Published in final edited form as:

Netw Sci (Camb Univ Press). 2017 December ; 5(4): 441–460. doi:10.1017/nws.2017.28.

Coding communications across time: Documenting changes in interaction patterns across adopter categories

KAR-HAI CHU,

Center for Research on Media, Technology, and Health, University of Pittsburgh, 230 McKee Place Suite 600, Pittsburgh, PA 15213, USA, chuk@pitt.edu

STEPHANIE R. PITTS,

Applied Physics Laboratory, Johns Hopkins University, 11100 Johns Hopkins Road, Laurel, MD 20723, USA, stephanie.pitts@jhuapl.edu

HEATHER WIPFLI,

Department of Preventive Medicine, University of Southern California, 2001 North Soto Street, 3rd Floor, Los Angeles, CA 90032, USA, hwipfli@med.usc.edu

THOMAS W. VALENTE

Department of Preventive Medicine, University of Southern California, 2001 North Soto Street, 3rd Floor, Los Angeles, CA 90032, USA, tvalente@usc.edu

Abstract

GLOBALink, a large online network of tobacco control professionals, was active in the promotion of the World Health Organization's Framework Convention on Tobacco Control treaty, an international treaty aimed at reducing the global burden of tobacco-related death and disease. We examined and compared the roles that different countries served in the GLOBALink community during FCTC negotiation and ratification. Previous studies of FCTC ratification found the process adhered to a diffusion of innovation model (Valente et al., 2015). We followed that work by conducting content analyses of discussion messages posted by GLOBALink members representing different countries. Based on the time when they ratified the FCTC, each country was labeled by one of the four adoption stages of the diffusion model and we investigated the amount of shared word use between the different stages. A goodness-of-fit chi-squared test indicated that content was not shared in an expected manner between stages ($\chi^2 = 11,856.45$, $N = 51,447$, $p < 0.001$). A deeper look at the specific words shared between countries within and between adoption stages provided insight into how interactions between certain countries might have served to support the ratification process.

Keywords

diffusion; content analysis; online activism; global tobacco control

1 Introduction

Online technology has changed dramatically since the early 1990's. Where "Web 1.0" offered mostly static web pages viewed by a PC-based browser, Web 2.0 delivered dynamic,

interactive content that can be created by anyone with basic computer skills and viewed from almost any device (Beer & Burrows, 2007). Blogs, wikis, and social networking sites (SNS) are some of Web 2.0's many applications. The large number of people going online for friendship and support on SNS's or information on Q&A/wiki sites testifies to the Internet's ease of access and potential to be a great source of information and resource exchange (Ridings & Gefen, 2004).

SNS's have demonstrated that people can and do form and sustain successful relationships online. Even pre-Web 2.0 studies had begun investigating how the Internet could create active communities (Galston, 2000). Today, Internet media has enabled communication of activist networks and created a rich database of interactions regarding various policies, social movements, and other causes. In recent years, sites such as Facebook and Twitter were central in helping spread the Occupy Wall Street (Caren & Gaby, 2011) and Arab Spring movements (Stepanova, 2011). These actions were well publicized and served as tangible examples of Internet activism. The involved groups were able to improve coordination of activities in a large-scale setting, recruited high profile celebrities to their causes, and recorded and displayed information for the public to see. Tools within the SNS's afforded its members abilities to act within certain roles, whether to initiate events, spread information, or coordinate efforts. The online setting also helped break through geographic barriers and supported international communication. It is now not only possible, but also relatively easy, for political activists to conduct and coordinate events around the world.

This paper presents research related to the World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC), an international treaty aimed at reducing the global burden of tobacco-related death and disease. We examined the online discussions from a community of tobacco control advocates called GFOBALink, and studied their interactions over time. We combined an exploratory network analysis and content analysis to show how countries that adopted the FCTC at different times interacted within and between each adoption group.

2 Background

Diffusion of innovation theory posits that adoption of an innovation spreads through a network in a defined pattern in which the innovation is initially adopted slowly by a small percentage of the network, followed by rapid adoption by the majority of the actors, with a small percentage of the remaining network resistant to adoption and either adopting the innovation long after the majority of actors or never adopting. Rogers (2003) and others classified adopters based on their time of adoption: innovators (the first 2.5%), early adopters (EA; the next 13.5%), early majority (EM; the next 34%), late majority (EM; the next 34%), and laggards (LA; 16%). The theory suggests adopters in each stage influence those in subsequent stages and that there should be inter-category communication and interaction. Our goal was to combine actor role identification with communication content to describe who transferred information about what during the diffusion process.

There are many studies of online interactions that have helped inform how we analyze our data. Wellman and Gulia (1998) studied different types of online relationships and how they

compare with those offline, exploring the possibility of intimate online relationships, and reviewing other potential extensions of offline interactions that the virtual world might be able to provide. Kollock (1998) observed online interactions where social action was taken independently of cost or benefit, finding particular incentive structures that helped motivate cooperation. Garton and colleagues (1997) applied SNA in a computer-mediated communication (CMC) study and found evidence that CMC affected the structure of a social network. More recently, studies have taken advantage of the abundance of readily available web-based data in SNS's such as Facebook and Twitter. Researchers have examined growth patterns in Live Journal (Backstrom et al., 2006), social capital in Facebook (Ellison et al., 2007), actor roles in Wikipedia (Gleave et al., 2009), and compared Twitter message spread with models of diffusion (Boyd et al., 2010). Indeed, newer diffusion research within communication science has found that interactions online could result in different processes, more closely resembling an external influence model with an R-curve (Danowski et al., 2011). In sum, many researchers have analyzed online communications and found there to be definitive community structures, norms for interaction, and the emergence of community.

Another area of research that is relevant to this study is semantic network analysis, which applies network concepts to represent semantic relationships (Atteveldt, 2008). The ability to apply grounded network theories and measures to study text documents has afforded network scientists the ability to mine and analyze any available text for research. For example, Gloor and Zhao (2006) developed a system to help understand social networks based on text-based communication between actors; Diesner and Carley (2005) analyzed text to find meaning and social structure within networks. Semantic network studies have also been used to describe citation networks (Kajikawa et al., 2007), online social media trends (Gloor et al., 2009), and many others. Furthermore, tobacco research has also taken advantage of network semantic analysis; Sidhu and Barnett (2012) analyzed and compared content from various online tobacco control campaigns. Modern variations of online semantic network studies can be seen in concepts such as word clouds. Several of these established methods are applicable to our current study.

