

research

Tobacco control: new resources, existing treaties, and emerging challenges

ORIGINAL RESEARCH Systematic collection of comparable data

Cigarette consumption estimates for 71 countries from 1970 to 2015

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Study question How have patterns in international cigarette consumption changed since 1970?

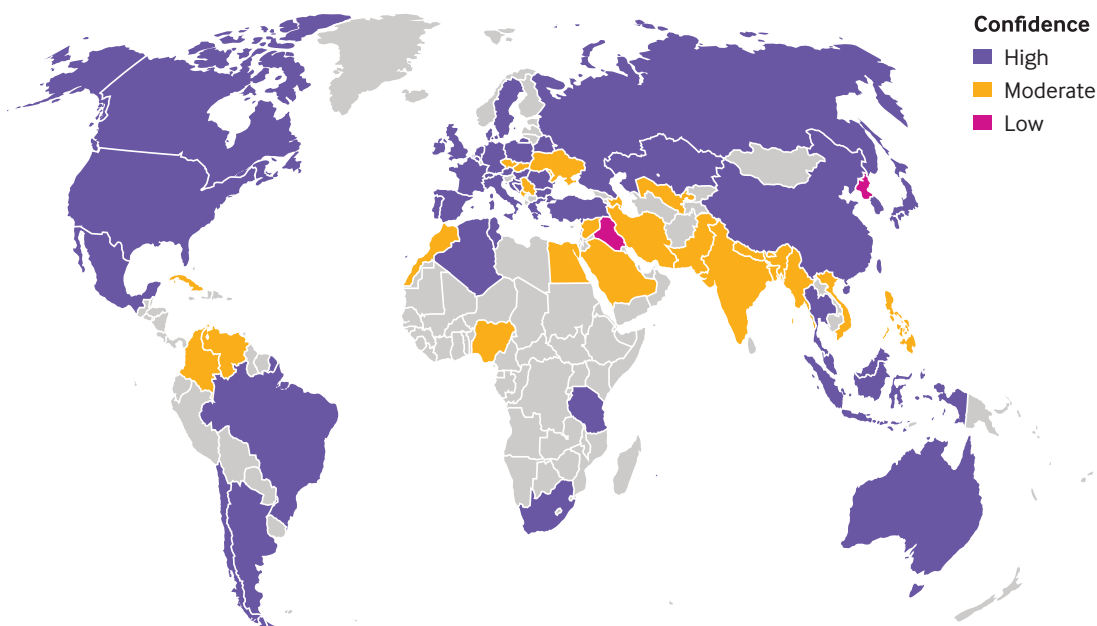
Methods Cigarette consumption data covering 1970-2015 were identified, appraised, selected, and reported for 71 countries representing over 95% of global cigarette consumption and 85% of the world's population. Data quality appraisal was conducted by two research team members in duplicate, with greatest weight given to official government sources. All data were standardised into units of cigarettes consumed per year in each country. A detailed accounting of data quality and sourcing was prepared.

Study answer and limitations Cigarette consumption fell in most countries over the past three decades but trends in country specific consumption were highly variable.

For example, China consumed 2.5 million metric tonnes (MMT) of cigarettes in 2013, more than Russia (0.36 MMT), the US (0.28 MMT), Indonesia (0.28 MMT), Japan (0.20 MMT), and the next 35 highest consuming countries combined. The US and Japan achieved reductions of more than 0.1 MMT from a decade earlier, whereas Russian consumption plateaued, and Chinese and Indonesian consumption increased by 0.75 MMT and 0.1 MMT, respectively. The authors were unable to obtain verified comparable data for many low consuming countries, alternative tobacco products, and illicit international flows of cigarettes.

What this study adds The findings underscore the need for more robust processes in data reporting, ideally built into international legal instruments or other mandated processes.

