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## Multi-country, cross-national comparison of youth tobacco use: Findings from Global School-based Health Surveys

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## Abstract

## Objective

Describe the prevalence of current cigarette smoking and other tobacco use among 13–15 year olds across 44 countries and 110 sites participating in the Global School-based Health Survey (GSHS), and compare these results with previous findings from the Global Youth Tobacco Survey.

## Methods

The GSHS is conducted in countries using standardized sampling and survey methodology procedures. Smoking and other tobacco use prevalence was compiled from fact sheets available on the GSHS web site from the available 110 sites where the survey has been conducted and resulting data processed. Tobacco use prevalence rates are weighted to adjust for the probabilities of nonresponse and varying probabilities of selection. Boy to girl ratios were calculated to examine gender differences in tobacco use prevalence.

## Results

Current smoking rates ranged widely from a low of approximately 1 in 100 students in Tajikistan and India to a high of more than 1 in 4 students in certain sites in Chile and Colombia, and more than 1 in 5 in other sites in Chile, Ecuador, Argentina, and Colombia. Other tobacco use prevalence ranged from a low of 1.0% in Hangzhou, China to a high of 43.7% in Northwest Namibia.

## Conclusion

This is the first multi-country, cross-national study of tobacco use involving GSHS data. Results provide an opportunity to examine youth tobacco use in several countries and compare results with the Global Youth Tobacco Survey (GYTS) which is a more extensive global surveillance of youth tobacco use.

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## Research Highlights

- ▶ First multi-country, cross-national study of tobacco use involving GSHS data.
- ▶ Current smoking and other tobacco use rates ranged widely. ▶ Highest smoking rate was in Chile, Ecuador, Argentina, and Colombia. ▶ Lowest cigarette use rates in Southeast Asia.

## Keywords

Tobacco use; Global School-based Health Survey; Smoking; Adolescents; Other tobacco use

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### 1. Introduction

Globally, tobacco use is a major preventable cause of death. Many smokers begin using tobacco in early adolescence. Every day an estimated 82,000 to 99,000 young people start smoking throughout the world; many are children under the age of 10 and most reside in low- or middle-income countries ([Lando et al., 2010](#) and [Mackay et al., 2006](#)). In fact, [Perry, Eriksen, and Giovino \(1994\)](#) describe cigarette smoking as a “pediatric disease” and “pediatric epidemic” whose addictive nature predicts the continuation of the habit into adulthood. Thus, many young people who take up the smoking habit, do not quit; and many go on to die prematurely from cigarette-related diseases. Tobacco use causes five million deaths annually and this number is expected to rise to 10 million deaths by 2020, including seven million in developing countries ([Davis et al., 2007](#) and [Mackay et al., 2006](#)). Half of all lifetime smokers die prematurely because of a cigarette-induced disease and cigarettes are likely to kill one billion people this century unless effective interventions are implemented to curb current smoking rates ([Mackay et al., 2006](#)).

Developed countries often have sophisticated youth behavior surveillance systems capable of monitoring youth tobacco use. Unfortunately, this is not the case in most developing countries, where informative data on youth smoking has been lacking and limited. To address this need the Global Youth Tobacco Survey (GYTS) was developed through a joint project of the World Health Organization (WHO), U.S. Centers for Disease Control and Prevention (CDC), Canadian Public Health Association (CPHA), and most WHO member states ([Warren et al., 2000](#) and [Warren et al., 2000](#)). This effort now provides data on the prevalence of tobacco use among 13–15 year olds from nearly 400 different sites within 131 countries since 1999 ([Warren, Jones, & Asma, 2005/2006](#)). The GYTS uses similar school-based sampling strategies, data collection procedures, and a core set of questions to be answered by youth respondents across the sites where it has been administered. In addition to obtaining standardized data on smoking and other tobacco use prevalence, the survey also gathers information about: perceptions and attitudes about tobacco; access and availability of tobacco products; and exposure to secondhand smoke, school curricula, media and advertising, and smoking cessation interventions. This data can be used by countries to monitor tobacco use and guide the development, implementation, and evaluation of tobacco prevention and control programs. It also allows for the comparison of national, regional, and global youth tobacco-related data ([Costas et al., 2009](#), [Ertas, 2006](#), [Rudatsikira et al., 2007](#), [Rudatsikira et al., 2008](#), [Salgado et al., 2008](#) and [Sirichotiratana et al., 2008](#)).

In recent years, the World Health Organization (WHO) has initiated the development of the Global School-based Health Surveillance System (GSHS) in a number of developing and resource-poor countries. The GSHS was developed by the World Health Organization (WHO) in collaboration with the United Nations Children's Fund (UNICEF), the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the Joint United Nations Program on HIV/AIDS, and with technical and financial assistance from the United States Centers for Disease Control and Prevention (CDC), to assess and measure a wide range of behavioral risk factors and protective factors related to the

leading causes of morbidity and mortality worldwide (e.g., dietary habits, alcohol and other drug use, injuries, violence, physical inactivity, and sexual activity) (Brown et al., 2009). Like the GYTS, the GSHS is a school-based survey conducted primarily among students aged 13–15 years that utilizes standardized sample selection and survey administration procedures. The GSHS can be implemented by Ministries of Health and Education at little cost at the country level to periodically monitor the prevalence of important health risk behaviors and protective factors.

The focus of the GSHS, relative to the GYTS, is much broader and therefore, the GSHS includes only a limited number of specific survey items about tobacco use. To date, very little data from the GSHS concerning youth tobacco use has been reported (Page, 2009). Despite the fact that it is also a school-based survey of students 13–15 year olds, and also has been conducted in a number of different countries, the prevalence of youth tobacco use from GSHS surveys has not been looked at in relation to GYTS surveys. Therefore, the purpose of this study is to use GSHS surveys conducted in 2003–2008 to describe the prevalence of cigarette smoking and other tobacco use in the 110 different sites and 44 different countries in which data is currently available, and to examine this data in light of the GYTS. A secondary purpose is to examine and describe GSHS tobacco use prevalence by gender in the various sites and countries.

## 2. Methods

The GSHS is part of a global surveillance system which uses a standardized scientific sample selection process and common school-based methodology to assess and monitor risk and protective factors among students in many countries (WHO, n.d.). This data helps countries develop priorities, develop programs, and advocate for resources for school health and youth health programs and policies. It helps establish a baseline for countries to more effectively monitor trends in the prevalence of health behaviors and protective factors and for use in evaluation of programs and policies. Another purpose of the GSHS is to allow countries, international agencies, and others to make comparisons across countries regarding these health behaviors and protective factors.

