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Original Investigation

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Trends in social norms toward smoking and vaping from 2016 to 2022: findings from the ITC Four Country Smoking and Vaping Surveys

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Abstract

Introduction: **We examined changes in smoking and vaping norms among adults who smoke daily in Canada, Australia, England, and the United States, which differ in regulatory approaches.**

Methods: **Data were from 4 biennial waves (2016-2022) of the International Tobacco Control Four Country Smoking and Vaping Surveys (19 915 participants). Measures included the proportion of 5 closest friends who smoke or vape, perceived disapproval of smoking or vaping from people important to you and the public, and opinions about smoking or vaping. Generalized estimating equations logistic regressions assessed changes over time and differences between countries, adjusting for demographic, smoking, and survey characteristics.**

Results: **Between 2016 and 2022, reporting that over half of 5 closest friends smoke remained stable (19.0%–17.6%, $P = .25$), whereas perceived disapproval of smoking from people important to you (63.5%–54.3%) and the public (83.3%–72.5%) and negative opinion of smoking (52.1%–43.0%) decreased (all $P < .001$). Reporting that over half of 5 closest friends vape increased (1.6%–2.8%, $P = .01$), as did perceived disapproval of vaping from people important to you (31.3%–41.4%) and the public (41.2%–48.3%) and negative opinion of vaping (32.8%–49.1%) (all $P < .001$). England had the lowest disapproval of both products and Canada had the highest smoking disapproval; only negative opinion of vaping showed a significant year-by-country interaction, with the smallest increase in England.**

Conclusions: **Anti-smoking norms weakened while anti-vaping norms strengthened. Countries differed in norm levels, consistent with policy environments, but largely similar trajectories suggest cross-national influences may shape norm change alongside national policies.**

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Implications: **The weakening of anti-smoking norms alongside strengthening anti-vaping norms among adults who smoke daily is concerning given the known harms of smoking. These opposing trends could reduce motivation to quit and, as vaping norms have been prospectively associated with trying vaping products, discourage switching to a substantially less harmful alternative. Whether these shifts translate into changes in quitting or switching requires longitudinal investigation. The broadly similar trajectories across countries with markedly different vaping regulations suggest that influences beyond national policy, such as international media coverage and major events, may shape these norms. Public health communication that conveys the risks of smoking and vaping transparently and accurately may help people who smoke make informed choices.**

Keywords epidemiology, public health, smoking or harm reduction, tobacco control, special populations

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Introduction

Social norms are central constructs in major theories of health behavior. In the reasoned action approach, which encompasses the theory of reasoned action and the theory of planned behavior, perceived normative pressure, together with attitudes and perceived control, shapes behavioral intentions, which in turn predict behavior.[1,2] Norms are commonly distinguished as descriptive norms (perceptions of others' behavior) and injunctive norms (perceptions of others' approval or disapproval of the behavior), and operate at interpersonal and societal levels.[2–5] Social Cognitive Theory similarly emphasizes learning from the behavior of others in one's social environment,[6] while CEOS (Context, Executive, and Operational Systems) theory highlights the role of social context in sustaining hard-to-maintain behavior change such as quitting smoking.[7] Among adults who smoke, stronger anti-smoking norms have been prospectively associated with quit intentions and quit attempts,[4,8,9] and norms toward vaping with subsequently trying vaping products.[4,8]

Several tobacco control policies have successfully changed smoking behaviors at least in part by leveraging social norms. For example, smoking bans and public health campaigns have shifted perceptions from smoking as common and acceptable to socially disapproved.[10] These denormalization strategies have played a role in motivating smoking cessation and preventing initiation.[11,12] However, recent evidence suggests this approach may be losing effectiveness among certain populations, particularly people who continue to smoke, who are increasingly concentrated in socioeconomically disadvantaged groups,[13] and as smoking declines fastest among young people, in older age groups.[14]

East et al. (2021) documented a concerning trend: anti-smoking norms among people who smoke daily in England, the United States, Canada, and Australia generally weakened over time between 2002 and 2015.[15] They proposed several mechanisms, including that widespread implementation of smoke-free policies may have reduced direct disapproval in daily life by confining smoking to private or designated spaces, and that the introduction of social media platforms around the mid-2000s may have facilitated the dissemination of pro-smoking content and fostered distrust in government and public health experts. Understanding whether these trends continued is critical, as persistently weakening anti-smoking norms among people who smoke daily could reduce motivation to quit in the population at highest health risk and could require reconsideration of denormalization approaches.

The 2016-2022 period presents an opportunity to examine both smoking and vaping norms simultaneously. This period witnessed substantial increases in vaping prevalence globally,[16] raising competing concerns about potential smoking renormalization versus harm reduction opportunities.[17] During this time, major events including the 2019 outbreak of e-cigarette or Vaping Product Use-Associated Lung Injury (EVALI), which was subsequently linked primarily to vitamin E acetate in illicit tetrahydrocannabinol-containing vaping products,[18,19] and the Coronavirus pandemic (COVID-19) may have influenced perceptions of both products.[20,21] Understanding how norms toward both products evolved during this period among people who smoke daily can help clarify their interrelationship and inform evidence-based policy.

Examining these trends across countries with different regulatory approaches can offer additional insights into policy-norm relationships. England, the United States, Canada, and Australia maintained comprehensive smoking control approaches while adopting markedly different vaping regulations.[22] England has embraced a harm reduction approach, permitting retail sale of nicotine vaping products (NVPs) subject to product standards (eg, limits on nicotine concentration and container size) and actively promoting them as smoking cessation through its national healthcare system, including stop smoking services,[23] infrastructure without a direct equivalent in the United States. Australia severely restricted NVPs, formalizing a prescription-only model for NVPs in October 2021.[24] Canada moved from restrictive to permissive, legalizing NVP sales in 2018, before tightening regulations in response to youth uptake, including advertising restrictions and a nicotine concentration cap.[22,25] The United States shifted from permissive to increasingly restrictive approaches, including raising the minimum sales age to 21 in 2019 and restricting flavored cartridge-based products in 2020, although much US vaping regulation, such as flavor bans, has occurred at the state level.[22] Previous research has demonstrated that policy differences and prevalence rates are reflected in social norms,[26,27] though patterns may vary between different use groups.[15,27] This natural experiment allows examination of whether norm trajectories differ across regulatory environments or reflect broader global trends.

