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IMPORTANCE OF NEGLECTED DISEASE SIGNALING

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ABSTRACT

The need to collect, process, analyze, and disseminate information about neglected diseases becomes necessary for health planning and actions. The information system for non-notifiable diseases (SIDONNI) used as a pilot region the municipality of Nova Iguaçú/ RJ since 2015 and currently implemented in São João de Meriti, aiming to be useful for other places. Seven diseases considered important because of the risk of considerable morbidity were investigated in the municipality of Nova Iguaçú as scabiosis, strongyloidiasis, giardiasis, myiasis, pythiosis, teniasis, and trichomoniasis, all considered neglected diseases. SIDONNI is an informative tool, acting in the municipality to control these diseases for remediation and prevention, being able to identify through geoprocessing the priority areas for environmental sanitation actions. The total value of 610 positive cases of diseases classified as neglected indicates the need for urgent actions to address the sanitary environmental issue of the municipality studied.

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INTRODUCTION

The twentieth century was marked by intense advances in scientific and technological knowledge and by profound social, economic and demographic changes. As the twenty-first-century approaches, it can be pointed out that some factors have increased the complexity of urban problems in many parts of the world, such as the conflicts in the Middle East, significantly increasing the migratory demand (Waldman, 2015). Migration interferes both in public policy and in public health issues, so in this context, the demand for a reorganization of health systems is increasing, with a special alert for infectious and neglected diseases. The disorderly increase of the population and the overload of the health systems become critical factors to be delineated by the policy makers towards the population.

These problems intensify when the focus is on neglected diseases in developing countries where neither the technological advances related to health nor the pharmaceutical industry nor science can fill the gaps in knowledge about such diseases and help the affected population. This situation leads us to remember the right to health guaranteed by the Brazilian Constitution. It is important to mention that health is considered as a general public good: it is not excluding, that is, that no one or any community is excluded from its possession or consumption, and that its benefits are available to all (Fortes and Ribeiro, 2014). The authors are still pursuing the definition of global health problems and include neglected infectious diseases. Global Health problems in the 21st century are marked by accumulated health problems, new problems, and problems stemming from paradigm shifts (Fortes and Ribeiro, 2014). Although globalization reaches, directly or indirectly, any space and person on the planet, this does not mean that its

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reflections and consequences reach everyone in the same way (Fortes and Ribeiro, 2014, Andrade and Rocha, 2016). The term One Health denotes a broad approach and encompasses the population itself, but in reality, this does not proceed. Therefore, the term neglected diseases (DN) is extensively investigated in articles and it is not known when this term will be extinct, as was smallpox. This is because it is intrinsically linked to the dark side of corruption and associated with social determinants of risk in developing countries. Global health must be based on the notion of supraterritoriality and establish connections from the local level to the global level "[...] (Fortes and Ribeiro, 2014) which may lead to a decrease of exorbitant social contrasts. However, the different commercial interests, security, foreign policy, values and motivations of the various social actors, both public and private, involved in the field of study and practice of Global Health must be recognized (Fortes and Ribeiro 2014). The incidence of DN is indicative of the perpetuation of extreme levels of inequality because they are associated with poverty conditions and are obstacles to the development of the country. Although funding for research in this context does exist, there is no policy of continuity for the sequencing of research on new drugs, diagnostic methods, and vaccines (Andrade and Rocha, 2016; Yamey *et al.*, 2018). In the eyes of the world, DNs continue to imprint their mark and make more and more victims through disfigurement, stigma, disability and premature death (Andrade and Rocha, 2016; Morin, 1996). One Health problems occurring in the Baixada Fluminense / RJ, are diverse and several diseases have their prevalence directed to the involvement of a high percentage of individuals in different age groups. This work does not pretend to extinguish the DN but to take the initial step that consists in the motivation and implementation of a management tool for epidemiological and territorial knowledge of these diseases. This research began in the municipality of Nova Iguaçu as a pilot project for the solidification of a computer system that notifies the DNs reported in the health units (Cólili *et al.*, 2016). Among the many factors that characterize Brazil as a developing country are the evidence of infectious and parasitic diseases, the majority of which are caused by lack of hygiene and basic sanitation. Therefore the country's development potential is diminished due to the need still to work with this type of prevention and cure of these diseases. Unfortunately, these diseases are characterized as neglected, causing this situation to continue latent and chronic in Brazil. Thus, the database provided by SIDONNI generates information that will enable the planning and improvement of the action process of health professionals involved in the care of patients and users of the health system. For this purpose, SIDONNI allows the availability of epidemiological data that will contribute to the promotion of health. These diseases need to be reported to show the reality through statistics and geoprocessing identifying the most affected neighborhoods and listing priorities. After all, everyone must have equal rights regardless of their illness, and each region must have due attention even with a single case of the disease. It is very important to conduct a spatial study on disregarded diseases because they are not being recorded. Since the end of the 1980s, Geographic Information Systems (GIS) has played an important role in the context of health (Carvalho and Souza-Santos, 2005). Epidemiology and geography sciences are important tools for One Health and needs to be further explored (Bousquat and Cohn, 2004). The spatialization of diseases linked to epidemiology situates the data in space and time helping in the interpretation of the causes and

