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Supplement Article

Using Exogenous Social Media Exposure Measures to Assess the Effects of Smokeless Tobacco–Related Social Media Content on Smokeless Tobacco Sales in the United States

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Abstract

Introduction: Prior research on the effects of social media promotion of tobacco products has predominantly relied on survey-based self-report measures of marketing exposure, which potentially introduce endogeneity, recall, and selection biases. New approaches can enhance measurement and help better understand the effects of exposure to tobacco-related messages in a dynamic social media marketing environment. We used geolocation-specific tweet rate as an exogenous indicator of exposure to smokeless tobacco (ST)-related content and employed this measure to examine the influence of social media marketing on ST sales.

Aims and Methods: Autoregressive error models were used to analyze the association between the ST-relevant tweet rate (aggregated by 4-week period from February 12, 2017 to June 26, 2021 and scaled by population density) and logarithmic ST unit sales across time by product type (newer, snus, conventional) in the United States, accounting for autocorrelated errors. Interrupted time series approach was used to control for policy change effects.

Results: ST product category-related tweet rates were associated with ST unit sales of newer and conventional products, controlling for price, relevant policy events, and the coronavirus disease 2019 (COVID-19) pandemic. On average, 100-unit increase in the number of newer ST-related tweets was associated with 14% increase in unit sales (RR = 1.14; $p = .01$); 100-unit increase in conventional ST tweets was associated with ~1% increase in unit sales ($p = .04$). Average price was negatively associated with the unit sales.

Conclusions: Study findings reveal that ST social media tweet rate was related to increased ST consumption and illustrate the utility of exogenous measures in conceptualizing and assessing effects in the complex media environment.

Implications: Tobacco control initiatives should include efforts to monitor the role of social media in promoting tobacco use. Surveillance of social media platforms is critical to monitor emerging tobacco product-related marketing strategies and promotional content reach. Exogenous measures of potential exposure to social media messages can supplement survey data to study media effects on tobacco consumption.

Introduction

Although cigarette smoking has steadily declined in the United States over the past five decades,[1,2] use of smokeless tobacco (ST) has remained relatively static at < 5% of the U.S. population, with some variability in prevalence across ST types in recent years.[3–5] However, the ST landscape is diversifying[6]; and use of "novel"/newer nicotine products (eg, pouches, gums) has rapidly increased in the past 5 years.[4] There was a 12-fold rise in sales of oral nicotine pouches, from 20 million monthly units in 2019 to over 250 million in 2022.[4,7,8] Furthermore, sales of established or "conventional" ST products (eg, moist snuff, loose-leaf chewing tobacco, and dry snuff) and snus have increased or remained unchanged among some population groups.[4]

Notably, ST products are disproportionately used by such at-risk groups as low-income individuals, rural males, military veterans, and cigarette smokers.[9–13] Use of conventional ST products also varies regionally. In states like Wyoming and West Virginia, overall adult prevalence of ST use was over 8% in 2020, while in New Jersey, the prevalence was 1.4%.[3] Among high school students, ST use is significantly more common among boys.[5] In 2022, 2.3% of high school males reported conventional ST product use and 2.1% reported nicotine pouch use.[14] In comparison, 2.3% reported cigarette use.[14] The emergence of new products and persistent disparities in established product use may undermine the recent progress in reducing overall tobacco product use among adolescents and young adults who are at a crucial stage related to initiation and escalation toward more regular, dependent levels of tobacco use.[6,9,15]

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While many factors are associated with ST use,[16,17] to date there has been little exploration of the role of ST product promotion. Advertising and health communication theories, as well as decades of tobacco control research, provide strong rationale to expect that exposure to ST marketing messages on social media will influence attitudes, beliefs, and behaviors related to ST use. Pro-tobacco advertising is associated with more positive tobacco-related attitudes and beliefs and higher rates of use, while anti-tobacco advertising and advertising bans are associated with de-normalization and reductions in tobacco use.[18–20]

