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PLANETARY HEALTH: DISTRIBUTION OF DENGUE, ZIKA, AND CHIKUNGUNYA CASES IN GOIÁS (2017-2021) AND SOCIO-ENVIRONMENTAL FACTORS

SAÚDE PLANETÁRIA: DISTRIBUIÇÃO DE CASOS DE DENGUE, ZIKA E CHIKUNGUNYA EM GOIÁS (2017-2021) E FATORES SOCIOAMBIENTAIS

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ABSTRACT: **Objective:** to identify the distribution of dengue, zika and chikungunya cases by health regions in the state of Goiás and propose interventions in the light of Planetary Health. **Method:** This is a cross-sectional and descriptive study with data from Tabnet (2017-2021). Data were organized according to the number of probable dengue, zika and chikungunya cases by municipality of residence in the state of Goiás, and then distributed among the 18 health regions. **Result:** The central region of the state of Goiás had a higher distribution of dengue, zika and chikungunya cases due to population density and poor sanitation. **Conclusion:** Public policies should consider the socio-environmental characteristics and strengthen Primary Health Care (PHC). PHC, mediated by Popular Health Education, should implement the principles of Planetary Health and environmental education, raising awareness about the relationship between environmental imbalances and diseases, and how preservation and changes in habits can reduce these impacts.
KEYWORDS: Dengue. Zika Virus. Chikungunya Virus. Primary health care. Planetary health.

RESUMO: **Objetivo:** identificar a distribuição de casos dengue, zika e chikungunya por regiões de saúde no estado de Goiás e propor intervenções a luz da Saúde Planetária. **Método:** Trata-se de um estudo transversal e descritivo com dados do Tabnet (2017-2021). Os dados foram organizados de acordo com os números de casos prováveis dengue, zika e chikungunya por município de residência do estado de Goiás, e, em seguida distribuídos pelas 18 regiões de saúde. **Resultado**: A região central do estado de Goiás teve maior distribuição dos casos de dengue, zika e chikungunya, devido à densidade demográfica e ao saneamento básico deficiente. **Conclusão:** Políticas públicas devem considerar as características socioambientais e fortalecer a Atenção Básica em Saúde (ABS). A ABS, mediada pela Educação Popular em Saúde, deve implementar os princípios da Saúde Planetária e da educação ambiental, conscientizando a população sobre a relação entre desequilíbrios ambientais e doenças, e sobre como a preservação e mudanças de hábitos podem reduzir esses impactos.
PALAVRAS-CHAVE: Dengue. Zika Virus. Vírus Chikungunya. Atenção Primária a saúde. Saúde planetária.

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INTRODUCTION

The warming of our planet and the destruction of our ecosystems have created serious threats to human health, such as: food insecurity, mental illnesses, excessive mortality due to heat and air pollution, physical and mental trauma, the extreme weather events and the expansion of the range of vector-borne diseases[1].

In addition, climate change and ecological destruction are undermining progress, access to ecological diversity and therefore sustainable life, thus creating important challenges for public and collective health. Although in the last century it has been of great importance in creating achievements in the area of health sciences[1].

In the meantime, mosquito-borne diseases are on the rise and their scope is reemerging in areas where they had been declining for decades. Among them, it is essential to emphasize the arboviral diseases (dengue[1], zika[2] and chikungunya[3]), transmitted mainly by the bite of the infected female *Aedes aegypti* mosquito.

These diseases have become a substantial global public health problem in most tropics and their specific diagnoses represent an enormous challenge due to the similarity between them[2-4].

Dengue and chikungunya have similar signs, while dengue is highlighted by the pains in the body, chikungunya stands out by pain and swelling in the joints. Zika is manifested by a lower fever (or absence of fever), many spots on the skin and itching on the body[4]. In short, the differential diagnosis of this triad is difficult due to the overlapping of symptoms[2,5].

In the state of Goiás, Brazil, this mosquito was introduced in 1987, in the south. Its synanthropic (adapted to living in urban environments) and anthropophilic behavior (preference for humans as food source or host) enabled its geographical expansion and, in 1990, was described for the first time in Goiânia "capital of the state of Goiás" in Brazil; five years later, 59 municipalities were reporting dengue epidemics. From then on, the disease showed an upward trend, even with control activities. Its transmission has a cyclical behavior, interspersing the years with high and low incidences. Thus, the epidemic peaks coincide with the rainy seasons and the most important risk factor has been to live or circulate in areas where cases are occurring[6-7].