### 2.1. GSHS questionnaire

The survey is conducted primarily among students aged 13–15 years. It uses a self-administered questionnaire which can be administered during one regular class period. The survey consists of 10 questionnaire modules which address the leading causes of morbidity and mortality among children worldwide: demographics; alcohol and drug use; dietary behaviors; hygiene; mental health; physical activity; protective factors; sexual behaviors that contribute to HIV infection, other sexually-transmitted infections, and to unintended pregnancy; tobacco use; and violence and unintentional injury. The GSHS questionnaire includes a core set of 48 questions shared by all countries; individual countries also have the option to add core-expanded questions which have been developed through the surveillance system or add their own additional items. The questions are translated into the appropriate language of instruction for the students and pilot tested for comprehension.

### 2.2. GSHS sampling and survey administration

Sampling within each country is conducted from a sampling frame in which countries provide a list of schools eligible to participate in the survey. From this two-stage cluster sampling is conducted in which schools are randomly selected for inclusion and then specific classes from each selected school are randomly chosen. In the selected classes all students are asked to participate in the survey. Fleming and Jacobsen (2009) point out that the research protocol requires approval by a national government organization in each participating country prior to administration of the survey. Students are given the choice to not participate and are informed that their responses will remain anonymous. Further details about the GSHS can be obtained at <http://www.who.int/chp/gshs> and <http://www.who.int/chp/gshs>

### 2.3. GSHS data processing and fact sheet development

GSHS survey coordinators are designated in each country implementing the GSHS. They are provided with computer-scannable answer sheets. Once answer sheets are collected they are sent by the survey coordinator to the U.S. CDC for data processing (scanning, cleaning, editing, and weighting). After processing, CDC sends each survey coordinator: 1) an electronic copy of the cleaned, edited, and weighted data set; 2) a code book; 3) a detailed report; and 4) a fact sheet. Fact sheets are approved by the survey coordinator and placed on the GSHS web site ([www.who.int/chp/gshs/fact-sheets/en/index.html](http://www.who.int/chp/gshs/fact-sheets/en/index.html)) and available publicly. The fact sheet summarizes data for students aged 13–15 years from the core GSHS questionnaire modules.

The GSHS web site included a total of 110 fact sheets representing 44 different countries. [Table 1](#) lists the countries, areas, and years of each of the 110 GSHS fact sheets by region and country. Current cigarette smoking prevalence was reported on 89 of the 110 fact sheets representing 34 of the 44 countries. Current other tobacco use was reported on 86 of the 110 fact sheets representing 34 of 44 countries. Missing reports of tobacco use reflects countries that opted not to include tobacco use items on their respective GSHS.

Table 1. Prevalence of current cigarette smoking and other tobacco use by region, GSHS site, and year.

Country	Area	Response rate	Sample size	% Current cigarette smoking <sup>a</sup>				Ratio B/G	To
				Total	Boy	Girl	To		
<i>Africa</i>									
Botswana	National 2005	95%	2197	7.0 ± 1.4	10.7 ± 2.6	3.8 ± 1.5 <sup>c</sup>	2.82	11	
Ghana	National 2007	83%	6236	NA	NA	NA	NA	NA	
	Central 2007	86%	1843	NA	NA	NA	NA	NA	
	North 2007	75%	2548	NA	NA	NA	NA	NA	
	South 2007	92%	1845	NA	NA	NA	NA	NA	
Kenya	National 2003	84%	3691	13.9 ± 3.2	17.3 ± 4.1	10.7 ± 3.5	1.62	13	
	Central 2003	93%	1629	16.3 ± 4.5	25.6 ± 7.9	9.9 ± 3.6 <sup>c</sup>	2.59	14	
	Coast 2003	95%	245	7.5 ± 0.8				5.8	
	Lake 2003	64%	829	14.5 ± 7.2	15.7 ± 7.4	13.6 ± 8.6	1.15	14	
	Pastoral 2003	91%	988	9.9 ± 3.2	11.1 ± 6.6	7.6 ± 3.8	1.46	9.8	
Mauritius	Mauritius 2007	88%	2278	15.4 ± 3.6	23.1 ± 3.9	8.5 ± 3.1 <sup>c</sup>	2.72	5.3	
	Rodrigues 2007	90%	1140	12.4 ± 0.4	15.8 ± 1.0	9.4 ± 0.4 <sup>c</sup>	1.68	4.7	
Namibia	National 2004	82%	6367	16.1 ± 2.6	18.2 ± 3.5	14.2 ± 2.9	1.28	31	
	Central 2004	88%	1574	15.3 ± 5.5	18.7 ± 6.4	12.7 ± 6.1	1.47	25	
	Northeast 2004	74%	1447	10.1 ± 4.6	12.7 ± 5.9	7.7 ± 4.3	1.65	31	
	Northwest 2004	81%	1421	17.5 ± 5.2	21.0 ± 7.7	14.6 ± 5.3	1.44	43	
	South 2004	85%	1925	17.9 ± 2.9	17.9 ± 3.6	17.8 ± 4.0	1.01	13	
Senegal	National 2005	60%	3154	6.5 ± 3.9	9.1 ± 5.5	2.7 ± 3.3	3.37	6.8	
Seychelles	National 2007	82%	1432	17.2 ± 0.9	24.1 ± 1.2	10.8 ± 2.5 <sup>c</sup>	2.23	9.2	
Swaziland	National 2003	96%	7341	NA	NA	NA	NA	NA	
	Hhono 2003	99%	2810	NA	NA	NA	NA	NA	
	Lubombo 2003	90%	979	NA	NA	NA	NA	NA	
	Manzini 2003	99%	2527	NA	NA	NA	NA	NA	
	Shiselweni 2003	95%	1025	NA	NA	NA	NA	NA	

