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Health Surveillance in Worker's Health in floating gas stations in Manaus, Amazonas

Vigilância Sanitária em Saúde do Trabalhador em postos revendedores flutuantes de Manaus, Amazonas

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ABSTRACT

Introduction: Automotive Gas Station's (AGS) workers are exposed to risks such as chemicals, physical risks, explosions and violence. Gas Stations are also on rivers, lakes and oceans, in boats without propulsion, classified by the National Petroleum Agency (NPA) as Floating Gas Stations (FGS). The Amazon region concentrates 95.0% of the FGS in Brazil, and they are fundamental for the transportation of people, cargo and services. **Objective:** Intervene in the risks associated with the health of FGS's workers, through an interdisciplinary and multi-institutional approach. **Method:** The study is qualitative and the methodology is an intervention research with the use of adapted checklist and interviews. **Results:** Specificities of FGS, irregularities found, worker's interviews and measures to mitigate the risks are described. Certain irregularities are similar to those reported for the AGS, added to others resulted from the specificities of the FGS. Precarious environments, conditions and work processes were found and there were reports of complaints related to benzene intoxication. **Conclusions:** AGS have been the subject of research and interventions, but there are no publications about FGS, specific legislation and actions to minimize the risks. The study generated collective learning and institutional cooperation to protect and improve workers' quality of life.

KEYWORDS: Gas Stations; Floating Gas Stations; Manaus; Sanitary Surveillance; Worker's Health

RESUMO

Introdução: Os trabalhadores em postos revendedores de combustíveis automotivos (PRCA) são expostos a riscos químicos, físicos, explosões e violência. Os postos de combustíveis também estão presentes nos rios, lagos e oceanos em embarcações sem propulsão, classificadas pela Agência Nacional de Petróleo (ANP) como Postos Revendedores Flutuantes (PRF). A Amazônia concentra 95,0% dos PRF do Brasil, e eles são fundamentais para o deslocamento de pessoas, de cargas e de serviços. **Objetivo:** Intervir de forma inaugural nos riscos associados à saúde dos trabalhadores de PRF, mediante uma abordagem interdisciplinar e pluri-institucional. **Método:** O estudo é qualitativo e o método, a pesquisa-intervenção com a utilização de roteiro de inspeção adaptado e entrevistas. **Resultados:** Foram analisados: as especificidades dos PRF; as não conformidades encontradas; os relatos dos trabalhadores e as medidas adotadas para mitigação dos riscos identificados. Certas não conformidades são semelhantes às relatadas nos PRCA e se somam a outras decorrentes das especificidades dos PRF. Precárias relações e situações de trabalho foram encontradas e houve relato de queixas possivelmente relacionadas à intoxicação por benzeno. **Conclusões:** Os PRCA têm sido objeto de pesquisas e intervenções; mas sobre os PRF inexistem publicações, normas específicas e ações de minimização do risco. O estudo gerou aprendizado coletivo e cooperação institucional para proteção e melhor qualidade de vida para os trabalhadores.

PALAVRAS-CHAVE: Postos Revendedores de Combustíveis Automotivos; Postos Revendedores Flutuantes; Manaus; Vigilância Sanitária; Saúde do Trabalhador

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INTRODUCTION

Work is a fundamental determinant in the health-disease process and the risks associated with worker's health must be detected and analyzed so that measures are taken to prevent them, a transdisciplinary articulation, intra e intersectorial[1,2], being essential.

Automotive gas stations (AGS) workers are exposed to several risks, with chemical exposure standing out. The AGS are also responsible for environmental contamination, involving soil, air, and water[2,3]. Chemical exposure includes benzene, xylene, and toluene but mainly the first, whose acute intoxication may cause signs and symptoms such as: myalgia, dizziness, drowsiness, and asthenia. Chronic exposure can lead to progressive bone marrow degeneration, aplastic anemia, and/or leukemia[4,5]. Benzene contamination can happen through oral, dermal, and respiratory routes, the last two being the most relevant. Gas station attendants, gas station supervisors, those in charge of measuring and discharging fuels, and those responsible for quality tests are the most exposed.