It is known that the expansion of arboviruses points to the needs regarding the restructuring of epidemiological surveillance, change in control policies, inclusion of municipal realities, environmental management and integration of other social sectors[6].

Understanding these relationships are of fundamental importance for the protection of the population's health, prevention of outbreaks, development of effective interventions and then in improving the quality of life of people affected by these diseases, especially when knowing the socio-environmental and territorial characteristics of the vectors[8].

Therefore, urbanization not only in the state of Goiás, but on a global scale, is present today and tends to increase only in the future, revealing the need to study environmental and urban health, in order to promote a better quality of life for individuals living in cities and avoid diseases that could be prevented as those presented here, in order to promote a Planetary Health (harmonious relationship between human health and the health of the planet) focused on issues (political, economic and social)

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1 Dengue: The first symptom of dengue fever is a high fever, between 39°C and 40°C, which appears suddenly and usually lasts from 2 to 7 days. It is accompanied by headache, body and joint pain, prostration, weakness, pain behind the eyes, skin rashes and itching on the body. Weight loss, nausea and vomiting may also occur[4].

2 Zika: The main symptom is an itchy rash accompanied by a low-grade fever (or no fever), conjunctivitis (red eyes without discharge or itching), joint pain, muscle pain, and headache. Symptoms usually disappear within 3 to 7 days[4].

3 Chikungunya: It starts suddenly with a fever, which can be high but is usually lower than in dengue fever. It presents with muscle and joint pain (more intense than in dengue fever and Zika fever), headache and skin rashes. Symptoms usually last from 3 to 10 days[4].

that aim to pursue the highest possible standard of health, well-being and equity, taking into account both human systems as well as the natural systems of Earth[9].

Thus, the following question arises: How is the distribution of dengue, zika and chikungunya cases by health regions in the state of Goiás? Given the above, the study aims to identify the distribution of dengue, zika and chikungunya cases by health regions in the state of Goiás and propose interventions in the light of planetary health.

METHODOLOGY

This is a cross-sectional and descriptive study, conducted using data collected through Tabnet. This tabulation tool developed by the Department of Informatics of the Unified Health System (DATASUS) allows on-line tabulations of data and generation of a spreadsheet, quickly and objectively, from the database of the Unified Health System (UHS)[10].

Concerning the state of Goiás, the following variables are included: number of probable dengue cases per municipality of residence in the state of Goiás from 2017 to 2021; number of confirmed cases of chikungunya per municipality of residence in the state of Goiás in the period from 2017 to 2021; and number of confirmed cases of zika per municipality of residence in the state of Goiás in the period from 2017 to 2021.

Subsequently, the cases by municipality for each disease were grouped in spreadsheets using the Excel software of the Microsoft Office 365® package and organized according to the 18 health regions of the state of Goiás: Central (central), Centro Sul (mid-south), Entorno Norte (north surroundings), Entorno Sul (south surroundings), Estrada de Ferro (railroad), Nordeste I (northeast I), Nordeste II (northeast II), Norte (north), Oeste I (west I), Oeste II (west II), Pireneus, Rio Vermelho, São Patrício I, São Patrício II, Serra da Mesa, Sudoeste I (southwest I), Sudoeste II (southwest II) and Sul (south). Thus, the distribution of cases by health region of the state of Goiás was obtained. After the cases, the illustrations were added up and elaborated. The results were then discussed proposing interventions in the light of Planetary Health.

Regarding the ethical aspects, in accordance with article 1 of the National Health Council (CNS) Resolution n. 510/16 dated 7 April 2016, detailed in the circular letter of the National Research Ethics Committee (CONEP) - Executive Secretariat of the National Health Council (SECNS) - Ministry of Health (MS) No. 17/2022, establish that research using information in the public domain, such as those collected on Tabnet, will not be registered or evaluated by the REC/CONEP system.

RESULTS

Figure 1 shows the distribution of dengue cases by health region in the state of Goiás, between 2017 and 2021, where the central region has 1,912,047 inhabitants and 26 municipalities, and the center-south with 25 municipalities and 934,746 inhabitants, regions that presented the highest number of cases for dengue, with 140862 and 81601 cases, respectively.

