Media disaster coverage over time: Methodological issues and results

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ABSTRACT: In 2000 disaster struck Enschede in The Netherlands. Due to explosions at a fireworks factory, 22 people were killed. This study aims to describe the developments in the media coverage of this disaster. Content analysis was performed on 4928 articles, derived from four distinct newspapers. After a period of intense coverage, media attention for the disaster declined. In this first month 772 articles were run (local paper 457, national papers 315). After three years this number is approximately 30 articles per month. This decline can be best described by an inverse function. This paper focuses on the changes in the amount of news coverage, and concentrates on some methodological issues researchers encounter when they try to analyse the news coverage of a disaster over time.

1 INTRODUCTION

On May 13, 2000 at 15:30 in the afternoon several explosions destroyed a fireworks plant located in a suburban area of Enschede, a city in the eastern part of the Netherlands with 150,000 inhabitants. The explosions and the fire that was started by the explosions killed 22 citizens, and wounded nearly 1,000 others. Over 4,000 people were made homeless, and the damages were estimated at several hundred millions of Euros. Within hours the magnitude of this event became clear and hundreds of journalists and news crews from all over the world poured into Enschede. The first footage aired on television showed the severe consequences of an industrial calamity that the country had never witnessed in recent history; the previously lively suburban area closely resembled a war zone.

Industrial disasters with citizen fatalities are rare events in countries as the Netherlands. Events like this have a high level of newsworthiness, and thus typically attract much media attention. Where the first accounts in newspapers and television are typically event driven and describe what has happened, the news framing soon changes its focus as journalists start to ask questions like “how could this happen?”, “Why was this disaster not prevented?”, and “Who is to blame?”. The tone-of voice of the news accounts changes as well, at first we primarily see sympathy and compassion for the victims and the inhabitants of Enschede, but soon both local and national authorities are questioned for not being able to prevent this disaster. Such questions were fed by the report of an Independent Investigation Committee, which was installed to find out which factors contributed to the disaster (Committee Oosting). After a while, media coverage fades away, as other issues arise and win the battle for the media’s and public’s attention.

In the coverage of a disaster one may expect differences between local and national newspapers. Newspapers have to write stories which are interesting to their readers. Local newspaper can be expected to pay more attention to the disaster than the national newspapers. Also, local newspapers can be expected to focus on the interests of and the personal relevance for the local readership, which may be different from those of the readership of national newspapers. One might expect more stories with a human interest frame or economical consequences frame in the local press, and more stories with an responsibility or conflict frame in the national press (Anderson & Marhadour, 2007).

In this paper we analyze the media coverage of the Enschede disaster in Dutch local and national newspapers for a three-year period after the disaster. We focus on the changes in the amount of news coverage, and concentrate on some methodological issues researchers encounter when they try to describe these changes in a mathematical function. We are not aware of any attempts to do so before. These issues are:

- Does the coverage in the local newspaper resemble that in the national newspapers and does a similar mathematical function apply to both? Or does one have to analyse the developments in media coverage for local and national newspapers separately?
- Which mathematical function fits the observed number of articles per period the best?
- To analyse the developments in coverage over time, the total period under investigation should be divided into smaller time segments. Does the length of these smaller periods affect the results?
How does one distinguish periods in which coverage temporarily intensifies? How can peaks in media coverage be related to events in the aftermath of the disaster?

Does the mathematical function apply equally well to specific subsets of the articles, which make use of a particular thematic frame?

The consequences of the various methodological choices will be illustrated by applying them to the news coverage of the Enschede fireworks disaster. This will result in a description of the developments in the media coverage of the Enschede disaster.

2 METHOD

2.1 Design and sample

A content analysis of four Dutch newspapers was performed over a three year period after the disaster. Sampled were the local newspaper in the disaster area (TcTubantia), two national newspapers (Volkskrant, Telegraaf) and one national/regional newspaper (AD) from one of the major industrial regions of the country. These newspapers were selected on the basis of their region of delivery, size of readership, and political and economic point of view. For these newspapers, all articles were selected from electronic databases that were published in the three years after the disaster. Selection criteria were the occurrence of keywords as ‘vuurwerkramp’ (fireworks disaster) or ‘Fireworks’ (SE Fireworks is the name of the company that owned the plant). Analysis indicated that these keywords returned the largest number of hits in the electronic databases.

