

## Examining Twitter Conversations About Electronic Nicotine Delivery Systems (ENDS)

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Currently tobacco use remains the leading cause of preventable death in the U.S. The emergence of new tobacco products such as electronic nicotine delivery systems (ENDS) lends a renewed urgency to reducing initiation rates of new smokers, the majority of which tend to be youth under the age of 18. This population is also comprised of avid users of social media, including social networking sites (SNSs), which in addition to providing another venue for socialization can facilitate information sharing covering a range of topics, including ENDS. Information shared over SNSs about ENDS in the form of messages between users have the potential to influence attitudes, norms, and behaviors of this population, however more research is required to understand the content of the most abundant and frequently shared ENDS-related messages on SNSs.

The long-term purpose of this research is to address some of the unanswered questions regarding the way ENDS are discussed on SNSs by examining three factors: 1) the features of ENDS-related messages [Study 1], 2) belief argumentation contained within messages used to promote ENDS use and characteristics of sources sharing these messages [Study 2], and 3) qualities and behaviors of robot accounts that share ENDS-related messages on SNSs [Study3]. All of these studies use the Social Media Analytic and Research Testbed (SMART) dashboard, which combines social media application program interface (API) and geographical information system (GIS) technology to gather ENDS-related messages from Twitter defined by keywords used in prior work examining ENDS and social media.

In Study 1, a random sample of 973 geocoded tweets was collected between October 2015 and July 2016 and analyzed using a manual coding procedure to identify characteristics of sources, contexts and messages. Briefly, the findings show a majority of tweets are positive (e.g., expressing approval of ENDS use) and discuss ENDS in a favorable light. Potential hazards of ENDS to health are often denied in tweets that make reference to ENDS' harmfulness, and any negative respiratory effects of ENDS use are not mentioned. At the same time, a noticeable proportion of ENDS-related messages are also either negative (e.g., expressing disapproval of ENDS use for any reason) or neutral (e.g., expressing neither approval nor disapproval of ENDS use). In addition, although organizations are more likely to share positive ENDS-related messages, most ENDS-related messages overall are shared by individuals, and over half of these individuals may be potential robot accounts. Although potential robot accounts constitute the majority of sources within this random sample of tweets, the ENDS-related messages from potential robot accounts are similar in their proportion of positive-to-negative ENDS-related messages to authentic human accounts.

Given that the majority of ENDS-related messages on Twitter are positive in nature and shared by authentic human accounts, Study 2 takes a closer look at the belief argumentation used to promote ENDS in these messages, while also examining the "advocates" or sources of these pro-ENDS messages. Extant literature provides different definitions for what constitutes a proponent or advocate of ENDS, however, the present study is guided by Kim and colleagues' definition of an ENDS advocate as a "user whose primary objective is to *promote but not sell* e-cigarette/vaping products", while also including users "whose primary objective is to *market and sell* e-cigarette/vaping products" (p. 8). This study also only focuses on authentic human (versus robot) accounts representing individuals (versus organizations). The SMART dashboard was used to collect a sample of publicly available geocoded tweets from e-cigarette advocates (N=14) in the same time frame as Study 1. Using a qualitative approach three themes emerge from the data, specifically that e-cigarette advocates 1) consider their actions a matter of conviction, 2) view their promotional efforts with a high degree of psychological importance, and 3) perceive their advocacy of e-cigarettes as an important part of their identity. A number of tactics used by advocates to communicate these beliefs are noteworthy and include attempts to frame e-cigarettes as safer than smoking, denounce gateway claims that ENDS use can lead youth to progress toward use of combustible tobacco as propaganda, and implications that federal government agencies lack sufficient competence or evidence for the policies they endorse around ENDS. Advocates also appear to use a

range of tropes to argue their position in support of ENDS, including encouraging an “us versus them” mentality”, attacking those opposed to ENDS, relying on personal anecdotal evidence, diverting attention to other possible causes of lung disease, minimalizing side effects, normalizing use, and emphasizing benefits of ENDS use. Using similar methodological approaches, Study 3 will continue where Study 2 ends by examining behaviors and characteristics of robot accounts acting as advocates of ENDS.

The findings of this research offer implications for research and policy. First, these findings can be used to create machine learning tools that can quickly code messages for a number of variables and help public health professionals calibrate their efforts in real-time to address online conversations about ENDS as they unfold over social media. Second, these findings may also be relevant for developing machine learning tools that can be used in policy regulation efforts of online tobacco marketing to accurately classify advocates who represent robot accounts.

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