Tradition gone mobile: An exploration of #betelnut on Instagram

Abstract

Background: As a psychoactive substance that spans borders and cultures, researchers estimate that 600 million people use the areca nut. Despite its historical and geographical significance, betel nut use has received far less research attention than other stimulants such as tobacco, coffee or tea. Scholars have observed that social media platforms have significant effects on the promotion and use of addictive substances.

Objectives: Our study investigates user practices and activities on a sample of Instagram posts tagged #betelnut dating back to 2011.

Methods: Using social media analytics and hashtag network analysis, we examined user practices and activities on a sample of over 7800 Instagram posts tagged #betelnut dated between July 2011 to February 2019 that were collected in early 2019.

Results: Findings determined that #betelnut is a growing topical hashtag on Instagram with content that drives social engagement.

Importance: Co-occurring hashtags with #betelnut reflect regional language and cultural naming conventions that center around the Indian subcontinent and Melanesia. The importance of future work in this area is highlighted.

Keywords: betel nut, areca nut, Instagram, social media, analytics.

Introduction

Betel nut use dates back to the First Millennium, when it was being consumed as a stimulant, aphrodisiac, antihelminthic and digestive agent (Barceloux, 2012). Currently, it is estimated that 600 million people use the areca nut and it is the fourth most commonly used psychoactive substance in the world, behind only nicotine, alcohol and caffeine (Winstock, 2013). Geographically, betel nut use encompasses the Indian subcontinent (India, Nepal, Pakistan and Bangladesh), Taiwan, Southern China, Southeast Asia (Indonesia, Thailand, Philippines, Guam, Malaysia, and others), and Melanesia (Vanuatu, Solomon Islands, Papua New Guinea, and Fiji) (Barceloux, 2012; Paulino et al., 2017b; Winstock, 2013). As a psychoactive substance that spans borders and cultures, betel nut has taken on a wide variation of terms that reflect its regional influence. Despite its historical and geographical significance, the areca nut has received far less research attention than other stimulants such as tobacco, coffee or tea (Rohel, 2017).

Scholars have expressed concerns that social media platforms are rife with socially engaging visual depictions of addictive substances (Cavazos-Rehg et al., 2016). Extant research has particularly looked into social media depictions of substances such as tobacco (Allem, Escobedo, Chu, Cruz, & Unger, 2017), e-cigarettes (Chu, Allem, Cruz, & Unger, 2016), alcohol (Boyle, LaBrie, Froidevaux, & Witkovic, 2016), and marijuana (Cavavos-Rehg et al., 2016). Broadly, these studies imply that social media can be used to promote substance use through the sociality found on these sites.

The present study attempts to expand this line of research by examining betel nut and the visual social media platform Instagram. Little research to date has attempted to identify how social media depict betel nut use and consumption. As a health concern, people who consume

betel nut are at greater risk of developing dependency symptoms than those who use tobacco products such as hookah (Winstock, 2013). Excessive betel nut use could result in deleterious consequences such as oral cancer and addictive behaviors (Winstock, 2013). Epidemiological studies have linked betel nut use to pharyngeal cancers (adjusted odds ratio = 7.7; 95% CI = 4.1–15.0) and adverse pregnancy outcomes (adjusted odds ratio = 2.8; 95% CI = 4.1–15.0) (Chen, Mahmood, Mariottini, Chiang, & Lee, 2017). Notably, the World Health Organization (WHO) (2012) regards betel nut abuse as a preventable, albeit urgent public health threat.

We chose Instagram because it is a popular visual platform that allows people to socially engage with photos posted by their peers and professional entities (Cotter, 2018). On Instagram, photos with socially engaging features attract considerable attention, and can affect people's judgments and behaviors (Cavazos-Rehg et al., 2016; Zulli, 2018). Betel nut users tend to have lower literacy levels (Croucher & Islam, 2002; Furber, Jackson, Johnson, Sukara, & Franco, 2013). As such, some scholars have argued that visual social media platforms such as Instagram can be particularly effective at interventions to discourage betel nut use (Furber et al., 2013). Moreover, recent research demonstrates a relationship between exposure to substance-related content on social media and their use of substances (Soneji et al., 2017; Yoo, Yang, & Cho, 2016). Identifying key features in betel nut use, Instagram posts can provide insights about commonalities in beliefs and practices among specific sub-groups of individuals, e.g., terms that are used only by specific cultural groups to describe betel nut use. Such findings will assist scholars and health campaign planners to design targeted social media campaigns aimed at curbing betel nut abuse (Pagoto et al., 2016; Sarkar et al., 2018).