Uganda	National 2003	69%	3215	4.3 ± 1.3	6.2 ± 1.8	2.6 ± 1.7 <sup>c</sup>	2.38	5.8
	Urban 2003	70%	1709	3.8 ± 2.0	5.7 ± 3.1	2.3 ± 2.1	2.48	3.9
	Rural 2003	67%	1506	4.8 ± 1.6	6.8 ± 1.8	2.9 ± 3.0	2.34	7.4
United Republic of Tanzania	Dar Es Salaam 2006	87%	2176	3.8 ± 1.7	5.3 ± 2.7	2.0 ± 1.1	2.65	4.7
Zambia	National 2004	70%	2257	NA	NA	NA		NA
Zimbabwe	Bulawayo 2003	84%	1804	8.3 ± 2.1	10.6 ± 4.3	6.6 ± 2.6	1.61	9.6
	Harare 2003	84%	1997	5.8 ± 1.0	9.6 ± 1.9	2.2 ± 1.0	4.36	7.9
	Manicaland 2003	85%	1864	10.2 ± 2.3	11.8 ± 3.7	8.6 ± 3.3	1.37	15
<i>The Americas</i>								
Argentina	National 2007	77%	1980	21.0 ± 3.4	19.8 ± 4.8	21.9 ± 3.9	0.9	5.6
Cayman Islands	National 2007	79%	1299	10.9	13.5	7.8	1.73	6
Chile	Region V 2004	86%	2016	28.6 ± 3.9	23.6 ± 4.1	33.8 ± 5.5 <sup>c</sup>	0.7	4.8
	Region VIII 2004	87%	1971	23.0 ± 4.3	24.2 ± 5.4	21.9 ± 4.5	1.11	4.7
	Metro region 2004	85%	2111	29.8 ± 3.3	25.7 ± 4.2	33.9 ± 4.1	0.76	5.7
	Metro region with intervention 2005	80%	1772	29.0 ± 4.1	24.7 ± 6.1	33.5 ± 5.1	0.74	6.3
	Metro region without intervention 2005	85%	1777	32.8 ± 2.3	28.2 ± 5.0	38.1 ± 5.6	0.74	5.7
	Region VIII with intervention 2005	89%	1859	19.1 ± 3.7	18.6 ± 4.2	19.6 ± 4.9	0.95	4.6
	Region VIII without intervention 2005	82%	1857	24.7 ± 2.6	22.3 ± 3.6	27.0 ± 3.4	0.83	5.4
Colombia	Bogota 2007	83%	1737	20.1 ± 3.7	20.2 ± 2.9	20.1 ± 5.5	1	9.8
	Bogota (official schools) 2007	87%	1170	20.5 ± 3.8	20.8 ± 3.5	20.3 ± 6.0	1.02	8.0
	Bogota (private schools) 2007	77%	567	20.6 ± 6.1	19.9 ± 7.4	21.2 ± 7.9	0.94	14
	Bucaramanga City 2007	81%	2093	11.3 ± 2.3	14.4 ± 4.3	8.5 ± 1.6	1.69	6.5
	Cali City 2007	77%	1945	20.5 ± 4.3	25.0 ± 5.2	17.0 ± 4.8	1.47	9.4
	Manizales 2007	85%	2037	25.1 ± 3.2	24.8 ± 3.0	25.4 ± 4.8	0.98	9.3
	Valledupar City 2007	86%	2095	4.2 ± 1.4	4.3 ± 2.1	4.1 ± 1.7	1.05	2.8
Ecuador	Guayaquil 2007	84%	2669	10.3 ± 2.7	13.6 ± 3.3	7.2 ± 2.7 <sup>c</sup>	1.89	6.2
	Quito 2007	86%	2215	12.6 ± 2.3	14.5 ± 3.1	10.6 ± 4.0	1.37	8.0
	Zamora 2007	84%	640	21.6 ± 6.6	32.7 ± 11.1	12.3 ± 7.4 <sup>c</sup>	2.66	6.7
Grenada	National 2008	78%	1542	4.7 ± 1.2	7.0 ± 2.4	3.0 ± 1.4 <sup>c</sup>	2.33	6.7
Guyana	National 2004	80%	1212	7.4 ± 1.7	11.8 ± 2.9	3.7 ± 1.5 <sup>c</sup>	3.19	8.2
Montserrat	National 2008	78%	212	NA	NA	NA		NA
Saint Lucia	National 2007	82%	1276	7.8 ± 2.1	9.8 ± 3.8	6.2 ± 2.1	1.58	8.3

Saint Vincent and the Grenadines	National 2007	84%	1333	8.5 ± 2.0	12.0 ± 2.9	5.1 ± 2.2 <sup>c</sup>	2.35	7.2
Trinidad and Tobago	National 2007	78%	2969	9.3 ± 2.6	9.7 ± 2.8	8.7 ± 3.1	1.11	7.3
	Tobago 2007	83%	1277	7.9 ± 2.2	10.9 ± 3.9	5.3 ± 2.2	2.06	9.5
	Trinidad 2007	75%	1692	9.4 ± 2.7	9.7 ± 2.9	8.8 ± 3.2	1.1	7.2
Uruguay	National 2006	71%	3406	17.7 ± 2.0	13.3 ± 2.7	21.4 ± 2.7 <sup>c</sup>	0.62	7.0
	Montevideo 2006	73%	1606	17.8 ± 2.9	13.6 ± 3.6	21.9 ± 4.1 <sup>c</sup>	0.62	7.1
	Rest of Country 2006	70%	1800	17.6 ± 2.8	13.1 ± 4.0	21.0 ± 3.5 <sup>c</sup>	0.62	7.0
Venezuela	Barinas 2003	85%	2166	NA	NA	NA		NA
	Lara 2003	86%	2166	NA	NA	NA		NA

#### South-East Asia

Myanmar	National 2007	95%	2806	2.0 ± 0.8	3.4 ± 1.2	0.6 ± 0.6 <sup>c</sup>	5.67	3.6
India	National (CBSE) 2007	83%	8130	1.2 ± 0.4	1.9 ± 0.7	0.2 ± 0.2 <sup>c</sup>	9.5	3.7
Indonesia	National 2007	93%	3116	11.1 ± 2.8	22.1 ± 4.9	0.9 ± 0.5 <sup>c</sup>	24.56	3.9
	Java 2007	92%	1521	11.7 ± 3.7	23.4 ± 6.2	0.7 ± 0.6 <sup>c</sup>	33.43	3.5
	Sumatra 2007	95%	1595	9.7 ± 2.8	18.5 ± 5.9	1.5 ± 0.8 <sup>c</sup>	12.33	5.1
Sri Lanka	National 2008	89%	2611	NA	NA	NA		NA
Thailand	National 2008	93%	2767	8.8 ± 1.5	15.8 ± 2.9	2.4 ± 1.2 <sup>c</sup>	6.58	7.4

#### European

The former Yug. Rep. of Macedonia	National 2007	93%	2114	10.5 ± 2.4	8.8 ± 2.5	12.3 ± 3.4	0.72	NA
Tajikistan	National 2006	80%	9714	0.9 ± 0.4	1.1 ± 0.5	0.6 ± 0.4	1.83	2.7

