

## RESEARCH ARTICLE

# A Cross-Country Comparison of Knowledge, Attitudes and Practices about Tobacco Use: Findings from the Global Adult Tobacco Survey

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## Abstract

**Background:** Knowledge and individual perceptions about adverse effects of all forms of tobacco exert direct influence on the level of tobacco consumption in various socio-demographic groups. The objective of this study was to determine the nature, extent and demographic correlates of knowledge, attitudes and perceptions of use of tobacco among adults in low and middle income countries. **Materials and Methods:** The Global Adult Tobacco Survey, conducted in fourteen different countries from 2008-2010, was sourced for the data analyzed in this study. Descriptive statistical analyses were conducted to determine the prevalent knowledge and individual perceptions amongst adults about all forms of tobacco consumption. **Results:** There was relatively high awareness about the harmful effects of smoking tobacco with main awareness being about its relationship with lung cancer (>90% in most countries). In contrast, there was relatively low awareness about harmful effects of smokeless tobacco (< 90% in all countries except India and Bangladesh), and observed correlation of smoking tobacco with heart attack (40.6% in China, 65.1% in India) and stroke (28.2% in China, 50.5% in India). **Conclusions:** A large proportion of adults living in low and middle income countries possess adequate knowledge about smoking tobacco but have inadequate awareness as well as false perceptions about smokeless forms of tobacco. Popular beliefs of inverse relationships of tobacco consumption with knowledge, attitudes and perception of populations towards tobacco are challenged by the findings of this study

**Keywords:** Tobacco - knowledge attitude and practice - Global Adult Tobacco Survey

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## Introduction

Tobacco use remains responsible for being one of the largest contributors to premature death, causing millions of deaths worldwide every year (World Health Organization, 2002; Thun et al., 2010). Both smoked and smokeless, forms of tobacco are associated with increased risk of chronic and terminal diseases (Critchley et al., 2003; Gupta et al., 2003; Nair et al., 2004; Krishna et al., 2013). These diseases include destructive periodontitis (Cutress, 2003; Gupta et al., 2003; Gupta et al., 2013); oral and oropharyngeal cancers (Johnson et al., 2011; Radoi et al., 2013); oral potentially malignant disorders, notably leukoplakia, erythroplakia, and oral submucous fibrosis (Warnakulasuriya et al., 2007) and cardiovascular disorders including stroke (Gupta et al., 2013). Other significant health disorders associated with tobacco consumption include erectile dysfunction (Wang et al., 2013) and problems in pregnancy, including stillbirth and low birth weight babies (Wisborg et al., 2001; England et al., 2010).

Knowledge and individual perceptions about adverse effects of all forms of tobacco, in addition to its social acceptance may influence the level of tobacco consumption in various socio-demographic groups (van Zyl et al., 2013). Though there is significant awareness at population level about lung cancer being related to smoking and smokeless tobacco in most of the world, however, no comparisons have been drawn among different nations about the knowledge of general population about relationship of smoking and smokeless tobacco consumption to other life threatening illnesses, like heart attack and stroke. In addition, as compared to smoking, little is known about the level of awareness of general population about health impact of second hand smoke.

Further, few studies have measured the knowledge, attitudes and perceptions of adult population (above 15 years) about impact of smoking, smokeless tobacco as well as second hand smoke on health, with particular reference to lung cancer, stroke and heart attack at a national level and no studies are available which have drawn any inter-

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country comparisons on this issue (Goebel et al., 2000; Dey et al., 2012). Global Adult Tobacco Survey has been conducted in fourteen countries across the world and, besides multiple other aspects of tobacco consumption, it has also measured knowledge, attitudes and perceptions of populations in different countries about tobacco use as well as second hand smoke (GATS, 2011).

This paper is based on data available from the Global Adult Tobacco Survey where for the first time nationally representative and comparable estimates of knowledge attitude and perception among adults in low- and middle income countries (GATS, 2011). Tobacco control, and thereby control of related mortality as well as morbidity, is dependent on prevalent knowledge, attitudes and perceptions across the populations. This study comparing these parameters across different nations will further aid the policy makers to formulate tobacco control strategies in terms of improving knowledge, attitudes and perceptions at population level by drawing out more successful strategies.

## Materials and Methods

GATS is a global as well as nationally representative, in-person household survey of non-institutionalized adults (aged  $\geq 15$  years) to monitor key tobacco indicators. During 2008–2010, fourteen countries conducted GATS using a standardized core questionnaire, sample design, data collection method, and analysis protocol to enhance comparability across countries. In every country, a multistage cluster sample design was used, and data were weighted as per the population characteristics to account for the complex sample design (GATS, 2011).

For administering the questionnaire, consent was taken from all the participants and information was collected on demographic and socioeconomic determinants such as age, sex, education, occupation and possession of household items. Explicit information was also registered on use and types of smoked and smokeless tobacco, second hand smoke, cessation, economics, role of media and knowledge, attitude and perception of the tobacco consumers along with information on initiation of age for the use of tobacco. Overall response rates for GATS ranged from 97.7% in Russia to 65.1% in Poland (GATS, 2011). The sample size in each country was as follows: Bangladesh (2009; n= 9619), Brazil (2008; n= 39425), China (2010; n= 13344), Egypt (2009; n= 20917), India (2009-2010; n= 69143), Mexico (2009; n= 13604), the Philippines (2009; n= 9697) Poland (2009-2010; n= 7834), Russian Federation (2009; n= 11398), Thailand (2009; n= 20560), Turkey (2008; n= 9030), Ukraine (2010; n= 8149), Uruguay (2009; n= 5581) and Vietnam (2010; n= 9918) (GATS, 2011).

