Sanitary conditions diagnosis in vulnerable communities in the City of Recife and its influence on Covid-19 cases

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ABSTRACT

The Covid-19 pandemic calls into question deficiencies in current public policies and infrastructure of basic services to the population in large urban centers. From health systems, environmental sanitation and social protection, particularly for the low-income population, this opens the debate of the values and priorities at different scales. The research study area are subnormal settlements located in the neighborhoods of Pina and Brasília Teimosa in the Metropolitan Region of Recife. The aim was to assess the sanitary conditions in ZEIS, by conducting semi-structured interviews and assessing secondary data. Among the interviewees, only 56.3% said they had sanitary sewage collection and another 74.4% (n=1041) had access to water supply by Compesa, showing a significant deficit in the provision of basic services. With the pandemic, the necessary production of detailed empirical field data from the perspective of the peripheries faces great scientific challenges. Ensuring access to ideal sanitary conditions is a right for all and is related in an integrated way to multiple SDGs of the 2030 agenda. Demanding safe, adequate and affordable housing, and inclusive and sustainable urbanization, with capacity for planning and management of participatory, integrated and sustainable human settlements.

KEY-WORDS: Sanitation; Vulnerable communities; Covid-19

INTRODUCTION

The advent of Covid-19 highlighted the urgent need to improve basic sanitation indicators in Brazil, as well as interconnected factors such as social inequality, precarious housing, public health, environmental sustainability, and quality of life[1]. Although there are investments and a relative improvement in the indicators that measure access to services are observed, the number of households without access to water supply and sanitary sewage has maintained relative stability. This shows that the public sanitation policy has not been able to keep up with the pace of growth, urbanization, and formation of precarious settlements in the country (ANA, 2019).

The United Nations (UN) highlights the speed and scale of the pandemic, the severity of the cases, and the social and economic disruptions caused by it, which are relevant to the achievement of the Sustainable Development Goals (SDGs) of the 2030 Agenda. This emphasizes the deprivation of people to the most basic and effective prevention measure against coronavirus, frequent hand washing, in a world where 2.2 billion people do not have access to water and 4.2 billion lack basic sanitation (SNIS, 2018). Universal and equitable access to water, is about ensuring that it is provided for all, regardless of social, economic or cultural status, gender or ethnicity.

The present study is justified by the current context of the Coronavirus pandemic, having as focus the areas defined as Special Zones of Social Interest (ZEIS). The ZEIS established in urban master plans stand out as an urban regulatory initiative and instrument that can affect precarious settlements or areas for the production of new housing, providing specific urban planning that make large-scale developments unfeasible. Therefore reducing the vulnerability of the low-income population living in subnormal settlements. Providing a fair, inclusive and plural urbanization having the right to the city as a horizon of conception and action.

The study contributes to the understanding of the scenario created by social isolation as a mitigating measure for the transmission of Covid-19. This measure has a strong negative impact on the economy, especially the informal economy, since the low-income population depends primarily on activities that require direct contact with society. Therefore it is essential

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1 Basic sanitation is defined as the set of services, infrastructure, and facilities for water supply, sanitary sewage, urban cleaning and solid waste management, and urban rainwater drainage, by Law No. 11,445, of January 5, 2007, which establishes national guidelines for basic sanitation (BRASIL, 2007).

to evaluate how the expansion of Covid-19 occurred in vulnerable communities in neighborhoods of the city of Recife, and the factors that converge the lack of sanitary conditions with the susceptibility of hundreds of families.

In this sense, evaluating access to sanitation services can be an important way to monitor socio-environmental vulnerabilities (QUEIROZ et al., 2020). In addition, collecting specific data, such as income, education and race variables, can provide empirical support to integrate public policies, which in turn help interrupt historical social and environmental injustices cycles. Therefore, the results aim to understand the socioeconomic scenario of the studied communities, as well as generating information that can be used for public policy formulation on the post-pandemic.

This being said, it becomes fundamental to evaluate how the expansion of Covid-19 in Recife is affecting these populations, especially on lockdown, that directly impacts people who have in the informal trade their only source of income. It is in this context that we propose to analyze the situation of sanitary conditions in the ZEIS in the city of Recife, as a representative place of this process.

OBJECTIVES

The study's main objective is to perform the diagnosis of sanitary conditions in vulnerable communities, located in the ZEIS in the city of Recife and its relationship with the impacts of Covid-19. The specific objectives are: (i) Characterize the communities in general terms of socioeconomic aspects; (ii) Diagnose the lack of basic sanitation services in the communities; and (iii) Evaluate the evolution of contamination by Covid-19 in the neighborhoods of Pina and Brasília Teimosa, Recife/PE.

METHODOLOGY

The research was developed in a qualitative-quantitative perspective. It used quantitative data about the communities, including primary data obtained in the field, and qualitative information together in order to establish a complementary relationship between them. That aimed at a more complete and accurate analysis in the search for description and explanations for the analyzed reality (MINAYO, 2009).

The spatial cutout of the present research was Pina and Brasília Teimosa neighborhoods, both located on the coast of Pernambuco's capital, in the southern area of the city of Recife. The diagnoses were carried out in the Special Zones of Social Interest (ZEIS), located in the Political-Administrative Microregion 6.1, where the districts of Boa Viagem, Brasília Teimosa, Imbiribeira, Ipsep and Pina are inserted. Among which, the districts of Pina and Brasília Teimosa were selected due to the presence of more critical indicators. The selected neighborhoods have a higher percentage of population living in ZEIS, lower average income, lower percentage of households with piped water and garbage collection service (Table 1).

