

Influence of environmental conditions on the prevalence of systemic hypertension in two riverine communities in the Amazon, Brazil

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Abstract *This article discusses the influence of environmental conditions on the prevalence of systemic hypertension in two riverine communities in the Sustainable Development Reserve of Tupé, Manaus, Amazonas, Brazil, through an ecological study of multiple groups and contextual analysis carried out with the local inhabitants. To identify the environmental etiology describing the risk of disease development, the study compares demographics, incidence rates and common daily practices in these communities, using data collected in the field, between 2012 and 2014, as well as values provided by IBGE, originally from National Health Survey, 2013. The results suggest that social and environmental determinants, such as general living conditions, occupation and access to protective health care, in the investigated communities, are relevant factors in explaining the observed variability in systemic arterial hypertension (SAH) incidence rates. The study concludes by pointing out the importance and need to consider socio-environmental vulnerability in the elaboration of public health policies and in the management of environmentally protected areas.*

Key words *Society, Environment, Systemic arterial hypertension, Health vulnerability, Health management*

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Introduction

It is well known that environmental factors such as air pollution, chemical exposure (i.e. pesticides, insecticides, heavy metals, etc.) and food and water contamination are embedded in the matrix of important molecular mechanisms that occur within the human body. As such, environmental toxins can, consequently, increase the risk of disease, and are capable of inflicting harm on future generations, through direct contact or by genetic transmission¹. However, socioeconomic factors should also be taken into account when studying the profile of illnesses and deaths within a population²⁻⁴.

The society-nature relationship is an important explanatory element in determining how the process of industrialization contributes to the prevalence of infectious diseases, when the societal profile is of low development, and of chronic-degenerative diseases, in the case of more industrialized societies⁵. In developing countries such as Brazil, which is transitioning to a more industrially developed society profile, though it has not yet been fully completed, some regions, due to their intrinsic characteristics (i.e. demographic profile and lifestyle) and extrinsic characteristics (i.e. geographic location, health care access and urban center influence), are subject to a gradual but not complete replacement of infectious diseases for chronic-degenerative diseases such as cardiovascular disease and cancer, as well as "external causes" or violent deaths. Such a transition constitutes a condition of risk or socio-environmental vulnerability, which is a major challenge for public health policies⁶.

When talking about risk and vulnerability, it is understood that the distribution of health and disease is socially and spatially stratified. For example, the pattern of material wealth produced, its volume, diversity and distribution to groups of individuals promotes their economic and social differentiation. This characteristic can be observed in societies by analyzing certain attributes that members of a status group have in common, such as gender, income, age group, education, occupation and place of residence. Each of these groups or collective divisions, by their actions, are competing for means, structures and processes to materialize, in their respective spaces, the equipment, goods and services placed at their disposal. This is not always done in an egalitarian, appropriate or sufficient manner, but that in a way that supports favorable conditions for a determined morbidity and mortality profile applicable to the people located in that socio-geographical space⁷.

In the case of localities with few inhabitants and limited infrastructure, it is nonetheless a challenge to guarantee the equity and integrity of access and health care. A higher overall gross domestic product (GDP) total or per capita does not guarantee that the health indicators will also be higher. This is because the volume of wealth is not a precondition for an improvement in the quality of life, and "there is not always a constant correlation between macro-indicators of wealth and health indicators"⁸. Thus, it is necessary to also observe the complex interactions among intervening factors.

Chronic non-communicable diseases (CNCDs), such as cardiovascular diseases, some cancers, diabetes and chronic respiratory diseases, are responsible for generating a high number of premature deaths, reducing the quality of life, and negatively impacting the economic lives of people, their families and society, in general⁹. Furthermore, chronic diseases such as diabetes and hypertension generate, in a growing and worrying way, enormous losses for the health care system, and are considered to be diseases of importance in public health worldwide¹⁰. In fact, a recent survey identified that CNCDs are responsible for about 70% of the mortality in Brazil, reaching, mainly, the poorest populations due to their greater exposure to risk factors and the lower access to adequate health care services¹¹. Habits and behaviors are considered to be risk factors for CNCDs, in general, and most are associated with the modern lifestyle, globalization and rapid urbanization. Such habits and behaviors include: sedentary lifestyle, consumption of foods with a high fat and sugar content, smoking, excessive alcohol intake, obesity, altered blood pressure levels, and hyperglycemia¹². Moreover, factors such as gender, ethnicity and education, in addition to the location and place of residence, also exert a considerable influence on the distribution pattern of CNCDs¹³.