### *Beliefs about the health effects of smoking*

Beliefs about health effects of smoking were assessed among all consenting responders by asking the questions- “Does smoking tobacco cause serious illness?”, “ Does smoking tobacco cause the following- a. Stroke (blood clots in the brain that may cause paralysis)? b. Heart attack? c. Lung cancer?”

### *Beliefs about the health effects of smokeless tobacco*

Beliefs about health effects of smokeless tobacco were assessed among all consenting responders by asking the question- “Does using smokeless tobacco cause serious illness?”

### *Beliefs about the health effects of second hand smoke*

Beliefs about health effects of second hand smoke were assessed among all consenting responders by asking the question- “Does breathing other people’s smoke cause serious illness in non-smokers?”

### *Data Analysis*

For every nation, knowledge, attitudes and perceptions about smoking, smokeless tobacco and second hand smoke were assessed overall by age, gender and residence. 95% confidence intervals were calculated on weighted data using SPSS V.18 which enabled estimation of variation in the clustered sample design. Estimates were not presented when the sample size for any subpopulation was less than 25 cases.

## Results

### *Age distribution of adults who believe that smoking tobacco causes serious illness*

Out of all the respondents in 15-24 year group, percentage of individuals who believed smoking tobacco causes serious illness was 98% in Bangladesh, 97% in Brazil, 89.4% in China, 97.5% in Egypt, 92.4% in India, 98.9% in Mexico, 95.0% in the Philippines, 93.5% in Poland, 89.1% in Russian Federation, 99.3% in Thailand, 97.8% in Turkey, 94.6% in Ukraine, 99.0% in Uruguay, 97.2% in Vietnam.

Out of the respondents in 25-44 year group, percentage of individuals who believed smoking tobacco causes serious illness was 98.2% in Bangladesh, 97% in Brazil, 84.7% in China, 97.9% in Egypt, 91.1% in India, 98.8% in Mexico, 94.2% in the Philippines, 92.0% in Poland, 90.4% in Russian Federation, 99.1% in Thailand, 97.9% in Turkey, 93.7% in Ukraine, 98.7% in Uruguay, 96.1% in Vietnam.

Out of the respondents in 45-64 year group, percentage of individuals who believed smoking tobacco causes serious illness was 96.3% in Bangladesh, 95.6% in Brazil, 77.8% in China, 97.4% in Egypt, 88.1% in India, 97.4% in Mexico, 93.8% in the Philippines, 89.6% in Poland, 90.8% in Russian Federation, 98.5% in Thailand, 97.2% in Turkey, 92.4% in Ukraine, 96.1% in Uruguay and 95.6% in Vietnam.

Out of the respondents in 65+ year group, percentage of individuals who believed smoking tobacco causes serious illness was 92.7% in Bangladesh, 92.1% in Brazil, 65.6% in China, 94.2% in Egypt, 82.0% in India, 94.5% in Mexico, 89.1% in the Philippines, 92.3% in Poland, 93.6% in Russian Federation, 95.0% in Thailand, 92.8% in Turkey, 91.9% in Ukraine, 96.1% in Uruguay, 90.1% in Vietnam (Table 1).

### *Gender distribution of adults who believe that smoking tobacco causes serious illness*

**Table 1. Percentage of Adults (males and females) by Age Distribution Who Believe that Smoking Tobacco causes Serious Illness**

Country	GATS Year	% (95% CI) Age (years)				Total
		15-24	25-44	45-64	65+	
Bangladesh	2009	98.0(96.9-98.7)	98.2(97.7-98.6)	96.3(95.0-97.4)	92.7(89.0-95.3)	97.4(96.8-97.8)
Brazil	2008	97.0(96.4-97.5)	97(96.6-97.3)	95.6(95.1-96.1)	92.1(91.0-93.0)	96.1(95.8-96.4)
China	2010	89.4(85.3-92.5)	84.7(81.3-87.5)	77.8(74.1-81.1)	65.6(60-70.7)	81.8(78.6-84.6)
Egypt	2009	97.9(97.1-98.4)	97.9(97.4-98.2)	97.4(96.8-98.0)	94.2(92.4-95.5)	97.6(97.2-97.9)
India	2009	92.4(91.5-93.2)	91.1(90.4-91.7)	88.1(87.1-89.0)	82.0(80.1-83.8)	90.2(89.6-90.8)
Mexico	2009	98.9(98.1-99.3)	98.8(98.4-99)	97.4(96.8-97.9)	94.5(92.6-95.9)	98.1(97.8-98.4)
Philippines	2009	95.0(93.6-96.1)	94.2(93.1-95.2)	93.8(92.0-95.3)	89.1(85.8-91.7)	94.0(93.1-94.8)
Poland	2009	93.5(91.3-95.1)	92.0(90.7-93.2)	89.6(88.1-90.9)	92.3(90.4-93.8)	91.5(90.7-92.3)
Russian Federation	2009	89.1(86.7-91.2)	90.4(88.9-91.8)	90.8(89.0-92.4)	93.6(91.6-95.2)	90.8(89.6-91.9)
Thailand	2009	99.3(97.8-99.7)	99.1(98.7-99.4)	98.5(97.9-98.9)	95.0(93.5-96.2)	98.6(98.2-98.8)
Turkey	2008	97.8(96.7-98.6)	97.9(97.2-98.4)	97.2(96.3-97.9)	92.8(90.5-94.7)	97.2(96.6-97.7)
Ukraine	2010	94.6(92.4-96.2)	93.7(92.5-94.6)	92.4(91.0-93.6)	91.9(90.3-93.3)	93.2(92.3-93.9)
Uruguay	2009	99.0(97.5-99.6)	98.7(97.7-99.3)	96.1(94.5-97.2)	96.1(94.5-97.2)	97.6(97-98.1)
Vietnam	2010	97.2(95.8-98.1)	96.1(95.1-96.9)	95.6(94.5-96.4)	90.1(87.6-92.1)	95.7(95.0-96.3)