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Countries (n=71) included in the study dataset, shaded according to appraised confidence in the data
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ORIGINAL RESEARCH Quasi-experimental evaluations

Impact of the WHO Framework Convention on Tobacco Control on global cigarette consumption

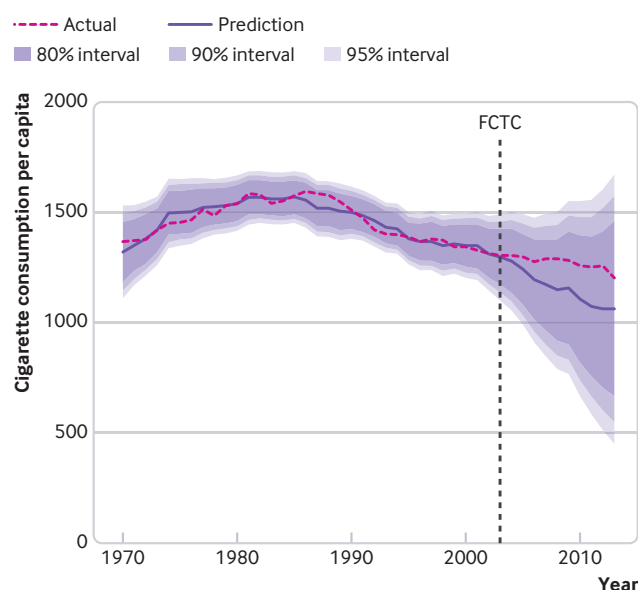
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Study question Has the adoption of the World Health Organization's Framework Convention on Tobacco Control (FCTC) led to reductions in global cigarette consumption per capita?

Methods Two quasi-experimental impact evaluations of the FCTC (an international treaty adopted in 2003 and legally binding in 181 countries) used verified national cigarette consumption data for 71 countries from 1970-2015, representing over 95% of the world's cigarette consumption and 85% of the world's population. The FCTC aims to reduce harmful tobacco consumption; lower smoking rates among children; and counteract the tobacco industry's lobbying, advertising, and promotional activities. Global, regional, and country level data were analysed before and after 2003 using interrupted time series analysis and in-sample forecast event modelling, with counterfactual control groups modelled using pre-intervention linear time trends and in-sample forecasts.



Population weighted, global event model predictions of cigarette consumption per capita, including 80%, 90%, and 95% prediction intervals, compared with actual consumption. In-sample forecast cut-off values begin in 2003 (adoption of the WHO Framework Convention on Tobacco Control (FCTC)), after which predictions are based on coefficients for the economy, political system, tobacco industry, and human development. Data are number of cigarettes consumed per individual aged 15 years or older per year

ORIGINAL RESEARCH Repeat national cross sectional surveys

Prevalence of vaping and smoking among adolescents in Canada, England, and the United States

Hammond D, Reid JL, Rynard VL, et al

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Study question Given changing vaping markets and varying national regulations, what are the differences in vaping and smoking prevalence among adolescents in Canada, England, and the United States?

Methods Repeat cross sectional surveys were conducted online in 2017 and 2018 with national samples of 16 to 19 year olds recruited from commercial panels in Canada (n=7891), England (n=7897), and the US (n=8140). Prevalence of vaping and smoking was assessed

Changes in prevalence of smoking and vaping between 2017 and 2018 among 16 to 19 year olds, by country.

Values are weighted percentages (numbers) or adjusted odds ratios (99% confidence intervals)