consequences in the control of the diseases (Reis and Santos, 2018). The grouping of the parameters to be studied and the analysis of the data concerning the reproduction of the real world classifies the Geographic Information Systems as powerful instruments in socio-environmental studies (Reis and Santos, 2018; Santana *et al.*, 2014; Oliveira, 2016). As a result of a partnership between the Municipal Health Secretariat of Nova Iguaçu and Iguaçu University, the Information System for Non-Reportable Diseases (SIDONNI) is in use representing an initial step in the notification of neglected diseases using the municipality of Nova Iguaçu as a project pilot and pioneer on this issue.

MATERIALS AND METHODS

The present study is exploratory, descriptive and prospective. The project was implemented at the primary health care, taking into account the territorial basis, present as the basis of the family health strategy of the SUS (Sistema Único de Saúde). The SIDONNI system makes it possible to provide an online system which promotes the insertion, search and interpretation of reports able to be exported for analysis in PDF, XML, etc. The collected data is entered in real-time and runs on MySQLi, hosted on a 24-hour server. Therefore, it was initially implemented as a model in all regional health units belonging to the municipality of Nova Iguaçu / RJ (Cólili *et al.*, 2016). A protocol was created for the records of the diseases selected for the beginning of this study. There was a consensus and mobilization of the professionals involved since the presentation of the project by the researchers as well as the health professionals who would fill out the sheets for the notification of neglected diseases. This study was submitted and approved by the Research Ethics Committee of the General Hospital of Nova Iguaçu, by the registered number 106603. The SIDONNI, projected from the PHP language (*Hypertext preprocessor*) is management tool (http://www.lcis.com.tw/paper_store/paper_store/php-manual-daimi-aarhus-universitet-41418-201471332053258.pdf) (Figure 1).

