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Terrorism in the News: The Efficiency and Impact of Sampling Methods on Data Collection and Content Analysis

William S. Parkin[a] and David A. Green[b]

[a]Criminal Justice Department, Seattle University, Seattle, WA, USA; [b]Department of Sociology, John Jay College of Criminal Justice, CUNY, New York, NY, USA

ABSTRACT

This study identifies the most efficient methodology for sampling from a population of *New York Times* articles related to terrorism, which were generated through keyword searching. Efficiency was based on which sample statistic was closest to the population parameters of interest. The smallest sample size, where 68 percent of the sample statistics were within one standard deviation of the population mean and 95 percent of the sample statistics were within two standard deviations of the population mean, were identified as the most efficient. In addition, we determine whether the frequency of news articles is correlated to the temporal distribution of terrorist incidents found in the Global Terrorism Database, which could possibly be utilized to more efficiently sample from the population. Our findings confirm prior research that shows that sampling efficiency is related to the weekly news cycle and, contrary to prior research, the sample must include between 20 to 29 constructed weeks to achieve representativeness of an entire year of coverage for a population generated through keyword searches. In addition, the study also found that there was a limited relationship between the frequency of terrorist incidents and the amount of terrorism coverage in the news.

This study seeks to determine the most efficient way to sample print media content about terrorism. Specifically, when data is accessed electronically through keyword searches and a researcher is not worried about attributes of a specific medium (e.g., number of photographs per newspaper edition), but is instead interested in attributes of a specific topic reported in that medium (i.e., terrorism). The ability to randomly sample a population is important in terrorism studies that rely on content analysis of media sources. Two reasons for this are because populations of interest can be large, as well as because a requirement of inferential statistics is random sampling.[1] To test sampling efficiency, we used a population of *New York Times* articles related to terrorism to determine the most efficient sample size and sampling methodology. We found that the constructed-week sampling method is most efficient. However, because of the large variations in the nature of terrorism content, between 20 and 29 constructed weeks were required before characteristics of the sample adequately

CONTACT William S. Parkin, Ph.D. parkinw@seattleu.edu Criminal Justice Department, Seattle University, 901 12th Avenue, Seattle, WA 98122, USA.

represented the population. We also conducted a secondary analysis to determine whether there is a relationship between the distribution of terrorist incidents and the distribution of newspaper articles that reference terrorism. This relationship, if it exists, also has the potential to inform an appropriate method for efficient sampling of keyword specific content.

This study is important because research relying on the content analysis of media accounts of terrorism can influence public perception and policy. According to Krippendorf, content analysis "seeks to analyze data within a specific context in view of the meanings someone—a group or a culture—attributes to them."[2] Developing sound, empirical methodologies utilizing media sources and content analysis to study terrorism and other topics is important, especially considering the scholarly criticism of such methods. Among these criticisms are the charges that such analyses say nothing about the critical choices made during the news production process on the front end, or effects of content on audiences on the back end.

There remains, however, a constellation of important questions that only the analysis of content can answer. For one thing, content analysis of a sample of articles can provide a useful starting point in any study of newsmaking or news production. Inferences made from the content one finds in news outlets' coverage of a particular topic can shape the kinds of questions one might ask of newsmaking personnel in survey, interview, or ethnographic approaches to news production. On the back end, audience effects research, which examines whether the media is altering or reinforcing a perspective in its audience, must be linked to content to be meaningful.[3] For example, audience effects research has shown that consumers were more likely to perceive that television or newspaper coverage of a large-scale terrorist event helped them cope with the trauma of the event, compared to Internet news sources.[4] Other studies have examined whether media consumption can affect an individual's fear of terrorism,[5] as well as their perception of victimization risk.[6] In short, then, in spite of its limitations, content analysis remains an important methodological tool for researchers interested in a range of media-related questions and the results of such analysis rely on the validity and reliability of a researcher's sampling method.

Media researchers face a series of consequential choices when developing a research approach reliant on content. Among these is the decision whether to analyze an entire population of content or a representative sample of the content population. Often the latter is the only manageable option, and yet, except for those that focus on the attributes of print media (e.g., newspapers and magazines), there are few studies that empirically identify the best—that is, the most reliably efficient way to reproduce a valid, representative sample—means of sampling content about a particular topic in a given news source or medium. Identifying an efficient and reliable method for sampling a specific topic is important in terrorism research, which has historically utilized open-source data, such as news articles, to not only identify political violence,[7] but also to examine the social construction of terrorism related issues,[8] and the relationship between the media and terrorism.[9]

Studying Mass-Mediated Terrorism

Researchers in the field of terrorism studies have long discussed the complicated relationship between terrorism and the media.[10] Normative debates have raged recently about the proper role of the news media when covering events like the Boston bombings or the gruesome murder of a British soldier on a London street. Nacos[11] states that the media, however

inadvertently, provide terrorists a means to communicate their message to the public and to governments. Thus, she argues, most terrorism is "mass-mediated terrorism."[12] There is evidence that terrorist organizations understand and use to their advantage the organizational goals and processes of the news media.[13] Chermak and Gruenewald, however, argue that based on their analysis of the print coverage of domestic terrorism in the United States, which demonstrated that many acts of terrorism go unreported in the news, "researchers have probably overstated the overall importance of achieving media publicity for terrorists balancing the risks and rewards of carrying out an incident."[14]

Some terrorism studies using content analysis do not need to draw representative samples from their units of analysis, often because entire article populations are of a manageable size to analyze without sampling. Altheide's examination of terrorism and the "politics of fear"[15] and Atwater and Green's study of network coverage of the 1985 Trans World Airlines (TWA) hijacking instead examine a specific population of news articles, which itself is purposefully selected.[16] In a content analysis of four newspapers over a year-long period, Papacharissi and Oliveira used keywords to identify their population of articles from Lexis-Nexis and examined the frames employed by journalists to discuss terrorist attacks post-9/11.[17] Nossek[18] and Parkin et al.[19] are examples of studies that follow news coverage from the perpetration of a terrorist act to the point when the initial coverage subsides. For studies like these, the size of the article population of interest and the methodologies employed allow for a manageable research study.

