

## ENVIRONMENTAL HEALTH RISKS IN URBAN INFORMAL SETTLEMENTS, BOGOTÁ COLOMBIA

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### Abstract:

Precarious settlements in the periphery of cities are a consequence of forced displacement and increasing poverty. Approximately eight million people in Colombia live in marginal conditions. Bogotá is one of the cities that receive the largest amount of displaced people and in its marginal neighborhoods the conditions of the internal environment of the housing and the neighborhood setting present multiple risk factors for the quality of life and health of the inhabitants. The objective of this article is to describe the housing conditions in a marginal neighborhood of Bogotá and the health of its inhabitants. For this purpose, a social characterization was carried out and environmental risk factors were identified. The results corroborate the fact that the neighborhood was formed by people displaced by violence from different Colombian regions, especially from rural areas. They arrive without economic assets, often without support networks and with a very low education level and little work experience, which limits their possibilities of finding jobs or forms of economic support. In general, the only options they find to generate income is through informal trade such as recycling, domestic activities and street vending. The housing environment in such urban informal settlements is adverse due to low temperatures, its location on steep terrain, and the lack of urban infrastructure and public service networks. The most recurrent health problems are respiratory and gastrointestinal diseases, associated with inadequate housing and environmental conditions.

**Keywords:** Urbanization, displaced population, informal settlements, environmental health, environmental issues.

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## INTRODUCTION

In low-income countries, the magnitude of displaced people, together with the lack of resources, obligate migrants to seek refuge in wastelands located in the extreme urban periphery (Tsapenko, 2021). There they occupy a territory under bad conditions, such as fast construction of precarious housing in marginal settlements (Chenut and Ocampo, 2014). Migration flows from the countryside to large cities are mainly due to the search for economic opportunities and improved living conditions, in addition to the forced displacement caused by the armed conflict and violence (UNHCR, 2019).

In marginal neighborhoods, the internal and external housing environment is highly adverse (Garnham *et al.*, 2022). In any formal context, housing provides not only shelter, but it also offers further benefits for households such as family stability, labor and educational productivity, healthy living practices, economic development, among others (Fien *et al.*, 2008). However, in marginal conditions, the internal environment of the household and the setting of the neighborhood present multiple risk factors for the quality of life and health of the members (Hancock, T, 2002). Another important aspect worth emphasizing is the precariousness, in terms of physical safety, materials, exposure to inclement weather and air quality, all factors that have a negative impact on people's health (Bently, 2014). Such adverse housing conditions are typical of the marginal neighborhoods where the migratory flows of vulnerable communities arrive (Satterhwaite, 1993).

Housing, even if it is a slum, is the vital physical space where the family life of people takes place, and where they rest and prepare their food. (Frumkin, 2010). The problem lies in the typical conditions of housing in these marginal environments, where construction materials are inadequate, the water supply and quality are poor and therefore contamination occurs. There is inadequate food handling, lack of hygiene and lack of care in the keeping of domestic animals (Shaw, M, 2004). The use and handling of chemicals takes place without precautions, and there is inadequate handling and disposal of excreta and solid waste (Alzate *et al.*, 2011). In these conditions there are health risks, e.g., exposure to fungi, humidity, low indoor air quality, toxic agents and psychological effects, among others (Suárez *et al.*, 2008).

Housing conditions are a central determinant of people's health, so precarious housing can affect the health of millions of people (PAHO, 2011). For instance, contaminated water can lead to acute dysentery, gastroenteritis, cholera and salmonellosis, while insects can expose inhabitants to diseases such as

Chagas disease, malaria, dengue fever and yellow fever; rodents can expose them to leptospirosis, and dogs to rabies (Desvasr-Larive *et al.*, 2020). On the other hand, overcrowding and inadequate ventilation can lead to tuberculosis and respiratory infections, while improper food handling can be associated with cholera, Cysticercosis, Salmonellosis and food poisoning (Alzate *et al.*, 2012).