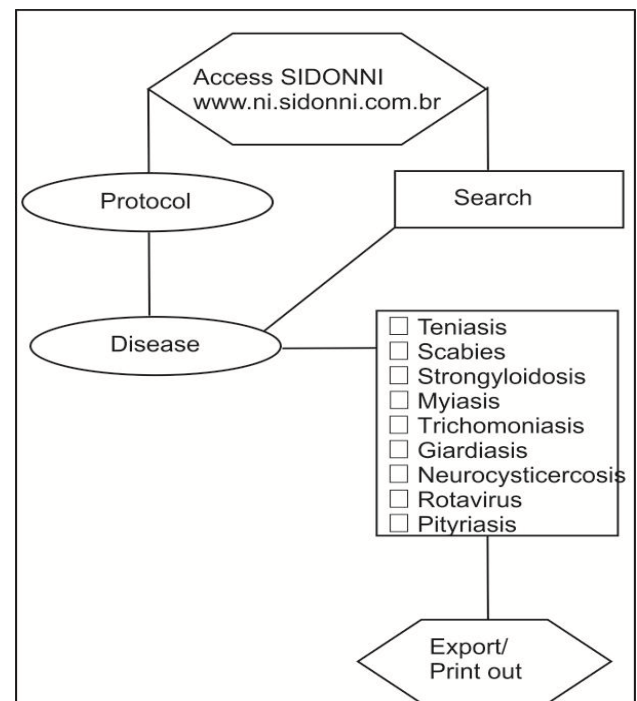


Figure 1. Flowchart of the main stages of use of SIDONNI

Table 1. Neglected Diseases in Nova Iguaçú from 2015 to 2017

Health unit	Trichomoniasis	Giardiasis	Scabies	Pythiasis	Strongyloidiasis	Myiasis	Teniasis
Centro de Saúde Vasco Barcelos	6	1	1	0	0	0	0
Clínica da Família 24h - Miguel Couto	0	0	20	0	0	0	0
Clínica da Família Cerâmica	14	15	12	0	0	0	0
Clínica da Família Corumbá	0	0	0	0	0	0	0
Clínica da Família de Austin	1	2	90	0	0	0	0
Clínica da Família Figueira	0	6	0	0	0	0	0
Clínica da Família Jardim Roma	2	0	10	0	0	0	0
Clínica da Família Jose Antonio da Silva Rego	0	0	0	0	0	0	0
Clínica da Família Vila Operaria	3	0	0	0	0	0	0
ESF Rio Douro	0	1	2	0	0	0	0
Estratégia de Saúde da Família - Lino Vilela	3	0	2	0	0	0	0
Hospital da Posse	0	2	17	0	0	0	0
Mini Posto de Saúde Lirio do Vale	0	0	0	0	0	0	0
Policlínica Dirceu de Aquino Ramos	3	3	11	0	0	0	0
Policlínica Dom Walmor	0	2	11	2	0	0	0
Policlínica Manuel Batista de Almeida	0	0	1	0	0	0	0
Posto de Saúde da Família - Dom Bosco	0	0	3	0	0	0	0
Posto de Saúde da Família - Três Henriques	5	0	1	0	0	0	0
Posto de Saúde da Família Marfel	0	2	4	0	0	0	0
Posto de Saúde Engenho Pequeno	0	0	3	0	0	0	0
PSF Jaceruba	0	0	0	0	0	0	0
PSF Rodilandia	3	0	4	0	0	0	0
UBS Manoel Resende	2	2	20	0	0	0	3
UBS Professor Rutilhos dos Santos	1	0	0	0	0	0	0
Unidade Básica de Saúde Caiçara	1	13	1	0	0	0	0
Unidade Básica de Saúde Cerâmica	5	16	6	0	0	0	0
Unidade Básica de Saúde Cobrex	0	38	55	0	0	0	0
Unidade Básica de Saúde Jardim Jasmim	0	1	5	0	0	0	0
Unidade Básica de Saúde Jardim Santa Eugênia	0	2	2	0	0	0	0
Unidade Básica de Saúde Julia Tavora	2	1	1	0	0	0	0
Unidade Básica de Saúde Nova America	5	0	0	0	0	0	0
Unidade Básica de Saúde Nova Brasília	0	0	0	0	0	0	0
Unidade Básica de Saúde Prata	7	0	11	1	1	0	0
Unidade Básica de Saúde Rancho Fundo	0	10	3	0	0	0	0
Unidade de Saúde da Família Vila Tânia	0	1	21	0	0	0	0
UPA - Bairro Botafogo	0	0	42	0	0	1	0
UPA Comendador Soares	0	0	62	0	0	0	0
Total	63	118	421	3	1	1	3

CS (Centro de Saúde); CF (Clínica da Família); ESF (Estratégia de Saúde da Família); H(Hospital); MPS (Mini Posto de Saúde); P (Policlínica); PSF (Posto de Saúde da Família); UBS (Unidade Básica de Saúde); USF (Unidade de Saúde da Família); UPA (Unidade de Pronto Atendimento)

