

**NATIONAL INSTITUTE OF MALARIOLOGY, PARASITOLOGY &  
ENTOMOLOGY (NIMPE)**



**REPORT FOR BASELINE SURVEY ON STHS  
INFECTION IN PRIMARY SCHOOL CHILDREN IN  
PHU THO, HOA BINH, THANH HOA AND NGHE AN  
PROVINCES IN 2016**

**(The survey was conducted and reported by NIMPE, the  
report is submitted to East Meets West Foundation)**

**HANOI, 2016**

# **Report for baseline survey on STHs infection in primary school children in Phu Tho, Hoa Binh, Thanh Hoa and Nghe An provinces in 2016**

## **1. BACKGROUND**

Viet Nam is located in tropical with climate conditions; living habits and environmental hygiene are favorable for the development and spread of the parasite. The parasitic worm disease has become a social diseases cause more harm long-term acute as well as affecting people's health, physical development of children and mentally, to reduce serious labor productivity and adverse impacts on the nutritional status of the community.

East Meets West Foundation (EMW) has been supported for Soil Transmitted Helminthiasis (STH) control four provinces namely Phu Tho, Hoa Binh, Thanh Hoa and Nghe An in Vietnam. More than 700.000 primary school-age (ages 6-11 years) children will be deworming 6 rounds (Mass Drug Administration) in three year 2016-2018.

For determining the effect of the STH control program in those provinces, NIMPE, EMW and Evidence Action will be conduct the baseline survey and final survey to assess the STH infection situation at before 1<sup>st</sup> MDA and before 6<sup>th</sup> MDA.

In May 2016, NIMPE conducted the survey in 16 primary schools in 4 provinces including Phu Tho, Hoa Binh, Thanh Hoa and Nghe An provinces.

## **2. MATERIALS AND METHODS**

### **2.1 Study location**

Four provinces including Phu Tho, Hoa Binh, Thanh Hoa and Nghe An provinces.

### **2.2 Duration of research**

May 2016

### **2.3 Research Methodology**

- Objective of the survey: Children in the primary school in 4 selected provinces in Vietnam.
- Provincial health staffs were random selected 4 districts in each province. Two main primary schools of 2 first districts were random choised base on the list of the name of all primary schools in the each district. In other two districts we purpose selected two primary schools, which have more than two sub-primary schools and have number pupils as least 50. All of the sellected main-primary and sub-primary schools located at rural area.
- Sample size: in each selected primary school, children were random selected according to sampling by NIMPE. About 50 children were random selected base on list of name of grade 3 first. Some school were not enough children in grade 3, the extra children from grade 4 at random selection, and some school was still not enough children, children in grade 5 were selected for survey.

**The information of the selected commune-primary school**

Province	District	Commune	Name of primary school	Name of main or sub school	Total pupil	Man	Female	Toilet	Washing area	Main or sub school
THANH HÓA	Hoàng Hóa	Hoàng Phương	Hoàng Phương	Hoàng Phương	291	165	126	1	1	Main school
	Nông Cống	Công Bình	Công Bình	Công Bình	293	147	146	2	0	Main school
	Như Thanh	Phượng Nghi	Phượng Nghi	Đông Phong	75	41	34	1	0	Sub school
	Như Xuân	Bình Lương	Bình Lương	Làng Mài	96	56	40	1	0	Sub school
HÒA BÌNH	Lạc Sơn	Tân Lập	Tân Lập	Tân Lập	546	300	246	1	0	Main school
	Tân Lạc	Ngọc Mỹ	Ngọc Mỹ	Ngọc Mỹ	473	275	198	1	1	Main school
	Mai Châu	Xăm Khòe	Xăm Khòe	Chi Pu	48	25	23	1	0	Sub school
				Xăm Khòe	152	72	80	1	1	Main school
	Đà Bắc	Hiền Lương	Hiền Lương	Mái Ngù, Rông, Oi	77	48	29	1	0	Sub school
PHÚ THỌ	Lâm Thao	Tiên Kiên	Tiên Kiên	Khu lẻ Tiên Kiên	82	34	48	1	1	Sub school
	Tam Nông	Thọ Văn	Thọ Văn	Thọ Văn	268	137	131	2	0	Main school
	Thanh Thủy	Đào Xá	Đào Xá	Đào Xá 1	518	277	241	2	0	Main school
	Thanh Sơn	Hương Cản	Hương Cản	Đông Quan	194	98	96	1	0	Sub school
NGHỆ AN	Tân Kỳ	Nghĩa Dũng	Dũng Hợp	Nghĩa Hợp và Thuận Yên	218	NA	NA	1	1	Sub school
	Đô Lương	Đại Sơn	Đại Sơn1	Đại Sơn 2	284	160	124	1	1	Main School
	Hung Nguyên	Hung Tân	Hung Tân	Hung Tân	821	401	420	1	1	Main school
	Quỳnh Lưu	Quỳnh Bá	Quỳnh Bá	Quỳnh Bá	361	167	194	1	1	Main school

- Cross-sectional descriptive survey.

- Examination by Kato-Katz method. Each sample 2 slides, taking the average value to calculate the prevalence and intensity of infection.
- All children in all schools be notified and the sampling bags from the previous day, the bags are labeled with full name, class, age, sex complete each grade. The next morning the samples were collected by homeroom teacher and NIMPE and the examination run in the field.
- Classification of degree of infection according to WHO (1998)

**Table 1. Classification of degree of STH infection**

Worm	Light (No.egg/g)	Median (No.egg/g)	Heavy (No.egg/g)
Ascaris	1 - 4.999	5.000 - 49.999	≥ 50.000
Trichuris	1 - 999	1.000 - 9.999	≥ 10.000
Hookworm	1 - 1.999	2.000 - 3.999	≥ 4.000

## 2.5 Treatment

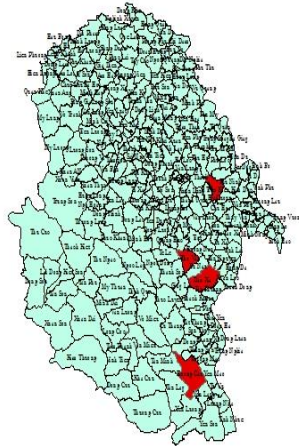
- Treatment: All the cases tested positive for any kind of worms that will be treated according to guidelines issued by the Ministry of Health and single dose Albendazole 400mg for any one in MDA campaign which were conducted after survey in May 2016.
- The term specimens after testing were treated in accordance with biosafety regulations and handling of medical waste.

**2.6 Data analysis:** The data of the survey were imported and analyzed with statistical software by Microsoft Excel and analyzed by Stata.

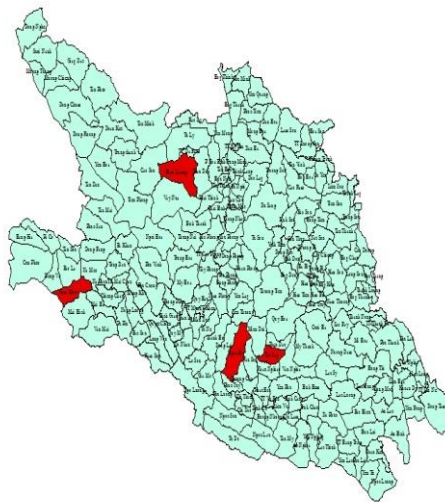
## 2.7 Map of the 4 provinces Phu Tho, Hoa Binh, Thanh Hoa and Nghe An

The places with red color are selected communes for the survey.

