

# Modification of knowledge on occupational accidents among schoolchildren who resided in a landfill impacted area

## *Modificação do conhecimento sobre acidentes de trabalho entre escolares residentes de uma área impactada por aterro sanitário*

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**ABSTRACT:** *Introduction:* The prevalence of occupational accidents is very high in Brazil, having impacts on the health system and social security. This requires prevention, which must start with students of the Basic Education. *Objectives:* The knowledge on this kind of accidents among children and adolescents studying in an area near a sanitary landfill was evaluated, before and after the development of activities on health education. *Methods:* A cross-sectional study was conducted in 2013 and included the application of the same questionnaire among students from a school in Cuiabá-MT, Brazil, before and after educational health activities related to the definition of occupational accidents. Univariate analyses of absolute and relative frequencies and bivariate analyses using the  $\chi^2$  Test and Fisher's Exact Test were performed with a significance level of 0.05 and 95%CI. *Results:* There was a statistically significant increase of the knowledge on these types of accidents after the educational activities ( $p < 0.05$ ). *Conclusion:* The activities carried out indicate that schools are important for the development and systematization of knowledge arising from reality.

**Keywords:** Occupational accidents. Children. Adolescents. Health education. Sanitary landfill. Environmental health.

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**RESUMO:** *Introdução:* A prevalência de acidentes de trabalho no Brasil é elevada, tendo impactos no sistema de saúde e na Previdência Social e requerem ações de prevenção, as quais devem ser iniciadas com estudantes da Educação Básica. *Objetivo:* Foi estimado o conhecimento sobre acidentes de trabalho, antes e depois de atividades de educação para a saúde, entre escolares que residem em área impactada por um aterro sanitário. *Métodos:* Foi realizado em 2013 um estudo transversal que incluiu a aplicação de um mesmo questionário entre alunos matriculados numa escola da rede municipal de Cuiabá-MT, Brasil, antes e depois de atividades de educação para a saúde voltadas para a definição dos acidentes de trabalho. Procedeu-se análise univariada de frequências absolutas e relativas e análise bivariada utilizando o Teste do  $\chi^2$  e o Teste Exato de Fisher, com nível de 0,05 de significância e IC95%. *Resultado:* Verificou-se aumento estatisticamente significativo do conhecimento sobre acidente de trabalho de uma fase para outra do programa ( $p < 0,05$ ). *Conclusão:* As atividades desenvolvidas evidenciaram a escola como espaço privilegiado para a valorização e a sistematização de saberes advindo da realidade dos escolares.

**Palavras-chave:** Acidentes de trabalho. Crianças. Adolescentes. Educação para a saúde. Aterro sanitário. Saúde ambiental.

## INTRODUCTION

Occupational accidents are a public health issue that impacts the epidemiological profile of the population. Besides the economic cost, mostly paid by social security for formal workers, the psychosocial costs for those who have been in an accident and their families are relevant. In this context, epidemiology allows designing, in the health status of the population, information that will contribute to get to know the impacts of the work accidents and their consequences on health services, which have more expenses with emergency care, assistance, and rehabilitation<sup>1</sup>.

Occupational accidents are usually associated with adults. Even though there are restrictions and specific legislation, the population of children and adolescents also suffer with this type of problem and its consequences. The early insertion in the work market exposes them to accidents that can be manifested through irreversible lesions, diseases and death<sup>2,3</sup>.

In 2006, out of the 5.1 million children and adolescents aged 5 – 17 years, 273,000 had lesions or got sick due to work in Brazil<sup>4</sup>. From 2006 to 2008, the percentage of adolescents who had weekly working hours equal to or higher than 40 increased from 28.6 to 30.2%<sup>5</sup>.

Even with the legislation that protects children and adolescents from early work<sup>6</sup>, some data require society's attention. Around the world, about 11% of the people aged between 5 and 17 years are not considered to be workers. In absolute numbers, it is the same as saying that 168 million children and adolescents are daily working, to the detriment of being, for example, in school<sup>7</sup>.