Cigarette marketing has been regulated at the Federal level since 2009,[21] while ST products are subject to most of the same federal marketing restrictions on broadcast media, outdoor, and print advertisement as cigarettes, some restrictions on sales and marketing do not apply. For instance, the 2009 Family Smoking Prevention and Tobacco Control Act banned characterizing flavors (except menthol) in cigarettes, but these provisions do not apply to ST products.[21,22] ST is also often marketed as a substitute for cigarettes in smoke-free environments or as a healthier alternative to combustible tobacco products without prior authorization, that is, modified-risk tobacco product designation.[23–25]

The Family Smoking Prevention and Tobacco Control Act reissued the "1996 rule" restrictions on branded sponsorship of athletic, musical, artistic, or other social or cultural events for cigarettes and ST, but these rules do not apply to tobacco product promotion on digital media.[22,26] The 2016 "Deeming Rule" expanded FDA authority to regulate flavors and sponsorships for non-cigarette products, but the FDA is still assessing numerous regulatory issues.[27] In April 2019, the FDA banned paid digital product marketing and influencer promotion of newly introduced tobacco products (such as IQOS heated tobacco brand), yet, digital promotion of other STs continues to be unregulated.[28,29] At the social media platform regulatory level, most platforms prohibit paid tobacco advertisements; however, enforcement of these policies has been uneven across platforms and product categories.[30,31]

Because of the current lack of regulation, social media promotion of ST products is proliferating[30–32] and likely contributes to disparities in tobacco marketing exposure and effects. Youth and vulnerable populations use social media at disproportionately higher rates compared to the general population, creating increased opportunities for exposure to this growing category of tobacco promotion.[33]

Early evidence from a meta-analysis of 29 studies, shows that individuals exposed to tobacco content on social media have greater odds of reporting tobacco use compared to those not exposed, and non-users of tobacco products exposed to such content have greater susceptibility to tobacco.[34] However, very few studies have examined the extent to which the evolving media environment influences ST outcomes specifically. Our previous research showed that this relationship holds for ST, with young people who self-reported frequent exposure to social media tobacco marketing having greater odds of current ST use.[35]

Research to date has generally relied on survey self-report data on both marketing exposure and tobacco use. Self-reported measures of exposure to product promotion on social media may be unreliable and the amount of exposure is difficult to ascertain. New approaches to create reliable exogenous exposure measures may help overcome inaccurate recall and selection biases associated with endogenous survey measures.[36]

Novel measurement approaches and communication theories aimed to explain the effects of exposure to marketing in the evolving media environment are emerging. For instance, based on the nascent body of theory about message exposure opportunities in the public communication environment (PCE), individual's "opportunities for exposure" to tobacco information as it occurs naturally in traditional and emerging social media shape beliefs, attitudes, intentions, and tobacco use behaviors.[37] Measuring the aggregation of messages in a PCE is analogous to measuring broadcast television ratings for programming or advertising content.[38] For television programming or advertisements, any given individual's exposure is determined by their viewing patterns, but in the aggregate, the opportunity for exposure is greater when there are more advertisements aired in their media market. Similarly, market-level social media message rate may serve as an exogenous indicator of an individual's ST-related PCE. We build on the PCE framework and leverage multiple data sources to provide the strongest possible evidence on the role of social media in ST use and examine the extent to which social media influences ST product sales.

The objective of the present study is to examine the influence of PCE, measured by geolocated Twitter data for ST-related content, on ST consumption. We use Twitter social media platform as previous research on PCE demonstrated that Twitter tobacco-related post volume, discussion of tobacco-related social norms, and other tobacco use-related themes and sentiment trends tracked across a number of traditional and digital media sources and were associated with behavioral outcomes.[37,39] Past research also demonstrates that topics discussed on Twitter tend to be tracked with news about global and local events, as well as news about impending or enacted government policies, including the domain of tobacco-related discussions and regulations.[40,41] Therefore, Twitter discourse analysis offers an unobtrusive way of understanding tobacco marketing and regulations-related PCE. Furthermore, we use retail sales of ST products as a measure of ST use, which enables us to study whether and to what extent ST purchasing behaviors correlate with ST Twitter content trends, controlling for policy, or other events that may affect tobacco sales. The present study uniquely contributes to the existing literature by using exogenous measures of exposure to social media promotion of tobacco products and consumption of smokeless products to explore the effects of exposure in a dynamic digital marketing environment.

