

# Patterns in Prevalence and Debunking of Three Rumors Online

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## **Abstract**

The spread of rumors has been the focus of much qualitative work and speculation by fact checking experts, but few studies have analyzed the actual behavior of rumors on the Internet. By tracking the spread of three common Internet rumors among Usenet groups over time, this paper contributes quantitative data to complement qualitative theories of how the prevalence of a rumor changes over time. Findings show that expiration may have more to do with interest in the topic than timeliness of the rumor. Additionally, findings identify a pattern of “pre-emptive debunking,” a phenomenon with implications for the role rumors play in collective sense making.

## **Introduction**

The creation and spread of rumor is hardly new. Scholarly writings concerned with the potential harm caused by the circulation of unverified information can be traced back as early as the writings of ancient Greek historian Thucydides (Mara 2008 as cited in Garrett, 2011). However, the rise of the Internet and proliferation of ways to communicate online creates new opportunities for rumors to spread and evolve. Internet rumors have prompted the creation of several prominent fact checking and urban legends reference sites. These sites spend considerable time and effort evaluating suspicious claims circulating online. From their efforts they gain a certain picture of how rumors operate online. Among the experts from these sites, there is a predominant idea that certain rumors come back over time. (*About Politifact*, 2011; Emery, 2011; *Factcheck.org: About us*, 2011; Mikkelson & Mikkelson, 2011). Barbara and David Mikkelson of Snopes.com state that particular rumors “continue to be circulated via email year after year,” (Mikkelson &

Mikkelsen, 2009). Similarly, several of the rumors David Emery (2011b) lists on his “Top 25 Urban Legends” list are misconceptions that he debunked some time ago.

Though work in social psychology has sought to characterize rumors and the roles they play (Allport, 1947/1964; Bordia & DiFonzo, 2004) and research in computer science has sought to model how information spread online (Leskovec, Backstrom, & Kleinberg 2009), little quantitative research has worked to address the accuracy of conventional wisdom about rumor prevalence over time as informally stated by fact checking experts. This work seeks to complement the research being done on the behavior of rumors on the Internet by exploring the life cycle of three particular rumors spread within Usenet newsgroups. Collecting data on how the frequency of a rumor changes as it circulates allows for the investigation of temporal patterns and assessment of whether the theories of fact checking experts about the behavior of rumors are reflected in our case studies. The amount of time it takes before false information is debunked once it has been posted is also explored and a pattern of “pre-emptive debunking” is identified.

## **Background**

### *Rumors*

Rumors became a popular focus of research in social psychology following World War II as researchers sought to understand the role they played in the dynamics of rhetoric surrounding the war (Rosnow, 1991). Allport and Postman published their book *Psychology of Rumor* (1947/1965), which remains one of the seminal works used to understand rumors and what circumstances prompt them to form and spread (Rosnow, 1991). According to Allport and Postman (1947/1965), a rumor “is a specific (or topical)

proposition for belief, passed from person to person, usually by word of mouth, without secure standards of evidence being present” (p. ix). They assert that rumors spread when they are of importance to the speaker and listener and when situations are ambiguous. Allport and Postman’s “Basic Law of Rumor” yields the formula  $R \sim i \times a$ , where  $R$  represents rumor intensity,  $i$  represents a measure of topical importance, and  $a$  represents the level of ambiguity (1947/1965, p. 33).

Some argue that Allport and Postman’s concept of rumor and model of rumor spreading ignores important variables such as anxiety, credulity, and outcome-relevant involvement (Rosnow, 1991). Others believe that Allport and Postman’s theories focus too narrowly on the individual, ignoring the group context necessary for rumors to be relevant (Bordia & DiFonzo, 2002). In their recent work, DiFonzo and Bordia (2007) build off traditional work in the understanding of rumors, incorporating the effects of context and emphasizing the role rumors play in social behavior, to define rumor as “unverified and instrumentally relevant information statements in circulation that arise in contexts of ambiguity, danger or potential threat, and that function to help people make sense and manage risk.”

Psychologists have not been the only researchers with an interest in understanding rumors. Research in applied mathematics has sought to develop models of rumor diffusion (Pittel, 1987). Pittel (1987) used mathematical reasoning to estimate how long it takes before a rumor spreads across an entire population. Recent work in complex systems further complicates these models, investigating the effects of network structure on rumor diffusion (Newman, 2003; Moreno, Nekovee, & Pacheco, 2004).

## *Rumors and the Internet*

Traditional theories of rumor and rumor spread focus on serial models of propagation (Allport, 1947/1965; Pittel, 1987), but with the rise of the Internet and the popularity of social media, a new framework must be used to describe the spread of rumors on the online. Bordia and DiFonzo (2004) adapted their theory of rumor to study the transmission of rumors online, characterizing the talk surrounding rumors as a form of social cognition. Because online conversations are recorded in a way that offline interactions generally are not, Bordia and Rosnow (1998) saw the advent of computer-mediated communication as an opportunity to better understand how rumors evolve over time and are responded to. However, Bordia and Rosnow used their analysis of an Internet rumor to supplement existing theories of how rumors operate, focusing on whether findings of lab and field studies, about the circumstances that cause rumors to arise and the roles individuals play in rumor evolution, could be verified in a natural environment. They did not consider the possibility that rumors spread on the Internet may be an entirely different class of rumors with inherent differences from rumors spread through traditional offline communication media.