However, other studies of media and terrorism require a different method. When a population is too large to analyze, a broad and diverse set of sampling techniques has been utilized to examine a subset of the population. Through a content analysis of terrorism in major news magazines, Simmons and Lowry conducted a simple random sample of 50 percent of the articles listed in their population source, *The Readers Guide to Periodic Literature*. These articles were listed under the heading of either "terrorism" or "terrorists" and were printed in *Time, Newsweek*, or *U.S. News & World Report* between 1980 and 1988.[20] Gerstenfeld, Grant, and Chiang used purposive sampling to conduct a content analysis of extremist websites.[21] One study that examined emotionality related to terrorism coverage, selected a subsample of news articles by removing transcripts of 100 words or less to decrease the overall sample size.[22] These methods are surprisingly diverse, and even more surprising is that several of these studies offered no justification for the chosen sampling technique. For example, Simmons and Lowry gave no explanation for their decision to sample 50 percent of the population.[23] Arbitrary sampling decisions with no explanation or justification have historically been an issue in communications research.[24] Clearly more rigor in the selection of samples is needed.

The current study seeks to build on the foundations of prior research, both in the fields of communications and terrorism research, by examining sampling efficiency in a subject population derived through keyword searches of the *New York Times*. Although prior research has discussed the appropriate criteria for keyword searches of electronic resources for the purpose of content analysis,[25] how researchers determine the appropriate method for efficiently sampling from such large bodies of content has received very little attention.[26] Our population of interest, as well as the subsequent analyses, seek to determine the most efficient way to sample from a population when conducting a content analysis of a specific topic discussed in the print media. For instance, and specifically, what sampling methodology would be most efficient if a researcher wanted to study changes in the usage of terminology

related to terrorism in a daily newspaper, such as the *New York Times*? In addition, we use the Global Terrorism Database (GTD) to determine whether the distribution of articles related to terrorism are correlated to the distribution of terrorist incidents, which could help in determining which sampling method is most efficient, and why.

The Validity of Population Sampling Methods

In media-related research, methods of population sampling need to be justified, preferably using prior empirical research for validation. Otherwise, it is impossible for researchers to reliably extrapolate their results to the population of interest. To identify valid and reliable methods, sampling efficiency studies have been conducted to determine the best way to sample from daily print newspapers,[27] weekly newspapers,[28] monthly magazines,[29] and television news programs.[30] We extend these efforts by identifying the most efficient means of sampling a population of terrorism-specific newspaper articles identified through keyword searches.

For the examination of terrorism-related content, like other types of news media research, the news cycle and the newshole are important concepts to consider when determining the most efficient sampling methodology. The news cycle refers to when and how much news must be produced for a specific medium. For many newspapers, there is a 24-hour news cycle, based on when a story must be completed so it can be printed for the daily edition of the paper. In print media, the newshole can be operationalized as the amount of space that is not dedicated to advertising.[31] The newshole will systematically vary from day to day based on how much of a publication is dedicated to advertising. For example, Wednesday and Sunday editions of daily newspapers will have more space for news because they print more advertising on those days.[32] Due to this, the amount of space a newspaper has available to print non-advertising content varies during the week. Prior research on sampling efficiency has verified that this systematic variation impacts sampling, and failure to accommodate newshole changes will compromise the integrity and validity of a sample. Therefore, stratified random sampling in the form of the constructed-weeks method is best for daily print newspapers.[33] Constructed-week sampling randomly selects one or more days from each day of the week from the time period under study. This ensures that variations in the size of the newshole will not skew the sample. For example, if prior research ascertained that the most efficient method of sampling was two constructed weeks from a year of coverage, than the researcher would randomly select two Sundays, two Mondays, two Tuesdays, and so on, from all possible days of the year.

When examining six months of coverage, Riffe, Aust, and Lacy found that one constructed week was more efficient at representing six months of coverage than both simple random sampling and consecutive day-week sampling, a method that randomly selects a starting point and analyzes data from the next seven days.[34] Extending the time frame, a similar study found that nine constructed weeks adequately represented the population of coverage for a five-year period.[35] For weekly newspapers, randomly selecting issues based on a monthly stratified sampling technique was efficient at 12 issues from a population of 52.[36] For monthly magazines, a constructed year was the most efficient means to draw a sample from a five-year period.[37] The efficiency of each of these methods was based on which sample statistic was closest to the population parameters of interest. The smallest sample size, where 68 percent of the sample statistics were within one standard deviation of the

population mean and 95 percent of the sample statistics were within two standard deviations of the population mean, were identified as the most efficient.

Extending sampling efficiency research to online, news-aggregation sites, Hester and Dougall studied news articles linked through Yahoo! News.[38] Their results showed that depending on the variable of interest, anywhere from two to five constructed weeks should be sampled before the sample reliably represents the six-month population. This means that in the medium of online news aggregation, researchers would need to sample between four and ten constructed weeks for each year under study, a substantial increase in sample size from those studying the daily print newspapers.

For the most part, however, these methodological studies have used attributes of the *medium* to develop their sample populations, not attributes specific to a particular *topic*. In other words, these studies are concerned with capturing an accurate representation of the range and type of content produced by a particular news outlet. They do not, however, provide guidance about how to draw an accurate, representative sample of content about a particular topic from a given news outlet. This study does, by focusing on the news media's treatment of the issue of terrorism. In addition, although prior research on print media shows that the most efficient sampling methods are informed by systematic variation in the newshole, no research has examined whether variation in real world events related to the topic under study can help inform one's sampling methodology. As stated, this research contributes to the extant body of literature by (1) identifying the most efficient method for sampling from a subject-specific population of news articles on terrorism and (2) utilizing existing data on terrorism events to examine what impact, if any, temporal variations in terrorist activity have on newspaper coverage.