Literature Review

The Characteristics of Instagram

Among all social media platforms, Instagram is noted for its photo-sharing capabilities. This visual social media platform enables people to upload photos that are accompanied by captions and hashtags (Systrom, 2017). As with Twitter, people are able to follow other Instagram profiles and react to profile photos by posting comments or 'liking' photos. However, the profile owners do not necessarily have to follow them back, making Instagram particularly well-suited for interactions between and among strangers (Marwick, 2015). Furthermore, Instagram provides photo filters for people to edit their photos before uploading them. These filters give people the latitude to creatively express their identities (Ibrahim, 2015; Zappavigna, 2016). Some scholars have argued that Instagram encourages people to make powerful visual statements about things that are integral to their self-concept, such as their cultural values (Al-Kandari, Al-Sumait, & Al-Hunaiyyan, 2017) and online identities (e.g., Marwick, 2015).

Importantly, Instagram is well-suited for the mobile phone's portable capabilities. Users often leverage on the pointing, tapping, and swiping capabilities of their mobile phones to tell visual stories from their point of view, and share pictorial mini-documentaries of their daily life with an imagined audience on Instagram (Chesher, 2012; Vivienne & Burgess, 2013; Marwick, 2015). In turn, the Instagram account's followers are able to understand more about them and receive frequent photo updates by scrolling through their Instagram mobile app (Lup, Trub, & Rosenthal, 2015).

Also, Instagram allows people to use hashtags in their captions or comments. Hashtags serve several functions. First, these hashtags help to expedite information searches (Small, 2011). Second, hashtags provide context for the various images posted on Instagram (Hitlin &

Holcomb, 2015). Third, they serve as keywords that bring people with mutual interests together to facilitate discourse around certain images and topics within a shared, networked space (Laestadius, 2016; Tiidenberg & Baym, 2017). For example, hashtags have helped to capture the language and culture associated with online communities of drug abusers (Dwyer & Fisher, 2016). It stands to reason that these Instagram hashtags can help promote conversations about topics associated with betel nut use and create a shared bond among people who consume this potentially addictive substance.

Thus far, little research has specifically examined socio-cultural variations in Instagram hashtags of betel nut use. Descriptive terms for the betel nut differ by geographical region. For example, the betel nut is known as *supari* in India, *puwak* in Sri Lanka, *gua* in Bangladesh, *mak* in Thailand, *pinang* in Malaysia, *daka* in Papua New Guinea, *pugua* in Guam, and *Kun-ywet* in Myanmar (IARC Working Group, 2004). Furthermore, when the nut is prepared with other ingredients such as betel leaf, slaked lime, and tobacco in India, it is called *paan*, *paan masala* as well as *gutkha* (Patidar, Parwani, Wanjari, & Patidar, 2015). Research has also demonstrated clear socio-cultural differences in substance use and consumption patterns (Alwan, Viswanathan, Rousson, Paccaud, & Bovet, 2011; Murphy & Herzog, 2015; Paulino et al., 2017a).

With all this in mind, it stands to reason that there will be socio-cultural differences in descriptions of betel nut use and consumption on Instagram. Given the deleterious effects of betel nut use, exploring terms associated with betel nut use on Instagram is imperative. The following research question is proposed:

RQ: On Instagram, how do users' practices around #betelnut unfold over time?

Methodology

To explore #betelnut on Instagram, our analysis incorporates aspects of social media data analytics and social network analysis. Social media analytics provide a visual analytic framework grounded in abductive ontological principles to promote a thorough exploratory orientation to data (Brooker, Barnett, & Cribbin, 2016).

Data Collection

According to Brooker et al. (2016), there are two types of data collection strategies for social media: user driven and semantically driven. User driven strategies focus around a certain group of social media users where a keyword query is not easily defined (i.e. where tweeters use implicit, informal, colloquial or general references to the area of interest) or "where there is value in understanding the role of a particular issue within a broader set of preoccupations" (p. 4). In contrast, semantically driven strategies involve a research process that begins by identifying keywords that are likely to typify social media content around a topic of interest applying logical operators to define the scope. For our study, we applied the semantically driven data collection strategy because the phenomenon of interest centers on the #betelnut on Instagram.