#### Eastern Mediterranean

Djibouti	National 2007	83%	1777	3.3 ± 1.3	3.7 ± 1.9	2.8 ± 2.3	1.32	8.8
Egypt	National 2006	87%	5249	NA	NA	NA		NA
Jordan	National 2004	95%	2457	12.6 ± 2.5	19.2 ± 4.3	6.6 ± 2.8 <sup>c</sup>	2.91	15
	National 2007	99.80%	2197	12.3 ± 3.8	17.7 ± 4.2	7.6 ± 2.6 <sup>c</sup>	2.33	17
Lebanon	National 2005	88%	5115	NA	NA	NA		NA
	National Private 2005	86%	2831	NA	NA	NA		NA
	National Public 2005	90%	2284	NA	NA	NA		NA
Libya	National 2007	98%	2242	4.2 ± 1.1	7.1 ± 1.9	1.1 ± 0.9 <sup>c</sup>	6.45	6.0
Morocco	National 2006	84%	2670	3.0 ± 1.0	4.6 ± 1.8	1.3 ± 0.9 <sup>c</sup>	3.54	5.9
Oman	National 2005	97%	2979	NA	NA	NA		NA
Tunisia	National 2008	83%	2870	7.5 ± 1.3	12.7 ± 3.3	2.7 ± 1.6 <sup>c</sup>	4.7	6.7
United Arab Emirates	United Arab Emirates 2005	89%	15,790	8.0 ± 1.1	12.7 ± 1.6	3.5 ± 0.8 <sup>c</sup>	3.63	9.8
	Abu Dhabi Emir (Government) 2005	93%	2031	9.4 ± 2.8	17.8 ± 4.5	3.6 ± 1.9 <sup>c</sup>	4.94	10
	Abu Dhabi Emir (Private) 2005	89%	2083	7.7 ± 2.7	10.8 ± 3.9	3.8 ± 1.7 <sup>c</sup>	2.84	9.9
	Dubai Emir (Government) 2005	92%	2114	8.0 ± 2.6	12.3 ± 3.2	4.2 ± 1.7 <sup>c</sup>	2.93	8.8

	Dubai Emir (Private) 2005	90%	1971	6.3 ± 2.4	8.9 ± 4.1	3.4 ± 2.0	2.62	9.5
	Northern Emir (Government) 2005	89%	1877	7.5 ± 3.4	12.5 ± 4.3	2.6 ± 1.4 <sup>c</sup>	4.81	8.9
	Northern Emir (Private) 2005	78%	1855	5.7 ± 1.9	8.7 ± 2.4	2.2 ± 1.2 <sup>c</sup>	3.95	7.2
	Sharjah Emir (Government) 2005	89%	1948	9.6 ± 2.3	14.9 ± 2.7	3.4 ± 1.3 <sup>c</sup>	4.38	11
	Sharjah Emir (Private) 2005	89%	1911	8.1 ± 4.4	11.7 ± 5.9	4.0 ± 2.6	2.93	9.6
Yemen	National 2008	82%	1175	NA	NA	NA		NA
<i>Western Pacific</i>								
China	Beijing 2003	99%	2348	8.7 ± 1.8	15.3 ± 3.1	2.4 ± 1.1 <sup>c</sup>	6.38	1.9
	Hangzhou 2003	98%	1802	3.5 ± 0.8	5.5 ± 1.3	1.4 ± 0.8 <sup>c</sup>	3.93	1.0
	Wuhan 2003	98%	1947	6.6 ± 3.1	11.1 ± 5.5	1.4 ± 1.0 <sup>c</sup>	7.93	1.6
	Murumgi 2003	98%	2918	6.2 ± 1.3	10.0 ± 2.3	2.2 ± 1.0 <sup>c</sup>	4.55	1.6
Philippines	Luzon 2003	83%	2327	12.3 ± 3.8	18.3 ± 5.4	8.3 ± 3.6 <sup>c</sup>	2.2	3.7
	Mindanao 2003	80%	2296	10.1 ± 2.8	18.5 ± 5.2	3.7 ± 1.6 <sup>c</sup>	5	6.9
	National 2003	84%	7338	12.0 ± 2.8	19.2 ± 4.1	7.1 ± 2.7 <sup>c</sup>	2.7	4.5
	Visayas 2003	89%	2715	12.0 ± 2.8	23.7 ± 6.0	3.7 ± 2.9 <sup>c</sup>	6.41	6.8
	Luzon 2007	81%	1794	11.3 ± 3.4	16.7 ± 5.3	7.0 ± 3.5 <sup>c</sup>	2.39	3.5
	Mindanao 2007	77%	1854	5.4 ± 2.2	10.0 ± 3.6	2.3 ± 1.4 <sup>c</sup>	4.35	3.4
	National 2007	81%	5657	9.5 ± 2.0	14.4 ± 3.3	5.8 ± 2.0 <sup>c</sup>	2.48	3.5
Visayas 2007	85%	2009	8.9 ± 2.8	12.1 ± 4.6	6.4 ± 2.2	1.89	2.6	

a Smoked cigarettes on one or more days in the past 30 days.

b Used any tobacco products other than cigarettes one or more days in the past 30 days.

c Confidence intervals for males and females do not overlap.

[Full-size table](#)

Table options ▼

#### 2.4. Tobacco use prevalence items and data treatment

In the current study, we examined the two tobacco use items reported on all of the fact sheets placed on the GSHS web site as of March 1, 2010, in order to compile tobacco use prevalence rates. These two items are current cigarette smoking (percentage of students who smoked cigarettes on one or more days during the past 30 days) and current other tobacco use (percentage of students who used any tobacco products other than cigarettes on one or more days during the past 30 days). The prevalence rates for these two measures were obtained from the GSHS site's fact sheet and used to construct [Table 1](#) which provides prevalence estimates and confidence intervals for current cigarette smoking and other tobacco use for both boys and girls in each site. To determine the GSHS tobacco use estimates a weighting factor is applied to each subject's responses to adjust for nonresponse and for varying probabilities (likelihood) of selection to produce weighted estimates. This weighting factor is applied in an identical way to GSHS variables in each country survey where GSHS has been implemented.

Male and female prevalence tobacco use estimates were examined to determine if confidence intervals overlapped. Non-overlapping confidence intervals provide a very

conservative estimation of gender differences. Boy to girl (B/G) ratios were also calculated for current cigarette smoking and other tobacco use and can be found in [Table 3](#).

### 3. Results

The GSHS web site includes fact sheets for GSHS data collected between 2003 and 2007, representing 44 countries among students 13–15 years. National level data have been gathered in 35 countries and 6 WHO regions, and data at the state, province, region, or city level in 20 countries. Of the 110 sites included in this study, 195,326 students completed the GSHS. Overall response rates ranged from 60% to 99.8%.

[Table 1](#) displays the sites and year of data collection included in the study with response rates and sample sizes.

