Socio-environmental vulnerability and health in schools in the context of agribusiness[1]

Vulnerabilidade socioambiental e saúde em escolas no contexto do agronegócio

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Abstract

This study sought to understand how students from rural and urban schools identify elements of socio-environmental vulnerability in the school environment, in the context of agribusiness, in the cities of Campo Novo do Parecis, Sapezal and Campos de Júlio, Mato Grosso, Brazil. A participatory mapping was conducted by the design of processes and protective and destructive elements to life in the school environment. The most cited processes and protective elements were school, trees and agricultural activities near schools, the production of cereals and cotton, and the generation of jobs. However, the spraying of pesticides in the plantation areas near the schools was the destructive process predominantly listed. These elements make up the relationships and processes of social and environmental vulnerability of the students and the populations involved in these schools. The contradictory facets (protective and destructive) evidenced on agricultural production demonstrate a political dynamics of dispute of the narrative about the positive socio-sanitary-environmental impact of agribusiness and the use of pesticides. The construction of the maps has proved to be a tool that can contribute to the recognition of socio-environmental vulnerabilities and enhance the participation of the people in the surveillance process in health and environment.

Keywords: Socio-Environmental Vulnerability; Agribusiness; Pesticides; Participatory Mapping.

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Resumo

Neste estudo buscou-se compreender como estudantes de escolas rurais e urbanas identificam elementos da vulnerabilidade socioambiental no espaço escolar, no contexto do agronegócio, nos municípios de Campo Novo do Parecis, Sapezal e Campos de Júlio, localizados no estado do Mato Grosso, Brasil. Realizou-se um mapeamento participativo por meio do desenho dos processos e elementos destrutivos e protetores da vida no espaço escolar. Os processos e elementos protetores mais citados foram a escola, as árvores e as atividades agrícolas próximas às escolas, pela produção de cereais e algodão e a geração de empregos. Entretanto, a pulverização de agrotóxicos nas áreas de plantio próximas às escolas foi o processo destrutivo elencado de forma predominante nos mapas. Esses elementos compõem as relações e os processos de vulnerabilização socioambiental dos estudantes e das populações envolvidas nessas escolas. As facetas contraditórias (protetoras e destrutivas) evidenciadas sobre a produção agrícola demonstram uma dinâmica política de disputa da narrativa sobre o impacto sócio-sanitário-ambiental positivo e negativo do agronegócio e do uso de agrotóxicos. A construção dos mapas mostrou ser uma ferramenta que pode contribuir para o reconhecimento das vulnerabilidades socioambientais e potencializar a participação popular no processo de vigilância em saúde e ambiente.

Palavras-chave: Vulnerabilidade Socioambiental; Agronegócio; Agrotóxicos; Mapeamento Participativo.

Introduction

The productive processes of agribusiness in the territories have contributed to the deepening of social, economic, racial and gender inequality and of the overexploitation of work and nature, triggering several damages to the health of the population and of the environment, in addition to conflicts and situations of socio-environmental injustices which, in turn, enhance the processes of socio-environmental vulnerability (Miranda et al., 2007; Picoli, 2005; Pignati; Machado, 2011; Porto; Pacheco, 2009).

The transformations in the state of Mato Grosso, from the 1970s, resulted from the expansion of the frontier and agricultural modernization, articulating it with the national and international economic-political system (Barrozo, 2008; Moreno, 2007). On the one hand, this growth of the economy increased the agricultural GDP, based on various tax incentives, low prices and abundant credit from the government; on the other, private colonization companies have appropriated millions hectares of unoccupied lands of the State and expropriated indigenous and quilombola populations in the territory (Barrozo, 2008). For Moreno (2007), in this logic of the process of capitalist construction, agricultural and business colonization drove the regional transformation of Mato Grosso, not even respecting environmental legislation, much less the consequences of this process for human health, such as the effects of fires and later of pesticides (Pignatti, 2005).