Using Instagram's API (Application Programming Interface), we conducted a text-based search acquiring metadata on over 7800 public Instagram posts using the hashtag "betelnut" on March 14, 2019. As a text-based search, our data collection method introduces an inevitable language bias favoring English language content (Pearce et al., 2018). Metadata consist of Instagram post url, username ID, timestamp, hashtag(s), caption, number of comments, number of likes, and type of content (i.e. photo or video). Except for username ID, all metadata were

subject to data analysis. Our dataset contains Instagram posts dated between July 2011 to February 2019. The initial time parameter was determined by the API. Specifically, the API collects a maximum of 10,000 posts, with the earliest of these posts falling within the July 2011 timeframe.

Although Instagram posts are an important part of the social media platform, it is the networked engagement of content that makes Instagram notably different than other photo-sharing platforms such as Flickr. Networked engagement means that any Instagram post has the potential for immediate spreadability (Highfield & Leaver, 2016). To measure social engagement within #betelnut, we apply the industry standard as 'likes' plus 'comments' (Carah & Shaul, 2016). Accordingly, we scored each Instagram post with an engagement score using the following formula:

Social media engagement = (Number of likes + Number of comments)

Data Analytical Approach

In addition to data collection strategies, Brooker and colleagues argue that visual analytics provide a way to decompose both temporal and semantic structures of data over a time period. Visual analytics help researchers gain high-level abstractions or overviews toward potentially interesting data phenomenon.

Brooker et al. (2016) argue for two analytic orientations (temporal analysis and corpus analysis) to provide insight into social media data. Temporal analysis supplies a chronological viewing of data with emphasis on the exploration of events. In this case, researchers may draw insight from the variation in the tweet volume occurring within a particular loci. Chronological viewing lends itself well to the exploration of events as they unfold on social media. Corpus analysis studies social media data as an 'information space' where semantic features (words,

hashtags, etc) intersect in insightful ways (Brooker et al., 2016). For example, researchers may "draw insights from the exploration of topical structures emerging from the entire body of data, investigating the ways in which keywords are used together to form broader themes" (p. 5). More specifically, our analysis applies a semantically driven data collection strategy on the #betelnut on Instagram. Drawing on visual analytics, our study utilizes both temporal and corpus analyses to examine event based and topic-based phenomenon on #betelnut.

To further develop our corpus analysis, we employ a hashtag network analysis on #betelnut to identify topical clusters which place terms occurring together frequently among user supplied Instagram hashtags (Radzikowski et al., 2016). A network dataset was created based on hashtag co-occurrence. In this network dataset, each node represented a hashtag and an edge was created each time two hashtags were used in the same post. Edges were created for up to a maximum of five hashtags used in each post. Hashtags containing single words were removed. Edge weight was determined by calculating the number of times a given pair of hashtags was used in the dataset. In weighted networks, each link (edge) has a unique weight (Barabási & Pósfai, 2016), and the weight of each edge in the #betelnut network indicates the relative popularity of each pair of hashtags. Our data analysis does not consider the content of the images or captions and comments associated with a particular Instagram post though we do highlight certain event-based content.

Results

Social Media Analytics

#betelnut on Instagram has seen a steady growth in activity since July 2011. Figure 1 shows a timeline visualization of the number of Instagram posts tagged #betelnut. It is quite clear that #betelnut has been actively mentioned by Instagram users, gaining notable increases in popularity in 2018. Overall, there were 85.5 posts per month on average. The highest number of posts (270) occurred in February 2018 with a drop to 149 in October 2018. There have been subsequent increases since then.

Figure 1 displays a timeline of the average engagement score for Instagram posts by month. Similar to the frequency of Instagram posts, average engagement within #betelnut has steadily increased since 2011. Monthly engagement scores trended similarly to the frequency of posts until November 2015 when the number of Instagram posts began exceeding average engagement activity. Overall, the average engagement score per month was 43.6. Engagement scores for individual Instagram posts varied from 0 to 9180 (mean = 55.29). This demonstrates that content on #betelnut is compelling and worthy of being shared and discussed among its users. Of particular note are the significant spikes in engagement scores occurring in March 2014, June 2016 and May 2018. We discuss these events in the next section.