Despite the importance of understanding recent norms changes, significant research gaps remain. For smoking norms, no studies have examined trends beyond 2015, leaving unclear whether the weakening anti-smoking trend continued, stabilized, or reversed. For vaping norms, research has been largely cross-sectional or

limited to youth populations,[8,28,29] and temporal changes among adults who smoke have not been examined. This study addresses these gaps using data from the International Tobacco Control Project Four Country Smoking and Vaping Survey (2016-2022) to examine how smoking and vaping norms as well as personal opinions (which correspond to the attitude construct in reasoned action theories and complement social norm measures given their strong correlation[30]), have evolved among adults who smoke daily across 4 countries. Year-by-country interactions are also explored to examine whether regulatory environments influence norms trajectories differently over time.

Methods

Design

This study analyzed longitudinal data from adults (aged 18+) in Canada, Australia, England, and the United States who participated in waves 1–4 (2016, 2018, 2020, and 2022) of the International Tobacco Control Four Country Smoking and Vaping (ITC 4CV) Survey. The ITC 4CV is a cohort survey of adults who smoked, vaped, or had recently quit smoking, recruited using probability-based and/or non-probability sampling frames and designed to be representative of these populations in each country. At each follow-up wave, respondents lost to attrition were replaced with newly recruited respondents to maintain sample sizes. Details of the cohorts, recruitment and sampling are provided in the Supplementary Methods and the ITC technical reports.[31–34]

All analyses were conducted on the subsample of adults who smoke daily. Country-specific survey weights were applied to adjust for sampling design and ensure the samples remained nationally representative at each wave. Further weighting procedures are described elsewhere.[31–34]

Participants and sample

This study included 29 016 observations from 19 915 unique adults who smoked daily at waves they were surveyed. Respondents who quit and relapsed to daily smoking were added back into the sample when they relapsed. Sample sizes by country and wave are provided in Table S1.

Measures

Outcome variables

Reporting that over half of 5 closest friends smoke or vape. "Of the five closest friends or acquaintances that you spend time with on a regular basis, how many of them are smokers [vapers]?". Responses were recoded as less than half (0,1,2) or more than half (3,4,5).

Perceiving that people who are important to you disapprove of you smoking or vaping. "What do people who are important to you think about you smoking cigarettes [vaping]?". Responses were recoded as disapprove (most disapprove, all or nearly all disapprove), other (all or nearly all approve, most approve, about half approve and half disapprove).

Perceiving that the public disapproves of smoking or vaping. "What do you think the general public's attitude is towards smoking cigarettes [vaping]?". Responses were coded as disapprove (most disapprove, all or nearly all disapprove), other (all or nearly all approve, most approve, about half approve and half disapprove).

Negative opinion of smoking or vaping. "What is your overall opinion of smoking cigarettes [vaping]?". Responses were recoded as negative (negative, very negative), other (very positive, positive, neither positive nor negative).

Predictor variables

Survey year (wave): 2016 (wave 1), 2018 (wave 2), 2020 (wave 3), and 2022 (wave 4).

Country: Canada, the United States, England, and Australia.

Covariates

Demographic variables included self-reported age group (18–24, 25–39, 40–54, and 55+), designated sex at birth, ethnicity (majority = white, minority), annual household income (low, moderate, and high), and education (low, moderate, and high). Country-specific coding of ethnicity, income and education is provided in the Supplementary Methods.

Heaviness of Smoking Index (HSI, 0–6) was included as a measure of nicotine dependence.

Time in sample was the cumulative number of waves completed up to and including the current wave (1–4), included to control for potential participation effects.

Time between survey waves was the time since the respondent last completed a survey, measured in years (0–4), included because intervals between waves varied across countries and participants.

Vaping status (currently use daily, weekly, monthly, less-than-monthly, quitter, past trier, never tried, or never heard of e-cigarettes) was included as a covariate in a sensitivity analysis only.

The questionnaires are available elsewhere.[35]

Statistical analyses

Sampling weights were calibrated to estimated population values from national benchmark surveys, incorporating gender, age, and region, and were adjusted for attrition. The wave 1–4 initial rescaled cross-sectional weights (from the initial wave the respondent participated in the survey) were used.

Logistic regression models using generalized estimating equations were adopted to regress each outcome measure on time (survey wave) and country, with demographic variables, time in sample and time between waves included as covariates to examine the change in norms over time. Generalized estimating equations account for correlations in the longitudinal data. Correlations between observations from the same individuals were modeled specifying an unstructured within-person correlation matrix.

Interactions between wave (categorical) and country were assessed for each outcome; where interactions were observed ($P < .05$), average predicted probabilities were plotted using Stata's margins command and compared pairwise using 95% confidence intervals (CIs).

Missing data

For all outcome variables, the "not applicable," "don't know," and "refused" responses were coded as missing. For descriptive norms outcome variables, "not applicable" responses included

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those who responded "none" to the question "How many friends or acquaintances do you spend time with on a regular basis?"

Missing data were less than 30% for all variables. Multiple imputations using iterated chained equations algorithm were used to fill in missing values and 50 datasets were imputed, assuming data were missing at random.[36]

All analyses were conducted using Stata v19. Statistical significance was reported for $P < .05$.

Sensitivity analysis

Two sensitivity analyses tested the robustness of the findings.

First, we examined the impact of coding responses to descriptive and injunctive norms questions differently. Instead of treating responses of "none" to "How many friends or acquaintances do you spend time with on a regular basis?" as missing data, we coded these participants as having "0" friends who smoke or vape (categorized as "less than half"). Additionally, "don't know" responses to injunctive norm questions were recoded as "others" rather than treated as missing.