This transformation is characterized as a process of environmental unsustainability that can be understood in three stages: in the first there is the deforestation of the cerrado and the forest; in the second, a high-tech agricultural system based on machinery, hybrid or transgenic seeds dependent on pesticides and chemical fertilizers; and, as a consequence, the third causes immediate (acute) and late (chronic) damage to human and environmental health, which produce socio-environmental vulnerability processes, increasing health problems and diseases, with negative social, health and environmental impact (Pignati; Machado; Cabral, 2007).

For the study of socio-environmental vulnerability processes and their relationship with health-disease, the territory assumes an empirical centrality in the understanding of human and environmental phenomena. Inseparably, it carries a symbolic, cultural and environmental dimension, whose origin is predominantly economic and political. There is no way to think the territory without considering appropriation, intention, power, identity and delimitation as a basis, in which the interests of different actors and conflicts at stake overlap, as well as the contexts that explain the production of health and well-being problems. (Goldstein; Barcellos, 2008; Haesbaert, 2006; Monken et al., 2008; Santos; Silveira, 2001).

The "vulnerability" category is associated with the idea of a condition of susceptibility to certain processes, whether social, environmental, economic or health (Ayres et al., 2009; Porto, 2012). The vulnerability in the interpretation of the health-disease process indicates inequity and social and environmental inequality (Bertolozzi et al., 2009). Acselrad (2006) adds that it is important to consider vulnerability as a process, and the condition of vulnerability as a social relationship.

Vulnerability as a process has two dimensions: one related to the "unequal protection" of the State, which favors the investment of private enterprises, which cause degrading processes to the health-environment of communities, not being responsible for this impact, imposing risks on the most unprotected and creating a deficit in the self-defense capacity of these subjects; and another centered on the deficit of defense of subjects and social groups, which must be seen as a result of the "unequal protection" of the State. The condition of vulnerability as a relationship, as it is socially constructed, will always be defined from some point of view. In this sense, it is also relative, subjective and open to disputes over definitions / statements from different social sectors (State, social movements, companies, multilateral bodies, etc.), which often have conflicting interests in defining the condition of vulnerability (Acselrad, 2006).

The purpose of this study was to understand how students from rural and urban, high and elementary public schools identify socio-environmental vulnerability in the school space, in the context of agribusiness, in municipalities in the Juruena River basin, Mato Grosso. The research was also used as an introduction strategy to the theme of health and environment, for the insertion of the school community in the broader research, "Evaluation of occupational, environmental and food contamination by pesticides in the Juruena Basin-MT", developed by the Nucleus of Environmental Studies and Worker Health (NEAST), from the Collective Health Institute (ISC) of the Federal University of Mato Grosso (UFMT).

Methodology

To understand, from the students' perspective, the socio-environmental vulnerability in the school space, we conducted a qualitative study with the development of a participatory mapping of the protective and destructive processes to life. This methodological proposal is based on Breilh (2003, 2006), which starts from the need to overcome conventional health surveillance – in which the health-disease process has an individual focus and a predominant approach in the quantification of disease cases – and proposes a participatory monitoring to understand and transform the destructive and protective processes of a community and its determinations in health (Breilh, 2006). This methodology was also adapted and applied by Búrigo et al. (2009), Marinho, Carneiro and Almeida (2011) and Carneiro et al. (2012).

The construction of maps can be used as a tool to enhance group discussion processes, share jointly produced knowledges about each region, aggregate information that is not present in the official databases and contribute to the development of health surveillance (Marinho; Carneiro; Almeida, 2011; Goldstein; Barcellos, 2008).

The study was carried out in six schools in the municipalities of Campo Novo do Parecis, Sapezal and Campos de Júlio, in the state of Mato Grosso, Brazil. Such municipalities are located in the northwestern portion of the state, 450 km from Cuiabá, forming part of the hydrographic basin of the Juruena and Tapajós river, of the Amazon river basin (EPE, 2010).