[Insert Figure 1 here]

Instagram users applied a variety of hashtags when posting to #betelnut on Instagram. Using the various regional terms that reference betel nut, we documented the most prolific hashtags co-occurring with #betelnut illustrated in Table 1. #paan was clearly the most often

tagged with #betelnut first appearing in the dataset in October 2012. #pinang and #supari also were frequently applied by #betelnut Instagram users beginning in 2013 and 2014. With respect to region, #paan, #pinang, #supari, #adakka, #pan, #sirih, and #jambe are all regional terms for betel nut in Southeast Asia. #buai and #pugua demonstrate betel nut's presence in the Pacific region. #binlang and #gua represent regional colloquial betel nut terms in China and Bangladesh respectively. The earliest co-occurring hashtag (October 2011) was #pugua, which is the cultural term for betel nut in Guam. The latest addition was #adakka. Adakka is the regional term for betel nut in the Indian state of Kerala.

[Table 1 here]

Combining geographic regions using local betel nut terms, Figure 2 maps where regional conversations are taking place within #betelnut on Instagram. By using differences in shading (darker colors indicate higher frequencies), the choropleth map visualizes the greater linguistic presence of Bangladesh, India and Pakistan regional betel nut hashtags over other areas of Southeast Asia and the Western Pacific. By observing the frequency of co-occurring hashtags within #betelnut on Instagram, our findings demonstrate that the center for betel nut use is in the Southeast Asian archipelago (Strickland, 2002).

[Insert Figure 2 here]

Hashtag Network Analysis

The final hashtag network used for analysis included 9441 nodes (hashtags) and 32234 edges (co-occurrences). Two network metrics (degree and eigenvector centrality) were calculated to assess the centrality of each node in the network. Degree, the number of links (edges) that connect a given network node with other nodes (Barabási & Pósfai, 2016), shows

the importance (degree centrality) of each node in the network. Eigenvector centrality assesses the centrality of each node in a network based on the centrality nodes of its neighbours, i.e. "the sum of the centralities of the vertices to which it is connected" (Bonacich, 2007, p.556).

Table 2 shows the top 25 edges in the hashtag network. Weight shows the edge weight--i.e., the number of times each pair of hashtags are used together. It is noticeable that edges with location-related hashtags have high weight in this network. This indicates that geographic location plays an important role in Instagram posts related to #betelnut.

[Insert Table 2 here]

Table 3 shows the top 25 nodes based on degree and normalised eigenvector centrality values. Degree level represents the number of times each hashtag was used with another in the same post. An eigenvector centrality value of one indicates that it is the most central node in the network. #betelnut is clearly central to both networks based on either measure.

[Insert Table 3 here]

The hashtag network analysis of #betelnut demonstrates the regional and geographic connections #betelnut has to Southeast Asia. Country names and geographic regions are often utilized as co-occurring hashtags to share photos using the hashtag #betelnut. Unfortunately, our Instagram dataset did not have geolocation metadata. As a result, we cannot state with confidence that Instagram users are posting to #betelnut from these geographic locations. However, our study demonstrates that the hashtags chosen and applied by these Instagram users reflect a cultural orientation that resides in their respective countries and geographic areas. For example, hashtags containing regional #betelnut names have high centrality in the network and are more influential in the hasthtag network. Moreover, the prominence of these regional

hashtags suggests that Instagram users often associate #betelnut with regional language and cultural practices centering on Indonesia, Taiwan, India, and Burma.

As noted by Bruns and Burgess (2015), not all users posting in a hashtag conversation also follow the underlying discussion or theme. In our dataset, we casually observed two different understandings of betel nut. Primarily, those using #betelnut posted within the context of the areca nut. Another understanding is how #betelnut relates to food and travel. A closer look at the Table 3 centrality measures demonstrate that food and travel were important for #betelnut. Within the top 25 nodes, there are central hashtags indicating #food, #travel, #nature, #breakfast, #betelnutcafe and #foodporn. Regarding specific geographic locations, a few influential Instagram users applied #betelnut to organize conversation around dining experiences. For example, the hashtag network revealed the influence of cafes within Indonesia and San Francisco. Figure 3 shows a highly engaged post in our dataset from a café along the east coast of Java, Indonesia. Instagram user-generated comments feature the love of Indonesian food applying hashtags such as #ilovebali and #ilovefood and suggest the lifestyle of the Instagram user (#foodblogger). Therefore, the co-occurrence of '#betelnut and #bali' or '#betelnut and #canggu' likely reflects the reach of social media influencers posting about their dining experience at this Indonesian cafe.