We are primarily interested in the interactions in GLOBALink's discussion forum in our study. Asynchronous discussion forums have been popular virtual spaces that allow people to congregate and discuss topics of shared interest. These can come in many forms, from an older USENET model, to general bulletin board software (e.g. phpBB, vBulletin, etc.), to site-specific features such as Facebook's Wall. Many studies examined USENET, an early model discussion forum, to understand virtual communities (Smith & Kollock, 1999) and user roles (Fisher et al., 2006). Other studies (Backstrom et al., 2006; Firth et al., 2006) have examined growth patterns and membership adoption in modern discussion-based communities, and compared them to diffusion models. Content analysis (Krippendorff, 2012) has also been heavily applied in data derived from discussion forums. Indeed, there have been efforts that combine network and content analyses in areas such as community discourse (de Laat, 2002) and online learning (Shea et al., 2010). However, studies such as these typically conduct the two types of analyses independently. We have applied the diffusion of innovation framework so that the exploratory network analysis can inform the later content analysis.

The Occupy Wall Street (Caren & Gaby, 2011; Hardt & Negri, 2011) and Arab Spring (Anderson, 2011; Stepanova, 2011) movements pushed online social media and Internet activism into mainstream news. However, online activist networks had been used prior to modern social media technologies. For example, email was used to coordinate the networks for anti-landmine treaty supporters (Matthew & Rutherford, 2003) and campaigners against the Multilateral Agreement on Investments (Deibert, 2000). These communication technologies became integral to the functioning of activist networks, and directly contributed to the success of international campaigns led by non-government organizations (NGO). They allowed for daily communication previously prohibited by cost and logistics, and contributed to the enhancement of existing collaborative efforts and the creation of new social relationships (Deibert, 2000). As activist groups tended to rely on donations, the ability to quickly coordinate activities in a low-cost manner was essential to organizing international campaigns in support of their causes (Rutherford, 2000).

In 2003, the 192 Member States of the WHO unanimously adopted the FCTC, and it became binding international law less than two years later. The FCTC is comprised of 38 articles that cover a range of tobacco control activities, such as protection from exposure to tobacco smoke and tax measures to reduce demand. As of this writing, 177 countries are signatories to the FCTC. While the treaty does not meet all of the public health gold standards for tobacco control, parties to the treaty commit to implementing a common set of domestic tobacco control policies, including tobacco health warnings, tobacco advertising bans, and public smoking restrictions (WHO, 2003).

Several studies related to GLOBALink and the FCTC have been published. Wipfli and colleagues (2010) tracked the adoption of the FCTC by different countries, and found that the likelihood of FCTC ratification by a country was three times as likely when that country was exposed to other members of ratifying countries via membership in GLOBALink. Both tobacco production and smoking prevalence were found not to be significant in ratification. Chu and others (2013) presented a longitudinal exploratory study with dynamic visualizations that illustrated the evolution of communities in the GLOBALink network, and demonstrated that its membership network grew following a growth model. Valente and others (2015) showed that countries that subscribed to the same services on GLOBALink influenced one another over time. This study examined the specific communications that occurred between countries based on their time of ratification.

The main goal of this study was to determine if specific discussion topics were shared between countries that ratified the FCTC at different stages (RQ1). By understanding how shared content differs between adopter categories, we can develop additional hypotheses focused on potential influences between adopter categories. However, as members of GLOBALink do not directly ratify the FCTC, it is important to delineate the adopter categories of the FCTC with the interactions on GLOBALink. A second goal of this study was to examine and compare results based on previous studies: identifying regional clusters from the content analysis informed by the earlier Chu et al. (2013) study, which found unexpected clustering in GLOBALink's referral network based on regional borders (RQ2). Lastly, we explored differences in FCTC implementation between adopter categories and

discuss how these differences in implementing tobacco control policies may be relevant to communication between the adopter categories.

3 Methodology

3.1 Data

Originated as a service of the American Cancer Society (ACS), GLOBALink was comprised of ACS staff and partners. In 1992, the Switzerland-based Union for International Cancer Control (UICC) took over coordination of the group, expanding it through various recruitment strategies, and maintaining a presence at large international tobacco control conferences. Over the following two decades, GLOBALink grew into a large network with over 7,000 members from throughout the world dedicated to controlling tobacco use. GLOBALink's online homepage contains news bulletins, electronic conferences, live interactive chat, and full-text searchable databases (including news, legislation, directories). Its growth and evolution took place at a time of dramatic change in access to, and use of, online technology and platforms. GLOBALink membership requirements were also different than most online communities. While they did not need to have a professional affiliation to tobacco control, new potential GLOBALink members were required to pass a strict process in which two existing members of GLOBALink had to vouch for the applicant. This procedure was put in place to ensure that members were committed to tobacco control and free from tobacco industry influence. Although GLOBALink members were very active during the FCTC development and ratification processes, not all ratifying countries had members in GLOBALink; relatedly, those that were on GLOBALink did not represent their country in any formal role.

The data from GLOBALink was received as a comma-separated values (CSV) flat file and loaded into a MySQL database. Separate tables were used to store message information and user data. Relevant message data included the ID of the discussion thread, the country of the user who posted the message, the sub-forum where the message was posted, and the posting date. An example from the discussion data can be seen here (fabricated):

ID: 12345, COUNTRY: Germany, FORUM: News-SecondHandSmoke, DATE: Jan 1, 2000, TITLE: Smoking ban would save 1,000 lives a year

All user data was kept private as we aggregated the discussion message headers at the country level, effectively removing information about the individual who posted the message. In total, the raw data included 90,080 messages posted by 9,128 users from 125 countries.

As part of a secondary analysis, we collected data on how each ratifying country implemented the different articles of the FCTC. Parties to the FCTC are required to report on their implementation status every two years to the WHO. This data is publicly available from the WHO FCTC Implementation Database (<http://apps.who.int/fctc/implementation/database/> accessed October 2014). The implementation survey contains multiple questions for each of the articles of the FCTC to assess compliance with the treaty. Data were not available for all treaty articles and data for articles 22 and 26 were combined. We used the

2012 report for our analyses, as it was the most complete dataset at the time of this writing, with reports from 91 of the countries that participated on GLOBALink.