Systemic arterial hypertension (SAH) is defined by the Brazilian Society of Cardiology in its "VI Brazilian Hypertension Guidelines" as a multifactorial clinical condition characterized by elevated and sustained blood pressure (BP)¹⁴. An adult patient (above 18 years of age) whose blood pressure measurement is above 140/90 mm/Hg is considered hypertensive, and mortality due to cardiovascular disease is related to an increase in BP. In fact, starting at a BP of 115/75 mm/Hg, this relationship increases proportionally in a "linear, continuous and independent manner"¹⁴. Among the risk factors involved in SAH, direct relationships have also been observed with age, linear-

ly increasing from the age of 40, slightly higher among men up to 50 years old, but reversing the proportion in favor of women over 50 years old. SAH is twice as prevalent among non-whites; and in overweight and/or obese people, even if they are active individuals. Eating habits that include excessive salt intake and prolonged use of alcohol have also been shown to be associated with the occurrence of SAH, in Brazil, regardless of demographic conditions. With regard to sedentary life styles, socioeconomic factors and genetic factors, although in certain situations the influence is noticeable, there are no sufficiently conclusive studies for Brazil¹⁴.

Being of a chronic and silent nature, the individuals with SAH have a difficult time perceiving the problem, and this invisibility of SAH severely compromises the quality of life of the individual. While SAH is a serious medical condition, it can also act as an aggravating factor for cerebrovascular, coronary artery, chronic heart and renal insufficiency as well as vascular disease of the extremities, often requiring hospitalization and highly complex medical procedures, thus resulting in loss of work, early retirement, and even death, which can pose serious problems for the individual, his family and society, in general¹⁵.

In Brazil, the Hiperdia program, was designed with the aim of registering and monitoring all patients with diabetes and hypertension, thus allowing municipalities, states and the Federation to devise strategies for maintaining adequate health care for these patients¹⁰.

Risk of illness and socio-environmental vulnerability are distinct perspectives for the analysis of the prevalent health-disease processes for a given social group. Risk is a statistical measure, since it indicates the probability that individuals and/or populations will become ill or die due to some health problem, arising from or associated with the characteristics that leave them exposed to events that compromise their well-being, whether physical, psychological or social¹⁶. Vulnerability refers to the individual and/or collective conditions and contexts that result in greater susceptibility to the processes of morbidity and mortality, or the degree of difficulty in accessing the resources for coping. It is also a measure of inequity and social inequality, and it predominates in societies still being formed or in the process of development¹⁷. Vulnerability is prior to risk, since it includes factors not only of biological origin, but also geographic, political, cultural and social, and is, therefore, of socio-environmental nature^{18,19}.

Objectives

Towards the goal of contributing to the improved management processes and the better use of resources applied to public health, the present study aims to discuss the influence of social and environmental conditions on the incidence and variability of SAH rates in two rural communities, located in the Sustainable Development Reserve (SDR) of Tupé, Manaus, Amazonas.

In order to achieve the proposed objective, this case study has been divided into three sections. In the first section, the procedures adopted for the field design and the study variables, the collection techniques and the form of treatment and analysis of the data are described. In the second section, the main results achieved in the study are summarized. Finally, in the third section, a discussion on how the socioenvironmental conditions may influence the behavior of the indicators of SAH in both communities examined is presented.

Methodological procedures

This is a case study²⁰, of an exploratory character, using the ecological analysis of multiple groups, in which the units taken for observation are not the individuals, but groups of individuals geographically delineated, and the technique of ethnographic observation, in which the various activities performed by groups of individuals are directly observed and recorded by the researchers. The results were used to determine the influence of socio-environmental conditions on the prevalence of SAH in two of the most densely populated riverine communities of the Sustainable Development Reserve (SDR) of Tupé: Livramento (with a total of 655 fixed residents) and Agrovila (with a total of 482 fixed residents).