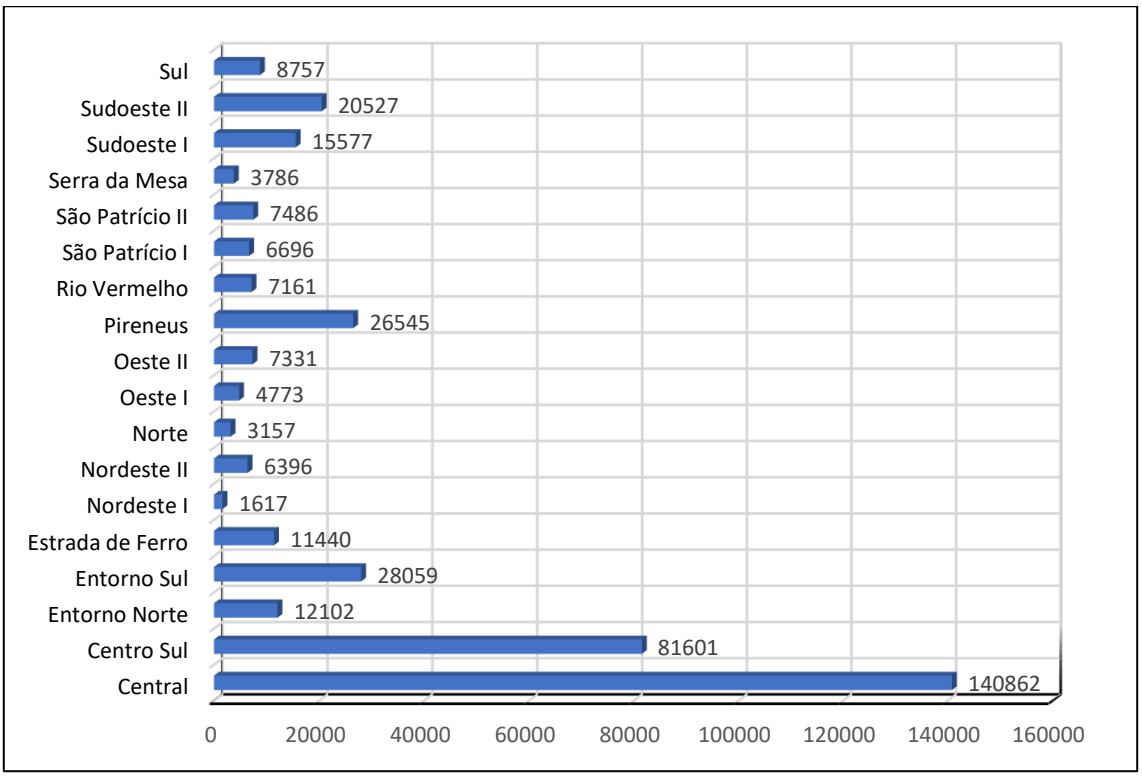

Figure 1 – Distribution of dengue cases by Health Region of the State of Goiás between 2017 and 2021.Goiás, 2022.
Source: DATASUS (2022).

Figure 2 shows the distribution of chikungunya cases by health region in the state of Goiás between 2017 and 2021. The health regions with the highest case distribution were the central and south surroundings regions. The Central region has 1,912,047 inhabitants and 26 municipalities and the south surroundings region, 7 municipalities and 900,524 inhabitants.