The popularity of fact checking and urban legends reference websites illustrate the perceived prevalence of rumors online and the interest, among some parties, of ensuring that false information does not go unchecked. Started in 1995 by husband and wife pair David and Barbara Mikkelson, Snopes.com is the oldest of the popular fact checking sites (Mikkelson & Mikkelson, 2011). About.com also has a site dedicated to urban legends. Run by David Emery since 1997, the site has a specific interest in “netlore,” rumors, hoaxes, and urban legends found primarily online (Emery, 2011).

While Snopes.com and UrbanLegends.About.com broadly cover rumors and urban legends circulating on the Internet, other websites focus specifically on correcting misinformation about politics and politicians. FactCheck.org is a nonprofit project of the University of Pennsylvania's Annenberg Public Policy Center, aiming to "reduce the level of deception and confusion in US politics" (*FactCheck.org: About us*, 2011). Politifact.com, a project of the St. Petersburg Times, also evaluates the veracity of statements related to politics (*About Politifact*, 2011). Although both FactCheck.org and Politifact.com focus broadly on statements made about politics, including information from speeches and campaign ads, both have sections dedicated to political misinformation spread in chain emails.

Although Snopes.com, UrbanLegends.About.com, Politifact.com, and FactCheck.org all make claims about the general form of rumors spread online, there is little research able to bolster these claims and verify whether they can be generalized or are simply individual observations relevant to a particular context. Related work by Leskovec, Backstrom, and Kleinberg (2009) surrounds quantifying the popularity of memes over time on online news media and blogs, identifying a heartbeat-like pattern in meme prevalence. Ratkiewicz et al. (2010) also recognized that information, specifically political misinformation, could spread differently online. They developed the "Truthy" system to identify "astroturf memes," political memes falsely intended to appear as if they are a product of grassroots efforts, and educate people about them. Previous work on rumors on the Internet either uses findings to supplement traditional theories of rumor spread and evolution, assuming that rumors behave the same online as offline, or focuses on identifying certain types of misinformation.

Beyond the speculations of domain experts from fact checking sites, little previous work has focused on broadly characterizing the behavior of rumors online.

### *Usenet*

First developed in 1979 by students at Duke University as a communication network for the Unix community, Usenet later evolved into an internationally used network for open discussion. Users can post and read messages to “newsgroups” organized around different topics (Hauben & Hauben 1997). In a restructuring of Usenet in 1987 known as “The Great Renaming” a hierarchy system to organize newsgroups was introduced. The original system included the seven top-level hierarchies: comp, misc, news, rec, sci, soc, and talk. Later the additional top-level hierarchies alt and humanities were added. These remain the main hierarchies organizing Usenet conversations. Users can post a message to multiple newsgroups at the same time, which is known as “cross-posting” (Pfaffenberger, 2003).

Though Usenet is no longer the dominant place for online discussions, NNTP, the protocol used to transmit Usenet posts, is still widely used. However, Kim, Schneider, Ager, and Feldmann (2010) find that binary files, most posted to the alt.binaries hierarchy, are responsible for the majority of NNTP requests made. They argue that this demonstrates that Usenet is now being used primarily for file sharing. Because of this, it is expected that rumors may not be as prevalent on Usenet as they are elsewhere on the web. However, Usenet provides a glimpse at the ways people interact online when provided with basic message sharing capabilities, so phenomena observed here are likely to be indicative of rumor spreading behavior across other online communication channels. The historical data

archived from Usenet allows for analysis of rumors over time, making it an attractive venue for this research.

## **Methods**

Three rumors identified by Snopes.com and UrbanLegends.About.com were chosen. Rumors were chosen based on their popularity as reported by Snopes.com and UrbanLegends.About.com and were selected to represent a range of features and qualitatively discussed behaviors. The first rumor, discussed in detail below, asserts that you must put your cell phone number on a do not call list by a certain date to avoid getting telemarketing calls. This rumor was chosen because it has been circulating for some time and, according to fact checking experts, tends to spike in popularity at certain times of year (Emery, 2010; Mikkelsen & Mikkelsen, 2009). The other two rumors are more recent and target specific political figures of opposing parties. For each rumor, queries were developed that were designed to retrieve all examples listed on Snopes.com, UrbanLegends.About.com, and when applicable, FactCheck.org, and Politifact.com.

### *Dataset and Data Collection*

To explore the patterns found in rumor spread over time a comprehensive longitudinal data set was needed. Google's archive of Usenet newsgroup posts is the most complete archive of Usenet available, dating back to 1981. The archives can be searched through the Google Groups web interface (*Overview of the Usenet Newsgroup*, 2011). This interface allows you to designate a subset of groups that you would like to search. To retrieve results from Usenet groups, but no additional sources, nine separate searches



were performed for each rumor, with each one specifying one of the nine main Usenet hierarchies (comp, news, sci, rec, soc, talk, misc, and alt). Search results were restricted to English.

Rate 1 \ Rater 2	Yes	No
Yes	71	6
No	6	93

Table 1 Rater agreements and disagreements in rumor coding decisions

Each of the results returned through Google Groups searches was read through and a decision was made about whether it was about the rumor queried. This decision was based on the description of the rumor and examples available on fact checking sites. Two independent coders read through a set of 176 results to ensure that the coding was reliable ( $\kappa = .861$ ) (see table 1). For each instance of the rumor, the group it was posted to and the date it was posted were recorded. Each message after it in the thread was also read until there was a message refuting the claim made in the rumor, meaning that if there was no refutation of the rumor, the entire thread was read. The number of posts between the initial posting of the rumor and a refutation of it were recorded as well as the time it took for the rumor to be refuted. Notes were also made about whether the first rumor-related post in a thread was a refutation of the rumor, if the person posting a rumor was questioning its truth, and if the author of the original rumor-related post was the one to later refute it.