Second, we included vaping status as an additional covariate in all models to account for potential differences between people who exclusively smoke and those who also vape.

In both sensitivity analyses, the interpretation of results remained unchanged.

Results

Sample characteristics at baseline

Table 1 shows the sample characteristics. A total of 19 915 respondents (29 016 observations) were included, of which 5069 were from Canada, 4185 from the United States, 7753 from England, and 2908 from Australia. The modal demographic categories at baseline were 25–39 years, male, majority ethnicity, high income, and moderate education (Table 1). Around 41.0% were recruited in 2016 (wave 1). Most took part in only one survey wave.

Reporting over half of five closest friends smoke

In 2016 (wave 1), 19.0% of those who smoked daily reported that over half of their 5 closest friends smoke, this remained stable over time (2022 [wave 4]: 17.6%, adjusted odds ratio [aOR] = 0.91 [95% CI = 0.76 to 1.07], $P = .25$) (Table 2; Figure S1).

Compared to participants from Canada, those from Australia had greater odds of reporting that over half of their 5 closest friends smoke (aOR = 1.33 [1.14–1.56], $P < .001$). There were no significant differences between Canada and the United States or England (all $P > .05$) (Table 3).

There was no evidence of a year-by-country interaction ($F(9,9504.7) = 0.51$, $P = .87$) (Figure 1).

Perceiving that people important to you disapprove of you smoking

In 2016, 63.5% perceived that people important to them disapprove of them smoking, this decreased gradually to 54.3% in 2022 (aOR = 0.70 [0.62–0.80], $P < .001$) (Table 2; Figure S1).

Compared to those from Canada, people from the United States (aOR = 0.86 [0.77–0.95], $P = .01$), England (aOR = 0.73 [0.66–0.80], $P < .001$), and Australia (aOR = 0.85 [0.75–0.96], $P = .009$) all had lower odds of perceiving that people important to them disapprove of them smoking. Compared to people from England, those from the United States (aOR = 1.18 [1.06–1.31], $P = .003$) and Australia (aOR = 1.17 [1.03–1.32], $P = .015$) had higher odds (Table 3).

There was no evidence of a year-by-country interaction ($F(9,25008.1) = 1.03$, $P = .42$) (Figure 1).

Perceiving that the public disapproves of smoking

In 2016, 83.3% perceived that the public disapproves of smoking, this decreased gradually to 72.5% in 2022 (aOR = 0.50 [0.43–0.59], $P < .001$) (Table 2; Figure S1).

Compared to people from Canada, those from the United States (aOR = 0.79 [0.69–0.91]) and England (aOR = 0.54 [0.49–0.61]), all $P < .001$, had lower odds of perceiving that the public disapproves of smoking. Compared to those from England, people from the United States (aOR = 1.45 [1.28–1.65]) and Australia (aOR = 1.58 [1.34–1.86]), all $P < .001$, had higher odds (Table 3).

There was no evidence of a year-by-country interaction ($F(9,70735.7) = 0.48$, $P = .89$) (Figure 1).

Negative opinion of smoking

In 2016, 52.1% had a negative opinion of smoking, this remained unchanged at wave 2, followed by significant decreases in 2020 (aOR = 0.73 [0.67–0.8], $P < .001$) and 2022 (43.0%, aOR = 0.69 [0.61–0.78], $P < .001$) (Table 2; Figure S1).

Compared to people from Canada, those from the United States (aOR = 0.73 [0.66–0.81], $P < .001$), England (aOR = 0.70 [0.64–0.77], $P < .001$), and Australia (aOR = 0.75 [0.67–0.84], $P < .001$) all had lower odds of having a negative opinion of smoking. There was no significant difference between England, the United States, and Australia (all $P > .05$) (Table 3).

There was no evidence of a year-by-country interaction ($F(9,352261.4) = 0.94$, $P = .49$) (Figure 1).

Reporting that over half of five closest friends vape

In 2016, 1.6% reported over half of their 5 closest friends vape. This showed little change through 2018 and 2020 before it increased to 2.8% in 2022 (aOR = 1.72 [1.12–2.66], $P = .01$) (Table 2; Figure S1).

There were no significant differences between countries (all $P > .05$) (Table 3).

There was no evidence of a year-by-country interaction ($F(9,3055.7) = 0.32$, $P = .97$) (Figure 2).

Perceiving that people important to you disapprove of you vaping

In 2016, 31.3% perceived that people important to them disapprove of them vaping, this increased to 43.9% in 2020 (aOR = 1.74

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Table 1 Descriptive statistics of participants at baseline, 2016-2022 ITC 4CV Surveys.

	Canada *n* = 5069	United States *n* = 4185	England *n* = 7753	Australia *n* = 2908	Overall *n* = 19 915
Age (%)					
18–24	8.62%	10.16%	16.00%	9.62%	11.75%
25–39	27.71%	29.45%	35.34%	41.36%	33.04%
40–54	33.75%	31.52%	25.82%	28.13%	29.51%
55+	29.92%	28.88%	22.85%	20.89%	25.69%
Sex: male (%)	55.90%	52.50%	53.71%	56.51%	54.46%
Ethnicity: majority (%)	83.87%	75.84%	90.36%	88.92%	85.20%
Income (%)					
Low	23.38%	43.80%	25.00%	20.59%	28.09%
Moderate	33.64%	28.55%	33.08%	25.16%	30.91%
High	42.97%	27.65%	41.92%	54.25%	41.00%
Education (%)					
Low	33.17%	59.41%	17.69%	41.57%	34.95%
Moderate	44.04%	30.27%	67.15%	38.47%	48.24%
High	22.79%	10.32%	15.16%	19.96%	16.81%
HSI (mean (SE))	2.32 (0.05)	2.36 (0.06)	2.20 (0.04)	2.54 (0.08)	2.32 (0.02)
Wave of recruitment (%)					
Wave 1	43.02%	43.69%	39.30%	37.99%	41.02%
Wave 2	25.38%	24.52%	30.95%	18.92%	26.11%
Wave 3	24.40%	17.54%	20.74%	17.17%	20.37%
Wave 4	7.20%	14.26%	9.01%	25.93%	12.50%
Time-in-sample (%)					
1 wave	60.46%	59.73%	71.03%	65.82%	64.55%
2 waves	24.75%	23.27%	18.51%	21.35%	21.83%
3 waves	10.09%	11.47%	7.24%	8.89%	9.31%
4 waves	4.70%	5.53%	3.22%	3.94%	4.30%

Data are weighted.