**Table 2. Percentage of Adults by Gender and Residence who Believe that Smoking Tobacco Causes Serious Illness**

Country	Year	% (95% CI)					
		Gender			Residence		
		Male	Female	Total	Urban	Rural	Total
Bangladesh	2009	97.6(96.8-98.2)	97.2(96.4-97.8)	97.4(96.8-97.8)	97.5(96.7-98.1)	97.3(96.7-97.9)	97.4(96.8-97.8)
Brazil	2008	95.9(95.5-96.3)	96.3(95.9-96.7)	96.1(95.8-96.4)	96.4(96.1-96.7)	94.2(93.2-95.2)	96.1(95.8-96.4)
China	2010	83.3(80.1-86.1)	80.3(76.7-83.4)	81.8(78.6-84.6)	90.4(88.2-92.1)	74.5(70.2-78.4)	81.8(78.6-84.6)
Egypt	2009	97.3(96.8-97.7)	97.9(97.4-98.2)	97.6(97.2-97.9)	98.4(98.1-98.6)	96.9(96.3-97.4)	97.6(97.2-97.9)
India	2009	91.5(90.9-92.2)	88.8(87.9-89.6)	90.2(89.6-90.8)	93.8(93.2-94.3)	88.7(88.0-89.5)	90.2(89.6-90.8)
Mexico	2009	98.2(97.8-98.5)	98.1(97.6-98.5)	98.1(97.8-98.4)	98.6(98.2-98.9)	96.5(95.5-97.3)	98.1(97.8-98.4)
Philippines	2009	93.1(91.9-94.2)	94.9(94-95.7)	94.0(93.1-94.8)	95.3(94.3-96.2)	92.7(91.3-94.0)	94.0(93.1-94.8)
Poland	2009	90.4(89.2-91.6)	92.6(91.4-93.6)	91.5(90.7-92.3)	90.9(89.7-92.0)	92.6(91.5-93.5)	91.5(90.7-92.3)
Russian Federation	2009	88.0(86.4-89.5)	93.2(91.8-94.3)	90.8(89.6-91.9)	90.2(88.6-91.6)	92.8(91.4-93.9)	90.8(89.6-91.9)
Thailand	2009	98.2(97.7-98.7)	98.9(98.5-99.1)	98.6(98.2-98.8)	99.1(98.9-99.3)	98.3(97.8-98.7)	98.6(98.2-98.8)
Turkey	2008	97.8(97.2-98.2)	96.7(95.7-97.4)	97.2(96.6-97.7)	97.7(97.0-98.3)	96.0(95.0-96.9)	97.2(96.6-97.7)
Ukraine	2010	91.5(90.2-92.6)	94.6(93.6-95.4)	93.2(92.3-93.9)	93.4(92.3-94.4)	92.6(91.4-93.6)	93.2(92.3-93.9)
Uruguay	2009	97.4(96.2-98.2)	97.8(97-98.4)	97.6(97-98.1)	97.6(97.0-98.2)	96.9(95.7-97.8)	97.6(97.0-98.1)
Vietnam	2010	95.4(94.4-96.2)	96.0(95.2-96.8)	95.7(95-96.3)	97.0(96.4-97.5)	95.1(94.1-96.0)	95.7(95.0-96.3)

The percentage of males amongst the respondents who believe that smoking tobacco causes serious illness was 97.6% in Bangladesh, 95.9% in Brazil, 83.3% in China, 97.3% in Egypt, 91.5% in India, 98.2% in Mexico, 93.1% in the Philippines, 90.4% in Poland, 88.0% in Russian Federation, 98.2% in Thailand, 97.8% in Turkey, 91.5% in Ukraine, 97.4% in Uruguay, 95.5% in Vietnam.

The percentage of females amongst the respondents who believe that smoking tobacco causes serious illness was 97.2% in Bangladesh, 96.3% in Brazil, 80.3% in China, 97.9% in Egypt, 88.8% in India, 98.1% in Mexico, 94.9% in the Philippines, 92.6% in Poland, 93.2% in Russian Federation, 98.9% in Thailand, 96.7% in Turkey, 94.6% in Ukraine, 97.8% in Uruguay, 96.0% in Vietnam (Table 2).

#### *Residential (urban/rural) distribution of adults who believe that smoking tobacco causes serious illness*

The percentage of urban based adults amongst the respondents who believe that smoking causes serious illness was 97.5% in Bangladesh, 96.4% in Brazil, 96.1% in China, 98.4% in Egypt, 93.8% in India, 98.6% in Mexico, 98.1% in the Philippines, 90.8% in Poland,

90.2% in Russian Federation, 93.2% in Thailand, 97.7% in Turkey, 93.4% in Ukraine, 97.6% in Uruguay, 97.6% in Vietnam.

The percentage of rural based adults amongst the respondents who believe that smoking causes serious illness was 97.3% in Bangladesh, 94.2% in Brazil, 96.4% in China, 96.9% in Egypt, 88.7% in India, 96.5% in Mexico, 98.6% in Philippines, 90.2% in Poland, 92.8% in Russian federation, 93.4% in Thailand, 96% in Turkey, 92.6% in Ukraine, 96.9% in Uruguay, 97.6% in Vietnam.