Geoprocessing Analysis

Data of neglected diseases were inserted in the Arcgis program, covering the period from 2015 to 2017 totaling 610 attended by the health unit (Table I), then the database associated with geographic coordinates primarily in an excel spreadsheet was converted to a shapefile file and inserted into Arc-GIS. initially, the adequacy and standardization of the cartographic projection system, scale and metadata were made of all cartographic bases that were used. The cartographic bases designed for the 1: 5,000 scale of work for the WGS 1984 UTM system, which, in addition to being adequate to the objectives and scale of work, is compatible with the SIRGAS 2000 system. In the geospatial density analysis of the health indicators, geoprocessing techniques were used in a geographic information system (GIS) environment using ArcGIS® software, version 9.3. Associated with each map is the graph with the quantitative based on the same information (table 1-Supplementary material) to which the moving average trend line was inserted in order to identify oscillations and trends of increase or decrease of the data series.

RESULTS

From the data obtained through SIDONNI, it was possible to identify critical sites with positive cases of parasitic diseases besides being a complaint to the precarious and unhealthy situations in territories worked with absence of basic sanitation

in the community. Associated with each map shows the graph with the information quantitatively explore the data. From the peaks of the graphs and the moving average, it identifies health units that present more cases of the diseases, but it is not quickly recognized in the graph if these units are distant or close to each other and therefore the maps add and complement the comprehension scabies (Figure 2) Of a total of 610 diseases inserted in SIDONNI, 421 cases of scabies denote a very high degree of concern since it is a contagious disease. The most critical places identified are Família da Figueira clinic (90 cases), UPA (Emergency care unit) Comendador Soares (62 cases), Basic health Unit Cobrex (55 casos) and UPA - Bairro Botafogo (42 cases). On the total amount of 37 health units, only 9 had no cases of scabies (Figura 2A). Caused by the mite *Sarcoptes scabiei* var. *hominis*, scabies is a cosmopolitan disease (Kovacs and Brito, 2006; Santiago and Janeiro, 2017). The main symptom is pruritus with usual nocturnal accentuation. Clinically, small erythematous papules are observed in the armpits, breasts, trunk, penis, gluteal regions and interdigital spaces of the hands. It is a DN by the population and also by doctors (Heukelbach *et al.*, 2003). In developing countries, scabies is associated with high rates of bacterial skin over infection, including impetigo, and concern WHO or *World Health Organization* (Santiago and Janeiro, 2017). Aggravating factors associated with scabies are the lack of knowledge and characterization of scabies as a disease because patients who come to see a doctor do so for other reasons and not due to

scabies themselves. Besides, many consider itchy skin to be normal and caused, for example, by water, which leads to the use of home-made treatments such as soap and plants or self-medication (Kovacs and Brito, 2006). Many DN is associated with negative feelings such as "feeling of filth, shame, disgust among others ". The anamnesis in patients is fundamental and it must be mentioned that the difficulties of access to doctors lead people to self-medication. Therefore, when evaluating the maps we can outline the difficulties that occur among affected people who may be using self-medication, getting used to itching and those who have not even come to care in a health unit (Figure 2-4).

zoonosis that causes substantial morbidity in humans, especially in disadvantaged or immunocompromised socioeconomic populations (Lal and Hales, 2015). Giardiasis worsens in case of reinfection as it may be related to IgA deficiency, which will be difficult to detect, as well as being an indicator of contaminated water in the analyzed territory. There are many studies in daycare centers associating conditions of social vulnerability with examples in Costa Rica (Barquero et al., 2018), Uruguay (Cabrera et al., 2017), Brazil (Cardoso et al., 1995; Takizawa et al., 2008; Torres et al., 1991; Fonseca et al., 2017). A significant sum of children (and individuals in general) with this protozoan colonizing the small