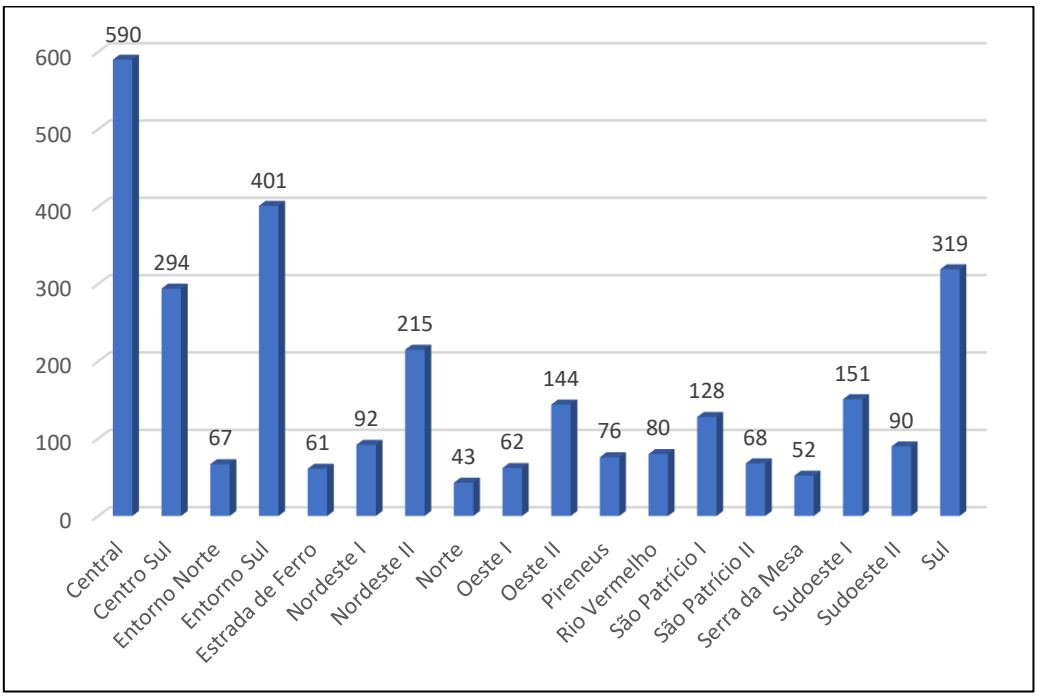

Figure 2- Distribution of chikungunya cases by Health Region of the State of Goiás between 2017 and 2021.Goiás, 2022.
Source: DATASUS (2022).

Figure 3 shows the distribution of Zika cases by health region in the state of Goiás between 2017 and 2021, where Central and Centro Sul regions had the largest distribution.

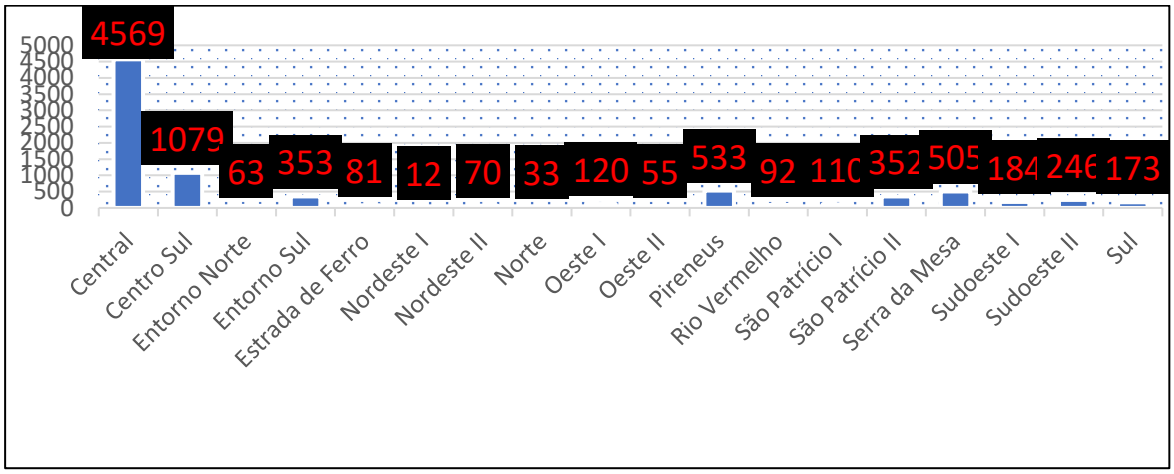

Figure 3 - Distribution of Zika cases by Health Region of the State of Goiás between 2017 and 2021.Goiás, 2022.
Source: DATASUS (2022).

In short, the results showed that the central health region of the state of Goiás presented a greater distribution of cases for the three arboviruses studied, since it comprises the cities of: Abadia de Goiás, Anicuns, Araçu, Avelinópolis, Brazabrantes, Campestre de Goiás, Caturaí, Damolândia, Goiânia, Goianira, Guapó, Inhumas, Itaguari, Itauçu, Jesúpolis, Nazário, Nerópolis, Nova Veneza, Ouro Verde de Goiás, Petrolina de Goiás, Santa Bárbara de Goiás, Santa Rosa de Goiás, Santo Antônio de Goiás, São Francisco de Goiás, Taquaral of Goiás and Trindade and a population of 1,912,047 inhabitants, being the most populous in the state.

DISCUSSION

According to the Brazilian Institute of Geography and Statistics (IBGE)[11], in 2022, the state of Goiás had a population of 7,056,495 residents. The health region with the highest distribution of dengue, chikungunya and zika cases was the central one. This region corresponds to a quantity of 1,912,047 inhabitants, being the most populous in the state, comprising 27.1% of all the inhabitants of the state[11].