The presence of informal and precarious settlements in the extreme periphery of large cities is a tangible consequence of the forced displacement of eight million Colombians (UNHCR, 2019). Bogotá is the second city that welcomes the largest amount of displaced population, with approximately 550 thousand inhabitants (RUV, 2017); of which 65% live in informal settlements (TECHO, 2015). The Tocaimita Oriental neighborhood in the USME district of Bogotá is one of the most critical marginal sectors of the city, gathering nearly 600 families displaced by violence. It is located in the mountains at the southeastern end of Bogotá, at an elevation of approximately 2800 meters above sea level and difficult to access. For this reason, there is little detailed information on living conditions and their association with health status. This is a relevant issue because this information is of vital importance not only to make the situation of these population groups visible, but also to design public health intervention plans. Therefore, the aim of this article is to provide concrete evidence of the effects of social and environmental conditions on the health of the inhabitants in this area and their condition of vulnerability.

The study collected and analyzed information at a deep level and based on scientific evidence, it identified concrete factors susceptible of intervention to improve the environmental conditions, the quality of life and health of the vulnerable population in the district of Usme. Information provided by the study constituted a valuable contribution for informed decision making by public entities. Therefore, the resulting data become a very important input to document evidence of the low quality of life and adverse situation suffered by the inhabitants of the Tocaimita neighborhood. This information allows them to show their problems clearly, and thus it will motivate the mobilization of resources, not only from the state but also from the private sector to mitigate and solve some of the issues.

## MATERIALS AND METHODS

The study was carried out under an applied research design of diagnosis-based practices with a participatory approach. For the development of the project, primary and secondary sources were used. It was carried out in the Tocaimita Oriental neighborhood of Usme in Bogotá. The target population of the project was a

population group whose members have been victims of forced displacement due to the armed conflict. Seventy-six (76) families voluntarily decided to participate in the research (Fig. 1).

The study was conducted in two phases: The first had the purpose of conducting an exploratory approach by means of tours in the area, establishing contacts with community leaders and conducting the initial diagnostic workshops based on the *wheel technique* (Chevalier, 2004). Subsequently, in the second phase, the survey was conducted with the community, and the information

was then systematized in a database and finally analyzed to generate the results.

The workshops conducted were aimed at the community and were intended to gather information for the diagnosis; they were also the basis for the design of the second phase of the study, which was carried out through a survey and on-site observation processes of the physical and environmental conditions of the houses. The workshop called *Housing Wheel* was carried out through exercises conducted in groups. The main topics covered were health risk factors related to housing. The workshop entitled *Wheel of Health*, also developed through group exercises, focused on the most common health conditions and/or diseases among the inhabitants of the sector.

The survey was composed of different modules that included social, environmental and health aspects, physical conditions and the quality of life of the households, perception of health status, environment and coexistence. This information was complemented with visits to the houses, where information related to location, type of structure, construction materials and risks was also collected.

The study's frame of reference expresses conditions of multidimensionality of concepts and phenomena that involve different dimensions, levels of analysis and categories which impact and determine health outcomes in the populations, as shown in Fig. 2.



Fig. 1 Meeting - workshop with the community.