The main economic activity of these municipalities is agricultural production in monocultures of cereals and cotton. In 2015, Campo Novo do Parecis and Sapezal planted around 600 thousand hectares of soy, corn, cotton, sugarcane and sunflower, with Sapezal being the largest cotton producer in Mato Grosso. In Campos de Júlio, in 2015, approximately 350 thousand hectares of these same products were planted (IBGE, 2017).

The six schools, one rural and one urban in each municipality, were selected jointly with the Municipal Education Secretariats, with the Union of Public Education Workers and in meetings of teachers from the municipal and state schools of each municipality. The selection process considered the location (urban or rural area), the availability of management and the adherence of teachers and students. In each school, a teacher was responsible for monitoring and organizing the research.

This study was approved by the Research Ethics Committee of UFMT, under the statement Nº 951.083 of 02/08/2015, as one of the objectives of the project "Evaluation of occupational, environmental and food contamination by pesticides in the Juruena basin - MT", Executed by NEAST / ISC / UFMT. It also received authorization from the Municipal Education Secretariats of the three municipalities and a collaboration agreement with the local headquarters of the Union of Public Education Workers (SINTEP / MT).

Maps of socio-environmental vulnerability were constructed in workshops with students, conducted in each school in April 2015. The technique used was the drawing or "sketch" of the territories (Silva; Verbicaro, 2016). To participate, the criteria established for the selection of students were: (1) not being enrolled in the final years of the cycle (for example, 3rd year of high school), so to enable the follow-up for more than a year ; and (2) showing interest in participating, after the invitation made in the selected classes. Thus, 10 to 20 students from the 1st year of high school participated in urban schools; 20 to 30 from 7th and 8th grade elementary school in rural schools in Sapezal and Campos de Júlio; and 18 from the 4th and 5th grades of elementary school in the rural school of Campo Novo do Parecis. Overall, 108 students from the three municipalities participated.

At the beginning of the workshop, a general presentation of the research was carried out. Then, students received an A1 size paper (59.4 × 84.1 cm) and were asked to observe and draw a "sketch" of the school space. During the construction of the map, students collectively discussed the spread of the school's territory, the components that should appear on the map, its forms of representation and the social and environmental elements that influence their health. This process of collective construction and dialogue between the students was followed by the researchers, who recorded in the field notebook the dialogues that took place.

At the end of the construction of the map, the students highlighted the protective elements and processes in green circles, and in red circles the elements and processes that are destructive to life. For a better graphic presentation, in this article the green circles are represented by dotted lines and the red circles by continuous lines. For ethical reasons, the names of schools on the maps were hidden.