3.2 Analysis

Our analysis was based on the discussion message headers from the GLOBALink discussion forums. We began by tokenizing each line, i.e. breaking up a sentence into its individual words, or tokens. Each word was then connected to the country of the person who posted it, creating a list of country-word pairs. For example, the sentence, “Women smoke cigarettes,” posted by a Canadian member, becomes tokenized to Canada-women, Canada-smoke, and Canada-cigarettes. We applied several filters during this stage: first, we removed common stop words and punctuations (e.g. an, and, the, etc.), automatically for English terms and manually for foreign language terms; second, due to the large number of words for each country, we restricted the list to only include the top 100 most frequent terms used by each country. Synonym sets were not used to prevent misleading clustering of specific terms.

For our initial exploratory network view, we used the country-word list to form a two-mode network, or bipartite network. The two modes were the countries and words, and ties between countries and words denoted the country’s use of a term in a message header. Figure 1 is a visualization of the country-word network. To maintain an interpretable graph, we only include the top 10 terms for each country. A benefit of this process is that, while the visualization was only developed as an exploratory view of the network, we found several highly central words that connected nearly every country. Finally, we projected the two-mode country-word network into its corresponding one-mode country-country network via matrix multiplication, and then exported the results. For example, two country-word ties such as Canada-smoke and Italy-smoke became a single country-country tie, Canada-Italy ((Borgatti, 2009; Breiger, 1974; Valente, 2010) for explanations on working with two-mode data). Several of these country-word and country-country relationships are later explored during the content analysis stage.

The final variable included in this study was the adoption stage for each country based on the time it ratified the FCTC. We modified Roger’s classification schema by combining the innovators and EA because the innovator group was too small, and the cutoff time to distinguish the two stages did not clearly discriminate between countries whose ratification times were separated by less than a month. Non-ratifying countries were included in the LA group. This country-category data was then merged with the country-country data to create a category-category matrix, which provides a list of shared content between any two adopter categories.

We studied the content of the messages in several ways. First, we began with the most frequent words by each adopter category. Then, we examined the most frequent words by each category-category pair, providing a sense of the most popular shared words between categories. We started with exploratory views of this data, investigated certain words in each group, and began developing possible interpretations as to why certain terms might be more popular in specific categories.

Following these observations, we conducted a more systematic content analysis using TF-IDF measurements. TF-IDF, or Term Frequency-Inverse Document Frequency, is a commonly used statistic in information retrieval to compare word relevance for a document across a large corpus (Salton et al., 1983). It classifies documents by identifying terms that have high frequency usage in individual (or a small subset of) documents, combined with low spread across multiple documents. TF is a measure of the importance of a single term in a single document, as determined by its frequency (usually normalized by the total number of words in the document). IDF is a measure of the discriminating power of the term by counting the number of all documents the term appears in, and taking the inverse. More advance techniques build from this foundation, but standard TF-IDF is a powerful content analysis tool to identify relevant (i.e. discriminating) terms in a single document out of a larger corpus, and has been used successfully in a variety of applications, from traditional online classifiers (Pazzani & Billsus, 1997) to musical lyrics (van Zaanen, & Kanter, 2010). The previous step in this study focused on the most frequent terms. While useful to identify popular topics, it was likely many of the adopter categories used similar terms. We used TF-IDF to complement that view and identify more discriminating terms, helping to better distinguish each adopter category.

In total, four word lists were generated for this study: the most frequent words used by each category, the most frequent words shared by each category–category pair, the top TF-IDF scored words by each category, and the top TF-IDF scored shared words by each category–category pair. We used the first two lists (i.e. highest frequency) to explore the most popular topics, and the latter two lists (i.e. highest TF-IDF) to study the terms unique to each category.

In our secondary analysis, we compared implementation status between the adopter categories using ANOVAs. The implementation questions were coded in the WHO's database as categorical responses indicating the level of implementation of the article components. We recoded these categories to numerical values, such as Yes = 1 and No = 0, or Full = 1, Partial = 0.5, and None = 0, allowing us to aggregate the data from questions with different, but comparable response categories. The mean of the questions for each article was then taken. Data from countries which responded to less than 50% of the questions for an article were dropped from analyses for that article. LA and LM countries were aggregated to one adopter category for this analysis due to the lack of implementation data for most LA. An ANOVA was calculated for each treaty article's implementation to detect differences in implementation between the adopter categories. Scheffe's post-hoc analysis was completed for those ANOVAs with significant *F*-tests.

4 Results and discussion

In the following section, we abbreviate the adopter categories as follows: EA, EM, LM, and LA. We first present the raw results of the category–category matrix, Table 1. The symmetrical matrix has a unique count of 51,447, where each count represents a term being shared between two adopter categories. Shared content between the same adopter categories were counted only if it occurred between different countries. A total of 118 countries were represented. Some countries were excluded because they are non-UN members (e.g. Taiwan

is not a member of the WHO and hence has no FCTC ratification data) and some because GLOBALink allowed certain classifications that were not actually sovereign states (e.g. Hong Kong). From the 118 countries, there were 19 EA, 45 EM, 43 LM, and 11 LA.

A goodness-of-fit chi-squared test was performed to determine whether content was shared between the groups with expected frequencies. The results (Table 2) were significant and showed that interactions were not equally distributed $\chi^2(9, N = 51,447) = 11,856.45, p < 0.0001$. Figure 2 is a graphical representation that visualizes the results of the analysis; more importantly, it emphasizes the difference between the within-category pairs (to the left) and the between-category pairs (to the right). While the most obvious differences between expected and observed frequencies were in the EM–EM and EM–LM groups, we believe the more important finding was that in each of the four within-category pairs, the observed frequency of shared content was higher than the expected, whereas in the six between-category pairs the observed frequency of shared content was lower than the expected. This indicated that shared content was occurring more frequently between countries that belonged in the same adopter category. These were countries that ratified the FCTC treaty at similar times, and likely shared beliefs on policies in tobacco control. The result had implications for RQ1: the observed frequencies of shared content suggested that there was a lower level of diffusion of information across different adopter categories. This was particularly relevant for the EA group, as these members can be important to help expose non-adopters to new ideas and instigate change (Rogers, 2003). The evidence suggested that countries were more likely to discuss topics with those who share similar opinions.

Below, we describe the results found in the TF-IDF analyses. The individual adopter category tables (Tables 3 and 5) include 15 top terms while the category–category pair tables (Tables 4 and 6) include 20 top terms. These were conveniently sampled to provide a good overall picture of the data while still small enough to not overload the reader.