Methods

Data and Measures

ST Retail Sales Data

Data Retrieval and Preparation

We obtained U.S. national tobacco retail store scanner data at 4-week intervals from February 12, 2017 to June 26, 2021, from The Nielsen Company (NielsenIQ). Sales data represent sales in the 48 contiguous U.S. states and District of Columbia and do not include Hawaii and Alaska. NielsenIQ provided data on product characteristics, including manufacturer and brand for each Universal Product Code and data on amount of dollar sales and unit sales for each Universal Product Code at the national level (ie, 48 states and D.C.)

in 4-week aggregates from the period ending on March 11, 2017 through the period ending on June 26, 2021 (57 4-week periods).

Nielsen uses a proprietary sampling method to estimate representative sales data for retail outlets by using in-store barcode scanning equipment and in-person audits.[42] Nielsen tobacco data represent sales in convenience stores, food or grocery stores, pharmacies, mass merchandisers, U.S. military commissaries, club and discount and dollar stores, and exclude tobacconist and vape shop sales.[7,43]

Calculating Unit Sales by ST Product Category

We categorized ST into three types: Newer products, snus, and conventional products. Newer ST includes nicotine pouches and dissolvable oral products, such as tablets, lozenges, orbs, sticks, or strips, and nicotine gum. Snus is finely ground pouched dry snuff that originated in Sweden. Conventional ST includes loose-leaf, plug, twist, and portioned chewing tobacco (eg, dry and moist snuff). Moist snuff dominates the conventional ST category as it makes up the vast majority of ST sales.[4] Snus products are distinct from conventional ST, like moist snuff, as these are pasteurized unlike moist snuff, which is fermented.[44] We identified newer products using brand names, such as Zyn, Dryft, and Zippix, and snus using brand names containing the string "snus," such as Camel Snus and Skoal Snus. We categorized everything else as conventional ST and excluded nicotine-free products, such as herbal chew or coffee pouch "smokeless alternative" products.

We calculated the average price of ST products—total dollar sales divided by total unit sales per 4-week period. To calculate unit sales, ST units were standardized accounting for subtypes following the approach by Gammon et al.[45]; one unit of ST equals 1.2 ounces or 1 count of loose moist snuff, 0.82 ounces or 5 counts of pouched moist snuff, 3 ounces or 1 count of chewing tobacco, 0.53 ounces or 1 count of snus, or 0.21 ounces or 20 counts of other ST products. Using the Gammon et al.[45]; and including total unit (rather than total ounce) sales in calculating the average product price allowed us to account for newer ST product sales in the analyses.

ST-Related Twitter Data

Data Retrieval

We developed a list of search terms related to ST brand names and associated behaviors and policies (eg, Copenhagen snuff, Skoal, packing a lip, mudjug, snus, dip AND lip) based on expert knowledge and exploratory searches on Twitter (see Supplementary Appendix 1 for the list of search terms). We collected 1 376 112 tweets posted from February 01, 2017 to June 26, 2021 based on the query. Non-English language tweets or tweets with an indication of being posted by users who were outside the United States were excluded.

Data Cleaning

As with any query, tweets not relevant to ST were collected. We developed a machine learning classifier to identify ST-related tweets and excluded non-relevant tweets. To build the classifier, we first prepared a training data by randomly sampling 4748 tweets and manually labeled the posts for ST relevance. Three coders were trained and coded a subset of 360 tweets to assess intercoder reliability. After a sufficient level of reliability had been reached (Fleiss Kappa = 0.82; percent agreement = 90.5%), the coders labeled the remaining sample of posts.

We used concatenated tweet content, including content from original tweets, quoted content if available, and titles of linked web addresses if available to train the classifier. We removed standard English stop words, and URLs, converted text to lowercase, and performed Term Frequency—Inverse Document Frequency vectorization.[46] The best-performing classifier was Stochastic Gradient Descent with squared hinge loss with F1 score = 0.91 via 10-fold cross-validation.[47] The classifier identified 746 010 ST-relevant tweets. We observed a large amount of misclassified data during September–October 2019 when e-cigarette or vaping-associated lung injury (EVALI) outbreak was widely discussed on social media. The EVALI-related discussion resulted in a spike in total volume of ST-related tweets partially due to the fact that ST products were mentioned as a potential substitute for electronic cigarettes. The higher volume of tweets resulted in greater absolute number of misclassified tweets, although the misclassification rate remained approximately the same during this period. Therefore, we conducted additional cleaning to reduce the total number of misclassified tweets to reduce error. We developed a filter comprised of regular expressions to further remove misclassified content; this resulted in 658 767 tweets relevant to ST.