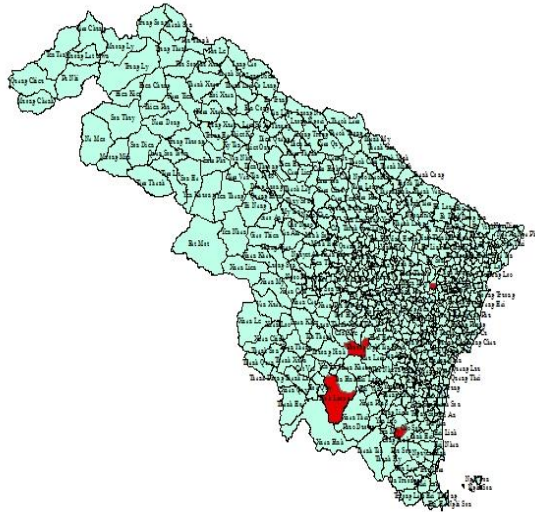
**Map 1. Phu Tho province**



**Map 2. Hoa Binh province**



**Map 3. Thanh Hoa province**



**Map 4. Nghe An province**



### 3. RESULTS

**Result of the survey on situation STHs of primary school children in four provinces in May, 2016**

#### 3.1. The results of the sth survey in Thanh Hoa province

Districts	Name of primary school	Name of main or sub school	Main or sub school	Total Examination	No. General STH infection	
					No. (+)	Percent (+)
Nhu Xuan	Binh Luong	Lang Mai	Sub school	50	12	24.00
Nong Cong	Cong Binh	Cong Binh	Main school	53	9	17.0
Hoang Hoa	Hoang Phuong	Hoang Phuong	Main school	52	2	3.9
Nhu Thanh	Phuong Nghi	Dong Phong	Sub school	53	14	26.4
<b>Total</b>				<b>208</b>	<b>37</b>	<b>17.8</b>

Data analysis of Kato-Katz fecal examination for primary school student:

Table 1: Stool sample collection process

Province	Date	District	No. Emitted plastic bags	No. Examined stool samples	No. Rejected stool samples
Thanh Hoa	19-21/4/2016	Nhu Xuan	155	50	0
	15-16/4/2016	Nong Cong	180	53	0
	13-14/4/2016	Hoang Hoa	150	52	0
	17-18/4/2016	Nhu Thanh	175	53	0
	<b>Total</b>			<b>660</b>	<b>208</b>

Table 2: Distribution of participant samples according to district

District	No. sample	Percent %
Nhu Xuan	50	25.00
Nong Cong	53	25.48
Hoang Hoa	52	25.48
Nhu Thanh	53	24.04
<b>Total</b>	<b>208</b>	<b>100.0</b>

Table 3: Distribution of participant samples according to grade

Grade	No. sample	Percent %
3	86	41.35
4	79	37.98
5	43	20.67
<b>Total</b>	<b>208</b>	<b>100.0</b>

Table 4: General STH infection rate of by provinces.

District	No samples	No. General STH infection	Percent	95 % CI
Nhu Xuan	50	12	24.00	0.119-0.360
Nong Cong	53	9	16.98	0.067-0.272
Hoang Hoa	52	2	3.85	-0.015-0.091
Nhu Thanh	53	14	26.40	0.144-0.385
<b>Total</b>	<b>208</b>	<b>37</b>	<b>17.79</b>	<b>0.125-0.230</b>
<b>Main school</b>	<b>105</b>	<b>11</b>	<b>10.48</b>	<b>0.046-0.164</b>
<b>Sub-school</b>	<b>103</b>	<b>26</b>	<b>25.24</b>	<b>0.167-0.337</b>

Table 5: Rate of helminth infection according to district.

District	No. sample Examination	Ascaris		Trichuris		Hookworm		Overall STH	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Nhu Xuan	50	0	0.00	12	24.00	0	0.00	12	24.00
Nong Cong	53	1	1.89	6	11.32	3	5.66	9	17.0
Hoang Hoa	52	0	0.00	2	3.85	0	0.00	2	3.9
Nhu Thanh	53	0	0.00	14	26.42	0	0.00	14	26.4
<b>Total</b>	<b>208</b>	<b>1</b>	<b>0.48</b>	<b>34</b>	<b>16.35</b>	<b>3</b>	<b>1.44</b>	<b>37</b>	<b>17.8</b>

Table 6: Intensity of Ascaris infection according to district

District	No. sample (+)	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Nhu Xuan	0	0	0.00	0	0.00	0	0.00
Nong Cong	1	1	100.0	0	0.00	0	0.00
Hoang Hoa	0	0	0.00	0	0.00	0	0.00
Nhu Thanh	0	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>1</b>	<b>1</b>	<b>100.0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 7: Intensity of Ascaris infection according to district

District	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Nhu Xuan	50	0	0.00	0	0.00	0	0.00
Nong Cong	53	1	1.89	0	0.00	0	0.00
Hoang Hoa	52	0	0.00	0	0.00	0	0.00
Nhu Thanh	53	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>208</b>	<b>1</b>	<b>0.48</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>



Table 8: Mean of Intensity of Ascaris infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Nhu Xuan	0	0	0	0	0	0	0	0
Nong Cong	1	1096	0	0	0	0	1	1096
Hoang Hoa	0	0	0	0	0	0	0	0
Nhu Thanh	0	0	0	0	0	0	0	0
<b>Total</b>	<b>1</b>	<b>1096</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1096</b>

Table 9: Intensity of Trichuris infection by district

District	No. sample	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Nhu Xuan	12	12	100.0	0	0.00	0	0.00
Nong Cong	6	6	100.0	0	0.00	0	0.00
Hoang Hoa	2	2	100.0	0	0.00	0	0.00
Nhu Thanh	14	14	100.0	0	0.00	0	0.00
<b>Total</b>	<b>34</b>	<b>34</b>	<b>100.0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 10: Intensity of Trichuris infection by district

District	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Nhu Xuan	50	12	24.00	0	0.00	0	0.00
Nong Cong	53	6	11.32	0	0.00	0	0.00
Hoang Hoa	52	2	3.85	0	0.00	0	0.00
Nhu Thanh	53	14	26.42	0	0.00	0	0.00
<b>Total</b>	<b>208</b>	<b>34</b>	<b>16.35</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 11: Mean of Intensity of Trichuris infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Nhu Xuan	12	92.67 $\pm$ 22.24	0	0	0	0	12	92.67 $\pm$ 22.24
Nong Cong	6	176 $\pm$ 86.31	0	0	0	0	6	176 $\pm$ 86.31
Hoang Hoa	2	96 $\pm$ 56	0	0	0	0	2	96 $\pm$ 56
Nhu Thanh	14	77.71 $\pm$ 26.23	0	0	0	0	14	77.71 $\pm$ 26.23
<b>Total</b>	<b>34</b>	<b>101.41 <math>\pm</math> 20.30</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>34</b>	<b>101.41 <math>\pm</math> 20.30</b>

Table 12: Intensity of Hookworm infection according to District

Provinces	No. sample	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Nhu Xuan	0	0	100.0	0	0.00	0	0.00
Nong Cong	3	3	100.0	0	0.00	0	0.00
Hoang Hoa	0	0	100.0	0	0.00	0	0.00
Nhu Thanh	0	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>3</b>	<b>3</b>	<b>100.0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 13: Intensity of Hookworm infection according to District

Provinces	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Nhu Xuan	50	0	100.0	0	0.00	0	0.00
Nong Cong	53	3	5.66	0	0.00	0	0.00
Hoang Hoa	52	0	100.0	0	0.00	0	0.00
Nhu Thanh	53	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>208</b>	<b>3</b>	<b>1.44</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 14: Mean of Intensity of Hookworm infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Nhu Xuan	0	0	0	0	0	0	0	0
Nong Cong	3	72 $\pm$ 21.16	0	0	0	0	3	72 $\pm$ 21.16
Hoang Hoa	0	0	0	0	0	0	0	0
Nhu Thanh	0	0	0	0	0	0	0	0
<b>Total</b>	<b>3</b>	<b>72<math>\pm</math>21.16</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>72<math>\pm</math>21.16</b>

Table 15: Rate of Ascaris infection in boys and girls by district

District	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Nhu Xuan	25	0	0.00	25	0	4.76
Nong Cong	24	0	0.00	29	1	0.00
Hoang Hoa	31	0	0.00	21	0	0.00
Nhu Thanh	34	0	0.00	19	0	0.00
<b>Total</b>	<b>114</b>	<b>0</b>	<b>0.00</b>	<b>94</b>	<b>1</b>	<b>1.06</b>