### *Rumors and Queries*

“Cell Phone Numbers go Public next month”

According to this rumor, a directory of cell phone numbers is going to be released to telemarketing companies soon and if you do not put your number on the national “Do Not

Call Registry” by a certain deadline you will soon be receiving copious amounts of sales calls on your cell phone (Mikkelson & Mikkelson, 2009; Emery, 2010). According to UrbanLegends.About.com this rumor has been circulating since September 2004 and has come back in several incarnations (Emery, 2010). The earliest example provided by Snopes.com is also from 2004 and their analysis states that this rumor “circulate[s] especially widely each January or June” (Mikkelson & Mikkelson, 2009).

UrbanLegends.About.com rates this rumor as “mostly false” (Emery, 2010), while Snopes.com rates it false (Mikkelson & Mikkelson, 2009).

To search for this rumor the query [“cell phone numbers” & telemarketing] was used since all of these terms were present in each example of the rumor (Mikkelson & Mikkelson, 2009; Emery, 2010).

#### “Obamaphones”

A rumor evaluated by UrbanLegends.About.com, Snopes.com, Politifact.com, and FactCheck.org asserts that a policy enacted by the Obama administration provides welfare recipients with free cell phones. Though there is a program in place like the one the email describes, it is funded by telephone companies, not taxes, and was around long before Obama was elected, prompting Snopes.com to rate it as a “mixture of true and false information,” About.UrbanLegends.com to rate it “partly true, with spin,” and Politifact.com to rate it “barely true” (Emery, 2009; Mikkelson & Mikkelson, 2010; Richert, 2009; Bank, 2009). FactCheck.org emphasizes that Obama has little to do with the program and traces the policy foundations behind it back to Woodrow Wilson’s time in office (Bank, 2009).

According to UrbanLegends.About.com this rumor has been circulating since October 2009 (Emery, 2009).

Based on all the examples provided by Snopes.com, UrbanLegends.About.com, FactCheck.org, and Politifact.com (Mikkelson & Mikkelson, 2010; Emery, 2009; Bank, 2009; Richert, 2009) the query [obamaphone | “obama phone”] was used to retrieve instances of this rumor.

“The books Sarah Palin tried to have banned”

Prior to the 2008 presidential election, a number of rumors circulated on the Internet about vice presidential candidate Sarah Palin (Jackson, Henig, Kolawole, Miller, & Robertson, 2008). One of the most salient rumors surrounded her supposed attempts to ban books from the Wasilla Public Library during her time as mayor. The details of her interactions with Wasilla librarians and whether or not she ever actually asked to have books removed is unclear. However, Snopes.com, UrbanLegends.About.com, Politifact.com, and FactCheck.org all deem the message going around, which claims to contain a list from “the official minutes of the Wasilla Library Board” of books Sarah Palin wanted to ban, to be false. In fact, several of the books on the list were not yet published at the time Palin was mayor (Mikkelson & Mikkelson, 2008; Emery, 2008; Farley, Holan, & Hollyfield, 2008b; Jackson et al., 2008). According to UrbanLegends.About.com this rumor has been circulating since September 2008 (Emery, 2008).

The query [palin & books & ban] was used to find examples of this rumor. This returned many posts about Sarah Palin’s supposed attempts to ban books from the Wasilla library, some of which were extreme enough in their denouncements that they could likely

be qualified as rumor, but because the exchange that actually occurred between Sarah Palin and the librarian at the Wasilla Public Library, and thus the truth value of these statements, is unknown (Farley, Holan, & Hollyfied, 2008a) this study focuses specifically on cases where a specific list of books is mentioned.