Tweet Geolocation

Of the ST-relevant tweets, 261 801 (33.7%) were mapped to the U.S. states via user-tagged locations and user locations predicted by Gnip, Inc. More details for identifying tweet geolocation and the *fitness for use* of geolocated tweets are reported elsewhere.[32]

Product Type Filter Development

We categorized ST-relevant tweets by-product subtype (ie, newer, snus, and conventional) using search algorithms based on regular expressions. To identify tweets mentioning newer products, we used brand names and common variants (eg, FullyLoaded or Fully Loaded; WhiteTail or White Tail). We excluded tweets mentioning non-nicotine products, such as cessation aids and herbal chew by brand name (eg, Smokey Mountain). Any tweets mentioning the term "snus" were categorized as snus-related. We calculated the number of ST-relevant tweets by subtype.

Statistical Analysis

ST Tweets and Sales

We analyzed the relationship between the number of ST tweets and the unit sales of ST products across time by ST product type, accounting for autocorrelated errors, as well as relevant policy changes and the COVID-19 pandemic period. We first calculated the number of ST tweets by 4-week period to merge with ST unit sales data from February 12, 2017 to June 26, 2021 (57 4-week periods). Spikiness was observed in the number of tweets over time due to the occurrence of viral posts, which could introduce noise and variability to modeling the association between ST tweets and sales. To address this issue, we fit the LOESS smoothing function (with 0.2 degree of smoothing) to obtain a smooth line. We used log-transformed LOESS-predicted tweet count per 4-week period as the outcome.

An Autoregressive Error Model was then used to address the autocorrelation in the ST unit sales across 57 4-week periods. We used SAS AUTOREG procedure to examine autocorrelation and determined the order of one lag for the autoregression error based on Durbin-Watson test and Yule-Walker.[48,49] We used an interrupted time series approach to control for potential effect of policy changes—modified-risk order granted to Swedish Match USA (October 22, 2019) and Tobacco 21 (federal minimum age of sale of tobacco products from 18 to 21, December 20, 2019)—and the COVID-19 period.[45,50] Thus, prior research demonstrates that the COVID-19 pandemic increased cigarette sales,[51] therefore a similar effect may be hypothesized for smokeless consumption across product groups. Tobacco 21 policies restrict youth access to tobacco products and are likely to be negatively associated with sales.[52] While the modified-risk tobacco product designation for General Snus is likely to result in increased snus product consumption, spillover effects on sales of other smokeless product categories could occur as well.[53] The interrupted time series approach allowed us to assess the extent to which sales changed after a policy was implemented. The interrupted time series approach has been used to evaluate tobacco policy change in other studies.[45]Two knots were specified for the period ending on November 16, 2019 and the period ending on January 9, 2020 to reflect the policy changes. In addition, multiple U.S. states issued stay-at-home orders and started restrictions on non-essential businesses in response to the COVID-19 pandemic in late March 2020. Thus, we specified a third knot to indicate the period ending on April 4, 2020 as the start of the pandemic. The model included log-transformed ST unit sales at a 4-week period as the outcome and the number of tweets in the same period as the primary independent variable and the number of 4-week periods from the start of the study period. The covariates included the number of periods since the start of the pandemic, the number of periods since the modified-risk order, and the number of periods since Tobacco 21. The unit sales of snus and conventional ST exhibited seasonal trends (Supplementary Figure A). Thus, we additionally included quarter indicators (Q2, Q3, and Q4) to control for the seasonal trend in the snus and conventional ST models. Since the outcome was in logarithmic scale, we calculated the relative ratio to interpret the effect of a one-unit change in the independent variables on the outcome. For the number of tweets, we calculated relative ratio for 100 tweets increase for more meaningful interpretation. We performed model diagnostics by inspecting residuals and white noise significance probability chart, which suggested the linear trend model was adequate.