Table 16: Rate of Trichuris infection in boys and girls by district

District	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Nhu Xuan	25	7	28.00	25	5	20.00
Nong Cong	24	1	4.17	29	5	17.24
Hoang Hoa	31	1	3.23	21	1	4.76
Nhu Thanh	34	7	20.59	19	7	36.84
<b>Total</b>	<b>114</b>	<b>16</b>	<b>14.04</b>	<b>94</b>	<b>18</b>	<b>19.15</b>

Table 17: Rate of Hookworm infection in boys and girls by district

District	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Nhu Xuan	25	0	0.00	25	0	0.00
Nong Cong	24	1	4.17	29	2	6.89
Hoang Hoa	31	0	0.00	21	0	0.00
Nhu Thanh	34	0	0.00	19	0	0.00
<b>Total</b>	<b>114</b>	<b>1</b>	<b>0.88</b>	<b>94</b>	<b>2</b>	<b>2.13</b>

Table 18: Rate of general helminth infection in boys and girls by districts

Districts	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Nhu Xuan	25	7	28.00	25	5	20.00
Nong Cong	24	2	8.33	29	7	24.14
Hoang Hoa	31	1	3.23	21	1	4.76
Nhu Thanh	34	7	20.59	19	7	36.84
<b>Total</b>	<b>114</b>	<b>17</b>	<b>14.91</b>	<b>94</b>	<b>20</b>	<b>21.28</b>

Table 16. The rate of mix-infection of STH of SAC in Thanh Hoa

Districts	Total No. (+)	Infection with one kind of worm		Infection with two kinds of worms		Infection with three kinds of worms	
		No. (+)	(%)	No. (+)	(%)	No. (+)	(%)
Nhu Xuan	12	12	100.0	0	0.0	0	0.0
Nong Cong	9	7	77.8	2	22.2	0	0.0
Hoang Hoa	2	2	100.0	0	0.0	0	0.0
Nhu Thanh	14	14	100.0	0	0.0	0	0.0
<b>Total</b>	<b>37</b>	<b>35</b>	<b>94.59</b>	<b>2</b>	<b>5.41</b>	<b>0</b>	<b>0.0</b>

Table 20. The rate of mix-infection of STH of SAC in Thanh Hoa

Districts	Total Examination	Infection with one kind of worm	Infection with two kinds of worms	Infection with three kinds of worms
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		No. (+)	(%)	No. (+)	(%)	No. (+)	(%)
Nhu Xuan	50	12	24.0	0	0	0	0
Nong Cong	53	7	13.2	2	3.8	0	0
Hoang Hoa	52	2	3.8	0	0.0	0	0
Nhu Thanh	53	14	26.4	0	0.0	0	0
<b>Total</b>	<b>208</b>	<b>35</b>	<b>16.8</b>	<b>2</b>	<b>1.0</b>	<b>0</b>	<b>0</b>

### 3.2. The results of the sth survey in Hoa Binh province

Distrits	Name of primary school	Name of main or sub school	Main or sub school	Total Examination	No. General STH infection	
					No. (+)	Percent (+)
Lac Son	Tan Lap	Tan Lap	Main school	52	6	11.54
Tan Lac	Ngoc My	Ngoc My	Main school	51	3	5.88
Da Bac	Hien Luong	Rong	Sub school	15	0	0.00
		Oi	Sub school	18	2	11.11
		Mai Ngu	Sub school	17	1	5.88
Mai Chau	Xam Khoe	Xam Khoe	Main school	23	0	0.00
		Chi Pu	Sub school	27	1	3.70
<b>Total</b>				<b>203</b>	<b>13</b>	<b>6.40</b>

Table 1: Stool sample collection process

Province	Date	District	No. Emitted plastic bags	No. Examined stool samples	No. Rejected stool samples
Hoa Binh	13-14/4/2016	Lac Son	100	52	0
	15-16/4/2016	Tan Lac	175	51	0
	17-19/4/2016	Mai Chau	130	50	0
	20-21/4/2016	Da Bac	155	50	0
	<b>Total</b>			<b>560</b>	<b>203</b>

Table 2: Distribution of participant samples according to district

District	No. sample	Percent %
Lac Son	52	25.62
Tan Lac	51	25.12
Da Bac	50	24.63
Mai Chau	50	24.63
<b>Total</b>	<b>203</b>	<b>100.0</b>

Table 3: Distribution of participant samples according to grade

Grade	No. sample	Percent %
3	143	70.44
4	58	28.57
5	2	0.99
<b>Total</b>	<b>203</b>	<b>100.0</b>

Table 4: General helminth infection rate of by provinces.

District	No. sample	No. General infection	Percent	95% CI
Lac Son	52	6	11.54	0.027-0.203
Tan Lac	51	3	5.88	-0.007-0.124
Da Bac	50	3	6.00	-0.007-0.127
Mai Chau	50	1	2.00	-0.194-0.059
<b>Total</b>	<b>203</b>	<b>13</b>	<b>6.40</b>	<b>0.030-0.098</b>
<b>Main school</b>	<b>126</b>	<b>9</b>	<b>7.14</b>	<b>0.883-0.974</b>
<b>Sub school</b>	<b>77</b>	<b>4</b>	<b>5.19</b>	<b>0.001-0.102</b>

Table 5: Rate of helminth infection according to district.

District	No. sample	Ascaris		Trichuris		Hookworm		General STH infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lac Son	52	1	1.92	4	7.69	1	1.92	6	11.54
Tan Lac	51	0	0.00	2	3.92	1	1.96	3	5.88
Da Bac	50	0	0.00	2	4.00	1	2.00	3	6.00
Mai Chau	50	0	0.00	1	2.00	0	0.00	1	2.00
<b>Total</b>	<b>203</b>	<b>1</b>	<b>0.49</b>	<b>9</b>	<b>4.43</b>	<b>3</b>	<b>1.48</b>	<b>13</b>	<b>6.40</b>

Table 6: Intensity of Ascaris infection according to district

District	No. sample (+)	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lac Son	1	1	100.0	0	0.00	0	0.00
Tan Lac	0	0	0.00	0	0.00	0	0.00
Da Bac	0	0	0.00	0	0.00	0	0.00
Mai Chau	0	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>1</b>	<b>1</b>	<b>100.0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 7: Intensity of Ascaris infection according to district

District	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lac Son	52	1	1.92	0	0.00	0	0.00
Tan Lac	51	0	0.00	0	0.00	0	0.00
Da Bac	50	0	0.00	0	0.00	0	0.00
Mai Chau	50	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>203</b>	<b>1</b>	<b>0.49</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 8: Mean of Intensity of Ascaris infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Lac Son	1	2096	0	0	0	0	1	2096
Tan Lac	0	0	0	0	0	0	0	0
Da Bac	0	0	0	0	0	0	0	0
Mai Chau	0	0	0	0	0	0	0	0
<b>Total</b>	<b>1</b>	<b>2096</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2096</b>

Table 9: Intensity of Trichuris infection by district

District	No. samples (+)	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lac Son	4	4	100.0	0	0.00	0	0.00
Tan Lac	2	2	100.0	0	0.00	0	0.00
Da Bac	2	2	100.0	0	0.00	0	0.00
Mai Chau	1	1	100.0	0	0.00	0	0.00
<b>Total</b>	<b>9</b>	<b>9</b>	<b>100.0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 10: Intensity of Trichuris infection by district

District	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lac Son	52	4	7.69	0	0.00	0	0.00
Tan Lac	51	2	3.92	0	0.00	0	0.00
Da Bac	50	2	4.00	0	0.00	0	0.00
Mai Chau	50	1	2.00	0	0.00	0	0.00
<b>Total</b>	<b>203</b>	<b>9</b>	<b>4.43</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 11: Mean of Intensity of Trichuris infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Lac Son	4	180 $\pm$ 42.14	0	0	0	0	4	180 $\pm$ 42.14
Tan Lac	2	196 $\pm$ 4	0	0	0	0	2	196 $\pm$ 4
Da Bac	2	76 $\pm$ 4	0	0	0	0	2	76 $\pm$ 4
Mai Chau	1	296	0	0	0	0	1	296
<b>Total</b>	<b>9</b>	<b>173.33<math>\pm</math>28.03</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>173.33<math>\pm</math>28.03</b>

