



Linking Global Youth Tobacco Survey Data to the WHO Framework Convention on Tobacco Control: the Case for Egypt

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Abstract

Purpose Limited publications from Egypt have focused on prevalence of tobacco use and tobacco control policy. We used four waves of the Egypt Global Youth Tobacco Survey (GYTS) between 2001 and 2014 and a cigarette affordability measure, to evaluate the implementation of the World Health Organization's MPOWER recommendations.

Findings Despite Egypt's implementation of several MPOWER recommendations, the enforcement of laws and regulations may be limited, and therefore had little to no impact on youth current smoking prevalence through 2014. Notably, experimentation with cigarette smoking has significantly increased between waves 2001 and 2014.

Summary There is a missed opportunity for implementing evidence-based interventions for youth tobacco control in Egypt. There is a strong need for initiatives aiming at meaningful taxation, enforcement of smoking bans in public places, promoting smoke-free homes, appropriate mass media counter-advertising, and effective cessation activities.

Keywords Global Youth Tobacco Survey · Youth · MPOWER · Smoking · Tobacco control · Egypt

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Introduction

Worldwide, smoking and second-hand smoking (SHS) exposure prematurely kills more than seven million people annually. This is mostly attributed to cigarette and other combusted tobacco product use, according to the 2014 US Surgeon General Report [1]. Around 70% of premature deaths due to tobacco occur in developing countries, such as Egypt [2–4]. In 2003, in an effort to curb the tobacco epidemic, the World Health Organization (WHO) negotiated a treaty, the Framework Convention on Tobacco Control (FCTC), that focuses on supply and demand reduction strategies to combat the tobacco use epidemic [5]. Egypt signed the FCTC in 2003 and ratified it in 2005 [6]. In 2008, to scale up the implementation of tobacco control policy detailed in the articles of the WHO FCTC, the WHO introduced a comprehensive set of evidence-based measures called “MPOWER”: Monitor tobacco use and prevention policies (Article 20); Protect people from tobacco smoke (Article 8); Offer help to quit tobacco use (Article 14); Warn about the dangers of tobacco (Articles

11 and 12); Enforce bans on tobacco advertising, promotion and sponsorship (Article 13); and Raise taxes on tobacco (Article 6) [7–9].

Although Egypt has passed several laws and regulations to control the epidemic, such as banning smoking in the workplace and in public transportation [10], prohibiting tobacco advertising, promotion, and sponsorship [10], and requiring cigarette package pictorial warnings [11], it is one of the highest consumers of tobacco in the Middle East and North Africa region [12]. Previous reports indicated that the overall number of smokers in Egypt have grown on an average of 8% annually, with a declining age of initiation [11–13]. The extent to which these laws and regulations are being enforced is questionable [10, 14, 15]. The Global Youth Tobacco Survey (GYTS) offers a standardized monitoring tool to evaluate the progress of the global tobacco control efforts by monitoring youth tobacco smoking rates around the world, in addition to other indicators pertaining to various tobacco control measures and policies. The aim of the GYTS is to enhance the capacity of countries to monitor tobacco use among youth and to guide the implementation and evaluation of tobacco prevention and control programs, and policies [9].

In this study, we analyze GYTS data to evaluate the impact of demand-related articles of the WHO FCTC in addition to Article 16 concerning sales to minors as a supply reduction strategy. This study utilized indicators from the GYTS, grouped across the MPOWER measures, to evaluate changes, if any, before and after Egypt's ratification to the WHO FCTC between 2001 and 2014. To date, there are no published evaluations pertaining to the tobacco control efforts in Egypt using the GYTS. We hypothesized that government implementation of the MPOWER strategies would result in less youth initiation and decrease in current smoking rates (i.e., past 30-day smoking) in Egypt.

Methods

Study Setting and Data Collection

This study utilizes cross-sectional secondary data ($n = 15,255$) of the GYTS waves 2001 ($n = 3792$), 2005 ($n = 4196$), 2009 ($n = 4796$), and 2014 ($n = 2471$) conducted in Egypt. Each wave was representative of the youth enrolled in the public school system. The overall response rate ranged from 77% in 2005 to 97% in 2009 [16–19]. The GYTS uses a common methodology for all waves. Public Egyptian schools (private schools were excluded) that had ≥ 40 students from 7th to 11th grade were eligible for sampling. The GYTS uses a two-stage cluster sample design (first for school level and then for classroom level). The probability

of schools being selected is proportional to the enrollment size (i.e., large schools were more likely to be selected than small schools) [9]. Schools that did not agree to participate were not replaced. Prior to the assessment, the school director obtained a waiver of parental written consent (“passive consent”) by sending a letter to the parents explaining the purpose and contents of the GYTS and advised on opting out procedures. All students present on the date of the survey in the selected classroom were eligible to participate and were informed that participation was voluntary. Trained assistants, without the presence of the teacher in the classroom, conducted data collection in schools. The GYTS sample design produces representative, independent, cross-sectional estimates for each site [9, 17, 20].

A weighting factor was applied to each student record to adjust for non-responses and variation in the probability of selection at the school, class, and student levels. The questionnaire was self-completed in 30–40 min anonymously by the students. The GYTS uses a standardized core questionnaire with possibility for additional country or region-specific questions (e.g., hookah/waterpipe use in Egypt). The questionnaire was translated to Arabic with back translation into English to check the accuracy of questions. The GYTS core questionnaire gathers data on smoking prevalence, knowledge and attitudes against smoking, role of media and advertising, access to cigarettes, smoking-related school curriculum, SHS, cessation of smoking. Permission to conduct the study was obtained from the Egyptian Ministry of Education.

Measures

Table 1 presents an outline of the WHO FCTC articles, the corresponding MPOWER measures designed to support implementation of those articles, and the corresponding GYTS indicators that the authors extracted to evaluate these measures. Briefly, we utilized the appropriate measures for each FCTC article that were present in at least three of the four GYTS waves to enable the assessment of existing trends. For each FCTC article and its related MPOWER strategy, we assessed several indicators ranging from two indicators for “offering help to quit smoking” to six indicators for “monitoring tobacco use and prevention policies” (Table 1). All the questions either had the same wording and response categories in all waves, or response categories were collapsed in a similar fashion to yield comparable responses. The latter approach was used for five indicators in total. For the indicator of source of last cigarette purchased, responses were grouped into two response categories across all survey years depicting whether the respondent has (a) bought them on their own or (b) got them some other way irrespective of the source.

