

## Vaccination and adolescent knowledge: health education and disease prevention

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**Abstract** *A cross-sectional study in conjunction with a health extension program was conducted with 605 adolescents aged between 13 and 18 years from 22 public schools in Divinópolis, Brazil. The aim of the study was to determine the vaccination status of the adolescents and their level of knowledge of communicable and vaccine-preventable diseases. Three-stage cluster sampling was used comprising schools, classes, and students. The findings show that vaccination coverage among adolescents was 45.1% and yellow fever was shown to have the lowest coverage rate (64%). The most mentioned diseases when the adolescents were asked which vaccinations they had had were infantile paralysis (60.7%), yellow fever (56%), tetanus (34%), and measles (28.6%). Extension activities were conducted with 6,650 people, comprising vaccination (2,334 doses administered), aimed at expanding vaccination coverage, and health education activities with 2,839 adolescents directed at sexually transmitted diseases, family planning; and licit and illicit drugs. The study had a positive impact in terms of the expansion of vaccination coverage and the extension activities played an essential role in increasing the adolescents' knowledge of the themes addressed.*

**Key words** *Public health, School health, Vaccination, Vaccination coverage, Health education*

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## Introduction

Adolescents are one of the priority groups of Brazil's National Immunization Program (NIP) due to their susceptibility to certain vaccine-preventable diseases and, primarily, to the low level of vaccination coverage among this age group<sup>1</sup>.

Adolescence is marked by important changes and needs. It is a phase that involves moments of choice and decision and often permeated by negative aspects such as increased exposure to risk factors related to the social circumstances adolescents can find themselves in, such as violence, drugs, and precocious sexual experiences<sup>2</sup>.

In view of this, the Ministry of Health advocates and provides immunization to adolescents against hepatitis B (three doses), diphtheria and tetanus (one dose every 10 years), yellow fever (two doses), measles, mumps and rubella (the two-dose MMR vaccine), and HPV, provided to girls aged between nine and 13 years and boys aged between 12 and 13 years and, up to 2020, between boys and girls aged between nine and 13 years. Brazil provides around 300 million doses of vaccine each year, making it one of the countries that most provides vaccines via the public health system. Other age groups and specific population groups besides adolescents have their own vaccine schedules. The child vaccine schedule has 15 types of vaccines and the adult, older adult, and pregnant women schedules have four, while the indigenous population and groups with special vaccination requirements have their own specific schedules<sup>3</sup>.

Under current health policy, vaccination is carried out preferably via the primary healthcare (PHC) system<sup>3</sup>, more specifically through the Family Health Strategy (FHS), which is organized around multiprofessional health team responsible for the population of a predetermined area. The FHS aims to expand healthcare via actions directed at health promotion and maintenance, disease prevention, diagnosis, treatment, recovery, and rehabilitation<sup>4</sup>.

However, gaps still exist in the provision of health services to adolescents, impeding the resolution of health issues specific to this age group. Healthcare lacks a systematic approach and service delivery tends to be based on meeting spontaneous demands, showing that the organization of work with this age group leaves much to be desired<sup>5</sup>. In this respect, low levels of demand for PHC services and adherence to PHC programs and actions and reluctance to being vaccinated may be considered factors that limit vaccination

coverage among adolescents<sup>2,5,6</sup>, justifying the choice of this age group as study participants.

A study conducted in Belo Horizonte reported that vaccination coverage among adolescents aged between 10 and 19 years was only 36.2 %<sup>6</sup>.

The School Health Program (*Programa Saúde na Escola* - PSE) was created to promote permanent integration and coordination between the education and health sectors. The program aims to improve the health of school children and contribute to health promotion and disease and risk prevention with a view to tackling the vulnerabilities that children and adolescents in the public education system experience. One of the components of the PSE is student health monitoring and assessment, including vaccination and disease status<sup>7</sup>.

In light of the above, this study asked the following questions: What is the vaccination coverage rate among students in the ninth year of primary education in public schools in Divinópolis in the State of Minas Gerais, considering the child and adolescent basic vaccine schedule? What knowledge do adolescents have about communicable diseases and vaccination?

