

SPATIAL REORGANIZATION OF HEALTH MICRO-AREAS WITH THE USE OF GEOPROCESSING

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ABSTRACT: The Family Health Strategy, created in Brazil in 1994 with the perspective of reorienting the model of health assistance, composes the Primary Health Care level. In this service action there is the need to construct a health situation map, in order to know the territory and to execute the proposed actions. This research discussed and evaluated the use of geoprocessing tools on the identification of micro-areas and their applicability as an instrument of strategic management of the services offered by the Family's Health Strategy. The study is descriptive, temporal and the selection of localities followed, for convenience, the criteria of historic relevance and social vulnerability. The studied area was the first unit of the Family Health Strategy, located in São Luís – MA. Identification of micro-areas was made using the softwares *Google Earth* version 7.1.2.2014, *QGIS 2.4*, *Chigiak, my maps (google)* and *Google Street*. As result, for the 10 micro-areas, the location of the studied area was generated. The study demonstrated that the artisanal method previously used was inefficient and static, considering that micro-areas were crisscrossing when they were not supposed to. New ways of representing the nine micro-areas adscript to the Family's Health Unit were generated. The use of this technology allows a practical and dynamic access, as well as the identification of the territory, a fundamental item at the implementation of this model of health care.

Key words: Family's Health Strategy, Geoprocessing, São Luís-MA.

REORGANIZAÇÃO ESPACIAL DAS MICROÁREAS DE SAÚDE COM O USO DO GEOPROCESSAMENTO

RESUMO: A Estratégia Saúde da Família foi criada no Brasil em 1994 na perspectiva de reorientar o modelo assistencial de saúde, compõe o nível de Atenção Primária à Saúde. Nesta ação do serviço há a necessidade da construção do mapa da situação de saúde, para conhecer o território e executar as ações propostas. A pesquisa discutiu e avaliou o uso das ferramentas do geoprocessamento na identificação de microáreas e sua aplicabilidade como instrumento de gestão estratégica dos serviços oferecidos pela Estratégia Saúde da Família. O estudo é descritivo, temporal e por conveniência, A seleção do local seguiu o critério por conveniência, relevância histórica, e de vulnerabilidade social. A área adscrita foi a primeira equipe, da Estratégia Saúde da Família, instalada em São Luís-MA. A identificação das microáreas foi realizada por meio dos *softwares Google Earth* versão 7.1.2.2014, *QGIS 2.4*, *Chigiak my maps (google)* e *Google Street*. Como resultado foi gerado a localização da área adscrita das 10 microáreas. O estudo demonstrou que o método artesanal anteriormente utilizado era ineficiente e estático, considerando que as microáreas se entrecruzavam, quando não deveriam. Foram geradas novas formas de representação das nove microáreas adscrita pela da Estratégia Saúde da Família. O uso da tecnologia possibilita o acesso prático, dinâmico e a identificação do território, item fundamental na implantação deste modelo de atenção à saúde.

Palavras-chaves: Estratégia Saúde da Família, Geoprocessamento, São Luís-MA.

1. INTRODUCTION

The Family Health Strategy (ESF, from the portuguese *Estratégia Saúde da Família*) was created in Brazil in 1994, with the perspective of reorienting the model for health assistance, and composes the Primary Health Care level. This model of care was initially applied to small municipalities, then to medium and large ones, especially to serve “underprivileged”, “of sanitary risks”, and “slum or poor” area, the so-called vulnerable groups from municipalities (BRASIL, 2002, p.18).

In São Luís, capital of Maranhão, the first ESF units were also established at the most underprivileged areas. According to Nicolau (2008, p.37), the initial care took place in the most suburban areas of the city. “The first Family Health Unit was installed in this municipality in September of 1994, at the Mixed Unit of Coroadinho. The chosen neighbourhood was Vila São Sebastião, as indicated by Health Community Agents and approved by the local Health Council”.

Among its basic attributions, the ESF should define the adscript population, specifying the area and micro-area coverage. In this service action, it is necessary to construct a health situation map in order to

better understand the territory and execute the proposed actions in a dynamic way.

The National Policy on Basic Care (PNAB) defines adscript population as the one present on the territory of the Basic Health Unit (UBS), in a way to stimulate the development of bonding and responsible relationships between healthcare units and the population, granting through that the continuity and constancy of the service, with the objective of serving as a reference (BRASIL, 2017). The Basic Care is to be performed with sanitary responsibility of a multi-professional unit and offered to the population in a well-defined territory.

The map of the territory or of the micro-areas adscript by the ESF’s team is a planning tool that allows the healthcare professionals to know the territory used by the residents, to understand its epidemiologic dynamics and demography. The objective of the map production is to represent graphically the areas in which the team will act and discuss existing vulnerabilities.