Method

The population of interest for this study consists of all articles printed in the *New York Times* in 1990 that contained the words "terrorism" or "terrorist(s)" in the headline, the body, or the assigned subject headings. The inclusion of subject headings allows researchers to not only analyze the use of the terms when printed, but also scenarios in which terrorism/terrorist(s) were not used in the text, yet the topic of the article was still related to terrorism. The *New York Times* was selected as it is one of the most commonly used newspapers in social science research, has both a national and international focus, is often referenced as "the paper of record," consistently has one of the largest circulation numbers in the United States, and is easily accessible for research purposes (all of its issues are electronically archived from 1851 to the present). The year 1990 was chosen because it represents a time period prior to the first World Trade Center attack in 1993, the 1995 Oklahoma City bombing, and the attacks of 11 September 2001—all domestic events that have the potential to disproportionately impact media coverage related to terrorism for an extended period after their occurrence. Moreover, 1990 also preceded the arrival of the Internet and 24-hour news networks on the media landscape, and their myriad impacts on journalism, public expectations, and news production processes. Finally, feasibility was also a concern as even one year of content resulted in a large amount of data that took time to clean and code. Our focus, then, is intentionally narrow and allows for a "cleaner" analysis of topic-relevant content. This developed methodology can be utilized and replicated, not only for historical research of traditional print

mediums, but also for large databases of news content that include new mediums that can also be keyword searched (e.g., blogs, 24-hour news channel transcripts).

The population of articles was gathered using Lexis-Nexis Academic and by searching for the terms "terrorism," "terrorist," or "terrorists." The articles, along with their key attributes, were downloaded from the database. The attributes of each article were then coded and used for the analysis. The variables that were automatically coded using the data produced by Lexis-Nexis included the desk of origin (National, Foreign, Metro, Other), the word count of the article, and whether the search term was present in the text of the article (either the body or the heading). The other variables, such as whether an image was associated with the article (either in the form of a picture or graphic), whether an article was on the front page, or had prominent placement (above the fold and on the front page), were recorded by coders. Similar to Lacy et al.,[39] no reliability check was needed for these variables due to the straightforward and objective coding procedures. The coders also accessed Proquest Academic and downloaded the scanned image of the article, as well as the scanned image of the page on which the article appeared. The collection of the article in its original format addresses the criticism that electronic sources produce text-only data, removing content from its original context, making it impossible, for instance, to perceive contextually an article's placement.[40]

This process yielded 1,097 articles that varied widely in their relationship to terrorism. For example, one article used the term "terrorist" while discussing nonviolent animal-rights activists[41] and another used the term as a label given to the assassination of Rabi Meir Kahane by his political enemies.[42] The term "terrorism" appeared in articles that detailed international trials[43] and criminal acts committed in South Africa under apartheid.[44] Some articles contained one of the keywords, but had nothing to do with terrorism. For example, an article from the Arts & Leisure Desk referring to "artistic 'terrorism.'"[45] Finally, in some articles the search term appeared only in the subject heading assigned by Lexis-Nexis. These articles ranged from an overview of Margaret Thatcher's political career and an assassination attempt directed at her by the Irish Republican Army[46] to a news brief about a Palestinian denying his involvement in an airline bombing.[47] If a researcher is examining the context of terrorism and related terminology in the print media, all of these articles represent an important piece in the overall picture.

In addition to the population of articles that represent the framing of terrorism, the article-level data were aggregated to comprise an issue-level dataset so that characteristics related to terrorism in each print issue were captured. This resulted in a population of 365 *New York Times* issues for the year 1990. For each issue, variables were created that described, in various ways, the frequency of terrorism-related articles printed in each issue. For example, the number of terrorism-related articles that were in a prominent position (front page above the fold) was captured, as well as the average length of article per issue. Although access to large databases of electronic versions of news media coverage can make traditional techniques such as issue sampling unnecessary, aggregating to the issue level allowed for the testing and comparison of varying sampling methodologies.

Three methods were used to determine the most efficient sampling technique. The first was a simple random sample of all articles. The second was a random sample of the issue population. The third was a random, constructed-week sample of the issue population. One hundred samples were taken from each population to measure the efficiency of each technique. As in prior research,[48] sampling efficiency was reached when 68 percent of sampling statistics were within one standard error of the population parameter and 95 percent of

sampling statistics were within two standards errors of the population parameter. If the percentage of sampling statistics reached this threshold, but subsequently dropped below it in additional samples, then the first time it met the criteria was not counted. The sampling began at two constructed weeks and its mathematical equivalent, fourteen random issues, and 3.8 percent of the population of articles. Samples sizes were increased by one week (or the equivalent), until the samples consistently met the 68 percent and 95 percent criteria.

In addition, the coefficient of variation (CV), which represents the amount of variation in the population of articles, was calculated for each variable. Measuring the CV is important. When it is greater than .5, prior research suggests that oversampling should occur because of the impact that increased variation may have on the ability of sampling statistics to represent population parameters.[49] Similarly, research has also found that variation in subject categories (e.g., terrorism coverage) could potentially be larger than the variation found for the entire medium (e.g., a newspaper).[50]

Also, although it is known that news coverage will systematically vary based on the size of the newshole for each day of the week, the impact of the frequency of real world events on coverage is not known. In an attempt to study this, data on the temporal distribution of terrorist incidents in 1990 was also collected to compare variation in the frequency of terrorism/terrorist(s) articles over time to the frequency of incidents. The GTD is an incident-level, open-source database representing one of the most complete collections of data related to terrorism in the world.[51] Although some terrorist events in the GTD were undoubtedly identified by their coverage in the *New York Times*, which could increase the correlation between the number of terrorism attacks and the amount of terrorism coverage, the database utilizes multiple sources, which reduces the likelihood of this being an issue. Specifically, the GTD, which originates from data collected by Pinkerton Global Intelligence Services (PGIS), utilizes