Table 1: Indicators per neighborhood in the 6.1 Political-Administrative Micro region, Recife/PE

Neighborhood	Total resident Population	Relation between ZEIS living population and total population. (%)	Average income (R$)	(%) people that inhabit houses with piped water	(%)of people living in urban households with garbage collection service
Boa Viagem	100.388	14,0	2.857,28	95,02	98,76
Brasília Teimosa	19.155	100,0	313,09	68,46	94,13
Imbiribeira	46.471	46,7	801,27	81,10	95,52
Ipsep	25.714	16,0	871,80	98,26	98,08
Pina	27.422	66,4	758,63	68,38	87,03

Source: Data from the Human Development Atlas in Recife, 2005

According to Recife's Master Plan in Law no. 16. 176/1996, the ZEIS located in the neighborhood of Pina, are the ZEIS Ilha de Deus and ZEIS Encanta Moça, which together include 5 (five) low-income communities, being Ilha de Deus, Bode, Beira Rio, Areinhas and Petrúcio. In addition, there is another ZEIS in the neighborhood of Brasília Teimosa - ZEIS Brasília Teimosa - adjacent to the neighborhood of Pina in its northern portion, covering the whole community of Brasília Teimosa (Figure 1).

Figure 1: Municipality of Recife and subnormal settlements (a), highlighting the Special Social Interest Zones (ZEIS) located in the neighborhoods of Pina and Brasília Teimosa (b)
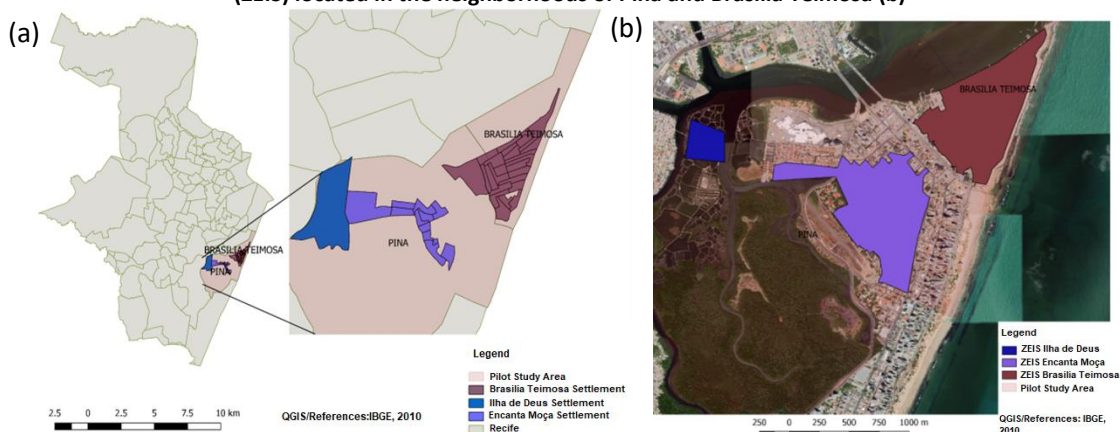
The neighborhoods of Pina and Brasília Teimosa have almost 50 thousand inhabitants. The clippings include communities with the same ecological, economic and social characteristics, whose occupation processes dates back to the 1930s and 1940s. These are traditional territories with a predominance of extractive activities such as fishing and also informal workers linked to the provision of services and leisure. These territories have progressively undergone different transformations in the physical-environmental, social, economic and in the dynamics of land use.

Secondary data were obtained monthly from the Center for Strategic Information in Health Surveillance (CIEVS), of the Executive Directorate of Health Surveillance of the Health Secretariat of Recife, from the daily bulletins published on the website: https://cievsrecife.wordpress.com/publicacoes-devs-sesau-recife/. It was possible to analyze the evolution of the Covid-19 cases and its relationship with the number of deaths from the first day of data availability on March until December 2020.

Shapefile files of the water supply and sewage distribution network were obtained from the Company of Sanitation of Pernambuco (Compesa), as well as indicators available in databases of the Brazilian Institute of Geography and Statistics (IBGE) and National Sanitation Information System (SNIS).

Primary data were obtained from the communities, through semi-structured questionnaires, applied in person with the support of social actors and collaborators. The questionnaires were also conveyed digitally by the local community leaders, via online form format built on Google Forms, containing questions with multiple choice answers to be answered in 10 to 20 min. The interviews and distribution of the form link occurred during two months, in the period from August 1 to September 30, 2020.

All documentation was submitted to the Research Ethics Committee (CEP/UFPE), through Plataforma Brasil, obtaining the Ethics Appreciation Submission Certificate (CAAE) No. 34363120.3.0000.5208 and approval No. 4,174,251.

RESULTS

In accordance with the established objectives the results are presented next. Compiling primary data from 1,399 interviewees, of whom 929 (66.4%) live in the Pina neighborhood, with a large representation of the Bode Community, and another 470 (33.6%) live in the Brasília Teimosa neighborhood. Table 2 presents the number of interviewees per community, located in the Special Zones of Social Interest.

Table 2: Number (nº) of interviews and % realized by community

Zeis / Communities	nº of interviews	% of interviews
Zeis Ilha de Deus		
Ilha de Deus	46	3,3
Zeis Encanta Moça		
Areinha	56	4,0
Beira rio	106	7,6
Bode	666	47,6
Petrúcio	25	1,8
Zeis Brasília Teimosa		
Brasília Teimosa	470	33,6
Others		
NI community at Pina	30	2,1

## Socioeconomic aspects of the community

In the studied communities there is a small local economy that meets the most immediate needs such as fishing and shellfish gathering, in addition to trade activities and small services. There are grocery stores, bars and snack bars, beauty salons, gyms, barbershops and tire repair shops (SILVA; SELVA, 2013). The Ilha de Deus is differentiated by the community tourism that has been structuring itself with the offer of accommodation (hostel), restaurant, trails and walks in the mangrove forest. The population of these communities that is not directly involved in the incipient local economy is employed in public service, commerce, domestic work, and informal services outside the communities.