[Insert Figure 3 here]

Discussion

Our exploratory analysis revealed some important findings within the Instagram hashtag public '#betelnut'. Timeline visualizations of Instagram posts and engagement showed a growing interest in tagging content with #betelnut. Since 2011, the number of Instagram posts

tagged #betelnut have increased from just a few posts per month to more than 200 posts every month. As an Instagram hashtag public, #betelnut exhibits characteristics of an active topical hashtag community (Bruns & Burgess, 2015).

According to Gupta and Warnakulasuriya (2002), India has the largest areca-consuming population in the world and our findings confirmed this with the number of regional hashtags in our dataset. For example, #adakka and #adike were among our most frequent co-occurring hashtags and both represent vernacular betelnut terms within regional states of India. #adakka is particularly notable for two reasons. One, it only recently appeared (2017) in #betelnut compared to other hashtags. Two, the hashtag network analysis revealed #adakka as having a high weight toward co-occurrence with #betelnut, #arecanut and #arecanuts. Therefore, as a regional term for betelnut that is not highly noted in the research literature, it has a large influence within our dataset and suggests evidence for the growth in mobile broadband penetration in Indian rural areas.

According to recent industry reports, India has 600 million Internet users and 400 million are mobile Internet users (IndiaTechOnline, 2019). In addition, India has experienced "exponential growth in data usage" and has become one of the countries with the highest mobile data usage (TRAI, 2018). Industry forecasts note that India will continue to be a primary driver of smartphone growth, adding more than 0.5 billion smartphone connections by 2025 (GMSA Intelligence, 2018). Another recent report found that Indian language Internet users have surpassed English Internet users. Over the next five years, 9 out of every 10 new Internet users in India will likely be Indian language users (KPMG, 2017). Furthermore, global statistics show that Instagram is especially popular among millennials aged between 18-34 years old (Clement, 2019). Therefore, as more rural areas in India gain Internet and smartphone access, we suspect

that #betelnut will continue to associate with regional terms and grow in popularity, particularly, among younger populations.

Temporal events in #betelnut

As discussed earlier, social engagement within #betelnut showed a few notable spikes in average engagement score (March 2014, June 2016, and May, 2018). A closer examination of Instagram posts within these particular months revealed how outlier engagement scores based on celebrities' or microcelebrities' posts skewed engagement in March 2014 and May 2018. In May 2018, a Brazilian celebrity (over 500,000 Instagram followers) posted about his dining experience with friends at the Betelnut restaurant in California generating over 2000 likes. In June 2016, a microcelebrity's (over 100,000 Instagram followers) post during their dining experience in the aforementioned Indonesian café attracted over 4000 likes (Figure 3). These high social engagement events speak to the "dynamics of hashtag communication in different hashtag communities" where different meanings of betel nut demonstrate the more or less diverse subsets of Instagram users present at any given time (p. 23). However, we cannot dismiss all high engagement posts as irrelevant to betel nut use.

In May 2018, another Instagram post tagged #betelnut generated over 2000 likes. Entitled 'The Nut Job' the Instagram author applied multiple hashtags indicating that this picture was submitted for a photo of the day contest (i.e. #photooftheday, #PhotoContest). Instagram user-generated comments noted the clever aesthetics of the photo. See Figure 4 below.

[Insert Figure 4 here]

Figure 4 is a colorful picture featuring mature betel nuts and clearly contributed to the engagement spike in May 2018. It is beyond the scope of this paper to analyze the content of

highly engaged Instagram posts but researchers should be aware of the variety of factors that contribute to social engagement within a topical hashtag. We bring attention to these examples to consider how #betelnut can be understood in contexts outside of the areca nut.

Geography and location in #betelnut

Consumption of betel nut is indigenous to the Indian subcontinent, South Asia and islands in the South Pacific, but it is also prevalent in Thailand, Indonesia, Malaysia, Cambodia, Vietnam, Laos, Taiwan and Southern China (Gupta & Warnakulasuriya, 2002; Winstock, 2013). People from these areas have migrated to Africa, Australia, the United Kingdom, and the United States, bringing along with them, the practice of betel nut use (Barceloux, 2012). Therefore, betel nut is consumed in a variety of countries and considered a global concern. Yet, our analysis demonstrated a smaller scope of influence geographically within #betelnut that centered around a few countries--India, Pakistan, Bangladesh and, to a lesser extent, Indonesia, Malaysia and Myanmar. Although betel nut use spans a large maritime area, Strickland (2002) notes that its center is the Southeast Asian archipelago (p. 85). We conclude that Instagram users posting with #betelnut live primarily in the center of betel nut use.

