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THE DISPOSAL OF NEEDLES AND SYRINGES DURING THE COVID-19 PANDEMIC IN THE IRANDUBA HEALTH SYSTEM

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ABSTRACT

This paper aimed to develop evidence-based guidelines to make the disposal of syringes and needles, applied in vaccinations against Covid 19 safer and healthier in the UBS of the Health System of the Municipality of Iranduba, located in urban areas and non-riparian units. Thus, this research was based on a thorough process of observation, exclusively in the area of performance of the health management of the aforementioned municipality. The development process was carried out from an observational analysis, where the discarding of health supplies used in vaccinations against covid-019 in the year 2021 were realized. In addition, a literature review was also performed for each of these steps. At the end of this arduous research, it was conclusively perceived the erroneous and harmful way in which the disposal of such solid waste was made, because these materials, soon after their use, were placed in a collection box, together with other sanitary inputs, perhaps the latter with the possibility of reuse or recycling, which would bring enormous risks to the workers of the UBS before the imminent probability of infection of covid-9.

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INTRODUCTION

A pandemic is a rapidly spreading infectious disease that poses a global threat. Pandemics tend to create social and economic chaos, causing severe disruption to business operations and disrupting the supply chain. In the current pandemic scenario, there are still many difficulties in controlling and reducing morbidity and mortality due to the different manifestations of the coronavirus, the difficulty of access to the health system, the lack of medicines, initially restricted to a small social group such as health professionals and the elderly. Among the plans necessary to face the pandemic, the Ministry of Health prepared the National Contingency Plan for Human Infection with the new coronavirus, in order to contain the human infection and mitigate the emergence of severe cases and deaths caused by the new coronavirus. This plan is composed of three response levels: "Alert," "Imminent Danger," and "Public Health Emergency. Each level is based on the assessment of the risk of covid-19 affecting Brazil and its impact on public health (MS, 1988). Therefore, such actions include: planning actions to reduce the number of new cases, through social isolation and health education measures aimed at the population; creating public policies that ensure the life and safety of the population; encouraging managers and professionals to develop

prevention management actions, in line with international protocols, in order to ensure the protection of health workers and the implementation of safe and quality actions for patients. The adoption of these strategies also aims to increase the healthcare system's capacity to support the impact of the pandemic. However, there are still few public policies and planning regarding the correct management of solid waste resulting from this pandemic. Thus, from this period, we can highlight the increase in production, the speed of generation and design of products, as well as the "non-degradable" characteristics of the waste generated, increasing every day the diversity of products with components and materials of difficult degradation and greater toxicity. Thus, in the current scenario, the waste generated in hospitals can become a major environmental problem. Thus, the central idea of this research is to stimulate debate about the management of waste generated in hospitals and similar facilities, determining how to dispose of syringes and needles, which will be used in the application of the vaccine against covid-19, in order to contribute to the preservation of health and the environment.

BIBLIOGRAPHIC REVIEW

Solid Waste: The generation of municipal solid waste in Brazil grows annually. According to ABRELPE (2020), in the publication

"Panorama of Solid Waste in Brazil", from 2011 to 2012 there was an increase of 1.3% in the generation of said solid waste. It is noteworthy that this increase is higher than population growth which, in the same period, registered an increase of 0.9%. Specifically regarding solid waste in health, the Institute of Applied Economic Research (IPEA) estimates that only 2% of the total solid waste produced is solid waste in health and, within this universe, about 10% to 25% is special or waste that requires specific treatment before final disposal. Considering the population contingent in Brazil, solid waste in health generates significant volumes and its mismanagement can result in considerable impacts, such as environmental contamination, the occurrence of occupational accidents due to improper disposal and the spread of various diseases due to its great potential for contamination.

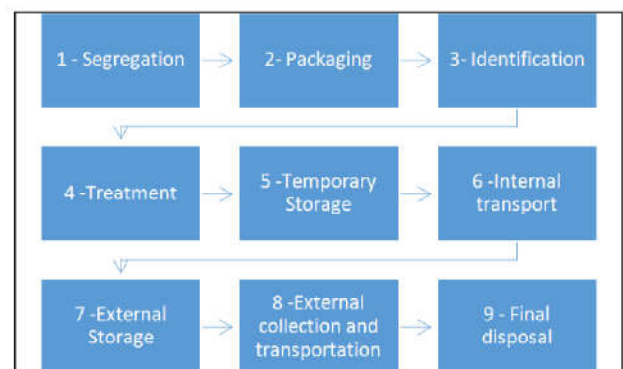
Solid Health Service Waste (HSR): All waste comes from human activities. According to the Federal Law No. 12.305/2010, solid waste is: "material, substance, object or discarded good resulting from human activities in society, and whose final destination is proceeded, is proposed to proceed or is required to proceed, in solid or semi-solid states, as well as gases contained in containers and liquids whose peculiarities make it unfeasible to launch them into the public sewage system or bodies of water, or require solutions technically or economically unfeasible in view of the best available technology" (BRASIL, 2010). Federal Law No. 12.305/2010 also classifies solid waste into 11 types, in relation to their origin, being of interest in this research the solid waste classified as health services waste and, as to their hazardousness, those classified as hazardous due to their characteristics of inflammability, corrosivity, reactivity, toxicity, pathogenicity, carcinogenicity, teratogenicity and mutagenicity, by presenting significant risk to public health or environmental quality (BRASIL, 2010).

The CONAMA Resolution, No. 358/2005, which defines solid waste in health, classifies them into 5 distinct groups:

- **Group A:** Potentially infectious waste, that is, waste with the possible presence of biological agents that, due to their characteristics of greater virulence or concentration, may present risk of infection. These residues must be stored and kept temporarily in a proper room, always covered and identified. The location must have a washable and smooth floor and walls;
- **Group B:** Represents the chemicals, i.e., waste containing chemical substances that may present risk to public health or the environment, depending on their characteristics of inflammability, corrosivity, reactivity and toxicity. They should be packaged in containers of rigid, suitable, non-reactive material with each type of substance. The liquids should be packaged in bottles of up to 2 liters or in coils of compatible materials always with strength and tightness, including the anti-leak lid;
- **Group C:** Represents radioactive waste, i.e., any material resulting from human activities that contain radionuclides in quantities exceeding the elimination limits specified in the National Nuclear Energy Commission-CNEN standards and for which reuse is inappropriate or not foreseen. They must be segregated according to their nature and kept in temporary storage for future release in appropriate containers. In addition, they must be identified and dated;
- **Group D:** Common residues, that is, residues that do not present biological, chemical or radiological risks to health or to the environment, and can be equated to domestic residues. They must be conditioned as directed by the local urban cleaning service, using impermeable bags, contained in properly identified containers. Only this category is classified as non-hazardous;
- **Group E:** Represents perforcorant materials, i.e., piercing or scarring materials, such as: razor blades, needles, scalpels, glass ampoules, burs, endodontic files, diamond tips, scalpel blades, lancets, capillary tubes, micropipettes, slides and coverslips, spatulas and all glass utensils broken in the

laboratory (pipettes, blood collection tubes and Petri dishes) and other similar materials. These materials should be discarded at the sites of generation immediately after use in a rigid, puncture and leak-resistant container with a properly labeled lid.