Table 12: Intensity of Hookworm infection according to District

Provinces	No. sample (+)	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lac Son	1	1	100.0	0	0.00	0	0.00
Tan Lac	1	1	100.0	0	0.00	0	0.00
Da Bac	1	1	100.0	0	0.00	0	0.00
Mai Chau	0	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>3</b>	<b>3</b>	<b>100.0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 13 : Intensity of Hookworm infection according to District

Provinces	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lac Son	52	1	1.92	0	0.00	0	0.00
Tan Lac	51	1	1.96	0	0.00	0	0.00
Da Bac	50	1	2.00	0	0.00	0	0.00
Mai Chau	50	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>203</b>	<b>3</b>	<b>1.48</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 14: Mean of Intensity of Hookworm infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Lac Son	1	40	0	0	0	0	1	40
Tan Lac	1	176	0	0	0	0	1	176
Da Bac	1	152	0	0	0	0	1	152
Mai Chau	0	0.00	0	0	0	0	0	0.00
<b>Total</b>	<b>3</b>	<b>122.67<math>\pm</math>41.9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>122.67<math>\pm</math>41.9</b>

Table 15: Rate of Ascaris infection in boys and girls by district

District	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Lac Son	31	0	0.00	21	1	4.76
Tan Lac	25	0	0.00	26	0	0.00
Da Bac	27	0	0.00	23	0	0.00
Mai Chau	26	0	0.00	24	0	0.00
<b>Total</b>	<b>109</b>	<b>0</b>	<b>0.00</b>	<b>94</b>	<b>1</b>	<b>1.06</b>

Table 16: Rate of Trichuris infection in boys and girls by district

Provinces	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Lac Son	31	3	9.68	21	1	4.76
Tan Lac	25	1	4.00	26	1	3.85
Da Bac	27	0	0.00	23	2	8.70
Mai Chau	26	1	3.85	24	0	0.00
<b>Total</b>	<b>109</b>	<b>5</b>	<b>4.59</b>	<b>94</b>	<b>4</b>	<b>4.26</b>

Table 17: Rate of Hookworm infection in boys and girls by district

District	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Lac Son	31	1	3.23	21	0	0.00
Tan Lac	25	1	4.00	26	0	0.00
Da Bac	27	1	3.70	23	0	0.00
Mai Chau	26	0	0.00	24	0	0.00
<b>Total</b>	<b>109</b>	<b>3</b>	<b>2.75</b>	<b>94</b>	<b>0</b>	<b>0.00</b>

Table 18: Rate of general helminth infection in boys and girls by districts

Districts	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Lac Son	31	4	12.90	21	2	9.52
Tan Lac	25	2	8.00	26	1	3.85
Da Bac	27	1	3.70	23	2	8.70
Mai Chau	26	1	3.85	24	0	0.00
<b>Total</b>	<b>109</b>	<b>8</b>	<b>7.34</b>	<b>94</b>	<b>5</b>	<b>5.32</b>



Table 19. The rate of mix-infection of STH of SAC in Hoa Binh

Distrits	Total No. (+)	Infection with one kind of worm		Infection with two kinds of worms		Infection with three kinds of worms	
		No. (+)	(%)	No. (+)	(%)	No. (+)	(%)
Lac Son	6	6	100.0	0	0.0	0	0.0
Tan Lac	3	3	100.0	0	0.0	0	0.0
Da Bac	3	3	100.0	0	0.0	0	0.0
Mai Chau	1	1	100.0	0	0.0	0	0.0
<b>Total</b>	<b>13</b>	<b>13</b>	<b>100.0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>

Table 20. The rate of mix-infection of STH of SAC in Hoa Binh

Distrits	Total Examination	Infection with one kind of worm		Infection with two kinds of worms		Infection with three kinds of worms	
		No. (+)	(%)	No. (+)	(%)	No. (+)	(%)
Lac Son	52	6	11.5	0	0	0	0
Tan Lac	51	3	5.9	0	0	0	0
Da Bac	50	3	6.0	0	0	0	0
Mai Chau	50	1	2.0	0	0	0	0
<b>Total</b>	<b>203</b>	<b>13</b>	<b>6.4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

### 3.3. The results of the survey in Phu Tho province

Distrits	Name of primary school	Name of main or sub school	Main or sub school	Total Examination	No. General STH infection	
					No. (+)	Percent (+)
Lam Thao	Tien Kien	Khu le	Sub school	50	6	12.00

Tam Nong	Tho Van	Tho Van	Main school	53	14	26.42
Thanh Thuy	Đao Xa	Dao Xa 1	Main school	51	12	23.53
Thanh Son	Huong Can	Dong Quan	Sub school	56	18	32.14
<b>Total</b>				<b>210</b>	<b>50</b>	<b>23.81</b>

Table 1: Stool sample collection process

Province	Date	District	No. Emitted plastic bags	No. Examined stool samples	No. Rejected stool samples
Phu Tho	13-14/4/2016	Lam Thao	135	50	0
	15-16/4/2016	Tam Nong	154	53	0
	17-18/4/2016	Thanh Thuy	140	51	0
	19-21/4/2016	Thanh Son	176	56	0
	<b>Tổng</b>			<b>605</b>	<b>210</b>

Table 2: Distribution of participant samples according to district

District	No. samples	Percent %
Lam Thao	50	23.81
Tam Nong	53	25.24
Thanh Thuy	51	24.29
Thanh Son	56	26.67
<b>Total</b>	<b>210</b>	<b>100.00</b>

Table 3: Distribution of participant samples according to grade

Grade	No. sample	Percent %
3	154	73.33
4	42	20.00
5	14	6.67
<b>Total</b>	<b>210</b>	<b>100.0</b>

Table 4: General STH infection rate of by provinces.

District	No. sample	No. General infection	Percent	95% CI
Lam Thao	50	6	12.00	0.028-0.212
Tam Nong	53	14	26.42	0.144-0.385
Thanh Thuy	51	12	23.53	0.117-0.354
Thanh Son	56	18	32.14	0.197-0.446

<b>Total</b>	<b>210</b>	<b>50</b>	<b>23.90</b>	<b>0.180-0.296</b>
<b>Main school</b>	<b>104</b>	<b>26</b>	<b>25.00</b>	<b>0.165-0.334</b>
<b>Sub school</b>	<b>106</b>	<b>24</b>	<b>22.64</b>	<b>0.145-0.307</b>

Table 5: Rate of helminth infection according to district.