The aim of this study was to determine the vaccination status of ninth year students from public schools in Divinópolis and their level of knowledge of communicable and vaccine-preventable diseases.

## Methods

A cross-sectional study was conducted in conjunction with a health extension program with adolescents aged between 13 and 18 years enrolled in the ninth year of primary education in municipal and state public schools in Divinópolis, Minas Gerais, Brazil. The study involved a total of 605 students from 22 schools and was undertaken between September 2013 and February 2015.

The municipality was chosen to be the study area because it is the administrative center of the Regional Health Superintendency and hub of the Expanded West Region of the State of Minas Gerais, made up of 54 municipalities grouped into six micro regions. Divinópolis has a population of 232,945 people (IBGE, 2016) and has low FHS population coverage (27.24%), with 32 FHS teams, according to data for October 2016 obtained from the portal of the Primary Care Department.

Data was collected using a 28-item structured interview guide comprising questions addressing

the following aspects: socioeconomic status and demographic characteristics; knowledge about vaccination, communicable diseases (including sexually transmitted infections), vaccination-preventable diseases included in the NIP child and adolescent schedule, and hepatitis B and its possible forms of transmission and prevention; and fear of injections. Data processing and analysis was undertaken using the software programs EpiInfo™ 7.2 and Statistical Package for Social Science (SPSS) 22.0, respectively. A descriptive analysis was performed calculating average, absolute, and relative frequencies and the standard deviation of the variables. Univariate analysis was conducted using Pearson's chi-squared test and adopting a significance level of 0.05 (CI<sub>95%</sub>) to determine the factors associated with vaccination.

The appropriate sample size was calculated based on the comparison of proportions and adopting a significance level of 0.05, power of 80%, and prevalence of unvaccinated adolescents of approximately 35% to obtain a representative sample of the population of ninth year school children in public schools in Divinópolis.

$$n = \frac{[z_{1-\alpha/2} \sqrt{2\bar{p}(1-\bar{p})} + z_{1-\beta} \sqrt{\hat{p}_1(1-\hat{p}_1) + \hat{p}_2(1-\hat{p}_2)}]^2}{(\hat{p}_2 - \hat{p}_1)^2}$$

Three-stage cluster sampling (schools, classes, students) was used to determine sample size in order to capture the total number of schools, total number of ninth year classes, and total number of students enrolled in the ninth year. The distribution of the schools in the sample was proportional to the number of municipal and state schools in Divinópolis with ninth year classes, resulting in a proportional representation of all schools across the different education regions of the municipality: central, northeast, northwest, southeast, southwest, and west.

The cross-sectional study (items 1 and 2) was conducted in conjunction with a health extension program (items 3, 4, 5, and 6) in the following stages: 1. Estimation of vaccination coverage among ninth year students in public schools in Divinópolis; 2. Determination of student knowledge about communicable diseases and vaccination; 3. Identification of students from the fifth to ninth years, teachers, and school staff susceptible to vaccine-preventable diseases; 4. Provision of the vaccines on the child and adolescent and adult vaccine schedules at the schools; 5. Assessment of vaccine acceptance; 6. Health education actions addressing the study theme.

The information about vaccination coverage for the vaccines on the basic adolescent vaccine

schedule – hepatitis B, *dupla adulto* (dT) or tetanus and diphtheria double vaccine, yellow fever (YF), and the MMR vaccine (MMR) – was collected from the students' immunization record cards. The analysis of vaccination status included the following: adolescents who presented their immunization record card (n = 535 or 88.4%); and all vaccines advocated for adolescents according to the NIP vaccination schedule.

The target audience of the vaccination and health education interventions undertaken under the health extension program comprised 6,650 children, adolescents, teachers, and staff from the 22 public schools. The aim of these interventions was to improve vaccination coverage rates through vaccination and educational actions addressing the study theme and themes proposed by the study participants on the interview guide: sexually transmitted diseases (STDs); family planning; and licit and illicit drugs.