Census 2010 shows that in 131,000 Brazilian families, adolescents aged 10 – 14 years are the main people in charge of providing for the household<sup>8</sup>. These young workers usually

work with agriculture. Around the world, this economic activity is responsible for 60% of the work offer, especially in activities involving small family farm businesses<sup>7</sup>.

The Central-Western region, between 2006 and 2009, did not reduce the percentage of children and adolescents aged between 5 and 17 years who work, ranging from 9.9 to 10.2%<sup>9</sup>. In the population of children and adolescents living in the state of Mato Grosso, aged from 10 to 17 years, 9.6% already work in some sort of activity. Out of these, only 14.9% are hired as apprentices, according to the current legislation<sup>10</sup>.

After analyzing the same situation of people living in the rural zone, the percentage in this age group with a formal work registry falls to 1.1%<sup>8</sup>. These data refer to the precariousness of work connections and control, which does not reach the rural area<sup>2</sup>.

Regarding the work of children and adolescents in Cuiabá-MT, specifically in the area of this study, the main economic activity of the community Coxipó do Ouro is agriculture and small family farms<sup>11</sup>. For some families, another source of income is the activities conducted in the landfill, such as the collection of recyclable materials. Many children and adolescents living in this community divide their time between school activities and work in this site<sup>12,13</sup>.

The landfill in Cuiabá has been functioning since 1997, and was created to meet the demand of 200 tons/day. However, in 2011 it received approximately 270 tons a day<sup>14</sup>. Because of that, the waste that is not treated according to the National Solid Waste Program, is in the outdoors<sup>13,15,16</sup>.

Children and adolescents working in a landfill is not a particular characteristic of this community. Studies already show this practice in other regions of Brazil<sup>17-21</sup>. Even observing the work of children and adolescents in the landfill of Cuiabá, this is part of the reality of this population, which works to contribute with the family income<sup>13</sup>. Minayo-Gomes and Meirelles<sup>22</sup> list the activities performed by children and adolescents and the effects on their health in Brazilian states. Not by accident, the state of Mato Grosso appears among the states where children and adolescents have been working with garbage picking since 1996.

Therefore, this study aims at estimating the knowledge on occupational accidents, before and after health education activities, among students from an area impacted by a landfill, in order to spread this knowledge among students and encourage them to adopt preventive measures.

## METHODS

This is a cross-sectional study that is part of the main project "Health of school adolescents in an area impacted by a landfill: risk assessment for health and analysis of applicability of a health education program," conducted by the Federal Universities of Rio de Janeiro and Mato Grosso.

The creation of the health education program, carried out in this study, comprehended contents about education and environmental health, with examples of the context, that is, work, practices that put health at risk, and prevention of work accidents.

The study was conducted in the district of Coxipó do Ouro, located 27 km away from the capital of Mato Grosso. A frontage road also leads to several communities and small farms, whose economic base is family subsistence agriculture. The district counts on a school unit where the research was conducted, which received 260 students (elementary and high school) of approximately 15 communities<sup>11</sup>.

Another relevant fact is the presence of the landfill in Cuiabá, less than 5 km away from this district. The place employs people who live in the surroundings. Many work informally as waste pickers/recyclers. There are children and adolescents who attend the mentioned school among these workers<sup>12</sup>.

The target population of this study included children and adolescents enrolled in high school in 2013 (5th – 9th grade) in the municipal school network of Cuiabá-MT, located in the district of Coxipó do Ouro. As an inclusion criterion, the student had to be enrolled and attending classes when the study was conducted. Students who were absent in one of the stages of the program were excluded to prevent biased information.

The collection instrument was validated by Câmara et al.<sup>23</sup> and used in previous studies<sup>24-26</sup>. The variables were age (10 – 12 and 13 – 17 years), grade (5th to 6th, 7th to 8th, 9th), gender (male and female), typical work accident (the one that happens because of work or while working for the company that can cause injuries to the worker), and equalization to occupational accidents: labor traffic accident (accident in the route from the household to the work place and vice-versa), occupational diseases (developed because of work), aggression inside the work place (accident at the place and time of work).

The methodology was carried out in four moments in October, 2013. In this process, students were led to a moment of reflection, concentration, identification, and socialization. In the first moment, students answered a questionnaire composed of questions containing examples of work accidents, in order to analyze the students' knowledge about the theme. The construct validity<sup>27</sup> was used to validate the answer about work accidents, analyzed by three evaluators.