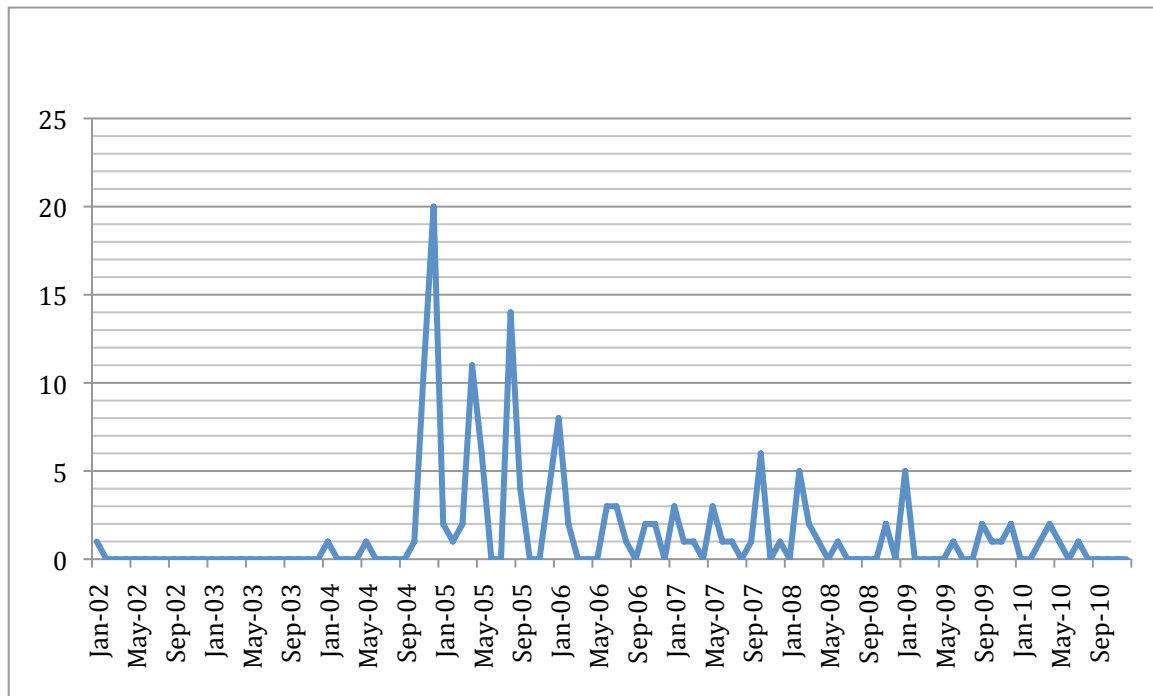
## Results

Table 2, below, outlines the overall findings. The rumor about cell phone numbers going public was found more times than the other two rumors. The rumor about the books Sarah Palin tried to have banned was the next most frequent, but over half of the instances found were cases where the rumor was debunked by the very first post. I refer to this type of posts as a “pre-emptive debunking.” The Obamaphones rumor was only found 13 times, but had the highest percentage of instances without refutations. Detailed findings for each rumor are described in the sections below.

Rumor	Total Instances	Instances Without Denials	Pre-emptive Debunkings
“Cell Phone Numbers go Public next month”	147	32	24
“Obamaphones”	13	6	3
“The books Sarah Palin tried to have banned”	75	3	53

Table 2 Overview of findings for each rumor

## “Cell Phone Numbers go Public next month”



**Figure 1** Number of threads containing the rumor “cell phone numbers go public” each month

The rumor that cell phone numbers are going public was found in 147 different threads between February 19, 2002 and July 6, 2010. 15 of these messages were duplicates because of cross-posting, so only 134 of the messages were unique. However, cross-posted message can lead to different threads in each newsgroup because responses may not be cross-posted. Figure 1 depicts the number of threads containing this rumor found each month, demonstrating how the rumor continues to reappear despite having been debunked. Contrary to the pattern described by David and Barbara Mikkelson of Snopes.com, the rumor does not seem to appear more often in January and June than in other months. In fact, the times it appears the most are December of 2004, April of 2005, and August of 2005, where it occurs 20, 11, and 14 times respectively.

This rumor was spread across 94 distinct groups with each group averaging 1.427 threads containing the rumors (range = 1-6, stdev = .799, median = 1). The groups with the most threads related to this rumor were comp.dcom.telecom (6 threads), alt.cellular (4 threads), rec.outdoors.rv-travel (4 threads), alt.cellular.verizon (3 threads), alt.x.y (3 threads), soc.culture.cuba (3 threads), and soc.senior.issues (3 threads).

In 5 of the cases of this rumor being spread, the original poster of the rumor was the one to later debunk it and in 14 instances, the original post author was questioning the claim's legitimacy. 32 of the threads did not contain any sort of refutation of the rumor. On the other hand, in 24 of the threads the very first post debunked the rumor. When a refutation of the rumor was present in the thread and it was not the first post, there were between 0-5 posts in the thread between the rumor and the refutation and between 1-54,345 minutes (equivalent to 37 days, 17 hours, and 45 minutes) until the refutation. On average there were .549 posts and a median of 38 minutes between the rumor and denial (mean 1021.099 minutes; stdev. = 1.098 posts, 5,877.431 minutes; median = 0 posts).