[1.56–1.95], $P < .001$), before slightly declining but remaining elevated at 41.4% in 2022 (aOR (compared to 2016) = 1.57 [1.37–1.80], $P < .001$) (Table 2; Figure S1).

Compared to those from Canada, people from England (aOR = 0.53 [0.48–0.59], $P < .001$) and Australia (aOR = 0.82 [0.72–0.94], $P = .003$) had lower odds of perceiving that people important to them disapproving of them vaping. Compared to those from England, people from the United States (aOR = 1.96 [1.75–2.20]) and Australia (aOR = 1.55 [1.35–1.78]) had higher odds (all $P < .001$). Those from the United States (aOR = 1.27 [1.10–1.45], $P < .001$) had higher odds than those from Australia (Table 3).

There was no evidence of a year-by-country interaction ($F(9,6479.3) = 1.77$, $P = .07$) (Figure 2).

Perceiving that the public disapproves of vaping

In 2016, 41.2% of those who smoke daily perceived that the public disapproves of vaping, this increased steadily to 53.5% in 2020 (aOR = 1.68 [1.51–1.87], $P < .001$) before decreasing but remaining elevated at 48.3% in 2022 (aOR (compared to 2016) = 1.35 [1.19–1.54], $P < .001$) (Table 2; Figure S1).

Compared to people from Canada, those from England (aOR = 0.49 [0.45–0.54], $P < .001$) and Australia (aOR = 0.88 [0.78–0.99], $P = .04$) had lower odds of perceiving public disapproval of vaping, while those from the United States showed no significant difference. Compared to those from England, people from the United States (aOR = 2.05 [1.87–2.24]) and Australia (aOR = 2.14 [1.92–2.39]) had higher odds (all $P < .001$) of perceiving public disapproval of vaping. Those from the United States (aOR = 1.19 [1.04–1.36], $P = .01$) had higher odds than those from Australia (Table 3).

There was no evidence of a year-by-country interaction ($F(9,11931.0) = 1.23$, $P = .27$) (Figure 2).

Negative opinion of vaping

In 2016, 32.8% of those who smoke daily had a negative opinion of vaping, this increased significantly to 49.1% in 2022 (aOR = 2.00 [1.77–2.26], $P < .001$) (Table 2; Figure S1).

Compared to those from Canada, people from England (aOR = 0.66 [0.60–0.73]) and Australia (aOR = 0.76 [0.67–0.86]) had lower odds (all $P < .001$) of having a negative opinion of vaping, while those from the United States showed no significant difference. Compared to those from England, people from the United States (aOR = 1.62 [1.45–1.80], $P < .001$) and Australia (aOR = 1.15 [1.01–1.31], $P = .032$) had higher odds. Those from the United States (aOR = 1.41 [1.23–1.61], $P < .001$) had higher odds than those from Australia (Table 3).

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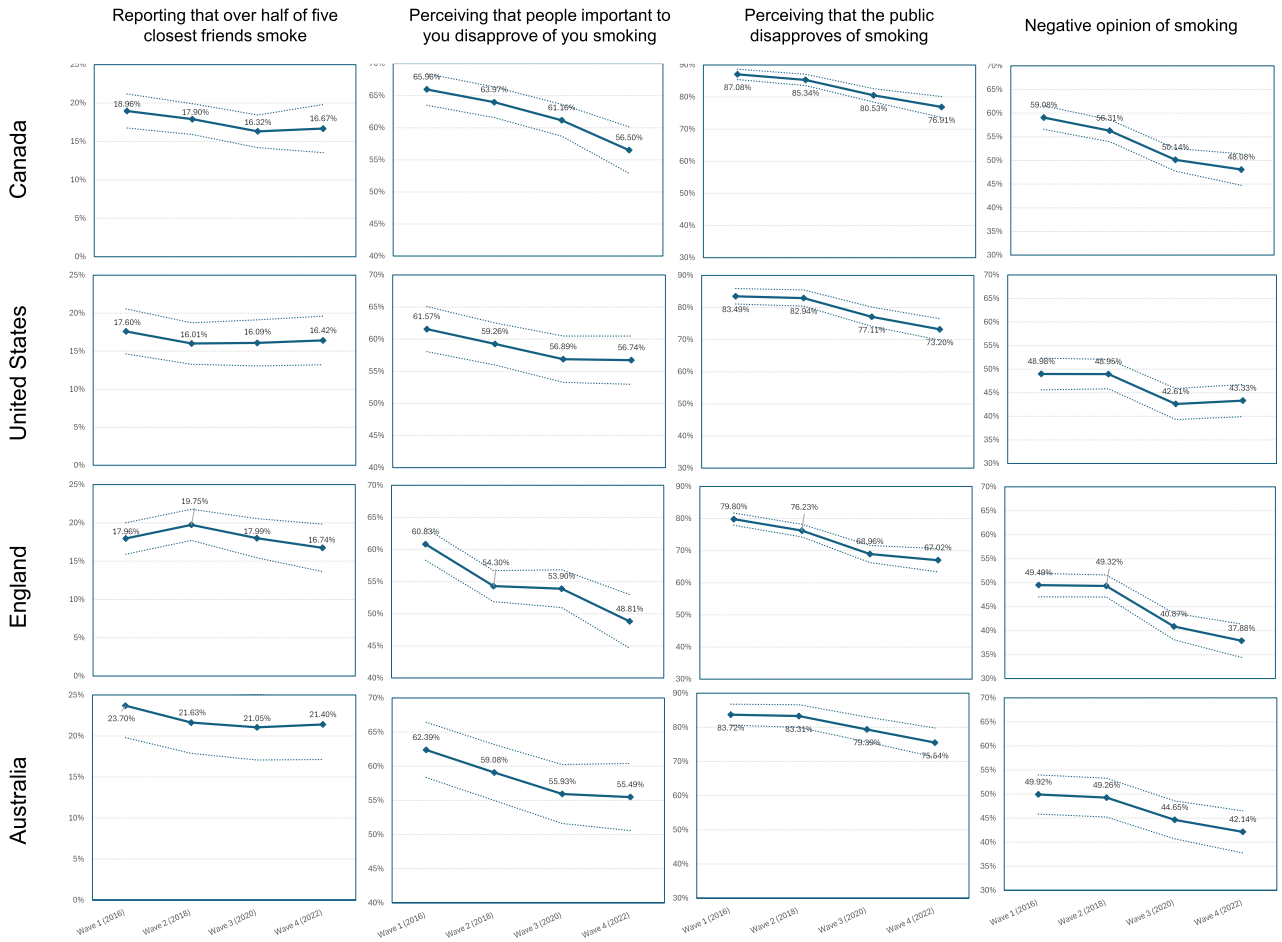