Other than the GYTS measures, we assessed cigarette affordability rather than absolute tax increase for the 4 years

Table 1 WHO FCTC Articles, their supporting MPOWER measures, and primary GYTS indicators used in the study

WHO FCTC Articles ^a	WHO MPOWER ^b measures	Primary GYTS indicators used in the current study
<i>Article 20</i> (Research, surveillance and exchange of information) and	Monitor tobacco use and prevention policies	<i>Ever cigarette smoking</i> (Have you ever tried or experimented with cigarette smoking, even one or two puffs? Yes/No); <i>past 30-day cigarette smoking</i> (During the past 30 days, on how many days did you smoke cigarettes? coded as binary); <i>past 30-day other tobacco use</i> (During the past 30 days, have you ever used any form of tobacco products other than cigarettes? Coded as binary); <i>past 30-day waterpipe smoking</i> (During the past 30 days, on how many days did you smoke waterpipe?); <i>age at smoking initiation of cigarettes</i> (How old were you when you smoked cigarettes for the first time? coded into 6 age categories: 7 years or younger, 8–9, 10–11, 12–13, 14–15, 16 years or older); <i>age at smoking initiation of waterpipe</i> (similar as for cigarettes)
<i>Article 8</i> (Protection from exposure to tobacco smoke)	Protect people from tobacco smoke	<i>Parental smoking</i> (Do your parents smoke? coded as None, both, father only, mother only, and other/I don't know); <i>exposure to SHS at home</i> (During the past 7 days, on how many days have people smoked in your home, in your presence? coded as binary); <i>exposure to SHS in public places</i> (During the past 7 days, on how many days have people smoked in your presence, in places other than in your home? coded as binary); <i>Support for smoking-free policies</i> (Are you in favor of banning smoking in public places? Yes/No)
<i>Article 14</i> (measures for cessation)	Offer help to quit tobacco use	<i>Quit attempts in the past 12 months among smokers</i> (During the past year, have you ever tried to stop smoking cigarettes? coded as binary); <i>receiving help to quit</i> (Have you ever received help or advice to help you stop smoking? coded as binary)
<i>Article 12^a</i> (Education, communication, training and public awareness)	Warn about the dangers of tobacco	<i>Past year awareness of acute effects of smoking through school programs</i> (During this past school year, were you taught in any of your classes about the effects of smoking like it makes your teeth yellow, causes wrinkles, or makes you smell badly? coded as binary); <i>Past year awareness of dangers of smoking through school programs</i> (During the school year, were you taught in any of your classes about the dangers of smoking/tobacco use? coded as binary); <i>Past month exposure to anti-smoking media campaigns</i> (During the past 30 days, how many media messages talk about smoking (e.g., television, radio, billboards, posters, newspapers, magazines, movies) have you seen or heard? coded as binary).
<i>Article 13</i> (Tobacco advertising, promotion and sponsorship)	Enforce bans on tobacco advertising, promotion and sponsorship	<i>Notice billboard ads</i> (During the past 30 days, how many advertisements for cigarettes have you seen on billboards? coded as binary); <i>Notice newspaper/magazine ads</i> (During the past 30 days (one month), how many advertisements for cigarettes have you seen in newspapers or magazines? coded as binary); <i>Ownership of item with cigarette brand logo</i> (Do you have something (t-shirt, pen, backpack, etc.) with a cigarette brand logo on it? coded as binary); <i>offered free tobacco product</i> (Has a tobacco company representative ever offered you a free cigarette/Tobacco Product? Yes/No), <i>Exposure to smoking in movies</i> (When you watch TV, videos, or movies, how often do you see actors smoking? coded as binary)
<i>Article 6</i> (Price and tax measures)	Raise taxes on tobacco	<i>Source of cigarette last purchased</i> (During the past 30 days, how did you usually get your own cigarettes? coded as got them myself, got them some other way); <i>cigarette affordability index by brand</i> (the average price of 100 packs of manufactured cigarettes as a percentage of GDP per capita) ^c
<i>Article 16</i> (Sales to and by minors) ^d	Not applicable	Refusal to sell cigarettes to minors (During the past 30 days (1 month), did anyone ever refuse to sell you cigarettes because of your age? coded as binary)

FCTC Framework Convention on Tobacco Control, GYTS Global Youth Tobacco Survey, GDP gross domestic product, SHS second-hand smoke, TV television, WHO World Health Organization

^a There were no questions included assessing the following article: *Article 11* (Packaging and labeling of tobacco products)

^b MPOWER strategies are (Demand reduction cost-effective measures)

^c This indicator is calculated based on cigarette prices for the most popular local (i.e., Cleopatra) and international (i.e., Marlboro) brands smoked in Egypt and the USD exchange rate in each survey year and GDP for each survey year (i.e., 2001, 2005, 2009, and 2014)

^d This is not an MPOWER strategy. This is a supply reduction measure

where the GYTS data were collected to better understand real-time affordability of cigarettes. The cigarette affordability measure was used to account for the affordability of a national (relatively cheaper) and more popular brand, Cleopatra, as well as another measure for the affordability of the most popular international (relatively more expensive) brand, Marlboro. The index was adapted from the CDC's indicator guideline reference for the Global Adult Tobacco Survey [21]. We first obtained the prices of the two brands in local currency (Egyptian pound) and calculated the price in USD dollars where we adjusted for the exchange rates for different years. We also obtained the GDP per capita rates for Egypt for each of the 4 years corresponding to the GYTS waves from the World Bank portal [22], and calculated the indices accordingly. The index of cigarette affordability was the average price of 100 packs of manufactured cigarettes as a percentage of GDP per capita. The higher the percentage the lower the affordability for a given cigarette brand.

Data Analyses

For this study, GYTS data from waves of 2001, 2005, 2009, and 2014 were merged ($n = 15,255$) and analyzed in 2017. Changes of the prevalence of each indicator between each of the waves were the outcome of the analyses. In order to reflect the complex sample design of the GYTS survey, data were analyzed using the—survey—module of Stata, Version 12.0 (Statacorp, College Station, TX, USA). Weighted proportions were obtained as estimates of prevalence for each indicator used in our study (Table 1). The applied weights represent the total population of youth attending school in Egypt as per the information provided in the CDC's manual for analysis of the GYTS survey. Weighted percentages and confidence intervals were used for descriptive analyses. The independent associations between the included indicators, sociodemographics (age and sex), and the survey year were assessed. To evaluate differences between waves among the indicators included in our study, we conducted logistic regressions, reporting adjusted odds ratios (aOR) for dichotomous outcomes and multinomial logistic regressions for categorical outcomes, reporting adjusted relative risk ratios (aRRR). This study used a significance level of $\alpha = 0.05$. We also calculated an affordability index for a local cigarette brand and an international cigarette brand corresponding to the survey wave years, and we plotted the results while fitting polynomial trend lines that showed the best fit. We also presented the polynomial trend lines for ever cigarette use, and past 30-day cigarette use to contrast the findings of cigarette affordability and cigarette prevalence estimates (Fig. 1). Table 2 presents the descriptive results of the indicators included in our analysis by GYTS wave and Table 3 presents the results of the logistic regression analyses.

Results

Across the four GYTS waves, a total of 15,255 students participated in the study of whom 8687 (52.1%) were males. The majority were in the 13-year-old age category (26.9%). Table 2 presents the characteristics and MPOWER indicators assessed in our sample for each wave.

Monitor Tobacco Use and Prevention Policies

The prevalence of ever smoking cigarettes showed an increase from 12.6% in 2001 to 22.9% in 2014 (Table 2), where youth had increased odds of ever smoking cigarettes in 2014 compared to 2001 (aOR = 2.27; 95% CI = 1.45–3.55, $p < 0.001$; Table 3). However, past 30-day cigarette smoking initially more than doubled in 2009 (9.6%) compared to 2001 (4.1%) and later declined in 2014 (5.1%). Overall, there was no significant increase in the past 30-day smoking rates among youth in Egypt in 2014 compared to 2001. Figure 1 presents the trend line for ever smoking and past 30-day smoking across the GYTS waves. Similarly, waterpipe smoking almost doubled in 2009 (11.2%) in comparison to 2001 (6.0%) and later declined in 2014 (6.3%), with no statistically significant difference between 2001 and 2014. Moreover, among ever smokers, initiating cigarette smoking was significantly associated with being from the age group of 10–11 years in 2014 compared to 2001 (aRRR = 3.17, 95% CI 1.41–7.12, $p < 0.05$), and initiating waterpipe smoking was significantly associated with being from the age group 8–9 years in 2014 compared to 2001 (aRRR = 5.13; 95% CI 1.1–23.8, $p < 0.05$) with 14 years or older as the reference age category.