Workers at reseller stations are also exposed to other risks, such as: robberies, trampling, assaults, fires, and explosions[2,6,7]. Besides that, the organic solvents present in petroleum derivates can be ototoxic[8,9] and cause ophthalmologic damage, such as loss of the ability to discriminate colors, in AGS workers[10].

According to the *International Agency for Research on Cancer* (IARC) of the World Health Organization (WHO), there is enough evidence of the carcinogenicity of benzene, which causes acute myeloid leukemia in adults[11].

The AGS is also present on floating vessels without propulsion, being called Floating Gas Stations (FGS), which operate at a location that is fixed and determined by the Port Authority. They resell automotive fuels at retail and supply tanks for consumption by sea, lake, and river vessels or authorized containers[12].

Present mainly on the Legal Amazon, these establishments are known locally for *pontões*, being essential for this region, which has 16 thousand kilometers of navigable rivers that are extremely important for the local economic, social, and cultural dynamics. It is estimated that in 2017 this waterway network has transported approximately 9.8 million passengers and 3.4 million tons of cargo distributed in the state and interstate longitudinal displacement and crossing[13].

FGSs have assisted in the displacement dynamics of vessels in the Amazon region for decades. Souza[14] presented reports on the *pontões* of the *manauara* coast in the 1960s in the extinct Floating City, a time when these establishments were installed on the Rio Negro, but distanced from the floating house clusters to prevent explosions or fires from causing further damage. Wilson Souza Aranha, in the 1960s, documented photographically an establishment of this type also in the old Floating City, which had its tanks at the top of the platform.

Over the years, the FGSs has undergone modifications in its construction. They were initially constructed on floating wood logs, mainly from *açacuzeiros*, as reported by Souza[14]. Presently, these establishments have metallic structures and submerged tanks; and many have convenience stores as well as their land-based counterparts.

According to data from the National Petroleum Agency (NPA), Amazonas has the highest number of FGS in Brazil, with 127 of the 199 authorized establishments in the country, which represents more than 60% of the existing services in the national territory. Pará has 46 and Acre has 17 FGS. Thus, those three states in Legal Amazon have approximately 95% of the FGSs across the country. The Manaus shore, the territory covered by this study, has 17 *pontões* authorized by NPA[15]. The state of São Paulo has three such establishments, Rio de Janeiro has two and states of Amapá, Bahia, Maranhão, and Rondônia each have one[15].

Moura-Correa et al.[2] reported the experience of the Occupational Health Surveillance (VISAT) network in AGS in six Brazilian states (Bahia, Paraná, Rio Grande do Sul, Rio de Janeiro, Santa Catarina, and São Paulo), between 2004 and 2014, and pointed out the following problems: no control over the sources of fuel vapors in the air; chemical exposure to products other than gasoline, such as alcohol, diesel, and gas; absence of training for workers; failures in the provision of personal protective equipment; low performance of periodic examinations; violence, assaults; trampling and aggression from customers. In Brazil, there are other reports of successful experiences of VISAT actions at the reseller stations[16,17,18,19,20], but all publications are focused on land services. Therefore, there are no practical references that can contribute to the planning of interventions in the specifics of services installed on vessels without propulsion.

In addition to the absence of reports on FGSs in the scientific literature, Cardoso[21], in a cyclical analysis by VISAT in the state of Amazonas, has reported that local actors involved in the inspection of processes, conditions, and work environments recognize the punctual nature of existing actions, with no continuous and systematic operationalization of activities over time.

Joint actions between Health Surveillance (Visa), Environmental Surveillance, Occupational Health Reference Center (CEREST), union and academy can have an important transforming nature for this type of activity, since: Visa has the necessary police power; Environmental Surveillance plays an important role in environmental risks; CEREST is the technical reference in occupational health in the Unified Health System; the union is the worker's representative institution, which has the essential knowledge of workers; and the academy is fundamental for the production, systematization, and dissemination of knowledge.

In Manaus, the municipal Visa plays a very important role in inspections of work environments, processes, and conditions, as it is the competent health authority to inspect all establishments under its jurisdiction. This service is responsible both for

the performance of services subject to annual health licensing, as well as work environments in general, which are exempt from the requirement of the Sanitary License, but which can be inspected when complaints are made, epidemiological reasons, or demands from other agencies.