The education activities were guided by the "Critical Health Education" intervention model, one of the strategies resulting from the Alma-Ata Declaration<sup>8</sup> to attain the goal of health for all by the year 2000. Critical Health Education seeks to value community participation, which in the case of this study involves dialectical interaction with the school community, in order to develop individual autonomy and a sense of responsibility for adopting healthy lifestyles. In this sense, it is the group that defines the priority themes and individuals who will participate in the educational activities.

The method used for the educational activities was group education<sup>9</sup>, addressing the themes defined by the adolescents. First, a group activity was used to promote interaction between the adolescents, followed by a conversation circle. The group education method allows adolescents to participate actively in the learning process, leading them to build new concepts, reflect upon the theme in question, and exchange knowledge, making them feel free to express ideas and opinions.

The study was carried out in accordance with the ethical principles of nonmaleficence, beneficence, justice, fairness, and participant autonomy laid out in the National Health Council Resolution 466/2012. Authorization was obtained from the directors of the educational institutions that took part in the study and the parents/guardians and adolescents signed an informed consent form and informed assent form, respectively. Students who did not present their immunization record card due to loss or damage, but

who presented the informed consent form were allowed to participate in the study but were excluded from the vaccination coverage analysis to avoid information bias. The cross-sectional study and health extension program was approved by the Research Ethics Committee of the São João del-Rei Federal University.

## Results

Six hundred and five adolescents from a total of 2,283 school children enrolled in the ninth year in the municipality's 22 public schools participated in the study. Participants were aged between 13 and 18 years and had an average age of 14.35 years (SD = 8.52). Table 1 shows the profile of the study participants and the variables analyzed in relation to vaccination.

Vaccination coverage was determined based on the assessment of 475 immunization record cards (78.8%; CI 95%: 75.0% - 81.7%), since 130 adolescents did not present their cards. Table 2 shows vaccination coverage by age group.

Vaccination coverage for all vaccines on the national adolescent vaccine schedule among the 475 participants who presented their immunization record card was only 45.1%.

The majority of adolescents and adults who refused vaccination (0.2% of the sample) reported "fear of injections". Despite being a subjective variable, this result shows that there was a statistically significant difference and that this may have influenced the adolescents' (mainly > 14 years) decision to refuse vaccination during the extension actions.

Table 3 shows the adolescents' knowledge about the vaccines on the immunization record card.

The most mentioned diseases when the adolescents were asked which vaccinations they had had were infantile paralysis (60.7%; CI 95%: 56.6% - 64.6%), followed by yellow fever (56.0%; CI 95%: 52% - 60%), tetanus (34.0%; CI 95%: 30.3% - 38.0%), and measles (28.6%; CI 95%: 25.1% - 32.4%). Twenty-seven point four percent (CI 95%: 24% - 31.2%) did not know. A small percentage of the adolescents (14.4%; CI 95%: 11.7% - 17.5%) mentioned dengue fever, for which a vaccine is not yet available through the public health system, and nonvaccine-preventable diseases such as syphilis (2.8%; CI 95%: 1.7% - 4.6%) and HIV/AIDS (1.0%; CI 95%: 0.4% - 2.3%). It is important to note that the adolescents were allowed to mention more than one disease or infection.

With regard to Hepatitis B, 48.6% (n = 294; CI 95%: 44.6% - 52.7%) of the adolescents reported having received information or advice about this disease. Table 4 shows the adolescents' knowledge about forms of transmission of Hepatitis B.

Despite the lack of knowledge among the adolescents regarding Hepatitis B and its forms of transmission, the findings show that Hepatitis B vaccination coverage was high (93.3%; CI 95%: 90.5% - 95.3%). Although the majority identified some forms of transmission of the disease, a significant proportion mentioned other factors that are not associated with the transmission of hepatitis B, such as shaking hands, kissing on the mouth, swimming pools, and the toilet seat.