Due to the relative similarity between the economic activities, in the context of location and proximity of the ZEIS, the data was analyzed as a whole. Among the informal activities of the residents of Pina and Brasília Teimosa the following were highlighted: (i) people

working at the Riomar Shopping Center; (ii) people who work on the beachfront (peanut vendors, oyster, shrimp and fish stew vendors, caretakers, etc); (iii) individuals who work in service provision (hairdressers, helpers, etc). These people, facing social isolation, are directly and severely affected in the economic, social and environmental point of view. Therefore, it was verified that the economical dynamics of these communities are affected by the pandemic occurrence, amplifying the vulnerability situation to which they were already subjected.
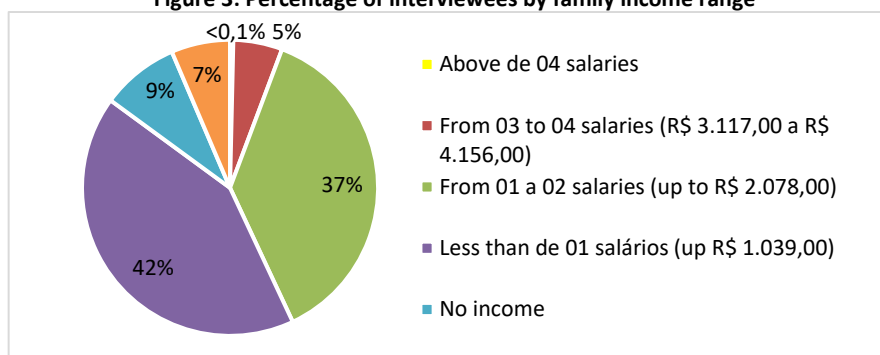
The population of Brasília Teimosa and Pina is mostly brown and black. In both neighborhoods, 49% of the population is Brown and 28% is Black (Figure 2a). The interviewees presented a well distributed age range, varying from 21% to 24% between 18 and 64 years old (Figure 2b).

Figure 2: Interviewees profile percentage by skin color (a) and age group (b)
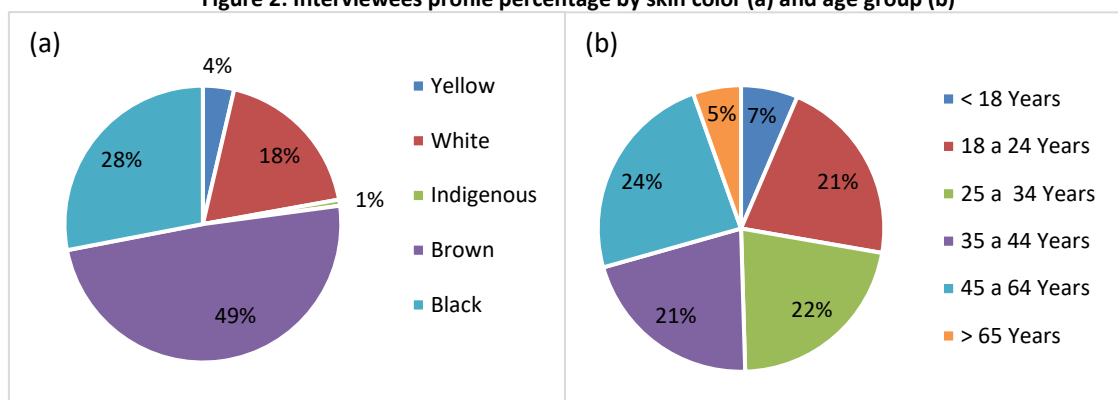
Regarding family income, about 42% of the population have an income of less than 1 minimum wage, and 37% have an income between 1 and 2 minimum wages (Figure 3). In addition to total of 79% low income presented, another 9% of the interviewees are currently without income. In both communities, more than 65% of the interviewees stated that they receive some form of government assistance.

**Figure 3: Percentage of interviewees by family income range**

The Pina neighborhood located in the South Zone of the Metropolitan Region of Recife, between the neighborhoods of Brasília Teimosa and Boa Viagem has 61 hectares and a resident population of 18,334 inhabitants, with 53.25% being woman. About 68% of the population is in the 15 to 59 age group. The average number of residents in the Pina neighborhood is 3.4 inhabitants per household. The proportion of women who are in charge of the household is

49.57%. Demographic Density is 302.81 inhabitants/hectare and it has 5,464 households (CITY OF RECIFE, 2020).

As for schooling, 46% have completed high school while 44% have not. The remaining 10% have entered/accomplished complementary training, either technical courses (n=7), incomplete higher education (n=67), complete higher education (n=61) or post-graduation (n=6). Other short courses, such as professional training, were taken by 26% of the respondents. Despite their education and training, most of the respondents are unemployed, looking for a job, working in the informal sector, or in the area of commerce and services.

Nevertheless, the percentages differ on the issue of employability. The neighborhood of Pina having 20.1% (n=387) of informal self-employed, 18.8% (n=237) unemployed and 18.8% employed in the commerce and services sectors (Figure 4). For Brasília Teimosa the indexes are 49.5% of informal self-employed, 11.9% of formal self-employed and 8.9% of retired people.