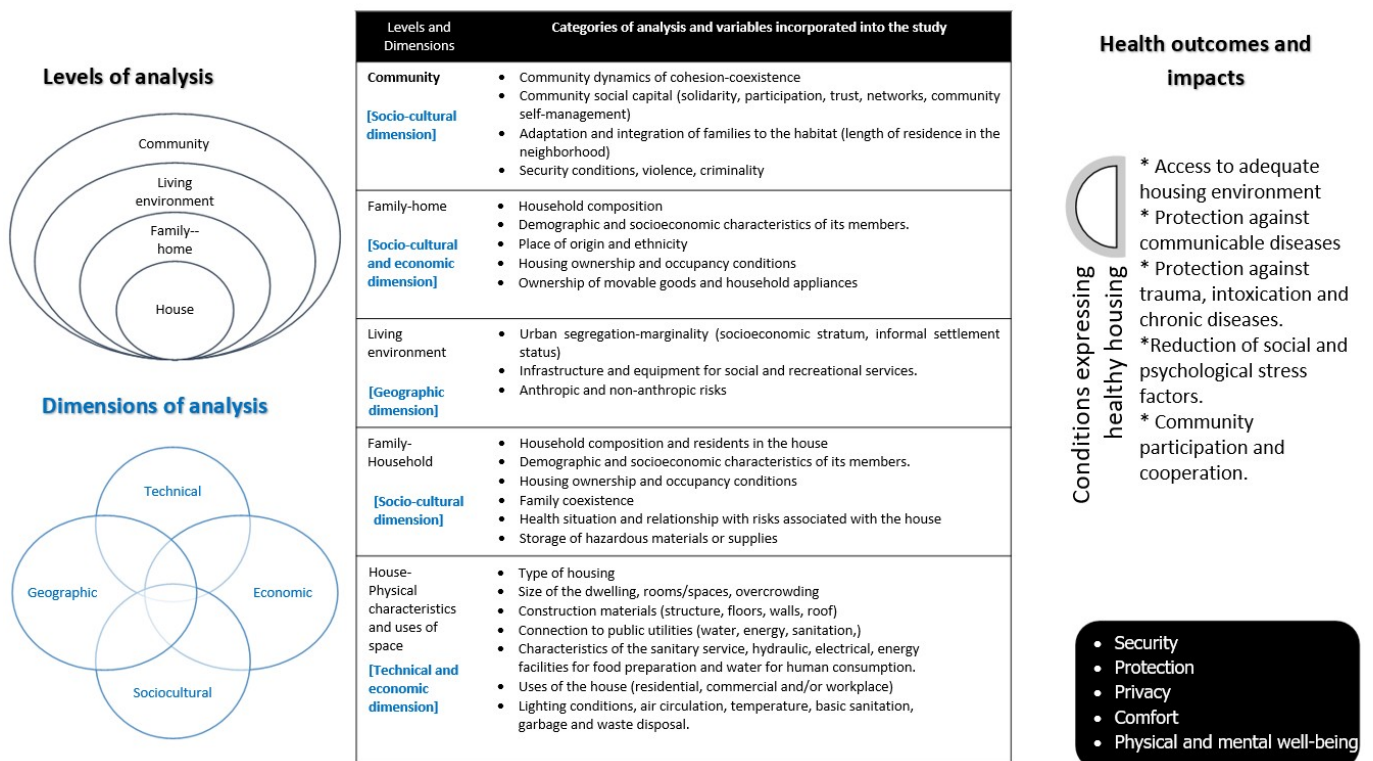


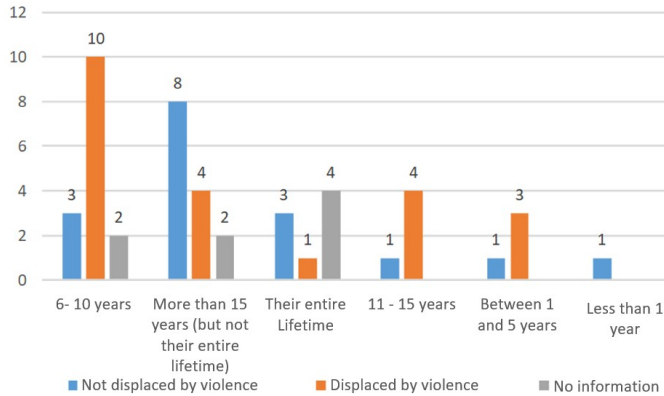
Fig. 2 Main categories and variables of the study.