The results show that 70.1% (n = 424; CI 95%: 66.2%-73.7%) of the adolescents who seek health services for vaccination go to the health center nearest to their house, 14.9% (n = 90; CI 95%: 12.2% - 18%) use a health center in another neighborhood, 9.3% (n = 56; CI 95%: 7.1%-11.9%) use private clinics, 4.3% get vaccinated only during vaccination campaigns (n = 26; CI 95%: 2.9%-6.3%), 6.1% failed to answer (n = 37; CI 95%: 4.4%-8.4%), and 2.1% (n = 13; CI 95%: 1.2%-3.7%) used other points of vaccination, such as their father's workplace and military police battalion. Adolescents were allowed to mark more than one place of vaccination.

## Extension activities

The extension program reached 6,650 people (children, adolescents, teachers, and school staff) from the 22 public schools, resulting in the administration of a total of 2,334 vaccine doses (Hepatitis B, YF, MMR, and tetanus and diphtheria), of which 1,923 were administered to adolescents aged between 13 and 18 years. Table 5 shows the number of doses by education region.

Given that the HPV and Influenza vaccination campaigns took place during the data collection period, these vaccines were also included in extension actions for the vaccination of susceptible children and adolescents. However, these vaccines did not comprise the vaccination status analysis.

Of the 6,650 people who participated in the extension activities, children and adolescents whose immunization record cards were not up-to-date and who were not authorized by their parents/guardians to have the vaccinations/failed to bring a signed authorization letter (n = 146 or 2.2%) and those who refused to be vaccinated

**Table 1.** Profile of ninth year public school children and the variables analyzed in relation to vaccination. Divinópolis, Minas Gerais, Brazil – September 2013 to February 2015.

Variable	N	%	CI 95%
Sex	(n = 605)		
Male	242	40.0	36.1% - 44.0%
Female	363	60.0	56.0% - 63.9%
Age	(n = 605)		
13 years	27	4.5	3.0% - 6.5%
14 to 15 years	538	88.9	86.1% - 91.3%
>15 to 18 years	40	6.6	4.8% - 9.0%
Immunization record card	(n = 605)		
In possession of	535	88.4	85.5% - 90.8%
Not in possession of	59	9.8	7.6% - 12.5%
Failed to answer	11	1.8	1.0% - 3.3%
Presented immunization record card	(n = 605)		
Yes	475	78.5	75.1% - 81.6%
No	130	21.5	18.4% - 24.9%
Scared of injections	(n = 605)		
Yes	251	41.5	37.5% - 45.5%
No	348	57.5	53.5% - 61.5%
Failed to answer	6	1.0	0.4% - 2.3%
Have experienced a reaction to a vaccine	(n = 605)		
Yes	76	12.6%	10.1% - 15.5%
No	524	86.6%	83.6% - 89.2%
Failed to answer	5	0.8%	0.3% - 2.0%
Think that vaccination is important	(n = 605)		
Yes	595	98.3	96.9% - 99.2%
No	8	1.3	0.6% - 2.7%
Failed to answer	2	0.4	0.1% - 1.3%
Vaccination coverage	(n = 475)		
Tetanus and diphtheria	355	74.7	70.5% - 78.5%
Yellow Fever	304	64.0	59.5% - 68.3%
Hepatitis B	443	93.3	90.5% - 95.3%
MMR	448	94.3	91.7% - 96.2%
Vaccination status up to date	214	45.1	40.5% - 49.7%

**Table 2.** Vaccination coverage among adolescents who presented their immunization record card by age group. Divinópolis, Minas Gerais, Brazil -September 2013 to February 2015.