Although there are diverse subsets of individuals with different meanings toward #betelnut (as shown in Figure 3), the importance of geographic location is still relevant to a majority of Instagram users in the hashtag. The hashtag network analysis uncovered the relevance of India, Myanmar, Indonesia, Taiwan and Papua New Guinea as central regional hashtags in the network. Considering the regional terms for betelnut as co-occurring hashtags, we contend that #betelnut on Instagram could possibly reflect a more concentrated geographic influence emphasizing the Indian subcontinent along with some parts of Melanesia. As speculated earlier, we suspect that increasing Internet and smartphone access may be an

important factor. However, there may be other important factors, such as the growth of migrant communities from these countries, or a demographically younger population in comparison to other betel nut consuming countries.

To answer the research question, our exploratory study serves as a first step toward investigating the unique user activity and practices taking place within #betelnut on Instagram. Although several studies have been published on Instagram and substance use, very few have examined betel nut use on social media platforms. Our findings confirm much of the existing research on betel nut use. With respect to geographical centrality, #betelnut Instagram users converge around a few countries and regional areas of Southeast Asia and parts of Melanesia. The frequent use of regional hashtags demonstrates the popularity of Instagram-based betel nut consumers within these regions. In addition, betel nut has many different naming conventions based on regional language and culture. Our hashtag analysis demonstrated the wide lexicon of related terms for betel nut based on regional preferences.

Limitations

Although this study provided an interesting overview of how vernacular terms associated with #betelnut on Instagram vary by geographical location, it is not without its limitations. First, we only analyzed posts of public Instagram accounts, not private ones. Second, we did not eliminate Instagram accounts that could potentially consist of bots for followers. This approach could have some bearing on overall engagement scores and frequencies of location-specific terms associated with #betelnut on Instagram. Third, other unrelated terms such as names of famous restaurants that were paired with #betelnut could have affected the results obtained in this study. Without performing a content analysis on our dataset, we recognize that

microcelebrities and dining experiences may inflate Instagram engagement occurring within #betelnut.

Future research

When we consider the unique demographic characteristics of Instagram users with the countries in our study, some interesting implications for future research should be noted. Instagram, as a form of visual social media, is highly favored by teens and young adults (Clement, 2019). In some regions, betel nut use starts at a young age and their first experience may begin in elementary school (Chen, Hsieh, Chen, Kao, Chen, 2018; Gupta & Warnakulasuriya, 2002; Shah, Merchant, Lubi, & Chotani, 2002). In addition, countries that have pan masala, a commercially produced betel nut product, heavily advertise to children and adolescents (Malik, Chowdhury & Chauhan, 2002). As a result, we speculate that adolescent and teen betel nut chewers from these regions are increasingly using Instagram to share and consume betel nut content. More in-depth research utilizing content analysis and other methods on #betelnut are needed.

Migrant communities have brought betel nut health concerns to Western countries (Lechner et al., 2019). For these communities, Internet and smartphones are fairly easy to acquire, assuming the economic means to do so. It is very possible that the growing popularity of #betelnut on Instagram is being driven by migrant communities living in Australia, the U.K. and the U.S. Further research is needed to confirm this phenomenon. In addition, the socioeconomic characteristics of betel nut use vary by region. For example, older and socially disadvantaged populations, such as blue collar workers in Taiwan (Ko, Chiang, Chang, & Hsieh, 1992), are far more likely to use betel nut than the general population (Zaman, 2014). We are curious to see if people within these regions will use Instagram and other social media platforms

to promote its consumption and use. As such, future research should examine whether there are demographic or socio-economic status differences in social media user activity associated with betel nut use.