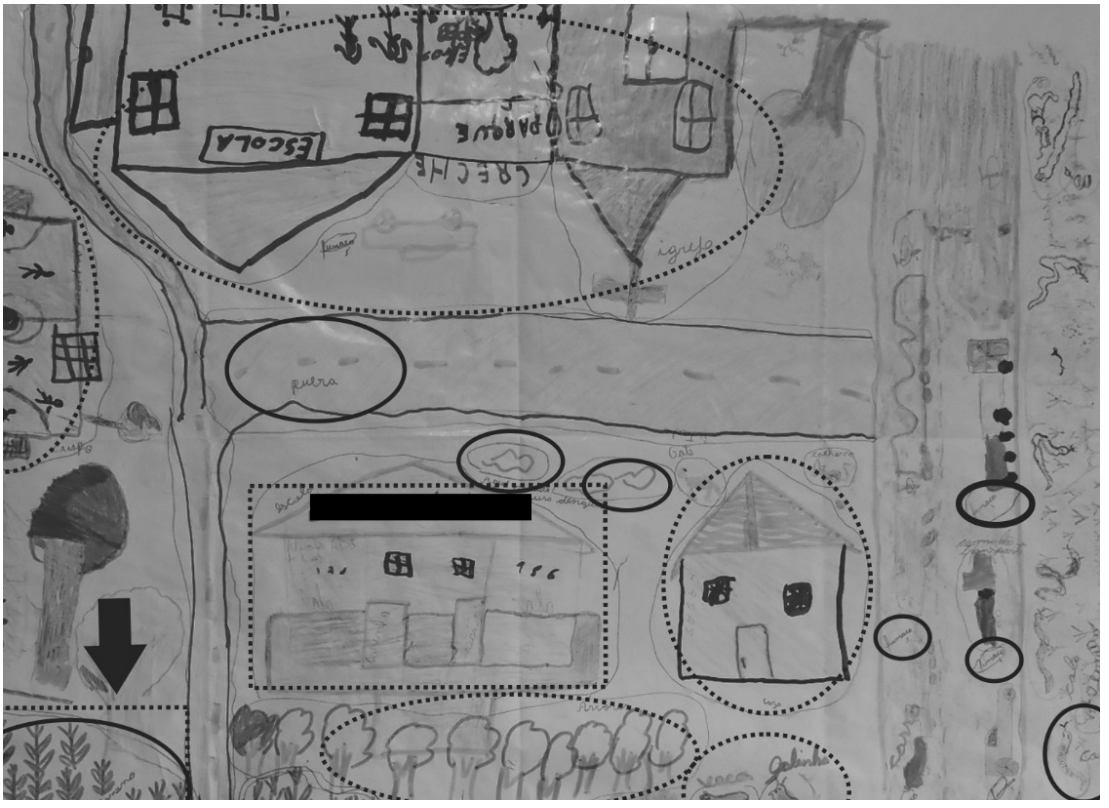
Thematic analysis was used as a basis for organizing and treating the material produced in the workshops (Minayo, 2010). The drawings and texts of the protective and destructive processes circulated on the maps were transcribed and grouped in words used by the students during the workshops. With these words, two "word cloud" images and a picture of the processes and elements that are protective and destructive to life were created. For the production of word clouds, the WordClouds online generator was used.[2] The evidence produced (the maps, the transcribed words and the field records) were interpreted in the light of the contributions of Acselrad (2006) and Breilh (2003, 2006), on the socio-environmental processes and relations of vulnerability and health.

2 WORDCLOUDS: Free online Wordcloud generator. Available at: <http://www.wordclouds.com/>.Access on: Jan. 20, 2017.

Results and discussion

The results of the socio-environmental vulnerability maps were organized comparatively between rural and urban schools, considering their similarities and differences. Figure 1 shows the map constructed by students from the school in the rural area of Campo Novo do Parecis. The students identified, through the dotted circles, the school, the church, the soccer field, the corn field, the trees, the animals (chicken, cat, dog and cow) and the house as protective elements of life. Dust from the road, the use of pesticides in the corn plantation, the smoke from cars, the puddle of standing water and the snake were identified in continuous circles as destructive elements. Beside the drawing of the corn plantation, the students wrote the word "*poison*", to represent the use of pesticides in the plantation.

Figure 1 - Map of socio-environmental vulnerability of the rural school in Campo Novo do Parecis / MT.