#### *Distribution of level of awareness about types of serious illnesses caused by smoking tobacco (Figure 1)*

The percentage of adults amongst the respondents who believe that smoking causes lung cancer was 94.2% in Bangladesh, 96.0% in Brazil, 79.0% in China, 96.0% in Egypt, 87.2% in India, 96.6% in Mexico, 91.5% in Philippines, 91.8% in Poland, 88.5% in Russian federation, 97.4% in Thailand, 96.8% in Turkey, 89.7% in Ukraine, 96.9% in Uruguay, 95.2% in Vietnam.

The percentage of adults amongst the respondents who believe that smoking causes heart attack was 90.2% in Bangladesh, 87.1% in Brazil, 40.6% in China, 94.8%

in Egypt, 65.1% in India, 80.5% in Mexico, 77.6% in Philippines, 79.5% in Poland, 65.7% in Russian federation, 75.3% in Thailand, 94.4% in Turkey, 75.5% in Ukraine, 92.3% in Uruguay, 63.0% in Vietnam.

The percentage of adults amongst the respondents who believe that smoking causes heart attack was 87.2% in Bangladesh, 75.5% in Brazil, 28.2% in China, 88.6% in Egypt, 50.5% in India, 59.9% in Mexico, 71.4% in

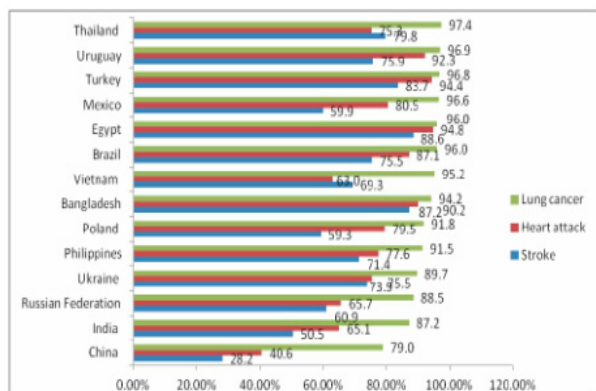
Philippines, 59.3% in Poland, 60.9% in Russian federation, 79.8% in Thailand, 83.7% in Turkey, 73.9% in Ukraine, 75.9% in Uruguay, 69.3% in Vietnam.

*Age distribution of adults who believe that using smokeless tobacco causes serious illness*

Out of the respondents in 15-24 year group, percentage of individuals who believed that using smokeless tobacco causes serious illness was 92.9% in Bangladesh, 69.1% in Brazil, not recorded% in China, not recorded% in Egypt, 91.6% in India, 68.4% in Mexico, 49.5% in the Philippines, 39.4% in Poland, 39.2% in Russian Federation, 65.2% in Thailand, not recorded% in Turkey, 44.1% in Ukraine, 49.3% in Uruguay, 55.4% in Vietnam.

Out of the respondents in 25-44 year group, percentage of individuals who believed that using smokeless tobacco causes serious illness was 93.6% in Bangladesh, 69.6% in Brazil, not recorded% in China, not recorded% in Egypt, 89.6% in India, 68.6% in Mexico, 47.8% in the Philippines, 39.8% in Poland, 40.2% in Russian Federation, 74.0% in Thailand, not recorded% in Turkey, 41.3% in Ukraine, 53.0% in Uruguay, 55.5% in Vietnam.

Out of the respondents in 45-64 year group, percentage of individuals who believed that using smokeless tobacco



**Figure 1. Percent of Adult who Believe that smoking causes Lung Cancer, Heart Attack, or Stroke.** Percentage (%): A weight Percentage Reflects the Population

**Table 3. Percentage of Adults by Age who Believe that using Smokeless Tobacco Causes Serious Illness**

Country	Year	% (95% CI)				Total
		Age (years)				
		15-24	25-44	45-64	65+	
Bangladesh	2009	92.9(91.1-94.3)	93.6(92.4-94.7)	92.5(90.6-94)	87.1(82.7-90.4)	92.7(91.6-93.7)
Brazil	2008	69.1(67.7-70.6)	69.6(68.5-70.6)	67.1(65.8-68.4)	64.0(62.2-65.8)	68.2(67.4-69.1)
China	2010	—(—)	—(—)	—(—)	—(—)	—(—)
Egypt	2009	—(—)	—(—)	—(—)	—(—)	—(—)
India	2009	91.6(90.7-92.4)	89.6(88.8-90.3)	86.1(85-87.1)	79.8(77.8-81.6)	88.8(88.1-89.4)
Mexico	2009	68.4(65.8-70.9)	68.6(66.7-70.4)	67.1(64.8-69.2)	60.6(56.5-64.7)	67.5(66.1-69)
Philippines	2009	49.5(46.5-52.5)	47.8(45.2-50.3)	48.9(45.9-52)	42.5(37.8-47.3)	48.2(46.1-50.3)
Poland	2009	39.4(35.5-43.5)	39.8(37.4-42.2)	36.1(33.7-38.6)	43.0(39.2-46.8)	39.0(37.2-40.9)
Russian Federation	2009	39.2(35.2-43.4)	40.2(37.2-43.3)	45.3(42.2-48.4)	49.0(44.5-53.5)	43.0(40.3-45.8)
Thailand	2009	65.2(61.6-68.7)	74.0(72.2-75.8)	73.4(71.6-75)	64.0(61.5-66.4)	71.1(69.6-72.6)
Turkey	2008	—(—)	—(—)	—(—)	—(—)	—(—)
Ukraine	2010	44.1(39.8-48.5)	41.3(38.7-43.9)	42.4(39.8-45.1)	35.1(32.1-38.2)	41.1(39.2-43)
Uruguay	2009	49.3(44.5-54.1)	53.0(49.3-56.7)	53.2(49.3-57.1)	59.3(54.9-63.5)	53.4(50.8-56)
Vietnam	2010	55.4(52.3-58.6)	55.5(53.2-57.9)	57.9(55.3-60.4)	49.2(45.2-53.3)	55.5(53.7-57.3)