2.2 Coding

The articles were identified by newspaper, publication data and title. The 3.927 articles were coded by several students based on a trained coding instruction. The articles were read and the coders coded whether one or more of the following frames were present: conflict frame, human-interest frame, responsibility frame, and economic-consequences frame (yes, no). The choice of frames was based on previous work by Semetko & Valkenburg (2000) and De Kort & d’Haenens (2005). The conflict frame focuses on conflicts between individuals, groups or organizations. This may reflect in the description of disclosure of conflicts of opinions, judicial procedures, criticizing the other party or defending oneself against the critique of others. The human-interest frame presents the human emotional aspects of an event, issue or problem. Typical are stories describing individual victims and disaster relief workers, identified with their full name. The responsibility frame presents an issue in a way that implies that responsibility for the issue is in the hand of some actor, e.g. government. The economic-consequences frame is present in an article when it discloses information or opinions about the financial consequences of an event, issue or problem for an individual, group, organization, region or country. Interrater reliability for the coding of the frames (Cohen’s Kappa) is moderate.

2.3 Sample characteristics

In the three year period after the disaster, a total of 4.928 articles were found. After exclusion of announcements of radio and television programs, and articles in which the disaster was mentioned but was not part of the storyline, 3.927 articles remained as our corpus of analysis (that is 986 articles or 20% were excluded). The local newspaper from the disaster area published considerably more articles than the other newspapers (local n = 2.679, national n = 1.248).

In these articles, the responsibility frame was used most frequently (64% of all articles uses this frame), followed by the conflict frame (52%), the human-interest frame (36%), and the economic consequences frames (31%). There were significant differences in frame use between the local and the national newspapers (multivariate $F(4, 3937) = 110, p \leq .0005$): the local newspaper more often made use of the human-interest frame ($F() = 230, p \leq .0005$), and the economic consequences frame ($F() = 222, p \leq .0005$) and slightly more often of the responsibility frame ($F() = 10, p \leq .001$), whereas the national papers more often made use of the conflict frame ($F() = 12, p \leq .001$).

2.4 Analysis

The analysed focused on the developments in the media coverage over time. The analysed period of three years has been divided into periods of equal length; in particular 39 periods of 4 weeks. In this way, each period consisted of an (almost) identical number of similar days of the week, 4 Mondays, 4 Tuesdays etc. Occasionally, newspapers did not publish issues, such as on Christmas Day A timeline was created. Characteristics of the media coverage of the disaster were added, as were events that took place in the aftermath of the disaster. Six types of events were identified on the timeline: (1) the aftermath of the disaster and crisis intervention, (2) recovery and rebuilding of the disaster stricken area, (3) prevention of similar events in the future, (4) judicial research and procedures against individuals or organizations that could be held responsible for their role in the disaster, (5) discussion about consequences for active politicians and authorities, and (6) external events.
3 RESULTS

3.1 The news coverage over time

In the three years following the fireworks disaster, 3,927 in-focus articles appeared in the investigated newspapers. At first, coverage was high. In the 4-week period directly after the disaster 772 articles were run (local paper n = 457, national newspapers n = 315). A sharp decline followed, which later levelled off to a gradual decline. Even after three years, the media still continued to cover the disaster. Three years after the disaster, coverage amounted to approximately 30 articles per month, which is an article per day on average.

The local paper (n = 2,679) published more articles on the fireworks disaster than the three national papers combined (n = 1,248). This difference holds for each 4-week period in the 2.5 years following the disaster.

There also was a significant difference between the local newspaper and the national newspapers in the distribution of articles over time (chi-square = 215, df = 38, p < .0005). The national newspapers published more articles in the period directly following the disaster (25% of the articles appeared in period 1) and in the period in which the results of the Independent Investigation Committee were published (7% appeared in period 11) than the local paper, that covered the disaster more smoothly (17% and 5% of the articles appeared in periods 1 and 11 respectively). This means the decline in media coverage of the disaster after the first period was steeper for the national newspapers than for the local newspapers, and that the coverage of the national newspapers may be more affected by events in the aftermath of the disaster, such as the publication of the report of the “independent investigation Committee”.