Figure 4: Professional activity of interviewees
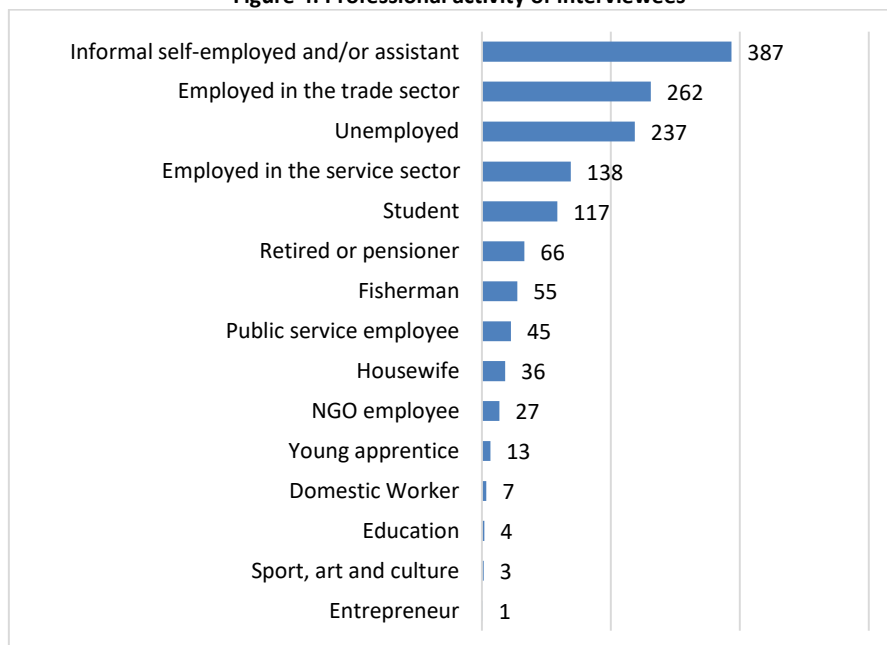
The greatest challenge in complying with the isolation measures is the need to obtain income and employment. However, it was stated by the majority of the respondents, of which 515 received emergency assistance from Covid-19, followed by another 333 respondents who did not (Figure 5). Socioeconomic aspects are related to the condition of the population's respect for the restrictive measures, as well as the community local organization, with great influence from information media.

Figure 5: Number of respondents receiving government assistance
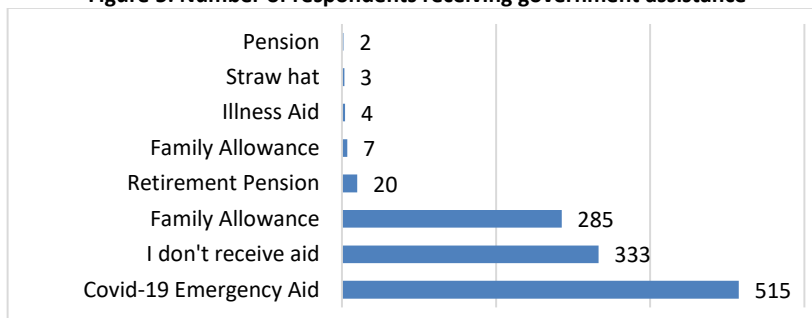
Basic sanitation and infrastructure services in the communities

Despite the fact that the Recife Metropolitan Region (RMR) and the municipality of Recife present a portion of the population with access to treated water higher than the national percentage, with 86.2% and 88.1%, respectively. The number of people without access to treated water is still extremely high with 443 thousand people in RMR and 183 thousand people in the municipality having precarious access (Table 3).

Table 3: Figures and Indexes on Access to Water and Sanitation

| Local	Share of population without access to treated water (%)	Number of people without access to treated water	Share of population without access to sewage collection (%)	Number of people without access to sewage collection
World*	29.0	2.2 billion	54,5	4.2 billion
Brasil	17.0	33,7 million	46,9	96.5 million
Pernambuco	19.5	1.7 million	72,5	6.4 million
RMR	13.8	443 thousand	67,3	2.7 million
Recife	11.9	183 thousand	66,5	687 thousand

Source: The authors, with data from SNIS (2018)

The City Statute, Law No. 10,257 of July 10, 2001, as amended by Laws No. 12,608 of April 10, 2012 and No. 13,116 of April 20, 2015, establishes that among the objectives of urban policy, the guidelines will include ensuring environmental sanitation, urban infrastructure, land title regularization, and urbanization of areas occupied by low-income populations. In addition to democratic management through popular participation and associations.

In this context, understanding urban settlements and their territorial organizational structure, as well as their interference in the environment become challenges within the logic of sustainability. Therefore, within a political and economic approach, the urbanization process reflects the direct relationship that exists between the city and the region where it is located. This process brings with it the consequent change in land use, socio-environmental impacts, and pressure on natural resources (LIMONAD, 2005). The urbanization process produces changes in the landscape, alters the composition of biological diversity and increases the pressure on environmental services.

Considering the data obtained from all respondents in the study area, 56.3% (n=788) stated that they have sanitary sewage collection and another 74% (n=1041) have access to water supply by Compesa, showing a significant deficit in the provision of basic services. According to IBGE (2012), about 100 million people do not have access to such service, where 31.1 million Brazilians do not have general network treated water and 5.8 million do not have a bathroom at home. An even smaller percentages, 32.3% (n=451), have paved streets and rainwater drainage services (Figure 6).