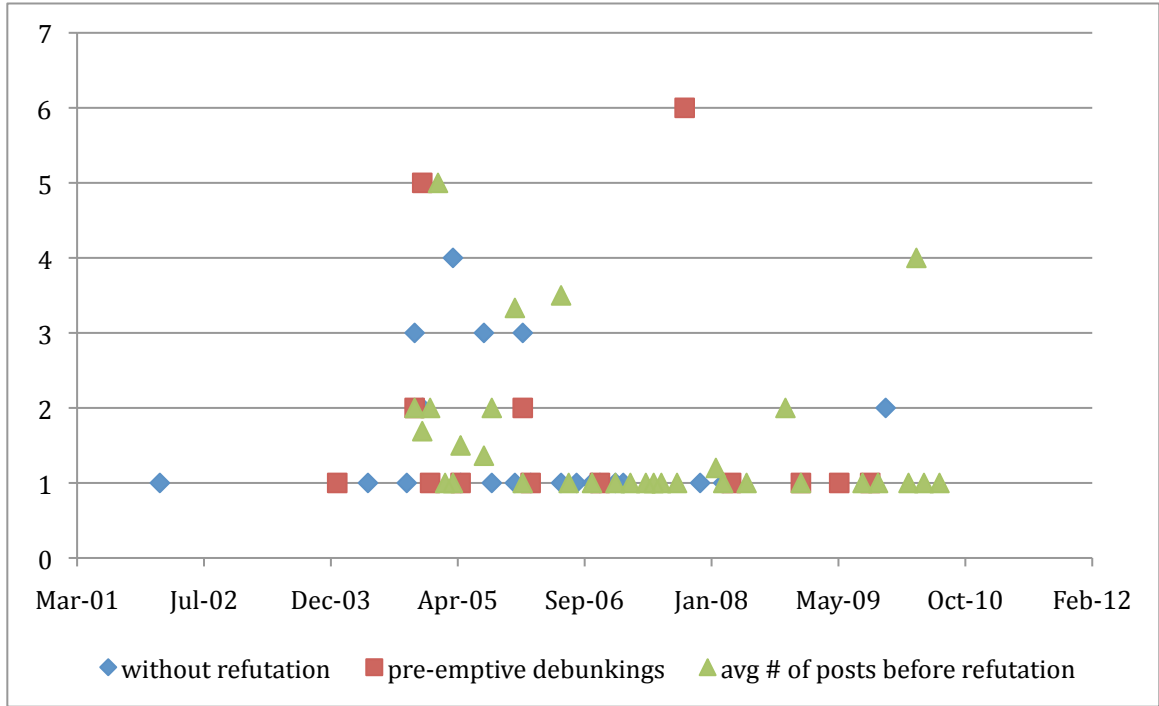


Figure 2 Number of “cell phone numbers go public” posts per month separated by time till debunking occurs

These findings are represented in figure 2, which demonstrates that there were more cases when the rumor was not debunked early in the rumor’s life cycle, with the maximum of 4 cases in one month occurring in April of 2005. The most pre-emptive debunkings occurred in October of 2007, with 6 cases found. For the most part, the average time taken to refute the rumor declines over time, settling around 1 post. However, there are a few cases that deviate from this pattern, like April of 2010, where it took 4 posts on average.

## “Obamaphones”

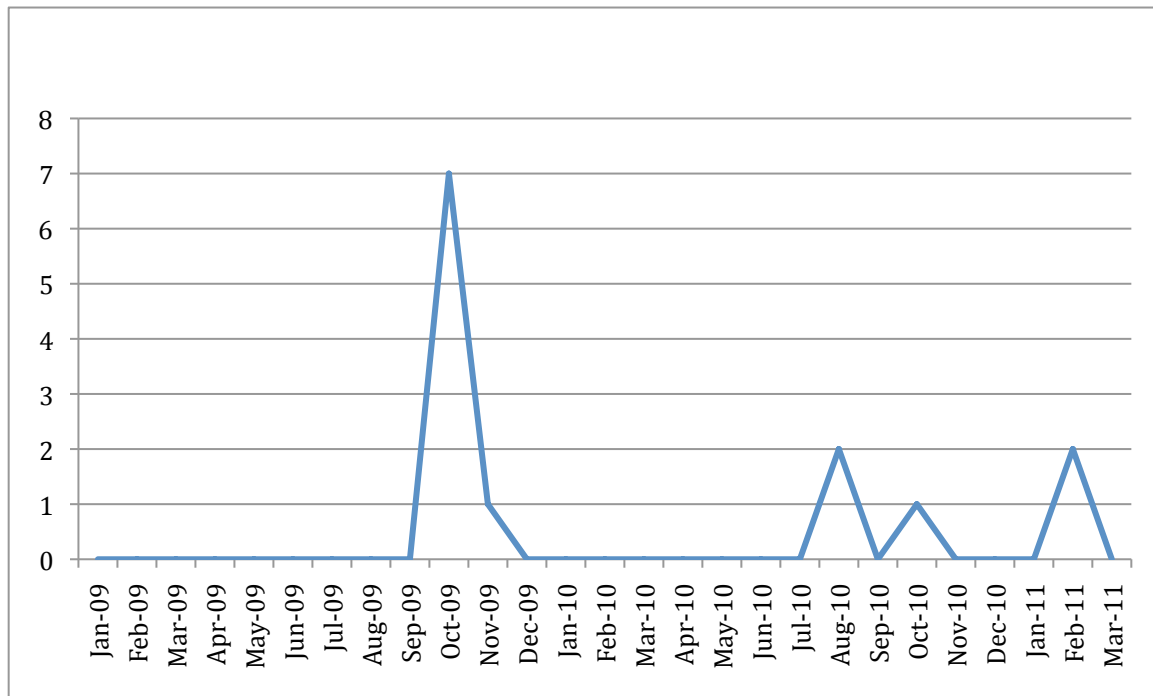


Figure 3 Number of threads containing the “Obamaphones” rumor each month

Examples of this rumor were found from October 25, 2009 to February 14, 2011 across 13 threads. None of these messages were cross-posted. As shown in figure 3, this rumor occurred most frequently in October of 2009, with 7 postings. Although an instance of this rumor was seen as recently as February 2011, its prevalence appears to have dropped off. Threads containing this rumor were spread across 11 groups with an average of 1.182 posts per groups (range= 1-3; stdev. = .603; median = 1). The only group with more than one thread related to this rumor was alt.gossip.celebrities, which had 3 threads.

In 6 of these threads the rumor was never refuted, while in 3 the first message was a denial. When the original post was not a refutation of the rumor and a denial was present, there were an average of .5 posts and a median of 47 minutes between the rumor and a correction of it (mean = 298.25 minutes; range = 0-1 posts, 9-1,090 minutes; stdev = .578



posts, 528.824 minutes; median = .5 posts). As shown in figure 4, this rumor was spread without being debunked the most times in October of 2009, when it first appeared. However, the most recent post also went without a refutation. The three cases of pre-emptive debunkings of this rumor are distributed over its life cycle.