As shown in Figure 1, the SDR of Tupé is an environmentally protected area located on the rural perimeter of the city of Manaus, Amazonas. While it is territorially extensive, there is a low population density. Approximately 1,800 people maintain a fixed residence within almost 12 thousand hectares of area, and are distributed among six population aggregates or communities, namely: Tatulândia, São João do Tupé, Central, Julião, Nossa Senhora do Livramento and Agrovila²¹. The location of this study was chosen and is justified because it presents sociodemographic, environmental and economic activity characteristics similar to those occurring in ru-

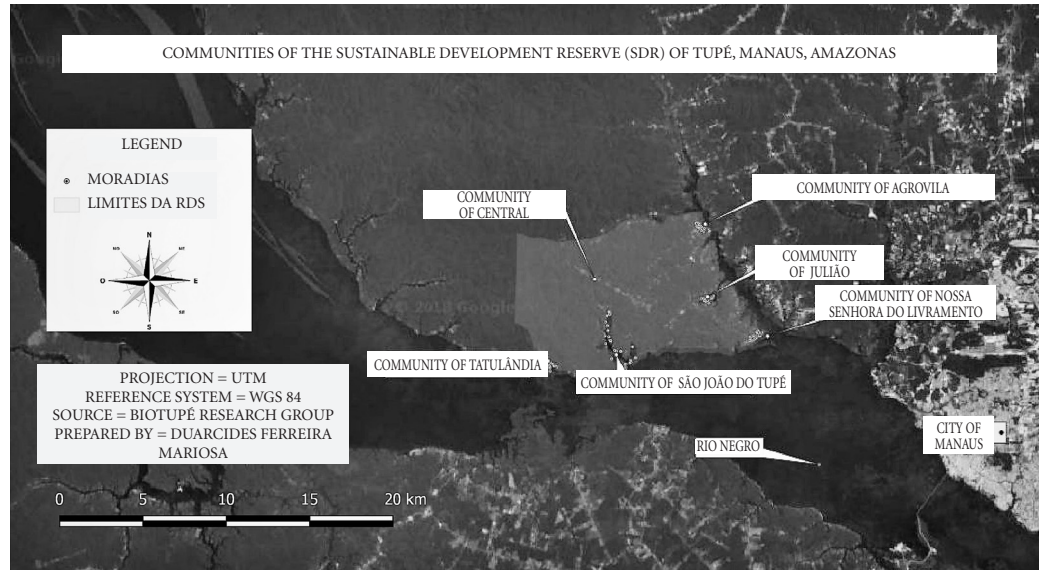


Figure 1. Location of the SDR communities of Tupé, Manaus, Amazonas (prepared by the authors).

ral areas of Brazil, as well as behaviors typically found in urban areas, as evidenced in the more distant Agrovila and Livramento communities, which are closer to the urban center of Manaus.

Data were collected by accessing to two different sources. For the construction of the reference frameworks in Manaus, Amazonas and Brazil, data from official statistics, taken from the report published by the IBGE²² which, in partnership with the Ministry of Health, produced the “National Health Survey 203: Perception of health status, lifestyles and chronic diseases Brazil, Major Regions and Units of the Federation” were used. For the study of the communities, the data obtained from two complementary surveys were used.

The first set of data was collected in 2012 by community health agents at the Monitoring and Evaluation Center of the Rural Health Office (RHO) of the Livramento Community, belonging to the Division of Health Care, linked to the Fluvial Health District (DISAGF), of the Department of Health of the Municipality of Manaus, Amazonas. In this instrument, information was collected on age, gender and confirmation of cases of diabetes mellitus, SAH and hypertension associated with diabetes from the residents of the Agrovila and Livramento communities.

The second set of data was collected as a sample, in a field survey carried out between 2013 and 2014, within the framework of the studies of social and environmental quality indicators²³, through the application of a semi-structured questionnaire, highlighting the sociodemographic variables of age, gender, education, occupation and monthly income. The sampling plan was delineated from the spatial distribution of the residences located in the Agrovila and Livramento communities. In a census survey, buildings were identified by their geographic coordinates. In the sequence, sets of addresses were randomized, considering the proportionality of the spatial concentration of the residences, 95% confidence interval and sample error of 5%. The residents selected for the interviews were those who maintained a fixed residence at the addresses selected and agreed to provide the required information. Prospective participants were excluded if they were temporary residents and/or lived at another address. Those who, after two attempts, were not present and those who refused to cooperate were also excluded from the survey.