**Table 4. Percentage of Adults by Gender and Residence who Believe that using Smokeless Tobacco Causes Serious Illness**

Country	Year	% (95% CI)					
		Gender			Residence		
		Male	Female	Total	Urban	Rural	Total
Bangladesh	2009	92.6(91.2-93.8)	92.9(91.4-94.1)	92.7(91.6-93.7)	94.9(93.3-96.1)	92.0(90.5-93.2)	92.7(91.6-93.7)
Brazil	2008	66.9(65.8-67.9)	69.5(68.5-70.5)	68.2(67.4-69.1)	68.1(67.2-69)	69.2(66.6-71.7)	68.2(67.4-69.1)
China	2010	—(—)	—(—)	—(—)	—(—)	—(—)	—(—)
Egypt	2009	—(—)	—(—)	—(—)	—(—)	—(—)	—(—)
India	2009	90.1(89.3-90.9)	87.3(86.3-88.2)	88.8(88.1-89.4)	93.0(92.3-93.6)	87.0(86.2-87.8)	88.8(88.1-89.4)
Mexico	2009	64.5(62.2-66.8)	70.3(68.5-72)	67.5(66.1-69)	68.1(66.3-69.8)	65.6(63.2-68)	67.5(66.1-69)
Philippines	2009	46.2(43.7-48.6)	50.2(47.9-52.5)	48.2(46.1-50.3)	49.6(46.6-52.6)	46.8(44-49.6)	48.2(46.1-50.3)
Poland	2009	33.6(31.3-36)	44(41.4-46.7)	39.0(37.2-40.9)	37.2(34.6-39.8)	42.1(39.7-44.6)	39.0(37.2-40.9)
Russian Federation	2009	37.9(35.1-40.8)	47.3(44.2-50.4)	43.0(40.3-45.8)	41.4(38-44.9)	47.8(44.2-51.4)	43.0(40.3-45.8)
Thailand	2009	69.2(67.2-71.2)	72.9(71.3-74.5)	71.1(69.6-72.6)	69.6(68.1-71)	71.8(69.7-73.8)	71.1(69.6-72.6)
Turkey	2008	—(—)	—(—)	—(—)	—(—)	—(—)	—(—)
Ukraine	2010	38.9(36.7-41.1)	42.9(40.4-45.4)	41.1(39.2-43)	42.0(39.5-44.5)	39.1(36.4-42)	41.1(39.2-43)
Uruguay	2009	50.9(47.7-54.1)	55.6(52.4-58.7)	53.4(50.8-56)	52.9(50.1-55.6)	60.0(55.8-64.1)	53.4(50.8-56)
Vietnam	2010	53.8(51.5-56.1)	57.1(55-59.1)	55.5(53.7-57.3)	56.8(54.8-58.8)	54.9(52.5-57.3)	55.5(53.7-57.3)

causes serious illness was 92.5% in Bangladesh, 67.1% in Brazil, not recorded% in China, not recorded% in Egypt, 86.1% in India, 67.1% in Mexico, 48.9% in Philippines, 36.1% in Poland, 45.3% in Russian Federation, 73.4% in Thailand, not recorded% in Turkey, 42.4% in Ukraine, 53.2% in Uruguay, 57.9% in Vietnam.

Out of the respondents in 65+ year group, percentage of individuals who believed that using smokeless tobacco causes serious illness was 87.1% in Bangladesh, 64.0% in Brazil, not recorded% in China, not recorded% in Egypt, 79.8% in India, 60.6% in Mexico, 42.5% in the Philippines, 43.0% in Poland, 49.0% in Russian Federation, 64.0% in Thailand, not recorded% in Turkey, 35.1% in Ukraine, 59.3% in Uruguay, 49.2% in Vietnam (Table 3).

#### *Gender distribution of adults who believe that using smokeless tobacco causes serious illness*

The percentage of males amongst the respondents who believed that that using smokeless tobacco causes serious illness was 92.6% in Bangladesh, 66.9% in Brazil, not recorded% in China, not recorded% in Egypt, 90.1% in India, 64.5% in Mexico, 46.2% in the Philippines, 33.6% in Poland, 37.9% in Russian Federation, 69.2% in Thailand, not recorded% in Turkey, 38.9% in Ukraine, 50.9% in Uruguay, 53.8% in Vietnam.

The percentage of females amongst the respondents who believe that that using smokeless tobacco causes serious illness was 92.9% in Bangladesh, 69.5% in Brazil not recorded% in China, not recorded% in Egypt, 87.3% in India, 70.3% in Mexico, 50.2% in the Philippines, 44.0% in Poland, 47.3% in Russian Federation, 72.9% in Thailand, not recorded% in Turkey, 42.9% in Ukraine, 55.6% in Uruguay, 57.1% in Vietnam (Table 4).

#### *Residential distribution of adults who believe that using smokeless tobacco causes serious illness*

The percentage of urban based adults amongst the respondents who believe that using smokeless tobacco causes serious illness was 94.9% in Bangladesh, 68.1% in Brazil, not recorded% in China, not recorded% in Egypt, 93.0% in India, 68.1% in Mexico, 49.6% in

the Philippines, 37.2% in Poland, 41.4% in Russian Federation, 69.6% in Thailand, not recorded% in Turkey, 42.0% in Ukraine, 52.9% in Uruguay, 56.8% in Vietnam.