Conclusion

In conclusion, this exploratory study examined user activities and practices taking place within #betelnut on Instagram. As noted in the title of this paper, betel nut as a chewing practice and tradition has gone mobile. It is mobile in the sense that diasporic communities have taken the practice outside of their regional cultures. Therefore, the growth of #betelnut on Instagram can be attributed to those in the Indian and Asia Pacific diaspora maintaining some connection to their home nations. Yet, it is also mobile because a primary platform for moving betel nut content is the smartphone application Instagram. The medium of the mobile phone itself encourages certain uses that emphasize portability and location (Schrock, 2015). As a result, most people who use #betelnut on Instagram culturally align from the Indian subcontinent and Melanesia. Also, regional hashtags of #betelnut clearly indicate geographical differences in vernacular usage of this term which firmly establishes the importance of geographic location. In this way, the mobility of the smartphone reinforces the geographic prominence of betel nut tradition and culture. As more than half of the world's mobile subscribers live in Asia Pacific – mostly in China and India (GMSA Intelligence, 2018), #betelnut will continue to trend and be a focal point for the networked visual communication of betel nut practices. Given Instagram's growing popularity coupled with the prevalence of betel nut use among Asians and Pacific Islanders, scholars should continue to examine how Instagram's affordances and socio-demographic characteristics shape discourse about betel nut use among these groups of individuals.

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Declaration of interests

The authors have no conflicts of interest to declare

Data availability statement

Data that support these findings are available from the corresponding author, [author initials], upon reasonable request.

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Table 1. Most prolific co-occurring regional hashtags used in #betelnut

Hashtag	Country	Frequency	Date of first appearance in dataset
paan	Bangladesh, India, Pakistan	519	October 28, 2012
pinang	Indonesia, Malaysia	361	February 26, 2014
supari	India, Pakistan	302	August 30, 2013
adakka	India	132	May 18, 2017
buai	Papua New Guinea	115	August 2, 2012
pugua	Guam	83	October 12, 2011
pan	Bangladesh	68	July 17, 2013
sirih	Indonesia	33	May 4, 2014
binlang	China, Taiwan	32	July 8, 2012
jambe	Indonesia	27	April 25, 2015
gua	Bangladesh	27	August 22, 2013
adike	India	24	August 5, 2013

Table 2. Edge weights in #betelnut

Hashtag Pair		Weight
betelnut	bali	403
betelnut	arecanut	375
canggu	betelnut	340
myanmar	betelnut	251
canggu	bali	238
betelnut	betel	231
pinang	betelnut	208
paan	betelnut	202
betelnut	betelleaf	166
supari	betelnut	140
taiwan	betelnut	135
betelnutco	betelnut	120
pinang	arecanut	114
yangon	betelnut	112
myanmar	burma	110
betelnut	adakka	109
yangon	myanmar	109
betelnut	areca	96
arecanuts	arecanut	95
pinang	arecanuts	94
pinang	adakka	91
india	betelnut	90
arecanut	adakka	89
arecanuts	adakka	87
betelnutcafe	betelnut	81

Table 3. Degree and eigenvector centrality in #betelnut

Degree Centrality		**Eigenvector Centrality**	
Hashtag	Degree	Hashtag	Eigenvector
betelnut	5372	betelnut	1
bali	551	bali	0.116969
paan	518	paan	0.1107
myanmar	445	betel	0.107736
betel	439	myanmar	0.096928
canggu	433	canggu	0.095893
arecanut	369	arecanut	0.095144
betelleaf	331	betelleaf	0.084043
taiwan	315	travel	0.077968
travel	293	taiwan	0.072755
india	252	india	0.063562
indonesia	224	supari	0.060358
supari	221	food	0.058608
food	200	indonesia	0.057392
burma	196	areca	0.053502
yangon	193	burma	0.051631
nature	189	yangon	0.050955
areca	167	nature	0.050108
png	156	tree	0.043608
papuanewguinea	150	pinang	0.043559
pinang	148	png	0.041612
breakfast	138	betelnutcafe	0.041554
tree	136	breakfast	0.041283
betelnutcafe	132	trees	0.040785
foodporn	129	culture	0.040529