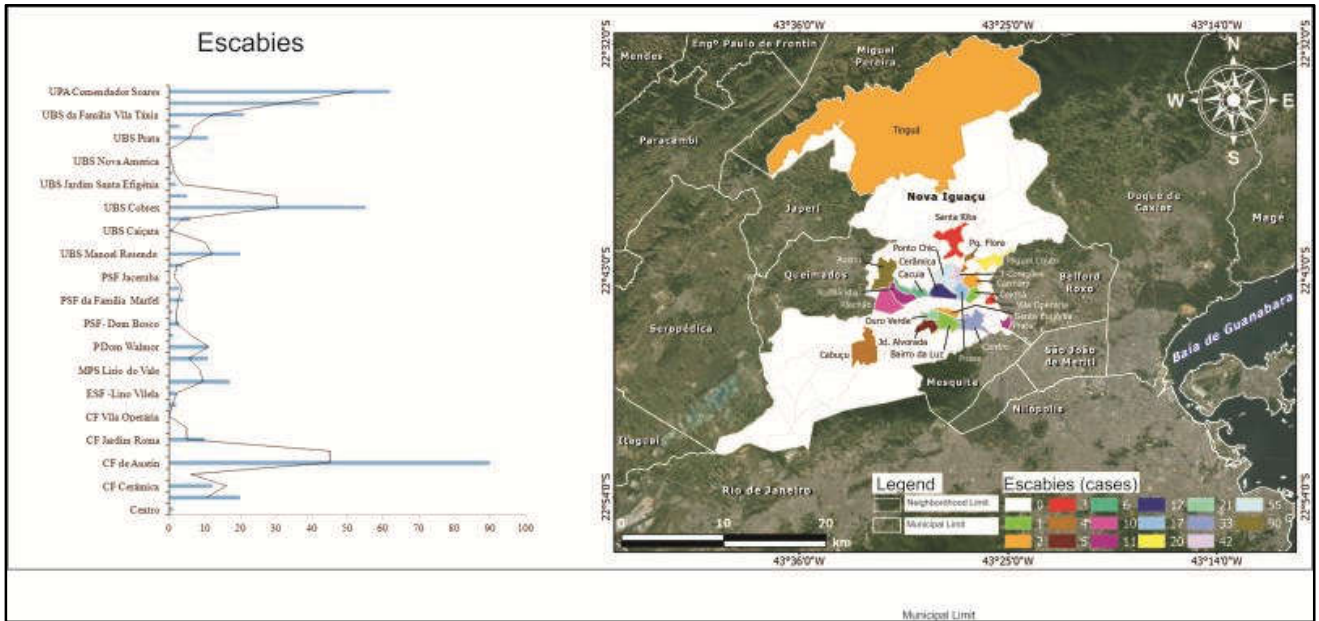


Figure 2. Graph and Geoprocessing of scabies occurrence reported in Nova Iguaçu

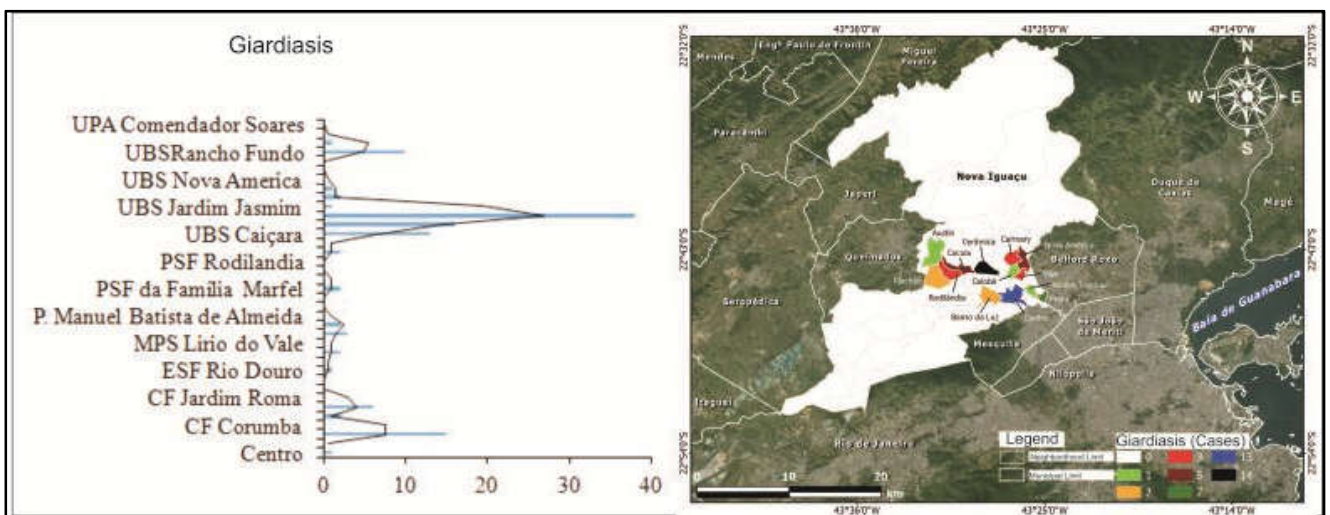


Figure 3. Graph and Geoprocessing of the occurrence of giardiasis reported in Nova Iguaçu

The second most prevalent disease is Giardiasis, caused by Giardia enteroparasite, with 118 cases with the Cobrex Basic Health Unit reporting the largest number of cases totaling 38 infected people. Following, the Basic Ceramic Health Unit (16 cases), the Ceramic Family Clinic (15 cases) and the Caiçara Basic Health Unit (13 cases). Of the 37 health facilities investigated 19 reported no cases of giardiasis. Giardiasis, a globally distributed disease, is recognized by WHO as part of the "Neglected Diseases" (Savioli et al., 2006) and is a

