to diseases and health standards consisted of high lethality and little symptomatology in males. This reinforces the need for awareness and increased understanding of these issues<sup>20</sup>.

With the reference to the causes of care, it is verified that the less frequent conditions, such as injuries, maternal and neonatal pathological conditions and oral conditions are those either attended in emergency services or more often in hospitals or dental practices, escaping the scope of this search. This reinforces the results verified in another study, indicating that primary care data are not sufficient for the correct estimation of the prevalence of diseases<sup>8</sup>. Complementarity with records from the secondary and tertiary levels of care may contribute to a more complete diagnosis of the health situation.

As the epidemiological transition response, non-communicable diseases (group II) account for 71.98% of the cases treated, overlapping with infectious / parasitic, maternal, perinatal and nutritional diseases (group I) and injuries (Group III). A 2004 Brazilian study with data referring to 19981 shows that, in the Southeast region, the proportion of disability-adjusted-life-year (DALY) in group II is slightly lower than that found in primary care in Vitória.

It is also validated that respiratory, dermatological, infectious and parasitic diseases triumph in childhood; Diseases of the genitourinary tract, from 15 to 29 years old; Diseases of the circulatory system and endocrine-metabolic diseases in adults, increasing its importance in old age.

Infectious and respiratory diseases cause impact to younger age groups, and children are more propitious to airway infections, the leading cause of morbidity and mortality in this age group in developing countries. Concurrently, several studies show that air pollution is correlated with a higher risk of these diseases, as well as agglomerations, tobacco smoke and gases from burning fuels<sup>21,22</sup>. In a study covering the period from 2001 to 2003<sup>23</sup>, it was shown that pollution levels are relatively low in Vitória when compared to standards proposed by the WHO. Nonetheless, the higher predominance of respiratory disease in certain neighborhoods was attributed to low socioeconomic conditions. Gaps still exist in the research data, contributing to the difficulty to establish which specific factors should be the target of public policies for effective prevention of respiratory diseases in the city.

On the contrary, the large proportion of elderly care and the significant impact of chronic diseases reflect the aging of the population. The high cost, multidisciplinary care and multi-year pharmacological treatment of these diseases make investment in chronic disease risk prevention as well as comprehensive strategies for healthy aging critical and urgent<sup>24-26</sup>, saving enormous costs in the future.

In this regard, except in early childhood, the young population is also the one with the lowest attendance in primary care, in Vitória. The doctor's office, especially in primary care, is considered one of the main places to stimulate the acquisition of appropriate dietary patterns and physical activity, crucial for the prevention of chronic diseases<sup>25,27</sup>. However, it is imperative an investment in care approaches in order to reach this population.

It is important to underline that some subgroups of cause of care present, in Vitória,

a higher proportion of female consultations. Diseases of genitourinary system diseases are the most expressive subgroup as found in the literature<sup>28</sup>.

In Brazil, the health expenses of the richest are usually concentrated in private insurance and health plans, which explains a lower expressiveness of the highest income class in the attendance in all age groups. In addition, criticisms of the public sector often have a negative effect on people's opinions and perceptions<sup>29</sup>, leading those who have the resources to not use the public sector<sup>12</sup>. The high-income census population accounts for 38.7% of the total and could benefit from primary health care services for the private sector is not organized to undertake health surveillance in the same way as the public sector<sup>6</sup>.

The results indicate the highest average attendance per inhabitant in the 0-4 range of the upper middle income classes, followed by the low average. This demonstrates that childcare seems to be more valued by the classes with better socioeconomic conditions than by those with low income, arguing in favor of the incessant search of these patients.

Still referring to socioeconomic reality, the causes of group I are more prevalent in less developed regions of country1, and an increased proportion of these causes is expected according to the lower income of the neighborhoods, as happened in Victoria. Nevertheless, when disease subgroups were analyzed, the difference observed was small. This requires new investigations and approaches, such as agent-based modeling and other methods of complex systems, and suggests the interaction of political, social, economic and biological factors, resulting in an epidemiological complexity that requires a critical analysis of the urbanization process<sup>4</sup>. Research into vulnerable populations of other sociodemographic data can improve the investigation of vulnerable populations

It is worth emphasizing the concern that young and high-income male are in the future more vulnerable to chronic diseases related to lifestyle and also related to distancing from prevention strategies, which can be deduced from the fact that they have fewer attendance care.

Ideal would even be to compare the results found with those of other cities in Brazil. Electronic health records systems may contribute to this process, since they may enable the production of indicators for health surveillance, the management and the implementation of public policies.

This study presents limitations, even though it has produced a broad diagnosis of the health situation in Vitória. The study did not allow the detection of the universe of patients with chronic diseases, for visits to the health service occur every two years or more<sup>8</sup>. Population data from 2010 were used to calculate indicators for 2014, disregarding demographic dynamics. A group-level variable was used for the income indicator, indicating an ecological fallacy in relation to this aspect. Secondary causes that may be involved in the visits were not screened. Considering that some diseases with simpler and well-known diagnostic criteria may have been more diagnosed than others with more subjective criteria, incorrect diagnoses and sub or overdiagnosed diseases may also have occurred in unknown proportions. In addition, the lack of information may have impaired the analysis of important data, such as the cause of care (20.15% of non-fulfillment), indicating the need for professionals to be aware of the importance of registration, as well as the investigation of strategies For better system data quality.

# CONCLUSION

The health profile found in primary health care in Vitória reflects the epidemiological transition, with a double impact of chronic diseases at more advanced ages and of infectious diseases at young ages. This reflects a challenge for management as it requires measures that can heal these two distinct classes of problems.

The results obtained were important to identify the health profile, as well as the discrepancies of attendance in relation to gender, age and income. It was observed that young, male and high-income individuals have fewer visits, probably by distancing themselves from prevention strategies. Therefore they are more vulnerable to chronic diseases due to lifestyle.

Future research should invest in improving the quality of data and methods of analysis of complex systems. The study of injuries, maternal and neonatal conditions and oral conditions, which are the focus of other services, requires complementation with specialized care data.

Electronic records systems implemented in other municipalities could bring significant benefits, as they would allow comparison of indicators, verification of the effect of interventions and planning of comprehensive approaches in populations.

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