Vaccination coverage	13 – 14 years n (%)	15 – 18 years n (%)	P value
Tetanus and diphtheria	303 (85.4%)	52 (14.6%)	p<0.01
Yellow Fever	211 (69.4%)	93 (30.6%)	p=0.20
Hepatitis B	319 (72%)	124 (28%)	p=0.25
MMR	325 (72.5%)	123 (27.5%)	p<0.05
Vaccination status up to date	181 (84.6%)	33 (15.4%)	p<0.01
Vaccination coverage	Fear of injections Yes	Fear of injections No	P value Test x2
Tetanus and diphtheria	178	259	p=0.48
Yellow Fever	110	191	p=0.03
Hepatitis B	178	259	p=0.48
MMR	182	261	p=0.15
Vaccination status up to date	73	139	p=0.01

**Table 3.** Number and percentage of adolescents from public schools who knew which diseases and infections are on the immunization record card by diseases/infection. Divinópolis, Minas Gerais, Brazil -September 2013 to February 2015.

Disease/infection	N	%	CI 95%
Yellow Fever	372	61.5	57.5% - 65.4%
Infantile paralysis	331	54.7	50.6% - 58.7%
Tetanus	270	44.6	40.6% - 48.7%
Hepatitis B	219	36.2	32.4% - 40.2%
Measles	208	34.4	30.6% - 38.3%
Rubella	132	21.8	18.6% - 25.4%
Meningitis	127	21.0	17.9% - 24.5%
Tuberculosis	74	12.2	9.8% - 15.2%
Mumps	67	11.1	8.7% - 13.9%
HPV	34	5.6	4.0% - 7.8%
Diseases that are not vaccination-preventable	131	21.7	18.5% - 25.2%
Didn't know	177	29.3	25.7% - 33.1%

**Table 4.** Forms of transmission of Hepatitis B according to adolescents from public schools in Divinópolis, Minas Gerais, Brazil -September 2013 to February 2015.

Variable*	N	%	CI 95%
Breast milk	105	17.4	14.5% - 20.7%
From mother to child	158	26.1	22.7% - 29.8%
Contaminated blood	265	43.8	39.8% - 47.9%
Tattoos and piercings	235	38.8	35.0% - 42.9%
Vaginal sex without condom	267	44.1	40.1% - 48.2%
Anal sex without condom	204	33.7	30.0% - 37.7%
Unprotected oral sex	176	29.1	25.5% - 32.9%
A sharp object	219	36.2	32.4% - 40.2%
Sharing contaminated needles and syringes	258	42.6	38.7% - 46.7%
Cocaine snorting straw	88	14.5	11.9% - 17.7%
Did not know	214	35.4	31.6% - 39.3%
Non transmittable types of Hepatitis B	242	40	36.1% - 44.0%

\* Participants were allowed to mention more than one alternative.

were given a letter informing their parents that their immunization record card was not up-to-date and requesting them to take their children to the FHS or care center closest to their home to be vaccinated.

A total of 2,283 adolescents from the ninth year and 556 from the eighth year participated in the health education actions, comprising all adolescents from all the ninth year classes present on the days the actions took place and some of the eighth year classes, at the request of the school principals. The themes comprised those most suggested by the adolescents on the interview guide: licit and illicit drugs (51.4%); STDs (50.6%), and family planning and contraceptive methods (45.8%).

The group activities lasted an average of 35 minutes. At the end of the group activities, the researchers offered to talk to participants on an individual basis and in some schools special attention was given to certain adolescents according to their own specific needs.

The group activity designed to promote participant interaction facilitated communication between the researchers and adolescents, arousing greater interest in the theme, thus fostering sharing and learning. The adolescents felt free to talk about their experiences and clarify doubts by asking questions when requested during both the group activities and individual sessions.

## Discussion

The findings of the present study show that the majority of participants were girls, presented an immunization record card, and thought that vaccination was important. Overall vaccination coverage was low (45.1%), with yellow fever and tetanus and diphtheria showing the lowest coverage rates (64.0% and 74.7%, respectively).

**Table 5.** Number of vaccine doses by vaccine and education region. Divinópolis, Minas Gerais, Brazil -September 2013 to February 2015.