Protect People from Tobacco Smoke

Concerning parental smoking behavior, there was no significant overall change between 2001 and 2009, and there were no data available for 2014. Overall, almost half of the youth reported that at least one of their parents was a current cigarette smoker (range 42 to 48%). Reported exposure to SHS at home was significantly higher in 2014, compared to 2001 (aOR = 1.51, 95% CI 1.13–2.03, $p < 0.05$). Youth had increased odds of exposure to SHS in public areas in 2014 compared to 2001 (aOR = 1.85, 95% CI 1.34–2.56, $p < 0.001$). Finally, youth in 2005 were significantly less likely to support smoke-free policies in comparison to youth in 2001 (aOR = 0.54, 95% CI 0.34–0.85, $p < 0.05$), and there were no data available for this measure as well in 2014.

Offer Help to Quit Tobacco Use

Among the total youth who smoked from 2001 to 2014, more than half (61%) reported having made a quit attempt in the past year and 85% reported receiving help to quit.

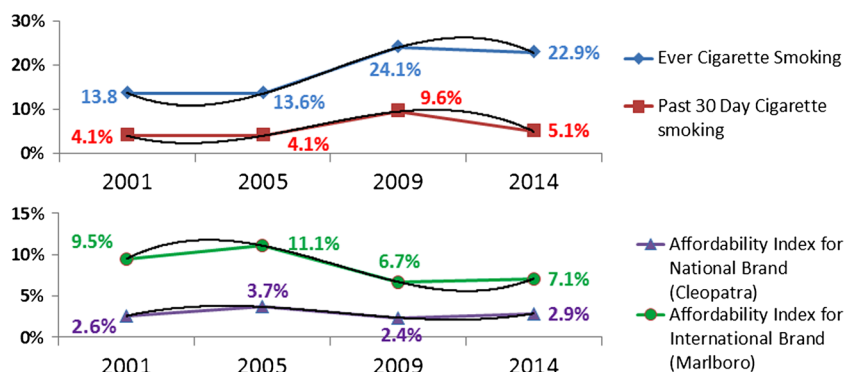


Fig. 1 Cigarette affordability indices and youth cigarette smoking prevalence estimates in Egypt (2001–2014). The index of cigarette affordability is the average price of 100 packs of manufactured cigarettes as a percentage of gross domestic product (GDP) per capita.

The higher the percentage, the lower the affordability for a given brand of cigarette (i.e., the trend of actual affordability is the reciprocal of the plotted trend line)

However, there were no significant differences in the likelihood of youth making quit attempts or receiving help to quit between 2001 and 2014.

Warnings about the Dangers of Tobacco

Youth reported significantly more exposure to school programs that educate them about the acute harms (e.g., teeth discoloration) of tobacco in 2014 compared to 2001 (aOR = 1.85, 95% CI 1.26–2.72, $p < 0.05$). However, there was no significant difference between 2014 and 2001 regarding school programs that educate students about the long-term dangers of smoking, although awareness of danger was significantly associated with both 2005 (aOR = 1.53; 95% CI 1.20–1.95; $p < 0.05$) and 2009 (aOR = 1.84; 95% CI 1.37–2.48; $p < 0.001$). Finally, youth had decreased odds of exposure to public anti-smoking campaigns in 2014 compared to 2001 (aOR = 0.56, 95% CI 0.36–0.87, $p < 0.05$).

Enforce Bans on Tobacco Advertising, Promotion, and Sponsorship

There was no significant decrease in self-reported billboard ad exposure from 2001 to 2009, but there was a significant decline in self-reported exposure magazine ads (aOR = 0.64; 95% CI 0.46–0.90, $p < 0.05$) (Table 3). However, 70% of youth still reported exposure to billboard ads in 2009 (Fig. 2). These indicators were not assessed in 2014; they were removed from the survey given that these types of advertising was already prohibited by the Egyptian government in 2002 and the survey needed to be shortened (personal communication with WHO EMRO office). Nevertheless, indicators assessing other prohibited industry promotional tactic were still included in 2014; there was a decrease in students reporting owning a personal item with a tobacco

company logo between 2001 (25.5%) and 2014 (8%) (aOR = 0.43; 95% CI 0.28–0.67, $p < 0.001$), and being offered a free tobacco product by a sales person from a tobacco company decreased from 26% in 2001 to 7% in 2014 (aOR = 0.25; 95% CI 0.15–0.41, $p < 0.001$). Figure 2 depicts the four aforementioned indicators. These observed declines in the above-mentioned indicators were consistent, as depicted in Table 3. Moreover, being exposed to smoking in movies, although it significantly declined through 2014 in comparison to 2001 (Table 3), it remained quite high as it ranged from 86% in 2001 to 75% in 2014.

Raise Taxes on Tobacco and Prohibiting Sales to Minors

Figure 1 shows the trends of change in the cigarette affordability index and its variability with the cigarette smoking prevalence estimates. Despite the substantial increase in prices between 2001 and 2014 for both, the local (approx. 1.25 to 7 Egyptian pounds) and international brands (approx. 4.5 to 17 Egyptian pounds), cigarette affordability did not considerably differ for the local brand between 2001 and 2014, with a slight increase for the international brand. Cigarette smoking prevalence estimates appear to have increased with relatively higher affordability for cigarettes in 2009 and decreased when affordability was relatively low in 2005 and 2014.

Among those who attempted to buy cigarettes, there were no significant differences in youth reporting being refused sales of cigarettes due to their age between 2001 and 2014. However, more youth reported that they bought cigarettes *themselves* in 2014 (85%) compared to youth in 2001 (60%), and these differences were statistically significant, where youth in 2014 had decreased odds of obtaining cigarettes *some other way* compared to youth in 2011 (aOR = 0.21, 95% CI 0.08–0.61, $p < 0.05$).

Table 2 Weighted frequencies of selected demographics and tobacco measures from the Global Youth Tobacco Survey (GYTS) 2001–2014 (*n* = 15,255)