Right after the questionnaire was applied, the discussion involved the relationship between the environment in which the students are inserted and the risks of the work they do. The activity included pictures from the internet that represented some risks of the location.

In the second moment, students searched, in their life contexts, work situations that could lead to work accidents, being then advised to present this information to the colleagues, and deciding on strategies to approach this matter. For this moment, the students chose the themes and the group division.

The third moment involved the activities proposed in the second moment, including interviews with locals, production of banners, presentation, pictures of people working and dramatization.

In the fourth moment, the same questionnaire used in the first moment was reapplied. A day was dedicated to conduct the third and fourth moments, accounting for three days in total. The program was analyzed in two stages: the first meeting with the students (application of the questionnaire) and another one, afterward, when the students identified in their contexts, using a poll that was conducted, presented, and discussed, characteristics of work that could lead to accidents (reapplication of the questionnaire).

The questionnaires were typed twice, and each of them was checked manually. STATA, version 9.0, was used. The univariate analysis was used for absolute and relative frequencies, and the bivariate analysis used the Prevalence-Ratio (PR) based on the  $\chi^2$  test and Fisher's exact test, with 0.05 significance level and 95%CI.

All students signed the informed assent form, and parties in charge signed the informed consent form. The project was approved by the Ethics Committee of the University Hospital Júlio Müller, at Universidade Federal de Mato Grosso, report no. 179.024/2012.

## RESULTS

From a total of 114 enrolled students, 84 answered the questionnaire in the first stage, and 93 in the second stage. The 9 students who had not participated in the first stage were excluded in the second stage, according to the exclusion criterion described in "Methods."

Adolescents were distributed according to gender, age group, and grade (Table 1). Eighty-four students took part, 48 being (57.1%) male and 36 (42.9%) female. Male students aged from 13 to 17 years were prevalent. As to schooling among the female population, those in the 5th and 6th grades were prevalent (21.5%). In the male population, students in the 7th and 8th grades were prevalent (22.5%). Out of the total of 84 students, 92.7% referred working. Out of these, 43.8% worked outside the household, and 57.8% in activities with their families.

Table 2 shows the characterization between the stages of the program about typical occupational accidents: labor traffic accidents, occupational disease, and physical assault. It is possible to observe that the knowledge about occupational accidents increased from 45.2% to 66.2% after the program was conducted. Regarding gender, more hits were found in the female population. From the 5th to the 8th grade, there was a gradual increase in the knowledge about work accidents, especially among students in the 5th and 6th grades, who had more hits between the stages ( $p < 0.001$ ).

The age group of 10 – 12 years had a 46.4% increase in hits from one stage to the other ( $p < 0.001$ ). Students aged 13 – 17 years already had previous knowledge about this variable, and, at the end of the second stage, they reached 67.8% of hits. Among the total of students, there was an increase of 21.5% ( $p = 0.005$ ) between the stages.

Regarding the characterization of labor traffic accidents (Table 2), there were hits higher than 85% in the second stage, except for the students in the 9th grade – even presenting the largest prevalence of modification of knowledge (PR = 0.68) and increase of 34.6% between the stages, they reached the second stage with 85.7% of hits in this theme.

Table 1. Distribution of students according to gender, age group, and grade. Cuiabá, MT, 2013.

Gender	Age group	Grade	Adolescents n (%)
Male	10 – 12 years old	5th and 6th	11 (13.1)
		7th and 8th	1 (1.1)
		9th	–
	13 – 17 years old	5th and 6th	4 (4.8)
		7th and 8th	18 (21.4)
		9th	14 (16.7)
Subtotal			48 (57.1)
Female	10 – 12 years old	5th and 6th	15 (17.9)
		7th and 8th	1 (1.1)
		9th	–
	13 – 17 years old	5th and 6th	3 (3.6)
		7th and 8th	10 (11.9)
		9th	7 (8.4)
Subtotal			36 (42.9)
Total			84 (100.0)

The correct answers about the characterization of occupational diseases as work accidents (Table 2) stood out among students aged 10 – 12 years, and among students in the 7th and 8th grades, who achieved all hits at the end of the program. The hits were higher than 90.0% in the second stage. Statistically significant differences were observed between the stages of application of the questionnaire ( $p = 0.001$ ), with 96.4% hits in the second stage in comparison to the first one.