Figure 6: Basic services offered to the population of the studied communities
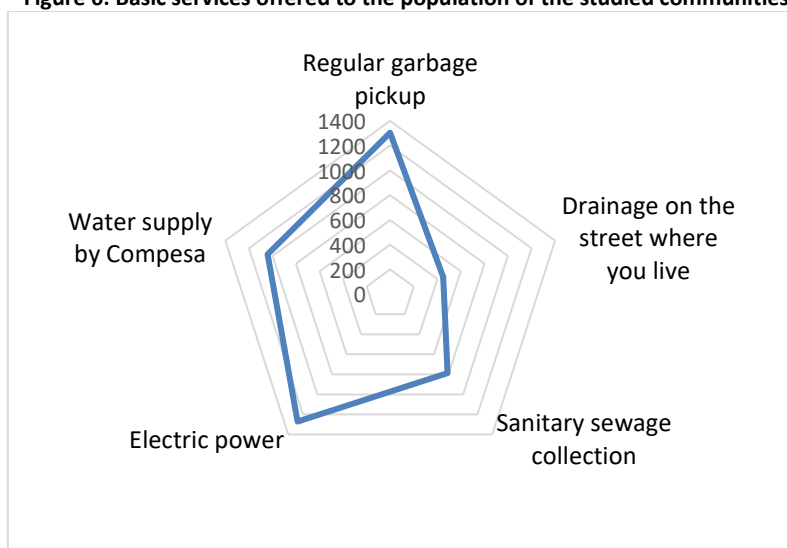
Shapefile data of the water supply and sewage systems, containing the locations of the services were made available by COMPESA. Figure 7 demonstrates the representativeness of the network distribution in the municipalities, being evident the superior relationship of the supply network in contrast to the sanitary sewage, which appears even more critical in the Pina neighborhood. The absence highlights are in the vicinity of riverside communities in both neighborhoods.

Figure 7: Studied neighborhoods sewage and water supply distribution networks
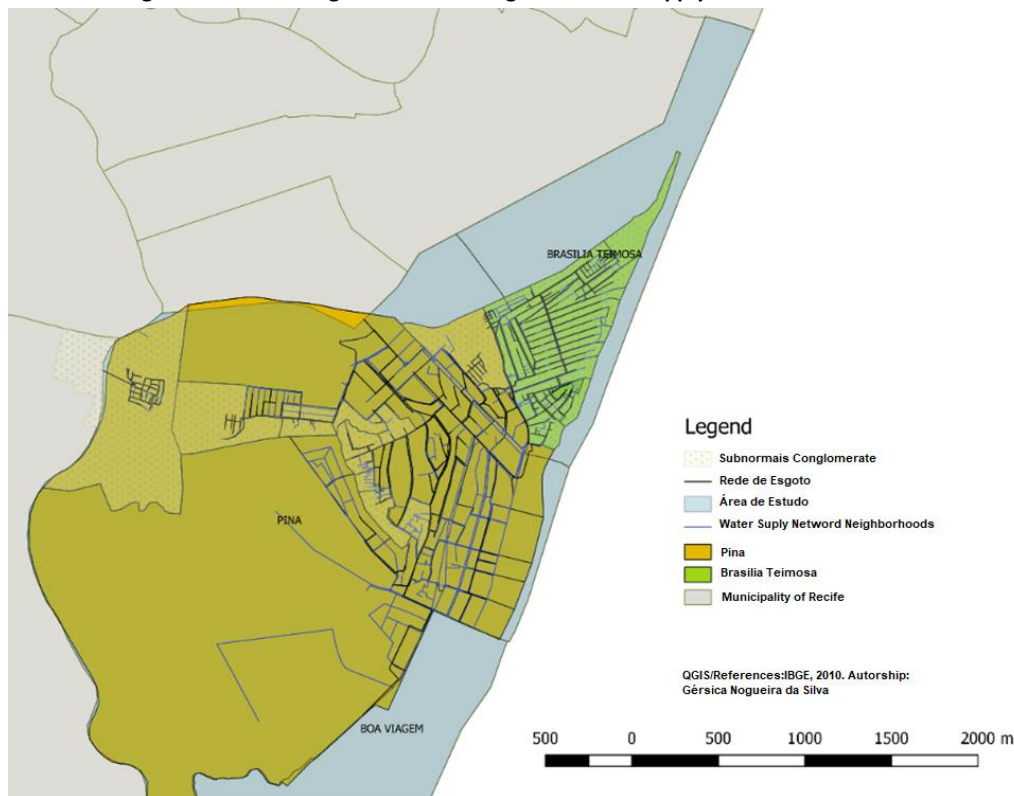

The lack of drinking water supply is more significantly distributed in the population with income ranges of up to one minimum wage, with a national average of 40% of the unserved population. This connects to SDG-11, in ensuring safe, adequate, and affordable housing access for all. In addition to inclusive and sustainable urbanization, with planning and management capacity for participative and integrated human settlements.

Adequate sanitary sewage and drinking water are elements of essential importance to fight coronavirus as described by Karmath et al. (2020). However, the Brazilian scenario still displays inadequate access to drinking water. Similarly, the city of Recife is no different regarding sanitary sewage.

The Pina basin region negatively stands out with regard to adequate sanitation. This is due to the large number of stilt houses located along the riverside. However, the region is in considerable proximity to the Rio Mar Shopping Mall and other regional important large enterprises, which reveal the huge social inequality.

Outrossim, o IBGE apresenta setores censitários no bairro do Pina onde a população se caracteriza pelo baixo acesso ao esgotamento sanitário. As regiões mais afetadas são as áreas da ZEIS Ilha de Deus. Tal aspecto foi comprovado pela pesquisa apresentada no presente trabalho (Figura 8).