Figure 1 Average predicted probabilities and 95% confidence interval of reporting that over half of 5 closest friends smoke, perceiving that people important to you disapprove of you smoking, perceiving that the public disapproves of smoking, negative opinion of smoking, by wave and country (29 016 observations from 19 915 unique participants). Data are weighted and from the binary logistic regression analyses including wave*country interaction terms, adjusted for age, sex, ethnicity, income, education, Heaviness of Smoking Index, time in sample, and time between waves. Dotted lines denote 95% confidence interval.

There was a significant year-by-country interaction ($F(9,47937.0) = 4.42$, $P < .001$). England showed the least pronounced increase in having negative opinion of vaping over time. The United States had a steeper increase than Australia in 2018 (aOR = 1.42 [1.13–1.79], $P = .002$) and 2020 (aOR = 1.57 [1.24–1.98], $P < .001$), and Canada in 2022 (aOR = 1.29 [1.04–1.59], $P = .02$) (Figure 2).

Discussion

This study examined changes in social norms toward smoking and vaping among adults who smoke daily across 4 countries between 2016 and 2022. Friend smoking remained relatively stable while perceived disapproval and negative opinions of smoking decreased. Conversely, friend vaping increased, as did disapproval and negative opinion of vaping. England showed lowest perceived disapproval of both products, Canada the strongest anti-smoking norms, and Australia lower anti-vaping norms than Canada and the United States.

The continued decrease in anti-smoking injunctive norms and negative opinions extends the declining trend observed by East et al. (2021) for 2002-2015,[15] suggesting a long-term shift rather than a temporary fluctuation. The mechanisms proposed by East et al. remain relevant. Smoke-free policies have become more normalized and widely accepted, and smoking prevalence has continued to fall,[14,37,38] potentially reducing perceived direct disapproval in daily life as smoking becomes less visible. Meanwhile, the continued proliferation and increasing sophistication of social media platforms may have amplified the dissemination of pro-smoking content and distrust in public health messaging, particularly during the COVID-19 pandemic. Competing health priorities including the pandemic, obesity, mental health, and opioid crises may also have shifted attention away from smoking as a primary public health concern. Psychological adaptation may also help explain. People who continue to smoke daily may adopt dissonance-reducing beliefs to reconcile their behavior with societal disapproval,[39] or socialize primarily with others who smoke. These weakening anti-smoking norms are concerning because this population would benefit most from quitting, yet perceived social disapproval, a potential motivator for quit attempts,[4,9] continues to decline.

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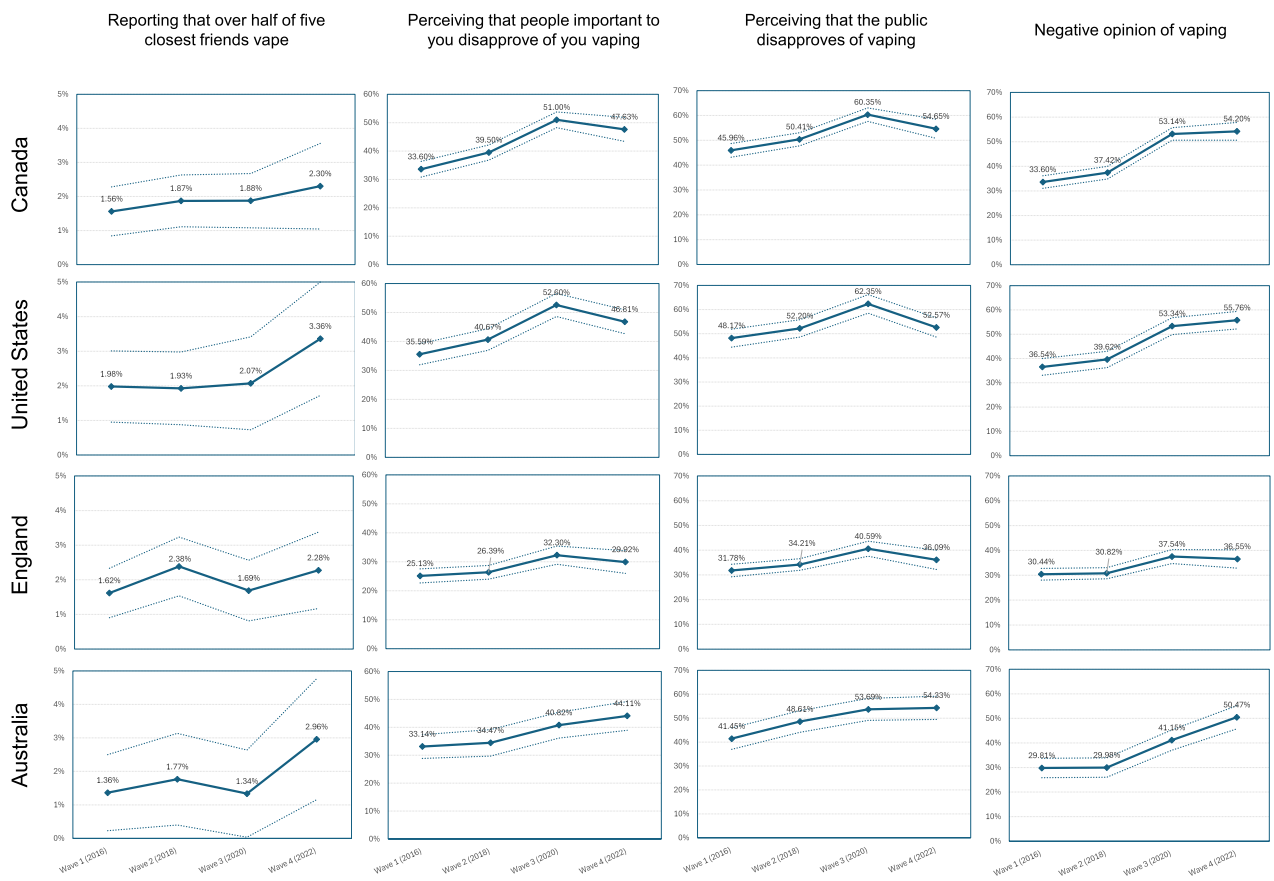