Vaccine	Education region						Total
	Central	Northeast	Northwest	Southeast	Southwest	West	
Yellow Fever	420	80	159	145	237	93	1.134
Tetanus and diphtheria	189	36	62	86	63	22	458
Hepatitis B	141	16	62	44	55	26	344
MMR	16	5	7	12	13	2	55
Influenza	58	-	-	49	-	-	107
HPV	136	-	-	100	-	-	236

Vaccine adherence was greatest among the 10 to 14 year age group, which may be attributed to the following factors: health prevention practices directed at children; greater participation of the family in the health of lower age groups because during this phase adolescents tend to feel independent, meaning that they tend not to value actions directed towards risk and disease prevention and adolescent health protection<sup>10</sup>.

It is known that adolescents account for only a small proportion of PHC service users. A study that investigated health professionals' perceptions of the provision of PHC services to adolescents showed that they thought that services were flawed because they were not geared to the specific needs and characteristics of this group<sup>2</sup>.

A systematic literature review of factors influencing the completion of multi-dose adolescent vaccine schedules showed that the administration of vaccines in schools is associated with higher schedule completion rates, given that only a small proportion of adolescents seek care at health centers<sup>11</sup>.

Gaps still exist in the provision of health services to adolescents, impeding the resolution of health issues specific to this age group. Healthcare lacks a systematic approach and service delivery tends to be based on meeting spontaneous demands, showing that the organization of work with this age group leaves much to be desired<sup>5</sup>.

Data from the 2014 National Immunization Survey-Teen (NIS-Teen) conducted by the Centers for Disease Control and Prevention (CDC) with 20,827 adolescents aged between 13 and 17 years show that despite increases compared to the previous year, vaccination coverage for tetanus, diphtheria and acellular pertussis (dTpa), meningococcal disease, and human papillomavirus infection, remained under 80% (79.3%, 60.0%, and 41.7%, respectively)<sup>12</sup>.

Although 12.6% of the sample reported having adverse reactions following vaccination, the occurrence of these events is generally lower among adolescents<sup>13</sup>. It is assumed that the events reported by the adolescents of this study refer to local reactions such as pain at the site of injection, normally associated with the tetanus and diphtheria vaccine administered every 10 years.

Fear of injections is expected and considered normal during certain phases of development as a form of protection in people who feel at risk and there are situations in which fear interferes in the adolescent's daily decisions and activities<sup>14</sup>.

The results of the present study are similar to those found by research into vaccination cov-

erage among a group of adolescents from a municipal school in the State of Pará, which showed that 77.6% of interviewees confirmed having knowledge about the definition and utility of the vaccine, while only 7.47% had knowledge about the adolescent vaccine schedule<sup>15</sup>.

One factor that could explain the low rate of vaccination coverage among adolescents found by the present study is the lack of knowledge about the vaccines and communicable and vaccination-preventable diseases. Although almost 100% of the adolescents thought that vaccination was important, the large majority lacked knowledge about the vaccination schedule, mentioning, for example, being vaccinated against diseases or infections that are not vaccination-preventable, such as HIV-AIDS, syphilis, candidiasis, gonorrhoea, and herpes simplex, and vaccination against dengue fever, which is still not available on the public health system. A study conducted in the State of Piauí, found that 60.2% participants reported that they were unaware of the adolescent vaccine schedule<sup>16</sup>.

Corroborating the findings of the present study regarding knowledge of vaccines, previous studies reported that 48.6% of participants cited the yellow fever vaccine and only one-third were aware of both the hepatitis B and tetanus vaccines<sup>16,17</sup>. A study conducted in the State of Pará showed that only 26.87% of participants were aware of the existence of a vaccine against hepatitis B<sup>15</sup>, while a study carried out in Teresina found that hepatitis B was the third best-known vaccine after the rubella and yellow fever vaccines<sup>16</sup>. Greater knowledge about the rubella and yellow fever vaccines may be due to national campaigns against these diseases with widespread media coverage.

Studies conducted with adolescents in Paraná<sup>18</sup> and Piauí<sup>17</sup> also revealed lower vaccination coverage for hepatitis B in the 15 to 19 year age group, compared to the 10 to 14 year group, while research in China found that hepatitis B coverage among people under the age of 20 was 93.3%<sup>19</sup>.

