A Social Media Study on Flavored Electronic Cigarettes and Their Associations with Health Symptoms

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Disclosure

- All authors have no potential conflict of interest to declare.

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- Respiratory category was consistently the most discussed health symptom category among all categories related to e-cigarettes on Reddit.

- Using social media data, we identified different potential associations between e-liquid flavors and the reporting of health symptoms.

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- This is a social media project conducted by the biostatistics and informatics core of CRoFT.

- It provides infodemiology evidence on the potential associations between e-liquid flavors and health symptoms.

- Results from our study provide guidance and directions for further investigation of the association of e-liquid flavors with health symptoms in mouse and human studies.
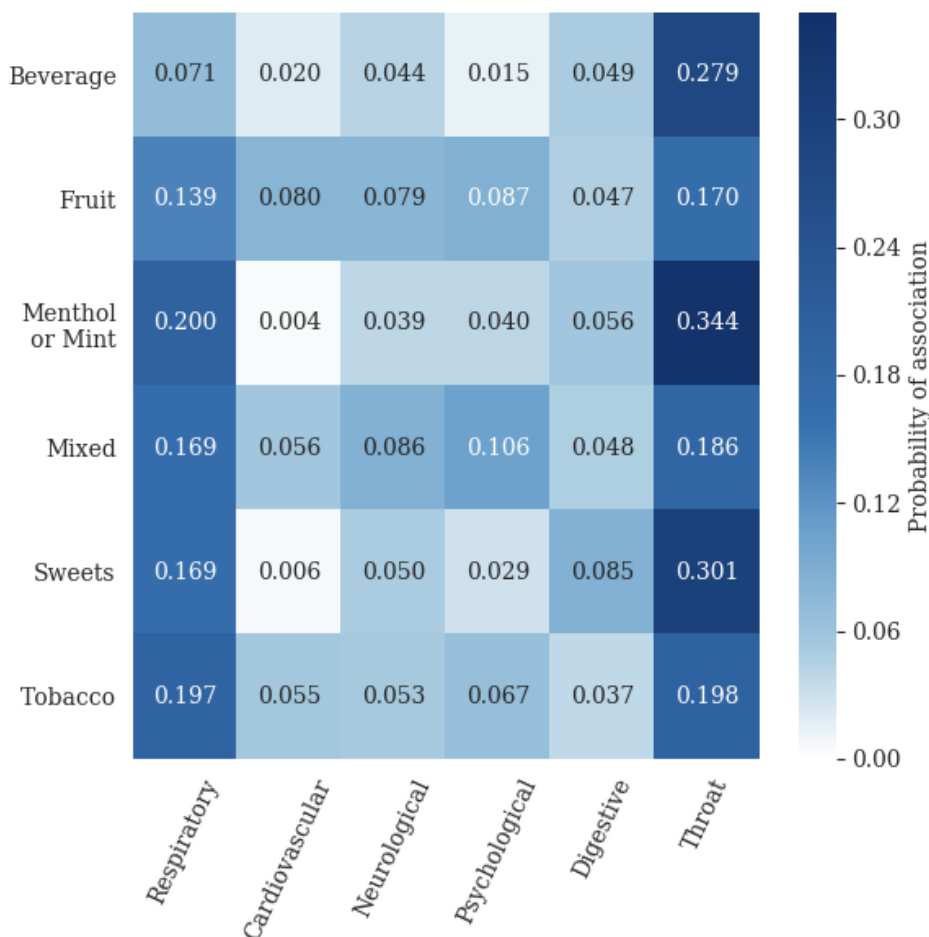
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- Reddit posts between January 01, 2013, and April 30, 2019, from Pushshift.io.

- Constructed the e-cigarette dataset consisting of 2,865,467 posts from 623,258 unique users using 20 e-cigarette keyword.

- Reddit posts with only one flavor-related keyword and at least one health-related keyword were selected.

- If one selected post contained more than one health keyword, each health-flavor keyword pair was regarded as one unique entry.

- In total, 3336 entries were included in the dataset.

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Methods

- Generalized estimating equation (GEE) models were used to quantify the potential associations between e-liquid flavors and major related health symptoms based on the e-cigarette–related discussions from Reddit users.

- GEE models were based on binomial distributions with logistic link functions.

- The within-user correlations were considered through the compound symmetry variance-covariance matrices.

- Probabilities of co-mentioning each flavor category with each health category was estimated from the GEE models.

- Tukey's method was used to adjust for multiplicity in pairwise comparisons between flavors.

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- Lower association of the Beverage flavors with Respiratory symptoms compared with other flavors.
- Higher association of the Fruit flavors with Cardiovascular symptoms than other flavors.
- Higher association of the Mixed flavor with Psychological symptoms than other flavors.

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- The results from this infodemiology study provide guidance and directions for future experimental studies on the causal-relationships between e-liquid flavors and health symptoms, which will provide valuable evidence for FDA's regulations on flavored e-cigarettes.