	Total			2001 (<i>n</i> = 3792)		2005 (<i>n</i> = 4196)		2009 (<i>n</i> = 4796)		2014 (<i>n</i> = 2471)	
	<i>n</i>	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Age	14,916										
11 or younger	1170	9.3	(7.1–12.2)	12.6	(9.4–16.7)	6.8	(5.1–8.8)	9.5	(5.9–14.9)	5.4	(1.9–14.4)
12	1952	15.1	(11.8–19.3)	21.5	(17.0–26.9)	16.5	(13.4–20.2)	10.2	(7.5–13.6)	7.5	(2.0–24.4)
13	4014	26.1	(22.5–30.1)	25.5	(19.4–32.7)	26.8	(23.0–30.9)	29.8	(24.5–35.6)	25.5	(19.5–32.7)
14	3922	22.4	(19.8–25.2)	15.5	(12.9–18.4)	26.7	(24.2–29.5)	25.2	(21.8–29.0)	29.7	(23.1–37.3)
15	2790	20.0	(16.7–23.8)	15.8	(11.2–21.9)	17.9	(13.4–23.7)	19.5	(13.8–27.0)	26.7	(19.8–34.9)
16 or older	1068	7.1	(5.5–9.2)	9.1	(6.1–13.5)	5.3	(3.7–7.3)	5.8	(4.1–8.2)	5.2	(3.4–7.8)
Male	8687	52.1	(44.7–59.4)	52.7	(40.7–64.4)	56.4	(43.3–68.7)	50.5	(34.7–66.1)	50.6	(37.7–63.4)
Ever smoke cigarettes	2772	17.9	(15.5–20.6)	13.8	(11.3–16.8)	13.6	(10.1–18.1)	24.1	(17.2–32.6)	22.9	(17.4–29.6)
Age of cigarette initiation	1965										
7 or younger	349	15.7	(12.5–19.6)	18.4	(12.8–25.7)	18.8	(15.2–23.1)	24.2	(16.1–34.8)	8.0	(4.7–13.2)
8 or 9	305	17.5	(13.1–23.2)	25.7	(18.7–34.4)	13.3	(9.1–18.9)	12.6	(7.9–19.4)	11.0	(4.0–27.2)
10 or 11	490	24.3	(21.5–27.4)	15.6	(12.8–18.8)	22.9	(19.4–26.9)	14.6	(9.1–22.5)	39.6	(32.6–47.0)
12 or 13	506	23.7	(19.0–29.2)	20.6	(16.5–25.3)	25.7	(21.4–30.5)	21.7	(13.1–34.0)	27.9	(17.1–42.2)
14 or older	315	18.7	(14.4–23.8)	19.7	(14.3–26.6)	19.3	(12.6–28.4)	26.9	(15.5–42.4)	13.5	(6.9–24.8)
Past 30-day cigarette smoking	826	5.0	(3.9–6.3)	4.1	(3.1–5.4)	4.1	(2.8–5.8)	9.6	(6.1–14.7)	5.1	(2.8–8.9)
Past 30-day other tobacco	1441	14.3	(11.9–17.0)	17.5	(14.1–21.6)	12.0	(9.9–14.5)	–	–	10.2	(6.6–15.5)
Age of shisha initiation	1408										
7 or younger	329	22.0	(17.1–27.9)	16.2	(9.8–25.5)	–	–	28.3	(21.6–36.2)	25.0	(15.7–37.2)
8 or 9	195	19.4	(11.0–31.8)	13.2	(9.3–18.5)	–	–	12.1	(8.3–17.4)	28.3	(11.9–53.6)
10 or 11	336	21.9	(15.8–29.6)	25.0	(14.6–39.5)	–	–	22.2	(11.4–38.7)	18.9	(11.7–29.0)
12 or 13	280	16.1	(11.8–21.6)	18.1	(10.6–29.1)	–	–	15.3	(9.1–24.6)	14.4	(8.9–22.6)
14 or older	268	20.6	(14.6–28.2)	27.5	(18.4–38.9)	–	–	22.1	(11.4–38.5)	13.4	(5.4–29.6)
Past 30-day shisha smoking	939	6.8	(5.5–8.3)	6.0	(4.3–8.2)	–	–	11.2	(8.0–15.4)	6.3	(4.3–9.2)
Parent smokers	12,620										
None	6348	52.1	(49.1–55.2)	54.2	(50.0–58.3)	42.3	(38.9–45.8)	52.4	(46.3–58.5)	–	–
Both	516	3.9	(3.0–5.1)	3.4	(2.2–5.1)	4.4	(3.2–6.0)	5.4	(3.5–8.4)	–	–
Father Only	5115	39.9	(37.3–42.6)	39.1	(35.8–42.5)	43.2	(40.3–46.2)	40.4	(33.5–47.9)	–	–
Mother Only	76	0.5	(0.2–1.1)	0.4	(0.1–1.7)	0.5	(0.3–0.7)	0.7	(0.4–1.5)	–	–
I don't know/other ^a	565	3.6	(3.0–4.3)	2.9	(2.2–3.9)	9.7	(8.3–11.3)	0.9	(0.3–2.8)	–	–
SHS exposure at home	6159	35.4	(32.7–38.2)	29.0	(26.6–31.5)	38.1	(34.8–41.4)	47.7	(42.1–53.3)	39.2	(32.8–46.0)
SHS exposure at other places	7344	46.6	(43.5–49.7)	40.1	(35.7–44.7)	42.2	(38.2–46.4)	53.5	(47.9–59.0)	54.4	(48.0–60.7)
Favor smoke-free policy	10,511	86.0	(83.8–87.9)	87.5	(84.7–89.9)	84.7	(82.3–86.8)	80.8	(74.1–86.2)	–	–
Past year quit attempt ^b	871	60.7	(52.5–68.3)	63.2	(54.4–71.2)	54.4	(48.8–60.0)	68.5	(53.7–80.3)	53.4	(30.1–75.3)
Receiving help to quit ^c	2391	84.6	(79.9–88.3)	88.1	(83.5–91.5)	84.9	(80.9–88.2)	80.9	(75.1–85.7)	80.0	(60.5–91.2)
Awareness of harms	4325	37.6	(34.1–41.2)	31.0	(27.5–34.7)	50.8	(47.0–54.7)	–	–	43.4	(35.2–52.0)
Awareness of danger	8,028	50.3	(47.8–52.7)	46.5	(42.7–50.4)	56.8	(52.1–61.3)	59.9	(53.6–65.9)	50.1	(46.5–53.7)
Anti-smoking campaigns	11,112	73.9	(70.2–77.3)	78.6	(74.5–82.2)	73.1	(69.2–76.6)	78.8	(75.4–81.9)	65.8	(56.5–74.0)
Billboard ads	8275	70.5	(68.1–72.7)	72.9	(69.4–76.1)	59.8	(57.2–62.4)	70.2	(65.2–74.7)	–	–
Newspaper/magazine ads	7515	66.6	(64.2–68.9)	71.3	(68.3–74.1)	52.7	(49.9–55.5)	60.0	(52.8–66.7)	–	–
Own brand logo item	2314	14.8	(13.0–16.9)	18.8	(15.8–22.3)	16.4	(14.8–18.2)	16.0	(12.6–20.2)	8.2	(5.6–11.9)
Offered free tobacco product	2477	17.3	(15.4–19.3)	25.5	(21.8–29.7)	14.5	(12.1–17.3)	16.0	(12.7–20.0)	6.9	(4.6–10.1)
Smoking in movies	12,181	81.3	(78.7–83.6)	86.3	(84.0–88.2)	81.0	(78.1–83.7)	80.9	(78.0–83.5)	74.5	(66.9–80.9)
Source of cigarettes	1407										
Bought them myself	905	64.6	(56.8–71.7)	60.2	(49.4–70.2)	43.7	(36.9–50.7)	52.3	(35.8–68.2)	84.7	(68.1–93.5)
Get them some other way	542	35.4	(28.3–43.2)	39.8	(29.8–50.6)	56.3	(49.3–63.1)	47.7	(31.8–64.2)	15.3	(6.5–31.9)
Refused sale ^d	637	38.1	(28.6–48.6)	37.1	(24.4–51.8)	54.2	(44.7–63.4)	34.5	(26.6–43.3)	37.7	(17.4–63.6)

Empty cells reflect that data were not available for this variable in the year of data collection.