intestine, irritating the intestinal mucosa may lead to several episodes of explosive, fat-laden diarrhea, steatorrhea, due to intestinal malabsorption. It is of fundamental importance to evaluate the quality of water consumed by residents of the area with positive cases. Cases of trichomoniasis reached the third place with 36 cases distributed among 14 health units, the most severe being the Ceramic Family Clinic (14 cases), the Silver Basic Health Unit (7 cases) and the Center with 6 cases (Figure 4).

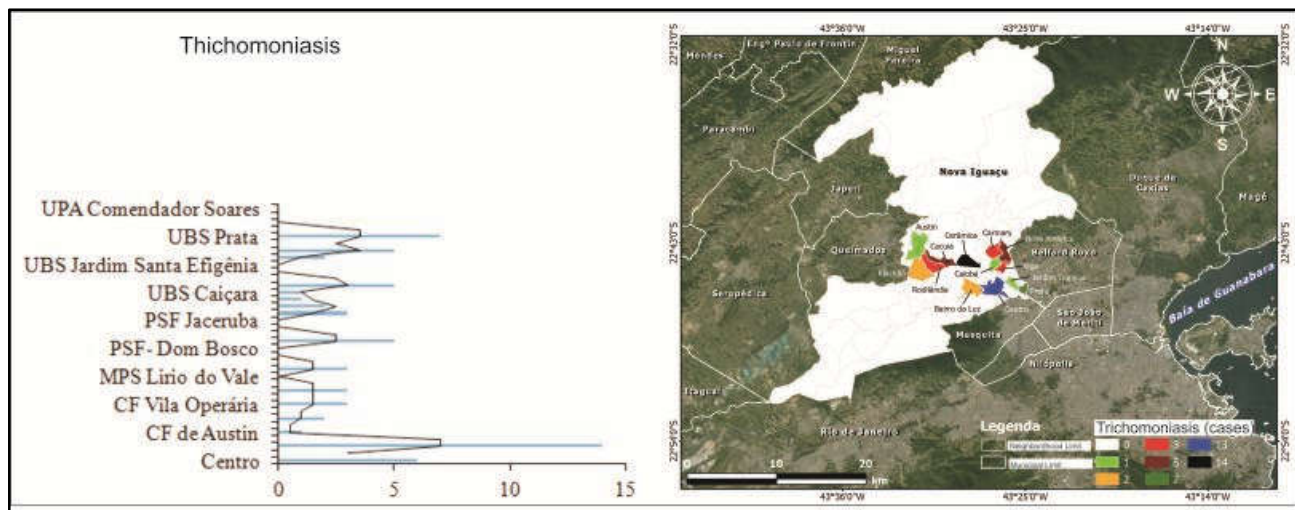


Figure 4. Gráfico e Graph and Geoprocessing of the occurrence of trichomoniasis reported in Nova Iguaçu