According to Dutra & Monteiro (2011), solid health care waste can cause several damages resulting from a management without the proper technical knowledge, among them we highlight the environmental contamination and risks to human health, mainly due to the spread of diseases caused by direct or indirect contact with contaminated sources. The correct management of solid health residues also impacts on the reduction of the occurrence of occupational accidents, especially in the case of sharps residues, common in hospitals or similar environments, involving health professionals and urban cleaning agents. These materials are responsible for 80% to 90% of the transmission of infectious diseases among health workers (DUTRA & MONTEIRO, 2011). Law No. 12.305/2010, which governs the National Policy on Solid Waste (PNRS), was a significant evolution in the legal framework of the matter, since it not only advances the discussion on the impact of solid waste on the environment, but also in the treatment of such waste. The mentioned law presents several possible and feasible instruments for the improvement of the integrated management of solid waste, highlighting the shared management between the private sector, governmental entities and society. This legislation delegates to the municipalities the responsibility for preparing municipal plans for the integrated management of solid waste, in addition to encouraging environmentally sustainable measures. CONAMA Resolution No. 358/2005, together with ANVISA's Resolution of the Collegiate Directorate (RDC) No. 306/2004, regulate, in a safer and more complete way, the management of solid health care waste, from its generation to its final adequacy, whose main objective is to prevent possible damage to the environment and to the population's health. The aforementioned resolution assigns the responsibility for solid health care waste to the generating agency and requires it to develop a management plan for health care waste at the local level. It should be noted that the plan must contain the 9 steps described in the Collegiate Directive Resolution (RDC) No. 306/2004, represented in the flowchart in Figure 1:



Source: Authors (2022).

Figure 1. PGRSS flowchart according to ANVISA's RDC No. 306/2004

1. **SEGREGATION** - Consists in the separation of the waste at the time and place of its generation, according to its physical, chemical and biological characteristics, its physical state and the risks involved.
2. **PACKAGING** - Consists in the act of packing the segregated waste in bags or containers that avoid leakage and resist puncturing and rupture actions. The capacity of the packaging containers must be compatible with the daily generation of each type of waste.
3. **IDENTIFICATION** - Consists of the set of measures that allows the recognition of the waste contained in the bags and containers, providing information for the correct management of solid health waste.

4. INTERNAL TRANSPORTATION - Consists in the transfer of the waste from the generation points to the site destined for temporary storage or external storage with the purpose of presentation for collection.
5. TEMPORARY STORAGE - Consists in the temporary keeping of the containers containing the already conditioned waste, at a location close to the generation points, with the aim of speeding up the collection within the establishment and optimizing the displacement between the generating points and the point destined for the presentation for external collection. Temporary storage cannot be done with the direct disposal of the bags on the floor, and the conservation of the bags in packaging containers is mandatory.
6. TREATMENT - This consists in the application of a method, technique or process that modifies the characteristics of the risks inherent to the waste, reducing or eliminating the risk of contamination, occupational accidents or damage to the environment. The treatment can be applied at the generating establishment itself or at another establishment, observing, in these cases, the safety conditions for transportation between the generating establishment and the treatment site. The health service waste treatment systems must be subject to environmental licensing, in accordance with CONAMA Resolution no. 237/1997 and are subject to inspection and control by the sanitary surveillance and environmental agencies.
7. EXTERNAL STORAGE - Consists in the storage of the waste containers until the external collection stage, in an exclusive environment with easy access for the collection vehicles.
8. EXTERNAL COLLECTION AND TRANSPORTATION - Consists in the removal of the RSS from the waste shelter (external storage) to the treatment or final disposal unit, using techniques that guarantee the preservation of the packaging conditions and the integrity of the workers, population and environment, and must be in accordance with the guidelines from the urban cleaning agencies.
9. FINAL DISPOSAL - Consists in the disposal of waste on the soil, previously prepared to receive them, obeying the construction and operation technical criteria, and with the environmental licensing in accordance with the CONAMA Resolution no. 237/97 (CONAMA, 2004).

Risk management: Risk management should be developed in order to ensure the maintenance of risk within an acceptable level in accordance with the regulations, seeking to avoid any adverse and/or serious effect on the public and the environment by selecting viable alternatives (TESFAMARIAM et al., 2010). Alencar & Schmitz (2012) assert that "the risk management of any project should be carried out in a simplified way, seeking a systematic treatment of the risks inherent in the activities of the referred project." The referenced authors explain, in an economically rational way, that risk management is a set of activities that aims to maximize the effect of positive risk factors and minimize the effect of negative risk factors. Thus, managing risk involves a series of sequenced and chained activities of risk analysis, control, and monitoring, forming a cycle. Conducting a risk analysis can be considered the moment to identify the risk factors, their impacts, and which specific actions should be checked so that opportunities are maximized and threats minimized. Risk analysis is a very important area of the project, because if a risk has not been considered of high potential, it can directly affect the expected outcome of the project. Furthermore, you can see that the risk management processes interact with each other, and these processes must occur at least once in each project and in one or more phases of the respective project. In summary, the risk management processes of a project/situation can be presented as shown in Figure 2:

- a) Risk management planning: Process that defines how the management activities will be conducted;
- b) Risk identification: Process that determines the risks that can affect the project and its characteristics;
- c) Qualitative risk analysis: Process that prioritizes the risks for analysis through the evaluation and combination of its probability of occurrence and impact;

- d) Quantitative risk analysis: Process that numerically analyzes the effect of the risks;
- e) Risk response planning: Process that develops an action option to increase the opportunities and reduce the threats of the project objective;
- f) Monitoring and controlling risks: Process that implements the risk response plan, follows up the identified risks, monitors the residual risks, identifies new risks and evaluates the effectiveness of the risk treatment processes throughout the project.



Source: Authors (2022).

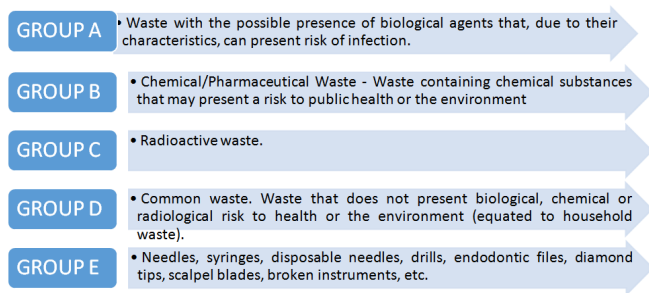
Figure 2. Risk management processes

From this perspective, it is important to emphasize that when it comes to risk management, there is a total dependence on the support of those who occupy the highest positions within a group due to the importance of strategic decisions, which produce effects in the departments and procedures for which they were created, in addition to the correct implementation at the tactical and operational levels, assigning responsibilities throughout the organization, these being included in the functional descriptions, supporting the principle of accountability and incidentally, performance evaluation in relation to reward, promoting operational efficiency from the top to the shop floor: top-down. In detail, the risks must be analyzed, identified, described and estimated through methods and techniques aiming at the creation of a profile with its classification by importance and priority of treatment effort, allowing one to obtain the investment level for risk control that must be increased, decreased or even redistributed in the pertinent areas, thus allowing one to identify the "owner" of the risk and ensure that the necessary resources for its prevention and solution are directed to him.