Figure 2 Average predicted probabilities and 95% confidence interval of reporting that over half of 5 closest friends vape, perceiving that people important to you disapprove of you vaping, perceiving that the public disapproves of vaping, negative opinion of vaping, by wave and country (29 016 observations from 19 915 unique participants). Data are from the binary logistic regression analyses including wave*country interaction terms, *adjusted for* age, sex, ethnicity, income, education, Heaviness of Smoking Index, time in sample, and time between waves and weighted. Dotted lines denote 95% confidence interval.

In contrast, perceived disapproval of vaping and negative opinions about vaping, increased significantly during 2016-2022. Several factors likely contributed. Media coverage of vaping globally was largely negative, particularly around the 2019 EVALI outbreak which was misattributed to nicotine vaping.[18,21,40] Concerns about respiratory health during COVID-19 may also have compounded this.[40] Public and policy attention in this period also centered on young people, driven by the rapid rise in youth vaping, particularly of disposable products, and by marketing and imagery appealing to young people.[29,40–42] Vaping may therefore have come to be seen less as a cessation aid for adults who smoke and more as a youth problem. This is relevant to interpreting our findings because most of our vaping measures capture perceived approval and personal opinion rather than perceived harm. Rising disapproval may therefore partly reflect the social image of vaping rather than judgments about its risks relative to smoking. The increase may also partly reflect convergence, as a relatively novel product that is itself not risk-free became subject to the scrutiny long applied to cigarettes. Additionally, as people more receptive to smoking alternatives may have already transitioned to vaping or quit entirely over time, those who continue to smoke daily may represent a group with increasingly entrenched opinions against vaping.

The divergent trajectories of smoking and vaping norms raise important questions. Public health messaging during this period emphasized vaping harms to deter youth uptake, often without providing comparative risk information relative to smoking.[42] Without clear risk comparisons, people who smoke may perceive vaping as equally or more harmful than smoking.[40] Current evidence indicates that vaping poses substantially lower health risks than smoking and switching could reduce harm for those unable or unwilling to quit.[43] As norms toward vaping have been prospectively associated with trying NVPs among adults who smoke,[4,8] increasing vaping disapproval may discourage consideration of this alternative. As we did not assess switching or cessation, whether these normative shifts translate into reduced interest in switching or quitting warrants further investigation.

The stability in descriptive smoking norms (friends who smoke) despite declining smoking prevalence in all 4 countries aligns with East et al.'s findings for 2002-2015[15] and likely reflects selection homophily—the tendency of people who smoke to maintain social connections with other people who smoke.[44] Meanwhile, the significant country differences observed align with previous research showing that policy environments influence social norms.[11,26] Canada's comprehensive tobacco control policies focused on denormalization[45] corresponds with the highest

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Table 2 Adjusted associations of social norms and opinion of smoking/vaping with wave, 2016-2022 ITC 4CV Surveys.

	Time (*ref.* Wave 1 (2016))									
	Wave 1 (2016)	Wave 2 (2018)	Wave 3 (2020)	Wave 4 (2022)	Wave 2 (2018)		Wave 3 (2020)		Wave 4 (2022)	
	%	%	%	%	aOR (95% CI)	*P*-value	aOR (95% CI)	*P*-value	aOR (95% CI)	*P*-value
Reporting that over half of 5 closest friends smoke	19.04	18.71	17.57	17.56	0.98 (0.87, 1.10)	.719	0.91 (0.79, 1.04)	.157	0.91 (0.76, 1.07)	.25
Perceiving that people important to you disapprove of you smoking	63.53	58.86	56.95	54.31	**0.85 (0.78, 0.93)**	**<.001**	**0.78 (0.71, 0.87)**	**<.001**	**0.70 (0.62, 0.80)**	**<.001**
Perceiving that the public disapproves of smoking	83.29	81.45	75.76	72.51	**0.87 (0.78, 0.98)**	**.016**	**0.61 (0.54, 0.68)**	**<.001**	**0.50 (0.43, 0.59)**	**<.001**
Negative opinion of smoking	52.09	51.19	44.45	43.00	0.96 (0.89, 1.04)	.346	**0.73 (0.67, 0.80)**	**<.001**	**0.69 (0.61, 0.78)**	**<.001**
Reporting that over half of 5 closest friends vape	1.64	2.06	1.78	2.78	1.27 (0.88, 1.82)	.196	1.09 (0.70, 1.69)	.705	**1.72 (1.12, 2.66)**	**.014**
Perceiving that people important to you disapprove of you vaping	31.34	34.77	43.85	41.38	**1.17 (1.06, 1.30)**	**.002**	**1.74 (1.56, 1.95)**	**<.001**	**1.57 (1.37, 1.80)**	**<.001**
Perceiving that the public disapproves of vaping	41.17	45.27	53.49	48.31	**1.19 (1.08, 1.31)**	**<.001**	**1.68 (1.51, 1.87)**	**<.001**	**1.35 (1.19, 1.54)**	**<.001**
Negative opinion of vaping	32.78	34.74	46.44	49.11	1.09 (1.00, 1.19)	.048	**1.79 (1.62, 1.98)**	**<.001**	**2.00 (1.77, 2.26)**	**<.001**