## RESULTS AND DISCUSSION

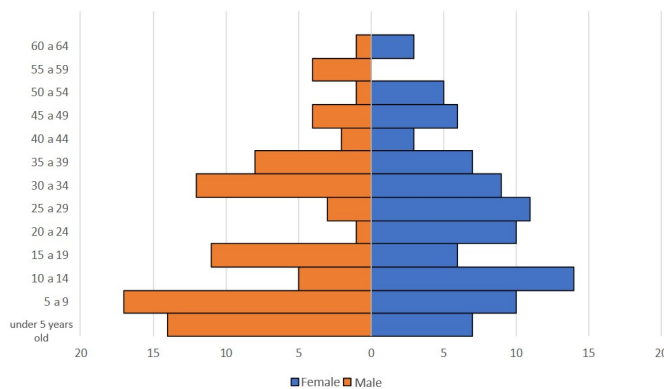
### Description of displaced population

The Tocaimita neighborhood in the locality of Usme has historically been shaped by the arrival of people from other regions of the country, who have typically been displaced by violence. The relationship between the time people have been living in Bogotá and the fact that they were displaced as a result of the armed conflict, is shown in **Fig. 3**. Displaced persons, who have resided in Bogotá for between 6 and 10 years are more numerous (45%), followed by those who have lived there for more than 15 years (18%), subsequently, there are those who have lived there between 11 and 15 years (18%), then those who have lived there between 1 and 5 years (14%), and finally those who have lived there all their lives (5%).

The population pyramid shows the largest male population can be found in the 5 to 9 years old age range, while females predominate in the 15 to 19 years old age range (**Fig. 4**). In the case of women, the distribution by age range tends to be more homogeneous than in the case of men, where greater contrasts are observed. It is worth noting that the population between 5 and 19 years old, in both sexes, has an important representation, which should be taken into account



**Fig. 3** Time of residence in Bogotá after displacement.



**Fig. 4** Population pyramid of the people in the surveyed households.

when planning neighborhood improvements and housing spaces. This is in accordance with one of the determinants of the quality of the housing environment proposed by Frumkim (2010): "spaces for the care and entertainment of children". It is worrying that the population of minors is so high, given that the socio-cultural conditions there are not the most appropriate for the healthy development of these children.

Regarding occupation, informal trades such as recycling (10%), domestic trade (7%) and street sales (4%) stand out, and other people mentioned a diversity of "casual work" activities. Some included in the official figures as self-employed "micro-businesses", which are usually carried out in the home (e.g.: preparation and sale of food, sewing, beauty, weaving, plants, animal breeding, among others) and based on empirical knowledge. A large part of the population did not provide information on their occupation or job (16%), most of the time this is associated with not having a job and even begging, conditions that are embarrassing so they prefer not to mention them (**Table 1**).

This finding is important, because when this information is compared with the population pyramid, it is observed that the second largest group of inhabitants can be found in the age range between 30 and 34 years old, i.e., people who are in full productive age, but the conditions of vulnerability, the low educational level, a demanding labor market and the lack of socio-cultural adaptation to the context, limits them to the performance of precarious jobs. Many of these "casual Job" activities and informal trades tend to be sporadic, with precarious income, lacking social security, sometimes risky and with little added value for those performing them and for society.

### Settlement conditions and risk factors in the environment

The external conditions of the housing are characterized by multiple environmental risks, with it being an urban environment with surface dumping and zoonosis

**Table 1.** Occupation and trade of the household population of working age

Occupation and trade	Percentage (%)
No information	29
Other	24
Recycling	18
Housework	12
Street vending	7
Construction related trades	4
Security	3
Food preparation and sales	1
Child/adult care	1
Gardening	1

problems. This condition favors the appearance of infectious and communicable diseases. **Table 2** shows the categories associated with factors external to the housing and classifies them according to the percentage of relevance given by the inhabitants of the sector.