This leads to the conclusion that there are probably substantial differences between the local and national newspapers in the mathematical functions describing the amount of media coverage over time. The coverage in the local and national newspapers should therefore be analysed separately.

3.2 Mathematical functions describing the developments in media coverage

Data analysis has taken place by means of the SPSS-12. This package allows one to investigate to what extent observed data fit with a large number of hypothetical, mathematical function \( R^2 \). The higher \( R^2 \), the better the fit. Estimates for the regression weights and a constant term are also given.

Table 1 shows the fits between the observed number of articles and all available mathematical functions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Local (n = 2,679)</th>
<th>National (n = 1,248)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverse</td>
<td>.90</td>
<td>.78</td>
</tr>
<tr>
<td>Logistic</td>
<td>.76</td>
<td>.47</td>
</tr>
<tr>
<td>Logarithmic</td>
<td>.76</td>
<td>.47</td>
</tr>
<tr>
<td>Cubic</td>
<td>.71</td>
<td>.43</td>
</tr>
<tr>
<td>Exponential</td>
<td>.66</td>
<td>.41</td>
</tr>
<tr>
<td>Growth</td>
<td>.66</td>
<td>.41</td>
</tr>
<tr>
<td>Compound</td>
<td>.66</td>
<td>.41</td>
</tr>
<tr>
<td>Quadratic</td>
<td>.62</td>
<td>.37</td>
</tr>
<tr>
<td>Power</td>
<td>.58</td>
<td>.50</td>
</tr>
<tr>
<td>S</td>
<td>.32</td>
<td>.39</td>
</tr>
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</table>

*Based on 39 periods of 4 weeks.

The best fit between the observed number of articles and the hypothetical, mathematical function was found for the inverse function. This function provided a very good fit for both the local newspaper \( R^2 = .90, \) standardized beta .95), and the national newspapers \( R^2 = .78, \) standardized beta .88). For the local newspaper, the full mathematical function describing the expected number of articles is \( E(N_t) = 22 + 426/t \), where t is the number of the four-week-period after the disaster. Similarly, for the national newspapers, the full mathematical function is \( E(N_t) = 4 + 255/t \). These formulas predict that the local newspaper started out paying much more attention to the disaster than the national newspapers together (local \( E(N_t) = 444 \), national \( E(N_t) = 259 \)) and that the coverage in the local newspaper eventually \( E(N_{event}) = 22 \) remains higher than that in the national newspapers \( E(N_{event}) = 4 \).

The inverse function described the developments in the disaster coverage in the local newspaper (.90) better than it did the coverage in the national newspaper (.78). The question arose whether the higher \( R^2 \) for the local newspaper could be attributed to the different sample sizes or to other factors such as differences in publication policy. To answer this question, a random sample of \( n = 1,248 \) was drawn from the articles in the local newspaper. The fit with the inverse function for this reduced sample was \( R^2 = .88 \), which is hardly any lower than for the full sample. The lower fit for the national newspapers can thus not be explained by a lower number of published articles.

3.3 Duration of the time periods

The analyses up till now have been based on the number of articles published in 39 periods of four weeks. A relevant question was, whether the results were affected by the chosen duration of the time-periods.
Table 2. Fit between the number of articles and the inverse function, for periods of various duration.

<table>
<thead>
<tr>
<th></th>
<th>Local (n = 2.679)</th>
<th>National (n = 1.248)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 week</td>
<td>.75</td>
<td>.78</td>
</tr>
<tr>
<td>2 weeks</td>
<td>.88</td>
<td>.76</td>
</tr>
<tr>
<td>4 weeks</td>
<td>.90</td>
<td>.78</td>
</tr>
</tbody>
</table>

Figure 1. Number of articles in the local and national newspapers over time.

To investigate this, the analyses were executed again for the number of articles published in periods of two weeks and one week respectively (see Table 2). The results show that, for the national papers, there is not much difference between the fits for periods based on four, two or one week; \( R^2 \) varies from .76 to .78. For the local newspaper, all fits were high, but the fit for the one-week period \( (R^2) \) seemed to be less than the fits for the two- and four-week periods. The reasons for this are not clear. May be the local paper reacted promptly to developments in the aftermath of the disaster, and compensated this extra attention by paying less attention to the disaster aftermath in the following week, while the national newspapers reacted with more restraint.