Hepatitis B is one of the world's biggest public health problems, with 240 million people chronically infected with the virus. Around 2 billion people have been infected with the hepatitis B virus across the globe and approximately 780,000 people die each year from the disease. Rates of chronic infection are high in the State of Amazonas and some parts of Eastern and Central Europe. The virus is transmitted through contact with the blood or other body fluids of an infected person and via vertical transmission<sup>20,21</sup>.

Low hepatitis B vaccination coverage among adolescents is worrying, particularly in the 15 to 18 year age group. Bearing in mind that the hepatitis B vaccine was included on the NIP basic vaccine in 1997 for everyone under the age of one and expanded to the 1 to 19 years age group in 2001, it is clear that missed opportunities for vaccination continue to occur. Health professionals need to pay close attention to young people's immunization record cards and, at every opportunity, make the most of immunization information systems and offer all vaccines to those who are eligible<sup>12</sup>.

Given the greater exposure of this group to risk factors such as multiple sexual partners and irregular condom use, increasing vulnerability to sexually transmitted diseases, the use and abuse of alcohol and other drugs, and sense of invulnerability to diseases<sup>22</sup>, immunization of adolescents against hepatitis B is particularly important.

The findings show that population coverage of the FHS teams during the study period was approximately 25% and that vaccination coverage among adolescents aged between 13 and 18 years was 45.1%, showing lower than expected adherence to vaccine-preventable disease prevention actions. Although the extension program brought the children's and adolescents' immunization records up to date, these activities are known to be isolated. It is therefore vital to ensure systematic monitoring of the vaccination status of this group by health teams.

In light of the above, greater attention is needed on the part of health professionals to develop actions that foster the engagement of adolescents in risk and disease prevention and health promotion actions. By adopting a dynamic and proactive approach, the knowledge acquired through these actions helps adolescents develop greater autonomy and therefore become co-responsible for their own health. In this respect, it is necessary to consider incorporating monitoring and follow-up of adolescent vaccination into the everyday practice of PHC services.

## Conclusion

A process of social transformation was observed during the study and extension activities, expanding vaccination coverage among the children, adolescents, staff, and teachers of the 22 public schools to 91%. The activities also had an impact on the education of these age groups through the knowledge shared and acquired regarding the importance of immunization and communicable and vaccination-preventable diseases.

The school population and all those who participated in the cross-sectional study and extension interventions strengthened their attitudes towards risk and disease prevention in a process that should be ongoing, in which it is understood that health education should be permanent and built, throughout life, within workplace and social relations and between people throughout society. Continuous learning engenders new conceptions, attitudes, and possibilities in recreating one's own way of being and caring for oneself.

In this sense, undertaking this study with adolescents enabled knowledge of the factors associated with a preventive action, which is vaccination against communicable diseases in the proposed study setting, as well as vaccination intervention when necessary.

This study in conjunction with extension generates knowledge about a given object and the reality investigated, and also provides that interventions should be implemented to change this reality. This study demonstrates its social role not only in the generation of knowledge, but also through the effectiveness of the interventions in creating a positive impact on the results achieved.

This study provides important inputs to the field of health by demonstrating that the implementation of risk and disease prevention actions in settings outside the walls of the health center, such as schools, reinforces the concepts of a new way "doing health", based on the concept of health surveillance, and can change realities.



## Collaborations

SMF Viegas participated in study conception and design, data collection, analysis and interpretation, extension, drafting this manuscript, and in the critical revision and approval of the version submitted for publication. FC Sampaio participated in the study and extension activities, data analysis and interpretation, and in drafting this manuscript. PP Oliveira participated in the study and extension activities, data interpretation, and in drafting and the critical revision of this manuscript. FM Lanza participated in data analysis and interpretation and in drafting and the critical revision of this manuscript. VC Oliveira participated in the extension activities, data interpretation, and in drafting and the critical revision of this manuscript. WJ Santos participated in drafting and the critical revision of this manuscript.

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Article submitted 17/07/2016

Approved 23/01/2017

Final version submitted 25/01/2017