Concerning VISAT, there is no specific sector in the structure of the Municipal Health Secretariat of Manaus (SEMSA), but VISAT actions occur in a transversal way, in health surveillance and the assistance network, with Visa being the only holder of police power, essential for inspections of work environments, conditions, and processes.

VISAT has as the main legal framework annex LXXIX to Consolidation Ordinance nº 5, of September 2, 2017[22], former Ordinance nº 3,120, of July 1st, 1998[23], which provides for inspections in wok environments and processes with an interdisciplinary and multi-institutional character, emphasizing the participation of workers and its legal representatives. The performance of worker knowledge in inspection acts is also supported by the National Policy for Workers Health [24] (PNSTT) and the Health Code of Amazonas[25].

Regulatory Standard (NR) nº 9[26], of 2006, has established minimal occupational health and safety requirements for activities with exposure to benzene applicable exclusively to land services (AGS) but neglected services installed on floating vessels without propulsion (FGS). However, Mendes et al.[6] highlighted the progress that this legal provision represents, as it allows expansion of actions to prevent AGS worker's exposure to benzene.

The environmental regularization of the FGSs is an important preventive measure not only for the environment but also for the workers of these ventures and populations that live in their surroundings. The Resolution of the National Environment Council (Conama) nº 273[27], of November 29, 2000, establishes since then the obligation of prior licensing and operation of AGSs and FGSs.

Fire protection measures are also essential to prevent accidents and ensure greater safety for workers and users. Thus, these establishments must meet the requirements of the Fire Department[28,29] of the state of Amazonas, as well as the provisions of NR nº 23, of July 6, 1978, specific for fire protection[30].

This study aimed to intervene in an initial way in the risks associated with the health of FGS workers, through an interdisciplinary and multi-institutional approach. We sought to contribute to the identification and prevention of risks related to the health of FGS workers on the Manaus waterfront; discuss the specificities of the risks to the health of FGS workers, as well as the potential environmental risks and promote the articulation of surveillance actions in the city of Manaus.

METHOD

The method used was intervention research with a multi-institutional and multi-professional character, as carried out in the field of occupational health, a modality of action research; the strategies adopted for structured data collection covered the application, during the inspections, of a specially adapted script and the conduction of interviews with workers. Participated in the inspections: the Manaus regional and Amazonas state CEREST; Visa Manaus, city Environmental Surveillance; Oswaldo Cruz Foundation (Fiocruz), and Union of employees in service stations for fuel and oil products, convenience stores, car wash, oil change and lubricant sales in the state of Amazonas (SINPOSPETRO/AM).

The inspection team was composed of a veterinary medical inspector from Visa Manaus, master's student in Public Health at Fiocruz; a unionist; professionals from Manaus regional and Amazonas state CEREST in the areas of phono audiology, medicine, psychology, and social service; as well as an engineer from the Environmental Surveillance of the city of Manaus.

A specific script was developed based on the instrument used by Santa Catarina state Visa for land establishments[31], with the following sections: 1- General company data; 2- Characteristics of economic activities; 3- Characteristics of areas, operations, and equipment; 4- Protective measures; 5- Electrical installations; 6- Training; 7- Hygiene and comfort conditions; 8- Uniforms; 9- Functions and activities developed; 10- Collective protective equipment (CPE); 12- Waste; 13- Deposits and 14- Final considerations about the inspection. In addition to these sections, the following annexes: List of documents to be evaluated and Document analysis.

The questionnaire applied to workers was composed of five sections with questions on: 1- Occupational accidents; 2- Critical incidents; 3- Referred morbidity; 4- Subjective perception of risk and 5- Improvements in work processes and environments. It should be noted that this document was prepared according to the provisions of the Normative Instruction for Occupational Health Surveillance[22].

The inspections were carried out in establishments regularizes in the NPA database, located on the Manaus waterfront. At the time of elaboration of the intervention project, the register had only nine FGS records[15], even though the Institute of Weight and Measures of Amazonas (IPEM-AM), in 2017, reported the existence of 21 establishments of this type in the city of Manaus[32]. The interventions occurred in four of those 9 FGSs chosen at a planning meeting of the institutions involved in the action, considering mainly the demands of Manaus regional and Amazonas state CEREST, as well as SINPOSPETRO/AM.