The concept of risk: Risk, broadly speaking, can be defined as the effect of uncertainty on objectives (ABNT NBR ISO 31000, 2018), but when we harness it to health services, we can say that it is a sequence of unwanted and adverse events for the day to day, and it can be something contrary to health, material goods, or the environment in which it is found. The estimation of risk is based on the expected value of the probability of its existence multiplied by the impact of its consequence, given that it has already occurred. According to Crawl & Jo (2007), risk consists of the possibility of an accident occurring and the consequences arising from that event. If only one of the components is considered, the risk may be wrongly assessed, with the means of control being inadequate. There are several possible approaches for risk assessment, among them: implicit or explicit, quantitative or qualitative, not being necessary the application of a complex process for its evaluation. Finally, according to Dias (2004), risks in projects are uncertain events that can impact their success. The risk can be positive or negative and its cause can be a requirement, a premise, a restriction or a condition that creates the possibility of this result impacting the project. Thus, in relation to the concept of risk, its dual contextualization is emphasized: probability and uncertainty.

Risks related to solid health care waste: The biggest problem with solid health care waste is its potential risk to health and the environment. Risk can be understood as the probability of occurrence of an unfavorable outcome, damage, or an unwanted phenomenon. Environmental risk can be classified according to the type of activity, encompassing the dimensions of instantaneous and chronic exposure,

probability of occurrence, severity, reversibility, visibility, and duration of its effects. Regarding the classification of waste produced by the health service, it is anchored in the ANVISA RDC 306/2004, CONAMA Resolution 358/2005 and ABNT NBR 10004:2004 as shown in Figure 3.



Source: ABNT NBR 10004 (2004).

Figure 3. Classification of waste produced by the health service

On the solid healthcare waste is considered hazardous, not only by the American legislation but also by the Brazilian standardization, and the hazardousness is attributed both by toxicity and pathogenicity. Among the hazardous components present in solid healthcare waste are chemical (heavy metals) and infectious biological components, and among the chemical components are chemical substances/preparations: toxic, corrosive, flammable, reactive, genotoxic, mutagenic; products held under pressure - gases, chemotherapeutics, pesticides, solvents, chromic acid; laboratory glass cleaning, mercury from thermometers, substances for revealing x-rays, used batteries, oils, used lubricants, among other materials harmful to health and the environment (BRASIL, 2021).

Risk management as a way to guarantee the right to health: At first, it is important to highlight that health has been gaining different concepts over the years, as it has undergone several transformations to readjust itself to the basic needs of citizens. The World Health Organization (WHO) defines health as: "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. This definition is enshrined in the preamble of the constitution of July 26, 1946. Rezende & Trindade (2003) define the right to health as a state of constant mutation and adaptation, that is, "health has been conceptualized through various worldviews in a social and historical construction. It goes from the magical-religious conception, to the conception adopted by the World Health Organization". Law number 8,080 of September 19, 1990 establishes guidelines on health conditions, as well as the regulation of the State's obligations in relation to the population's health, which has as its main objective to offer equal conditions to all citizens who need it. In this sense, there was a need for the implementation and regulation of social rights, with the constituent's concern with man's physical integrity, a fact that was consolidated with the Magna Carta of 1988, in its chapter II, providing for these rights. The right to health is also foreseen in articles 196 to 200 of the Federal Constitution, and it is up to the Executive power to fulfill what the law determines, including the obligation of each federative entity to reserve the minimum resources to the federative entities for public health service actions, inserted into the system through Constitutional Amendment no. 29 of September 13, 2000: Art. 196. Health is a right of all and a duty of the State, guaranteed through social and economic policies that aim to reduce the risk of disease and other problems and to universal and equal access to actions and services for its promotion, protection, and recovery. In this sense, the government must guide and supervise health-related actions, providing the population with prevention, medical, hospital, and pharmaceutical assistance, as shown in article 197 of the Federal Constitution: Art. 197. Health actions and services are of public relevance, and it is up to the Public Power to dispose, under the terms of the law, about its regulation, inspection, and control, and its execution must be done directly or through third parties, and also by private individuals or legal entities. It is noticeable that there was an enormous concern of the legislator in establishing such competencies to the federative entities, since, in face of the joint

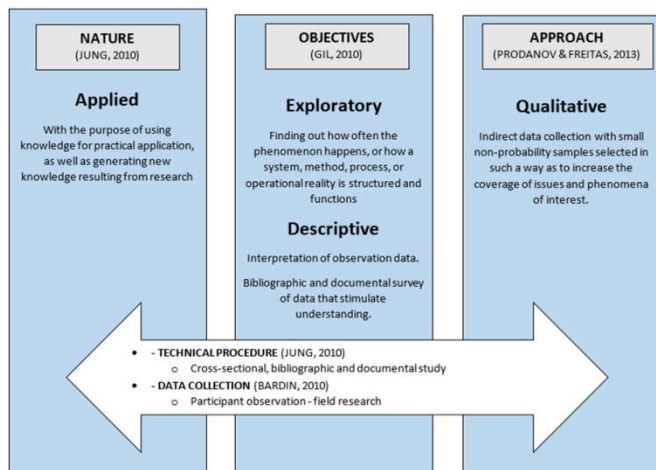
performance, there is a greater possibility of guaranteeing the protection of the fundamental right in question, with the purpose of complementation, that is, in case a certain entity is omissive or has a deficiency in its performance, it can be supplied or complemented by another entity with the purpose of providing better health services. Considering the above, this research contributes to the existing literature and seeks to analyze how the Brazilian government has structured the risk management adopted to combat covid-19 and how public policies have been designed to combat the problems generated by it.

The need to create new public policies: Public policies are actions carried out by the State directly or indirectly, with public participation or by private companies, that aim to ensure certain rights for a specific social, cultural, ethnic, or economic segment. In this way, public policies ensure constitutional rights or rights that are affirmed thanks to recognition by the State and society. Public policies, especially in Brazil, have historically been characterized as submissive to economic and political interests. They have been implemented through assistentialist and clientelist practices, reflecting relationships that do not incorporate the recognition of social rights. Currently, social policies in Brazil maintain an emergency character, acting in a fragmented way, making possible the favoring of governments in the search for the support of the social bases to remain in power, having a contradictory character, because at the same time it legitimizes the dominant class, it also meets some needs of the subordinate classes. One can see, in this process, that public policies do not follow a stable rule, but are flexible according to the interests at stake. According to Teixeira (2002): "Public policies" are guidelines, guiding principles for action by the public authorities; rules and procedures for relations between the public authorities and society, mediations between society and the State. They are, in this case, explicit policies, systematized or formulated in documents (laws, programs, financing lines) that guide actions that normally involve the application of public resources. Not always, however, there is compatibility between interventions and declarations of will and the actions developed. Non-actions, or omissions, should also be considered as a form of policy manifestation, since they represent options and orientations of those in office. Public policies represent forms of exercise of political power and, in its elaboration process, implementation, and results, there will always be conflict, since they involve several social actors with different and contradictory objectives. Thus, there is a need for mediation by the population and institutions, so that a consensus can be reached and public policies can be effectively implemented. To elaborate a public policy, it is necessary to define who makes the decisions and what consequences this will bring. Thus, it is important to differentiate "Public Policy" from "Governmental Policy", because not always governmental policies are public, although they are state policies. To be "public", it is necessary to consider to whom it is addressed and whether in its elaboration process there was public debate.