Results

ST Tweets

Of 261 801 U.S.-geolocated ST-relevant posts, 226 010 (86.3%) referenced conventional tobacco, 18 447 (7%) mentioned snus, and 18 283 (7%) referenced newer ST products. Figure 1 presents the amount of ST-related tweets, overall and by product type, over time in decimal logarithm. While there was a decline in the total amount of ST-relevant tweets and the number of conventional ST tweets during the study period, the number of tweets referencing snus remained relatively stable and the amount of newer ST-related tweets increased, eventually surpassing the snus-related tweets (Figure 1).

ST-Related Tweets and Product Unit Sales

Analysis of the association between ST-related tweets and smokeless product unit sales by product type is presented in Table 1. Since the outcome (unit sales) was on a logarithmic scale, we calculated the relative ratio to derive a relative change in the outcome in association with a one-unit change in the independent variables (tweet rates). For newer and conventional ST products, there was a positive relationship between the number of tweets and unit sales, controlling for price, relevant policy events, and the COVID-19 pandemic (Figures 1 and 2). On average, 100-unit increase in the number of newer ST-related tweets was associated with 14% increase in the unit sales (p = .001); 100-unit increase in the number of conventional ST-related tweets was associated with < 1% increase in the unit sales (p = .04).

Higher average price was associated with a decline in the unit sales (Table 1). The impact of price appeared to be stronger for conventional (RR = 0.49; p < .0001) and snus products (RR = 0.78, p < .0001) than newer products (RR = 0.91; p < .0001).

Discussion

Our analyses reveal that ST content on social media is prevalent and the amount of discussion related to newer ST products (eg, nicotine pouches) is increasing, with the amount of snus-related content remaining unchanged despite recent platform self-regulation activities. These trends in prevalence and reach of ST messages raise significant concerns as social networking sites are a major medium of expression for youth and young adults who can be exposed to this content.

In addition to characterizing ST-related tweet trends, breaking new conceptual and empirical ground, the present study uses geolocation- and product-specific tweet rates as exogenous indicators of potential exposure to ST-related social media content and utilizes these measures to examine the impact of ST message exposure on ST sales. Our findings reveal that exposure to social media messages played an important role in influencing consumption of ST products. ST tweet rate was associated with increased ST unit sales of newer and conventional products, controlling for price, relevant policy events, and the COVID-19 pandemic.

The study results demonstrate a robust association between the ST-related tweet rate and ST consumption. These findings are also consistent with early survey research on the relationship between social media marketing exposure and tobacco use which was based on self-report measures of exposure.[34] We expand prior research by using tweet rate as an exogenous measure of potential exposure to ST-related messages and incorporating analyses of temporal effects to help establish evidence of a causal relationship and shed light on the influence of social media exposure on tobacco use as social media are becoming the primary unregulated marketing platform.[30,31,54]

The rapid and near-ubiquitous adoption of emerging social media has increased the accessibility of tobacco-related information in ways not yet fully understood.[55–57] A greater understanding of the relationship between social media exposure to ST-related content and development of ST use, as well as the extent of the effect of policy on modifying these relationships can help inform evidence-based public health efforts to protect young people and disparity populations from nicotine dependence and the effects of ST promotion. This research helps produce valuable information to update health behavior theories and tobacco regulatory science for the digital era and to understand the relationships among key environmental factors—social media messages about ST and tobacco marketing and tobacco control policy that influence ST use. Our