In São Luís – MA, artisanal mapping of micro-areas is still used. The process is executed by team members who, in general, do not have any basic knowledge to construct such resource. The maps resulting from these handmade drawings have no precision regarding geographic locations and their data

are stagnated, with no possibility of change unless all the artisanal work is done again, which requires time, as well as human and financial resources.

It should also be noted that artisanal maps need constant updating, considering the population dynamics that alters the configuration of micro-areas. Considering that fact, and the necessity to know the territory, this study is based on the assumption that using the Geographic Information System – GIS one can map a certain area in a more dynamic and precise way, with relatively low costs.

Therefore, the present work discusses and evaluate the use of geoprocessing tools on the identification of micro-areas and its applicability as a strategic management tool for the services offered by ESF.

2. MATERIAL AND METHODS

This is a descriptive and temporal study, which demonstrates the applicability of geoprocessing tools on map construction of adscript territories.

The location choice followed, for convenience, historical relevance and social vulnerability criteria. The adscript area was the first unit of the Family Health Strategy installed in São Luís – MA, which operates at

Vila dos Frades, in the Coroadinho neighbourhood (Figure 1). This neighbourhood is São Luís' largest subnormal agglomeration and holds the fourth and first position on occupied private households, nationally and in São Luís respectively. (IBGE, 2010).

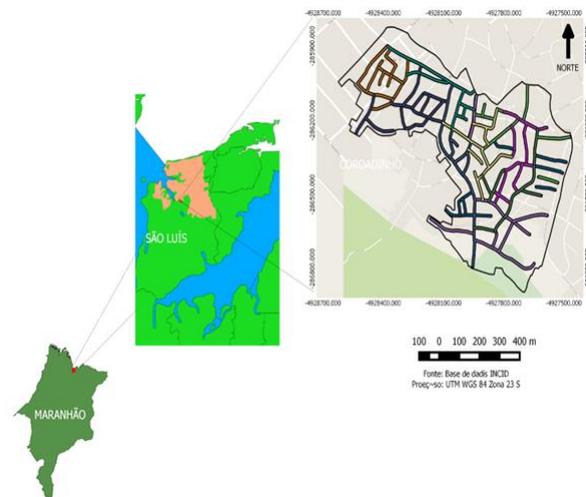


Figure 1 – Location of the first area of coverage of the ESF2017, São Luís - MA.

Vila dos Frades emerged on the 1970s, through irregular occupation of the east portion of the Bacanga Environmental Reserve. Nowadays, its occupation is starting to be regularized by the municipal government, with the delivery of land tenure titles. However, street traces are considerably irregular, with no paving, no basic sanitation and water supply, and people still make use of artisanal wells (Curvelo-Matos, 2014; Costa, 2010).

Four steps were described and compared for the identification of micro-areas' maps. The first two were acquired through the photography collection of ESF. The third map was constructed through georeferencing tools of public domain.

In this step, mapping was performed at the Center for Teaching and Environmental Research (NEPA) from the Universidade Federal do Maranhão, in collaboration with the researchers and 10 Health Community Agents (ACS). Each ACS was responsible for identifying, through computer, the streets that limited their micro-areas, while the researchers marked all necessary coordinates. The identification was performed using the softwares *Google Earth* version 7.1.2.2014, *QGIS 2.4*, *Chigiak* and, as a product, the first map of micro-areas from the ESF unit was generated, digitalized, with a layer of satellite imagery of the Vila dos Frades community, at Coroadinho neighbourhood. With the first digitalized map, it was possible to have a broad vision on the 10 micro-areas, which showed limitations on their spatial representations, specifically because their

vectorial bases were constituted of crossing lines. This fact did not allow for precise identification of the adscript areas.

The fourth step was performed at the Basic Health Unit, at Coroadinho, with the use of the softwares *My Maps* (Google), *Google Earth 2014* and *Google Street*. This step consisted in reorganizing the micro-areas identified on the previous map, proposing new delimitations through other vectorial bases, with adscript areas as polygons. The final spatial representation was performed with complete autonomy of the ESF team, which resulted in the redefinition of the area with 9 micro-areas.

3. RESULTS AND DISCUSSION

Figure 2 represents the artisanal method, produced by the ACS for the identification of micro-areas, true handmade drawings in cardboards. Figure 3 shows the first attempts to increment mapping, as a printed version. Streets' delimitation was based on activities developed by the ACS, with no technical cartographic supervision.



Figure 2 – Health map Drawn by the ESF team.