> wire services (including Reuters and the Foreign Broadcast Information Service [FBIS]), U.S. State Department reports, other U.S. and foreign government reporting, U.S. and foreign newspapers (including the New York Times, the British Financial Times, the Christian Science Monitor, the Washington Post, the Washington Times, and the Wall Street Journal), information provided by PGIS offices around the world, occasional inputs from such special interests as organized political opposition groups, and data furnished by PGIS clients and other individuals in both official and private capacities.[52]

Although the GTD is an incident-level database, it was useful for aggregating the number of terrorist incidents that occurred on each day of the year, during each week of the year, each month, and finally, each day of the week. These totals were then correlated with the number of articles published in the *New York Times* during the corresponding time periods. These data were used to help determine whether articles that employed the term "terrorism/terrorist(s)" were correlated with the raw count of terrorist incidents. That is to say, was there a relationship between the news cycle and the cycle of terrorist incidents and, if so, how might this inform the most efficient way for sampling from a population?

Analysis and Results

Population Characteristics

Table 1 presents the percent of articles with the coded characteristics from the population. For example, 87.1 percent of the articles in the population had the word terrorism, terrorist,

Table 1. Article descriptives ($N = 1{,}097$).

	Percent	*n*
Terror Present	87.1	956
Front Page	9.4	103
Prominent Place	6.6	72
Editorial Section	11.8	129
Foreign Section	52.8	579
Metro Section	7.7	84
National Section	5.8	64
Other Section	22.0	241
Image	37.5	411

and/or terrorists somewhere in the heading or body (Terror Present). Of all the articles in the population, 9.4 percent were on the front page, while 6.6 percent had a prominent place above the fold on the front page. More than half of the articles published in 1990, which were in some way related to a derivative of the term "terrorism" or "terrorist," were published by the Foreign Desk. Also of interest, 37.5 percent of the articles included an image.

The articles were also aggregated into daily issues (Table 2). On average, there were slightly more than three articles published each day in the *New York Times* related to terrorism. Twenty-eight issues had the minimum of zero articles, while one issue had the maximum of 13. Each issue had an average of 2.62 articles in which terrorism/terrorist(s) was present, 1.13 articles had an image, and the average number of words per article was 2,688.

Simple Random Sampling of the Article Population

The next step in the analysis was to determine how large of a random sample of the population of 1,097 articles was required to reach our chosen threshold of sampling efficiency. Sampling efficiency operationalized as the point at which 68 percent of the sampling statistics reliably fall within one standard error of the population mean and 95 percent of the sampling statistics fall within two standard errors of the population mean. One hundred simple random samples were taken from the population of articles, increasing in size until these predetermined threshold criteria were met. These results are presented in Table 3, which presents the mean, standard error (SE), standard deviation (SD), and the CV. The CV

Table 2. Issue descriptives ($N = 365$).

	Mean	S.E.	*SD*	Range	Minimum	Maximum
Terror Present	2.62	0.11	2.08	12	0	12
Front Page	0.28	0.03	0.51	2	0	2
Prominent Place	0.20	0.02	0.41	2	0	2
Editorial Section	0.35	0.03	0.65	4	0	4
Foreign Section	1.59	0.06	1.24	7	0	7
Metro Section	0.23	0.03	0.52	3	0	3
National Section	0.18	0.02	0.44	3	0	3
Other Section	0.66	0.07	1.40	9	0	9
#Words	2,688	145	2,768	22,281	0	22,281
#Images	1.13	0.07	1.35	9	0	9
#Articles	3.01	0.12	2.25	13	0	13

Table 3. Results of sampling efficiency analysis of a random sample of *New York Times* articles published in 1990 about terrorism.

		Terror present		Front page		Prominent place		Editorial section		Foreign section		Metro section		National section		Other section		#Words		Image	
	Mean	0.871		0.094		0.066		0.118		0.528		0.077		0.058		0.220		895.2		0.375	
	S.E.	0.010		0.009		0.007		0.010		0.015		0.008		0.007		0.013		22.3		0.015	
	SD	0.335		0.292		0.248		0.322		0.499		0.266		0.234		0.414		737.3		0.484	
	CV	0.384		3.108		3.775		2.741		0.946		3.474		4.019		1.885		0.824		1.293	
%Articles	Articles	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2
42.3%	465	0.50	0.91	0.64	0.97	0.60	0.93	0.69	0.95	0.61	0.98	0.71	0.95	0.54	0.91	***0.75***	***0.95***	0.58	0.82	0.60	0.89
46.2%	507	0.54	0.90	0.67	0.98	0.66	0.93	0.72	0.94	***0.72***	***0.99***	0.69	0.94	0.61	0.96	***0.72***	***0.95***	0.60	0.88	0.60	0.90
48.1%	528	0.61	0.92	0.75	0.92	0.67	0.93	0.78	0.94	***0.72***	***1.00***	0.65	0.95	0.59	0.93	***0.80***	***0.95***	0.59	0.83	0.58	0.92
50.0%	549	0.62	0.93	***0.71***	***0.98***	0.71	0.96	0.77	0.93	***0.75***	***1.00***	***0.72***	***0.97***	0.62	0.90	***0.78***	***0.98***	0.62	0.89	0.68	0.94
51.9%	570	0.66	0.96	***0.69***	***0.97***	0.67	0.95	0.71	0.97	***0.81***	***0.99***	***0.70***	***1.00***	0.65	0.94	***0.79***	***0.99***	0.64	0.90	0.64	0.96
53.8%	591	0.63	0.95	***0.74***	***0.98***	0.73	0.98	0.74	0.94	***0.79***	***0.99***	***0.74***	***1.00***	0.63	0.93	***0.77***	***0.99***	0.65	0.92	***0.70***	***0.96***
55.8%	612	0.67	0.96	***0.76***	***0.99***	0.67	0.98	***0.71***	***0.96***	***0.85***	***1.00***	***0.73***	***0.99***	0.72	0.94	***0.82***	***0.99***	***0.69***	***0.96***	***0.70***	***0.98***
57.7%	633	***0.72***	***1.00***	***0.84***	***0.99***	***0.71***	***0.97***	***0.76***	***0.98***	***0.86***	***1.00***	***0.74***	***0.99***	0.74	0.96	***0.78***	***1.00***	***0.69***	***0.98***	***0.75***	***0.99***
59.6%	655	***0.68***	***1.00***	***0.85***	***0.99***	***0.68***	***0.98***	***0.83***	***0.98***	***0.86***	***1.00***	***0.75***	***0.99***	0.64	0.96	***0.82***	***1.00***	***0.71***	***0.99***	***0.77***	***1.00***
61.5%	676	***0.68***	***0.99***	***0.88***	***0.99***	***0.81***	***0.99***	***0.85***	***0.99***	***0.84***	***1.00***	***0.74***	***0.99***	***0.75***	***0.99***	***0.85***	***1.00***	***0.76***	***0.99***	***0.77***	***0.99***