District	No. sample	Ascaris		Trichuris		Hookworm		STH infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lam Thao	50	2	4.00	3	6.00	2	4.00	6	12.00
Tam Nong	53	1	1.89	13	24.53	3	5.66	14	26.42
Thanh Thuy	51	0	0.00	12	23.53	0	0.00	12	23.53
Thanh Son	56	6	10.71	15	26.79	0	0.00	18	32.14
<b>Total</b>	<b>210</b>	<b>9</b>	<b>4.29</b>	<b>43</b>	<b>20.48</b>	<b>5</b>	<b>2.38</b>	<b>50</b>	<b>23.90</b>

Table 6: Intensity of Ascaris infection according to district

District	No. sample (+)	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lam Thao	2	2	100.0	0	0.00	0	0.00
Tam Nong	1	1	100.0	0	0.00	0	0.00
Thanh Thuy	0	0	0.00	0	0.00	0	0.00
Thanh Son	6	4	66.67	2	33.33	0	0.00
<b>Total</b>	<b>9</b>	<b>7</b>	<b>77.78</b>	<b>2</b>	<b>22.22</b>	<b>0</b>	<b>0.00</b>

Table 7 : Intensity of Ascaris infection according to district

District	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lam Thao	50	2	4.00	0	0.00	0	0.00
Tam Nong	53	1	1.89	0	0.00	0	0.00
Thanh Thuy	51	0	0.00	0	0.00	0	0.00
Thanh Son	56	4	7.14	2	3.57	0	0.00
<b>Total</b>	<b>210</b>	<b>7</b>	<b>3.33</b>	<b>2</b>	<b>0.95</b>	<b>0</b>	<b>0.00</b>

Table 8: Mean of Intensity of Ascaris infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Lam Thao	2	1680 $\pm$ 1632	0	0	0	0	2	1680 $\pm$ 1632
Tam Nong	1	336	0	0	0	0	1	336

Thanh Thuy	0	0	0	0	0	0	0	0
Thanh Son	4	816±285.73	2	21536±10416	0	0	6	7722.67±51 32.87
<b>Total</b>	<b>7</b>	<b>994.28±431.15</b>	<b>2</b>	<b>21536±10416</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>5559.1±3498.37</b>

Table 9: Intensity of Trichuris infection by district

District	No. sample (+)	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lam Thao	3	3	100.0	0	0.00	0	0.00
Tam Nong	13	13	100.0	0	0.00	0	0.00
Thanh Thuy	12	11	91.66	1	8.33	0	0.00
Thanh Son	15	15	100.0	0	0.00	0	0.00
<b>Total</b>	<b>43</b>	<b>42</b>	<b>97.67</b>	<b>1</b>	<b>2.33</b>	<b>0</b>	<b>0.00</b>

Table 10: Intensity of Trichuris infection by district

District	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lam Thao	50	3	6.00	0	0.00	0	0.00
Tam Nong	53	13	24.53	0	0.00	0	0.00
Thanh Thuy	51	11	21.57	1	1.96	0	0.00
Thanh Son	56	15	26.79	0	0.00	0	0.00
<b>Total</b>	<b>210</b>	<b>42</b>	<b>20.00</b>	<b>1</b>	<b>0.48</b>	<b>0</b>	<b>0.00</b>

Table 11: Mean of Intensity of Trichuris infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean ± SD	No. sample (+)	Mean ± SD	No. sample (+)	Mean ± SD	No. sample (+)	Mean ± SD
Lam Thao	3	152±72.59	0	0	0	0	3	152±72.59
Tam Nong	13	178.46±41.79	0	0	0	0	13	178.46±41.79
Thanh Thuy	11	242.18±91.79	1	1640	0	0	12	358.67±143.49
Thanh Son	15	155.2±31.31	0	0	0	0	15	155.2±31.31
<b>Total</b>	<b>42</b>	<b>184.95±29.41</b>	<b>1</b>	<b>1640</b>	<b>0</b>	<b>0</b>	<b>43</b>	<b>218.79±44.38</b>

Table 12: Intensity of Hookworm infection according to District

Provinces	No. sample (+)	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lam Thao	2	2	100.0	0	0.00	0	0.00
Tam Nong	3	3	100.0	0	0.00	0	0.00

Thanh Thuy	0	0	0.00	0	0.00	0	0.00
Thanh Son	0	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>5</b>	<b>5</b>	<b>100.0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 13: Intensity of Hookworm infection according to District

Provinces	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Lam Thao	50	2	4.00	0	0.00	0	0.00
Tam Nong	53	3	5.66	0	0.00	0	0.00
Thanh Thuy	51	0	0.00	0	0.00	0	0.00
Thanh Son	56	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>210</b>	<b>5</b>	<b>2.38</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 11: Mean of Intensity of Hookworm infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Lam Thao	2	68 $\pm$ 12	0	0	0	0	2	68 $\pm$ 12
Tam Nong	3	45.33 $\pm$ 19.22	0	0	0	0	3	45.33 $\pm$ 19.22
Thanh Thuy	0	0	0	0	0	0	0	0
Thanh Son	0	0	0	0	0	0	0	0
<b>Total</b>	<b>5</b>	<b>54<math>\pm</math> 12.4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>54<math>\pm</math> 12.4</b>

Table 12: Rate of Ascaris infection in boys and girls by district

District	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Lam Thao	22	1	4.55	28	1	3.57
Tam Nong	25	1	4.00	28	0	0.00
Thanh Thuy	21	0	0.00	30	0	0.00
Thanh Son	29	1	3.45	27	5	18.52
<b>Total</b>	<b>97</b>	<b>3</b>	<b>3.09</b>	<b>113</b>	<b>6</b>	<b>5.31</b>

Table 13: Rate of Trichuris infection in boys and girls by district

Provinces	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Lam Thao	22	0	0.00	28	3	10.71
Tam Nong	25	6	24.00	28	7	25.00
Thanh Thuy	21	6	28.57	30	6	20.00
Thanh Son	29	9	31.03	27	6	22.22

<b>Total</b>	<b>97</b>	<b>21</b>	<b>21.65</b>	<b>113</b>	<b>22</b>	<b>19.47</b>
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Table 14: Rate of Hookworm infection in boys and girls by district

District	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Lam Thao	22	1	4.55	28	1	3.57
Tam Nong	25	2	8.00	28	1	3.57
Thanh Thuy	21	0	0.00	30	0	0.00
Thanh Son	29	0	0.00	27	0	0.00
<b>Total</b>	<b>97</b>	<b>3</b>	<b>3.09</b>	<b>113</b>	<b>2</b>	<b>1.77</b>

Table 15: Rate of general helminth infection in boys and girls by districts

Districts	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Lam Thao	22	2	9.09	28	4	14.29
Tam Nong	25	7	28.00	28	7	25.00
Thanh Thuy	21	6	28.57	30	6	20.00
Thanh Son	29	10	34.48	27	8	29.63
<b>Total</b>	<b>97</b>	<b>25</b>	<b>25.77</b>	<b>113</b>	<b>25</b>	<b>22.12</b>

Table 16. The rate of mix-infection of STH of SAC in Phu Tho

Districts	Total No. (+)	Infection with one kind of worm		Infection with two kinds of worms		Infection with three kinds of worms	
		No. (+)	(%)	No. (+)	(%)	No. (+)	(%)
Lam Thao	6	5	83.33	1	16.67	0	0.00
Tam Nong	14	12	85.71	1	7.14	1	7.14
Thanh Thuy	12	12	100.0	0	0.00	0	0.00
Thanh Son	18	15	83.33	3	16.67	0	0.00
<b>Tổng</b>	<b>50</b>	<b>44</b>	<b>88.00</b>	<b>5</b>	<b>10.00</b>	<b>1</b>	<b>2.00</b>

Table 17. The rate of mix-infection of STH of SAC in Phu Tho

Districts	Total examination	Infection with one kind of worm		Infection with two kinds of worms		Infection with three kinds of worms	
		No. (+)	(%)	No. (+)	(%)	No. (+)	(%)
Lam Thao	50	5	10.0	1	2.0	0	0.0
Tam Nong	53	12	22.6	1	1.9	1	1.9

Thanh Thuy	51	12	23.5	0	0.0	0	0.0
Thanh Son	56	15	26.8	3	5.4	0	0.0
<b>Tổng</b>	<b>210</b>	<b>44</b>	<b>21.0</b>	<b>5</b>	<b>2.4</b>	<b>1</b>	<b>0.5</b>

#### 4. The results of the sth survey in Nghe An province

Distrits	Name of primary school	Name of main or sub school	Main or sub school	Total Examination	No. General STH infection	
					No. (+)	Percent (+)
Do Luong	Dai Son	Dai Son 2	Main school	52	4	7.69
Tan Ky	Dung Hop	Nghia Hop	Sub school	33	8	24.24
		Thuan Yen	Sub school	21	7	33.33
Hung Nguyen	Hung Tan	Hung Tan	Main school	54	1	1.85
Quynh Ba	Quynh Ba	Quynh Ba	Main school	51	1	1.96
<b>Total</b>				<b>211</b>	<b>21</b>	<b>10.0</b>

Table 1: Stool sample collection process

Province	Date	District	No. Emitted plastic bags	No. Examined stool samples	No. Rejected stool samples
Nghe An	13-15/4/2016	Tan Ky	120	54	0
	16-17/4/2016	Do Luong	100	52	0
	18-19/4/2016	Hung Nguyen	180	54	0
	20-21/4/2016	Quynh Ba	150	51	0
	<b>Total</b>			<b>550</b>	<b>211</b>

Table 2: Distribution of participant samples according to district

District	No. sample	Percent %
Do Luong	52	24.64
Tan Ky	54	25.59
Hung Nguyen	54	25.59
Quynh Ba	51	24.17
<b>Total</b>	<b>211</b>	<b>100.0</b>

Table 3: Distribution of participant samples according to grade

Grade	No. sample	Percent %
3	120	56.87
4	91	43.13
5	0	0.00
<b>Total</b>	<b>211</b>	<b>100.0</b>

Table 4: General helminth infection rate of by provinces.