Figure 3 – Printed health map.

It was clear that the ESF team did not have the necessary geographic knowledge in their training bases to enable adequate map constructions.

Nowadays, geotechnology is capable of significantly improving data and image dinamization, enabling a faster interface between planning and actions. Using GIS in this process can be efficient and dynamic for territory analysis. The use of geoprocessing by basic care teams has been increasing in Brazil,

although still incipient in some capitals, such as São Luís (Muller, Cubas and Bastos, 2010; Prefeitura Municipal De São Paulo, 2012; Prefeitura Duque De Caxias, 2012).

Figure 4 shows a satellite image layer of Vila dos Frades community in the Coroadinho neighbourhood, overlapped by the individualized identification and delimitation layer of the 10 micro-areas. Based on this spatial representation, it was possible to understand how the crossing of micro-areas

made it difficult for the ACS to act, for the comparative analysis of data generated by the health condition monitoring reports and, consequently, to the territorial management.

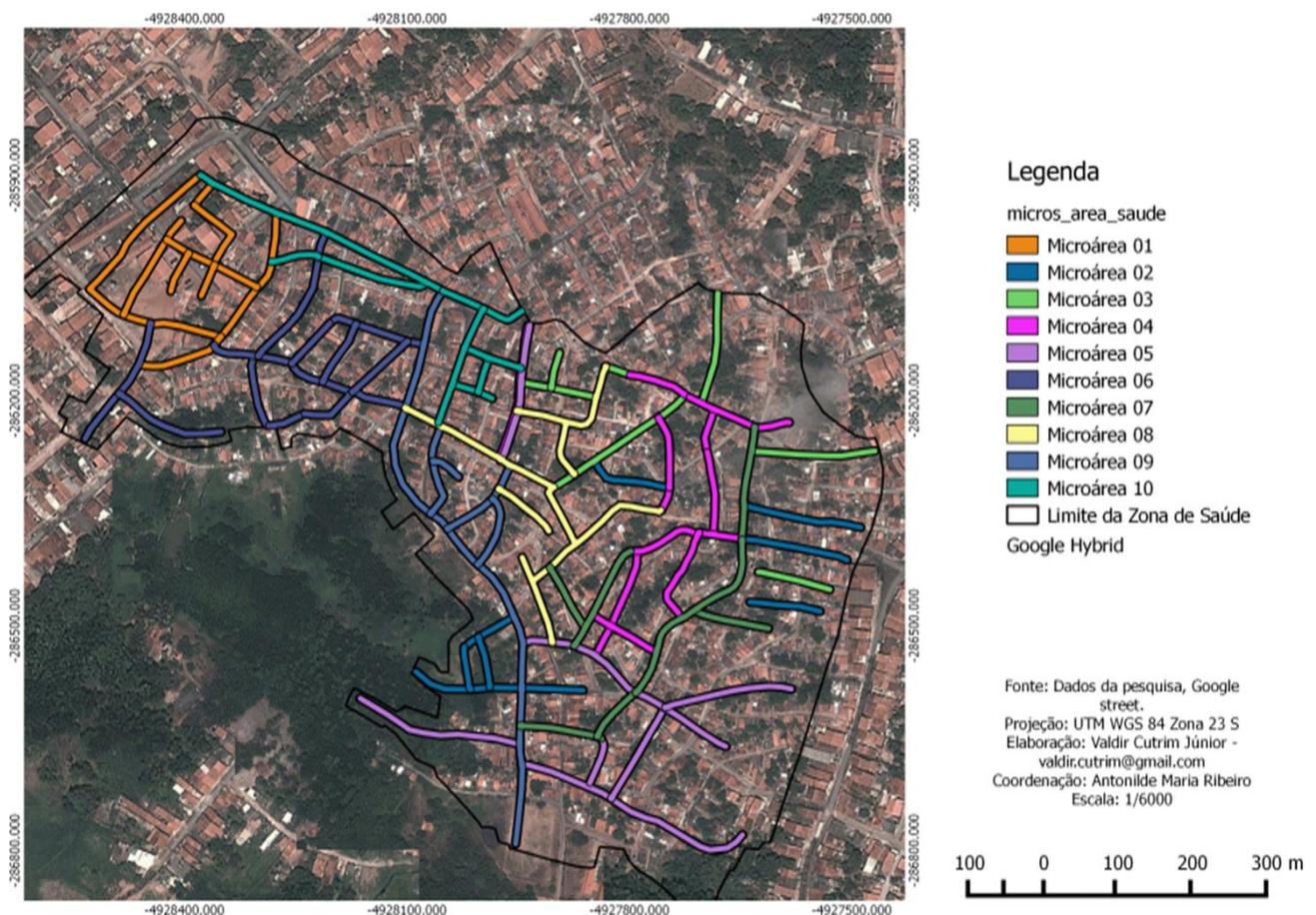


Figure 4 – Spatialization of the 10 micro-areas of the ESF.