The data analysis plan, which was designed to show the presence of different socioenvironmental conditions in the prevalence of hypertension, followed the following strategy: a) the occur-

rence rates were compared in six different environments: rural Brazil, urban Brazil, Amazonas, Manaus, Agrovila and Livramento, so as to identify possible discontinuities in occurrences; b) the distribution of gender in relation to SAH in these socio-spatial contexts; c) and whether the occurrence of SAH was influenced by confounding variables such as age, gender and/or education in the “Amazonas”, “rural Brazil” and “urban Brazil” was verified. To isolate the conditions of distribution of SAH in the Agrovila and Livramento communities to reference environments (i.e. Manaus, Amazonas, urban Brazil and rural Brazil), the following steps were followed: a) verify if in these communities the gender differences were statistically significant; b) determine the odds ratios for the occurrence of SAH according to variables such as gender, age group and place of residence (Agrovila and Livramento communities); c) and highlight, through resources of the observational research techniques, the socio-environmental conditions that influence the indicators and whether these can be assumed as explanatory elements for the distribution of SAH observed.

In the categorization of variables, the model proposed by the National Health Survey was followed¹⁹. The age group variable was organized into five age groups, and only respondents above 18 years of age were considered. For the gender variable, the informants were subdivided into male and female. With regards to education, the population was grouped into four levels of formal education.

On the other hand, considerations about lifestyle predominantly present in the communities were observed as the main characteristics of the activities developed in the socio-occupational and environmental space in which the residents are located. The influence of the type of food, storage conditions and physical activity were analyzed using direct observation techniques, interviews for displacement situations, and income and occupation data from field surveys conducted between 2013 and 2014, from semi-structured questionnaires, applied by teams previously qualified for the job and formed by students of the institutions in which the authors are affiliated. Observations, such as daily activities were collectively organized and distributed among different population groups and were subsequently incorporated into the study.

Finally, the collected data were systematized and treated through measures of centrality, means, association and relative and absolute frequencies using the Microsoft Office Excel pro-

gram. Statistical models were used to determine significance, proportionality and contingency; the Kruskal-Wallis Test with Yates Correction was applied to the observed and expected proportions; the Nominal Multinomial Model was used for odds ratios and the Wald Test was employed for its amplitude, using the Action Software – Estatcamp. For the interpretation of the results, the model of ecological analysis was followed, indicating evidence of association between demographic, environmental and epidemiological variables that affect the groups and, not necessarily the individuals²⁴.

This work was submitted to and approved by the Research Ethics Committee at the University of Nove de Julho, through registration in the Brazil Platform, and complied with the guidelines proposed by Resolution 466/2012 regarding ethical and legal aspects involving research with human beings, which is in accordance with the principles contained in the Declaration of Helsinki of the World Medical Association. All interviewees signed an Informed Consent Form after receiving verbal and written explanations regarding the study.

Results

In Figure 2, the data are summarized in the charts and tables. These results indicate that the population above 18 years of age, who live in the SDR of Tupé communities studied, Livramento and Agrovila, when separated by gender, display different patterns for the occurrence of SAH. Compared to what occurs in different social and environmental situations, the behavior of the indicators in Livramento’s epidemiological profile approximates those of the rural and urban environments of Brazil; while the Agrovila community, also located in the SDR of Tupé area, has a pattern more similar to what is found in the city of Manaus or the state of Amazonas.

Although in the different socio-spatial contexts analyzed it is possible to notice a higher incidence of SAH among women, the proportionality of the rates between genders in the Agrovila community is well above the others. The social group formed by women in this community presents a risk that is 3.994 times greater than observed in the men of that community. The Kruskal-Wallis test values for “ X^2 ” of 23.36475062 and the p-value of approximately “0”, indicated that the difference between genders is not a coincidence or due to chance.

On the other hand, in the Livramento community, there is not a statistical difference between the prevalence of SAH between women and men. Using the same statistical measures, it is observed that the “X²” value of 0.050777708 and

p-value of 0.82171 do not to rule out the hypothesis that the difference between genders is due to chance.

Among the intervening and possibly explanatory factors of the differences pointed out, in the