The characterization of aggression in the work place as a work accident showed more modification of knowledge between the stages (Table 2), reaching a 61.9% increase ( $p < 0.001$ ) in the general population of students.

Among the students in the first stage, 47.6% claimed to have been involved in a work accident, and this percentage was higher among boys (54.1%), in comparison to the female gender (38.9%), without statistically significant association ( $p > 0.05$ ).

## DISCUSSION

Processes of production and consumption are among the different challenges to be faced by contemporary society. Among these processes, the direct relationship of men with work instruments stands out, since they are not always skilled to prevent accidents<sup>29</sup>.

Table 2. Knowledge about typical occupational accident, labor traffic accident, work-related disease and aggression at work, per stage of the program according to gender, age group and grade. Cuiabá, MT, 2013.

	Stage Previous		Posterior Stage			
	Adolescents (n)	Hits (%)	Hit (%)	PR	95%CI*	P value*
Characterization of typical occupational accident						
Gender						
Male	48	22 (45.8)	31 (64.5)	0.68	0.45 – 1.02	0.064
Female	36	16 (44.4)	25 (69.5)	0.60	0.38 – 0.96	0.032
Age group (years old)						
10 – 12	28	5 (17.8)	18 (64.2)	0.27	0.11 – 0.64	< 0.001**
13 – 17	56	33 (58.9)	38 (67.8)	0.82	0.57 – 1.19	0.326
Grade						
5th and 6th	33	6 (18.2)	19 (57.6)	0.36	0.17 – 0.75	0.001
7th and 8th	30	16 (53.4)	22 (73.4)	0.66	0.40 – 1.07	0.108
9th	21	16 (76.1)	15 (71.4)	1.13	0.54 – 2.35	0.725**
Total	84	38 (45.2)	56 (66.7)	0.65	0.48 – 0.88	0.005
Characterization of labor traffic accident as occupational accident						
Gender						
Male	48	23 (47.9)	41 (85.4)	0.46	0.31 – 0.66	< 0.001
Female	36	20 (55.5)	31 (86.1)	0.51	0.33 – 0.78	0.004**
Age group (years old)						
10 – 12	28	15 (53.6)	25 (89.2)	0.46	0.29 – 0.73	0.003**
13 – 17	56	28 (50.0)	47 (84.0)	0.49	0.34 – 0.69	< 0.001
Grade						
5th and 6th	33	18 (54.5)	29 (87.8)	0.48	0.31 – 0.74	0.002**
7th and 8th	30	16 (53.4)	30 (100.0)	0.34	0.23 – 0.51	< 0.001**
9th	21	9 (42.8)	13 (61.9)	0.68	0.36 – 1.26	0.216
Total	84	43 (51.1)	72 (85.7)	0.48	0.36 – 0.63	< 0.001**

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Tabela 2. Continuação.