Table 3 lists the 15 most frequent words used by each individual category. The most frequent word list for each of the four adopter categories revealed some clues about the types of discussions occurring in GLOBALink. The most used terms were tobacco and smoking; similarly, the same terms appear as the most central words in the two-mode network graph (Figure 1). This was expected and the words did little to answer any research questions or offer an avenue of exploration. However, it is worth noting that in the LM group, several other terms had higher raw counts: news, European, and bulletin. Investigating further, we found that several members from Belgium regularly posted updates from the European News Bulletin (abbreviated ENSP, another top term), a non-profit organization created in Belgium. This was a surprising finding, as Belgium was a late majority ratifying country, and we did not expect to see such a strong activist movement. However, Belgium's structurally central position in the country-word network graph, surrounded by EA, provided the first clue that it might not be a typical late adopter. A possible reason for their late ratification might have been related to an internal political crisis from 2007–2011. An examination of the ENSP website showed many similarities to GLOBALink, although it focused specifically on European concerns in tobacco control. The consistent updates connecting GLOBALink and ENSP (messages were regularly posted for almost 10 years) served as a good example of the strong links between tobacco control advocates in different online communities. Another

interesting term appearance was cancer, which was only found in the LA list. Aside from health, cancer was the only other health-related term in any of the four categories. Rather, the other highly used terms appeared to be country specific (e.g. US, NZ, UK, France), related to cigarettes (e.g. smoking, cigarettes), or policy (e.g. ban, control, law, FCTC). We found that the three main countries that posted about health and cancer were Canada, Switzerland, and the United States. It is not surprising that countries with advanced healthcare systems would tend to frequently discuss health effects related to tobacco. Unfortunately, this did not necessarily correlate with ratification, as both the United States and Switzerland remain non-adopters. This focus on specific health topics shows some of the potential disconnect between internal country politics and healthcare priorities.

Table 4 lists the 20 most frequent words used by each of the 10 category–category pairs. For this list, we removed several additional common words (e.g. about, day) and common foreign language terms (e.g. la, et, les). When we examined these results, more details about how the countries in different categories interacted with each other were revealed. In the previously discussed individual category word list, FCTC only showed up for two of the four groups. However, in the category–category list, it was near or at the top of every column (highlighted in yellow). In comparing the difference in how the term was considered (i.e. individually vs. shared), the results suggested that while FCTC might not be frequently used by any individual country, many different countries, across all adopter categories, used the term. Thus, discussion of the FCTC was across adoption categories and could be a source of further investigation for potential diffusion of ratification. Other policy-related terms, such as ratification and ratified, also appeared several times (highlighted in orange). It is especially notable that the terms appeared in the EA–LM and EM–LM lists, as those interactions offered a strong link between two groups who adopted the treaty at different times, implying potential for influence in the diffusion process, and provided additional hints of addressing RQ1.

Other important shared terms included industry (highlighted in green), which—similar to FCTC—appeared in nine of the ten groups, even though it was not in any of the single category top lists. In fact, terms such as bat (British American Tobacco), phillip, morris, and other industry-related words appeared in most of the category–category groups. This suggested there were many shared discussions between countries in each of the category groups focused on tobacco companies and other industry related efforts. Reversing our approach, we also searched for terms that had more discriminating power, i.e. only appeared in few groups. We quickly noticed NGOs, only found in LM–LA and LA–LA (highlighted in blue). In the LM–LA group, Africa was also seen in its only appearance. This result presented an opportunity to answer RQ2. One finding from the Chu et al. (2013) study was the clustering of African countries in the GLOBALink referral network. Similarly, the only LM–LA countries that used NGOs were almost exclusively from the African continent. During the early phases of the FCTC negotiations, the WHO African region formed a cohesive voting block, a tactic used by other regions during negotiations (Mamudu & Glantz, 2009). The African region has remained unified in their tobacco control efforts and formed the African Tobacco Control Alliance (<http://atca-africa.org/en/>) in 2008. While NGO's were heavily active in all regions, a major difference in Africa was that African NGO's worked largely in isolation, with a strong emphasis in establishing their identity,

both in terms of their country of origin and continent as a whole. This result from the content analysis helped provide evidence for some of the surprising clustering found in the GLOBALink referral network.

In Table 5, we return to the top words by category, this time sorted by their TF-IDF score. We began with the original word list, without any filtering. We examined the results to identify terms with high discriminating power. The term lists for each of the four individual adopter categories were noticeably different than those from the raw frequency counts. One major difference in examining these new terms was how we compared them. By its nature, TF-IDF identifies terms that are important in a single document (in our case, adopter category), thus high ranking terms would not be expected to appear across many groups. In addition, it will naturally eliminate common terms due to their appearance in many different categories. Graphically, TF-IDF would eliminate a large portion of highly central terms in Figure 1. An important group of terms that caught our attention were the names of countries in each group. While the raw frequency table also included several countries, it was not surprising then to see the US, UK, or France mentioned because of the high number of members from each of those countries in GLOBALink. Here, the TF-IDF lists now included Bangladesh, India, Korea, Georgia, Uganda, Romania, China, and several other countries that did not previously appear. In many cases when a country was mentioned, the message was posted by someone from another country that was in the same adopter category. In other words, John from Hungary, an EA country, would post a message about Japan, another EA country. However, there were several noticeable examples of country mentions from a different category: Canada (an EM country) cited Bangladesh and India (both EA countries); the UK (EM) frequently mentioned India (EA); and Nigeria (EM) often used Uganda (LM) in its message headers. These interactions were particularly notable, as much of the research surrounding ratification of the FCTC was conducted in high-income countries, with a demand for more studies examining low- and middle-income countries (Leischow et al., 2012). In examining several of these cases, they were usually discussions on examples of policies or studies that demonstrated successful tobacco control in the mentioned countries. In the cases of Canada and the UK, it was a promising signal that EM countries were referencing EA countries, as instances of countries where ratification had already occurred. For RQ1, these results would seem counter to the results of the chi-square test.

Several other terms from the category lists also caught our attention. In the EM group, we first saw women appear. Canada was the country that mentioned women the most, with over 200 messages in that topic. This example was one of the few occurrences where the topic was focused on a demographic that was not related to any particular country. While the high amount of attention being given by Canadian members was an indication that women and tobacco was a topic important to Canadians, it was also restricted to one adopter category and thus was not shared across adopter categories. Interestingly, the term did not appear in the country-word graph, indicating it was not one of the top 10 terms used by Canada, or any other country. Viewing the more comprehensive country-word graph (not available), we found that even though women was able to retain a moderately central position—being attached to Canada—it was not able to gain the prominence of other top terms. This showed that without greater support from other central countries, a particular topic will not be able to break the threshold into a network core. This analysis highlighted that certain subjects,

women, and tobacco in this case, may be important to some countries or during some historical time periods as a policy diffuses, but did not seem to retain its importance during other, later, stages of diffusion.