SHS second-hand smoke, CI confidence interval

^a This question included former smokers in the “other group” in 2001 and 2005, but not in 2009

^b This variable had a total response of 1504

^c This variable had a total response of 2829

^d This variable had a total response of 1932

Table 3 Weighted logistic regression to compare MPOWER tobacco measures by year for the Global Youth Tobacco Survey (GYTS), grouped by MPOWER strategies ($n = 15,255$)

	2005 ($n = 4196$)		2009 ($n = 4796$)		2014 ($n = 2471$)	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
<i>M</i> Monitor Tobacco Use and Prevention Policies						
Ever smoke cigarettes	1.11	(0.77–1.61)	2.39**	(1.53–3.74)	2.27**	(1.45–3.55)
Age of cigarette initiation (aRRR) ^a						
7 or younger	1.08	(0.52–2.24)	1.00	(0.45–2.20)	0.69	(0.24–1.96)
8 or 9	0.50	(0.21–1.22)	0.33*	(0.13–0.84)	0.63	(0.14–2.81)
10 or 11	1.21	(0.65–2.26)	0.55	(0.23–1.29)	3.17*	(1.41–7.12)
12 or 13	1.10	(0.59–2.04)	0.72	(0.27–1.90)	1.84	(0.73–4.59)
14 or older	Ref		Ref		Ref	
Past 30-day cigarette smoking	0.94	(0.62–1.41)	2.56**	(1.53–4.28)	1.27	(0.63–2.56)
Past 30-day other tobacco use	0.63*	(0.47–0.84)	–	–	0.64	(0.37–1.12)
Age of shisha initiation (aRRR) ^a						
7 or younger	–	–	2.53*	(1.03–6.20)	3.34	(0.93–11.98)
8 or 9	–	–	1.53	(0.55–4.24)	5.13*	(1.10–23.87)
10 or 11	–	–	1.29	(0.35–4.81)	1.70	(0.52–5.52)
12 or 13	–	–	1.12	(0.39–3.25)	1.59	(0.58–4.33)
14 or older	–	–	Ref		Ref	
Past 30-day shisha smoking	–	–	2.08*	(1.27–3.40)	1.21	(0.73–1.99)
<i>P</i> Protect People from Tobacco Smoke						
Parent smokers (aRRR) ^a						
None	Ref		Ref		–	–
Both	1.93*	(1.07–3.48)	1.77	(0.94–3.31)	–	–
Father only	1.39*	(1.12–1.71)	1.02	(0.73–1.42)	–	–
Mother only	1.36	(0.26–7.13)	1.52	(0.24–9.79)	–	–
I don't know/other ^b	4.10**	(2.88–5.85)	0.32	(0.10–1.03)	–	–
People smoked in your home	1.50**	(1.25–1.80)	2.22**	(1.73–2.84)	1.51*	(1.13–2.03)
People smoked in public places	1.09	(0.84–1.40)	1.77**	(1.33–2.34)	1.85**	(1.34–2.56)
Favor smoke-free policy	0.76	(0.56–1.03)	0.54*	(0.34–0.85)	–	–
<i>O</i> Offer Help to Quit Tobacco Use						
Past year quit attempt	0.80	(0.51–1.25)	1.37	(0.65–2.89)	0.74	(0.26–2.08)
Receiving help to quit	0.80	(0.48–1.34)	0.65	(0.40–1.06)	0.66	(0.26–1.65)
<i>W</i> Warn about the dangers of tobacco						
Past year awareness of acute effects of smoking	2.40**	(1.89–3.05)	–	–	1.85*	(1.26–2.72)
Past year awareness of dangers of smoking	1.53*	(1.20–1.95)	1.84**	(1.37–2.48)	1.17	(0.95–1.46)
Past year exposure to anti-smoking media campaigns	0.76	(0.58–1.01)	1.09	(0.81–1.46)	0.56*	(0.36–0.87)
<i>E</i> Enforce Bans on Tobacco Advertising, Promotion, and Sponsorship						
Notice billboard ads past month	0.56**	(0.45–0.68)	0.91	(0.67–1.22)	–	–
Notice newspaper/magazine ads past month	0.47**	(0.39–0.56)	0.64*	(0.46–0.90)	–	–
Ownership of item with cigarette brand logo	0.88	(0.70–1.11)	0.87	(0.63–1.21)	0.43*	(0.26–0.70)
Offered free tobacco product	0.51**	(0.39–0.67)	0.62*	(0.42–0.90)	0.25**	(0.15–0.41)
Exposure to smoking in movies	0.71*	(0.56–0.92)	0.67*	(0.53–0.85)	0.43**	(0.28–0.67)
<i>R</i> Raise Taxes on Tobacco						
Source of cigarette						
Get them myself	Ref		Ref		Ref	
Get them some other way	1.85*	(1.05–3.25)	1.52	(0.75–3.07)	0.21*	(0.08–0.61)
Supply reduction measure						
Refused cigarette sale	2.22*	(1.13–4.37)	0.81	(0.40–1.64)	1.08	(0.37–3.12)

Empty cells reflect that data were not available for this variable in the year of data collection. Statistically significant odds ratios are italicized. Reference group was the GYTS survey for 2001. Models were adjusted for age and sex, except age of cigarette initiation and age of shisha initiation models were adjusted for sex only

aOR adjusted odds ratio, CI confidence interval, aRRR adjusted relative risk ratio, Ref reference category

* < 0.05, ** < 0.001

^a Multinomial logistic regression was utilized for these models, where results were reported as aRRR instead of aOR

^b This question included former smokers in the “other group” in 2001 and 2005, but not in 2009

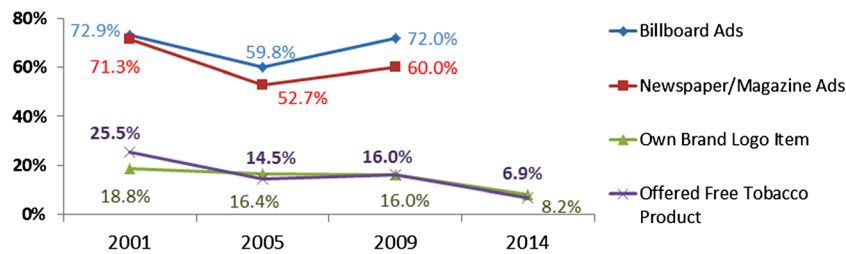


Fig. 2 Exposure to tobacco advertising among youth across Global Youth Tobacco Survey (GYTS) waves in Egypt (2001–2014). In 2002, tobacco advertising, promotion, and sponsorship were completely

prohibited (Article 6 of Law 85 for 2002). Questions regarding billboard ads and newspaper/magazine ads were not included in the 2014 wave

Discussion

We evaluated the MPOWER measure implementation in Egypt by assessing the GYTS data collected in four consecutive GYTS waves in 2001, 2004, 2009, and 2014. We hypothesized that effective implementation of the MPOWER strategies would likely prevent youth initiation and decrease current smoking rates (i.e., past 30-day smoking). We found that MPOWER strategies were not effectively implemented. Youth in 2014 were more likely to initiate smoking cigarettes and waterpipe at a younger age compared to 2001. Overall, there was no significant decline in past 30-day smoking rates among youth in Egypt in 2014 compared to 2001. Further, youth experimentation and past 30-day smoking rates fluctuated with affordability, with more adolescents initiating cigarette smoking, particularly at a younger age. While it is difficult to ascertain the reason behind this rapid fluctuation in smoking rates, it is plausible that cigarette smoking increased when cigarettes were more affordable (Fig. 1). However, since the experimentation and past 30-day use decline of cigarettes in 2014 compared to 2009 was not accompanied with similar decline in other indicators suggesting that youth might have been quitting, another plausible hypothesis is that there might have been an oversampling of smokers in the GYTS of 2009, or there might have been under-sampling of smokers in 2014, especially given that the sample size in the 2014 wave was considerably lower. Finally, the prohibition of tobacco advertising, promotion, and sponsorship in 2002 [23] was associated with a decrease of offering free tobacco product samples to youth; however, these prohibitions failed to be associated with a decrease in advertisement exposure (e.g., more than 60% of youth reported seeing ads in magazines and on billboards in 2009), and laws banning public smoking did not help decrease youth exposure to SHS in public places and at home.