### 3.4 Identification of significant peaks in coverage

Figure 1 showed that the decline in media coverage was not monotonous and that there were fluctuations. It is tempting to attribute these fluctuations to events in the aftermath of the disaster (see Figure 2). However, some of the fluctuations might be random. This raised the question if it were possible to determine whether fluctuations are random, or whether they could be labelled significant peaks in media coverage.

A manner to decide whether the number of published articles deviates significantly from the expected number based on the hypothesized function, would be to inspect the confidence intervals. If the observed number in a specific period falls within the confidence limits, one concludes the peak is a random fluctuation. If the observed number falls outside the confidence interval, one concludes there is a genuine and significant peak in media coverage (see Figure 3).

There is a problem with this procedure. The estimation of the parameters in the inverse function (regression coefficients and constants) depends on the coverage in all periods, including the period in which coverage may be excessively high. This means that the expected value for the period suspected to show a peak in coverage, is too high. As a result, there seems to be a tendency for significant peaks to be considered insignificant.

It is not clear how one should deal with this problem. Theoretically, one might argue that the inverse function should be estimated based on all points, minus the ones suspected of peaking. This should lead to an corrected estimate, which can be used to decide whether the observed number of articles is higher than the upper-limit of the corrected estimate. In order to do so, however, one first has to identify which points in time may peak. This strategy thus seems to run in circles. This best correction we came up with, was using the 90%-confidence interval instead of the usual 95% interval, thus slightly lowering the critical upper-limit.

Employing the 90%-confidence interval, in the coverage of the local newspaper three four-week-periods can be distinguished in which coverage peaked. These were the three periods following the publication of the report of the Independent Investigation Committee (periods 11, 12 and 13). Coverage in the national newspapers peaked in two four-week-periods, namely the period directly following the disaster and the period following the presentation of the report by the Independent Investigation Committee (period 11). The results thus showed that only a few of the peaks in media coverage, suggested by Figure 2, were statistically significant.

### 3.5 Mathematical functions describing the developments in the use of specific frames

The question arose whether the inverse function would also provide the best fit for the number of articles in which a specific thematic frame was used. This proved to be the case, for both the local and the national newspapers. However, the fit between the number of articles with a specific frame and the inverse function is less than that for the number of articles in general (see Table 3). The fit was best for the human-interest frame, followed by the economic consequences frame. The fits for the conflict and responsibility frame were found to be lower. A major contributor to this fact seemed to be the extensive disaster coverage with a
Conflict and responsibility frame in the period following the publication of the report of the Independent Investigation Committee. This suggests the disaster coverage with a conflict and responsibility frame to be more event driven than the disaster coverage with a human interest and an economic consequences frame.

Again, the fit was better for the local newspaper than for the national newspapers. It was observed that there was a larger increase in articles with the conflict and responsibility frame in the period following the report of the Independent Investigation Committee for the national papers than for the local paper. This suggests the disaster coverage of the national newspaper was more event driven than the coverage in the local newspaper.

4 DISCUSSION

Disasters typically attract much media coverage. After a while, other issues with a high newsworthiness emerge, and the media attention for the disaster fades. No attempts have been made as yet to describe this decline in media coverage by a mathematical function. This paper discusses some of the methodological
issues we encountered, when we do this for the media coverage of the Enschede Fireworks disaster. Other researchers who focus on the developments in the media coverage of some other incident or disaster, will to face similar issues.

The media coverage in the local and three national newspaper was studied. The first question relates to the duration of the total period to be analysed. While it is a lot of work to code and analyse a long period of time, our research showed that major changes in news coverage were observed following the publication of the report of the Independent Investigation Committee, nine months after the disaster; three years after the disaster still about one article per day was published. Researchers should thus guard themselves against analysing too short a period.

The investigation showed that it might be important to distinguish between local and national newspapers. For both the local and the national newspaper, at first, coverage was high. A sharp decline followed, which later levelled off to a gradual decline. However, the decline in media coverage of the disaster after the first period was steeper for the national newspapers than for the local newspapers. This suggested that the coverage in the national newspapers may be more affected by events in the aftermath of the disaster, such as the publication of the report of the Independent Investigation Committee. There were thus similarities and differences in coverage between the local and the national newspapers. Researchers should thus ask themselves whether the coverage in the local and national newspapers should be studied separately.