Abbreviations: %, average predicted probability; aOR, adjusted odds ratio; 95% CI, 95% confidence interval. Data are weighted and from binary logistic regression analyses, adjusted for country, age, sex, ethnicity, income, education, Heaviness of Smoking Index, time in sample, and time between waves. Bold values indicate statistical significance at $P < .05$.

Table 3 Adjusted associations of social norms and opinion of smoking/vaping with country, 2016-2022 ITC 4CV Surveys.

	Ref. Canada						*Ref.* England				*Ref.* Australia	
	United States		England		Australia		United States		Australia		United States	
	aOR (95% CI)	*P*-value	aOR (95% CI)	*P*-value	aOR (95% CI)	*P*-value	aOR (95% CI)	*P*-value	aOR (95% CI)	*P*-value	aOR (95% CI)	*P*-value
Reporting that over half of 5 closest friends smoke	0.93 (0.81, 1.07)	.320	1.05 (0.94, 1.18)	.374	**1.33 (1.14, 1.56)**	**<.001**	0.88 (0.77, 1.01)	.080	**1.26 (1.08, 1.48)**	**.004**	**0.70 (0.58, 0.84)**	**<.001**
Perceiving that people important to you disapprove of you smoking	**0.86 (0.77, 0.95)**	**.010**	**0.73 (0.66, 0.80)**	**<.001**	**0.85 (0.75, 0.96)**	**.009**	**1.18 (1.06, 1.31)**	**.003**	**1.17 (1.03, 1.32)**	**.015**	1.01 (0.88, 1.16)	.903
Perceiving that the public disapproves of smoking	**0.79 (0.69, 0.91)**	**<.001**	**0.54 (0.49, 0.61)**	**<.001**	0.86 (0.73, 1.02)	.075	**1.45 (1.28, 1.65)**	**<.001**	**1.58 (1.34, 1.86)**	**<.001**	0.92 (0.77, 1.09)	.341
Negative opinion of smoking	**0.73 (0.66, 0.81)**	**<.001**	**0.70 (0.64, 0.77)**	**<.001**	**0.75 (0.67, 0.84)**	**<.001**	1.04 (0.94, 1.16)	.437	1.07 (0.95, 1.21)	.270	0.97 (0.85, 1.11)	.692
Reporting that over half of 5 closest friends vape	1.20 (0.85, 1.71)	.298	1.08 (0.78, 1.48)	.655	0.96 (0.61, 1.51)	.864	1.12 (0.77, 1.62)	.550	0.89 (0.58, 1.39)	.619	1.25 (0.78, 2.01)	.349
Perceiving that people important to you disapprove of you vaping	1.04 (0.94, 1.16)	.438	**0.53 (0.48, 0.59)**	**<.001**	**0.82 (0.72, 0.94)**	**.003**	**1.96 (1.75, 2.20)**	**<.001**	**1.55 (1.35, 1.78)**	**<.001**	**1.27 (1.10, 1.45)**	**<.001**
Perceiving that the public disapproves of vaping	1.05 (0.94, 1.17)	.400	**0.49 (0.45, 0.54)**	**<.001**	**0.88 (0.78, 0.99)**	**.036**	**2.05 (1.87, 2.24)**	**<.001**	**2.14 (1.92, 2.39)**	**<.001**	**1.19 (1.04, 1.36)**	**.012**
Negative opinion of vaping	1.07 (0.97, 1.19)	.191	**0.66 (0.60, 0.73)**	**<.001**	**0.76 (0.67, 0.86)**	**<.001**	**1.62 (1.45, 1.80)**	**<.001**	**1.15 (1.01, 1.31)**	**.032**	**1.41 (1.23, 1.61)**	**<.001**

Abbreviations: aOR, adjusted odds ratio; 95% CI, 95% confidence interval. Data are weighted and from binary logistic regression analyses, adjusted for wave, age, sex, ethnicity, income, education, Heaviness of Smoking Index, time in sample, and time between waves. Bold values indicate statistical significance at $P < .05$.

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levels of smoking disapproval, while England's harm reduction approach and endorsement of vaping for smoking cessation[22] corresponds with the lowest vaping disapproval. Australia's lower anti-vaping norms than Canada and the United States, despite its restrictive regulations, may reflect the widespread availability of illicit NVPs, which made vaping visible and accessible regardless of prescription requirements.[22]

Changes over time were largely consistent across countries. For 7 of the 8 outcomes, there was no evidence that trajectories differed by country, although interaction tests may have had limited power to detect modest differences. The exception was negative opinion of vaping. It increased least in England, consistent with its supportive policy stance, and more steeply in the United States than in Australia and Canada in later waves, possibly reflecting heightened concerns following the 2019 EVALI outbreak and increasingly restrictive regulatory responses to youth vaping. Overall, countries differed in the level of norms in ways consistent with their policy environments, but the direction of change was largely shared. This suggests that influences operating across countries, such as international media coverage and events such as EVALI and the COVID-19 pandemic, may shape norm change alongside national policy.