Therefore, it is a consensus of the literature that the process of disorderly urbanization producing regions with high population density, with serious deficiencies in water supply and urban cleaning, and the intense traffic of people between urban areas is fundamentally inefficient in fighting the vector and makes the transmission and control of arboviruses a thorny job[12].

The discussion about the attraction and permanence of people in a territory raises issues related to development that are also affected by public policies, in a two-way street, as the people living in the locality generate demands that need to be supplied with adequate public policies, as the very offer of these policies can, to some extent, contribute to the movement of people within the regions[13].

In this context, according to the IBGE[11], in 2022, the state of Goiás had a certain inefficiency of coverage of some basic sanitation services, which comprises a set of services fundamental for the socioeconomic development of a region, such as: water supply, sewage, urban cleaning, urban drainage, solid waste and storm water management, in worrying numbers.

In Goiás, only 53.47% of the homes are connected to the sewage network, below the national average, which is around 64.69%; of these, 84.54% are supplied by the general water network and

94.38% have garbage collection. These are predictors for the development of *Aedes aegypti*, which causes this triad, and may explain why so many cases occur in this region where urbanization is greater[11].

Thus, epidemiological surveillance and public health responses may need to be done for longer periods, increasing the demand for already scarce public resources. It is observed that these changes may not translate into increased morbidity if health systems identify and suppress such complications[14-15].

In Brazil, the public health responses to these diseases occur with some inefficiency, partly due to the lack of public health services and professionals, especially regarding their recognition that the degradation and environmental impacts contribute to the development of diseases and their professional roles in the mitigation of such conditions. In this regard, there are the Primary Health Care (PHC) services, which, in line with the Declaration of Alma-Ata, contemplate three essential components: universal access and first point of contact of the health system; the indissociability of health from socioeconomic development, recognizing the social determinants that are contained in the territories; and social participation[8,16].

Moreover, Basic Health Units (BHU) and Family Health Strategy Teams (FHS) make the Brazilian PHC possible, characterizing itself as the first level of health care and performing a set of health actions, both individually and collectively, covering the promotion and protection of health, prevention of health problems, diagnosis, treatment, rehabilitation, harm reduction and maintenance of health with the aim of developing an integral care that positively influences the health situation of communities. It is the ideal place where educational actions are developed to mitigate such reality[17-18].

As a proposal for suppression, the Planetary Health is presented, which consists of the highest possible standard of health, well-being and equity, taking into account both human systems and the natural systems of the Earth, being proposed as a comprehensive solution to address sustainability and human life on the planet. This concept represents a new effort that adopts an integrative, transdisciplinary and global perspective. It assumes that the problems related to the planetary crisis transcend geopolitical boundaries and academic boundaries, affecting humanity in its totality[9,19].

This approach promotes a systemic vision by focusing on understanding, quantifying and acting to reverse the impacts of human population growth and intensification of socioeconomic activities on the environment. Such activities cause disturbances in the natural ecosystems of the Earth, which in turn negatively affect human health and well-being[19].

In line with such information, the World Health Organization (WHO) attributes almost a quarter of global disease burden and deaths to environmental degradation, and thus vector control is of paramount importance, since it is the main method to reduce transmission and contain outbreaks due to the often unavailability of immunobiologics and drugs for fighting such diseases[2,20].

For this reduction, there is an urgent need for continuous education in the community about the impacts of climate change and environmental degradation on health, especially within the territories of each family, and this is what these PHC services do or should do, because they are located within the territories and close to the family[8,21-22].

PHC services should be guided in aspects of Popular Health Education (PHE), based, for example, on the epistemology of Paulo Freire, valuing the popular knowledge, the ancestry and promoting the active participation of people in the construction of knowledge and in the transformation of their realities, that is, promoting change from their ways of life. In order to demonstrate their roles both in contributing factors, in terms of environmental degradation aspects for the development of health problems, and in the mitigation of them[23].

The time is right to implement crucial measures to combat mosquito proliferation, such as: teaching the population to identify and eliminate sites of accumulation of standing water, where the

mosquito reproduces; guiding people to check their yards and home environments weekly to remove containers such as tires, bottles, plant pot dishes and clogged gutters; encouraging the use of repellents; promoting the installation of screens on windows and doors to prevent mosquitoes from entering the homes; carrying out proper maintenance of water boxes and cisterns, always keeping them closed to prevent the mosquito from depositing eggs in these places; and reinforcing the importance of notification to health authorities about possible mosquito outbreaks and suspected cases of diseases transmitted by *Aedes aegypti* for control and sectoral epidemiological actions.