#### 3.1. Current cigarette smoking and other tobacco use

[Table 1](#) also presents current cigarette smoking rates and current other tobacco use by each of the sites. The following countries did not include tobacco use items on their GSHS: Ghana, Swaziland, Zambia, Venezuela, Saint Lucia, Sri Lanka, Egypt, Lebanon, Oman, and Yemen. This represents 37,507 students represented in the fact sheets. Thus, students represented in current cigarette smoking is 157,819 and 155,705 for current other tobacco use.

Overall, the total current smoking prevalence ranged from a low of 0.9% in Tajikistan, National (2006) to a high of 32.8% in Chile, Metro Region without intervention (2005). In the Africa region current smoking prevalence ranged from a low of 3.8% in Uganda, Urban (2003) to a high of 17.9% in Namibia, South (2004). In the Americas region, current smoking prevalence ranged from a low of 4.2% in Colombia, Valledupar City (2007) to a high of 32.8% in Chile, Metro Region without intervention (2005). In the South-East Asia region, current smoking prevalence ranged from a low of 1.2% in India, National (CBSE) (2007) to a high of 11.7% in Indonesia, Java (2007). In the Eastern Mediterranean region, current smoking prevalence ranged from a low of 3.0% in Morocco, National (2006) to a high of 12.6% in Jordan, National (2004). In the Western Pacific region, current smoking prevalence ranged from a low of 3.5% in China, Hangzhou (2003) to a high of 12.3% in Philippines, Luzon (2003).

Overall, the total current other tobacco use prevalence ranged from a low of 1.0% in China, Hangzhou (2003) to a high of 43.7% in Namibia, Northwest (2004). In the Africa region current smoking prevalence ranged from a low of 3.9% in Uganda, Urban (2003) to a high of 43.7% in Namibia, Northwest (2004). In the Americas region, current other tobacco use prevalence ranged from a low of 2.8% in Colombia, Valledupar (2007) to a high of 20.6% in Colombia, Bogota private schools (2007). In the South-East Asia region, current other tobacco use prevalence ranged from a low of 3.5% in Indonesia—Java 2007 to a high of 7.4% in Thailand, National (2008). In the Eastern Mediterranean region, current other tobacco use prevalence ranged from a low of 5.9% in Morocco, National (2006) to a high of 17.7% in Jordan, National (2007). In the Western Pacific region, current other tobacco use prevalence ranged from a low of 1.0% in China, Hangzhou (2003) to a high of 6.9% in Philippines, Mindanao (2003).

#### 3.2. Gender differences in tobacco use

In 46 of the 109 sites reporting prevalence of current smoking for both boys and girls, the confidence intervals of the point estimates (smoking prevalence) did not overlap. This very conservative indicator (non-overlapping confidence intervals) reflects that these 46 gender comparisons of point estimates (prevalence) were significantly different. [Table 2](#) identifies the specific sites in which boys and girls differed significantly in terms of smoking prevalence on this basis. The Kenya, Coast (2003) GSHS with a total sample size of only 245, reported total smoking prevalence but not prevalence for boys or prevalence for girls separately.



Table 2.

GSHS sites with the highest and lowest prevalence of current cigarette smoking and other tobacco use.

Highest total current smoking				Highest boys current smoking				Highest gi
Region	Country— area	Year	%	Region	Country— area	Year	%	Region
The Americas	Chile— Metro region without intervention	2005	32.80	The Americas	Ecuador— Zamora	2007	32.70	The Americas
The Americas	Chile— Metro region	2004	29.80	The Americas	Chile— Metro region without intervention	2005	28.20	The Americas
The Americas	Chile— Metro region with intervention	2005	29.00	The Americas	Chile— Metro region	2004	25.70	The Americas
The Americas	Chile— Region V	2004	28.60	Africa	Kenya— Central	2003	25.60	The Americas
The Americas	Colombia — Manizales	2007	25.10	The Americas	Colombia —Cali City	2007	25.00	The Americas
Highest total other tobacco use				Highest boys other tobacco use				Highest gi
Region	Country— area	Year	%	Region	Country— area	Year	%	Region
Africa	Namibia— Northwest	2004	43.70	Africa	Namibia— Northwest	2004	42.80	Africa
Africa	Namibia— National	2004	31.80	Africa	Namibia— Northeast	2004	34.20	Africa
Africa	Namibia— Northeast	2004	31.30	Africa	Namibia— Central	2004	33.80	Africa
Africa	Namibia— Central	2004	25.60	Africa	Namibia— National	2004	33.50	Africa
Eastern Mediterranean	Jordan— National	2007	17.70	Eastern Mediterranean	Jordan— National	2007	24.00	Africa
Lowest total current smoking				Lowest 10 smoking males				Lowest gi
Region	Country— Area	Year	%	Region	Country— Area	Year	%	Region
European	Tajikistan— National	2006	0.90	European	Tajikistan— National	2006	1.10	South— East Asia
South-East Asia	India— National (CBSE)	2007	1.20	South-East Asia	India— National (CBSE)	2007	1.90	European
South-East Asia	Myanmar— National	2007	2.00	South-East Asia	Myanmar— National	2007	3.40	South- East Asia
Eastern Mediterranean	Morocco— National	2006	3.00	Eastern Mediterranean	Djibouti— National	2007	3.70	South- East Asia
Eastern Mediterranean	Djibouti— National	2007	3.30	The Americas	Colombia — Valledupar City	2007	4.30	South- East Asia

Lowest total other tobacco use				Lowest boys other tobacco use				Lowest gi
Region	Country	Year	%	Region	Country	Year	%	Region
Western Pacific	China—Hangzhou	2003	1.00	Western Pacific	China—Hangzhou	2003	1.20	Western Pacific
Western Pacific	China—Murumgi	2003	1.60	Western Pacific	China—Wuhan	2003	2.50	South-East Asia
Western Pacific	China—Wuhan	2003	1.60	Western Pacific	China—Murumgi	2003	2.60	Western Pacific
Western Pacific	China—Beijing	2003	1.90	Western Pacific	China—Beijing	2003	3.30	Western Pacific
Western Pacific	Philippines—Visayas	2007	2.60	European	Tajikistan—National	2006	3.50	Western Pacific

[Full-size table](#)

Table options 

Boy-to-girl ratios for current smoking prevalence and other tobacco use are displayed in [Table 3](#). The highest ratios, indicating greater smoking among boys than girls, were found in: Indonesia, Java (2007); Indonesia, National (2007); Indonesia, Sumatra (2007); India, National (2007); China, Wuhan, (2003); Thailand, National (2008); Libya, National (2007); Philippines, Visayas (2003); China, Beijing (2003); and Myanmar, National (2007). Among the lowest boy to girl ratios for current smoking, indicating lower smoking among boys than girls, were six of the Chile sites (2004 and 2005), three of the Uruguay sites (2006), and the former Yugoslavia Republic of Macedonia (2007). The highest and lowest boy-to-girl ratios for other tobacco use are also presented in [Table 3](#).