	Stage Previous		Posterior Stage			
	Adolescents (n)	Hits (%)	Hit (%)	PR	95%CI*	P value*
Characterization of occupational disease as work accident						
Gender						
Male	48	29 (60.4)	46 (95.8)	0.42	0.31 – 0.58	< 0.001**
Female	36	30 (83.4)	35 (97.2)	0.53	0.36 – 0.80	0.046**
Age group (years old)						
10 – 12	28	23 (82.1)	28 (100.0)	0.45	0.33 – 0.61	0.019**
13 – 17	56	36 (64.2)	53 (94.6)	0.46	0.34 – 0.62	< 0.001**
Grade						
5th and 6th	33	26 (78.8)	32 (96.9)	0.51	0.34 – 0.75	0.023**
7th and 8th	30	24 (80.0)	30 (100.0)	0.44	0.32 – 0.59	0.009**
9th	21	9 (42.8)	19 (90.4)	0.37	0.21 – 0.66	0.001**
Total	84	59 (70.2)	81 (96.4)	0.47	0.37 – 0.59	0.001**
Characterization of physical aggression in the work environment as work accident						
Gender						
Male	48	10 (29.8)	41 (85.4)	0.23	0.13 – 0.41	< 0.001
Female	36	11 (30.5)	32 (88.9)	0.29	0.17 – 0.50	< 0.001**
Age group (years old)						
10 – 12	28	7 (25.0)	25 (89.2)	0.25	0.12 – 0.48	< 0.001**
13 – 17	56	14 (25.0)	48 (85.7)	0.28	0.17 – 0.46	< 0.001
Grade						
5th and 6th	33	8 (24.3)	28 (84.8)	0.26	0.14 – 0.50	< 0.001**
7th and 8th	30	7 (23.4)	28 (93.3)	0.21	0.11 – 0.42	< 0.001**
9th	21	6 (28.6)	17 (80.9)	0.33	0.15 – 0.68	< 0.001**
Total	84	21 (25.0)	73 (86.9)	0.26	0.17 – 0.38	< 0.001

PR: prevalence ratio; 95%CI: 95% confidence interval; \*Pearson's  $\chi^2$  test; \*\*Fisher's Exact Test.

This statement corroborates the data about knowledge obtained among the students in this study before and after the application of an educational program, which showed that the subjects of health, environment, and work are not approached in school, which



only includes preservation of the environment, without associating it to its implications on human health<sup>16</sup>.

From this perspective, the study conducted with students living in a landfill-impacted area showed that they are inserted in labor activities, and some of them are carried out in a location that stores solid waste coming from the city of Cuiabá. This fact has been a constant since the creation of the landfill, in 1997<sup>14,12</sup>.

This situation becomes worse when there are children and adolescents, because this population should be in the school environment, acquiring knowledge to prepare them for life. When children and adolescents are exposed to work early, they may face negative consequences, such as occupational accidents and diseases.<sup>18,25,26</sup>

There was a reduction in the total number of participants between stages 1 and 4 in this study. This is possibly due to the fact that adolescents execute activities related to family work, which causes them to miss classes. This reality of adolescents who start working early to help and complement the family income is also observed in other parts of Brazil, even though it is against the Statute of the Child and Adolescent<sup>17-20</sup>. As a repercussion in health, the waste-picking activity can lead to intoxication caused by rotten food and chemical substances, worms, and accidents caused by machines and disposal trucks, among others<sup>17,22</sup>.

Considering that children and adolescents work in this rural community, the first stage of the program observed that students had considerable previous knowledge about what occupational accidents are, showing that they acquired this knowledge because of their own experience in the field. The results obtained in this study are in accordance with those found by Câmara et al<sup>24</sup> regarding the hits between the stages of application of the questionnaire, showing that the program can be reproduced in different contexts, however, addressed to the population of teenage students. However, data point out that the schools have not inserted subjects related to work skills in their project, such as the approach of different ways to start working and the exposure to occupational accidents.

Considering that 57.8% of the students work at home, it is important to mention that many of them do not consider the activities they do as work, because they think they are natural and mistake them for other things that happen in the family environment (household). Regarding women, who culturally start working early in terms of household chores, and considering the informality of labor relations, this naturalization is even more serious<sup>30</sup>. It is worth to mention that the students live in small farms and live on subsistence agriculture, or accompany their families to work in the landfill<sup>31</sup>.

This evidence of contact with the work reality in the family environment or outside of it can explain the higher knowledge about work accidents observed between the stages of the educational program, leading to changes in the previous knowledge to that found after the conduction of the activities. This result shows how important it is to teach about occupational activities and the assimilation of this knowledge for students. These activities are expected to contribute with the reduction in statistics of occupational accidents in the age group of 10 – 12 years.

Literature indicates this age group as being responsible for the largest concentration of work accidents due to physical and cognitive immaturity to conduct the activities, which are mostly carried out by adults. It is also important to point out that, in the first stage, these students had little previous knowledge about work accidents in comparison to students aged 13 – 17 years, who already work or are about to start working<sup>7,9</sup>.