The reported prevalence estimates recorded in the GYTS are comparable with those from the Survey of Young People in Egypt among the 15–17 years age group, where cigarette smoking rates were found to be 5.9% in 2001 [24], as compared to an average of 5% past 30-day smoking across four waves of the GYTS. Similar to our findings, other studies have demonstrated that cigarette smoking experimentation and current use (i.e., past 30-day use) among youth were

correlated with the fluctuation of cigarette affordability. Youth are particularly sensitive to cigarette price changes [25, 26] and overall cigarette affordability [27]. Previous literature and our results suggest that policymakers in Egypt should account for the cigarette affordability indices, not just for absolute price changes, to guide the taxation scheme of cigarettes in the future.

Prior research demonstrates the declining age of smoking initiation in Egypt [12, 13, 28]. In support of this trend, our current findings show a significant increase in initiating both cigarettes and waterpipe among younger age groups [29•]. Currently, Egyptian tobacco control laws target cigarette smoking and do not often include other tobacco products, such as waterpipe. Waterpipe is perceived to be less harmful and could be attracting youth more than cigarettes [30–32]. Moreover, poly-tobacco is increasing among youth in many countries [29•, 33–35, 36••, 37•], including Egypt [36••, 38]. For example, GYTS findings demonstrated past 30-day dual cigarette and waterpipe use was 4.3% among youth in Egypt [36••]. Given the rapidly changing landscape of tobacco use [39], and that electronic cigarettes (e-cigarettes) are currently available in Egypt [40], future tobacco surveillance efforts need to consider assessing emerging tobacco and nicotine-containing products in more detail (e.g., waterpipe, e-cigarettes).

In 1994, the Egyptian government introduced an environmental protection law that banned smoking in public places and all modes of public transportation [23]. However, this study suggests a significant overall increase in the proportion of Egyptian youth exposed to SHS in public places as well as at home ($p < 0.05$). Youth exposed to SHS are more likely to initiate smoking [20]. The GYTS does not include the type of combustible product that youth report being exposed to at their homes. Recent research suggests that SHS resulting from waterpipe smoking in homes is more hazardous than SHS resulting from cigarettes in the home because waterpipe smoking emits substantially higher levels of carbon monoxide and leads to at least twice the air particulate matter (2.5) levels of cigarette smoking [41••]. In future GYTS waves, it might be beneficial to ascertain the type of tobacco that youth are being exposed to at home to inform future public health

campaigns and interventions. Further, while laws banning public smoking exist, more vigorous enforcement of this regulation would benefit public health [42–44]. Perhaps enforcement of a smoke-free work environment would be a readily impactful action because, among Egyptian adults, those that worked in a smoke-free environment have been found to be significantly more likely to report also living in a smoke-free home [45•]. Enforcing smoke-free work places could benefit youth by increasing the likelihood of having smoke-free homes and decreasing SHS exposure.

Findings from this study indicated that a high proportion of the youth surveyed in the GYTS recall being exposed to school programs that raise awareness of the acute effects of smoking on health, such as teeth discoloration, as well as long-term effects on smoking such as increased cancer risk. However, these youth also reported being significantly less often exposed to anti-smoking media campaigns in 2014 in comparison to 2001, which is an essential element to denormalize smoking [46–48]. This might also be a factor for why there were significantly less youth in 2009 who favored smoke-free policies, despite having the majority of youth, in general, in favor of smoke-free policies [49]. However, whether existing programs in Egyptian schools are effective warrants further research, [50–52]. Additionally, authors were not able to find existing literature supporting that evidence-based youth prevention or cessation program has been put in place in Egypt.

A recent review suggested that youth are more likely to recall and think about advertising that includes personal testimonials; a surprising narrative; and intense images (e.g., pictorial warnings), sound, and editing [48, 53]. Moreover, youth recall pictorial warning more often than text-only warnings, where it sparks greater negative emotional reaction compared to text-only warning [53]. In 2007, a presidential decree mandated all cigarette manufacturers to include pictorial warnings on cigarette packs in compliance with the FCTC recommendations (e.g., 50% or more of and not less than 30% of the principal display areas, and to be pictorial) [8]. To date, no studies have evaluated the effectiveness of these warnings within the Egyptian context. Finally, the effectiveness of health warnings on waterpipe has shown similar effects to that of cigarettes [54•, 55–57]; however, to date there are no comparable warnings that are mandated for waterpipe tobacco.

This study had some limitations: the data was self-reported which may result in under- or over-reporting; however, using survey weights likely corrected for this limitation [58]. There is considerable variability in the questionnaires used, despite supervision from the CDC and the WHO. For example, questions on noticing tobacco advertising on billboards and magazines/newspapers were not included in the 2014 survey. While there is sufficient reasoning for removing these questions, as they were outlawed more than a decade before the 2014 wave,

our findings indicate that banning advertising on billboards was yet not enforced till 2009, which was the last wave where this indicator was assessed. Specific to Egypt, school enrollment rates are 83% in the 12–14 years age group and 69% in the 15–17 years age group, decreasing the representativeness of the GYTS results. Additionally, the sample size of the 2014 data was considerably lower than previous years. These data are repeated cross sections, which could, in principle, reflect impacts by time or selection confounders. E-cigarette use is not yet included in the GYTS for Egypt. Exploring its use in subsequent waves could be beneficial to fully understand the tobacco and nicotine use behavior among youth in Egypt.