In first place, zoonosis problems have the greatest negative implications for people’s health, according to the perception of 83% of households. This is related to the presence of stray dogs, rats and insects (the latter associated with vector-transmitted diseases). In second place, the problem with poor public lighting was identified by 77% of households, which is associated with a life safety risk, and affects mental health since it favors fear and uncertainty of being exposed to robbery, theft and other types of violence. For the inhabitants of Tocaimita, the simultaneous presence of criminal groups adds to the precarious condition of lighting infrastructure, abandoned areas and lonely places, as situations of constant threat to their safety, keeping them in a state of anxiety. The abandonment of infrastructure and lack of maintenance or care of public spaces in the neighborhood is very frequent.

Problems related to solid waste management were identified by between 72 and 74% of households. They report the permanent presence of garbage in the streets, offensive odors and open burning of solid waste. The risks typical of squatter settlements on vulnerable land were also relevant, such as landslides and ground subsidence are a concern for 60%. The presence of human excreta in the street received a percentage of 57%; however, this factor is highly dangerous since it creates outbreaks of infectious diseases.

Although some houses show a certain level of formality with the use of construction materials (15%), none of the case studies show any consideration for the

parameters established by the World Health Organization (2008; 2011), WHO (2019) in terms of solidity, safety and security, availability of basic services such as drinking water and affordable sanitation, access to public services, reasonable security of ownership and adaptation to climate change.

The mountainous terrain, the indiscriminate cutting of trees and the land use model show a high level of physical vulnerability associated with low levels of risk preparedness by the inhabitants; the lack of formal and safe basic services, as well as very precarious hygiene conditions (40%), both in the houses and in the settlement are the cause of illnesses associated with low temperatures (72%), exposure to bad weather (85%) and air quality (49%) in spaces such as bedrooms, often without windows to reduce thermal discomfort.

During the visits to the settlement and buildings in Tocaimita Oriental, the following were recognized as the main risk factors regarding housing: active mass removal phenomena, the prevalent materials in structures, inadequate enveloping surfaces and floors, as well as precarious spaces for food preparation and personal hygiene.

The houses of the settlement have 1 or 2 stories and have an average area of 62 m<sup>2</sup>, and the average occupancy is 3.9 people per unit. 85% of the houses can be defined as shantytowns due to their precarious construction, hygienic conditions and level of comfort. The structural materials used are round wood (72%), driven into the ground and joined with wire ties or nails (58%), frequently associated with boards (49%). Zinc roof tiles (96%) and recovered polyethylene tiles, set in place with heavy objects to prevent them from being blown away by the wind, prevail on the roof surface (**Fig. 5**). The external walls are made of galvanized tiles (51%), often combined with other materials such as fabric, cardboard, cans, waste, plastic (60%); the materials used for interior partitions are of a similar nature (43%). The floor materials are mainly natural ground (77%) and boards, especially used on the upper floors (43%).

**Table 2.** External factors of housing.

External factors	Percentage (%)
Stray dogs, rats, insects	83
Lack of Street lighting	77
Pollution from garbage in the streets	74
Offensive odors	72
Burnig of garbage in the streets	72
Landslides or landfalls	60
Ground subsidence	60
Contamination of excreta in the street	57
Loneliness of space	55
Polluted air	51
Vandalized or deteriorated spaces	51
Environmental noise	36
Exposure to polluted water	36
Undeveloped areas	30
Invasion of public space	28
Flooding	27
Surrounding factories	15
Abandoned construction sites	13