The flagellated protozoan *Trichomonas vaginalis*, which causes trichomoniasis, was first described in 1836 by the French physician Alfred Donné, who isolated it from a woman with vaginitis (Dan *et al.*, 2014) and how these women today have low socioeconomic status. Its occurrence may have harmful consequences for pregnancy and is related to infertility and increased risk of transmission of other sexually transmitted diseases - STDs as they facilitate the sexual transmission of the human immunodeficiency virus - HIV (Passos, 2006). Inflammation of the cervical epithelium caused by this bioagent has been recognized as one of the predisposing cofactors to cervical carcinogenesis, as disturbance of the vaginal flora is known to increase the risk of acquiring HPV-human papillomavirus infection. Therefore, trichomoniasis monitoring and control is important given the high incidence of acute infections (Alvarez *et al.*, 2009; Machado *et al.*, 2017). Trichomoniasis is the most common non-viral STD in the world, affecting more than 200 million people annually (Lima *et al.*, 2013), the majority (92%) being women (Alvarez *et al.*, 2009). WHO data cite that more than 142.6 million new cases of trichomoniasis occur every year worldwide (Newman *et al.*, 2015). Thus, trichomoniasis, together with chlamydia, gonorrhea, and syphilis infections, represents a classic, preventable, curable STD that is far from a unique health problem in the process of solution (Dan *et al.*, 2014).

Health professionals agree that trichomoniasis does not have a significant incidence rate (Passos, 2006). PNDST / AIDS has established a non-compulsory reporting STD surveillance system, certain specific diseases, and syndromes of national interest in which trichomoniasis was excluded. Thus, it is necessary to reflect on the neglect of trichomoniasis. The following is a sequence of 4 diseases with a low quantity by health facilities such as pityriasis versicolor, strongiloidosis, myiasis and teniasis. Despite the low quantity, such diseases are indicative of serious health deficiencies. Like Pityriasis versicolor, it is a very common superficial fungal infection of the genus *Malassezia*, characterized by causing hypo- or hyperpigmented spots and which can cause high morbidity in some cases (Barroso *et al.*, 2014; Oliveira *et al.*, 2002). Studies indicate that the groups most at risk for contracting pityriasis are newborns weighing less than 1.5 kg, premature infants and immunosuppressed individuals (Oliveira *et al.*, 2002). The epidemiological profile and prevalence of Pityriasis Versicolor are scarce, and there are few studies

regarding therapy, which suggests the need for further research on the disease to find viable and effective treatments for the cure and, consequently, a decrease of cases (Oliveira, 2016; Oliveira *et al.*, 2002; Velegraki *et al.*, 2015; Martins *et al.*, 2018). Therefore, it is understood that SIDONNI can contribute to updated data on notified and selected diseases according to the epidemiological profile of the municipality. Three cases of pityriasis were reported, two in Dom Walmor Polyclinic and one in UBS Prata. Then the strongyloidiasis caused by the geo helminth *Strongyloides stercoralis*, a parthenogenetic female that has two evolutionary cycles, direct and indirect, and which can lead to lethal form (Bosqui *et al.*, 2018; Farthing *et al.*, 2018) and 1 case of strongiloidiasis was reported at UBS Prata. Worldwide the burden of the disease ranges from 300 to 400 million infections; and according to the current World Gastroenterology Organization Global Guidelines document released in 2018 it is categorical to state that despite the numbers there is not yet a global public health strategy for parasite control. This statement already supports the importance of this disease being notified through a system such as SIDONNI. Equally to pityriasis the prevalence of infection and morbidity burden of strongyloidiasis is unknown. Actions need to be taken as this disease varies from asymptomatic to severe forms and can lead to hyperinfection syndrome and if associated with immunosuppressed patients leading to a high mortality rate (Bosqui *et al.*, 2018; Farthing *et al.*, 2018).