As before, we followed the individual category list with the category-category pairs (Table 6). This list is sorted by the top TF-IDF scores, with some terms manually removed (e.g. common terms in foreign languages, random numbers, etc.). One immediate group of terms that had not been seen before in any of the previous lists was related to smokeless tobacco. Specifically highlighted in red, smokeless and e-cigarettes made their first appearances in this study. In the EM–EM interactions, these conversations were dominated by Canada, Australia, and the UK; In each of the EA interaction groups (EA–EA, EA–EM, EA–LA), India, and New Zealand were heavily involved; In the LA groups (EA–LA, LM–LA, LA–LA), the US and Switzerland had the most topics. A cursory view of several topics suggested that the main areas of focus were national headlines (e.g. FDA Warning on E-Cigarettes) and new research (e.g. Mortality rates and smokeless tobacco). It was interesting that these topics only appeared in the category–category lists and not the individual category lists, indicating that these terms elicited discussion between countries across different categories.

Our secondary analysis found that implementation was significantly different between the adopter categories for 4 out of the 17 articles of the FCTC treaty. These four articles assessed price and tax measures to reduce tobacco demand (article 6); sales to and by minors (article 16); research, surveillance, and exchange of information (article 20); and assistance provided to help other nations implement tobacco reduction measures (articles 22 and 26). For articles 6 and 16, the LM and LA group had significantly lower mean implementation in comparison to the innovator and EA group. Although post-hoc analyses did not find significant differences between the groups for article 20 and articles 22 and 26 combined, the LM/LA group had a lower mean than the other two adopter categories for both articles. To note, this analysis may have been underpowered and inspection of mean implementation for those articles without significant *F*-tests suggested that there may be important differences undetected. However, we do note that two of the articles with significant findings focused on sharing information and providing assistance to help other countries implement the FCTC, suggesting that countries in different adopter categories may have played different roles in GLOBALink forums.

During a diffusion process (e.g. the ratification of the FCTC), it is vitally important that channels of communication are available between members, especially those that adopt an innovation at different periods of time (Rogers, 2003). EAs are important because they have the most potential to influence non-adopters into changing their behaviors. In a system where EA do not share their knowledge, or if there are no lines of communication to other members, diffusion becomes more difficult and less likely to occur.

5 Limitations and future directions

There are still several limitations that can be addressed in future work in this line of research. One important element was the longitudinal component. While the ratification

adopter categories were inherently time-sensitive, we did not include timestamp data for the discussion messages. The scope of this project was to explore the relationship between adopter categories and their choice of words used, and demonstrated an example of this method of study. Future studies could include timestamp data to provide better precision in how word use evolved over time. Indeed, there is on-going work in modeling the diffusion of treaties that includes communication interaction data (Valente et al., 2015).

The data from GLOBALink included all text from discussion message headers but did not consider the full text of each post. This limits our discovery of topics to short message headers, and reduces precision that could come from full message bodies. We are still currently in the process of retrieving this data, which could provide better accuracy in our word network and content analysis. We have also focused our analysis primarily on English words as the results of the TF-IDF analysis clearly showed the majority of the content to be written in English. However, GLOBALink is an international community, with many posts and sub-forums dedicated to other languages, the most popular ones being French, Spanish, German, Portuguese, and Swedish. Most of these non-English words did not have the raw counts to propagate up our frequency lists, but a focused effort on non-English languages could help be more inclusive of countries that did not have many English speakers.

6 Conclusion

This research presented a method of studying diffusion using content analysis from an online community. We explored data from an online discussion forum within GLOBALink, an international community of tobacco control advocates, in unison with information on when 177 WHO countries ratified the FCTC treaty. This cross-examination of two distinct datasets allowed us to examine how countries in different diffusion adopter categories interacted based on shared word content. Our content analysis relied on both a raw frequency count of popular terms and a systematic method of using TF-IDF statistics to compare discriminating terms.

The research demonstrated that this approach could support both exploratory studies and answering specific research questions. The content analyses via shared terms between adopter categories found many interesting points that could be studied further. We discovered terms and topics that have different relative popularity when comparing their frequency in individual adopter category versus category–category pairs, which suggested that content analyses of interaction data should apply multiple methods to prevent misleading results. We found examples such as Belgium’s connection to the ENSP, a community similar to GLOBALink, which persisted for over 10 years. Canada’s advocacy on women and tobacco was an unforeseen result of the TF-IDF study and—just as important—it was not clear why the topic did not spread to other adopter categories. These unexpected country-specific findings offered potential avenues of research with more focus on either a single country or adopter category.

In attempting to address RQ1, we found conflicting results. The chi-square test showed that shared content was occurring more frequently in the within-group category pairs than the between-group pairs. This suggested that specific discussion topics were not being readily

shared between countries that ratified the FCTC treaty at different stages. However, we also found many examples of cross-category interactions that were specific to the FCTC ratification in our raw frequency category-category results. Additionally, the TF-IDF findings included a large amount of country name mentions from outside their adopter category. So while we found there were many instances of shared discussion topics between countries that adopted the FCTC at different times, we believe GLOBALink still retained potential for more collaborative efforts.

In the context of online activism, we discovered unexpected activity by late majority members, connections to external groups, and the strength of support for the FCTC. In relation to RQ2, we were able to find supporting evidence for clustering in African countries that was discovered in a previous study, and explained why it might be occurring based on NGO activity that was unique to Africa. Our secondary analysis also provided support to our primary aims by finding that those countries who adopted earlier self-report higher information exchange and assistance provided to other countries in FCTC implementation. They also had higher implementation of other treaty articles suggesting that not only do they perceive themselves as assistance providers, they have knowledge and experience to share from implementing the treaty in their own countries.