Table 3.  
GSHS sites with the highest and lowest boy to girl ratios of current cigarette smoking and other tobacco use.

Highest current smoking				Highest other tobacco use			
Region	Country—area	Year	Ratio B/G	Region	Country—area	Year	Ratio B/G
South-East Asia	Indonesia—Java	2007	33.43	South-East Asia	Indonesia—Java	2007	16.75
South-East Asia	Indonesia—National	2007	24.56	South-East Asia	Thailand—National	2008	9.64
South-East Asia	Indonesia—Sumatra	2007	12.33	The Americas	Ecuador—Zamora	2007	9.00
South-East Asia	India—National (CBSE)	2007	9.50	Western Pacific	Philippines—Visayas	2003	6.70
Western Pacific	China—Wuhan	2003	7.93	Western Pacific	China—Beijing	2003	6.60
South-East Asia	Thailand—National	2008	6.58	Western Pacific	China—Wuhan	2003	6.25
Eastern Mediterranean	Libya—National	2007	6.45	South-East Asia	Indonesia—National	2007	6.18
Western Pacific	Philippines—Visayas	2003	6.41	Western Pacific	Philippines—Mindanao	2007	5.50
Western Pacific	China—Beijing	2003	6.38	Eastern Mediterranean	United Arab Emirates—Abu Dhabi Emir (Government)	2005	4.88
Lowest current smoking				Lowest other tobacco use			
Region	Country—Area	Year	Ratio B/G	Region	Country—Area	Year	Ratio B/G
The Americas	Uruguay—Montevideo	2006	0.62	Africa	Kenya—Pastoral	2003	0.87
The Americas	Uruguay—	2006	0.62	The Americas	Colombia—	2007	0.90

	National				Bucaramanga City		
The Americas	Uruguay—Rest of Country	2006	0.62	The Americas	Chile—Region I	2004	0.92
The Americas	Chile—Region V	2004	0.70	The Americas	Ecuador—Quito	2007	0.96
European	The former Yug. Rep. of Macedonia—National	2007	0.72	Africa	Namibia—Northwest	2004	0.99
The Americas	Chile—Metro region with intervention	2005	0.74	The Americas	Colombia—Bogota (private schools)	2007	1.01
The Americas	Chile—Metro region without intervention	2005	0.74	Africa	Namibia—National	2004	1.11
The Americas	Chile—Metro region	2004	0.76	The Americas	Colombia—Manizales	2007	1.12
The Americas	Chile—Region I	2004	0.78	Africa	Kenya—Lake	2003	1.16

Table options ▼

## 4. Discussion

The Global School-based Health Survey (GSHS) allows participating developing and resource-poor countries to assess several behavioral risk factors and protective factors related to the leading causes of morbidity and mortality worldwide and provides these countries with essential information about these factors. The GSHS also provides opportunity to examine risk behaviors, such as cigarette smoking and other tobacco use, across the various participating sites and countries. Because the GSHS surveys young people in different countries in a standardized manner, it allows for comparisons among and between countries. The current study is the first multi-country, cross-national study of tobacco use involving GSHS data.

### 4.1. Geographic variance in the prevalence of smoking

Consistent with previous research from the Global Youth Tobacco Survey (GYTS), our results presented in [Table 1](#) show that tobacco use by 13–15 year old school-attending youth varies among and between countries and WHO regions, and is a serious problem that is global in nature ([Baska et al., 2009](#), [Centers for Disease Control and Prevention, 2008](#), [Global Youth Tobacco Survey Collaborative Group, 2002](#) and [Warren et al., 2006](#)). We found current smoking rates to range widely from a low of approximately 1 in 100 students in Tajikistan (2006) and India (2007) national GSHS samples to a high of more than 1 in 4 students in certain sites in Chile and Colombia, and more than 1 in 5 in other sites in Chile, Ecuador, Argentina, and Colombia. Tobacco use across countries and sites can be expected to vary because the determinants of tobacco use are many and varied and include such factors as cultural and religious norms, availability of different types of tobacco products, local and national tobacco control strategies, and differences in tobacco industry influence ([Global Youth Tobacco Survey Collaborative Group, 2002](#)).

The GYTS, which includes several more countries and sites than the GSHS has to date, identifies current smoking in 13–15 year olds to be highest in the WHO Regions of the Americas and the European Region ([Warren et al., 2005/2006](#)). The Southeast Asian and Eastern Mediterranean regions have the lowest smoking rates, with rates slightly higher in the Western Pacific region. Smoking prevalence in the African region is higher than in the Eastern and Western Mediterranean region, but only about half the rate of that found in the Americas and European regions. With this pattern in mind, we were not surprised that among the GSHS sites with available smoking prevalence data, the highest rates of smoking were in the region of the Americas and more specifically in Chile and neighboring South American countries (e.g., Chile, Ecuador, and Uruguay). Other research confirms that high rates of youth smoking are a significant public health concern

in these countries and that these countries lead the Americas in smoking-attributable mortality ([Bianco et al., 2006](#), [Mejia and Perez-Stable, 2006](#) and [Muller and Wehbe, 2008](#)).

The GSHS only included two sites from the European region; Tajikistan, National (2006) and the Former Yugoslavia Republic of Macedonia, National (2007). The smoking prevalence in the Tajikistan site (0.9%) was the lowest of all of the GSHS sites, which, by way of comparison, was nearly identical to the 2004 Tajikistan GYTS finding of a prevalence of 1.1%. The current smoking prevalence rate in Tajikistan was the lowest of the 29 European countries in the GYTS and much lower than the second lowest country, Kryrgyzstan which had a prevalence of 5.5% ([CDC, 2008](#)). The 2003 Macedonia GYTS found a smoking prevalence of 7.7%, whereas we found smoking prevalence of 10.5% in the 2007 GSHS. These two countries were much below the average smoking prevalence for the European region of 19.2%. Thus, these two countries do not represent the average in terms of smoking prevalence for this region.