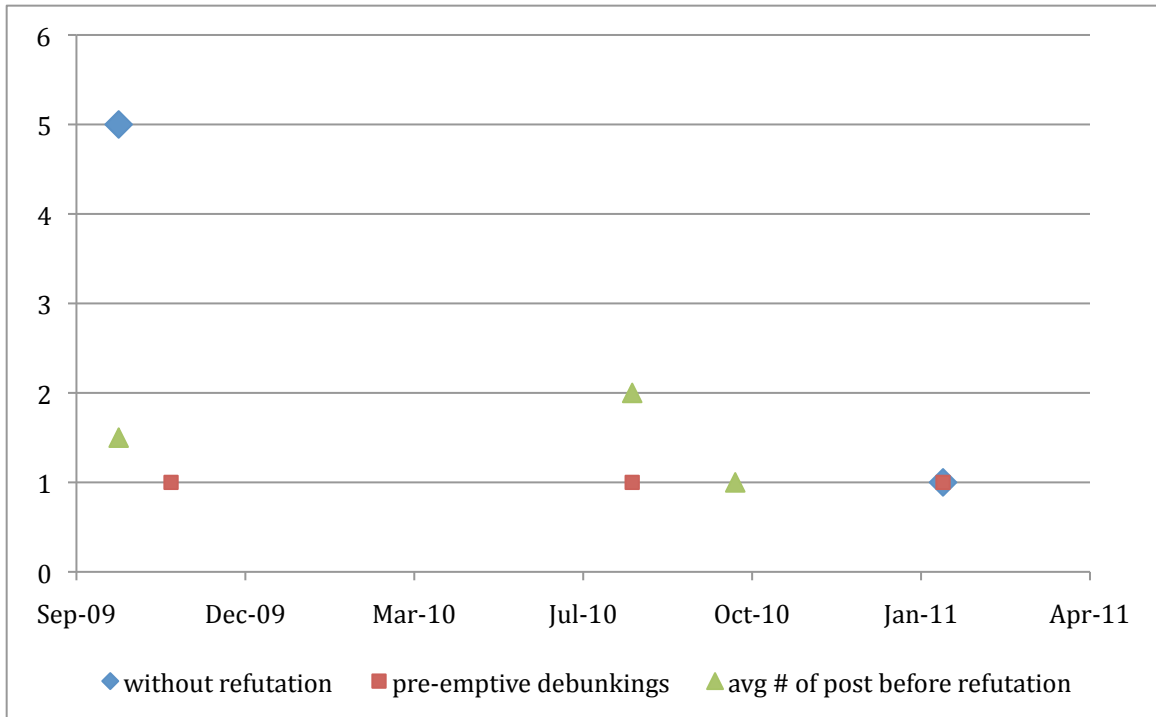


Figure 4 Threads containing the “Obamaphones” rumor each month, separated by when debunkings occur

## “The books Sarah Palin tried to have banned”

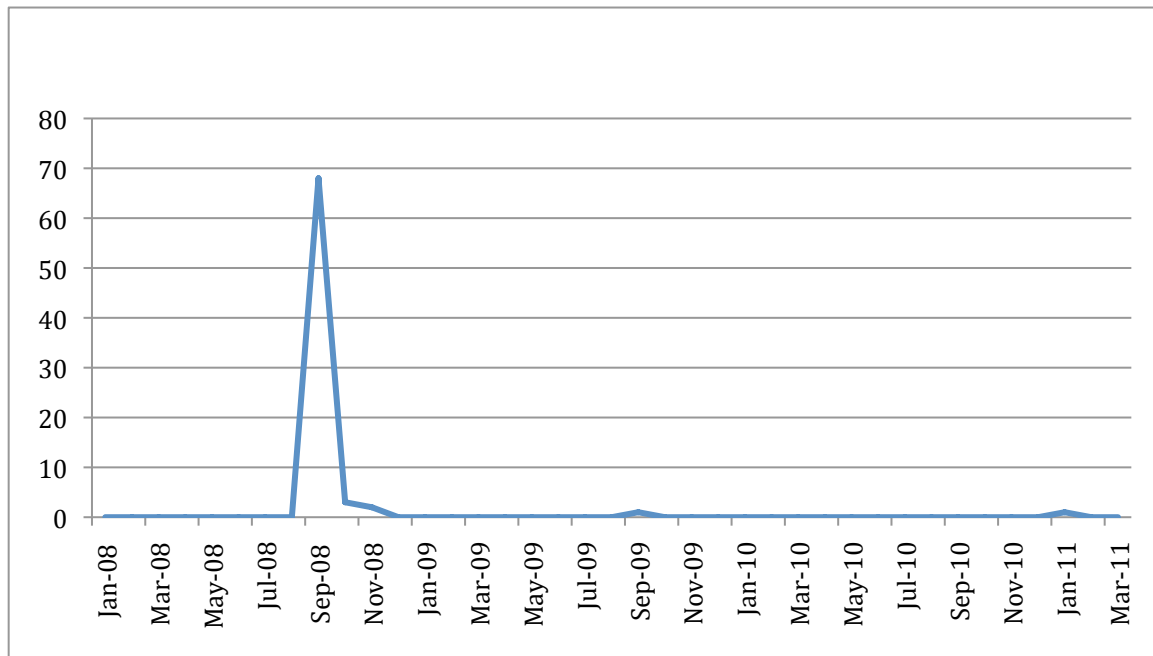


Figure 5 Number of threads each month containing the rumor about a list of books Sarah Palin tried to have banned

Threads containing this rumor were found from September 3, 2008 to January 7, 2011. There were a total of 75 instances found. 11 of these were duplicates because of cross-posting, so 64 of the messages were unique. This rumor was found in 47 different groups. On average these groups each contained 1.596 instances of the rumor (range=1 – 7; stdev.= 1.409; median=1). As seen in figure 5, this rumor occurred often in September of 2008 and rarely after that. The rumor was most commonly found in the groups alt.fan.rush-limbaugh and talk.politics.misc. There were 7 threads containing the rumor found in both of these groups. The next most common places where the rumor was posted were soc.retirement (5 threads), soc.culture.usa (4 threads), and rec.music.makers.guitar.acoustic (3 threads).