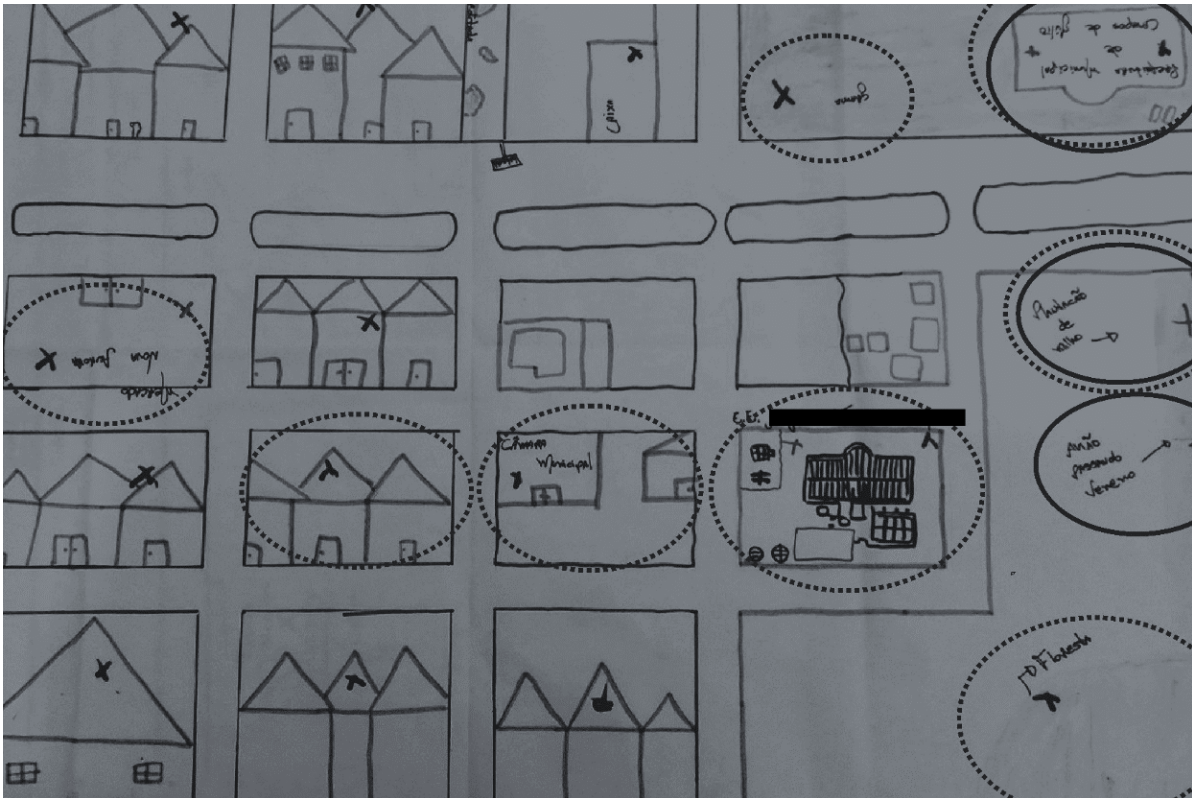
Legend: dotted lines - elements that protect life; continuous lines - elements that are destructive to life.

All maps of rural schools demonstrated the proximity to planting areas, mainly soybeans and corn, and showed similarities between them, in relation to the organization of their territory and how students understood such processes.

Students identified that plantations, due to the use of pesticides, are destructive elements, but they also identified that the same plantations, as they generate jobs for their families and produce food, are protective to life.

Regarding the maps built by urban schools, a similarity was observed in the maps of Campo Novo do Parecis and Campos de Júlio. In both, students' understanding of the space around the school covered most of the city and not just closer limits, as Figure 2 shows.

Figure 2 - Map of socio-environmental vulnerability of the urban school in Campos de Júlio / MT



Legend: dotted lines - elements that protect life; continuous lines - elements that are destructive to life.