These findings have important implications for tobacco control. First, persistent decline in anti-smoking norms among people who smoke daily despite increasingly restrictive policies raises questions about the ongoing effectiveness of denormalization strategies for this population, though further research is needed to establish whether these norm shifts are translating into reduced cessation motivation. Broader evidence suggests that the impact of individual tobacco-control measures can diminish over time; for example, reactions to strengthened cigarette pack health warning labels decline with repeated exposure and are smaller where warnings were already strong.[46] Established denormalization levers may therefore be reaching diminishing returns in this population, and approaches focusing on self-efficacy and addressing barriers to cessation rather than relying primarily on social pressure[47,48] may be needed. Second, increasing disapproval of vaping among people who smoke daily may present a barrier to using NVPs as a cessation aid, concerning given evidence of their effectiveness.[49] This highlights the importance of public health communication that is transparent and accurate about the risks of both products, including that vaping is not risk-free but is substantially less harmful than smoking,[43] so that people can make informed choices. Messages may differ in emphasis across audiences, for example encouraging people who do not use nicotine not to start and people who smoke to switch completely or quit, while remaining consistent with the evidence. As our findings relate to adults who smoke daily, they should not be extrapolated to young people, whose norms toward smoking and vaping have followed different patterns.[29] Third, the largely shared trajectories across countries suggest that cross-national events and media coverage may influence norms alongside domestic policy.

Several limitations warrant consideration. Our sample included only adults who smoke daily, limiting generalizability to other smoking behaviors or the general population. Self-reported norms measures may be subject to social desirability biases. While we observed associations between country policy contexts and norm differences, we cannot establish causal relationships.[50] Additionally, methodological differences between this study and previous ITC research affect comparability: friend smoking proportions were lower (19% vs 50% in East et al. 2015)[15] due to survey routing and wording changes,[31] while friend vaping proportions appear lower than Aleyan et al. (2019)[26] and Yong et al. (2023)[4] due to different thresholds (over half vs at least one friend). However, methodological consistency within our study period ensures valid trend analysis.

Future research should explore the mechanisms underlying the divergent trajectories of smoking and vaping norms, including whether they differ by age and other population characteristics. Longitudinal studies examining whether norms changes predict cessation attempts or product switching would clarify the practical implications of these normative shifts. Additionally, comparisons of people who exclusively smoke, exclusively vape, or use both, and within-person analyses testing whether changes in vaping norms covary with changes in smoking norms, would help clarify whether these trends are linked or independent.

Conclusion

Among people who smoke daily in Canada, the United States, England and Australia anti-smoking norms continued to weaken between 2016 and 2022 while anti-vaping norms strengthened. Countries maintained distinct average norm levels consistent with their policy environments and prevalence rates, but largely similar trajectories across diverse regulatory contexts suggest that cross-national influences may shape norm change alongside national tobacco control policies. Transparent and accurate communication about the relative risks of smoking and vaping, together with attention to both domestic policies and cross-national influences, may help people who smoke make informed choices.

Supplementary material

Supplementary material is available at *Nicotine & Tobacco Research* online.

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Declaration of interests

K.M.C. has in the past and continues to serve as a paid witness in litigation filed against cigarette manufacturers. G.T.F. has been an expert witness or consultant for governments defending their country's policies or regulations in litigation. C.G. has served as an expert witness for the Australian Government in litigation. All other authors have no conflicts of interest to declare.

Author contributions

Giang Thu Vu (Conceptualization [equal], Data curation, Formal analysis [lead], Methodology [equal], Writing—original draft, Writing—review & editing [lead]), Katherine East (Conceptualization [equal], Formal analysis [supporting], Methodology [lead], Writing—review & editing [equal]), Ron Borland (Conceptualization, Methodology [supporting], Writing—review & editing [equal]), Hua-Hie Yong (Writing—review & editing [equal]), Pete Driezen (Conceptualization, Formal analysis, Methodology [supporting]), Andrew Hyland (Data curation, Resources [equal]), Geoffrey T. Fong (Funding acquisition, Project administration [lead], Resources [equal]), K. Michael Cummings (Data curation, Funding acquisition, Resources [equal]), Ann McNeill (Data curation, Resources [equal]), Jason Connor (Supervision [equal], Writing—review & editing [supporting]), Phong K. Thai (Supervision [equal], Writing—review & editing [supporting]), Coral Gartner (Supervision [equal], Writing—review & editing [supporting]), Janni Leung (Supervision [equal], Writing—review & editing [supporting]), and Gary C. K. Chan (Supervision [lead], Writing—review & editing [equal])

Data availability

In each country participating in the International Tobacco Control Policy Evaluation (ITC) Project, the data are jointly owned by the lead researcher(s) in that country and the ITC Project at the University of Waterloo. Data from the ITC Project are available to approved researchers 2 years after the date of issuance of cleaned data sets by the ITC Data Management Centre. Researchers interested in using ITC data are required to apply for approval by submitting an International Tobacco Control Data Repository (ITCDR) request application and subsequently to sign an ITCDR Data Usage Agreement. The criteria for data usage approval and the contents of the Data Usage Agreement are described online (http://www.itcproject.org).

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None.

Ethical approval

The ITC Four Country Smoking and Vaping (Australia, Canada, England, and United States) survey protocols and all materials, including the survey questionnaires, were cleared for ethics by Research Ethics Board, University of Waterloo, Canada (REB#20803/30570, REB#20803/30878), Human Research Ethics at Cancer Council Victoria, Australia (IRB HREC 1603), Human Research Ethics Committee, The University of Queensland, Australia (IRB #2016000330, IRB#22/HE001187), Research Ethics Office, King's College London, UK (IRB RESCM-17/18-2240), and ethics clearance at the Medical University of South Carolina, US was waived due to minimal risk.

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