**Fig. 5** Tocaimita neighborhood (authors)

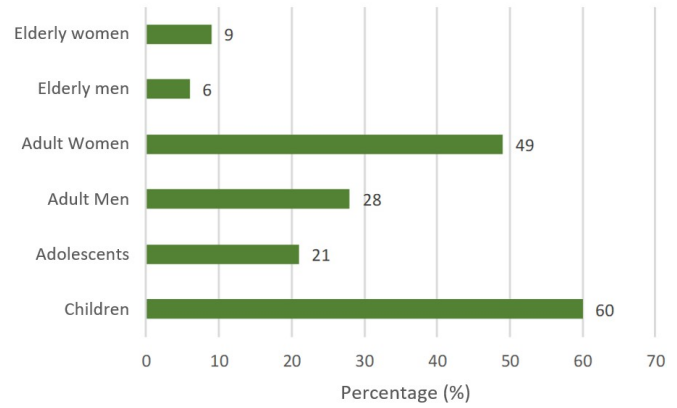
In terms of spaces and equipment, the home visits evidence that "31.9 of the housings do not have a specific space for cooking their food", but they do have an area used for this purpose in 68% of the households, furnished and in precarious hygienic conditions. Although spaces for personal hygiene are independent in 60% of the cases, only 68% drain to the self-built sewer with stoneware pipe. In terms of health, the space is used for other activities that require the use of water, and in 28% of the cases, the kitchen and bathroom spaces are shared.

Air pollution inside the house is mainly due to mold generated by high humidity and poor ventilation in the bedrooms, which often do not have windows so as to limit the cold at night. The scarcity of resources for food is registered in 38% of the households, as well as its poor quality and conservation. A quarter of those interviewed consider that overcrowding and lack of privacy have an impact on the health situation of their members. The internal factors are shown in **Table 3**.

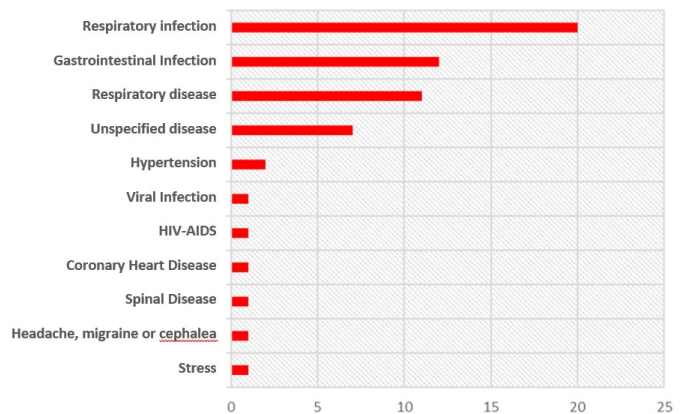
**Health conditions of the community**

The environment in which they live represents a serious threat to the health of the community. In Tocaimita neighborhood, interviews asked whether the members of the households participating in the study had been ill during the last 6 months, 77% responded in the affirmative.

The analysis of the information segmented by age ranges is shown in **Fig. 6**, where those who fell ill more often were children, with 66% of cases in this group, followed by adult women, 49% of which reported health problems. In contrast, the elderly were the ones who fell ill less often, only 9% of elderly women and 6% of elderly men.



**Fig. 6** Morbidity fell in the last 6 months.



**Fig. 7** Diseases reported in the survey.

The most recurrent diseases identified in fieldwork are shown on **Fig. 7**. The first place is caused by acute respiratory infections (ARI), which are a group of diseases caused by microorganisms such as viruses and bacteria. Gastrointestinal infections were reported as the second most frequent; these attack the stomach and intestines, and are caused by bacteria, parasites, viruses and certain foods. The third place went to acute respiratory diseases (ARDs), which affect the respiratory system. These findings are consistent with the reports in the previous section, given that these diseases are closely related to the lack of access to drinking water, basic sanitation and air pollution.

In the six months prior to the application of the survey, respiratory infections were reported by 20 participants, while gastrointestinal infections were reported by 12 and 11 respiratory diseases. Compared to the other diseases, these 3 accounted for more than 80% of the reported cases. When contrasting the results of the diseases with the environmental factors, it is observed that there is congruence, given that the lack of drinking water, basic sanitation, poor air quality and zoonosis problems are closely associated with infectious and respiratory diseases such as those found in the study.