The inspections were guided by the provisions on the Manaus Sanitary Code[33,34] and by other relevant legislation, with administrative procedures being carried out as required for each case. They were also recorded using audiovisual resources, as provided for in the Amazonas Health Code.[25].

The inspection reports were prepared together with the technicians of the institutions participating in the interventions and delivered to the FGS representatives, at which time the necessary clarifications and guidance were provided. It should be

noted that, within the scope of this study, biological samples were not collected from workers, as the focus of this project was not on the effects of exposure to benzene, toluene, ethylbenzene, and xylene (BTEX).

The data collection strategies were mainly qualitative and, in addition, in the case of an intervention proposal, the data analysis started simultaneously with the collection and extended in a later period. The responses to the questionnaires were analyzed in relation to each FGS and in relation to the group of workers.

The research was authorized by Manaus SEMSA and the project was submitted to the Research Ethics Committee (REC) of the Sergio Arouca National School of Public Health (ENSP), having obtained the favorable substantiated opinion number 2,896,402.

The inspections were monitored by the workers' legal representative, SINPOSPETRO/AM. This was intended, in addition to respecting the principles of interventions in Occupational Health, to ensure that FGS employees had greater protection.

RESULTS

The inspections were carried out on November 13, 2018, in the morning and afternoon periods. In the first establishment in the morning shift (FGS 01) and the first of the afternoon shit (FGS 03), no action was taken, as the first had its activities closed and the second was closed by the NPA. The two establishments that were in full operation were inspected, one in the morning (FGS 02) and another in the afternoon (PRF 04). Two workers were interviewed in each *pontão*.

Specificities of floating gas stations

FGSs are vessels without propulsion that are distant from the banks of the river. Its location is fixed and determined by the Port Authority. Being floating, in a fast-flowing river, it should be noted that all FGSs should have a guardrail on all its edges, to prevent workers and customers from falling into the river.

Fuel is unloaded by vessels that transport oil products between the refinery and the FGS, and this service can be proprietary or outsourced.

FGSs commercialize a type of fuel that does not exist in AGSs, marine diesel.

Unlike the AGSs, which have gutters around the supply lane and the unloading area for fuel drainage in the event of spills, FGSs have barriers of approximately 10 cm around these areas. Thus, in the event of an accident, the spilled product would be contained in the defined area and would be removed with the aid of absorbent materials.

The sale of fuel in containers is quite common in FGSs. Due to the long distances traveled by vessels in the Amazon region, some stock up on oil products to avoid shortages along the way. It is also common that, for fueling, the attendants hand out the nozzle for the vessel conductor to carry out the process.

Commonly, the FGSs have guard dogs on board to assist in the security of establishments due to the frequent robberies carried out by pirates in the rivers of the Amazon region.

Life jackets are among the PPE necessary for this type of activity, as well as regarding CPEs, lifeboats. The inspected FGSs did not have this resource.

Non-conformities at floating gas stations

Non-conformities, which were classified according to the current regulations, are shown in Chart 1.

Interviews with the workers

There were four workers in each FGS at the time of the inspection, and two were interviewed at each establishment. Chart 2 shows the workers interviewed, their workplaces, and their functions.

Chart 3 shows the workers' responses to each section of the questionnaire.

Measures adopted

For the two FGSs inspected, Notices of Infraction were drafted, which initiated Sanitary Administrative Proceedings for each of the establishments. In addition, Notices of Intimation were issued granting 90 days for the adequacy of non-conformities detected during inspections. Thus, the provisions of the Manaus Sanitary Code[32,33] were fulfilled.

DISCUSSION

The study sought to answer two questions. The first on the specific risks related to FGS worker's health, which demanded to explore the specificities of this type of work environment. The second, on how to intervene in the health risks of FGS workers, was embodied in the intervention carried out, of an interdisciplinary and multi-institutional character, centered on sanitary inspection and documented with the use of audiovisual resources. This intervention research is original, considering that no published works on this topic were identified in the review of the national and international scientific literature, carried out in 2018 and updated in January 2019.