Conclusion

In Egypt, between 2001 and 2014, no significant observable gains were made in the battle against the tobacco epidemic. Despite Egypt's ratification of the WHO FCTC, the indicators assessed in this study did not seem to have had significant impact on tobacco product use prevalence among youth wherein the overall tobacco product use did not decline over the four GYTS waves. While Egypt has enacted tobacco control regulatory policy, this study demonstrates their further enforcement could have a large impact of public health. In conclusion, developing novel approaches that can overcome the barriers to implementing the MPOWER recommendations in Egypt could enable researchers and policy makers in Egypt to form a comprehensive tobacco control program. Continuous monitoring and evaluation of the tobacco control activities in Egypt is needed.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. US Department of Health Human Services. The health consequences of smoking—50 years of progress: a report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014. p. 17.
2. Chung T, Lam T, Cheng Y. Knowledge and attitudes about smoking in medical students before and after a tobacco seminar. *Med Educ.* 1996;30(4):290–5. <https://doi.org/10.1111/j.1365-2923.1996.tb00831.x>.
3. World Health Organization. Why is tobacco a public health priority? 2007. http://www.who.int/tobacco/health_priority/en/index.html. Accessed 12 Jul 2007.
4. Islam SMS, Johnson CA. Western media's influence on Egyptian adolescents' smoking behavior: the mediating role of positive beliefs about smoking. *Nicotine Tob Res.* 2007;9(1):57–64. <https://doi.org/10.1080/14622200601078343>.
5. Framework Convention on Tobacco Control, editor. WHO framework on tobacco control, reprint 20052003. Geneva: WHO Document Production Services.
6. Framework Convention on Tobacco Control. Country data: Egypt. 2007. <http://www.fctc.org/index.php?item=countryinfo&code=EGY>. Accessed 20 Jul 2007.
7. Song Y, Zhao L, Palipudi KM, Asma S, Morton J, Talley B, et al. Tracking MPOWER in 14 countries: results from the Global Adult Tobacco Survey, 2008–2010. *Glob Health Promot.* 2016;23(2_suppl):24–37. <https://doi.org/10.1177/1757975913501911>.
8. World Health Organization. WHO report on the global tobacco epidemic, 2008: the MPOWER package. 2008.
9. Dous NM. Report on the result of the global youth tobacco survey in Egypt. Centers for Disease Control and Prevention. 2003. http://www.cdc.gov/tobacco/global/GYTS/reports/emro/2001/00_pdfs/egypt_intro.pdf. Accessed 12 Jul 2007.
10. Nassar H. The economics of tobacco in Egypt: a new analysis of demand. 2003. <http://www.mohp.gov.eg/Sec/Services/SmComp1.asp?x=11>. Accessed 20 Aug 2007.
11. Ministry of Health and Population. Webpage: tobacco control program. 2007. <http://www.mohp.gov.eg/Sec/Services/SmComp1.asp?x=11>. Accessed 12 Jul 2007.
12. Islam SMS, Johnson CA. Influence of known psychosocial smoking risk factors on Egyptian adolescents' cigarette smoking behavior. *Health Promot Int.* 2005;20(2):135–45. <https://doi.org/10.1093/heapro/dah604>.
13. Mohamed MK, Loffredo CA, Israel E, El-Setouhy M, Radwa G, Andel-Rahman R, et al. Monograph. Tobacco use in shisha: studies on water pipe smoking in Egypt. Harmony: WHO, Cairo; 2006.
14. Youssef H. The Egyptian experience with tobacco earmarking. In: Tobacco free initiative. 2003. http://www.who.int/tobacco/training/success_stories/Tfir3hrEG.pdf Accessed 20 Aug 2007.
15. Egyptian Smoking Prevention Research Institute. Five pillars are needed for an effective smoking prevention program in rural Egypt. 2006.
16. U.S. Centers for Disease Control and Prevention. Fact sheet: global youth tobacco surveys (GYTS) Egypt. 2005. <https://nccd.cdc.gov/GTSSDataSurveyResources/Ancillary/DownloadAttachment.aspx?ID=216>. Accessed 12 Jul 2017.
17. U.S. Centers for Disease Control and Prevention. Fact sheet: global youth tobacco surveys (GYTS) Egypt. 2014. <https://nccd.cdc.gov/GTSSDataSurveyResources/Ancillary/DownloadAttachment.aspx?ID=1311>. Accessed 10 Aug 2017.
18. U.S. Centers for Disease Control and Prevention. Fact sheet: global youth tobacco surveys (GYTS) Egypt. 2001. <https://nccd.cdc.gov/GTSSDataSurveyResources/Ancillary/DownloadAttachment.aspx?ID=215>. Accessed 30 Sept 2017.
19. U.S. Centers for Disease Control and Prevention. Fact sheet: global youth tobacco surveys (GYTS) Egypt. 2009. <https://nccd.cdc.gov/GTSSDataSurveyResources/Ancillary/DownloadAttachment.aspx?ID=1135>. Accessed 30 Sept 2017.
20. U.S. Centers for Disease Control and Prevention. Exposure to secondhand smoke among students aged 13–15 years—worldwide, 2000–2007. *MMWR Morb Mortal Wkly Rep* 2007;56(20):497.
21. Global Tobacco Surveillance System (GTSS), Global Adult Tobacco Survey (GATS): indicator guidelines: definition and syntax. 2009. http://www.who.int/tobacco/surveillance/en_tfi_gats_indicator_guidelines.pdf. Accessed 30 Oct 2017.
22. World Bank. GDP per capita (current US\$); World Bank national accounts data, and OECD National Accounts data files. 2017. <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=EG>. Accessed 30 Oct 2017.
23. Campaign for tobacco free kids. Tobacco control laws: country details for Egypt. 2017. <https://www.tobaccocontrolaws.org/legislation/country/egypt/summary>.
24. El-Zanaty F, Way AA. Egypt demographic and health survey 2000. 2001.
25. Kostova D, Chaloupka FJ, Shang C. A duration analysis of the role of cigarette prices on smoking initiation and cessation in developing countries. *Eur J Health Econ.* 2015;16(3):279–88. <https://doi.org/10.1007/s10198-014-0573-9>.
26. Stone E, Peters M. Young low and middle-income country (LMIC) smokers—implications for global tobacco control. *Transl Lung Cancer Res.* 2017;6(S1):S44–6. <https://doi.org/10.21037/tlcr.2017.10.11>.
27. Li DX, Guindon GE. Income, income inequality and youth smoking in low-and middle-income countries. *Addiction.* 2013;108(4):799–808. <https://doi.org/10.1111/add.12075>.
28. Loffredo CA, Radwan GN, Eltahlawy EM, El-Setouhy M, Magder L, Hussein MH. Estimates of the prevalence of tobacco smoking in Egypt. *Open Journal of Epidemiology.* 2015;5(02):129–35. <https://doi.org/10.4236/ojepi.2015.52017>.
29. • Arrazola RA. Current tobacco smoking and desire to quit smoking among students aged 13–15 years—global youth tobacco survey, 61 countries, 2012–2015. *MMWR Morb Mortal Wkly Rep.* 2017;66. **This study demonstrates that more than 50% of youth have a desire to quit in 40 low- and middle-income countries, with proportion as high as 90% in the Philippines. With high smoking rates among youth in these countries, implementing effective youth cessation interventions is a considerable challenge.**
30. Robinson JN, Wang B, Jackson KJ, Donaldson EA, Ryant CA. Characteristics of Hookah tobacco smoking sessions and correlates of use frequency among US adults: findings from wave 1 of the Population Assessment of Tobacco and Health (PATH) study. *Nicotine Tob Res.* 2017; <https://doi.org/10.1093/ntr/ntx060>.
31. Martinasek MP, Haddad LG, Wheldon CW, Barnett TE. Beliefs and attitudes associated with hookah smoking among a United States college population. *Respir Care.* 2017;62(3):370–9. <https://doi.org/10.4187/respcare.05069>.
32. Akl EA, Irani J, Jawad M, Obeid R, Lam WY. Motives, beliefs and attitudes towards waterpipe tobacco smoking: a systematic review. *Harm Reduction J.* 2013;10(1):12. <https://doi.org/10.1186/1477-7517-10-12>.
33. Kowitz SD, Patel T, Ranney LM, Huang L-L, Sutfin EL, Goldstein AO. Poly-tobacco use among high school students. *Int J Environ Res Public Health.* 2015;12(11):14477–89. <https://doi.org/10.3390/ijerph121114477>.