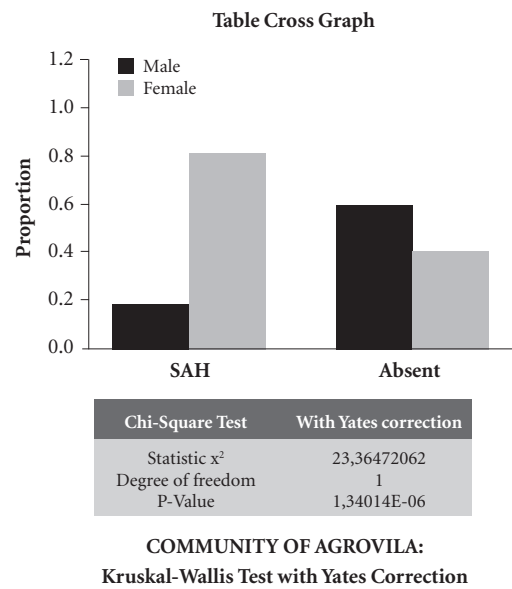
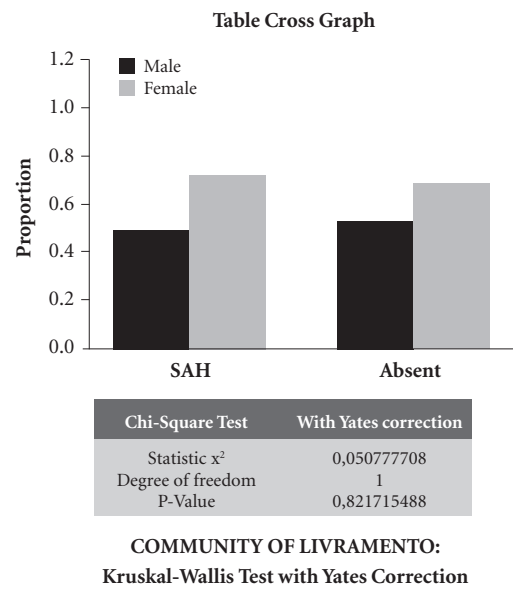
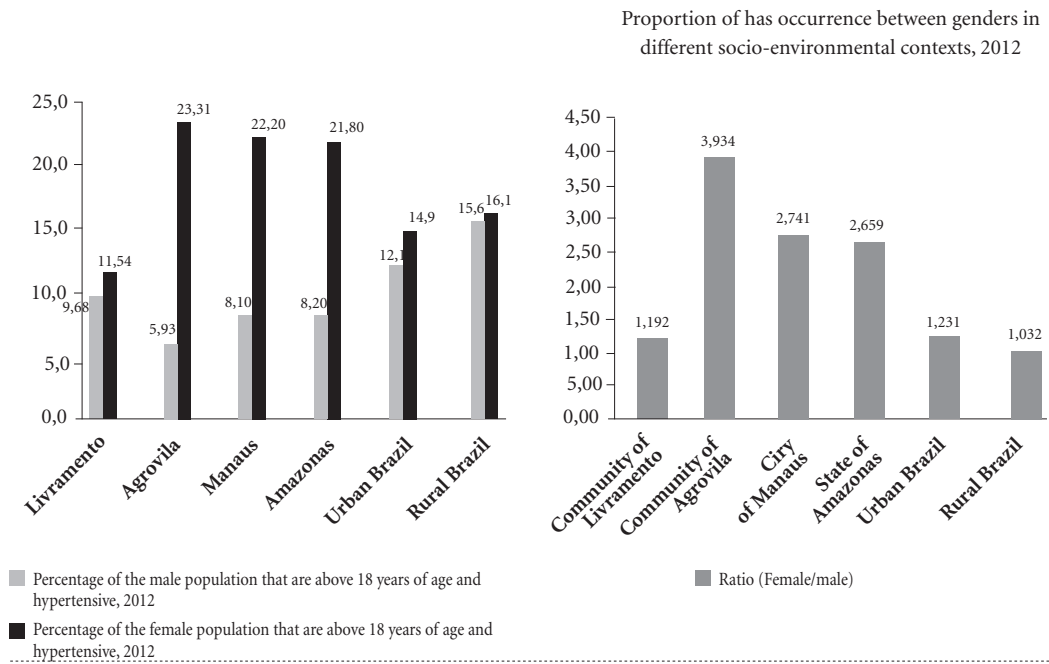


Figure 2. Percentage of the population over 18 years of age with systemic arterial hypertension, separated by gender, in the Livramento and Agroviola communities; Manaus; Amazonas; Urban Brazil and Rural Brazil, 2012, tables and statistical tests.

distribution of SAH, for three distinct environments, the variables gender, education and age group will initially be considered.

Using the population that lives in urban and rural areas of Brazil as a reference, Table 1 shows that the gender difference is not proportionally significant. However, for the State of Amazonas, the proportion of women with SAH in relation to men is relevant.