District	No. sample	No. General infection	Percent	95% CI
Do Luong	52	4	7.69	0.003-0.150
Tan Ky	54	15	27.78	0.156-0.399
Hung Nguyen	54	1	1.85	-0.018-0.055
Quynh Ba	51	1	1.96	-0.019-0.058
<b>Total</b>	<b>211</b>	<b>21</b>	<b>9.95</b>	<b>0.059-0.140</b>
<b>Main school</b>	<b>157</b>	<b>6</b>	<b>3.82</b>	<b>0.932-0.992</b>
<b>Sub school</b>	<b>54</b>	<b>15</b>	<b>27.78</b>	<b>0.156-0.399</b>

Table 5: Rate of helminth infection according to district.

District	No. sample	Ascaris		Trichuris		Hookworm		STH infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Do Luong	52	0	0.00	4	7.69	3	5.77	4	7.69
Tan Ky	54	6	11.11	10	18.52	3	5.56	15	27.78
Hung Nguyen	54	0	0.00	1	1.85	0	0.00	1	1.85
Quynh Ba	51	1	1.96	1	1.96	0	0.00	1	1.96
<b>Total</b>	<b>211</b>	<b>7</b>	<b>3.32</b>	<b>16</b>	<b>7.58</b>	<b>6</b>	<b>2.84</b>	<b>21</b>	<b>10.0</b>

Table 6: Intensity of Ascaris infection according to district

District	No. sample (+)	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Do Luong	0	0	0.00	0	0.00	0	0.00
Tan Ky	6	3	50.0	3	50.0	0	0.00
Hung Nguyen	0	0	0.00	0	0.00	0	0.00
Quynh Ba	1	0	0	1	100.0	0	0.00
<b>Total</b>	<b>7</b>	<b>3</b>	<b>42.86</b>	<b>4</b>	<b>57.14</b>	<b>0</b>	<b>0.00</b>



Table 7: Intensity of Ascaris infection according to district

District	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Do Luong	52	0	0.00	0	0.00	0	0.00
Tan Ky	54	3	5.66	3	5.56	0	0.00
Hung Nguyen	54	0	0.00	0	0.00	0	0.00
Quynh Ba	51	0	0.00	1	1.96	0	0.00
<b>Total</b>	<b>211</b>	<b>3</b>	<b>1.42</b>	<b>4</b>	<b>1.90</b>	<b>0</b>	<b>0.00</b>

Table 8: Mean of Intensity of Ascaris infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Do Luong	0	0	0	0	0	0	0	0
Tan Ky	3	266.67 $\pm$ 12.68	3	12981 $\pm$ 3679	0	0	6	6624 $\pm$ 3285.98
Hung Nguyen	0	0	0	0	0	0	0	0
Quynh Ba	0	0	1	8376	0	0	1	8376
<b>Total</b>	<b>3</b>	<b>266.67<math>\pm</math>186.89</b>	<b>4</b>	<b>11830<math>\pm</math>2845</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>6874.28<math>\pm</math>2788.41</b>

Table 9: Intensity of Trichuris infection by district

District	No. sample (+)	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Do Luong	4	4	100.0	0	0.00	0	0.00
Tan Ky	10	10	100.0	0	0.00	0	0.00
Hung Nguyen	1	1	100.0	0	8.33	0	0.00
Quynh Ba	1	0	0.00	1	100.0	0	0.00
<b>Total</b>	<b>16</b>	<b>15</b>	<b>93.75</b>	<b>1</b>	<b>6.25</b>	<b>0</b>	<b>0.00</b>

Table 10: Intensity of Trichuris infection by district

District	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Do Luong	52	4	7.69	0	0.00	0	0.00
Tan Ky	54	10	18.52	0	0.00	0	0.00
Hung Nguyen	54	1	1.85	0	0.00	0	0.00
Quynh Ba	51	0	0.00	1	1.96	0	0.00
<b>Total</b>	<b>211</b>	<b>15</b>	<b>7.11</b>	<b>1</b>	<b>0.47</b>	<b>0</b>	<b>0.00</b>

Table 11: Mean of Intensity of Trichuris infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Do Luong	4	46 $\pm$ 27.78	0	0	0	0	4	46 $\pm$ 27.78
Tan Ky	10	60 $\pm$ 11.26	0	0	0	0	10	60 $\pm$ 11.26
Hung Nguyen	1	16	0	0	0	0	1	16
Quynh Ba	0	0	1	2536	0	0	1	2356
<b>Total</b>	<b>15</b>	<b>53.33 <math>\pm</math> 10.40</b>	<b>1</b>	<b>2536</b>	<b>0</b>	<b>0</b>	<b>16</b>	<b>208.5 <math>\pm</math> 155.47</b>

Table 12: Intensity of Hookworm infection according to District

Provinces	No. sample	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Do Luong	3	3	100.0	0	0.00	0	0.00
Tan Ky	3	3	100.0	0	0.00	0	0.00
Hung Nguyen	0	0	0.00	0	0.00	0	0.00
Quynh Ba	0	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>6</b>	<b>6</b>	<b>100.0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 13 : Intensity of Hookworm infection according to District

Provinces	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Do Luong	52	3	5.77	0	0.00	0	0.00
Tan Ky	54	3	5.56	0	0.00	0	0.00
Hung Nguyen	54	0	0.00	0	0.00	0	0.00
Quynh Ba	51	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>211</b>	<b>6</b>	<b>2.84</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 14: Mean of Intensity of Hookworm infection according to district

District	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Do Luong	3	42.67 $\pm$ 10.67	0	0	0	0	3	42.67 $\pm$ 10.67
Tan Ky	3	96 $\pm$ 60.39	0	0	0	0	3	96 $\pm$ 60.39
Hung Nguyen	0	0	0	0	0	0	0	0
Quynh Ba	0	0	0	0	0	0	0	0
<b>Total</b>	<b>6</b>	<b>69.33 <math>\pm</math> 29.9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>69.33 <math>\pm</math> 29.90</b>

Table 15: Rate of Ascaris infection in boys and girls by district

District	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Do Luong	25	0	0.00	27	0	0.00
Tan Ky	33	4	12.12	21	2	9.52
Hung Nguyen	25	0	0.00	29	0	0.00
Quynh Ba	24	1	4.17	27	0	0.00
<b>Total</b>	<b>97</b>	<b>3</b>	<b>3.09</b>	<b>113</b>	<b>6</b>	<b>5.31</b>

Table 16: Rate of Trichuris infection in boys and girls by district

Provinces	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Do Luong	25	1	4.00	27	3	11.11
Tan Ky	33	4	12.12	21	6	28.57
Hung Nguyen	25	1	4.00	29	0	0.00
Quynh Ba	24	1	4.17	27	0	0.00
<b>Total</b>	<b>107</b>	<b>7</b>	<b>6.54</b>	<b>104</b>	<b>9</b>	<b>8.65</b>