A single case of myiasis identified at UPA Bairro Botafogo. Those affected by this disease, mainly with neurological diseases, immunosuppressed, diabetes, malnutrition, elephantiasis and in general is associated with poor health conditions (Carvalho *et al.*, 2009). Patients with neurological diseases, immunosuppressed, diabetes, malnutrition, elephantiasis are the main affected by this disease and are generally associated with poor health conditions (Carvalho *et al.*, 2009). Myiasis can also occur in hospitals due to hospital incidents when *Cochliomyia macellaria* attracted by the characteristic odors of some diseases deposit their larvae affecting patients (Carvalho *et al.*, 2009). Since all neglected myiasis disease is not reported. Larvae are hardly quantified and sent to the reference laboratories (Carvalho *et al.*, 2009). These are rare behaviors in the hospital environment and the situation is aggravated by the situation in which the procedure is accompanied by expressions of disgust and disapproval

regarding the patients' situation (Carvalho *et al.*, 2009). Through the SIDONNI was accounted for 24 months, 3 cases of teniasis from UBS Manoel Rezende, which may be caused by the *Taenia solium* and *Taenia saginata* cestodias in a single health unit. This is important information because knowing that the route of contamination is the ingestion of raw or undercooked meat, it is questioned the habit of individuals in a certain territory to buy meat from clandestine slaughter without knowing. This disease is known as an anthroponosis, as the sick man can eliminate mature proglottids with a very high parasitic load of eggs through the feces and these can infect pigs and cattle in inappropriate breeding, and the man can behave as an accidental host. and develop more severe disease, neurocysticercosis through internal and / or external autoinfection and heteroinfection through the consumption of *Taenia solium* eggs in unhygienic ingested fruits and vegetables (Rossi *et al.*, 2014). An autochthonous case of teniasis may indicate that in the studied territory there may be a clandestine slaughter, inadequate rearing of cattle, swine, in unhealthy areas. In these cases an intervention with sanitary and epidemiological surveillance will be fundamental, thus forming an intersectoral integration between Health Surveillance and other sectors of other departments such as works, environment, and education with real and responsible interventions.

DISCUSSION

These diseases are associated with poverty and are public health issues that need to improve access to health. Therefore, it is necessary to notify diseases in SIDONNI, because from these data means can be developed for prevention and intervention through directing control with planning by the epidemiology sector and health education. In the same way, the spatialization of these results is fundamental to the immediate visualization of the most affected places and to list the priorities. The perception of this disease may indicate areas with poor storage of waste. Neglected diseases persist due to different causes or "failures" that we classify into three types: failure of science (insufficient knowledge); market failure (medicines or vaccines exist, but at a prohibitive cost); public health failure (cheap or even free medicines that are not used due to insufficient planning) (Morel, 2006). The challenges in tackling these diseases in Brazil are immense as in any developing country. We need to increase the interrelationship between the University, the government, the productive sector, and health (Morel *et al.*, 2006). The management tool SIDONNI is online and provides data on the diseases proposed by the program since its implementation in Nova Iguaçu until the present moment in full operation in São João de Meriti. The system is easy to understand, especially regarding the completion of the form by health professionals, showing a large adherence to the project. A total of 3397 records applied at the Health Units of the municipality of Nova Iguaçu from August 2014 to December 2015. In São João de Meriti, SIDONNI was implemented in August 2017 and until November 2018. Health Units already account for 2305 positive cases of neglected diseases such as Trichomoniasis, Giardiasis, Scabies. The site is online, with easy access for project participants and also with all data related to the researched diseases. The obtained results provide epidemiological information for scientific research and public health actions, essential for the health and dignity of the population.

Conclusions

Reporting of neglected diseases needs to be detected in different territories with different socioeconomic and cultural profiles throughout the Rio de Janeiro state using SIDONNI as a tool to contribute to the direction of consistent and responsible public policies. The work is permanent and aiming to add more municipalities and to know the reality of these diseases that contribute to the dispute of beds in hospitals, when in the most serious forms, which could be early diagnosed, treated and monitored in their own territory Using geographic processing serves as a warning guide for the most affected regions. It would be ideal to map the entire Baixada Fluminense. As advocated by Bioethics and Human Rights, it is necessary to promote actions that may decrease the incidence of NP every year year after year after all because it is not only about biological problems but also compromise psychological and work disability many times.

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