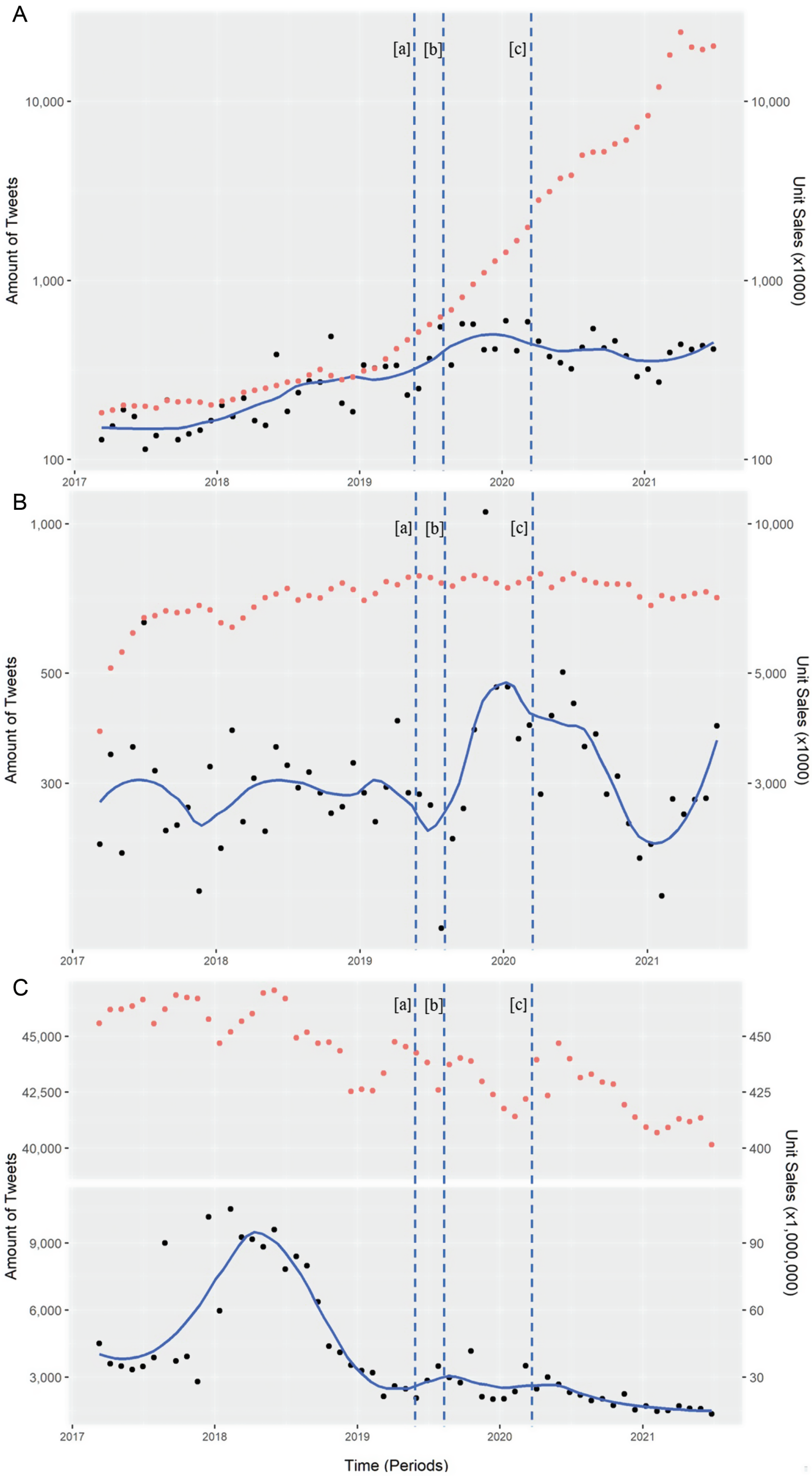

Figure 1. Trends in smokeless tobacco (ST)-related geolocated tweet rates (blue and black) and ST sales (red) over time by product type: (A) Newer ST Products; (B) Snus Products; (C) Conventional ST Products.**Note: The black dots indicate the number of tweets per month. The blue lines are loess smoothing curves with 0.3 span. The *x*-axis represents 57 4-week periods, and the right *y*-axis represents the number of tweets per 4-week period, log-transformed with base 10. The left *y*-axis represents the number of unit sales. Timeline of ST-relevant policy events and coronavirus disease 2019 (COVID-19) is marked as: (A) modified-risk order granted to Swedish Match USA (October 22, 2019); (B) Tobacco 21 (federal minimum age of sale of tobacco products from 18 to 21, December 20, 2019) and (C) the COVID-19 period.