Public policies are the ways to respond to the demands of sectors that are on the margins of society, and these demands are analyzed by those in power, but are also influenced by social pressure and mobilization. These public policies also have the role of extending and enforcing citizenship rights. There are also policies that aim to promote development, creating employment and income alternatives, and still other policies that are necessary to regulate conflicts between several social actors. As an example of public policies, we can cite health in Brazil, which is a universal right of all Brazilians, since its guarantee and promotion are established in the Federal Constitution itself, which makes it a *mandamus* to be fulfilled indistinctly for all citizens of the country.

MATERIALS AND METHODS

This work was classified according to its nature, objectives, approach, in addition to the technical procedures and data collection method admitted according to several authors of scientific methodology, as can be seen in Figure 4.



Source: Authors (2022).

Figure 4. Research classification

The present work, in its research methodological part, is composed, as to its objective, as exploratory and discursive research. The exploratory research has as main objective to develop, clarify and discuss concepts and ideas already existing within the academics, seeking the formulation of problems amenable to further studies. In the words of Gil (2010): Exploratory research is developed with the aim of providing an approximate overview of a given fact. This type of research is conducted especially when the chosen theme is little explored and it is difficult to formulate precise and operationalizable hypotheses. Descriptive research is that which seeks to establish relationships between variables. It observes, registers, analyzes, and organizes data without manipulating them, that is, without the researcher's interference. It seeks to discover the frequency with which a fact occurs, its nature, characteristics, causes, relationships with other facts. For the present work, the exploratory research will be used in the first moment, in the first stage of investigation of the work, when the broader concepts about the coronavirus will be dealt with. In the second moment, the descriptive research will be used to understand which measures are being adopted by the governors for waste management that have been generated during this period of confrontation with the virus. The research method used was the bibliographic and the documental, since this type of research permeates all moments of the academic work and is used in all researches as a base to compile materials such as books, articles, among others. The bibliographical research is that which is carried out from materials already prepared, and its main advantage "[...] lies in the fact that it allows the researcher to cover a much wider range of phenomena than he could research directly. This advantage becomes important when the research problem requires scattered data (GIL, 2010, p. 50)", which is the case of the present research. On the other hand, the documentary research will aim to complement the bibliographic research, to the extent that the documentary research allows the researcher to use official documents, newspaper reports, letters and contracts in his work.

With regard to the approach technique, this research is classified as qualitative, as it does not use statistical methods and techniques, that is, it does not translate the results obtained into numbers. "The data collected in this research are descriptive, portraying the largest possible number of elements existing in the studied reality. It is much more concerned with the process than with the product" (PRODANOV & FREITAS, 2013, p. 70). The data collection technique used was the indirect one, carried out through journal articles, doctrinal notes and other materials from indexed databases and institutional websites. To achieve the objective of this research, news from Brazilian newspapers and magazines were analyzed. To collect data about Covid-19, Brazilian newspapers and magazines available in digital format were consulted from June 2020 to December 2021. The digital newspapers and magazines were searched through a Google search engine using the term "Covid-19". The data collected were analyzed using content analysis, which is

a type of method used for qualitative research, as this paper is classified. According to Bardin (2010), this technique should be divided into three steps: a) organization, b) coding, and c) categorization. In the organization phase, all the documents that are on hand about the general theme of the work were analyzed, separating the useful from the useless. It is in this phase that the books, articles and documents will be taken as relevant to answer the research problem. Thus, in the words of Bardin (2010), "[...] this first phase has three missions: the choice of documents to be submitted to analysis, the formulation of hypotheses and objectives, and the elaboration of indicators to support the final interpretation. In this phase, the researcher must do a floating reading of the selected documents, that is, he must initially know the material and seek the creation of familiarity with the material adduced. According to Marques (2016), coding will be the phase in which the raw data, of the previously selected texts, will be transformed into relevant information that allows an accurate description of the characteristics of the content. In the second phase, two stages occur: the registration unit and the context unit. In the registration unit, there will be the coding of words, chapters, themes, and main ideas concerning the main theme, within the books, articles, and documents selected in the previous phase. In the unit of context, the registration units will be coded, analyzing the context in which they are inserted. As explained by Urquiza and Marques (2016): For the coding effort to be successful, there are techniques that need to be followed. The first one is the cut, which can be a sentence, an isolated word, or words as a whole that indicate a relevance for the analysis. It is through clipping that the units of registration and the units of context are selected. The second technique that the researcher needs to keep in mind when undertaking categorization is that of enumeration: the way of counting. For example: You can count how many times a word appears in the messages, or, in which position it appears in the corpus texts, etc. The last technique to be employed in coding is classification and aggregation; by applying this technique, the researcher advances in the effort to form categories.

The last phase consists of categorization. The categorization process can be defined as an operation of classifying the constituent elements of a set by differentiation and then by regrouping according to genre. Here, the data collected will not be categorized according to gender and age, because the research is specifically based on the objects: plunger, ampoules, injections, needles, used in the Covid-19 vaccination. In this phase there is then the definition of categories, differentiating and grouping the units of context found in the previous phase. We traveled through 8 non-riparian communities, listed below, (by land) where part of the UBS of the municipality of Iranduba are located. Strictly speaking there are 21 UBS distributed in several communities of the mentioned hinterland. We started our research in the urban area of the city of Iranduba, specifically, in the UBS Dr. Lourenço Borghi. Next, still in the city of Iranduba itself, our investigation was in the UBS Nilce Domingos dos Reis. Within the urban area of the referred municipality, we ended with the investigative visit to the UBS Artur Freire da Cunha. We had, on that occasion, the warm receptivity of the managers of the respective Health Units, who understood and collaborated, as much as possible, with our arduous academic mission. Subsequently, the route continued on rural roads, starting with the non riparian community São Sebastião where the UBS Joana Miranda de Oliveira was located 5km from the city of Iranduba. The investigative mission was completed in the non-riverine community Lago do Limão in the UBS Maria Venuzário, 30km from the city of Iranduba. The in loco investigative data collection was predominantly observational, with the consent/collaboration of the manager of each researched UBS post, without, however, interfering in the research work. In this type of observational study, the cross-sectional type was adopted, because we only recorded information, mostly through photographs, about samples without manipulation or interference in their environment. We analyzed the way in which the disposal of solid health waste was done, used in covid-19, and, in particular, the container where such waste was stored, in order to assess its suitability and safety of those who work in the UBS of those locations in the municipality of Iranduba. We investigated the infrastructure and sanitary logistics

implemented in the UBS as well as the way in which the disposal of solid health waste, used in covid-19, was done in different groups of servers in the same period of time. In view of this premise, it was possible to assess how the servers, allocated in the studied PHUs, performed the disposal of solid health care waste, perforating-cutting material, used in covid-19, with the respective legislative standards inherent to it. Finally, in view of what had been carried out in the research, the proposal of strategies was developed, regarding the correct disposal of hospital supplies, of a model for the disposal of these supplies for rural communities, in order to establish appropriate parameters for the disposal of hospital solid waste by the public agents responsible for the disposal.