Table 17: Rate of Hookworm infection in boys and girls by district

District	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Do Luong	25	1	4.00	27	2	7.41
Tan Ky	33	2	6.06	21	1	4.76
Hung Nguyen	25	0	0.00	29	0	0.00
Quynh Ba	24	0	0.00	27	0	0.00
<b>Total</b>	<b>107</b>	<b>3</b>	<b>2.80</b>	<b>104</b>	<b>3</b>	<b>2.88</b>

Table 18: Rate of general helminth infection in boys and girls by districts

Districts	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Do Luong	25	1	4.00	27	3	11.11
Tan Ky	33	8	24.24	21	7	33.33
Hung Nguyen	25	1	4.00	29	0	0.00
Quynh Ba	24	1	4.17	27	0	0.00
<b>Total</b>	<b>107</b>	<b>11</b>	<b>10.28</b>	<b>104</b>	<b>10</b>	<b>9.62</b>

Table 19. The rate of mix-infection of STH of SAC in Nghe An

Distrits	Total No. (+)	Infection with one kind of worm		Infection with two kinds of worms		Infection with three kinds of worms	
		No. (+)	(%)	No. (+)	(%)	No. (+)	(%)
Do Luong	4	1	25.0	3	75.0	0	0.0
Tan Ky	15	11	73.3	4	26.7	0	0.0
Hung Nguyen	1	1	100.0	0	0.0	0	0.0
Quynh Ba	1	0	0.0	1	100.0	0	0.0
<b>Tổng</b>	<b>21</b>	<b>13</b>	<b>61.9</b>	<b>8</b>	<b>38.1</b>	<b>0</b>	<b>0.0</b>

Table 20. The rate of mix-infection of STH of SAC in Nghe An

Distrits	Total Examination	Infection with one kind of worm		Infection with two kinds of worms		Infection with three kinds of worms	
		No. (+)	(%)	No. (+)	(%)	No. (+)	(%)
Do Luong	54	1	1.9	3	5.6	0	0
Tan Ky	52	11	21.2	4	7.7	0	0
Hung Nguyen	54	1	1.9	0	0.0	0	0
Quynh Ba	51	0	0.0	1	2.0	0	0
<b>Tổng</b>	<b>211</b>	<b>13</b>	<b>6.2</b>	<b>8</b>	<b>3.8</b>	<b>0</b>	<b>0</b>

### 3.5. The results of the 1st round of survey (4 provinces)

Data analysis of fecal examination for primary school children

Table 1: Distribution of participant samples according to provinces

Provinces	No. sample	Percent %
Thanh Hoa	208	25.00
Hoa Binh	203	24.40
Phu Tho	210	25.24
Nghe An	211	25.36
<b>Total</b>	<b>832</b>	<b>100.0</b>

Table 2: Distribution of participant samples according to grade

Grade	No. sample	Percent %
3	503	60.46
4	270	32.45
5	59	7.09
<b>Total</b>	<b>832</b>	<b>100.0</b>

Table 3: General STH infection rate of by provinces.

Provinces	No. sample	No. General infection	Percent %	95% CI
Thanh Hoa	208	37	17.79	0.126-0.230
Hoa Binh	203	13	6.40	0.030-0.098
Phu Tho	210	50	23.90	0.180-0.296
Nghe An	211	21	9.95	0.589-0.140
<b>Total</b>	<b>832</b>	<b>121</b>	<b>14.54</b>	<b>0.121-0.169</b>

Table 4: Rate of helminth infection according to provinces.

Provinces	No. sample	Ascaris		Trichuris		Hookworm		STH infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Thanh Hoa	208	1	0.48	34	16.35	3	1.44	37	17.8
Hoa Binh	203	1	0.49	9	4.43	3	1.48	13	6.40
Phu Tho	210	9	4.29	43	20.48	5	2.38	50	23.9
Nghe An	211	7	3.32	16	7.58	6	2.84	21	10.0
<b>Total</b>	<b>832</b>	<b>18</b>	<b>2.16</b>	<b>102</b>	<b>12.26</b>	<b>17</b>	<b>2.04</b>	<b>121</b>	<b>14.5</b>

Table 5: Intensity of Ascaris infection according to provinces

Provinces	No. sample (+)	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Thanh Hoa	1	1	100.0	0	0.00	0	0.00
Hoa Binh	1	1	100.0	0	0.00	0	0.00
Phu Tho	9	7	77.78	2	22.22	0	0.00
Nghe An	7	3	42.86	4	57.14	0	0.00
<b>Total</b>	<b>18</b>	<b>12</b>	<b>66.67</b>	<b>6</b>	<b>33.33</b>	<b>0</b>	<b>0.00</b>

Table 6 : Intensity of Ascaris infection according to provinces

Provinces	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Thanh Hoa	208	1	0.48	0	0.00	0	0.00
Hoa Binh	203	1	0.49	0	0.00	0	0.00
Phu Tho	210	7	3.33	2	0.95	0	0.00
Nghe An	211	3	1.42	4	1.90	0	0.00
<b>Total</b>	<b>832</b>	<b>12</b>	<b>1.44</b>	<b>6</b>	<b>0.72</b>	<b>0</b>	<b>0.00</b>

Table 7: Mean of Intensity of Ascaris infection according to provinces

Provinces	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Thanh Hoa	1	1096	0	0	0	0	1	1096
Hoa Binh	1	2096	0	0	0	0	1	2096
Phu Tho	7	994.28 $\pm$ 431.15	2	21536 $\pm$ 10416	0	0	9	5559.11 $\pm$ 3498.37
Nghe An	3	266.67 $\pm$ 186.891	4	11830 $\pm$ 2845	0	0	7	6874.28 $\pm$ 2788.41
<b>Total</b>	<b>12</b>	<b>912.67 <math>\pm</math> 285.36</b>	<b>6</b>	<b>15065 <math>\pm</math> 3828</b>	<b>0</b>	<b>0</b>	<b>18</b>	<b>5630.22 <math>\pm</math> 2022.47</b>

Table 8: Intensity of Trichuris infection by provinces

Provinces	No. sample	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Thanh Hoa	34	34	100.0	0	0.00	0	0.00
Hoa Binh	9	9	100.0	0	0.00	0	0.00
Phu Tho	43	42	97.67	1	2.33	0	0.00
Nghe An	16	15	93.75	1	6.25	0	0.00
<b>Total</b>	<b>102</b>	<b>100</b>	<b>98.04</b>	<b>2</b>	<b>1.96</b>	<b>0</b>	<b>0.00</b>

Table 9: Intensity of Trichuris infection by provinces

Provinces	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Thanh Hoa	208	34	16.35	0	0.00	0	0.00
Hoa Binh	203	9	4.43	0	0.00	0	0.00
Phu Tho	210	42	20.00	1	0.48	0	0.00
Nghe An	211	15	7.11	1	0.47	0	0.00
<b>Total</b>	<b>832</b>	<b>100</b>	<b>12.02</b>	<b>2</b>	<b>0.24</b>	<b>0</b>	<b>0.00</b>

Table 10: Mean of Intensity of Trichuris infection according to provinces

Provinces	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Thanh Hoa	34	101.41 $\pm$ 2030	0	0	0	0	34	101.41 $\pm$ 2030
Hoa Binh	9	173.33 $\pm$ 28.03	0	0	0	0	9	173.33 $\pm$ 28.03
Phu Tho	42	184.95 $\pm$ 29.41	1	1640	0	0	43	218.79 $\pm$ 44.38
Nghe An	15	53.33 $\pm$ 10.40	1	2536	0	0	16	208.5 $\pm$ 155.47
<b>Total</b>	<b>100</b>	<b>135.76 <math>\pm</math> 15.20</b>	<b>2</b>	<b>2088 <math>\pm</math> 448</b>	<b>0</b>	<b>0</b>	<b>102</b>	<b>174.03 <math>\pm</math> 31.41</b>