When taking into account the explanatory variable of education in the prevalence of SAH, which has a general tendency is to decrease the percentages as the years of study increase, these populations, for the most part, follow this trend. An exception to this trend is observed for rural Brazil, which shows an increase in SAH in individuals with "College completed", and Amazonas, where this increase occurs among the inhabitants that have an education level between "High school completed" and "College incomplete".

Regarding age, although the cut-off patterns adopted by the IBGE (2014) are not homogeneous among the age groups, there is a trend of increased SAH occurrence rates in individuals greater than 30 years of age, regardless of the environments analyzed.

Considering as exogenous and therefore environmental factors, the socio-occupational characteristics of the communities in which they live (Agrovila and Livramento) and, additionally, the variables of age and gender as factors of en-

dogenuous origin and, in this sense, biological, in the multinomial regression model it is possible to statistically size the odds ratios for the occurrence of hypertension in relation to age, gender and environment.

As observed in Table 2, it is therefore possible to ascertain that the risk for the development of SAH is much higher in females, over 40 years of age and who have a fixed residence in the Agrovila community.

Discussion

The maintenance of high blood pressure levels is considered an important public health problem, especially due to the high number of cases identified each year. Despite the existence of a number of ways of reducing these indices, including a wide range of anti-hypertension drugs, the control of high blood pressure is still well below what is expected and far from being achieved²⁵.

The specific spatial location of the communities that form the SDR of Tupé results in these communities being influenced by both urban (Manaus - AM) and rural environments (forested areas and their surroundings). Furthermore, these communities reside in an area that is environmentally protected, which aggravates the socioeconomic conditions of the population. Despite of the differences in geographical locations

Table 1. Prevalence of SAH in the rural and urban environment of Brazil and the state of Amazonas, according to its distribution in the variables of gender, education and age group, 2013.

Analyzed demographic variables		Environment			
		Brazil		Amazonas	Manaus
		Urban	Rural		
Gender	Male	12.1	15.6	8.2	8.1
	Female	14.9	16.1	21.6	22.2
Education	No formal education and elementary/middle school incomplete	15.6	17.0	15.9	
	Elementary/middle school completed and high school incomplete	13.0	14.1	13.0	
	High school completed and college incomplete	12.3	5.2	22.1	
	College completed	9.3	20.1	4.0	
Age group	From 18 to 29 years	6.1	10.8	6.7	
	From 30 to 59 years	12.4	15.6	15.1	
	From 60 to 64 years	14.7	16.2	7.9	
	From 65 to 74 years	16.3	14.6	29.6	
	With 75 years or more	17.2	21.5	15.7	

Source: IBGE. National Health Survey 2013: Perception of health status, lifestyle and chronic diseases in Brazil, Major Regions, and Federation Units.

Table 2. Ratio for the occurrence of SAH, according to variables: age group, gender.

Demographic reference variables		Population with systemic arterial hypertension (SAH)		
		p-value	Odds Ratio	95% Confidence Interval
Age group	From 18 to 30 years (ref.)	-	-	-
	From 30 to 40 years	0.019**	0.267	LI (-0.836) LS (1.370)
	From 40 to 50 years	0.033**	0.333	LI (-0.679) LS (1.345)
	From 50 to 60 years	0.151	0.533	LI (-0.325) LS (1.391)
	From 60 to 70 years	0.853	0.933	LI (0.205) LS (1.662)
	More than 70 years	0.253	1.467	LI (0.810) LS (2.123)
Gender	Male (ref.)	-	-	-
	Female	0.0***	3.500	LI (2.858) LS (4.142)
Community	Livramento (ref.)	-	-	-
	Agrovila	0.055*	1.615	LI (1.126) LS (2.104)

Significance at ***1%, **5% or *10%.

Source: Data collection performed in the Agrovila and Livramento communities of the SDR of Tupé, Manaus-AM, 2013 and 2014.

of the population samples mentioned here, this situation is very similar to what was observed in the population of the 22 municipalities of Sergipe and Alagoas, which comprise the region of lower São Francisco, in northeastern Brazil²⁶.

It should be noted that productive activities within the boundaries of the SDR of Tupé cannot expand, since industrial, agricultural, commercial, and tourism ventures that put native forest and water source areas at risk are simply banned or severely restricted. In this region, agriculture plays a central role in the economy. Therefore, continued efforts and investments should be focused on improving the conditions of agricultural practices in the region, since any effort that does not focus on the established patterns for the riverine environment will be doomed to failure²⁷.