Although the FGSs have specificities, there are several similarities between these services and their land counterparts. Thus, many non-conformities existing in the AGSs and reported by several authors[2,6,7] were also detected on the FGSs.

Despite the various fires and explosions involving FGSs, widely reported on local news[35,36,37,38,39,40], including those with serious and fatal victims, the inspected establishments were not regularized with the Fire Department. In FGS 04 there was an outdoor grill for preparing meals for workers, which increases the risk of accidents. It should be noted that no service provided proof of training of employees regarding preventive and fire-fighting

Chart 1. Non-conformities verified at the inspected floating gas stations (FGS 02 and FGS 04).

Non-conformities	FGS 02	FGS 04
Documentation		
Risk maps prepared and displayed in the workplace	No	No
Evidence of PPE supply to workers	No	No
Occupational Health Examination Program (PCMSO)	No	No
Updated supplementary examinations of workers	No	No
Updated Occupational Health Certificate (ASO)	No	No
Annual PCMSO report	No	No
Environmental Risk Prevention Program (PPRA)	No	No
Updated single-line schemes of the establishment's electrical installations with the specifications of the grounding system and other protective equipment and devices	No	No
Evidence of cleaning air conditioners	No	No
National Hazardous Waste Operators Register of the company responsible for the collection and final destination of hazardous waste	No	No
Waste management plan	No	No
Fire Department Inspection Report	No	No
Written procedures for containment of small spills	No	No
Contract with the company responsible for waste collection	No	No
Uniforms' hygiene		
Uniforms cleaning carried out by employers and with a minimum weekly frequency	No	No
Supply lane		
Splash protectors on the nozzles	No	No
When selling fuels in containers, they are appropriate	No	No
PPE		
Appropriate uniforms and provided by the employer	No	No
Worker's uniforms with reflective strips	No	No
Supply of full-face respiratory protection equipment, with filter for organic vapors, for workers who need its use when necessary	No	No
The employer provides protective skin cream for workers who need it	No	No
The employer provides hooded coats to protect workers who may be exposed on rainy days	No	No
Use of appropriate and non-slip shoes	No	Yes*
Collective protection equipment		
The employer provides lifeboats	No	No
Existence of guardrails to prevent accidents with subsequent fall into the river	No	No
Storage of fuel samples		
Appropriate place to store samples	No	No
Training		
Evidence of training for workers who carry out their activities at risk of occupational exposure to benzene, including: a) risks of exposure to benzene and absorption routes; b) basic concepts on environmental, biological, and health monitoring; c) signs and symptoms of benzene occupational poisoning; d) preventive measures; e) emergency procedures; f) basic characterization of facilities, risk activities, and points of possible benzene emissions; g) legal provisions on benzene	No	No
Evidence of training of workers on the following topics: firefighting, workplace safety, occupational training of the activities developed	No	No
Sanitary facilities		
Appropriate trash bin (with pedal)	No	No
Hand drying device	No	No
Liquid soap for hand hygiene in the sink	Yes	No
General conditions of comfort and hygiene		
Has cleaning material deposit or closet for this purpose	No	No
Has locker room with double cabinets for workers	No	No
The establishment has a cafeteria	No	No
Food stored in an appropriate place, separated from chemicals	No	No
Drinking water supply for workers	No	Yes
Electrical installations		
Protected electrical wiring	Yes	No
Residues		
They had a container to keep the residues from the containment of small spills	No	No

Source: Own elaboration, 2019.
FGS: floating gas stations; PPE: Personal protective equipment; PCMSO: Occupational Health Examination Program; ASO: Occupational Health Certificate; PPRA: Environmental Risk Prevention Program.
* Non-slip shoes were not provided by the employer.

Chart 2. Interviewed workers, their workplaces, and their functions.

FGS	Worker	Function
FGS 02	W01	Fuel transportation between the refinery and the FGS
FGS 02	W02	Fuel transportation between the refinery and the FGS
FGS 04	W03	Gas station attendant
FGS 04	W04	Cooker

Source: Own elaboration, 2019.
FGS: floating gas stations.