Note: When the reported proportion met, and remained above, the criteria of .68 for one SE and .95 for two SEs, that proportion and subsequent proportions were bolded and italicized.

ranged from 0.384 to 4.019. For all but one variable, the CV was higher than .5, the cutoff suggested before a larger sampling size is recommended.[53] Below each variable's descriptive information is the proportion of the 100 samples whose average for that variable fell either within one standard error of the population mean or two standard errors of the population mean. When that proportion met, and remained above, the criteria of .68 for one SE and .95 for two SEs, that proportion and subsequent proportions were bolded and italicized. The random article sample sizes met the threshold for sampling efficiency between 465 articles, or 42.3 percent of the population, and 676 articles, or 61.5 percent of the population. The average number of articles needed for the sample statistic to consistently meet the minimum threshold based on the variables examined was 582, or 53.1 percent of the population.

Simple Random Sampling of the Issue Population

For the simple random sample of issues, the number of issues needed so that the sample statistics were within one and two standard errors (68 percent and 95 percent of the time) ranged from 168 issues (24 weeks) to 217 issues (36 weeks). These results are presented in Table 4. The CV ranged from a minimum of 0.748 to a maximum of 2.515, indicating that oversampling should be considered for all variables studied. The variables that met the criteria with the fewest number of randomly selected issues were the number of articles on the front page of the issue, the number published by the Editorial Desk, the average length of the articles found in each issue, and the number of articles accompanied by an image. The number of articles published in each issue by the Foreign Desk needed the largest sample before the sample statistic fell within one SE of the population mean 68 percent of the time and two SEs of the population mean 95 percent of the time. On average, across all 12 variables used in this analysis, it took 181.4 issues, or just under 27 weeks, for the sample statistics to consistently be higher that 68 percent and 95 percent.

Constructed-Week Sampling

The results of the final sampling type, constructed weeks, are presented in Table 5. The average length of the articles in each issue needed the smallest sample size (20 constructed weeks) to reach the appropriate criteria, while the number of articles on the front page, the number with prominent placement, and the number reported by the Foreign Desk needed the largest sample size (29 constructed weeks). On average, across all 12 variables, a sample size of approximately 24.9 weeks was needed for the sample statistics to be within one SE of the population mean for 68 samples out of a 100 and two SEs of the population mean 95 samples out of a 100.

Comparing Sampling Methods

Table 6 and Table 7 compare the sampling efficiency of each method. Although the percentage of articles needed from the population is not a direct comparison to the number of issues needed for the random sample of issues and constructed-weeks sample, an attempt is made to show how they might compare (Table 6). If the average number of articles per issue is used, it can be estimated that, on average, three articles would appear in each issue of the *New York Times* and 21 articles would be printed related to terrorism each week. The

Table 4. Results of sampling efficiency analysis of random issues of *New York Times* articles published in 1990 w/articles about terrorism.

	Terror present		Front page		Prominent place		Editorial section		Foreign section		Metro section		National section		Other section		#Words		#Images		#Articles	
Mean	2.619		0.282		0.197		0.353		1.586		0.230		0.175		0.660		2688.0		1.126		3.005	
S.E.	0.109		0.027		0.022		0.034		0.065		0.027		0.023		0.073		144.9		0.071		0.118	
SD	2.078		0.508		0.412		0.649		1.241		0.515		0.441		1.402		2768.2		1.353		2.250	
CV	0.793		1.800		2.089		1.837		0.782		2.239		2.515		2.124		1.030		1.201		0.748	
Issues	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2
168	0.70	0.94	***0.69***	***0.96***	0.64	0.97	***0.71***	***0.95***	0.59	0.92	0.59	0.92	0.76	0.93	0.65	0.96	***0.75***	***0.96***	***0.69***	***0.95***	0.67	0.95
175	***0.71***	***0.97***	***0.70***	***0.96***	***0.72***	***0.97***	***0.69***	***0.96***	0.59	0.92	0.61	0.92	0.71	0.91	0.67	0.96	***0.78***	***0.98***	***0.75***	***0.98***	***0.69***	***0.97***
182	***0.72***	***0.96***	***0.75***	***0.97***	***0.68***	***0.96***	***0.73***	***0.98***	0.60	0.92	0.63	0.91	0.77	0.96	***0.75***	***0.96***	***0.74***	***0.98***	***0.69***	***0.99***	***0.68***	***0.95***
189	***0.69***	***0.98***	***0.74***	***0.96***	***0.70***	***0.96***	***0.76***	***0.98***	0.65	0.92	0.62	0.92	0.76	0.94	***0.74***	***0.96***	***0.71***	***0.99***	***0.75***	***0.99***	***0.68***	***0.96***
196	***0.74***	***0.98***	***0.71***	***0.98***	***0.71***	***0.95***	***0.80***	***0.98***	0.65	0.92	0.65	0.94	***0.79***	***0.97***	***0.73***	***0.98***	***0.75***	***0.99***	***0.79***	***0.99***	***0.72***	***0.98***
203	***0.74***	***0.98***	***0.79***	***0.97***	***0.74***	***0.97***	***0.83***	***0.98***	0.67	0.93	***0.72***	***0.98***	***0.81***	***0.96***	***0.74***	***0.97***	***0.77***	***0.99***	***0.83***	***0.99***	***0.75***	***0.97***
210	***0.73***	***0.99***	***0.76***	***0.98***	***0.72***	***0.96***	***0.83***	***0.99***	0.68	0.94	***0.75***	***0.98***	***0.81***	***0.96***	***0.74***	***0.98***	***0.75***	***0.99***	***0.80***	***0.99***	***0.75***	***0.97***
217	***0.68***	***0.99***	***0.71***	***0.98***	***0.73***	***1.00***	***0.86***	***1.00***	***0.74***	***0.99***	***0.77***	***0.99***	***0.74***	***1.00***	***0.75***	***0.98***	***0.73***	***1.00***	***0.77***	***0.99***	***0.69***	***0.98***