The percentage of rural based adults amongst the respondents who believe that using smokeless tobacco causes serious illness was 92.0% in Bangladesh, 69.2% in Brazil, not recorded% in China, not recorded% in Egypt, 87.0% in India, 65.6% in Mexico, 46.8% in The Philippines, 42.1% in Poland, 47.8% in Russian Federation, 71.8% in Thailand, not recorded% in Turkey, 39.1% in Ukraine, 60.0% in Uruguay, 54.9% in Vietnam.

#### *Age distribution of adults who believe that breathing other people's smoke causes serious illness to non-smokers*

Out of the respondents in 15-24 year group, percentage of individuals who believed that breathing other people's smoke causes serious illness was 95.2% in Bangladesh, 92.6% in Brazil, 77.5% in China, 96.8% in Egypt, 86.6% in India, 96.8% in Mexico, 92.7% in The Philippines, 80.5% in Poland, 77.4% in Russian Federation, 97.5% in Thailand, 95.9% in Turkey, 87.7% in Ukraine, 94.3% in Uruguay, 92.5% in Vietnam.

Out of the respondents in 25-44 year group, percentage of individuals who believed that breathing other people's smoke causes serious illness was 94.9% in Bangladesh, 92.9% in Brazil, 68.4% in China, 96.9% in Egypt, 83.5% in India, 96.1% in Mexico, 92.9% in the Philippines, 81.9% in Poland, 80.8% in Russian Federation, 97.0% in Thailand, 95.8% in Turkey, 87.1% in Ukraine, 96.5% in Uruguay, 88.2% in Vietnam.

Out of the respondents in 45-64 year group, percentage of individuals who believed that breathing other people's smoke causes serious illness was 91.6% in Bangladesh, 90.8% in Brazil, 56.6% in China, 96.3% in Egypt, 79.8% in India, 95.0% in Mexico, 90.1% in The Philippines, 80.8% in Poland, 83.4% in Russian Federation, 94.4% in Thailand, 96.3% in Turkey, 86.1% in Ukraine, 91.2% in Uruguay, 84.4% in Vietnam.

Out of the respondents in 65+ year group, percentage of individuals who believed breathing other people's smoke causes serious illness was 81.5% in Bangladesh, 84.6% in Brazil, 41.9% in China, 89.4% in Egypt, 72.9% in India,

**Table 5. Percentage of Adults by Age who Believe that Breathing other People's Smoke Causes Serious Illness to Non-Smokers**

Country	Year	Age (years), %(95% CI)				Total
		15-24	25-44	45-64	65+	
Bangladesh	2009	95.2(94.96.2)	94.9(93.8-95.7)	91.6(89.8-93.1)	81.5(77.2-85.1)	93.4(92.6-94.2)
Brazil	2008	92.6(91.7-93.4)	92.9(92.3-93.4)	90.8(90.91.5)	84.6(83.2-85.9)	91.4(90.9-91.8)
China	2010	77.5(72.5-81.8)	68.4(64.3-72.2)	56.6(52.1-61.1)	41.9(36.7-47.2)	64.3(60.5-67.9)
Egypt	2009	96.8(95.9-97.6)	96.9(96.2-97.4)	96.3(95.6-97)	89.4(86.8-91.5)	96.3(95.8-96.8)
India	2009	86.6(85.5-87.6)	83.5(82.5-84.5)	79.8(78.5-81.1)	72.9(70.7-74.9)	82.9(82.1-83.7)
Mexico	2009	96.8(95.8-97.6)	96.1(95.1-96.8)	95.0(93.9-95.9)	91.0(89.0-92.7)	95.6(95.96.2)
Philippines	2009	92.7(91.0-94.1)	92.9(91.8-93.9)	90.1(88.1-91.8)	83.9(79.9-87.2)	91.6(90.7-92.5)
Poland	2009	80.5(77.2-83.4)	81.9(79.9-83.8)	80.8(78.8-82.6)	82.4(80.0-84.7)	81.4(80.0-82.7)
Russian Federation	2009	77.4(74.3-80.2)	80.8(78.4-83.1)	83.4(81.3-85.3)	86.2(83.3-88.6)	81.9(80.3-83.4)
Thailand	2009	97.5(96.4-98.2)	97.0(96.3-97.5)	94.4(93.6-95.1)	82.6(80.2-84.8)	94.9(94.3-95.5)
Turkey	2008	95.9(94.6-97)	95.8(94.9-96.6)	96.3(95.5-97.1)	90.5(87.8-92.6)	95.5(94.9-96.1)
Ukraine	2010	87.7(84.6-90.3)	87.1(85.4-88.7)	86.1(84.3-87.7)	83.7(81.6-85.5)	86.3(85.2-87.4)
Uruguay	2009	94.3(91.6-96.2)	96.5(95.2-97.4)	91.2(89.2-92.8)	91.6(89.7-93.2)	93.8(92.9-94.5)
Vietnam	2010	92.5(90.6-94.1)	88.2(86.5-89.6)	84.4(82.5-86.2)	71.7(68.2-75)	87.0(85.7-88.1)

91.0% in Mexico, 83.9.1% in the Philippines, 82.4% in Poland, 86.2% in Russian Federation, 82.6% in Thailand, 90.5% in Turkey, 83.7% in Ukraine, 91.6% in Uruguay, 71.7% in Vietnam (Table 5).