Area Description: The present research work was developed in the municipality of Iranduba, in the UBS inserted in the administration of the Health Department of Iranduba, a city that is part of the metropolitan region of Manaus, due to its proximity to the capital of our state.

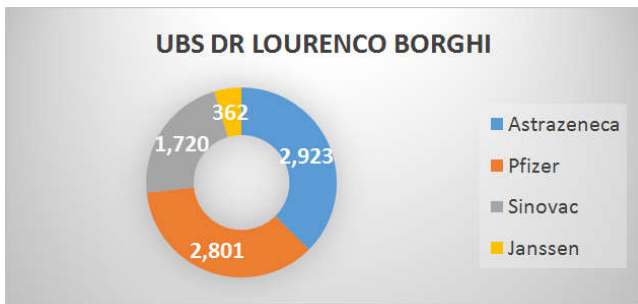
Dr. Lourenço Borghi PHU: Located on Juruá Street, in the Solimões I neighborhood, close to the central area of Iranduba, it is honored by the doctor Lourenço Borghi, who worked for many years in the municipality of Iranduba, in the public health system.



Source: Authors (2022).

Figure 5. UBS Dr. Lourenço Borghi

In the graph of Figure 6, there is the list of types and quantities of vaccine doses against covid-19, applied in 2021, which were, from the Health Secretariat of Iranduba, distributed to the UBS Lourenço Borghi. In this UBS, the disposal of syringes and needles was done equally, i.e., both (syringes and needles) were disposed of in the same container (a cardboard collection box of 30cmX25cmX15cm - length X width X depth, respectively). However, we also noticed that this container was used for the disposal of devices used in ordinary patients, and not only for devices used in the vaccination against covid-19.



Source: Authors (2022)

Figure 6 - Distribution Chart of Vaccines at UBS LB.

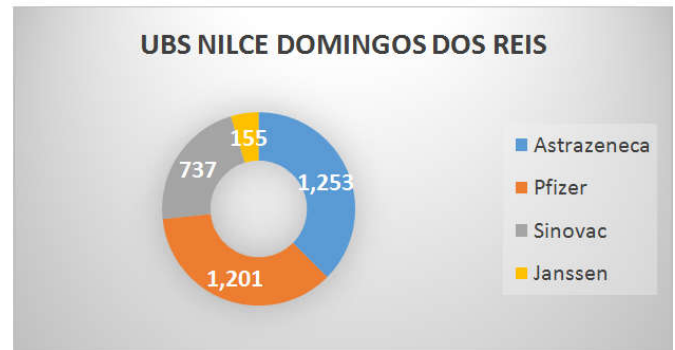
UBS Nilce Domingos dos Reis: Located on Rua Rio Purus, in the São Francisco district, near the Iranduba headquarters, it honors Mrs. Nilce Domingos dos Reis, a renowned midwife who worked for many years in the municipality of Iranduba, both in health units and in the homes of pregnant women, as shown in Figure 7.



Source: Authors (2022).

Figure 7. UBS Nilce Domingos dos Reis

In the figure in graphic 8, there is the list of types and amounts of vaccine dosages against covid-19, applied in 2021, which were, from the Health Secretariat of Iranduba, distributed to the UBS Nilce Domingos Reis. In this UBS, the disposal of syringes and needles was done in a similar way to the aforementioned UBS, i.e., both (syringes and needles) were disposed of in the same container (a cardboard collection box of 30cmX25cmX15cm - length X width X depth, respectively). However, we also noticed that this container was used for the disposal of devices used in ordinary patients, and not only for devices used in the vaccination against covid-19.



Source: Authors (2022).

Figure 8. Vaccine Distribution Chart at UBS NDR

UBS Artur Freire da Cunha: Located at Arara Street, in the Cidade Nova district, near the central area of Iranduba, it is honored by Mr. Artur Freire Cunha, a renowned resident of the city, who worked for many years as a councilman in the Iranduba City Council.

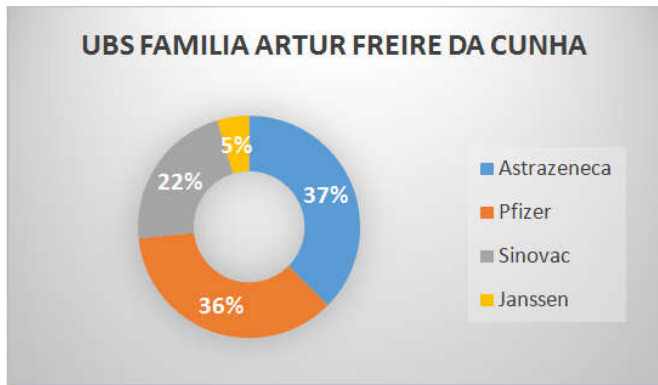


Source: Authors (2022)

Figure 9. Distribution of Vaccines at UBS AFC

In Figure 10 of the graph, there is the list of types and quantities of doses of vaccines against covid-19, applied in 2021, which were, from the Health Secretariat of Iranduba, distributed to the UBS Arthur Freire da Cunha. In this UBS, the disposal of syringes and needles was done equally, that is, both (syringes and needles) were disposed of in the same container (a cardboard collection box measuring 30cm x

25cm x 15cm - length x width x depth, respectively). However, we also noticed that this container was used for the disposal of devices used in ordinary patients, and not only for devices used in the vaccination against covid-19.



Source: Authors (2022).

Figure 10. Vaccine Distribution Chart at UBS AFC

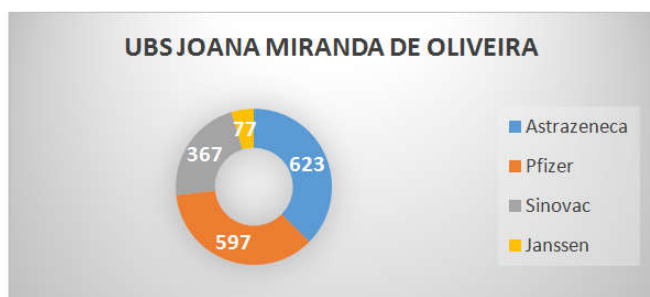
UBS Joana Miranda de Oliveira: Located on Raimundo Pantoja Street, in the São Sebastião Community, a community 5 km away from the Iranduba headquarters, it is honored to Mrs. Joana Miranda de Oliveira, a renowned resident of that community, who donated to the municipality the land where the referred UBS is installed.



Fonte: Autores (2022).

Figura 11. UBS Joana Miranda de Oliveira

Figure 12 - Chart of the relationship between the types and amounts of covid-19 vaccine doses used in 201, which were distributed by the Iranduba Health Department to the Joana Miranda de Oliveira UBS. In this UBS, the disposal of syringes and needles was done equally, i.e., both (syringes and needles) were disposed of in the same container (a cardboard collection box of 30cmX25cmX15cm - length X width X depth, respectively). However, we also noticed that this container was used for the disposal of devices used in ordinary patients, and not only for devices used in the vaccination against covid-19.