Note: When the reported proportion met, and remained above, the criteria of .68 for one SE and .95 for two SEs, that proportion and subsequent proportions were bolded and italicized.

Table 5. Results of sampling efficiency analysis of a random sample of *New York Times* constructed weeks published in 1990 about terrorism.

	Terror present		Front page		Prominent place		Editorial section		Foreign section		Metro section		National section		Other section		#Words		#Images		#Articles	
Mean	2.619		0.282		0.197		0.353		1.586		0.230		0.175		0.660		2688.0		1.126		3.005	
S.E.	0.109		0.027		0.022		0.034		0.065		0.027		0.023		0.073		144.9		0.071		0.118	
SD	2.078		0.508		0.412		0.649		1.241		0.515		0.441		1.402		2768.2		1.353		2.250	
CV	0.793		1.800		2.089		1.837		0.782		2.239		2.515		2.124		1.030		1.201		0.748	
Weeks	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2	SE1	SE2
20	0.61	0.93	0.65	0.83	0.53	0.83	0.68	0.91	0.59	0.87	0.55	0.86	0.61	0.90	0.64	1.00	***0.69***	***0.96***	0.71	0.94	0.63	0.94
21	0.72	0.94	0.64	0.89	0.65	0.89	0.69	0.93	0.61	0.91	0.62	0.91	0.71	0.92	***0.75***	***0.98***	***0.74***	***0.99***	***0.70***	***0.98***	0.73	0.99
22	***0.69***	***0.95***	0.63	0.90	0.54	0.90	0.60	0.95	0.63	0.93	0.61	0.90	0.70	0.96	***0.74***	***0.99***	***0.77***	***0.98***	***0.73***	***0.98***	0.68	0.95
23	***0.70***	***0.97***	0.63	0.93	0.66	0.92	0.61	0.95	0.63	0.91	0.68	0.92	0.59	0.97	***0.80***	***0.99***	***0.76***	***0.99***	***0.72***	***0.98***	0.67	0.97
24	***0.74***	***0.96***	0.64	0.98	0.63	0.94	0.65	0.94	0.66	0.92	0.61	0.94	0.64	0.94	***0.84***	***1.00***	***0.78***	***0.97***	***0.77***	***0.97***	***0.68***	***0.96***
25	***0.77***	***0.96***	0.71	0.94	0.69	0.95	***0.70***	***0.97***	0.66	0.96	0.65	0.94	***0.69***	***0.96***	***0.81***	***1.00***	***0.77***	***1.00***	***0.82***	***1.00***	***0.76***	***0.99***
26	***0.75***	***0.97***	0.73	0.96	0.68	0.92	***0.68***	***0.97***	0.68	0.95	0.67	0.94	***0.73***	***0.99***	***0.82***	***1.00***	***0.81***	***1.00***	***0.80***	***0.99***	***0.76***	***0.97***
27	***0.79***	***0.99***	0.75	0.95	0.69	0.97	***0.77***	***1.00***	0.71	0.98	***0.72***	***1.00***	***0.72***	***0.97***	***0.90***	***1.00***	***0.81***	***1.00***	***0.82***	***1.00***	***0.81***	***0.99***
28	***0.81***	***0.97***	0.66	0.99	0.67	0.96	***0.79***	***0.95***	0.75	0.94	***0.70***	***0.97***	***0.70***	***0.97***	***0.90***	***1.00***	***0.88***	***1.00***	***0.82***	***1.00***	***0.85***	***0.99***
29	***0.77***	***0.98***	***0.73***	***0.98***	***0.74***	***0.96***	***0.78***	***0.97***	***0.74***	***0.96***	***0.76***	***0.99***	***0.76***	***0.97***	***0.92***	***1.00***	***0.85***	***1.00***	***0.84***	***1.00***	***0.79***	***0.99***

Note: When the reported proportion met, and remained above, the criteria of .68 for one SE and .95 for two SEs, that proportion and subsequent proportions were bolded and italicized.

Table 6. Sampling efficiency results by method with random sample of *New York Times* articles published in 1990 about terrorism.