Additionally, it was identified that the unit's adscript area needed to be adjusted according to the current legislation. The current National Policy on Basic Care (PNAB) determines that the adscript population should not be larger than 3.000 people per area of ESF operation. In this understanding, georeferencing techniques were used to

adjust the adscript area to the current legislation.

During the last phase, *My maps (Google)* tools were used along with *Google Street*. Through *Google Street*, each micro-area's limits were identified by polygons. Inside each micro-area, the limit of 750 people per ACS and the maximum of 3.000 people by unit

were considered. It was also possible to make available for the adscript population, the electronic address through which the population on its own could locate itself and

indicate points to be analysed. This could be done from different smartphone and social networks platforms (Figure 5).

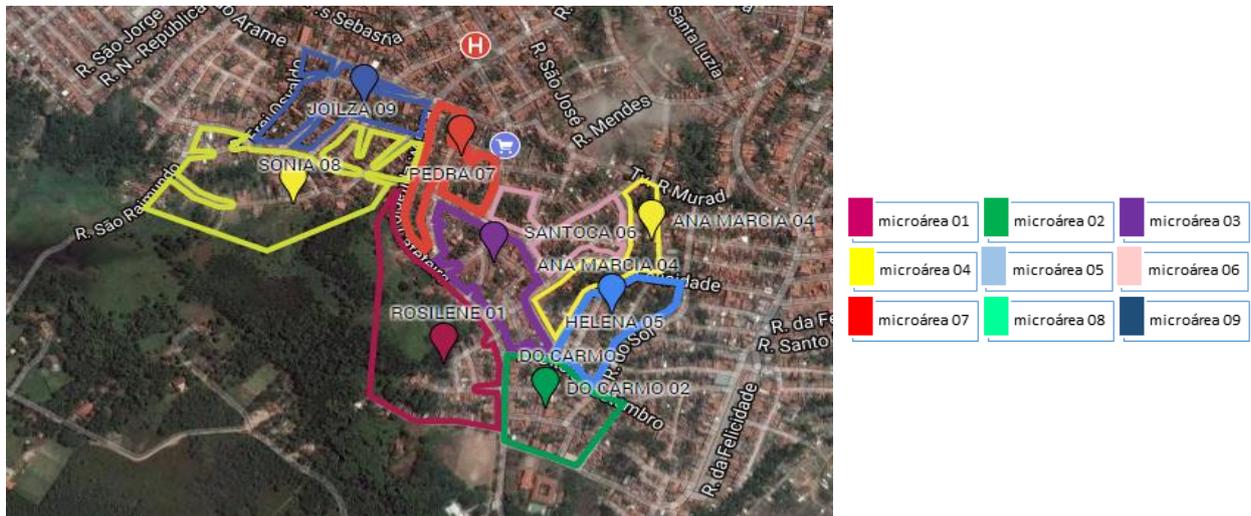


Figure 5 – Differentiation proposal by micro-area of the ESF.

This work was pioneer for the ESF and for the population of São Luís, being able to subsidize other ESF units, and confirming the efficiency of the proposed method as a tool to support management.

By georeferencing each micro-area, it is possible to correlate the conditions of a location to its population's health, thus helping to understand the specificities of the health-disease process.

4. CONCLUSION

The use of GIS tools as a way to define health territories showed the importance of the place on the action, management and

planning at the Family Health Unit. It also demonstrated the need for new perspectives and the support of new professionals to permeate and create subsidies that enhance the knowledge about the territory.

The mapping of micro-areas and the profile of the adscript population can be correlated in different ways and needs. The artisanal method previously used was inefficient and static, considering that micro-areas crisscrossed when they were not supposed to. Based on the use of GIS, it was possible to observe the various functions that can be given to the territory. With this tool, the location of the ESF's adscript area and its micro-areas was generated.

The research demonstrates that the use of technology enables practical access of ESF to territory identification, a fundamental item on the implementation of the health care model from the National Unified Health System (SUS) with social engagement.

In this way, it was showed that it is possible to analyse a territory beyond numeric tables and graphs. It is possible to observe the place, its physical and social arrangement, and its dynamic in a more precise way, as seen by the use of georeference. Presenting a health map as a dynamic tool, available to the population and that promotes integrality to the health network, helps building a perspective that promotes the accessibility for users and for professionals looking for a resolute, precise and participative planning.

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