Source: Authors (2022).

Figure 12. Distribution of Vaccines in UBS JMO

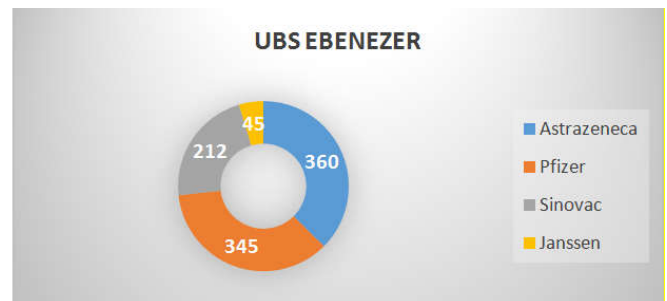
UBS Ebenézer: Located on Rua Santa Catarina, in the São Pedro Community, a community 20 km away from the headquarters of Iranduba, in the region known as Lago do January, the name of the UBS refers to the biblical term Ebenezer, which in Hebrew means "stone of help". In the Bible, the prophet Samuel raised a stone memorial and named that place Ebenezer, and God defeated the enemies of Israel in that place.



Source: Authors (2022).

Figure 13. UBS Ebenézer

Figure 14 - Chart of the relationship of types and quantities of covid-19 vaccines used in 2021 against covid-19 that were, from the Health Secretariat of Iranduba, distributed to the Ebenezer UBS. In this UBS, the disposal of syringes and needles was done equally, i.e., both (syringes and needles) were disposed of in the same container (a cardboard collection box of 30cmX25cmX15cm - length X width X depth, respectively). However, we also noticed that this container was used for the disposal of devices used in ordinary patients, not only devices used in the vaccination against covid-19.



Source: Authors (2022).

Figure 14. Vaccine Distribution Chart at UBS EBN

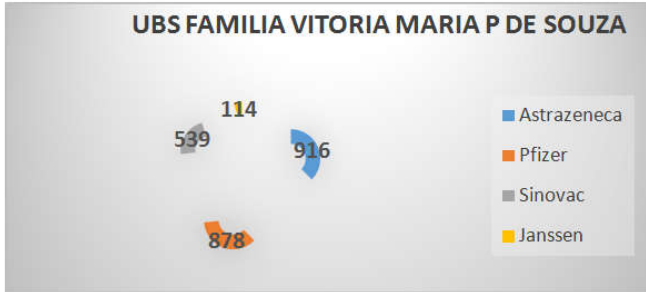
UBS Vitória Maria Paz de Souza: Located at Rua do Comércio, in the Comunidade Cacau Pirêra, a community 30 km away from the Iranduba headquarters, it honors Mrs. Vitória Maria Paz de Souza, a renowned resident of that community who, like Mrs. Nilce Domingos dos Reis, was an active midwife for many years in that community, working both in health units and in the homes of pregnant women.



Source: the author himself (2022).

Figure 15. UBS Vitória Maria Paz de Souza

Figure 15 - Chart of the relationship of the types and amounts of covid-19 vaccine dosages applied, in 2021, against covid-19 that were, from the Health Department of Iranduba, distributed to the UBS Vitória Maria P. de Souza. In this UBS, the disposal of syringes and needles was done equally, i.e., both (syringes and needles) were disposed of in the same container (a cardboard collection box of 30cmX25cmX15cm - length X width X depth, respectively). However, we also noticed that this container was used for the disposal of devices used in ordinary patients, and not only for devices used in the vaccination against covid-19.



Source: Authors, (2022).

Figure 16. Vaccine Distribution Chart at UBS VMPS

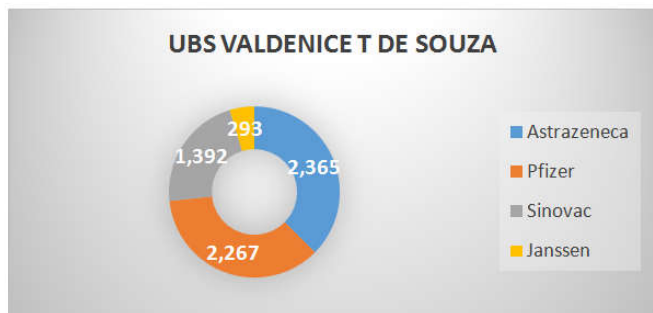
UBS Valdenice Trindade de Souza: Located on Rua 4, in the Nova Veneza neighborhood, in the Cacau Pirêra Community, 30 km from the Iranduba headquarters, it is honored to Mrs. Valdenice Trindade de Souza, a renowned resident of that community, who worked for 12 years as a health agent in that community.



Source: the author himself (2022).

Figure 17. UBS Valdenice Trindade de Souza

Figure 18 - Chart of the relationship between the types and quantities of vaccine dosages used in 2021 against covid-19 that were distributed by the Iranduba Health Department to the Valdenice T de Souza PHU. In this UBS, the disposal of syringes and needles was done in a similar way to that of the previously researched UBSs, i.e., both (syringes and needles) were disposed of in the same container (a cardboard collection box measuring 30cm x 25cm x 15cm - length X width X depth, respectively). However, we also noticed that this container was used for the disposal of devices used in ordinary patients, not only devices used in the vaccination against covid-19.



Source: Authors, (2022).

Figure 18. Vaccine Distribution Chart at UBS VTS

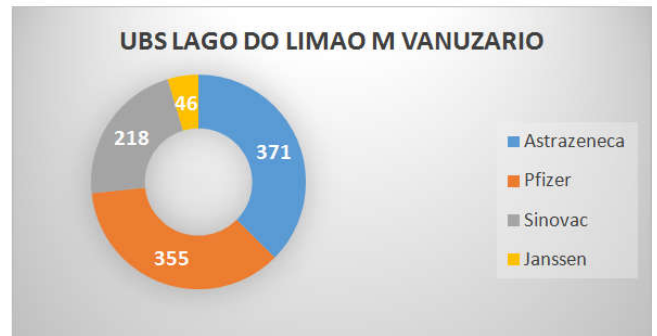
UBS Maria Venuzzario: Located in the Lago do Limão community, 30km from Iranduba, it honors Mrs. Maria Venuzzario, who was known and famous for her work in the art of giving birth and blessing.



Source: Authors (2022).

Figure 19. UBS - Maria Venuzária

Figure 20 - Chart of the relationship between the types and quantities of vaccine doses, applied in 2021, against covid-19 that were distributed by the Iranduba Health Department to the UBS Maria Vanuzario. In this UBS, the disposal of syringes and needles was done equally, i.e., both (syringes and needles) were disposed of in the same container (a cardboard collection box of 30cmX25cmX15cm - length X width X depth, respectively). However, we also noticed that this container was used for the disposal of devices used in ordinary patients, and not only for devices used in the vaccination against covid-19.