		Terror present	Front page	Prominent place	Editorial section	Foreign section	Metro section	National section	Other section	# Words	# Images	# Articles	Total
Weeks	Articles	30	26	30	29	***24***	***26***	32	22	29	28	—	2
	Issues	25	***24***	***25***	***24***	31	29	28	26	24	24	25	3
	Constructed Weeks	***22***	29	29	25	29	27	***24***	***21***	***20***	***21***	***24***	6
Percent articles	Articles	57.7%	50.0%	57.7%	55.8%	***46.2%***	***50.0%***	61.5%	42.3%	55.8%	53.8%	—	2
	Issues	47.9%	***46.0%***	***47.9%***	***46.0%***	59.4%	55.6%	53.6%	49.8%	46.0%	46.0%	47.9%	3
	Constructed Weeks	***42.1%***	55.6%	55.6%	47.9%	55.6%	51.7%	***46.0%***	***40.2%***	***38.3%***	***40.2%***	***46.0%***	6

Note: When the reported proportion met, and remained above, the criteria of .68 for one SE and .95 for two SEs, that proportion and subsequent proportions were bolded and italicized.

constructed weeks sample was most efficient in six of the twelve variables used, with sampling efficiency occurring in sample sizes ranging from 20 to 24 constructed weeks. Random samples of *New York Times* issues were more efficient than the other two methods four of the twelve times, falling between the equivalent of 24 and 26 week samples. The simple random sampling of articles performed worst; it was the most efficient sampling method for only two of the eleven variables used. A more direct comparison, however, can be seen once the random sample of articles is removed and the random sample of issues and random constructed weeks are compared directly (Table 7). When this is done, the constructed week sampling methodology is more efficient over 70 percent of the time, with sampling efficiency being reached between 20 and 29 weeks, depending on the variable measured.

Temporal Variations in Terrorism Coverage

Finally, when comparing the temporal variation of the population of *New York Times* articles with the population of terrorist incidents reported in the GTD for 1990, there is little evidence to suggest that the frequency of terrorism news is driven primarily by the frequency of terrorist incidents. Table 8 reports the frequency and percentages of both terrorist incidents and news articles for each day of the week. In line with prior research, the greatest percentage of articles is printed on Sunday, the day with the largest newshole. For terrorist incidents, the highest frequency occurs on Wednesdays, with Sunday having the lowest frequency.

Across all units of analyses, terrorist incidents on average occur more frequently than their coverage indicates, and those frequencies deviate from the standard more than the dis-

Table 7. Sampling efficiency results by method without random sample of *New York Times* articles published in 1990 about terrorism.

		Terror present	Front page	Prominent place	Editorial section	Foreign section	Metro section	National section	Other section	# Words	# Images	# Articles	Total
Weeks	Issues	25	***24***	***25***	***24***	31	29	28	26	24	24	25	3
	Constructed Weeks	***22***	29	29	25	**29**	**27**	***24***	***21***	***20***	***21***	***24***	8

Note: The bolded and italicized number represents the most efficient sampling methodology.

Table 8. Distribution of terrorist incidents and *New York Times* articles by day of week.

	Incident *n*	Article *n*	Percent incidents	Percent articles
Monday	599	123	15.5	11.2
Tuesday	641	125	16.5	11.4
Wednesday	658	134	17.0	12.2
Thursday	569	153	14.7	13.9
Friday	537	129	13.9	11.8
Saturday	449	123	11.6	11.2
Sunday	424	310	10.9	28.3
Total	3877	1097	100.1	100.0

Note: The percent incidents total is higher than 100 due to rounding.

tribution of news articles (Table 9). Also worth noting is that when articles and incidents are aggregated to day of the year and to the week, there is no relationship. When aggregated to the month, there is a positive, moderate correlation—which is to say that, as incidents per month increase, so does the number of articles per month. The day of the week when the incident and the article occurred, however, have a strong, negative relationship. This, however, is likely due to the fact that newspaper articles on terrorism more often occur on Sundays, when the newshole is largest, and remain relatively stable throughout the rest of the week. Terrorist attacks are more likely to occur on Wednesdays and least likely to occur on Sundays, systematically increasing and decreasing on the days between. Even if the days on which articles are published are lagged to account for the fact that it takes time for an article reporting on a terrorist attack to be written and published, the relationship is still weak to non-existent for the day of year (Table 10). For day of the week, one would expect that a lag would show the strongest relationship either the day after, or two days after, a terrorist incident. There is no reason that an incident that occurred on a Monday would not be reported on the next day, or by Wednesday at the latest. It is on these days that the relationship is either in a negative direction, or too weak to be meaningful. It is important to note, however, that any relationship between terrorism incidents and news about terrorism could be masked by the population used for this study, which includes all articles related to terrorism, not just articles on recent terrorist incidents.

Discussion

Unlike prior research, which measured characteristics of a population of a specific type of medium to determine whether a sample adequately represented the population, this study

Table 9. Temporal distribution of terrorist incidents and *New York Times* articles.

		Mean	*SD*	Minimum	Maximum	Pearson's
Days ($N = 365$)	GTD Incidents	10.6	7.1	0	54	−0.09
	NYT Articles	3.0	2.2	0	13	
Weeks ($N = 52$)	GTD Incidents	74.4	24.9	22	137	0.09
	NYT Articles	21.1	6.3	9	41	
Months ($N = 12$)	GTD Incidents	323.1	60.3	217	411	0.31
	NYT Articles	91.4	14.0	74	129	
Day of week ($N = 7$)	GTD Incidents	553.9	83.5	424	658	−0.61
	NYT Articles	156.7	63.3	123	310	

Table 10. Pearson's *r* between frequency of terrorist incidents and lagged *New York Times* articles.