In accordance with the GYTS, which identified the world's lowest smoking rates in the Southeast Asia and Eastern Mediterranean regions, GSHS sites with very low smoking rates (less than 5%) were also among Southeast Asia (India, and Myanmar) and Eastern Mediterranean (Djibouti, Libya, and Morocco) sites. The GYTS also identified low smoking rates among these same specific countries, with the exception of the 2001 Myanmar GYTS, where a prevalence of 10.2% is reported ([CDC, 2008](#)). This is much higher than the 2% prevalence reported in the 2007 Myanmar National GSHS. We also found very low prevalence rates in the 2003 Uganda (4.3%) and Tanzania (3.8%) national GSHS sites in the African region, and 2003 China, Hangzhou site in the Western Pacific. [Lopez, Collishaw, and Piha \(1994\)](#) have described a stage model where countries with a low smoking prevalence (Stage 1) often continue to higher levels of smoking because they represent untapped potential for the tobacco industry and as such become increasingly targeted as consumers in the global tobacco economy. Even in countries that have imposed bans on direct advertising, the tobacco industry increases its influence through indirect advertising/marketing approaches such as sponsoring sports events, putting logos on promotional items, giving away free samples where young people concentrate, and sponsoring entertainment events ([Baska et al., 2009](#), [Framework Convention Alliance for Tobacco Control, 2006](#) and [Sussman et al., 2007](#)). To counter forces that contribute to increasing smoking in low youth smoking prevalence countries, it is imperative that tobacco control strategies are implemented to counter these pro-smoking influences and avert a rise in youth smoking and the subsequent consequences on human health.

#### 4.2. Smoking among girls and gender difference

Previous research has identified that among adults, smoking among women is lowest in the Western Pacific, Southeast Asia, and Eastern Mediterranean WHO regions, and ratios of males to females who smoke are the greater than in any other of the WHO regions ([Corrao et al., 2000](#) and [World Health Organization, 2003](#)). Based on this pattern we were not surprised that smoking was also very low in several of the GSHS sites representing these regions. Current smoking prevalence rates were lower than 5% in 6 of 6 Southeast Asia GSHS sites, 7 of 12 Western Pacific sites, and 13 of 15 Eastern Mediterranean sites. Boy to girl (B/G) ratios in current smoking ([Table 3](#)), reflecting higher smoking among boys than girls, were also highest in sites representing these three regions, with the highest in Indonesia (Java, National, and Sumatra), India (National), Thailand (National), Libya (National), Philippines (Visayas), and China (Beijing). Our findings are also consistent with studies involving the GYTS, which showed the highest boy to girl smoking ratios in the Southeast Asia, Western Pacific, and Eastern Mediterranean regions ([Global Youth Tobacco Survey Collaborative Group, 2003](#)) and similar low current smoking rates among girls in the same countries represented by GSHS sites (e.g., Indonesia, India, Thailand, China, Djibouti, Libya, Tunisia, United Arab

Emirates, and Morocco) ([CDC, 2008](#)). It is also important to point out that we also found smoking rates lower than 5% among girls in three African sites (Botswana/National, Senegal/National, and Zimbabwe/Harare) and also Colombia (Harare) and Tajikistan (National).

Rising rates of smoking among women and girls in a number of countries in South America, Africa, and Asia are cause for concern and tobacco control experts caution that what has occurred in many middle and high income countries, where smoking rose to the level of males, or in some cases even higher, likely will occur in the developing world as well ([Glynn et al., 2010](#) and [Pampel, 2006](#)). Smoking prevalence among adult males (48%) is estimated to be about four times that of females (12%) globally according to the [WHO \(2003\)](#). The difference in smoking rates between men and women is even greater in developing countries (48% of men, and 7% of women) than in developed countries (42% of men, and 7% of women) ([Global Youth Tobacco Survey Collaborative Group, 2003](#)). [Glynn et al. \(2010\)](#) assert that multinational tobacco companies have stepped up the marketing of cigarettes and other forms of tobacco to females in low-and-middle income countries in Eastern Europe, Asia, Africa, and Latin America. Smoking is promoted with images of freedom, emancipation, slimness, and glamor; at the same time governments in many of these countries fail to recognize and treat tobacco use among females as a priority health issue ([Kin, 2009](#)). As a result, it is projected that 20% of the world's women will be smokers in 2025, while global rates among males are expected to decline ([WHO, 2007](#)). We found on the GSHS that 13–15 year old girls in Chile (all sites), Argentina (National), Uruguay (all sites), and Colombia (all Bogota sites and Manizales) have already reached this level of 20% or higher for current smoking. Current smoking rates of 10% or higher among girls were found in Colombia (Cali), Ecuador (Quito and Zamora), and within three African sites (Kenya/Lake, Namibia/Northwest, and Namibia/South).

[Warren et al. \(2006\)](#) point out from GYTS data that gender differences in cigarette smoking appears to be changing. Whereas globally adult men are four times more likely to smoke than women, GYTS data shows that boys 13–15 years were only 2.3 times more likely to smoke than girls, and in many countries there were no differences by sex. While we were unable to calculate the mean smoking rate for boys and girls across GSHS sites, we were able to determine whether confidence intervals in prevalence rates for boys and girls did not overlap. This is a very conservative estimate of the significant difference and does not take into account those instances where confidence intervals for prevalence estimates overlap but are statistically significant. In this analysis, we determined that of 86 comparisons of boy and girl smoking prevalence rates that in 44 (51.2%) the confidence intervals did not overlap (were conservatively significantly different). This is higher than what was observed in the GYTS where significant gender difference was found in 39.1% of 117 sites ([Global Youth Tobacco Survey Collaborative Group, 2003](#)). This difference may be due to the fact that the GYTS includes more countries and a wider mix of countries that provides more “global” representation than the GSHS. Nevertheless, gender differences are important considerations that need to be taken into account to counter and prevent rising smoking rates in girls. [Kin \(2009\)](#) warns that if traditional social norms preventing girls from taking up smoking are not replaced by effective smoking and tobacco control strategies within countries a global smoking epidemic among females could result. The WHO Framework Convention on Tobacco Control (FCTC) provides a useful basis for the implementation of strategies (e.g., education, counter advertising, higher tobacco taxes, and confronting the multinational tobacco industry) that are needed to curb rising smoking rates in females ([Framework Convention Alliance for Tobacco Control, 2006](#) and [Glynn et al., 2010](#)).