3 of these threads did not contain a refutation of the rumor and in 53 of these cases the first occurrence of the rumor was a denial. In all the other threads there was an average of 1.895 posts and a median of 35 minutes between the rumor and a refutation of it (mean = 267.579 minutes; range = 0 – 15 posts, 6 – 1,866 minutes; stdev = 3.43 posts, 539.772 minutes; median = 1 post, 35 minutes). Figure 6 outlines the temporal patterns found in how long it took for this rumor to be debunked.

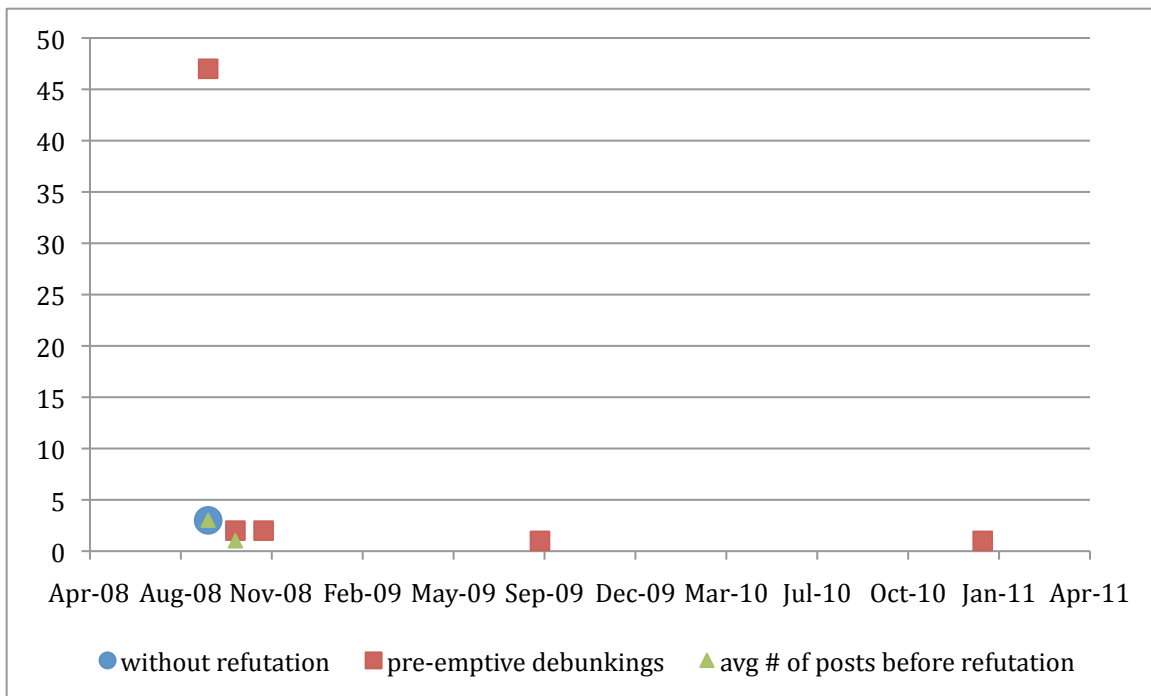


Figure 6 Number of threads each month containing the rumor about the list of books Sarah Palin wanted to ban, separated by how long it took for debunkings to occur

## Discussion

### *Temporal Patterns*

All three of the rumors investigated saw declines in the number of instances found over time. The prevalence of the rumor about cell phone numbers going public fluctuates the most. This is somewhat surprising given that this is also the only rumor of the three

that contains time-sensitive material. Logically, one might think that a rumor that “cell phones go public next month” would decline after that month has passed. Instead, this rumor recurs, often in identical form. The findings pertaining to this rumor also reflect that the intuitions of fact checking experts may not be accurate in describing overall patterns. If the pattern seen in how this rumor recurs is common among Internet rumors, one would expect to see similar fluctuations in prevalence in the rumors about Palin and Obama, especially since these rumors lack an expiration date. However, both these rumors saw sharp declines in prevalence.

There are a number of possible reasons why the cell phone numbers rumor continues to appear, year after year, while the rumors about Obama and Palin seem to have trailed off. One option is that this is an indication of the importance of topical relevance on rumor popularity. The rumors about Palin and Obama may have played a role in the political discourse of the time surrounding the 2008 election and Obama’s early days as president. Now, they may seem less important as new political issues and rumors take precedence. In contrast, peoples’ level of concern about receiving telemarketing calls on their cell phones may be more constant.

Another possibility is that the deadlines described in the cell phone numbers rumor give it urgency. People may feel that it is more important to share the information with as many people as possible because of the impending deadline. It is also possible that the patterns seen in the cell phone numbers rumor are simply atypical, despite what fact-checking experts say. On the other hand, the rumors about Palin and Obama have not been circulating as long as the cell phone numbers rumor. Similar patterns may emerge over time.