Chart 3. Workers' responses to the questionnaire.

Questionnaire section	Worker	Report
Occupational accidents	W01	A worker from a nearby FGS was beaten on the head with a revolver during a robbery, then thrown into the river. The victim was rescued and taken to medical care.
	W02	A co-worker suffered a burn when handling a battery. According to W02, the accident happened because the employee forgot the engine running for lack of attention.
	W03	A worker from a nearby FGS suffered burns after the explosion of the motor pump of a vessel that carries fuels.
Referred morbidity	W02	Muscle pain, dizziness, and weakness.
Improvements in work processes, conditions, and environment	W02	Reported that if they had a formal contract, they would have better working conditions.
Subjective perception of risk	W01	Reported that there was a risk of violence in the activity due to the robberies. According to this worker, the establishment installed security cameras for surveillance and also reports that the guard dog assists in security.
	W02	"[...] working with oil is flammable, it means working on a bomb that can explode at any time, *for me, it's a risk factor, for me*". According to this employee, the PPE use decreases the risks of accidents, but reports that they are working at the FGS for six months, however, they never received their PPE.
	W03	Reported that smoking and using cell phones in the FGS is dangerous. This worker also relates the stench of fuels with health risks but reports that they no longer feel the strong odor present in the work environment.
Others	W01	Works for 12 days straight, 24h a day, and takes four days off.
	W02	Reported working two weeks in a row, 24h a day, with three days off. Does not receive an unhealthy or dangerous and nightly surcharge.

Source: Own elaboration, 2019.
FGS: floating gas stations; PPE: personal protective equipment.

measures. In addition, the inspected FGSs did not have lifeboats to assist in evacuating the environment when necessary.

It was noted that, during the fueling step, attendants hand out the nozzle to vessel conductors so that they would be responsible for the procedure. Consequently, this FGS characteristic minimizes risk to workers, who are less exposed to toxic vapors from fuels, however exposing the consumer. As a factor that increases the attendants' exposure, it was found during the inspections that the sale of oil products in containers brought by customers is frequent. In these cases, attendants fill the containers with the products themselves and keep holding the dispensing nozzle to control the filling level. At the two inspected stations, there was no protection device for the pump nozzles against splashes, resulting in greater and unnecessary exposure, either by attendants or consumers.

The presence of guard dogs in the inspected FGSs and in the others seen during the inspection team's displacement through Rio Negro was verified. According to reports from these establishments' workers, these animals live in the FGSs and assist in the security, as crimes carried out by pirates in the rivers of the Amazon region are common. It should be noted that a worker (W01) referred to a robbery in which an FGS employee was hit on the head with a revolver and thrown into Rio Negro. Therefore, it is necessary to implement public policies in the area of public security to minimize risks related to violence to which FGS workers are exposed.

It was found during inspections and team displacement through Rio Negro that the FGSs do not have a guardrail at their edges, which favors falls into the river, both from workers and customers. The risk of this type of accident is increased on rainy days when the floor of establishments gets wet. In addition, the instability of floating gas stations caused by the movement of rivers leads to imbalance and, subsequently, falls. This risk is greater in some circulation areas of *pontões*, which are very narrow, without proper lateral protection and with obstacles, which can lead to accidents such as the one in which a 35-year-old man disappeared after falling from a localized FGS on Rio Amazonas[39]. It is important to highlight that no rules are defining minimum parameters for building FGSs. Therefore, the elaboration of regulation with the specifications of the architectural aspects of the FGSs is necessary to minimize the risks in this activity.

The inexistence of regulations related to FGSs goes beyond their physical structure, as no regulations are establishing minimum parameters and best practices for the functioning of this activity.

Besides that, the absence of systematic actions by the health sector on *pontões* makes them even more vulnerable. Consequently, the normative vacuum added to the incipient inspection in this sector results in a scenario of frequent accidents with serious and fatal victims. It should be noted that the NPA's most emphatic performance concerns the quality of fuels. Thus, the multi-institutional and interdisciplinary strategies, such as those carried out in this intervention research, should be expanded to minimize the risks to workers, users, the populations living in the vicinity of these establishments, and the environment.