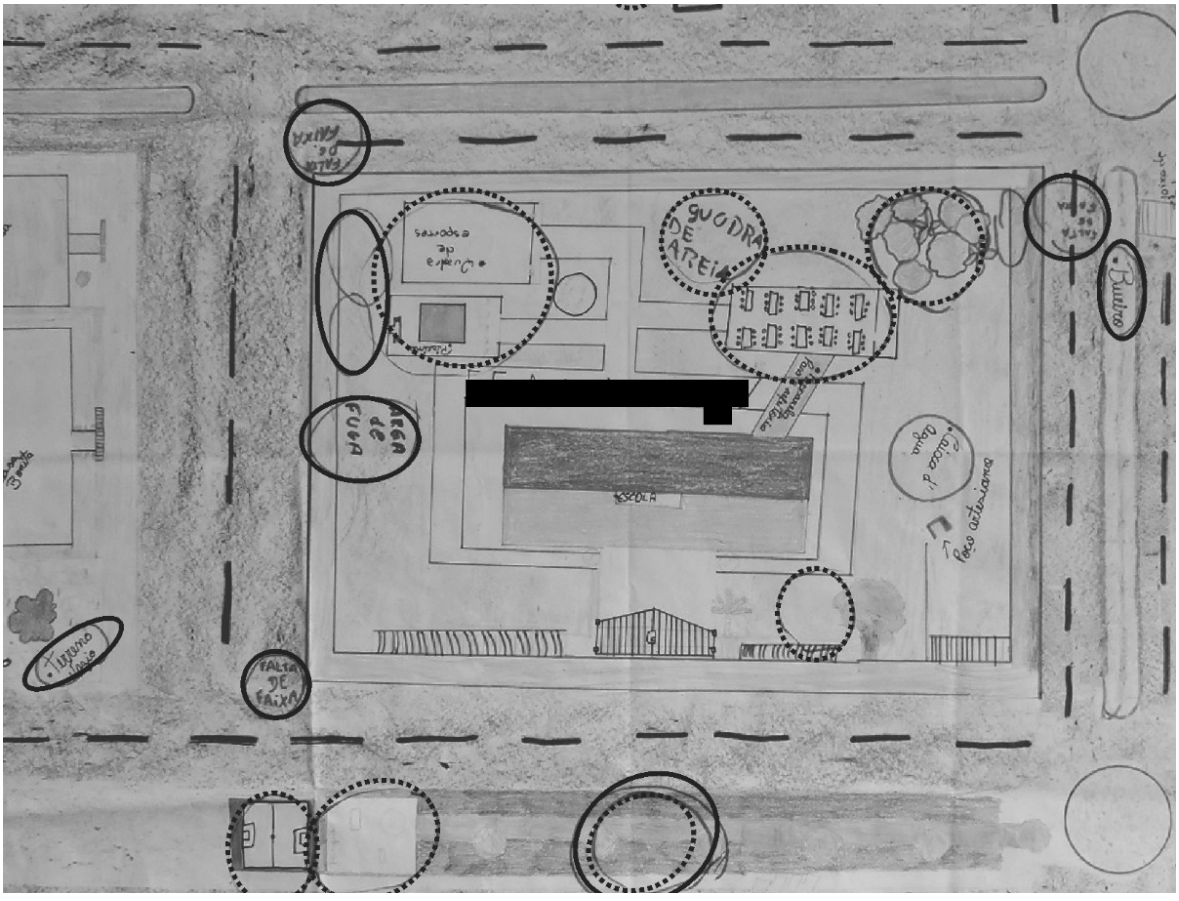
In the map constructed by the students of the urban school of Campos de Júlio (Figure 2), the elements identified as protective to life were: the school, the forest, the corn plantation, the houses, the supermarket, the City Council and the City Hall. Corn planting, aerial spraying of pesticides next to the school and also the City Hall were identified as destructive.

In the urban schools of Campo Novo do Parecis and Campos de Júlio, even though they are officially located in an area considered urban, students represented that next to and in front of the schools there are areas used for soy, corn and sunflower plantations. According to the students' report, pesticides are sprayed in these areas with the use of a tractor and airplane.

In the map of Campo Novo do Parecis, we observed that, in other regions of the city, the urban space also contains planting areas that use pesticides. The students narrated that there was an unintended aerial spraying of pesticides over a neighborhood bordering on a planting area. At one point on the map, the students expressed in writing their understanding of the plantations: "*the plantation is not good, because the pesticides are put and with the wind the poison goes to the city where the population is...*".

The map that most differed from the others in relation to the destructive elements and processes was that of the urban school in Sapezal (Figure 3). This map was the only one that did not express agriculture or the use of pesticides as a protective or destructive process to life, since around the school there is no planting area. The school is located in the middle of the cluster of buildings for housing, commerce and public services in Sapezal - therefore, the health problems mentioned are more related to this scenario, such as open drains without cleaning, the lack of crosswalk and the empty grounds around the school, which accumulate garbage and disease vectors. The protective elements to life, however, were not very different from the other schools, as the students pointed out the school, the square, the trees, the court and the cafeteria.

Figure 3 - Map of socio-environmental vulnerability of the urban school in Sapezal / MT



Legend: dotted lines - elements that protect life; continuous lines - elements that are destructive to life.

