

Perception of FDA Electronic Cigarette Flavor Enforcement Policy on Twitter: Observational Study

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Introduction

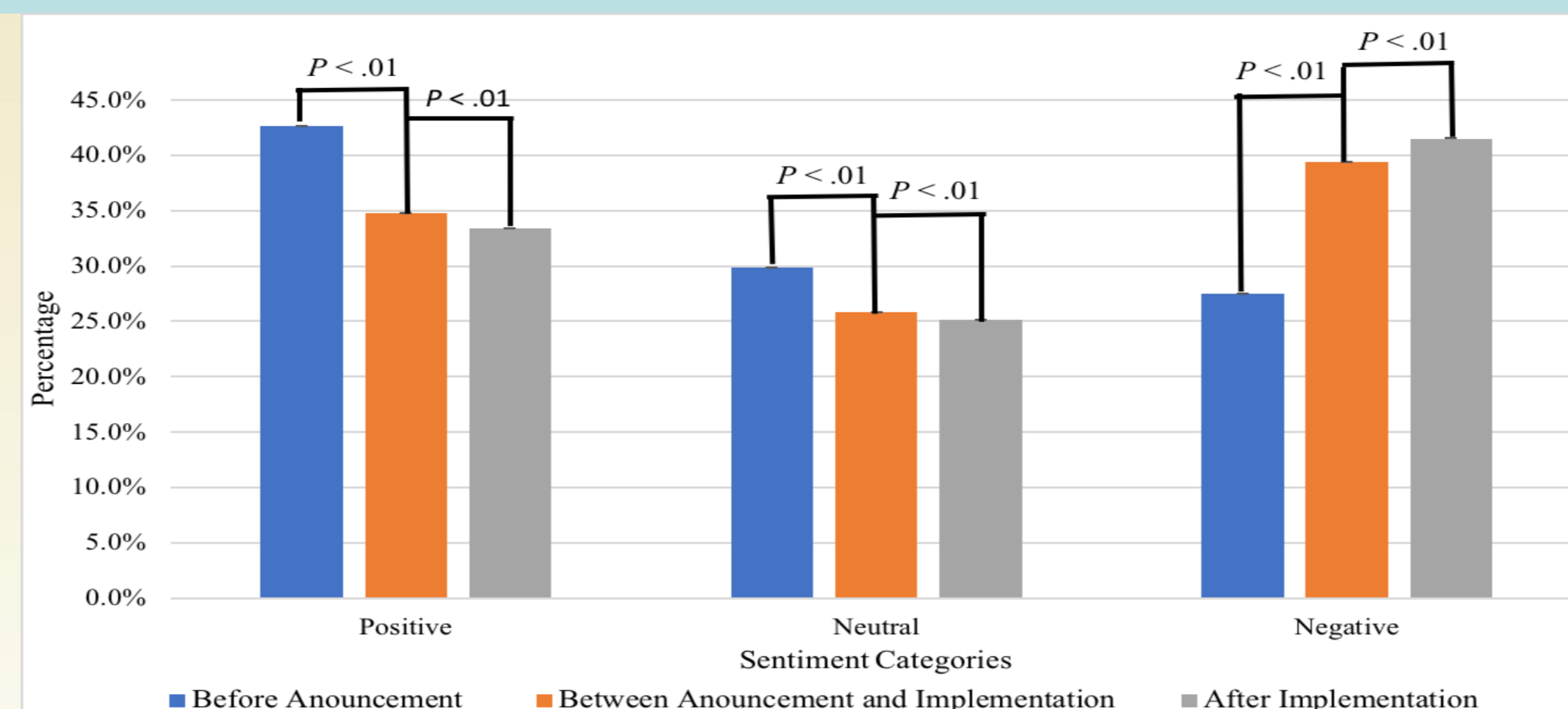
- ❖ The popularity of e-cigarettes has rapidly increased in recent years, especially among youth.
- ❖ Recent studies have found the association of e-cigarette use with multiple health symptoms and diseases such as respiratory symptoms, heart diseases, and cognitive problems.
- ❖ The outbreak of e-cigarette or vaping associated lung injury (EVALI) in the US in 2019 further indicated the harm of e-cigarette use.
- ❖ Various flavors in the e-cigarette products have been identified as one of the main reasons to attract youth to use e-cigarettes.
- ❖ On January 2, 2020, the FDA announced the flavor enforcement policy to restrict the sale of cartridge-based flavored e-cigarettes excluding tobacco and menthol flavor. The flavor enforcement policy was implemented on February 6, 2020.
- ❖ Twitter as one of the most popular social media platforms has many discussions about the flavored e-cigarettes.
- ❖ Using Twitter data, we aim to examine the impact of the FDA flavor enforcement policy on public perceptions of flavored e-cigarettes.