Despite the small number of interviews carried out, since only four workers were interviewed, they point to degrading work situations, with reports of several problems such as violence, accidents, illness, lack of PPE, and precarious working conditions. In one of the interviews, one of the workers reported having episodes of muscle pain, dizziness, and weakness, commonly found in cases of acute benzene intoxication according to the scientific literature[4,5]. It should be noted that several non-conformities detected by the inspection team, as well as demands present in the Notifications of Infraction, can be related to the risk of benzene exposure. Therefore, it is expected that the intervention, which is intended to be extended after conducting this research, minimizes the risks and consequently their dangers.

In one of the reports of one of the workers (W02), it is possible to identify the use of the idea of the unsafe act to blame the victim in cases of accidents at work, since this employee reported that a colleague suffered a burn when handling a battery, but the accident occurred because, for lack of attention, the engine was left still running. For Vilela, Iguti, and Almeida[41], this model of thought is convenient and useful for eliminating the fault of the employer or its representatives, thus maintaining a mood of impunity concerning occupational accidents. It is important to highlight that several non-conformities detected on the FGSs, which are the direct responsibility of employers, can be associated with occupational accidents, such as the lack of training and exhaustive hours.

Given all non-conformities verified in the inspected FGSs, Manaus city's Visa assessed and ordered establishments to adjust all irregularities within 90 days, as provided by the Manaus Sanitary Code[32,33]. With this measure, it is expected that detected infractions will be remedied within the period granted to the inspected FGSs. Otherwise, the Sanitary Administrative Proceedings will be carried out, with the possibility of penalties being applied against the inspected services.

There was a significant increase in FGS authorizations in the NPA public database after the inspections in these establishments, which may have been motivated by the execution of this intervention project, which, in its initial phase, more precisely February 2018, found nine FGSs in the NPA records for the city of Manaus[15], despite data from IPEM-AM pointing to a number of 21 *pontões* in the capital of Amazonas[31]. Therefore, more than 50% of these establishments were out of the NPA system before the inspections. In just over a year, after the first consultation with the NPA website, in March 2019, the portal of this regulatory agency started to present 17 authorized FGSs for the city of Manaus, an increase of almost 100% when compared to February 2018[15].

The joint work of several institutions and professionals from different backgrounds was essential for the planning and execution of this intervention project, which also served to strengthen the multi-institutional articulations at the local level. However, there was a need for the involvement of other partners in further actions, such as: Port Authority, Amazonas State Public Ministry (MP-AM), Fire Department, Institute of Environmental Protection of Amazonas (IPAAM), and Amazonas Regional Labor and Employment Office (DRT/AM).

Through this intervention project, it was possible to identify and describe several specificities and risks unique to the FGSs, which will be extremely useful for the preparation of future regulations and the planning of continuous actions for this economic activity.

CONCLUSIONS

The lack of published studies nationally and internationally related to the FGSs and the lack of specific regulations for this activity were the main limitations for the planning and execution of this intervention research project. Therefore, other research must be carried out to deepen the identification and assessment of specific risks related to the *pontões*. In addition, the multi-institutional and multi-professional articulation must be expanded at the regional and national levels to encourage the regulation of this type of service in Brazil. At the beginning of the study, it was believed that there were FGSs only in the Amazon region, with no current knowledge of the distribution in nine Brazilian states and three Brazilian regions (North, Southeast, and Northeast) of FGSs authorized by the NPA.

It is intended that this study, in addition to the expected developments with the measures adopted and with the multi-institutional and multi-professional approach, provides visibility to problems related to the health of FGS workers, establishments neglected by the health sector and other regulatory bodies, mainly in the Amazon region, where approximately 95% of these services are concentrated in the country. Thus, the planning and implementation of public policies that can alter the scenario of illness and death related to the *pontões* will be possible.

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Authors' Contributions

Chaves SOC - Conception, planning (study design), acquisition, analysis, data interpretation, and writing of the work. De Seta MH - Conception, planning (study design), analysis, data interpretation, and writing of the work. All authors approved the final version of the work.

Conflict of Interest

Authors have no potential conflict of interest to declare, related to this study's political or financial peers and institutions.