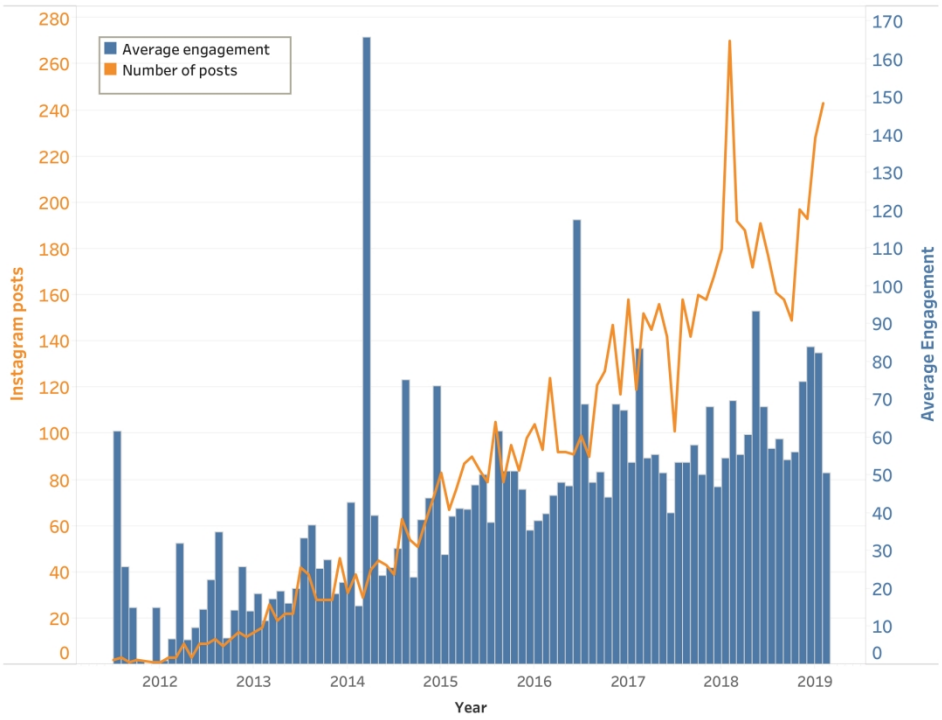

Figure 1. Timeline of monthly Instagram activity and engagement within #betelnut (June 2011 to February 2019)

830x614mm (72 x 72 DPI)

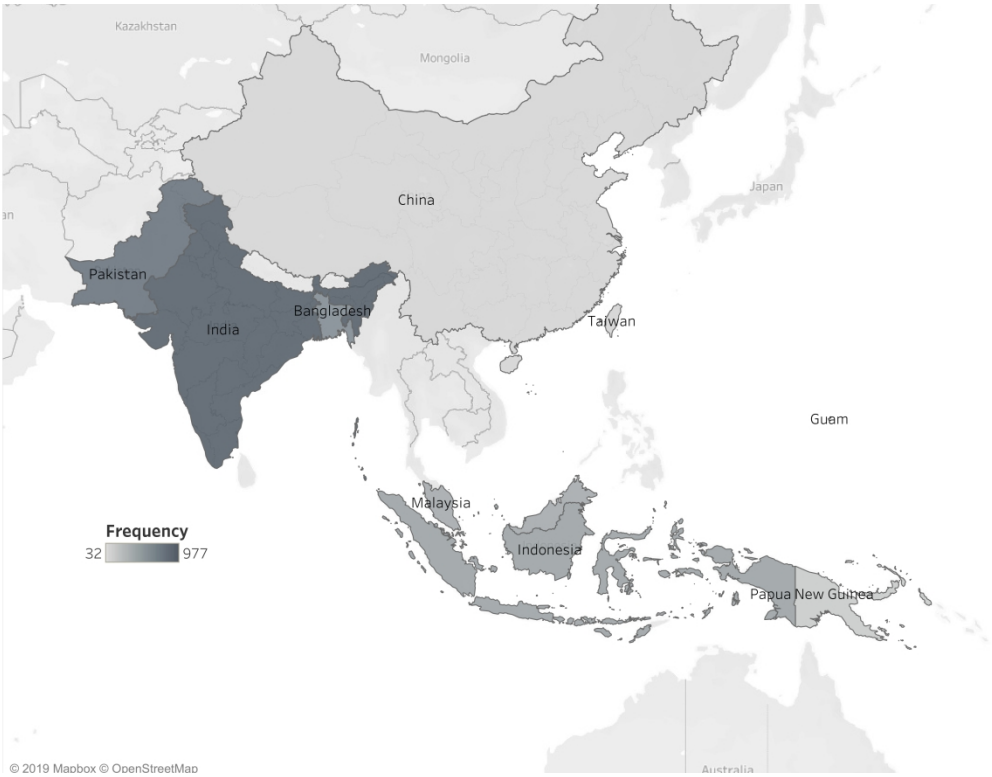

Figure 2. Geographic regions referenced by regional betel nut terms within #betelnut on Instagram

184x141mm (600 x 600 DPI)

Figure 3. Instagram #betelnut post from an Indonesia cafe

1211x893mm (72 x 72 DPI)

Figure 4. Popular and socially-engaged Instagram #betelnut post

1225x889mm (72 x 72 DPI)