**Table 3.** Internal factors affecting health conditions.

External factors	Percentage (%)
Lack of water supply	74
Lack of sewage	72
Dust and mold on floor/walls	64
No garbage collection	60
Lack of money for food	38
Indoor air pollution	38
Shortage of food for daily consumption	36
Contamination of drinking water	34
Lack of privacy	28
Per hair, dust or lice	26
Food quality	23
Overcrowding (at home)	21
Passive smoking	15
Work activity in the house	11
Lack of daily physical activity	11
Active smokers at home	2

The most frequent diseases in the inhabitants of the neighborhood are those that affect the respiratory and gastrointestinal tracts, factors directly related to inadequate housing conditions; the inhabitants themselves recognize the lack of protection from the weather (85%), the presence of extreme temperatures in the houses (72%), insufficient natural and artificial lighting (64%) as well as ventilation (49%) both in excess and in defect, as the main factors affecting their health.

Gastrointestinal diseases are closely related to water quality and basic sanitation. The problems related to the access to drinking water have a high impact on the community. According to the perception of 74% of the families, either because the water company does not provide the public service and does not guarantee permanent access to it, or because of the problems of drinking water quality generated by the collection tank and the rainwater they collect. In fact, in 34% of the cases, it was specified that the consumption of contaminated water was the cause of the health problems. The lack of sanitation was mentioned by 70% of the families, whereas 60% referred to the precariousness of the garbage collection service, and these facts were deemed as determinants of health problems in their families.

Air pollution inside the home was associated with dust and mold generated by the floor and wall materials in the homes (64% of the cases) as well as by the combustion materials used to prepare food, such as firewood, charcoal, kerosene, among others. This situation explains the high incidence of respiratory illnesses.

For 38% of the families, food shortage is another critical factor, due to the lack of money to buy food. The type and poor quality of the food they consume also plays a role because it does not contribute to adequate nutrition (in 23% of the cases). In addition, nearly a quarter of the households interviewed consider that overcrowding and lack of privacy in their homes are conditions that affect the health situation of their members.

## Conclusions

The population of the Tocaimita neighborhood has increased gradually, with many of its inhabitants being displaced by violence, arriving in conditions of poverty and vulnerability. The social conditions are adverse, given that there are high rates of violence, common crime, drug trafficking and the presence of illegal groups.

The housing environment is adverse because of the climatic conditions with low temperatures and its location in a steep terrain, also because of the lack of

urban infrastructure and essential public services networks; it is located in a zone with natural hazards such as landslides and floods, evidencing active faults (Varini et al., 2018), which leads to the fall apart of houses. Furthermore, housing there consists of shantytowns that make it impossible to control atmospheric agents, with temperatures approaching zero degrees in the early morning, strong winds and penetration of rainwater into the interior.

The health of the inhabitants of the Tocaimita neighborhood is affected by the precarious living conditions and exposure to environmental risks. Generally speaking, 77% of the inhabitants reported some type of illness in the 6 months prior to applying the survey. The most common diseases were acute respiratory infections (ARI), gastrointestinal infections, and acute respiratory diseases (ARD).

There was consistency between the conditions of the housing environment (external and internal) and the diseases developed by the inhabitants. The difficulty in accessing drinking water in the neighborhood is a factor related to health conditions in just over 70% of the cases studied. The environmental problems affecting air quality, especially those linked to the inadequate disposal and burning of garbage, occupy a similar proportion; there is also the non-existent, or inadequate, disposal of excreta, which is a factor linked to the lack of basic sanitation services.

The planning of the improvement of the physical conditions of the houses goes hand in hand with the sanitary conditions and implies a creative and co-operative impulse between public administration and the families of the community, without excluding the consensual and organized relocation of the inhabitants of the neighborhood in conditions of immitigable risk.

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## Declaration of Competing Interests

There are not competing Interests. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

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