As shown in Table 3, in the Agrovila and Livramento communities, the main sources of labor and income of the residents are linked to family agriculture, extractivism, fishing and handicrafts using non-timber forest products. Similar conditions were previously described in a study developed with a quilombola community located in the Atlantic Forest of the city of Cananéia - SP, where the population involved did not depend on purchasing food from external sources, and largely depended on the use of the various preexisting resources in their habitat²⁸. It should also be mentioned that individuals who are dependent on income from retirement pensions, small businesses, public employees' salaries and occasional activities, such as owners of small farms and vacation homes located in the interior of the Reserve are also included in this amount.

Despite of the fact that measuring the quality of life of an individual, or even of a group, is considered a very pretentious objective²⁹, it is understood that the socioeconomic condition has a direct impact on the quality of life of an individual, especially when considering the presence of hypertension³⁰. For the most part, the houses in this region have little or no structure for sanitation and cleaning, running water and/or electric lighting. In general, the educational level of the population is low, which is a result quite similar to that reported by Cabral et al.³¹, who carried out a study in the city of Uatamã - AM, where it was observed that more than half of the sample studied had only elementary/middle school level education. Furthermore, incomes are reduced and access to information, social projects and health programs are hampered by seasonality of the water levels of the rivers and streams that surround it, which is similar to the results of a previous study carried out with riverine inhabitants of Rio Machado de Ji-Paraná, RO³². As a consequence of all these factors, the diet is rich in fatty foods, high in salt and preservatives, which is not a cultural issue, but because until very recently, the lack of electricity in the communities prevented them from conserving and storing perishable foods. Thus, the control of glycemic indexes, cholesterol, triglycerides and blood pressure is extremely precarious. In a survey carried out by the Brazilian Institute of Geography and Statistics (IBGE) in the State of Amazonas, it was observed that between 2008 and 2009, when compared to data obtained in 2002 and 2003, there was a considerable reduction in the con-

Table 3. Main occupation according to gender of the residents of the Livramento and Agrovila communities, belonging to the SDR of Tupé, Manaus, AM, in 2013 and 2014.

Community	Gender	Principle occupation				
		Public Employees	Retired	Permanent Job	Farming	Trade
Livramento	Male	1.72%	3.45%	5.17%	8.62%	1.72%
	Female	1.72%	4.17%	8.33%	9.72%	1.39%
	Sub-total	1.54%	3.85%	6.92%	9.23%	1.54%
Agrovila	Male	8.82%	5.88%	14.71%	19.12%	2.94%
	Female	4.62%	7.69%	3.08%	10.77%	3.08%
	Sub-total	8.27%	10.53%	9.02%	15.04%	3.01%

Community	Gender	Ocupação principal				
		Casual Work	From Home	Students, Minors and Others without Income	Do not know/Did not inform/Refused	Total
Livramento	Male	12.07%	0.00%	58.62%	8.62%	100%
	Female	6.94%	5.56%	58.33%	4.17%	100%
	Sub-total	9.23%	3.08%	58.46%	6.15%	100%
Agrovila	Male	2.94%	0.00%	30.88%	14.71%	100%
	Female	3.08%	3.08%	38.46%	26.15%	100%
	Sub-total	3.01%	1.50%	34.59%	20.30%	100%

Source: Data collection performed in the Agrovila and Livramento communities of the SDR of Tupé, Manaus-AM, 2013 and 2014.

sumption of foods such as fish and cassava flour, and a gradual increase in the consumption of industrialized foods, in riverine communities³³.

The proximity of Manaus directly interferes with the population profile of SDR of Tupé. Young people, especially males, often go to the capital in search of employment and study opportunities. In fact, Medeiros Valle and Lima³⁴, reported that residents of the riverine communities migrate in search of employment in the Free Economic Zone of Manaus – AM. In contrast, the population over 40 years old does the opposite. This could be because these individuals cannot adapt to the rigors of competition for work, income, study and/or housing, or because the bucolic life of the countryside enchants some of the inhabitants from the Amazonian capital. Additionally, the occupation of the communities within the SDR of Tupé presents a distinct socio-historical dynamic, generally determined or at least conditioned by the limits imposed by the local geography.

The community called “Agrovila Amazonino Mendes”, or simply Agrovila, was officially founded on April 10, 1994. It is located in the extreme northeast of the SDR of Tupé, highlighted by different socio-occupational clusters. The cen-

tral area is where most of the houses, incipient commerce, school, churches and common areas are located. Away from this nucleus, towards the forest, are plots or lots of land, which are intended for planting and other agricultural practices. A little further away, is the population that live off of foraging, fishing and subsistence planting on the banks of the Igarapés Acácio and Caniço.