*Gender distribution of adults who believe that breathing other people's smoke causes serious illness to non-smokers*

The percentage of males amongst the respondents who believed that that breathing other people's smoke causes serious illness was 97.0% in Bangladesh, 90.8% in Brazil, 65.3% in China, 96.8% in Egypt, 84.9% in India, 95.2% in Mexico, 90.2% in the Philippines, 77.4% in Poland, 75.7% in Russian Federation, 94.6% in Thailand, 95.9% in Turkey, 82.5% in Ukraine, 93.2% in Uruguay, 87.0% in Vietnam

The percentage of females amongst the respondents who believe that that breathing other people's smoke causes serious illness was 89.9% in Bangladesh, 91.9% in Brazil, 63.2% in China, 95.8% in Egypt, 80.8% in India, 96.1% in Mexico, 93.0% in the Philippines, 85.1% in Poland, 87.0% in Russian Federation, 95.2% in Thailand, 95.1% in Turkey, 89.5% in Ukraine, 94.3% in Uruguay, 86.9% in Vietnam (Table 6).

*Residential distribution of adults who believe that breathing other people's smoke causes serious illness to non-smokers*

The percentage of urban based adults amongst the respondents who believe that breathing other people's smoke causes serious illness was 94.9% in Bangladesh, 92.1% in Brazil, 77.1% in China, 98.1% in Egypt, 88.0% in India, 96.4% in Mexico, 93.9% in the Philippines, 79.9% in Poland, 81.1% in Russian Federation, 96.1% in Thailand, 96.3% in Turkey, 87.0% in Ukraine, 93.7% in Uruguay, 91.4% in Vietnam.

The percentage of rural based adults amongst the respondents who believe that breathing other people's smoke causes serious illness was 92.3% in Bangladesh, 87.4% in Brazil, 53.4% in China, 94.9% in Egypt, 80.8% in India, 93.1% in Mexico, 89.4% in the Philippines, 83.8% in Poland, 84.3% in Russian Federation, 94.4% in Thailand, 93.6% in Turkey, 85.0% in Ukraine, 94.2% in

Uruguay, 85.0% in Vietnam.

**Discussion**

This study assessed data from GATS conducted across 14 low- and middle income nations to assess knowledge, attitudes and perceptions towards tobacco use in a nationally representative sample of adults in these nations. To our knowledge, this is the first ever study to explore these aspects drawing international comparisons as well as using the largest ever population sample size. The results are suggestive that a large number of adults in most of the countries do believe that tobacco consumption (smoking and smokeless tobacco) in addition to exposure to second hand smoke causes serious illness. However, significant variations were observed across gender and age in most nations. The variations were not significant between urban and rural regions. But there was a significant variation between observed levels of relatively high knowledge about harmful effects of tobacco consumption which did not co-relate with high actual tobacco consumption levels.

The awareness about smoking tobacco being a cause of serious illness was uniformly high (>90%) across all countries where GATS was conducted except in China (81.8%). The awareness about the harmful effects was predominantly about the relationship between smoking tobacco and lung cancer (>90% in most countries). In comparison, the awareness about relationship of smoking tobacco to heart attack (40.6% in China, 65.1% in India) and stroke (28.2% in China, 50.5% in India) was relatively much lower. This trend is reflected for all the countries where GATS was conducted (see Figure 1). Also, the awareness was fairly uniform across all age groups in most of the countries, except in China where the awareness was least in elderly age group (65+) (Table 1). Considering gender trends, there was marginally higher awareness amongst males in China and India and slightly higher awareness amongst females in Russian federation and Ukraine. There was no significant difference in awareness between both genders in other countries (Table 2). India and Mexico exhibit slightly higher awareness in urban population in comparison to uniform awareness in

**Table 6. Percentage of Adults by Gender and Residence who Believe that Breathing other People's Smoke Causes Serious Illness to Non-Smokers**

Country	Year	% (95% CI)					
		Gender			Residence		
		Male	Female	Total	Urban	Rural	Total
Bangladesh	2009	97.0(96.2-97.6)	89.9(88.3-91.2)	93.4(92.6-94.2)	96.7(95.8-97.3)	92.3(91.2-93.2)	93.4(92.6-94.2)
Brazil	2008	90.8(90.2-91.3)	91.9(91.4-92.5)	91.4(90.9-91.8)	92.1(91.6-92.5)	87.4(85.7-88.9)	91.4(90.9-91.8)
China	2010	65.3(61.1-69.4)	63.2(59.5-66.8)	64.3(60.5-67.9)	77.1(74.1-79.8)	53.4(48.8-58.0)	64.3(60.5-67.9)
Egypt	2009	96.8(96.2-97.4)	95.8(95-96.5)	96.3(95.8-96.8)	98.1(97.8-98.4)	94.9(93.9-95.7)	96.3(95.8-96.8)
India	2009	84.9(83.9-85.9)	80.8(79.7-81.8)	82.9(82.1-83.7)	88.0(86.9-89.0)	80.8(79.7-81.8)	82.9(82.1-83.7)
Mexico	2009	95.2(94.3-95.9)	96.1(95.3-96.7)	95.6(95-96.2)	96.4(95.6-97.0)	93.1(91.6-94.3)	95.6(95-96.2)
Philippines	2009	90.2(88.9-91.4)	93.0(91.9-94)	91.6(90.7-92.5)	93.9(92.5-95.0)	89.4(87.9-90.7)	91.6(90.7-92.5)
Poland	2009	77.4(75.2-79.4)	85.1(83.4-86.6)	81.4(80-82.7)	79.9(78.0-81.7)	83.8(81.9-85.5)	81.4(80.0-82.7)
Russian Federation	2009	75.7(73.4-77.8)	87(85.3-88.6)	81.9(80.3-83.4)	81.1(79.0-83.0)	84.3(82.1-86.3)	81.9(80.3-83.4)
Thailand	2009	94.6(93.9-95.3)	95.2(94.5-95.8)	94.9(94.3-95.5)	96.1(95.6-96.5)	94.4(93.6-95.1)	94.9(94.3-95.5)
Turkey	2008	95.9(95.1-96.6)	95.1(94.2-95.8)	95.5(94.9-96.1)	96.3(95.6-97.0)	93.6(92.5-94.5)	95.5(94.9-96.1)
Ukraine	2010	82.5(80.8-84.1)	89.5(88.2-90.7)	86.3(85.2-87.4)	87.0(85.4-88.4)	85.0(83.5-86.4)	86.3(85.2-87.4)
Uruguay	2009	93.2(91.7-94.4)	94.3(93.1-95.3)	93.8(92.9-94.5)	93.7(92.8-94.6)	94.2(92.8-95.3)	93.8(92.9-94.5)
Vietnam	2010	87.0(85.5-88.4)	86.9(85.4-88.2)	87.0(85.7-88.1)	91.4(90.3-92.4)	85.0(83.3-86.5)	87.0(85.7-88.1)