Lag	0 days	1 day	2 days	3 days	4 days	5 days
Day of Year	−0.09	0.01	0.06	−0.01	0.12	0.06
Day of Week	−0.61	−0.41	0.01	0.08	0.40	0.33

measured characteristics of a topic-specific population from a medium. Terrorism, unlike the news cycle, is not a reliably occurring phenomenon. Therefore, it is not surprising to find that measuring variation in terrorism stories across time requires a much larger sample than those often used for it to represent the population of stories related to terrorism. The main takeaway from this research is that the prior standard of two randomly sampled constructed weeks may not be appropriate when studying a substantive topic, such as the use of terrorism-related terminology in the news. A content analysis of two constructed weeks would not be reflective of the population's characteristics. In fact, it would take between 20 and 29 constructed weeks per year before the sample statistics were close enough to the population parameters, depending on the variables under study. In addition, because of high CV values, oversampling is recommended. Based on this, it is safe to state that researchers should use 30 or more constructed weeks of data if they want to be certain that their sample adequately represents the population under study. Though such samples are considerably larger than those produced by the commonly used sampling methods, it nonetheless reduces the size of the corpus under study, rendering it more manageable than a study of an entire content population.

It is informative to future mass-mediated terrorism research that 61.5 percent of articles, 217 issues, or 29 constructed weeks must be sampled to reliably capture information that represents the population of newspaper articles. Media and communication research that uses samples of large populations should take this into account. Substantive questions, such as those related to framing and content analyses of specific terrorism topics, cannot be reliably answered using, for instance, only two constructed weeks per year. Although this type of sampling might adequately reflect attributes of the publications, it does not capture the attributes of the publication or the articles when researching a specific topic area. For example, if a researcher wants to adequately capture the variation in terrorism coverage based on which *New York Times* desk it is published from, a minimum sample of 29 constructed weeks would have to be taken from each year.

One reason for the discrepancy between the number of constructed weeks needed in this research, and the number determined in past research, could lie in the temporal variation in both the news cycle and the salience of terrorism. One hypothesis is that more acts of terrorism will result in more articles about terrorism, such as news reports of incidents or discussions about counterterrorism and international policy. As discussed, the reason that the constructed week is so efficient is that the news cycle and newsholes reliably vary based on the news medium. Similarly, terrorism will vary based on its own unique, and most likely much more complex, set of factors. Therefore, newspaper coverage of terrorism is the result of a mixture of the temporal ordering of terrorism events and the news cycle. This would explain why random constructed-week sampling methods are still most efficient at capturing population characteristics, albeit with much larger samples.

Strictly speaking, this research only speaks to the most efficient sampling methodology of terrorism articles in the *New York Times* in 1990. There is a possibility that the *New York*

Times coverage of terrorism is not indicative of the terrorism coverage in other U.S. print newspapers. As the *New York Times* has a strong international focus, and the majority of terrorist events occur outside of the United States, its coverage may be biased, including more acts of political violence than the typical paper. In addition, although future research can cite this study to justify their sampling method, there is no guarantee that sampling efficiency based on article and issue characteristics is generalizable to other types of content outside of terrorism. Only a content analysis of an entire population of data used for a similar sampling efficiency study would truly inform researchers of the impact that sampling techniques have on an analysis examining the media's use of the terms "terrorism/terrorist(s)." Future research on subject-specific sampling methodologies would be needed to determine the reliability of random sampling of constructed weeks for different time periods, different media, and different topics. This study, we hope, provides a blueprint for such analyses.

Outside of historical research on terrorism, whether using content analysis or other methods, there are additional recommendations related to media sampling for future research. Any study seeking to utilize the vast amount of media coverage currently available on terrorism, should expand outside of only print editions of newspapers. The news cycle, although still present, is not as restricted for newspaper outlets that can and do publish articles online at anytime during the day. The newshole, for such organizations, is no longer as powerful in dictating how much material is published and when. Newspapers with an online presence can publish articles online that never end up in print, or end up in print in an abbreviated format. Terrorism news stories that never make it to print, but are published electronically, are still part of the population of interest in a study and should be collected and analyzed. Also, as the public now has access to myriad news outlets through the Internet, the impact of a sole source on how a nation or region perceives a phenomenon has lessened. Research that examines a topic such as terrorism in the current mediascape, will need to sample news content from multiple sources across multiple mediums. Studies that validate these sampling methodologies are imperative so that researchers can have confidence in the generalizability of the results of their analyses.

Therefore, the importance of this research is not necessarily found in its ability to generalize to other media or topics outside of terrorism, but in broadening the discussion of the impact of new technologies for both accessing and distributing news. The ability to keyword search large archives of news content provides avenues for research questions that previously could not be answered. It is important that terrorism researchers who utilize media sources for data collection and analysis continue simultaneously to develop and validate new methods for sampling and analyzing large amounts of content. Research methods that were appropriate for certain media, such as print news, must be tested and refined as researchers gather, sample, and analyze old and new media to answer important research questions.

Conclusion

With more and more access to news aggregation databases such as Lexis-Nexis, ProQuest, or even Google News, the ability to search and download entire populations of articles for media-related research has grown exponentially over the last ten years. In fact, entire databases on political violence, such as the United States Extremist Crime Database and the Global Terrorism Database, collect valid and reliable data from open-sources accessed electronically. No longer do researchers have to find hard copies of print media or review full

issues on microfilm to identify their population, take their sample, and code the content. In a few clicks, and a few carefully worded queries, thousands of articles can be at a researcher's disposal. Questions that years ago would have been too labor intensive to ask because of the onerous demands of data collection alone, are now within the reach of anyone who has access to subscription-based news services and the Internet. This access to data, however, has not eased the manpower needed for the coding process, although software developed for qualitative data analysis has made it easier. In many ways, the data we can collect far surpasses the data we can analyze. This article is an attempt to move empirical media research beyond prior sampling techniques to determine the most appropriate, and efficient, way to sample from large, keyword-search-generated populations. Specific to the use of terrorism/terrorist(s) in the *New York Times*, we can say that more than half of the population, whether measured as articles or aggregated to issues, has to be sampled for us to be confident that the sample represents the population for the characteristics measured

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