Methods

- ❖ E-cigarette related tweets were downloaded through Twitter streaming API using keyword searching based on a list of e-cigarette-related keywords such as “e-cig”, “vape”, “juul” etc from June 13, 2019, to August 22, 2019 (before the announcement of the FDA flavor enforcement policy), from January 2, 2020, to February 5, 2020 (between the announcement of the FDA flavor enforcement policy and the implementation of the FDA flavor enforcement policy), and from February 6, 2020, to March 30, 2020 (after the implementation of the FDA flavor enforcement policy).
- ❖ After removing retweets, tweets from the US were selected using state names and names of big cities.
- ❖ The final data include 2,341,660 e-cigarette related tweets with 644,686 before the announcement of the FDA flavor enforcement policy, 702,488 tweets between the announcement and implementation of the FDA flavor enforcement policy, and 994,486 tweets after the implementation of the FDA flavor enforcement policy.
- ❖ The public perceptions of e-cigarettes were measured using sentiment analysis through the VADER (Valence Aware Dictionary and sEntiment Reasoner) method. The public perceptions were classified as positive, neutral, and negative attitude based on cutoffs of sentiment scores (-0.05 and +0.05).
- ❖ Topic modeling of the collected tweets was conducted using the LDA (Latent Dirichlet allocation) modeling to identify popular topics related to e-cigarettes.

Results

Figure 1: Changes in public perceptions of e-cigarettes on Twitter with the announcement and implementation of the FDA flavor enforcement policy.



- ❖ Compared to the sentiment before the announcement of the FDA flavor enforcement policy, the proportion of tweets with positive sentiments towards e-cigarettes decreased significantly with the announcement and implementation of the FDA flavor enforcement policy from 42.6% to 34.8% and 33.4% (P -value < 0.01).
- ❖ The proportion of tweets with negative sentiment toward e-cigarettes significantly increased from 27.5% to 39.4% and 41.5% after the announcement and implementation of the FDA flavor enforcement policy (P -value < 0.01).

Table 1: Top topics related to e-cigarettes before and after the FDA flavor enforcement policy

Topics	Before the announcement			Between the announcement and implementation			After the implementation		
	% Tokens	Keywords		% Tokens	keywords	Topics	% Tokens	Keywords	
Stop vaping and smoking to protect health	31.20%	vape, vaping, lung, smoke, get, go, people, stop, cancer, health		Ban on flavored tobacco products due to lung disease.	32.90%	vaping, vape, cigarette, smoking, product, flavor, ban, quit, lung, people	Vaping and smoking have risks to get COVID-19	35.60%	vape, vaping, smoking, smoke, want, could, know, risk, covid, people
New e-cigarette flavor use among friends	24.60%	vape, new, ude, level, link, case, dear_ncan, space_nasking, use, friend		ways to buy vaping products	24.90%	vape, would, buy, get, think, shop, go, need, take, look	Buy juul products through shipping	22.70%	vape, juul, get, shop, keep, still, flavor, product, sure, ship
Single Juul pod equals a pack of cigarettes	23.80%	juul, hit, be, pod, say, still, stare, go, iterally, single		Time to stop vaping and smoking	23.80%	smoke, time, vape, juul, stop, early, good, hit, read, drink	Intention to stop vaping	21.20%	take, vape, stop, late, note, dah, photo, see, guy, friend
Vaping leads to nicotine addiction for those who unlikely smoke	20.40%	smoking, cigarette, generation, whole, create, first, start, addiction, unlikely, statistically		Epidemic of teenager vaping	18.40%	vape, kid, school, new, vapefam, high, top, epidemic, give, vaper	Vaping and corona virus can cause respiratory disease	20.40%	go, lung, vape, virus, people, young, bro, respiratory, disease, affect

Conclusions

- ❖ The perception of US Twitter users towards e-cigarettes were significantly affected by the announcement and implementation of the FDA flavor enforcement policy, which became more negative with the announcement and implementation of the FDA flavor enforcement policy.
- ❖ Twitter could be used as a tool to monitor the public responses to FDA policies on tobacco products.

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