other countries irrespective of the residence of the study population (Table 2).

On the contrary, awareness about harmful effects of smokeless tobacco was significantly low in most countries with an exception of Bangladesh (92.7%) and India (88.8%). Poland, the Philippines, Ukraine and Russian federation showed significantly low awareness (<50%) about harmful effects of smokeless tobacco. Unfortunately, no data was collected for smokeless tobacco in China and Egypt. These trends are quite alarming showing the societal acceptance of smokeless tobacco as a harmless substance in these countries (Gupta et al., 2013). This awareness was the least in 65+ age group across all countries (Table 3). The awareness of female population about harmful effects of smokeless tobacco was higher in all countries except India where male awareness was slightly higher. Rural population showed higher awareness in Poland, Russian Federation, Uruguay and Bangladesh whereas urban population showed higher awareness in other countries (Table 3).

The awareness about harmful effects of second hand smoke was lowest in China (64.3%), relatively low in India (82.9%), Poland (81.4%), Russian Federation (81.9%), Ukraine (86.3%) and it was more than 90% in all other countries. Females showed higher awareness in all countries except India. Urban population showed higher awareness in Bangladesh, India, Mexico, Phillipines and Ukraine (Table 4). The awareness was least in 65+ age group, with younger age groups showing higher awareness in all countries (Table 5). Females showed higher awareness in Poland, the Philippines, Russian federation and Ukraine. Rural population showed higher awareness in Poland, Russian Federation and Uruguay whereas urban population showed higher awareness in other countries (Table 6).

It is popularly believed that gaining knowledge about ill effects of tobacco use is likely to influence individual consumption of tobacco by smoking or smokeless products (Shiffman, 1986; Charlton et al., 1989; Nobile et al., 2000; Ma et al., 2003; Panda et al., 2012). However, a high level of knowledge about the ill effects of tobacco consumption is not necessarily a predictor of low tobacco consumption prevalence (Flay et al., 1999; Rosendahl et al., 2005). GATS survey in multiple countries has shown that awareness about harmful effects of tobacco smoking is very high. In view of this, it is difficult to explain the high prevalence of tobacco use despite high levels of knowledge about its harmful effects (Jena et al., 2013). One needs to consider other factors as possible mediators in individuals' decision to adopt and continue smoking habits (Rosendahl et al., 2005). Further studies are required to establish the association between knowledge of harmful effects of tobacco and smoking habits and factors influencing these decisions over time, especially during adolescence and young adulthood (Jena et al., 2013).

One may also consider the Festinger's cognitive dissonance theory to explain the high consumption of tobacco products despite awareness of its harmful effects. (Lim et al., 2009) This theory postulates that dissonance or psychological turmoil occurs when a person has two or more conflicting cognitions (behaviour and attitude).

To reduce this dissonance, the smokers get compelled to either change their attitude towards smoking or stop smoking. Since it is easier to change attitude as compared to behaviour, most tobacco consumers tend to develop a positive attitude towards tobacco consumption instead of quitting it. (Cooper, 2007) Behavioural changes required to change the tobacco consumption habits are definitely likely to include awareness of harmful effects but that is not likely to be sufficient alone (Prochaska et al., 1992; Strecher et al., 1997).

In addition, the way the knowledge is acquired also influences the consumption behaviour- generalized or personalized (Bien et al., 1993). Generalized knowledge would be related to average detrimental effects on general population whereas personalized knowledge is related to personal risk and likely to be more effective in influencing behavioral change (Rosendahl et al., 2005). Amongst younger population, aesthetic considerations are considered more important than health considerations (Honjo et al., 2003; Rosendahl et al., 2005).

In most of countries where GATS was conducted, there was relatively low awareness levels about risks associated with smokeless tobacco, except Bangladesh and India. This is associated with the fact that smokeless tobacco is perceived as relatively safe and harmless and has shown very high smokeless tobacco consumption prevalence in these countries. There is a need to increase the awareness about harmful effects of smokeless tobacco through media and campaigns similar to the ones conducted against smoking.

In conclusion, it is popularly believed that tobacco consumption (smoking and smokeless) is inversely linked to knowledge, attitudes and perception of population towards tobacco. However, GATS has shown a significant gap between these two parameters. Despite high awareness about harmful effects of smoking, people continue to smoke developing a tolerant attitude towards it. The reasons for this phenomenon remain unclear and need to be studied in further depth.

In addition, the awareness of ill effects of tobacco smoking in most countries remains limited to lung cancer with relatively low awareness about ill effects on cardiovascular system in form of heart attack and stroke. Also, there is surprisingly low awareness about ill effects of smokeless tobacco in most countries. This needs to be rectified by governments and policy makers of respective countries through sustained media and educational campaigns to increase population awareness about the ill effects of smokeless tobacco as well as preventing initiation into tobacco consumption (smoking or smokeless).

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