Arriving and leaving the community Agrovila is only possible by traveling by boat through the Igarapé Taruma-Mirim, a tributary of the Rio Negro. When the water rises in the rainy season, the travel time to Manaus is about two hours, and depends on the speed of the boat and other navigation conditions. In the dry season, the water level drops to such an extent that it is only possible to navigate in small boats and canoes.

Located in the extreme southeast of the SDR of Tupé, the Nossa Senhora do Livramento community was founded, in 1973, by a group of workers linked to the Union of Rural Workers, who sought to control and take over ownership of the land where they extracted coal, which was then sold to consumers in Manaus. It has always been strongly influenced by its proximity to Manaus. Over the years it has been expanding into the reserve, forming a differentiated nucle-

us of residents. The oldest and more financially stable residents reside in the central part of the community, and have easy access to schools, the health clinic, trade and boat transportation to Manaus. Surrounding this nucleus, are at least two other agglomerates, characterized by residential plots, which are sometimes dedicated to the agricultural activities of the owner.

Sedentary lifestyle and obesity are among the most influential exogenous factors in the prevalence of SAH³⁵. By analyzing only the general conditions of life of the communities studied here, we find that the most intense work activity is most prevalent among the men of Agrovila. In the Livramento community, which is closer in proximity to Manaus, and has regular transportation and access to consumer goods and work, the labor intensity appears to be similar for both men and women. In this sense, the data observed in the present study resemble those described in a study carried out with residents of the rural area of Nova Betânia de Farias Brito – CE³⁶, a region distant from large urban centers, where SAH was more prevalent in women than in men, since the men perform activities that require constant physical activity, while the women have a more sedentary lifestyle.

With the occupational categories and the values indicated in Table 3, the percentage of the population that engages in agricultural work with the one that maintains a fixed job, is engaged in trade or commerce, does occasional casual work for third parties or is responsible for domestic activities can be calculated. For the Livramento community this difference was relatively small between men (27.59%) and women (31.94%). On the other hand, for the Agrovila community, the difference was significant: 39.71% of the men have intense work activity, while only 23.08% of the women are in this situation.

Final considerations

The study is justified by the need, in the public health system, to construct mechanisms and ways to prevent, control and reduce morbidity and mortality indicators, especially in places with a low demographic density or economic significance.

Assessing the risk profile, that has an impact on the prevalence of CNCDs, such as SAH, depends on the types of habits, behaviors, lifestyles and diets of the individual. These conditions not only depend on the socioeconomic profile of the individual (i.e. income, occupation and education), but also on the time or moment when the individual is exposed to socio-environmental conditions. On one hand, the modern lifestyle provides the population access to consumer goods, improved housing and infrastructure, and increased mobility through the use of motorized vehicle. On the other hand, the modern lifestyle imposes limitations on public health, through the consumption of unhealthy foods, and reduced exercise and manual labor. In both cases, the control of the disease requires the individual to adopt more healthy life style habits, which include the control of anxiety, depression, stress and agitation associated with modern life, as well as the control of body weight, consumption tobacco and alcoholic beverages, foods and beverages containing sugars in various forms (glucose, sucrose, fructose, lactose), fats and farinaceous and regular exercise³⁷⁻³⁹.

Access to the health network, which allows for the regular monitoring of the patient, is fundamental for the control of chronic diseases, such as hypertension. However, Buss⁴⁰ reported that in addition to simple access to health services, an adequate standard of quality in the treatment of individuals and populations that present health conditions is required, in order to consider the care and services to be satisfactory. Furthermore, disease control depends on the availability of collectively organized resources, such as clinics, doctor's offices, outpatient clinics and hospitals with sufficient and adequate equipment and medication, multiprofessional technical personnel, appropriate transportation systems, as well as human and financial resources.

Finally, the results pointed out in this study, though restricted with regards to socio-environmental and geographical aspects, suggest that health care networks should be planned, managed and organized according to population characteristics that are stratified territorially, so that they are effective and satisfactorily benefit the population.

Collaborations

DF Mariosa performed the research, designed the methodology, and contributed to the final writing of the text. RRN Ferraz contributed to the outline of the article and the final writing of the text. EN Santos-Silva was responsible for the research and data collection.

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