Table 1. Analysis of ST-Related Tweets and ST Unit Sales by Product Category

	Newer ST product sales			Snus sales			Conventional ST sales		
	RR[7]	(95% CI) [7]	*p*	RR[7]	(95% CI) [7]	*p*	RR[7]	(95% CI) [7]	*p*
Tweet rate[1]	1.14	(1.05, 1.22)	.001	1.00	(0.98, 1.01)	.99	1.00	(1.00, 1.00)	.04
Period[2]	1.07	(1.06, 1.08)	<.0001	1.005	(1.003, 1.006)	<.0001	1.00	(0.999, 1.001)	.63
Price[3]	0.91	(0.89, 0.93)	<.0001	0.78	(0.76, 0.80)	<.0001	0.49	(0.35, 0.66)	<.0001
MRO[4]	0.96	(0.85, 1.07)	.47	0.98	(0.95, 1.00)	.17	0.99	(0.97, 1.00)	.19
T21[5]	0.96	(0.82, 1.10)	.53	1.03	(0.98, 1.07)	.17	1.03	(1.00, 1.04)	.02
COVID-19	1.09	(0.99, 1.18)	.06	0.98	(0.96, 1.00)	.05	0.98	(0.97, 0.98)	.0002
Q2[6]				1.03	(1.01, 1.04)	.002	1.04	(1.02, 1.04)	<.0001
Q3[6]		N.A.		1.03	(1.01, 1.05)	.002	1.04	(1.02, 1.05)	<.0001
Q4[6]				1.05	(1.03, 1.07)	<.0001	1.05	(1.03, 1.06)	<.0001

[1]LOESS-predicted number of tweets.
[2]Sequential numbers from −28 to + 28; number of 4-week periods centered at the period ending on May 4, 2019.
[3]Average prices ($) per unit by subtype.
[4]MRO = number of periods since the modified-risk order was granted to Snus.
[5]T21 = number of periods since the policy that raised the minimum legal sales age for all tobacco from 18 to 21.
[6]Seasonal trend: Q1 (quarter 1) as the reference. The quarter was assessed based on the last date of the period in a calendar year. If a 4-week period ended in the middle of the month, the research team made a decision regarding assigning that period to the most appropriate quarter.
[7]log-transformed units. ST = smokeless tobacco.