Common sense predicts that the length of time since a rumor began circulating would be inversely related to the amount of time until someone debunks an instance of it. It would also make sense to see more cases where the rumor is not refuted early in its life cycle because fewer people know enough about the rumor to debunk it. These intuitions are backed up by our findings to some extent. For the rumor about cell phone numbers going public it took people longer to debunk the rumor on average and there were more cases where the rumor was never debunked during the period where it peaked in overall prevalence from late 2004 to 2005. The rumor about “Obama phones” was posted without receiving a refutation the most times in October 2009, when it began circulating. The posts about the rumor discussing the list of books Palin wanted to ban are somewhat more surprising. Most of the early instances of the rumor found among Usenet groups are pre-emptive debunkings. This implies that the rumor may have been spread elsewhere, through email, media, or in person communications, for example, before reaching Usenet.

### *Pre-emptive Debunking*

Though the role and efficacy of rumor denials has been explored by social psychologists (Bordia, DiFonzo, Haines, & Chaseling, 2005) the concept of pre-emptive debunking has not been addressed. This is surprising given the findings of this exploration. 53 of the 75 examples of the rumor about the list of books that Palin wanted to ban were cases of pre-emptive debunking, as were 24 of the 147 instances of the rumor about cell phone numbers going public, and 3 of the 13 examples of the rumor about “Obama phones.”

These pre-emptive denials may appear to simply combat the spread of rumors, but may also be playing other roles in shaping discourse about these topics. Further analysis is needed to broadly characterize the role that these pre-emptive denials play, but cursory inspection yields three main functions that these types of refutations seem to have. The first is combative. In these cases, the refuter uses their denial of the rumor to negatively portray those who are spreading the rumor. For example, one thread is labeled “LIST OF LIBRARY BOOKS BANNED BY PALIN IS TYPICAL LIBERAL DEMOCRAT LIE.” Another is headed “More Lies from Dems about Palin Debunked.” By revealing false hoods and attributing their spread to the Democratic Party, people debunking the rumor in this way are able to contribute to a certain portrayal of Democrats.

The second role that pre-emptive debunkings seem to play is preventative. By debunking a rumor, the poster aims to quell the spread of misinformation. These tend to take the form of “I’ve seen this going around and just wanted to make sure everyone knew that it’s not true.” With rumors that are not about polarizing topics, like the rumor about cell phone numbers going public, the effects of this are likely to be benign, even if it increases discussion of the rumor.

Some of the pre-emptive debunkings related to the rumor about the list of books Sarah Palin wanted to ban illustrate another role these refutations can play in further complicating the spread of a rumor. Though the list of books circulating is entirely fabricated, the accuracy of statements discussing Palin’s attempts, or desires, to have books removed from the public library is less clear-cut. In many cases, mentions of Palin’s attempted book banning were countered with a link to one of the popular fact checking sites debunking the fraudulent list. In this way, pre-emptive debunkings played a defensive

role, dissipating conversations about a controversial topic where the actual occurrences and truth-value are unclear. Over-generalizing the debunking of a specific falsehood allowed Palin supporters to dismiss an entire class of statements with varying degrees of truth.

Regardless of the larger role they play, pre-emptive debunkings contribute to conversations about rumors. Whether these contributions aid in attenuating these rumors or help them to propagate further, by sparking related discussions, is unclear. Further work that is able to isolate the effects of pre-emptive debunking would be helpful in gaining a better understanding of this process.

### *Study Limitations*

Though searching for rumors in Google's archive of Usenet postings had many advantages, namely providing access to a comprehensive collection of postings beginning from before any of the rumors investigated started, this method had several limitations. The most troublesome drawback was that search results are dependent on Google's search algorithm. By formulating broad queries for each rumor, we attempted to protect against any potential repercussions of relying on Google's search functionality. However, a dataset over which we had more control could allow for more thorough analysis. Another drawback of the dataset used was that usage of Usenet for conversational postings has declined in recent years. Finally, the people still using Usenet are a self-selected group that may have unusual models of Internet usage that effect how they spread and react to rumors.

One of the main advantages of exploring Usenet data is that it allows you to get a relatively comprehensive picture of the entire community. Although this is one of the reasons Usenet was chosen for this study, it is worth noting that it is possible that rumors spread on the Internet today propagate across multiple platforms. It would be interesting to learn more about how this process takes place.

## **Conclusion**

Investigating the prevalence of three common Internet rumors across Usenet groups demonstrated that, as urban legends experts suggest, rumors do tend to circulate long after they are known to be false. However, in general when posted, the rumors examined in this study were debunked very quickly, with the median number of posts between a rumor and a denial of it being 1 or less in all three cases and the median time less than an hour. The recurrence of the rumor about cell phone numbers going public, despite its out-datedness, combined with the patterns found with the other two rumors where the rumors peaked in prevalence around the 2008 presidential election, leads to questions about whether a temporal pattern for online rumor prevalence can be generalized. Topical importance seems to play an influential role in patterns found.

This exploration also revealed the frequent occurrence of “pre-emptive debunking,” where a rumor is refuted before it has been introduced. Further work is needed to investigate the role that these types of posts play in the life cycle of a rumor. Overall, this work, using Usenet data, adds quantitative data to support common conceptions of how rumor prevalence changes with time and identifies areas that would be interesting to investigate further.



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