	Canada			England			US		
Vaping and smoking measures	2017 (n=4038)	2018 (n=3853)	Adjusted odds ratio (99% CI) for change*	2017 (n=3995)	2018 (n=3902)	Adjusted odds ratio (99% CI) for change*	2017 (n=4095)	2018 (n=4045)	Adjusted odds ratio (99% CI) for change*
Vaping									
Ever	29.3 (1182)	37.0 (1425)	1.50 (1.31 to 1.71)	33.7 (1348)	32.7 (1276)	0.96 (0.84 to 1.09)	31.3 (1283)	33.6 (1360)	1.11 (0.97 to 1.28)
Past 30 days	8.4 (340)	14.6 (562)	1.95 (1.58 to 2.40)	8.7 (347)	8.9 (346)	1.03 (0.82 to 1.29)	11.1 (454)	16.2 (655)	1.55 (1.28 to 1.88)
Past week	5.2 (208)	9.3 (357)	1.99 (1.53 to 2.60)	4.6 (184)	4.6 (178)	0.99 (0.73 to 1.36)	6.4 (262)	10.6 (429)	1.74 (1.37 to 2.22)
≥15 days in past 30 days	2.1 (85)	3.6 (139)	1.86 (1.23 to 2.79)	2.0 (80)	2.2 (87)	1.13 (0.71 to 1.79)	3.0 (124)	5.2 (210)	1.75 (1.23 to 2.49)
Cigarette smoking									
Ever	31.9 (1288)	36.6 (1412)	1.31 (1.15 to 1.50)	40.4 (1615)	39.8 (1555)	0.98 (0.86 to 1.12)	32.3 (1322)	33.1 (1337)	1.04 (0.90 to 1.19)
Past 30 days	10.7 (431)	15.5 (599)	1.60 (1.32 to 1.94)	15.6 (622)	16.4 (641)	1.08 (0.91 to 1.29)	11.0 (451)	12.2 (494)	1.12 (0.91 to 1.38)
Past week	7.6 (308)	11.9 (460)	1.71 (1.37 to 2.14)	9.8 (391)	11.3 (441)	1.19 (0.97 to 1.47)	8.5 (347)	8.8 (356)	1.04 (0.82 to 1.32)
≥15 days in past 30 days	4.8 (196)	7.4 (286)	1.64 (1.24 to 2.15)	5.0 (200)	6.4 (248)	1.31 (0.99 to 1.72)	4.6 (189)	5.1 (205)	1.10 (0.81 to 1.50)

*Change from 2017 to 2018, in logistic regression models within country, adjusting for age, sex, and race/ethnicity.



PETER TURNLEY/CORBIS/VC VIA GETTY IMAGES

Study answer and limitations No significant change was found in the rate at which global cigarette consumption had been decreasing after the FCTC's adoption in 2003, using either quasi-experimental approach. After 2003, high income and European countries showed a decrease in annual consumption by more than 1000 cigarettes per adult, whereas low and middle income and Asian countries showed an increased annual consumption by more than 500 cigarettes per adult when compared with the counterfactual event model. The methods had assumptions of a constant underlying time trend in the absence of an intervention (interrupted time series analysis) and a constant association between cigarette consumption and the model's explanatory variables (event model). Causal associations cannot be stated with certainty, owing to the exploratory nature of the study that purposefully included multiple testing under various models, assumptions, and scenarios.

What this study adds This study found no evidence to support the idea that global progress in reducing cigarette consumption has been accelerated by the FCTC treaty mechanism. This null finding combined with significant regional differences should motivate greater implementation of proved tobacco control policies, encourage assertive responses to tobacco industry activities, and inform the design of more effective health treaties in the future.

Funding, competing interests, and data sharing Funded by the Canadian Institutes of Health Research and the Research Council of Norway. SJH was previously employed by WHO. Open access data are available at <https://dataverse.scholarsportal.info/dataverse/iccd>.

for use: ever, in the past 30 days, in the past week, and on 15 days or more in the past month. Use of JUUL (a nicotine salt based electronic cigarette) and usual vaping brands were also assessed. Logistic regression models examined differences in vaping and smoking between countries and over time.

Study answer and limitations Between 2017 and 2018, the prevalence of vaping (past 30 day, past week, and 15 days or more in the past month) increased among 16 to 19 year olds in Canada and the US, and smoking prevalence increased among Canadian adolescents, while little change was observed in England. The use of JUUL increased in all countries, particularly the US and Canada; for example, the proportion of current vapers in the US citing JUUL as their usual brand increased threefold between 2017 and 2018. Although there are limitations to using non-probability online samples, estimates were consistent with national benchmarks.

What this study adds The findings suggest that vaping among adolescents increased in Canada and the US between 2017 and 2018, in parallel with the rise of JUUL and nicotine salt based vaping products and the introduction of more permissive vaping regulations in Canada. Fewer changes were observed among adolescents in England, where there are stronger marketing restrictions and maximum nicotine limits.