34. Lee YO, Hebert CJ, Nonnemaker JM, Kim AE. Youth tobacco product use in the United States. *Pediatrics*. 2015;135(3):409–15. <https://doi.org/10.1542/peds.2014-3202>.
35. Agaku IT, Filippidis FT, Vardavas CI, Odukoya OO, Awopegba AJ, Ayo-Yusuf OA, et al. Poly-tobacco use among adults in 44 countries during 2008–2012: evidence for an integrative and comprehensive approach in tobacco control. *Drug Alcohol Depend*. 2014;139:60–70. <https://doi.org/10.1016/j.drugalcdep.2014.03.003>.
36. Jawad M, Lee JT, Millett C. Waterpipe tobacco smoking prevalence and correlates in 25 Eastern Mediterranean and Eastern European countries: cross-sectional analysis of the Global Youth Tobacco Survey. *Nicotine Tob Res*. 2015;18(4):395–402. **This study demonstrated that waterpipe is becoming alarmingly high across many Eastern Mediterranean and Eastern European countries. Additionally, dual smoking of cigarette and waterpipe is becoming prevalent, which requires ongoing monitoring of waterpipe as well as designing interventions that are appropriate for youth waterpipe cessation.** <https://doi.org/10.1093/ntr/ntv101>.
37. Cavazos-Rehg PA, Krauss MJ, Spitznagel EL, Gruzca RA, Bierut LJ. Youth tobacco use type and associations with substance use disorders. *Addiction*. 2014;109(8):1371–80. **This study examined the associations between youth poly-tobacco use and substance use disorders. It found that tobacco use in adolescence was associated with higher rates of substance use disorders (including alcohol, marijuana and other drug use) across all tobacco users, especially among those who use cigarettes plus other tobacco products.** <https://doi.org/10.1111/add.12567>.
38. Zaytoun S, Afifi R, Alsenbesy M, Ayoub H. Patterns and distribution of drug dependence and associated risk factors among male youth in upper Egypt. *Eur J Sci Res*. 2015;131(2):2015.
39. Ali M, Gray TR, Martinez DJ, Curry LE, Hom KA. Risk profiles of youth single, dual, and poly tobacco users. *Nicotine Tob Res*. 2016;18(7):1614–21. <https://doi.org/10.1093/ntr/ntw028>.
40. Abo-Elkheir OI, Sobh E. Knowledge about electronic cigarettes and its perception: a community survey, Egypt. *Respir Res*. 2016;17(1):58. <https://doi.org/10.1186/s12931-016-0365-0>.
41. Weitzman M, Yusufali AH, Bali F, Vilcassim MR, Gandhi S, Peltier R et al. Effects of hookah smoking on indoor air quality in homes. *Tob Control*. 2016;tobaccocontrol-2016-053165. **This study was the first to measure air quality in homes where hookah is smoked. It demonstrated that the air quality at homes remain substantially low for prolonged periods of time after a hookah session and is much more hazardous than the air quality at homes where cigarettes are smoked.**
42. Gholamreza Heydari M, Shadmehr MB, Fadaizadeh L. The second study on WHO MPOWER tobacco control scores in Eastern Mediterranean countries based on the 2013 report: improvements over two years. *Arch Iran Med*. 2014;17(9):621.
43. Heydari G, EbnAhmady A, Lando HA, Chamyani F, Masjedi M, Shadmehr MB, et al. Third study on WHO MPOWER tobacco control scores in Eastern Mediterranean countries 2011–2015. *East Mediterr Health J*. 2017;23(9):598–603. <https://doi.org/10.26719/2017.23.9.598>.
44. Heydari G, Talischi F, Algouhmani H, Lando HA, Ebn Ahmady A. WHO MPOWER tobacco control scores in the Eastern Mediterranean countries based on the 2011 report. 2013.
45. Nazar GP, Lee JT, Glantz SA, Arora M, Pearce N, Millett C. Association between being employed in a smoke-free workplace and living in a smoke-free home: evidence from 15 low and middle income countries. *Prev Med*. 2014;59:47–53. **This study replicates the evidence from western countries that working in smoke-free environment in developing countries is associated with establishing smoker-free homes, which is associated with less SHS exposure and smoking initiation among youth.** <https://doi.org/10.1016/j.ypmed.2013.11.017>.
46. Wakefield MA, Loken B, Hornik RC. Use of mass media campaigns to change health behaviour. *Lancet*. 2010;376(9748):1261–71. [https://doi.org/10.1016/S0140-6736\(10\)60809-4](https://doi.org/10.1016/S0140-6736(10)60809-4).
47. Depue JB, Southwell BG, Betzner AE, Walsh BM. Encoded exposure to tobacco use in social media predicts subsequent smoking behavior. *Am J Health Promot*. 2015;29(4):259–61. <https://doi.org/10.4278/ajhp.130214-ARB-69>.
48. Allen JA, Duke JC, Davis KC, Kim AE, Nonnemaker JM, Farrelly MC. Using mass media campaigns to reduce youth tobacco use: a review. *Am J Health Promot*. 2015;30(2):e71–82. <https://doi.org/10.4278/ajhp.130510-LIT-237>.
49. Koh HK, Alpert HR, Judge CM, Caughey RW, Elqura LJ, Connolly GN et al. Understanding worldwide youth attitudes towards smoke-free policies: an analysis of the Global Youth Tobacco Survey. *Tobacco control*. 2011;tc. 2010.038885.
50. Sussman S, Unger J, Rohrbach LA, Johnson CA. School-based smoking prevention research. *J Adolesc Health : Off Publ Soc Adolesc Med*. 2005;37(1):4; **author reply 6–8–4**; author reply 8. <https://doi.org/10.1016/j.jadohealth.2005.03.002>.
51. Thomas R, Perera R. School-based programmes for preventing smoking. *Cochrane Database Syst Rev* (Online). 2006;3(Journal Article): CD001293. <https://doi.org/10.1002/14651858.CD001293.pub2>.
52. Thomas RE, McLellan J, Perera R. School-based programmes for preventing smoking. *Evidence-Based Child Health: A Cochrane Review Journal*. 2013;8(5):1616–2040. <https://doi.org/10.1002/ebch.1937>.
53. Peebles K, Hall MG, Pepper JK, Byron MJ, Noar SM, Brewer NT. Adolescents' responses to pictorial warnings on their parents' cigarette packs. *J Adolesc Health*. 2016;59(6):635–41. <https://doi.org/10.1016/j.jadohealth.2016.07.003>.
54. Nakkash R, Khalil J. Health warning labelling practices on narghile (shisha, hookah) waterpipe tobacco products and related accessories. *Tob Control*. 2010;19(3):235–9. **This study is one of the first studies to evaluate the effectiveness of waterpipe warnings and advocate for adding these warning labels on waterpipe apparatus itself, rather than having earnings only on the packaging where waterpipe café patrons will not be exposed.** <https://doi.org/10.1136/tc.2009.031773>.
55. Islam F, Salloum RG, Nakkash R, Maziak W, Thrasher JF. Effectiveness of health warnings for waterpipe tobacco smoking among college students. *Int J Public Health*. 2016;61(6):709–15. <https://doi.org/10.1007/s00038-016-0805-0>.
56. Jawad M, Bakir A, Ali M, Grant A. Impact of waterpipe tobacco pack health warnings on waterpipe smoking attitudes: a qualitative analysis among regular users in London. *Biomed Res Int*. 2015;2015:1–6. <https://doi.org/10.1155/2015/745865>.
57. Jawad M, Darzi A, Lotfi T, Nakkash R, Hawkins B, Akl EA. Waterpipe product packaging and labelling at the 3rd international Hookah Fair; does it comply with Article 11 of the framework convention on tobacco control? *J Public Health Policy*. 2017;38(3):303–13. <https://doi.org/10.1057/s41271-017-0078-8>.
58. International Agency for Research on Cancer. *Methods for evaluating tobacco control policies*. World Health Organization; 2008.