This educational approach is the opportune moment for health professionals to associate the principles of Environmental Education and Planetary Health Education. Due to environmental education concern with the relationship between humans and the environment, promoting awareness of environmental issues and encouraging sustainable practices. And the Planetary Health Education for expanding this concern to a global perspective, encompassing the interdependence between all living beings and the planet as a whole, being key to the formation of transforming agents, that is, these citizens in capacity to change the reality in society[23-25].

Therefore, by uniting PHE with the principles of environmental education and Planetary Health Education, an integrated and holistic approach is created that not only seeks to improve the health of people and communities, but also promotes a broader awareness about the interconnectedness between human health, environmental health and planetary sustainability. This results in more inclusive, participatory and transformative educational practices, aligned with contemporary health and environmental challenges, promoting more conscious citizens within their territories and then elsewhere, seeking to understand the environmental factors that affect human health, such as air and water pollution, climate change and environmental degradation, but also the promotion of sustainable lifestyles and the protection of natural ecosystems and then the reduction of diseases such as diseases transmitted by mosquitoes[23-28]. Thus, promoting and empowering these peoples to face environmental impacts and teaching them how to preserve the environment in order to learn to live harmoniously with nature reduces such impacts[26-28].

Furthermore, a study conducted in 2018 among the surveyed municipalities of Goiás showed that Goiânia had the highest literacy rate, a municipality with higher population density within the central region and with greater distribution of cases of the three arboviruses. These results highlight the importance of population education, especially in the context of combating neglected vector diseases. Schooling plays a crucial role in these initiatives, since many actions depend on the collaboration and active participation of the community[13].

In the meantime, studies indicate that low literacy is associated with several health problems. To address these issues effectively, it is essential to present information in a simple and accessible manner. However, many resources, mainly online, with the advent of digitization, contain complex and often inaccessible language, which makes it difficult to understand for those with limited reading and interpretation skills. This directly undermines efforts to combat *Aedes*, especially concerning home care, since many residents do not understand the necessary instructions to prevent the proliferation of the vector, thus making it impossible to carry out actions in environmental education and planetary health education through PHE, once again emphasizing the importance of this practice in the community[13,24].

Therefore, rethinking the evaluation and promotion of health literacy and environmental literacy is of fundamental importance to provide adequate guidance at the level of understanding of each population, enabling promotional actions within PHC services. Unfortunately, there is an increasing frequency of diseases related to the environment, which reinforces the urgency for health professionals, users and managers to incorporate the theme into their daily practices. Most of the time, these

professionals recognize that impacts on natural systems have consequences for human health, but do not consider such repercussions in their daily workflow[8,29-30], thus the importance of integrating the principles of Planetary Health and its daily practices.

A limitation of the study concerns the analysis of only one Brazilian federative unit and the use of a descriptive analysis, which does not allow the explanation of a phenomenon or generalization of data, but brings a reflection on the distribution of cases of circulating arboviruses in a federal unit in the central region of Brazil, as well as ponders the importance of monitoring and training the population and communities to mitigate health problems and then generates the appreciation of the promotion of PHC services throughout the national territory, drawing the attention of public authorities to such devices and the importance of promoting PHE in them imbued with social and environmental aspects.

Moreover, from the point of view of social impact, the research can play a crucial role in formulating more effective public policies on health and environment, resulting in direct improvements in the quality of life of the population.

CONCLUSION

The distribution of dengue, zika and chikungunya cases by health regions in the state of Goiás from 2017 to 2021 showed that the central region of the state had a higher case distribution of the three arboviruses studied, as it makes up the cities with the highest sociodemographic concentration, including the state capital.

In this region, areas of high population density were also evidenced, with high circulation of people and deficiency in basic sanitation services, being a predictor for the development of arboviruses. As a suppression measure, it is recommended the development of public health policies that massify the importance of PHC services, by doing close and continuous work with families within their assigned territories.

To maximize these aspects, it is of fundamental importance that these services recognize the social and environmental characteristics, the way of life of families and their social determinants, in order to maximize and promote effective actions regarding arboviruses. This can be done through the implementation of Popular Health Education, mediated by Planetary Health and environmental education, recognizing the triad between environment, society and health, making people recognize that the environmental impact causes diseases such as arboviruses evidenced here and that environmental preservation and changes in habits can mitigate them.

ORIGIN OF THE ARTICLE

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