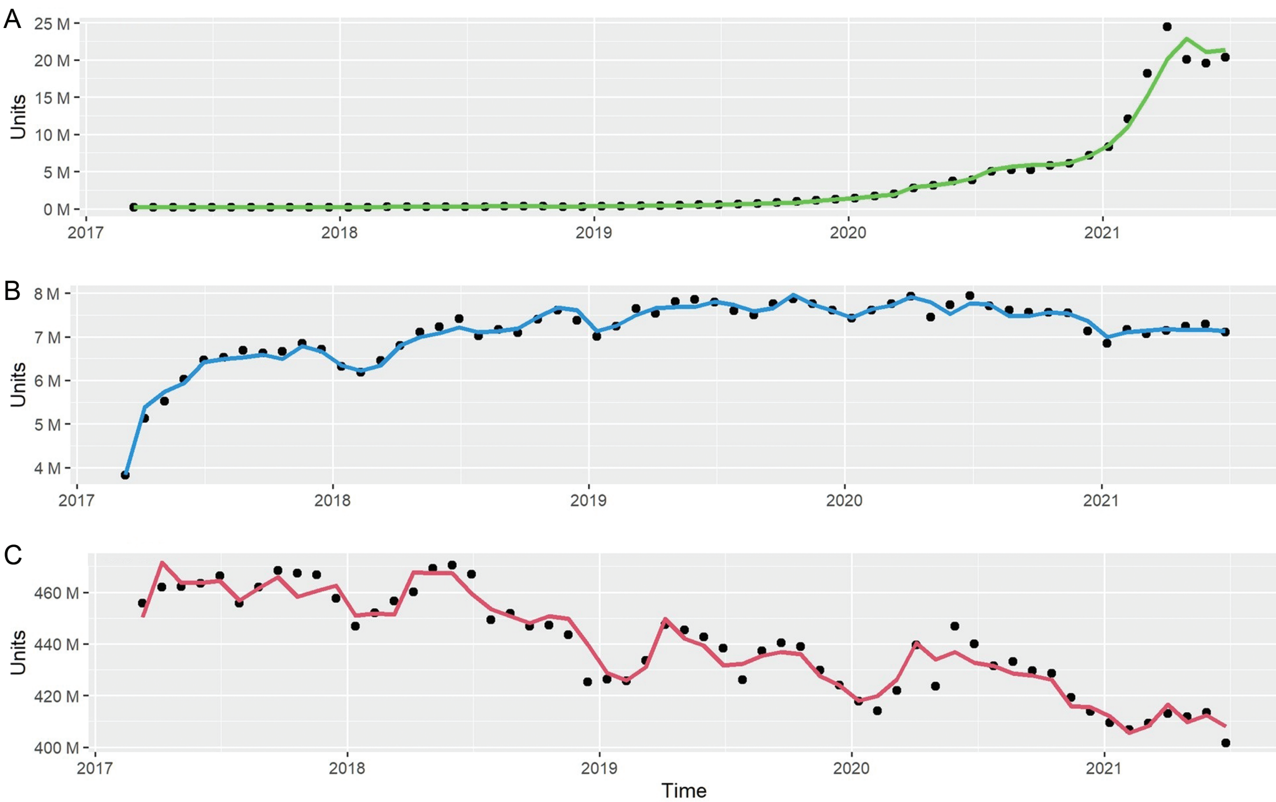

Figure 2. Model-estimated smokeless tobacco (ST) unit sales by product type during the February 2017–June 2021 study period: (A) Newer ST Products; (B) Snus Products; (C) Conventional ST Products.

study capitalizes on the powerful observational capacity of social media to explore how, and to what extent, social media marketing environment influences "real-world" outcomes.

Our study is not without limitations. Twitter data reflects posts by urban population more than rural population.[58,59] Improved surveillance approaches are needed to gauge potential exposure to digital tobacco marketing and population norms, as well as the impact of social media marketing on rural residents. Another limitation has to do with the fact that the amount of ST sales may be underestimated because NielsenIQ data do not include e-commerce, tobacco specialty stores, or vape shop transactions. Furthermore, non-English tweets were excluded from our study. Given that 19% of U.S. population are Hispanics and approximately 38% of the

Hispanic population primarily use Spanish, future research should investigate the impact of Spanish-language tweets on tobacco use among this population in the United States.[60,61]

In summary, the ST messages posted on social media may influence smokeless use. Surveillance of social media platforms is critical to monitor emerging tobacco product-related marketing strategies and promotional content reach. Exogenous measures of potential exposure to social media messages can supplement survey data to study media effects on tobacco consumption and related behavioral outcomes.

Supplementary Material

A Contributorship Form detailing each author's specific involvement with this content, as well as any supplementary data, are available online at https://academic.oup.com/ntr.

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Declaration of Interest

All authors have no conflicts of interest to declare.

Author Contributions

Ganna Kostygina (Conceptualization [Lead], Funding acquisition [Lead], Writing—original draft [Lead], Writing—review & editing [Equal]), Yoonsang Kim (Conceptualization [Equal], Formal analysis [Lead], Methodology [Lead], Writing—original draft [Equal], Writing—review & editing [Equal]), Zachary Gebhardt (Formal analysis [Equal], Methodology [Supporting]), Hy Tran (Formal analysis [Equal], Methodology [Equal], Writing—original draft [Supporting], Writing—review & editing [Supporting]), Andrew Norris (Data curation [Equal], Formal analysis [Supporting]), Simon Page (Data curation [Supporting], Formal analysis [Supporting]), Mateusz Borowiecki (), Shyanika Rose (Conceptualization [Supporting], Methodology [Equal], Writing—review & editing [Equal]), and Sherry Emery (Conceptualization [Lead], Formal analysis [Equal], Funding acquisition [Lead], Methodology [Equal], Writing—original draft [Equal], Writing—review & editing [Equal]).

Disclaimer

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Data Availability

Data may be obtained from a third party (i.e., vendor) and are not publicly available. Twitter data were acquired from Gnip, Inc; smokeless tobacco sales data were provided by NielsenIQ.

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