An inverse function provided the best fit with the observed number of articles, for both the local and the national newspaper. However, the formulas for the local and national newspapers were different. The local newspaper started at a far higher level of coverage than the national newspapers, and three years after the disaster, the local newspaper still showed a higher level of coverage. The local disaster news coverage over time was thus similar, but not identical in magnitude to the national disaster news coverage.

Additionally, it was found that the inverse function provided a better fit for the number of articles published over the three years in the local newspaper ($R^2 = .90$), than in the national newspaper ($R^2 = .78$). This difference could not be accounted for by differences in sample size. Perhaps this difference in fit may be explained by differences in publication policy. Support for this interpretation is found in the observation that there were large differences between the local and national newspapers in the use of specific frames. Newspapers have to publish articles that interest their readers. The local paper focused its coverage on the relevance of the disaster for the local residents; it made use of an human-interest frame and an economic consequences frame more often than the national paper.

The national paper, on the other hand, emphasised the national relevance of the disaster, and published more articles with a conflict frame.

The events in the aftermath of the disaster, such as the publication of the report of the Independent Investigation Committee, relate to the role of governmental agencies, the Board of the Fireworks factory and a potential arsonist in bringing about the disaster. Such events stimulate stories with a conflict or responsibility frame, rather than a human-interest frame. The national papers thus seemed to have reacted more strongly to the events in the aftermath of the disaster, while the local newspaper covered the disaster aftermath in a less volatile manner. Such differences in coverage policy would result in the observed finding that the number of articles in the local newspaper showed a closer fit to the inverse function than the number of articles in the national newspapers.

Another question which relates to the fit with the inverse function, concerns the thematic framing of the articles. It was found that the inverse function also provides the best fit for the number of articles in which a specific thematic frames was used, for both the local and the national newspapers. However, the fit between the number of articles with a specific frame and the inverse function is less than that for the number of articles in general. This may be due to the fact that events in the aftermath of the disaster evoked articles with specific frames, such as the conflict or responsibility frame. Researchers should realise, that different theoretical models may apply to the news coverage of an event than two news coverage of issues related to that event. Whereas the model for the former might be a monotonous decrease in attention over time, the developments in framed news coverage might be better explained by models such as the issue-attention model (Downs, 1991).

An important question in studying media coverage over time relates to the duration of the periods. One argument could be the fit with the inverse function. For our investigation, the results showed that all fits were high and that there was not much difference between the fits for periods with a duration of four, two or one week; for the national papers $R^2$ varied between .76 to .78, for the local paper between .75 and .90. For the local newspaper, the fit for the one-week period ($R^2$) seemed to be less than the fits for the two- en four-week periods. The reasons for this are not clear. May be the local paper reacted promptly to developments in the aftermath of the disaster and compensated this extra attention by paying less attention to the disaster aftermath in the following week, while the national newspapers react less instantaneous. A two- or four week period thus seems to be a proper choice. Choosing for a two-week period has the advantage that the regression coefficient can be based upon two periods with high coverage directly following the disaster, in
stead of one, as was the case in our study. At the same
time, however, the global picture might become too
detailed to comprehend.

It was found that the decline in media coverage was
not monotonous and that there were fluctuations. It
is tempting to attribute such fluctuations to events in
the aftermath of the disaster. However, some fluctu-
ations might be random, and researchers should be
aware. Inspection of the confidence intervals for the
estimated number of articles might give an indica-
tion. If the observed number of articles falls within
the confidence limits, one concludes the peak is a
random fluctuation. If the observed number falls out-
side the confidence interval, one concludes there is a
genuine and significant peak in media coverage. One
should bear in mind, however, that, though the proce-
dure is theoretically correct, in practice it has some
methodological caveats. For the Enschede disaster,
many peaks were visually identified, but only the peak
in media coverage in the periods following the publi-
cation of the report of the Independent Investigation
Committee was found to be significant. So, things are
not always what they look.

Insight into media coverage processes is important,
because news coverage influences public opinion and
risk perception. Studying media coverage will help
to predict which influence and how much influence
is being exerted on the media consumers. This paper
has focused on the Enschede fireworks disaster and
has discussed some methodological issues and their
solution. Many questions still remain, in particular
related to the generalisability of the results to other
disasters. More research is clearly needed

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