#### 4.3. Other tobacco use

While the major focus of this paper has been on cigarette smoking, we also compiled the prevalence of current other tobacco use from the available GSHS sites. We observed

sites in the various regions, excepting the Americas and Western Pacific, where in a number of sites the use of other tobacco products by 13–15 year old students was often as high as, or higher than, cigarette smoking. This finding, also supported by GYTS research, provides evidence that other tobacco use is a major public health problem and tobacco control and prevention programs must also aggressively counter these forms of tobacco use ([Centers for Disease Control and Prevention, 2008](#) and [Warren et al., 2006](#)). [Prokhorov et al. \(2006\)](#) provide an excellent review of the diverse array of tobacco products used worldwide by youth. They stress that the wide variety of tobacco products must be taken into account when tobacco prevention and cessation measures are implemented in developed and developing countries. They also note that information on the use of tobacco products other than cigarettes such as bidis, kreteks, hookahs, and smokeless tobacco is very sparse and limited in developing countries.

A very surprising finding was the high prevalence of current other tobacco use reported in Namibia's Northeast, Northwest, and Central 2004 GSHS sites where reported use was 25.6%–43.7%. A high prevalence (31.8%) of other tobacco use was also reflected in Namibia's national survey. These results are much higher than the 15.0% reporting current other tobacco use in the 2004 Namibian GYTS ([CDC, 2008](#)). This difference is puzzling but may relate to differing items used to assess current other tobacco use in the GYTS and GSHS. The GYTS asks whether in the past 30 days “have you ever used any form of tobacco products other than cigarettes (e.g. chewing tobacco, snuff, dip, cigars, cigarillos, little cigars, and pipe);” while the GSHS asks whether during the past 30 days “on how many days did you use any tobacco products other than cigarettes, such as [country examples].” In the Namibian GSHS the country examples of other tobacco use included in the item were “snuff, prium (chewing tobacco), or tobacco leaves (BB, springbok, or black and white).” Unfortunately, there is very little research on youth tobacco use in Namibia and other African countries, and specifically on tobacco use other than cigarettes, in which to gain insight into this issue ([Mpabulungi & Muula, 2006](#)).

More research is needed to discern the cultural and social norms and conditions surrounding other tobacco use in various countries, and the health-related perceptions of these products. For example, [Gupta and Ray \(2003\)](#) describe that smokeless tobacco use in India and Bangladesh is often used medicinally for conditions such as toothache, headache, and stomachache, and that users particularly with low educational levels are unaware of the harmful effects of these products. Reports indicate that hookah smoking has reemerged as a social practice in Arab countries, and often takes place in hookah cafes and coffee houses, and users consider the practice to be healthy relative to conventional smoking ([Kandela, 2000](#)). Bidis are popular in South Asian countries and use is associated with poverty, low education, and forced or voluntary labor in bidi manufacturing factories ([Prokhorov et al., 2006](#)).

#### 4.4. Limitations

The findings in this study are limited to 13–15 year old youths attending school in the various GSHS sites in which data is publicly available and has been published in a GSHS fact sheet. Thus, the data was limited to 44 countries and 110 sites for which GSHS data were available, but further limited to the 34 countries and 89 sites which included tobacco use items in their GSHS. Nevertheless, despite these critical limitations, it is important that the available GSHS data is a previously untapped and rich data source not previously investigated in studies on youth tobacco use. The data collated in this study provide useful information on more than 150,000 youth in 34 different countries that has been collected in a standardized manner. Furthermore, the GSHS provides nationally representative samples in a number of countries and in others provides three or more different sites within a country. The GSHS will continue to be an important data source because as of March 2010 approximately 45 additional countries, not included in the current study, have either implemented the GSHS (data not currently publicly available), or are in the process of implementation. While the GSHS is limited to youth attending

school, according to the United Nations Children's Fund ([UNICEF, 2002](#)) the majority of youth aged 13–15 years attend regular, private, or technical schools.

Like other youth risk behavior surveillance systems, the GSHS is based on self reports of behavior. This could lead to under or over reporting of tobacco use, and it is possible that the likelihood of inaccurate reporting may vary from country to country. To date, there are no published studies demonstrating the reliability or validity of the GSHS ([Page, 2009](#)). However, the survey items included on the GSHS are similar or identical to those used in other youth risk behavior surveillance systems such as the GYTS, the U.S. Youth Risk Behavior Survey (YRBS), and the Health Behavior in School-aged Children (HBSC) survey program in Europe. Further, [Brener et al. \(2002\)](#) provide evidence that youth responses to cigarette smoking and other tobacco use show good test–retest reliability. It is interesting that the GYTS has also not determined the extent of reporting bias on the self-reports of cigarette use and tobacco use, despite the fact that this survey has been administered in more than 140 different countries from 2000–2007 and is the most comprehensive youth tobacco surveillance system ever developed, implemented, and maintained ([Centers for Disease Control and Prevention, 2008](#) and [Warren et al., 2006](#)).

Finally, this study was limited by the fact that some countries did not include the cigarette smoking and other tobacco use item on their GSHS. In each instance, we noticed that the specific country was a participant in the GYTS. Thus, these countries appeared to opt not to include the tobacco items because they rely on the GYTS for tobacco use surveillance.

## 5. Conclusions

This study represents the first multi-country, cross-national study of tobacco use involving GSHS data, and as such provides an opportunity to examine youth tobacco use in 44 different countries and 110 different sites representing six different WHO regions. Current smoking rates were highest in India and lowest in Tajikistan, and generally highest in the region of the Americas (more specifically in Chile and neighboring South American countries). Smoking rates were lowest in the Southeast Asia and Eastern Mediterranean Regions. Boy to girl ratios in current smoking, reflecting higher rates of smoking among boys than girls, were highest at sites in Southeast Asia, Western Pacific, and Eastern Mediterranean regions. The prevalence of girls' smoking exceeded that of boys in Uruguay, Chile, and Republic of Macedonia sites.

Findings regarding other tobacco use showed, excepting the Americas and Western Pacific, that use was often as high as, or higher than, cigarette smoking. Thus, while cigarette smoking is a major public health problem, tobacco control and prevention programs throughout the world must also aggressively counter the use of forms of youth tobacco use in addition to cigarettes. More research is needed to discern the cultural and social norms and conditions surrounding both cigarette and other tobacco use in various countries, and the health-related perceptions of various tobacco products. With standardized survey instrumentation, sampling and administration procedures, the Global Student-based Health Survey (GSHS) provides a rich resource for gaining insight into global youth tobacco use, and compliments the broader and more extensively implemented Global Youth Tobacco Survey (GYTS).

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## Contributors

R.M. Page wrote the first draft and subsequent drafts of the manuscript. M. Danielson compiled tobacco use prevalence rates and organized the tables. M. Danielson contributed to the second draft and approved the final manuscript.

## Conflict of Interest

Both authors have approved this version of the manuscript and declare no conflict of interest. This manuscript has not been published or accepted for publication in another journal. Neither has it been considered by any other journals.

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