This method of word identification provided an important complement to study the diffusion process. With information that defined a country's adopter category, and communication data between countries from different categories, we had an opportunity to examine the interactions between adopter categories in the context of diffusion. This can reveal important actions or milestones in the diffusion process, e.g. influential behavior, decision-making, reaching critical mass, or exposure to ideas. In our study, we were able to find evidence of both supportive information-sharing behavior and unshared ideas that might have hindered diffusion. This left us unable to conclusively address RQ1, but provided a clear view of the interactions in the GLOBALink community and many cases of how diffusion did or did not occur. GLOBALink has proven that online activism can be successful, even before networks such as Facebook and Twitter made coordination significantly easier. Continued research into such communities can help future community organizers develop better tools and methods that can support improved coordination, collaboration, and realizing untapped resources.

Acknowledgements

This research was supported by NIH grant R01CA157577 (PI: Thomas W. Valente), training grant T32CA009492 from the National Cancer Institute, and K12HS022989 from the Agency for Healthcare Research and Quality. An earlier version was presented at the XXXIV annual INSNA meeting, St. Pete Beach, Florida, USA. We would like to thank the Union for International Cancer Control for its assistance, and in particular Julie Torode and Robert Hradil.

References

- Anderson L (2011). Demystifying the Arab spring: Parsing the differences between Tunisia, Egypt, and Libya. *Foreign Affairs*, 90 Retrieved from http://www.comfama.com/contenidos/Servicios/GerenciaSocial/Cursos/Universidad%20de%20Columbia%202012/Lecturas/LisaAnderson_DemystifyingtheArabSpring.pdf.

- Atteveldt W. H. van. (2008). Semantic network analysis: Techniques for extracting, representing, and querying media content. Retrieved from <http://dare.ubvu.vu.nl/handle/1871/15964>.
- Backstrom L, Huttenlocher D, Kleinberg J, & Lan X (2006). Group formation in large social networks: Membership, growth, and evolution. Presented at the Proceedings of the 12th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, ACM (pp. 44–54). Retrieved from 10.1145/1150402.1150412.
- Beer D, & Burrows R (2007). Sociology and, of and in Web 2.0: Some initial considerations. Sociological Research Online, 12 Retrieved from 10.5153/sro.1560.
- Borgatti S (2009). 2-mode concepts in social network analysis In Encyclopedia of complexity and systems (pp. 8279–8291). Berlin: Springer Retrieved from <http://steveborgatti.com/papers/2modeconcepts.pdf>.
- Boyd D, Golder S, & Lotan G (2010). Tweet, tweet, retweet: Conversational aspects of retweeting on twitter. In Proceedings of the 2010 43rd Hawaii International Conference on System Sciences (HICSS) (pp. 1–10). IEEE Computer Society Washington, DC.
- Breiger R (1974). The duality of persons and groups. Social Forces, 53, 181–190. Retrieved from 10.1093/sf/53.2.181.
- Caren N, & Gaby S (2011). Occupy online: Facebook and the spread of occupy wall street. Social Science Research Network. Retrieved from 10.2139/ssrn.1943168.
- Chu K-H, Wipfli H, & Valente TW (2013). Using visualizations to explore network dynamics. Journal of Social Structure, 14 Retrieved from <http://www.cmu.edu/joss/content/articles/volume14/ChuWipfliValente.pdf>.
- Danowski JA, Riopelle K, & Gluesing J (2011). The revolution in diffusion models caused by new media: The shift from s-shaped to convex curves The diffusion of innovations: A communication science perspective (pp. 123–144). Peter Lang Publishing, Inc. New York, NY.
- de Laat M (2002). Network and content analysis in an online community discourse. In Proceedings of the Conference on Computer Support for Collaborative Learning: Foundations for a CSCCL Community (pp. 625–626). Boulder, Colorado: International Society of the Learning Sciences Retrieved from <http://dl.acm.org/citation.cfm?id=1658616.1658755>.
- Deibert RJ (2000). International plug'n play? Citizen activism, the Internet, and global public policy. International Studies Perspectives, 1, 255–272. Retrieved from 10.1111/1528-3577.00026.
- Diesner J, & Carley KM (2005). Revealing social structure from texts: Meta-matrix text analysis as a novel method for network text analysis In Narayanan VK & Armstrong DJ (Eds.), Causal mapping for information systems and technology research: Approaches, advances, and illustrations (pp. 81–108). Idea Group Publishing, Hershey, PA.
- Ellison N, Steinfield C, & Lampe C (2007). The benefits of facebook “friends:” social capital and college students use of online social network sites. Journal of Computer-Mediated Communication, 12, 1143–1168.
- Firth DR, Lawrence C, & Clouse SF (2006). Predicting internet-based online community size and time to peak membership using the bass model of new product growth. Interdisciplinary Journal of Information, Knowledge, and Management, 1, 1–12.
- Fisher D, Smith M, & Wesler HT (2006). You are who you talk to: Detecting roles in Usenet newsgroups. Presented at the Proceedings of the 39th Hawaii International Conference on the System Sciences (HICSS), New Brunswick: Institute of Electrical and Electronics Engineers, Inc. (IEEE) Retrieved from 10.1109/HICSS.2006.536.
- Galston W (2000). Does the internet strengthen community? National Civic Review, 89, 193–202. Retrieved from 10.1002/ncr.89302.
- Garton L, Haythornthwaite C, & Wellman B (1997). Studying online social networks. Journal of Computer-Mediated Communication, 3, 0–0.
- Gleave E, Welser H, Lento T, & Smith M (2009). A conceptual and operational definition of “social role” in online community. Presented at the 42nd Hawaii International Conference on System Sciences Retrieved from citeulike-article-id:4302669.
- Gloor PA, & Zhao Y (2006). Analyzing actors and their discussion topics by semantic social network analysis. In 10th International Conference on Information Visualisation (IV'06) (pp. 130–135). Retrieved from 10.1109/IV.2006.23.