Table 11: Intensity of Hookworm infection according to provinces

Provinces	No. sample	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Thanh Hoa	3	3	100.0	0	0.00	0	0.00
Hoa Binh	3	3	100.0	0	0.00	0	0.00
Phu Tho	5	5	100.0	0	0.00	0	0.00
Nghe An	6	6	100.0	0	0.00	0	0.00
<b>Total</b>	<b>17</b>	<b>17</b>	<b>100.0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 12: Intensity of Hookworm infection according to provinces

Provinces	No. sample Examination	Light infection		Medium infection		Heavy infection	
		No. (+)	Percent (+)	No. (+)	Percent (+)	No. (+)	Percent (+)
Thanh Hoa	208	3	1.44	0	0.00	0	0.00

Hoa Binh	203	3	1.48	0	0.00	0	0.00
Phu Tho	210	5	2.38	0	0.00	0	0.00
Nghe An	211	6	2.84	0	0.00	0	0.00
<b>Total</b>	<b>832</b>	<b>17</b>	<b>2.04</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>

Table 13: Mean of Intensity of Hookworm infection according to provinces

Provinces	Light infection		Medium infection		Heavy infection		Total	
	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD	No. sample (+)	Mean $\pm$ SD
Thanh Hoa	3	72 $\pm$ 21.16	0	0	0	0	3	72 $\pm$ 21.16
Hoa Binh	3	122.67 $\pm$ 41.9	0	0	0	0	3	122.67 $\pm$ 41.9
Phu Tho	5	54 $\pm$ 12.4	0	0	0	0	5	54 $\pm$ 12.4
Nghe An	6	69.33 $\pm$ 29.90	0	0	0	0	6	69.33 $\pm$ 29.90
<b>Total</b>	<b>17</b>	<b>74.82<math>\pm</math>13.87</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>74.82<math>\pm</math>13.87</b>

Table 14: Rate of Ascaris infection in boys and girls by province

Provinces	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Thanh Hoa	<b>114</b>	0	0.00	94	1	1.06
Hoa Binh	109	0	0.00	94	1	1.06
Phu Tho	97	3	3.09	113	6	5.31
Nghe An	107	5	4.67	104	2	1.92
<b>Total</b>	<b>427</b>	<b>8</b>	<b>1.87</b>	<b>405</b>	<b>10</b>	<b>2.47</b>

Table 15: Rate of Trichuris infection in boys and girls by province

Provinces	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Thanh Hoa	114	16	14.04	94	18	19.15
Hoa Binh	109	5	4.59	94	4	4.26
Phu Tho	97	21	21.65	113	22	19.47
Nghe An	107	7	6.54	104	9	8.65
<b>Total</b>	<b>427</b>	<b>49</b>	<b>11.48</b>	<b>405</b>	<b>53</b>	<b>13.09</b>



Table 16: Rate of Hookworm infection in boys and girls by province

Provinces	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Thanh Hoa	114	1	0.88	94	2	2.13
Hoa Binh	109	3	2.75	94	0	0.00
Phu Tho	97	3	3.09	113	2	1.77
Nghe An	107	3	2.80	104	3	2.88
<b>Total</b>	<b>427</b>	<b>10</b>	<b>2.34</b>	<b>405</b>	<b>7</b>	<b>1.73</b>

Table 17: Rate of general helminth infection in boys and girls by provinces

Provinces	Boys			Girls		
	n	No. (+)	% (+)	n	No. (+)	% (+)
Thanh Hoa	114	17	14.91	94	20	21.28
Hoa Binh	109	8	7.34	94	5	5.32
Phu Tho	97	25	25.77	113	25	22.12
Nghe An	107	11	10.28	104	10	9.62
<b>Total</b>	<b>427</b>	<b>61</b>	<b>14.29</b>	<b>405</b>	<b>60</b>	<b>14.81</b>

Table 18. The rate of mix-infection of STH of SAC in 4 provinces

Distrits	Total No. (+)	Infection with one kind of worm		Infection with two kinds of worms		Infection with three kinds of worms	
		No. (+)	(%)	No. (+)	(%)	No. (+)	(%)
Thanh Hoa	37	36	97.30	1	2.70	0	0.00
Hoa Binh	13	13	100.00	0	0.00	0	0.00
Phu Tho	50	44	88.00	5	10.00	0	0.00
Nghe An	21	13	61.90	8	38.10	1	4.76
<b>Tổng</b>	<b>121</b>	<b>106</b>	<b>87.60</b>	<b>14</b>	<b>11.57</b>	<b>1</b>	<b>0.83</b>

Table 19. The rate of mix-infection of STH of SAC in 4 province

Distrits	Total Examination	Infection with one kind of worm		Infection with two kinds of worms		Infection with three kinds of worms	
		No. (+)	(%)	No. (+)	(%)	No. (+)	(%)
Thanh Hoa	208	36	17.3	1	0.5	0	0.0
Hoa Binh	203	13	6.4	0	0.0	0	0.0
Phu Tho	210	44	21.0	5	2.4	0	0.0
Nghe An	211	13	6.2	8	3.8	1	0.5
<b>Tổng</b>	<b>832</b>	<b>106</b>	<b>12.7</b>	<b>14</b>	<b>1.7</b>	<b>1</b>	<b>0.1</b>

Table 20. The rate of STH infection of SAC in main school and sub-school by provinces

Provinces	Main school			Sub-school		
	No. exam	(+)	%	No. exam	(+)	%
Thanh Hoa	105	11	10.48	103	26	25.24
Hoa Binh	126	9	7.14	77	4	5.19
Phu Tho	104	26	25.00	106	24	22.64
Nghe An	157	6	3.82	54	15	27.78
<b>Total</b>	<b>492</b>	<b>52</b>	<b>10.57</b>	<b>340</b>	<b>69</b>	<b>20.29</b>

Total have 832 schools age children participated the survey in 4 provinces in the Northern Vietnam. The number SAC of grade 3 were 503 (60.46%); grade 4 was 270 (32.45%) and grade 5 was 59 (7.09%).

The prevalence of STH infection in the 4 provinces was 14.5% and range from 6.4% to 23.9%.

The prevalence of STH infection in SAC in Thanh Hoa province was 17.8%; in Hoa Binh 6.4%; Phu Tho 23.9% and in Nghe An was 10.0%.

The prevalence of *Ascaris lumbricoides* in 4 provinces was 2.16%, *Trichuristrichuira* was 12.26% and hookworm 2.04% only. Other parasite infection such as *Enterobius vermicularis* was 0.6%.

The highest prevalence of STH infection was 23.9% in Phu Tho province, the schools have prevalence for STH were very high 12%, 23.5%, 26.4% and up to 32.1%.

The STH infection rates in some schools in Thanh Hoa province were still high 16.98%, 24% and 26.40%.

The STH infection rates of SAC in sub school in two provinces Thanh Hoa and Nghe An are higher than that in main school. But in Phu Tho and Hoa Binh the STH infection rate of SAC in main school is higher than that in sub school.

Almost of the children had light infection with STH when intensity of *A. lumbricoides* 66.67%; *T. trichuira* 98.04% and Hookworm 100%. No any children has heavy for STH infection.

#### **4. CONCLUSION**

The prevalences of soil-transmitted helminthiasis were still high in Thanh Hoa and Phu Tho provinces event they have MDA deworming for SAC in every 10 years ago (2 times per year with 3 province Hoa Binh, Thanh Hoa, Nghe An and one per year for Phu Tho province). The prevalences of STH of SAC in Hoa Binh and Nghe An provinces were low infection 6.4% and 10.0%.

The last MDA deworming in the four provinces were in November 2015, the coverage of MDA more than 95%. We use Albendazole for the MDA deworming.

Almost of thecases had light intensity infection level from 66.67% (100%). The moderate infection levels is very low, non have heavy infection.

The Hoa Binh and Nghe An provinces are poor and mountain province but the prevalence of STH infection in there were very low 6.9% and 10.0% only.

We can continuous conduct more MDA deworming campaign for SAC in Phu Tho province 1 MDA per year; in Thanh Hoa and Nghe An provinces one MDA time per year and one time per two year for Hoa Binh province.

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**Do Trung Dung**