Chart 1 gather the processes and elements that are protective and destructive to life that were designed and cited by students from all schools. In the table, in front of each process / element, the number of citations is in parentheses.

Based on the frequency of citations, two "word cloud" images were constructed (Figure 4), which demonstrate, by the size of the words, the processes and elements that are protective and destructive to life, which were more repeated in the understanding of socio-environmental vulnerability.

Chart 1 - Processes and elements that are protective and destructive to life in rural and urban schools in the municipalities of Campo Novo do Parecis, Sapezal and Campos de Júlio / MT

Life's PROTECTIVE processes / elements	Life's DESTRUCTIVE processes / elements to life
- School (6)	-Agriculture: use of pesticides (5)
- Trees / forest (6)	- Dust (2)
- Agriculture: food production and employment (5)	- Snake (2)
- Sports Court (3)	- Agricultural airplane (2)
- Houses (3)	- Poison (1)

continua...

Chart 1 – Continuação

Life's PROTECTIVE processes / elements	Life's DESTRUCTIVE processes / elements to life
- Church (2)	- Deforestation (1)
- Animals: cow, chicken, cat, dog, snake (2)	- Cars' smoke (1)
- Supermarket (2)	- Puddle of standing water (1)
- Road (1)	- City Hall (1)
- Water tank (1)	- Wasteland (1)
- Cafeteria (1)	- Lack of crosswalk (1)
- Playground (1)	- Manhole (1)
- "Motocross track" (1)	- School escape area (drilled fence) (1)
- Soccer field (1)	- Cars (1)
- Square (1)	
- Agricultural airplane(1)	
- Garden (1)	
- Cars (1)	
- City Hall (1)	
- City Council (1)	

Figure 4 - Word cloud of protective(left) and destructive (right) elements to life in rural and urban schools in the municipalities of Campo Novo do Parecis, Sapezal and Campos de Júlio

These destructive and protective elements and processes of life described by the students (Chart 1 and Figure 4) comprise the relationships and processes of socio-environmental vulnerability of these school communities, which are decisive in the health-disease process of these populations.

Among the destructive processes and elements listed by the students, the use of pesticides in the planting areas close to the schools stood out in a common and predominant way, which can be considered a critical process of socio-environmental vulnerability for the population. During the workshops, situations of exposure to pesticides were recurrent in the student's reports, as experienced by them and their families, which culminated in possible acute intoxications (headache, malaise, vomiting, skin irritation, allergy, cough and abdominal pain) and chronic (respiratory, kidney and liver diseases, and cancers). The degradation of school and home gardens and orchards by spraying these products around schools, houses and small farms was also constantly reported.

However, agricultural activity in the schools' territory was also identified as a life-protecting process, since, for them, this activity is associated with the movement of the economy, the generation of employment for their families and the production of food. Some students expressed that there would be no production without the use of pesticides and that such products make the farmer's profit possible.

This finding reinforces Breilh's (2006) conception of protective and destructive processes, which, as they develop in a given social formation, are guided by the real possibilities of each way of life and their social relations. In their concrete development, the processes can acquire protective and destructive facets and forms. In rural schools, especially, students' families work in activities related to agribusiness, which highlights the understanding of this production model as something beneficial, as it is part of the livelihood, the ways of life and the daily life of this population.

Still, in the condition of vulnerability, there is a sociology of refusal and consent, defined by the horizons and life expectations of the subjects involved in this relationship, since the narrower these horizons and expectations are, the greater the propensity to accept degrading living conditions (Acselrad, 2006). Thus, Acselrad (2006) considers that the interpretation of this relationship of refusal and consent is defined from the different inflections in what the social groups consider tolerable or intolerable, and that the consent to the conditions of vulnerability will be as great as the condition of disqualification of rights, such as the imposing exposure to pesticides, identified by students as a destructive element to life.