These data lead to a worrisome reality, considering that children and adolescents before the age of 14 cannot work, according to the Statute of the Child and Adolescent<sup>6</sup>, because of the consequences of the work they do can lead to injuries and diseases that can affect their entire lives. Besides, work subtracts the time the child or adolescent has to socialize, to enjoy leisure activities, appreciate family life, and study. The lack of studies in this phase of life reduces their opportunities as adults, and these opportunities are related to having access to better working conditions, as well as housing, leisure, among others<sup>2,30</sup>.

In this sense, it is important to consider that children and adolescents are subject to work accidents, and this exposure can be considered as the tip of the iceberg, showing the harsh reality of exploitation suffered by these young workers. This can compromise the health of this population segment<sup>31</sup>.

In Brazil, the information collected about occupational accidents include, in a single age group, all accidents involving adolescents aged up to 19 years old<sup>32</sup>. Statistics about children who have been involved in work accidents is not collected, because child labor is illegal. The lack of information reduces the social visibility of this problem, and the extension of the economic load of the accidents and diseases involving children and adolescents is not known<sup>33</sup>.

Even though Brazil has made great efforts in the past few years to reduce work among children and adolescents, and, consequently, occupational accidents involving this population, such reduction is still slow. The goal of eradicating all forms of child labor until 2020 is far from the Brazilian reality<sup>7-9</sup>. By dealing with the population living in the rural zone, where the lack of control and the informality of labor relations are present, the situation becomes worse<sup>33</sup>.

The context of working children and adolescents and occupational accidents was observed among students in this study, which pointed out that 47.6% were involved in a work accident until the conclusion of this study. In previous studies, this reality was observed in different work contexts<sup>24-26</sup>.

The knowledge of students about the characterization of a typical occupational accident, a labor traffic accident, work-related disease, and aggression showed statistically significant growth between the stages. In previous studies, similar results were found<sup>24-26</sup>, ratifying the need for the school to be the promoter of preventive strategies relating health and work by using learning-teaching activities. The knowledge of students in the second stage shows that the program had positive impact, changing the knowledge and enabling new ways of understanding how work can have negative influence on health, in case of accidents or diseases caused by labor activities.

Promoting initiatives aiming at knowledge as being the promoter of behavioral changes is important for all students, especially those living in the rural area, because this part of the population suffers with the worst indicators of quality of life. Inequalities in public policies are also part of their reality, and these are dealt with invisibility for this population.

By dealing with the materiality of public policies in the rural scope, there are many challenges to be faced. Varied policies are necessary to break with the barriers that were historically built between the countryside and the city<sup>34,35</sup>. The vulnerability of this population may be proven by the historical abandonment it has been submitted to, being neglected when it comes to accessing the policies in comparison to the population living in an urban area<sup>35</sup>.

From this perspective, it is necessary that public educational policies include the formation of environmental health teachers, so that they can bring themes/ contents about work environment, prevention of accidents, and occupational diseases to the school. This approach would contribute to the formation of future workers, assisting teenagers who already work as apprentices.

Some limitations should be considered in this study, especially the cross-sectional design, which does not allow defining causality relations between the knowledge about work accidents and the conduction of the educational program. As an advantage, this methodology allowed analyzing the modification of knowledge among the same students by conducting the program.

## CONCLUSION

The analysis of the results obtained in the second stage of the educational program addressed to students in a school impacted by a landfill showed the positive modification of knowledge among participants regarding occupational accidents. Therefore, the school is considered as a privileged space for the development of systematized knowledge, and the appreciation coming from the reality of the students for behavioral changes, with the objective of preventing occupational accidents in all the phases of life of this adolescent, who will be a worker in the future. However, it is worth mentioning the need for multifaceted actions to change the context of working children and adolescents.

Valuing the knowledge of students, considering their previous knowledge about occupational issues, and encouraging the search for new knowledges within their contexts can be essential for the construction of new practices, aiming at the prevention of health diseases and conditions.

Finally, it is important to emphasize that the discussions about the health of children and adolescents as apprentices, according to the legislation, must be part of the political and educational project of the school in order to gain visibility for public policies, especially

addressed to those considered as “invisible” for being away from the eyes of society, without access to their basic rights.

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