- Gloor PA, Krauss J, Nann S, Fischbach K, & Schoder D (2009). Web Science 2.0: Identifying trends through semantic social network analysis. In International Conference on Computational Science and Engineering, 2009. CSE '09 (Vol. 4, pp. 215–222). Retrieved from 10.1109/CSE.2009.186.
- Hardt M, & Negri A (2011). The fight for “real democracy” at the heart of occupy wall street. Foreign Affairs, 11 Retrieved from http://relooney.fatcow.com/0_New_11478.pdf.
- Kajikawa Y, Ohno J, Takeda Y, Matsushima K, & Komiyama H (2007). Creating an academic landscape of sustainability science: An analysis of the citation network. Sustainability Science, 2(2), 221 Retrieved from 10.1007/s11625-007-0027-8.
- Kollock P (1998). The economies of online cooperation: Gifts and public goods in cyberspace In Communities in the cyberspace (pp. 259–262). London: Routledge Retrieved from citeulike-article-id:201583 <http://www.amazon.ca/exec/obidos/redirect?tag=citeulike09-20&path=ASIN/0415191408>.
- Krippendorff K (2012). Content analysis: An introduction to its methodology. SAGE Publications, Incorporated, Thousand Oaks, CA Retrieved from <http://www.uk.sagepub.com/booksProdDesc.nav?prodId=Book234903>.
- Leischow SJ, Ayo-Yusuf O, & Backinger CL (2012). Converging research needs across framework convention on tobacco control articles: Making research relevant to global tobacco control practice and policy. Nicotine & Tobacco Research, ntsl99. Retrieved from 10.1093/ntr/ntsl99.
- Mamudu HM, & Glantz SA (2009). Civil society and the negotiation of the framework convention on tobacco control. Global Public Health, 4, 150–168. [PubMed: 19333806]
- Matthew RA, & Rutherford KR (2003). The evolutionary dynamics of the movement to ban landmines. Alternatives: Global, Local, Political, 28, 29–56. Retrieved from 10.1177/030437540302800102.
- Pazzani M, & Billsus D (1997). Learning and revising user profiles: The identification of interesting web sites. Machine Learning, 27(3), 313–331. Retrieved from 10.1023/A:1007369909943.
- Ridings C, & Gefen D (2004). Virtual community attraction: Why people hang out online. Journal of Computer-Mediated Communication, 10, 00–00.
- Rogers E (2003). Diffusion of innovations (5th ed.). New York: Free Press Retrieved from <http://www.amazon.de/exec/obidos/ASIN/0743222091>.
- Rutherford KR (2000). Internet activism: NGOs and the mine ban treaty. International Journal on Grey Literature, 1, 99–106. Retrieved from 10.1108/14666180010345528.
- Salton G, Fox EA, & Wu H (1983). Extended boolean information retrieval. Communications of the ACM, 26(11), 1022–1036. Retrieved from 10.1145/182.358466.
- Shea P, Hayes S, Vickers J, Gozza-Cohen M, Uzuner S, Mehta R, ... Rangan P (2010). A re-examination of the community of inquiry framework: Social network and content analysis. The Internet and Higher Education, 13(1–2), 10–21. Retrieved from 10.1016/j.iheduc.2009.11.002.
- Sidhu AK, & Barnett G (2012). The semantic structure of tobacco control initiatives: An analysis of missions, goals and objectives of state tobacco control programs. Presented at the International Network of Social Network Analysis (INSNA), Redondo Beach, CA.
- Smith M, & Kollock P (1999). Communities in cyberspace. Psychology Press, London, UK Retrieved from <http://www.amazon.com/Communities-Cyberspace-Peter-Kollock/dp/0415191408>.
- Stepanova E (2011). The role of information communication technologies in the “Arab Spring.” PONARS Eurasia, 15, 1–6.
- Valente TW (2010). Social networks and health. Oxford: Oxford University Press Retrieved from <http://www.amazon.com/Social-Networks-Health-Methods-Applications/dp/0195301013>.
- Valente TW, Dyal SR, Chu K-H, Wipfli H, & Fujimoto K (2015). Diffusion of innovations theory applied to global tobacco control treaty ratification. Social Science & Medicine, 145, 89–97. Retrieved from 10.1016/j.socscimed.2015.10.001. [PubMed: 26460508]
- van Zaanen M, & Kanters PHM (2010). Automatic mood classification using tf*idf based on lyrics. In 11th International Society for Music Information Retrieval Conference (ISMIR 2010) (pp. 75–80). Creative computing. Retrieved from [https://pure.uvt.nl/portal/en/publications/automatic-mood-classification-using-tfidf-based-on-lyrics\(bdd6389b-f19e-499e-9fea-e7ad7bd16e0e\).html](https://pure.uvt.nl/portal/en/publications/automatic-mood-classification-using-tfidf-based-on-lyrics(bdd6389b-f19e-499e-9fea-e7ad7bd16e0e).html).
- Wellman B, & Gulia M (1998). Virtual communities as communities: Net surfers don’t ride alone In Communities in cyberspace. London: Routledge Retrieved from citeulike-article-id:4299353.

WHO. (2003). WHO Framework Convention on Tobacco Control.

Wipfli H, Fujimoto K, & Valente TW (2010). Global tobacco control diffusion: The case of the framework convention on tobacco control. *American Journal of Public Health*, 100, 1260
Retrieved from 10.2105/AJPH.2009.167833. [PubMed: 20466967]

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Fig. 1.
Two-mode network of countries and term usage. (Color online)

Fig. 2. Chi-square results. The four groups on the left are within-category comparisons. The six groups on the right are between-category comparisons. (color online)

Table 1.

Category matrix of shared content.

	EA	EM	LM	LA
EA	1,908	5,915	3,753	1,236
EM	5,915	15,314	10,053	3,391
LM	3,753	10,053	7,148	2,131
LA	1,236	3,391	2,131	598

Table 2.

Chi-square results.

Category	Exp %	Exp freq	Obs %	Obs freq.
EA-EA	2.477	1,274.437	3.709	1,908
EA-EM	12.386	6,372.184	11.497	5,915
EA-LA	3.028	1,557.645	2.402	1,236
EA-LM	11.835	6,088.976	7.295	3,753
EM-EM	14.342	7,378.318	29.767	15,314
EM-LA	7.171	3,689.159	6.591	3,391
EM-LM	28.031	14,421.26	19.540	10,053
LA-LA	0.797	409.9,066	1.1623	598
LM-LA	6.852	3,525.197	4.142	2,131
LM-LM	13.081	6,729.92	13.894	7,148

Chi-square (9) = 11,856.45

 $p < 0.001$

Table 3.

Top 15 words by frequency in each adopter category.

EA	EM	LM	LA
Tobacco	Tobacco	News	Tobacco
2004	Smoking	European	Smoking
Smoking	Ash	Bulletin	US
Control	Bulletin	Tobacco	News
Smokefree	Scotland	2005	Ban
News	Daily	ENSP	Cigarette
Health	US	Smoking	Tabaco
Hungarian	News	FCTC	Cigarettes
NZ	Ban	2006	Smoke
Law	Globalink	2004	Health
STSTCN	UK	2008	UK
2005	Health	2007	TABAC
World	Smoke	Control	Smokers
FCTC	Cigarette	Health	France
Ban	Smokers	2003	Cancer

Table 4.