Funding, competing interests, and data sharing

This project was funded primarily by the US National Institutes of Health. Several authors have served as expert witnesses in legal challenges against tobacco companies; no other relationships or activities, financial or otherwise, influenced the submitted work. De-identified study data will be made available upon appropriate request.



International investment in tobacco control is more important than ever

Tobacco use remains the leading preventable cause of death in the world.¹ Three research papers in *The BMJ* examine smoking and efforts to deal with it, and these studies pose important questions about progress made and where to go next.

First, Hoffman and colleagues describe a new open access dataset, the International Cigarette Consumption Database (ICCD).² In their paper, they chronicle an ambitious programme of work to identify, review, and report estimates of cigarette consumption from sales and other data in 214 countries (former and present). The ICCD includes 71 countries where reliable data were available from 1970 to 2015. It identifies a decline in cigarette consumption per capita in most countries in the past three decades, but also substantial increases in China and Indonesia, and a doubling of consumption in Russia in the years immediately after the collapse of the former Soviet Union.

Although the ICCD covers 85% of the world's population, the researchers struggled to find reliable data for many countries, particularly in Africa. These data complement but cannot replace prevalence surveys that provide valuable information on smoking across different population groups.

Framework Convention on Tobacco Control

The ICCD was used in Hoffman and colleagues' second paper to evaluate the impact of the Framework Convention on Tobacco Control (FCTC).⁴ The FCTC is an international treaty adopted in 2003 that required its 181 signatories to implement evidence based measures for tobacco control. The authors concluded that the FCTC had not accelerated existing declines in cigarette consumption overall, but they did find highly variable patterns. High income countries saw large reductions, but low and middle income countries and Asian countries increased cigarette consumption per capita.

At face value, these findings suggest that the FCTC has not yet delivered on its

main objective, to reduce smoking and associated harms. But that interpretation is too simplistic, given divergence across countries. As smoking began to fall in high income countries, tobacco manufacturers turned their attention to new markets in low and middle income countries where the industry saw the potential for growth. These countries had limited capacity to combat industry attempts to delay or derail FCTC policies.⁵

Previous research found that full implementation of tobacco taxes, smoke-free laws, advertising bans, and cessation support did result in substantial declines in prevalence.⁶ But in many countries, particularly low and middle income countries, FCTC implementation has been slow. The key lesson from Hoffman and colleagues' second paper is that ongoing efforts to support FCTC countries to deliver on their obligations are urgently needed. This is not a failure of the treaty but a call for continued investment in international tobacco control to increase capacity, improve governance, and enhance cooperation across countries to combat tobacco industry influence.

E-cigarettes

While countries have been attempting to implement the FCTC, the market has evolved and new products have emerged, most notably electronic cigarettes that do not contain tobacco but deliver nicotine in an aerosol. Existing research suggests that e-cigarettes are less harmful than smoking⁷ and can help smokers quit,⁸ and can appeal to young people. In the third paper, Hammond and colleagues provide new evidence from repeat cross sectional surveys of 16-19 year olds in the US, Canada, and England.⁹ They report that recent and regular vaping increased in both North American countries between 2017 and 2018. At least part of this increase could have been driven by new vaping products that contain nicotine salts and are discreet to use. Worryingly, smoking prevalence in 16-19 year olds also increased in Canada during the same period, but not in the US.



Tobacco use remains the leading preventable cause of death in the world

By contrast, no significant increase in vaping or smoking was found in England.

While the characteristics of young people are unlikely to vary substantially between North America and England, the policy environment is substantially different.¹⁰ Initially through European legislation with subsequent domestic additions, England has introduced a ban on most forms of e-cigarette marketing and limits on nicotine concentration in vapour products. In addition, mass media campaigns promote vaping for smoking cessation in adults and contain very different messages from industry marketing tactics.

Taken together, these new studies emphasise the value of comparative research for tobacco control across different countries. They also warn against complacency in our attempts to address smoking, now and in the future.

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