Figure 8: Access to sanitary sewage vulnerability by census sector in the neighborhoods of Brasília Teimosa (a) and Pina (b)
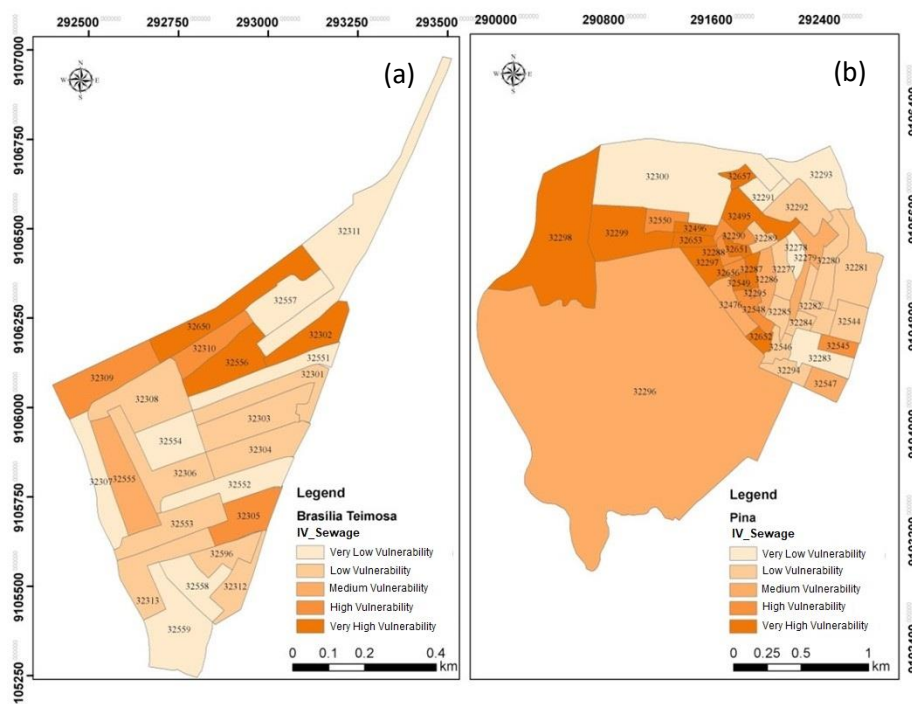
The Pina and Brasília Teimosa neighborhoods map, presents the vulnerability index highlighting the ranges between Very Low and Very High Vulnerability. The negative highlights are sectors 32298 and 32299, which correspond to the Ilha de Deus region.

However, water management and sanitation are in crisis and worsened with the continuous growth of cities around the world (CARLOS, 2001). Irregular occupations and subnormal housing, contribute in several socio-environmental impacts, such as the cause of diseases (LARA et al. 2012).

According to the World Health Organization (WHO, 2019), waterborne diseases notably diarrheal diseases, accounted for about 900,000 deaths in 2016 and account for the second leading cause of death among children under 5 years old. Nevertheless, in 90% of cases, it could be easily prevented or treated (LARA et al., 2012; CARVALHEIRO, 2018). The WHO has estimated that safe drinking water, sanitation and hygiene shortage is responsible for the death of 1.9 million people every year (WHO, 2019).

As for water supply, 74% of respondents said they are served by COMPESA's water supply network, of which half also have another complementary source (well, rainwater, river water). Of the remaining 26% that do not use the water supply network, 18% use well water, rainwater, tank cars, or river water, 7% use water exclusively from wells, and a little more than 1% (18 families) said they had no access to water (Figure 9).

This data corroborates the information that 19 respondents affirm that they do not have a bathroom inside their residence. From those, 10 respondents share the bathroom with other residences, 4 use a shared bathroom, and another 5 respondents do not use bathrooms.

Figure 9: Water supply service percentages in Brasília Teimosa and Pina neighborhoods communities
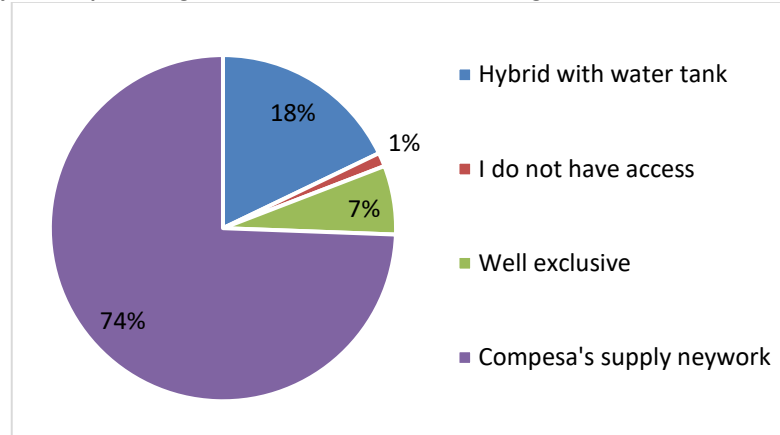

The Federal Senate recently approved the new legal framework for basic sanitation (PL 4.162/2019), which changes the Basic Sanitation Law (11.445/2007) in several points. The new legal framework for sanitation addresses: (i) universal access to potable water; (ii) access to potable water for 90% of the population by the end of 2033; (iii) defines the ANA (National Agency of Water and Basic Sanitation) as the regulatory agency establishing norms and standards for control and loss of water; (iv) determines the closure of landfills by December 31, 2020; (v) allows for the privatization of water and sewage services, among other aspects that caused controversial opinions.

Covid-19 Evolution and Challenges of Isolation Compliance

According to Figure 10, it is possible to observe the evolution of both the number of cases and deaths in the neighborhood of Pina. The number of cases has already reached 163 with close to 50 deaths in 2020, meaning that about 30% of those infected with COVID-19 in the neighborhood of Pina died. The data presented can be influenced by the low testing offered in the city of Recife, and therefore low registration of infected people.