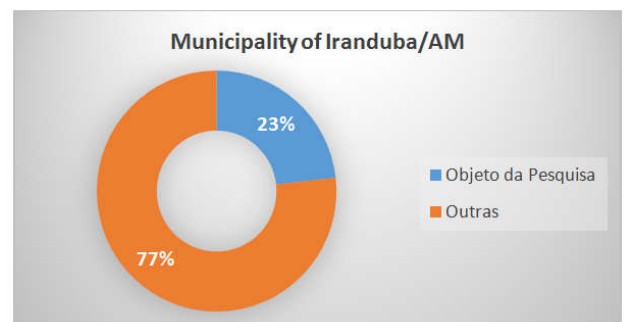


Source: Authors (2022).

Figure 20. Vaccine Distribution Chart at UBS MVA

RESULTS AND DISCUSSIONS

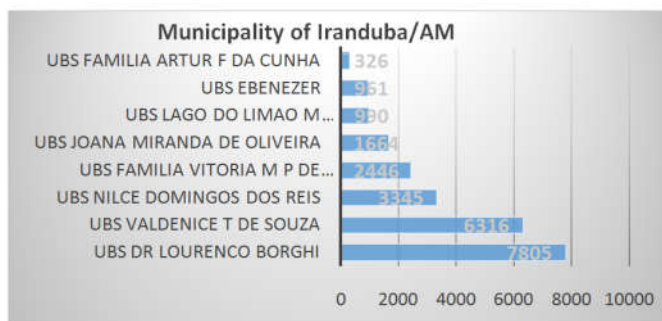
Figure 21- Graph showing the percentage of syringes/needles received by the municipality of Iranduba, which was the sixth in the state of Amazonas to receive the largest number of supplies related to needles and syringes, used in the application of vaccines against covid-19, but also vaccine dosages in the fight against the referenced pandemic.



Source: the author himself (2022).

Figure 21. Syringes/Needles Distribution to UBS 2021

Figure 22 - Chart showing the list of the studied PHUs and the equivalent numbers of inputs related to syringes/needles distributed according to the population size in each researched PHU. Notably, as shown in the above graph, the PHU receiving the largest number of these inputs was the Lourenço Borghi, to which 7,805 syringes/needles were passed on in 2021. On the other hand, the UBS that received the least amount of such inputs was the UBS Arthur Freire da Cunha, with 326 units of syringes/needles, as described in the chart above. We have as an effective result of this dissertation, evidenced in the field research at the locations already mentioned above, to exhaustion, the disposal in an inappropriate and unsafe way, because all syringes and needles, arising from the application of vaccination against covid-19, are allocated in a collection box, which also serves as a container for the disposal of all types of hospital material used in UBS, which were our source of observational research in the Municipal Health Department of Iranduba. This asseverated irregularity regarding the disposal of inputs used for the application of vaccines against covid-19, when comparing the work activity of the professionals who work in the respective UBS, where the research was conducted, in different teams, it is noticeable that the performance of these professionals occurs in a standardized way regarding their irregular disposal, considering that the collection box, which was to be disposed of only products used against covid-19, but was also used to dispose of other sanitary products, perhaps some of which could be recycled or reused, which would undoubtedly put the health of service providers in the respective PHUs at risk, with a high probability of being infected with the covid-19 virus.



Source: Authors (2022).

Figure 22. Syringe Distribution per PHU 2021

Fieldwork and sample analysis: The covid-19 outbreak in late 2019 was much more than a global health crisis. It is affecting society and the national economy and has had a profound impact on the daily lives of Brazilian citizens. The WHO declared the covid-19 outbreak a pandemic in March 2020 (PAS/WHO, 2020), and the number of victims is still spreading rapidly around the world. While protecting lives and restoring livelihoods are at the center of national and local policies and actions, proper waste management, including household, health, and other hazardous wastes, is an essential civic service to minimize potential secondary health and environmental impacts. An unintended consequence of covid-19 safety procedures has been increased waste, with regard to face masks and gloves, and now discarded syringes and needles from covid-19 vaccinations. Developing countries, which already lack adequate waste management practices due to technical, practical, and/or financial constraints, are largely vulnerable to waste management difficulties during the pandemic. Waste collection services are precarious due to workers dissatisfied with the service they perform, lack of job security, lack of safe handling of not only household waste but also hospital waste, thus undermining the assurance of safe waste management from disposal through collection to recycling or treatment facilities. Thus, countries and cities are fighting covid-19 to contain its spread while avoiding the risks to the environment and human health, especially that of workers directly related to hospital waste. The waste management system at the local level requires specific precautions, operations, and management practices about pandemic covid-19, in addition to the normal protocols for household, healthcare, and other infectious waste management. It is also

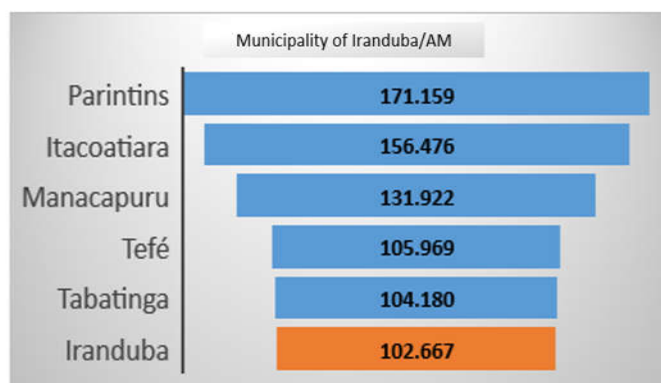
necessary to have a contingency plan that promotes safe, adequate, and practical options in a timely and appropriate manner. Although incineration based on well-designed and maintained facilities operating within their design tolerances is a widely accepted and commonly recommended method of treating solid healthcare waste, most developing countries do not have access to these advanced incinerators or even the conditions necessary to operate them safely. Thus, the question is: what will happen to all the added residues of covid-19 vaccines if they are not properly disposed of, considering that public collection policies do not reach the entire Brazilian territory? In this space, we seek the answer to this question by studying how has been the management of sharps waste in UBS located in the municipality of Iranduba. Although the covid-19 pandemic is a negative event worldwide, it develops in a diverse and multiple way from the singularity of infrastructure, environments, practices, meanings, relationships and habits of life peculiar to different societies around the world. By considering specific cultural knowledge and forms, religiosities, ethnicity, gender, economic inequalities, or labor relations, we realize the conditions to understand the effects of the pandemic and offer evaluations and solutions that are more faithful to the distinct realities where it occurs (TORALES et al., 2020).

The eagerness and dream to achieve better living conditions was what led many northeasters to face the Amazon Forest and its dangers, transforming challenges into conquests, in a process that represented some of the most common migratory flows to the region. The demography of the Metropolitan Region of Manaus, where the city of Iranduba is inserted, originating in the migratory movements, after the second half of the twentieth century, had the influence of the Federal Government's development strategies for the region as a way to modify the image of a "backward" region. According to Wagley (1988): Migration to Belém or Manaus, or to some other small community in the Amazon Valley, not only eliminates the memory of the family's low origin, but also allows an individual from the lower classes to form new relationships, thus escaping from the higher class people he had become accustomed to. These Amazonian human movements aligned with the history of several characters responsible for the emergence of several communities, especially those in the interior of the State of Amazonas. According to Pizarro (2012), the stories told and heard about the Amazon have their narratives starting from the river, a statement confirmed by Tocantins (2001), when reporting that life in the Amazon has the rivers as one of the guiding threads, as he relates below: "These fabulous oases made possible the conquest of the land and ensured the human presence, beautified the landscape, make civilization spin - they command life in the Amazonian amphitheater." It is almost impossible to talk about the Amazon, to talk about the places, about the communities, without making reference to the rivers, those that are the streets through which the boats and canoes, voadeiras and rabetas glide, and through which the men who live in the Amazonian communities transit and establish their trades. In the Amazon, communities and rivers cross each other, forming a perfect labyrinth. The communities are profiled, spliced into an almost silhouette.