Top 20 words by frequency in each category–category pair.

EA-EA	EA-EM	EA-LM	EA-LA	EM-EM	EM-LM	EM-LA	LM-LM	LM-LA	LA-LA
FCTC	Health	FCTC	FCTC	Health	FCTC	Health	FCTC	FCTC	Health
Health	FCTC	Health	Health	FCTC	Health	FCTC	Conference	Conference	Public
Smokefree	Ban	News	Smokefree	Smokefree	Smokefree	Smokefree	Health	Health	Smokefree
Ban	Smokefree	Conference	Conference	Ban	Conference	Cessation	News	Smokefree	Cessation
FCA	Industry	Smokefree	Cessation	Industry	News	Conference	Law	Free	FCTC
News	News	Free	Public	Smoke	Free	Ban	2005	News	Conference
World	World	FCA	Free	Cessation	Law	Free	Free	Law	Morris
Free	Free	World	News	News	Smoke	Public	Smokefree	Smoke	Free
Industry	Smoke	Industry	Ban	Free	Industry	Smoke	Ratification	WHO	Ban
Conference	Conference	Smoke	World	Cigarettes	Ban	World	FCA	World	Tabaco
Smoke	Cessation	Ratification	Smoke	World	2005	News	Smoke	Cessation	PM
Public	Cigarettes	Ban	May	Conference	World	Morris	Industry	May	Who
2004	2006	2004	FCA	Law	WHO	Cancer	2004	FCA	World
Cessation	Public	Law	WHO	Cancer	Cigarettes	Law	International	Ban	US
Cigarettes	Bat	2005	Morris	BAT	International	WHO	WHO	International	May
2006	Report	Cigarette	Industry	Report	BAT	Industry	Information	Industry	Smoke
Cigarette	WHO	International	2006	WHO	Information	Cigarettes	Meeting	2004	NGOs
May	Cigarette	WHO	Cigarette	2006	Cigarette	Smokers	Congratulations	NGOs	Tabaquismo
Against	International	Cigarettes	Cigarettes	Information	Cessation	Philip	Convention	UN	Week
Meeting	FCA	May	2004	International	Ratified	BAT	Cigarette	Cigarette	Smokers

Table 5.

Top 15 words by TF-IDF in each adopter category.

EA	EM	LM	LA
Hungarian	Daily	European	Summaries
NZTAN	Edition	ENSP	FDA
Bangladesh	MJU	Georgia	Citations
NZ	Listserv	Uganda	Tobacco-related
Review	Australia	Eletrnico	Breather
E-news	Med	Geaneews	Australia
Filter	Women	Framework	China
Tar	California	Comunicato	Imperial
Indian	SHS	Romania	CDC
Daily	Korea	Cigarros	RJR
New Zealand	Rico	TTCF	Documents
Mauritius	Firms	Nepal	Tobinfo
Maurice	Alberta	Regional	Indonesia
Maori	NY	Giornata	Czech

Table 6.

Top 20 words by TF-IDF in each category-category pair.

EA-EA	EA-EM	EA-LM	EA-LA	EM-EM	EM-LM	EM-LA	LM-LM	LM-LA	LA-LA
Sales	Smokeless	Convention	Treatment	Smokeless	Urgent	PM	Convention	Initiative	PM
Smokeless	Sales	Taxation	Tragic	Campaign	Directive	US	Framework	Education	US
Olympics	Campaign	Draft	Seminar	NRT	Petition	Women	Georgia	E-cigarettes	Lung
Affairs	AD	Kenya	Music	AD	Bureau	Ramadan	Russian	Parliament	E-cigarettes
2012	NRT	CCLAT	Alliance	Women	Studies	Prize	Burkina	American	Passive
Tobacco free	Japan	Urgent	Situation	Dangerous	Bans	Anti-tobacco	Mali	Passed	Fumer
Treatment	Movies	2009	US	Companies	Burkina	Lung	Partent	Smuggling	Treatment
CSR	Bars	Contrebande	E-cigarettes	Packs	Niger	Passive	Uzbekistan	Resources	Nigeria
Taxation	Europe	Forum	India	Bans	OMS	Risk	Tutunului	Community	Anti-tobacco
Registration	STSTCN	BATs	Bars	Exposure	Ukraine	Scotland	Tigari	Tobinfo	Tanzania
Policies	Policies	Web	Europe	Ramadan	2009	Reduction	Ukraine	Treatment	Control
Campaign	Bans	Results	Movies	Studies	Vote	Movies	Adopte	England	Ban
Poverty	Youth	Afrique	Antismoking	Violation	European	Antismoking	Campagne	Lung	Smoke
Movie	Germany	Lafrique	Future	Trade	Society	Brother	Niger	Antitabaco	Help
Survey	Safe	American	Risk	Guidelines	Shisha	Australia	Meilleurs	Nigeria	Smokefree
STSTCN	Legal	2002	Invitation	Petition	Vietnam	Posters	Tabagismo	Passive	Free
Japan	Drug	Vote	Dependence	Hidden	Smuggling	China	CCLAT	Womens	Tobacco
India	Films	Promotion	Banning	Swedish	Death	Indonesia	Urgent	Fumer	Cessation
Europe	Poverty	Bans	Argentina	SHS	Georgia	Canadian	2009	Gates	Nicotine
Bars	Urgent	Release	Effect	QMS	Russian	Geneva	Graphic	Estudio	2008

Table 7.

Abbreviations found in semantic analysis terms.

NZ	New Zealand
STSTCN	South to South Tobacco Control Network
FCTC	Framework Convention on Tobacco Control
Ash	Action on smoking and health
US	United States
UK	United Kingdom
ENSP	European Network for Smoking and Tobacco Prevention
FCA	Framework Convention Alliance
WHO	World Health Organization
BAT	British American Tobacco
UN	United Nations
NGOs	Non-governmental Organizations
MJU	Medical journal update
SHS	Second hand smoke
NY	New York
TTCF	Tanzania tobacco control forum
FDA	Food and Drug Administration
CDC	Center for Disease Control
RJR	RJ Reynolds
CSR	Corporate social responsibility
NRT	Nicotine replacement therapy
PM	Phillip Morris
OMS	Organization mondiale de la Sante
CCLAT	Convention Cadre pour la Lutte Antitabac