Figure 10: Evolution of the number of cases and deaths in Pina and Brasília Teimosa neighborhoods, from March to December 2020, Recife/PE
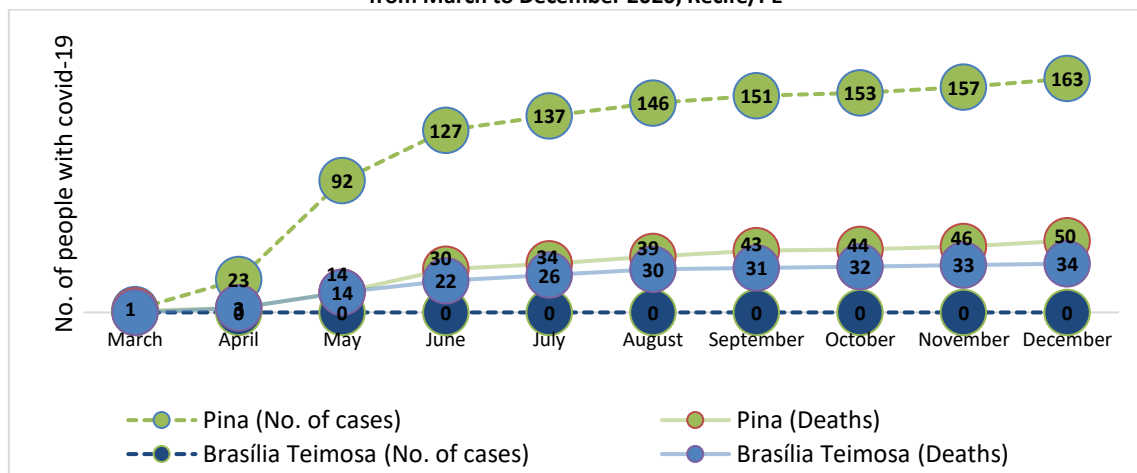
Comparing Covid-19 data of infections and deaths in the neighborhood of Pina and Brasília Teimosa (Table 4), it is possible to observe that, although the Pina neighborhood has a higher number of cases and deaths than Brasília Teimosa, the percentage of deaths of these infected individuals is lower. This implies a higher number of recovered individuals from Covid-19 in the Pina neighborhood. Analyzing Table 4, it is possible to observe that of the total number of infected individuals, 35.1% and 30.7% died in the neighborhoods of Brasília Teimosa and Pina, respectively.

Table 4: Number of cases, deaths and percentage in Pina and Brasília Teimosa e neighborhoods, from March to December 2020, Recife/PE

Neighborhood	Nº of cases	Nº of deaths	% of deaths in relation to Nº cases
Brasília Teimosa	97	34	35,1%
Pina	163	50	30,7%

Source: Center for Strategic Information in Health Surveillance (2020)

SARS-CoV-2 infection rates are higher in areas of concentrated poverty due to several factors that increase the risk of exposure. Increased housing density, often with multiple generations clustered under one roof, limits ability to physical distance and can lead to Covid-19 family clusters (YAYA et al., 2020).

Empinotti and Ferrara (2020) indicate that, although the disease first arrived in wealthy neighborhoods, the districts with higher mortality rates are the peripheral ones. It is there where the black, low-income population, with the need to commute to work and with less access to health services is concentrated. Bitoun et al. (2020) identified that the concentration in precarious settlements in the city of Recife/PE is proportional to the lethality and death rate per 10,000 inhabitants, which reach 23.2 and 8.2, respectively. The indicators are related to the limitation of income and access to the public health system, and also cite the existing limitations in access to digital technologies and the handling of modern tools for diagnosis and remote consultations, reducing the chances to cure the Covid-19 (BITOUN et al., 2020).

The residences density is quite high, with about 50% of the population in the Pina neighborhood having houses with 3 or more people. The percentage values are 27.5% with more than 3 people per house, 21.7% with 2 or more people per house and 22.4% with more than 4 people per house. In the same way, Brasília Teimosa presents very similar information where: 28.7% of the residences have 4 or more people per house, 27.4% with 3 or more people per house, and 17.4% with two or more people per house.

The contact between family members reduces the social distance and is related to the size and number of rooms in the households, with 70% of households have only 01 to 02 rooms (Figure 11). Populations living in slums face a higher risk of exposure to Covid-19 due to high population density and poor sanitation conditions (UN, 2020).

Figure 11: Population percentage according to the number of rooms in households
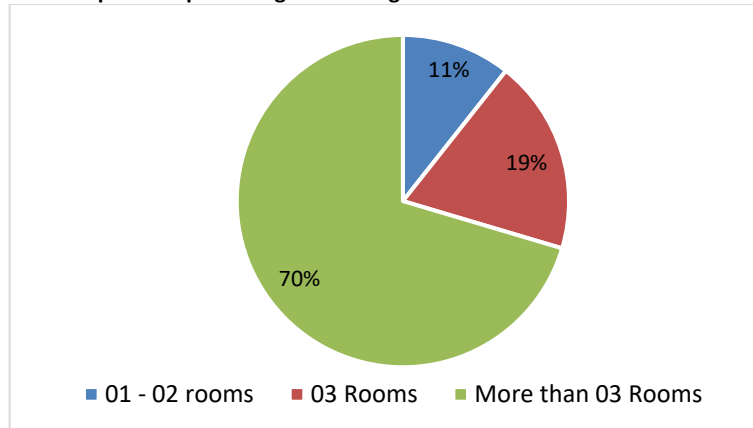
In Pina neighborhood about 73% said they respected the government social isolation measures, while for Brasília Teimosa the compliance was around 86%. Regarding the new coronavirus, more than 95% of the interviewees in both communities consider social isolation important. Nevertheless, in Brasília Teimosa it was more respected, which may be related to the better housing infrastructure and basic services in this area.

About the news broadcasted about the Pandemic, about 56.1% of the interviewees said that the news are enlightening. However, for the interviewees in Brasília Teimosa 61% of the news are characterized as confusing. Given the current scenario of the Pandemic of the new coronavirus, 69.2% feel insecure in the neighborhood of Pina while 56% also feel insecure in the neighborhood of Brasilia Teimosa.