In fact, the critical process for the health of these school communities does not lie simply in the presence of agricultural plantation areas close to the cities, schools or housing. We understand that the critical process is in the hegemonic agricultural production mode, which is dependent on the use of pesticides, culminating in the spraying of these products on crops, contaminating food, the environment, rural workers, students, teachers and the entire population of the surrounding area (Oliveira et al., 2018; Pignati; Machado; Cabral, 2007).

This study corroborates the one by Marinho, Carneiro and Almeida (2011), carried out in the Lower Jaguaribe / CE region, with communities of workers living in the context of fruit-growing agribusiness, who also expressed the proximity of residences with plantations as destructive elements, aerial spraying, the use of pesticides and the contamination of water and air.

In March 2006, the population of Lucas do Rio Verde, a municipality in Mato Grosso with large agricultural production, was impacted by a drift of pesticides from aerial spraying conducted on plantations around the city. The fog of pesticides poisoned the population and damaged vegetable gardens and ornamental plants in the streets and backyards of the city. Pignati, Machado and Cabral (2007), when describing this case, characterized it as an "expanded rural accident", of an occupational and environmental character.

Likewise, in May 2013, in the rural area of the city of Rio Verde, Goiás, 92 students and teachers from the São José do Pontal Municipal Rural School were intoxicated by a "rain" of pesticides from an aerial spray that was being applied in a corn plantation close to the school (Lima Júnior, 2015).

The contradiction between food production and the use of pesticides is expressed as a critical process, as it occurs due to a chemical-dependent agricultural production mode, in which the objective is not to guarantee nutritional and food sovereignty and to promote the health of the populations, but to produce agricultural commodities for capital accumulation. We can see, in this case, that this production model changes the concept of food production, as it induces students, workers and the population in general to perceive the process of cultivating and handling "food" as a risk, something dangerous, from which they should keep distance.

The contradictory (protective and destructive) aspects evidenced on agricultural production also demonstrate a political dynamic that is open in society in relation to the dispute over the narrative about the positive and negative socio-sanitary-environmental impact of agribusiness and the use of pesticides. On the one hand, we have multinational companies that produce pesticides, fertilizers, transgenic seeds, large rural producers and an increasing number of politicians in legislative houses and in executive positions in favor of agribusiness production. On another hand, there are movements to fight against monoculture commodities, against pesticides, for agrarian reform, for a concrete and viable policy for the implementation of agroecology, and various resistance movements in the face of this model of agriculture that is destructive to the environment and health (Carneiro et al., 2015).

Final Remarks

The produced maps show how students understand the concrete processes and elements that are reproduced daily in school routine and their interface with their life, health and environment, which in turn are evidence of their conditions of socio-environmental vulnerability.

With the construction of the maps, we can understand that students identify being daily exposed to pesticides, mainly due to the proximity of schools to planting areas, and because they understand that pesticides can directly contaminate the air, rain, rivers and food. In an urban school in the municipality of Sapezal, the indirect "invisibility" of contamination of water, food, rain and air by pesticides was not perceived as a destructive element, probably due to the distance from the crop to urban buildings.

The indication of pesticides as a destructive element to life should be seen as a warning and a demonstration of the government's negligence in guaranteeing the right to health and a balanced environment. Staying in this condition of daily exposure to pesticides tends to increase the socio-environmental vulnerability of this population.

This participatory mapping proved to be a tool that can contribute to popular participation in health surveillance. This methodology highlights the dialogue and reflection of the population on how the socio-environmental organization of their territories positively and negatively affects their health and their lives, and made it possible for students to participate in the care of the environmental contamination measuring devices of pesticides placed later in schools as part of the pesticide monitoring and surveillance project in the area.

The results of this study are important notes that, although contradictory between survival and destruction of life in the use of pesticides, may lead to the need to use another form of agricultural production based on agroecology, and must be taken into account when collective intervention in the health-disease process of these populations, in the perspective of socio-sanitary-environmental transformation with a view to health promotion.

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Authors' contributions

Beserra, Pignati and Pignatti participated in the conception and design of the research. All authors participated in the analysis and interpretation of data, writing of the article, critical review and approval of the version to be published.

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