The area of 2.215.033km² that covers the municipality of Iranduba constitutes an important geographical space close to the urban zone of the city of Manaus, separated by a few minutes of a car trip, where landscape modifications are directly related to a strong tendency of human occupation and expansion of its activities. The concept of landscape is based on Sauer's theory (apud ROSENDAHL & CORRÊA, 1998), who came to understand geography in an integrated way, focusing, at the same time, on natural and social factors, inserting the understanding of the category landscape as an integrating link of these factors, emphasizing that any single, disorganized or unrelated definition of it has no scientific value, and divides the content of landscape into two parts: (1) the "site," which represents the sum total of natural resources; and (2) its cultural expression, or the mark of man's action over an area. The city of Iranduba is situated on the left bank of the Solimões River, at its confluence with the Negro River, southwest of the capital of Amazonas, from which it is distant about 9 km, considering the

crossing of the Rio Negro Bridge to the Cacaú Pirera district. Its location allows the existence of two diverse ecosystems: (1) paradisiacal landscapes, beaches, waterfalls and abundant forests (Rio Negro riverside); (2) extensive floodplain areas with agricultural, fishing and contemplation activities (along the Solimões River) (TAMANHA & NEVES, 2014). The forms of organization of the places of the rural communities in the Amazon, although complex, are articulated among themselves, a characteristic of the communities Cacaú Pirera, Lago do January, and Lago do Limão. The space that takes anyone to these communities is full of curiosities and natural beauties, starting with the road traveled, whether by boat or by road. The communities visited in this research are very close to each other and, according to Matos (2009), the changes related to community mobility, whether rural or urban, come to be analyzed from the point of view of the transition process, once it crosses the communities, because what was once distant is now considered close, and the perception of space and time is observed by the residents from these changes. When referring to the "rural and urban opposite pair" as an element of the same process, it is observed that the residents call the area where the municipal headquarters is located an urban area; while the communities, distant or not from the headquarters, are called rural areas or zones. In Basic Health Units, the reason for this research, despite all the steps of disposal of inputs used against covid-19, more specifically syringes and needles, that internally in the respective UBS, analyzed and evaluated in this simple academic work, meet, in theory, the requirements of the Health Surveillance, notably, it can be seen that the segregation of solid waste is a critical procedure, since there are indications of irregularities regarding the proper and safe separation of solid waste generated before the pandemic that devastates the country. To mitigate the chaos before the erroneous way to segregate solid health waste within the UBS, under management of the Health Department of Iranduba, would require the training of all health professionals, who work in their UBS, as well as those responsible for hospital cleaning, so that the segregation will be operated safely and correctly, isolating the syringes and needles in a single collection box for these inputs and many other collection boxes for other inputs generated in UBS. Today, there is no effective control of all solid waste generated in the studied PHUs in the municipality of Iranduba. Although the primary focus of the mission of this research is to control the correct and safe disposal of inputs used in vaccinations against covid-19, there is no way to forget the health of all those, regardless of positions/functions, who work in the UBS of the city, considering the risk of contamination inherent to all who are present in UBS, including patients. Although the Basic Health Units researched in the aforementioned municipality are equipped to serve the public in a satisfactory way, there must be a greater commitment of managers to the need and awareness of the segregation of solid health waste, especially regarding its correct and safe destination at the time of disposal, thus separating the "wheat from the chaff".

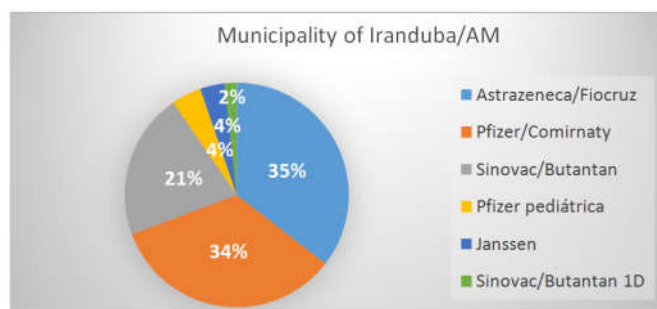
Figure 23 - Chart pointing to the number of vaccines, in the year 2021, passed on by the Health Surveillance Foundation of the Amazon for the city of Iranduba, leaving this city with a total of 102,667 vaccines, being in sixth place compared to other municipalities regarding the number of vaccines received.



Source: Authors (2022).

Figure 23. Vaccine Repass in Amazonas 2021

Figure 24 - Graph in percentage, which indicates the types of vaccines, from several laboratories, that are sent to the municipality through the Health Surveillance Foundation of Amazonas.



Source: Authors (2022).

Figure 24. Vaccine Distribution by Brand 2021

CONCLUSION

One must devote special attention to the disposal of solid waste as a whole and, especially in times of pandemic, to health supplies used in the fight against covid-19, in view of the great lethal risk that this type of solid waste health boasts. The management of solid waste disposal activity health is a topic of extreme relevance, because its correct and safe way in view of the successive disposal of these materials in UBS of the municipality of Iranduba will avoid harmful impact on the working life of their health workers, as well as damage to the environment. It is evident that it is important that the health facility employees should receive training so that they know the correct way to treat this waste and the final destination for disposing of hospital waste. The importance of the law being followed can bring many benefits to society, the healthcare facility, and the environment. It should be noted that the environmental repression agencies, in times of pandemics, have created specific rules to minimize the infection by covid-19. In this vein, they have sought to subsidize the safe and healthy disposal of solid waste, especially needles and syringes used in vaccinations against covid-19, with the ultimate goal of avoiding its reuse or recycling. Despite all regulatory efforts, many managers allocated in UBS are unaware of or simply ignore basic rules that are imposed on them, which consequently tends to accentuate the spread of the virus. The steps investigated in this research, regarding the correct and safe disposal of inputs used in vaccinations against covid-19, were limited only to the procedures within the walls, i.e., the disposal of these types of inputs allocated in a collection box, soon after their use, to be stored internally in the UBS until a company from the environmental branch comes to follow the next steps, considered extramural: external storage, displacement and, finally, incineration. For this reason, it is suggested that another academic research be conducted with the purpose of detailing the subsequent activities, performed by a company in the environmental field that provides solid waste collection service in the UBS of the municipality of Iranduba.

ACKNOWLEDGMENTS

The Institute of Technology and Education Galileo of the Amazon (ITEGAM) for supporting this research and the Postgraduate Program in Engineering, Process Management, Systems and Environmental (PPMSE).

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