CONCLUSIONS

With the advent of the Covid-19 pandemic the long existing acute contemporary social problems, intensified and became even more evident. The intersections between income, labor, housing, food (in)security, sanitation, economic inequalities, socio-environmental and racial injustice, and access to health and education are, key factors in assessing the impact of Covid-19. Not only in terms of mortality rates, but also its economic, political, and social consequences.

Some inadequate infrastructure conditions reveal the lack of basic services such as toilets and piped water available to the entire population in the studied neighborhoods. As observed in the areas with stilts around the Pina basin. This aspect is of great concern given the presence of the virus that is secreted in the feces even after the cure of patients, as well as in asymptomatic people.

It is a fact that after the pandemic, the already existing social inequalities, especially in vulnerable communities, tend to be intensified. The information presented can contribute to the planning of actions in order to mitigate the impacts. In addition, it can help integrate efforts between public authorities, community leaders, and possible extension and professional qualification projects with educational institutions, favoring improvements in the reality of these populations.

Therefore, the application of the quali-quantitative methodology proves to be efficient to observe statistical issues in order to obtain an analysis for essential health services. In the social scope it contributes to evaluate structural decision making for improvement to the

population. The great benefit of the proposed methodology is the easy access and processing of the database for statistical analysis through a geographic information system.

With the pandemic, the necessary production of detailed empirical field data from the perspective of the peripheries faces major scientific challenges. Besides social isolation, the process happens in real time. Moreover, scientists and the media have pointed out the problem of underreporting and lack of transparency with data in Brazil.

REFERENCES

BITOUN, J.; BEZERRA, A.; DUARTE, C.; FERNANDES, A. C. **Distribuição desigual dos casos, óbitos e letalidade por SRAG decorrentes da COVID-19 na cidade do Recife**. Nota Técnica. 05 de junho de 2020. Disponível em: https://www.ufpe.br/documents/39626/0/notaCOVID.pdf/f91dab20-1ee5-4af9-87f8-b48028b05535. Acesso em: 20 jun. 2020.

CARLOS, A. F. A. **Espaço-tempo na metrópole**. 1. Ed. São Paulo: Contexto, 2001.

CAROZZI, F.; PROVENZANO, S.; ROTH, S. (2020) **Urban density and COVID-19**, IZA Discussion Daper 13440. Disponível em: http://ftp.iza.org/dp134 40.pdf. Acesso em: 10 mar. 2020.

EMPINOTTI, V.; FERRARA, L. Segurança Hídrica e a COVID-19 na Macrometrópole Paulista: da política do corpo ao território. In: JACOBI, P. ANJOS, L.A.P., SANTANA-CHAVES, I.M., TRAVASSOS, L.R.G.F.C. (org.) **Dilemas Socioambientais**. Dossiê Covid-19. v. 20, 2020.

IBGE – Instituto Brasileiro de Geografia e Estatística. **Censo Demográfico 2010**. Rio de Janeiro: IBGE, 2010.

KAZTMAN, R. Seducidos y abandonados: el aislamiento social de los pobres urbanos. **Revista de la CEPAL**, Santiago do Chile, n.75, p.171-189. 2001.

MEDEMA, G.; HEIJNEN, L.; ELSINGA, G.; ITALIAANDER, R.; MEDEMA, G. Presence of SARS-Coronavirus-2 in sewage. Methods Sewage samples**. medRxiv**, n.7, p. 511-516. 2020. Disponível em: https://doi.org/https://doi.org/10.1101/2020.03.29.20045880. Acesso em: 02 jan. 2021.

MINAYO, M.C.S. (Org.) **Pesquisa Social: teoria, método e criatividade**. Petrópolis, RJ: Vozes, 28. ed., 2009.

ONU – Organização das Nações Unidas. Shared responsibility, Global solidarity: Responding to the socio-economic impacts of COVID-19, 2020. Disponível em: https://www.un.org/sites/un2.un.org/files/sg_report_socio-economic_impact_of_COVID-19.pdf. Acesso em: 01 jul. 2020.

PREFEITURA DA CIDADE DO RECIFE. 2020. **Serviços para o Cidadão: Pina**. Disponível em: http://www2.recife.pe.gov.br/servico/pina. Acesso em: 28 mar. 2020.

QUEIROZ, V. C.; CARVALHO, R. C.; HELLER, L. New Approaches to Monitor Inequalities in Access to Water and Sanitation: The SDGs in Latin America and the Caribbean. **Water**, n.12, p.931, 2020.

RECIFE. **Lei Nº 16.176/96.** Lei de Usos e Ocupação do Solo. (Revisão do Plano Diretor dado pela Lei nº 17.511/2008). (Regulamentada pelo Decreto nº 26.601/2012). Disponível em: https://www.recife.pe.gov.br/pr/leis/luos/. Acesso em: 26 mar. 2020.

SECRETARIA MUNICIPAL DO RECIFE. 2020. **Plano Municipal de Contingência sobre o COVID-19.** Disponível em: http://www2.recife.pe.gov.br/sites/default/files/plano_de_contingaancia_de_recife_coronava_rus_covid19_10.03 20.pdf. Acesso em: 29 mar. 2020.

SILVA, S. D.; SELVA, V. S. F. **Vulnerabilidade climática e adaptação às mudanças em comunidades de baixa renda**. Recife: Gráfica Alencar, 2013, v.1, p. 89.

SNIS – Sistema Nacional de Informação sobre Saneamento 2018. Disponível em: http://www.snis.gov.br/. Acesso em: 29 abr. 2020.

YAYA, S.; YEBOAH, H.; CHARLES, C. H. OTU, A.; LABONTE, R. **Ethnic and racial disparities in COVID-19-related deaths: counting the trees, hiding the forest**. BMJ Glob Health, v.5, n.6, e002913, 2020. Disponível em: <http://dx.doi.org/10.1136/bmjgh-2020-002913>. Acesso em: 20 mar. 2021.