

Specialty matters. Analysis of health journalists' coverage about vaccines

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Abstract

This study examines specific professional patterns among health journalists, and assesses whether these differ from those among generalists in the case of vaccines. 131 articles were analysed from national newspapers in Spain, of which 52% (n=68) were written by specialised health journalists. Content analysis was undertaken to examine the differences in terms of journalistic genre, frames, tone, sources and length of the article. Results revealed key journalistic patterns and confirmed that health journalists perform significantly differently than other authors in terms of journalistic genre, tone, sources and length of the article. Health journalists wrote more features and less opinion articles, from a more neutral perspective, using a wider number of scientific sources, especially those from professional associations and scientific journals. These findings provide insights into the process of health journalism, and identify potential aspects to further develop the profession for the broad dissemination of health news to the public.

Keywords

Content analysis; Health journalism; Health journalists; Health news Journalists; Media; Newspapers; Public health; Science; Sources; Specialty; Vaccines.

1. Introduction

The mass media are today the most important source of information and are the only source about health and science for many people (Riobó, 2016; Yanovitzky; Blitz, 2000). The media are crucial in keeping the public informed about scientific issues as well as framing and heightening the salience of health-related issues (Viswanath *et al.*, 2008). In addition, the media allow citizens to stay informed so that they can participate in the public debate regarding health issues, and even manage their own health; this is due to the fact that the media can potentially shape beliefs, attitudes, and even behaviours (Cacciatore *et al.*, 2012; Hinnant; Len-Ríos; Oh, 2012). In this regard, journalists have a great responsibility in the scientific field, because through their routine coverage of scientific studies, news media are a key intermediary in translating research for the public, patients, policymakers and clinicians (Viswanath *et al.*, 2008).

Despite their importance in the dissemination of health and scientific information, only few studies have explored the professional practices of health and science journalists (Viswanath *et al.*, 2008; Deprez; Van-Leuven, 2018). Many studies have conducted media content analyses of health topics but without examining the specific routine of health specialised journalists in comparison with generalists (i.e. Casciotti *et al.*, 2014a; Clarke, 2008; Meyer *et al.*, 2016). This is in great contrast with other specialties, such as political journalism, where many research studies have been carried out

over the last decades. The present article is an attempt to fill this gap by analysing the work conducted by health journalists from a comparative perspective to understand the added value of the specialisation in health journalism. Using the case of vaccines as a backdrop, and by setting up content analysis of print media in Spain, this research attempts to shed light on the nature of health journalists' coverage and explore the differences between said coverage and the coverage of other journalists and authors who also cover health issues in the media. The findings here provide insights into the key advantages of health journalists and lead to discussion surrounding the tension between different ideologies and practices in the structure of professional journalism.

2. The specialty of health journalism

Science journalism is considered a minor specialty within the profession (**Fedler et al.**, 1998) when compared to others such as history, law, international, economics and politics. The development of science journalism mirrors the growth of the scientific research enterprise and the need to inform the public of important scientific developments, such as the discovery of antibiotic "wonder drugs" that could tackle highly deadly illnesses. While science journalism is a broad specialty including topics such as environment, technology, space, etc., the most dominant specialty is health (**Kennedy; Overholser**, 2010).

It is an interesting time to study health journalism nowadays, since it has experienced important changes in the last decade. Health journalism has fallen victim to the overall problems facing journalism, which have been exacerbated by the global economic downturn in 2008 (**Bristol; Donnelly**, 2011). There is less space and time to tell a story in traditional media outlets; news media are shorthanded, while science sections have seen significantly cut back in number and scope throughout North America and Europe, and the number of health journalists holding full-time jobs is decreasing (**Brumfiel**, 2009; **Kennedy et al.**, 2011). In Spain, the amount of specialised health journalists is also decreasing (**Cebrián**, 2016), however after the economic crisis new health-related media and contents are being published (**Barrera-Páez**, 2016). In fact, health topics are not being reduced in the media, as public interest in health news is higher than ever (**Molyneux; Holton**, 2015). Therefore, there is an increasing international tendency for health journalists to be replaced with generalists to cover health issues (**Len-Ríos et al.**, 2009) and those who write about a broad range of topics, from full-time health/science journalists to general-assignment journalists.

Health news articles have been questioned by public health officers for incorrect, misleading, careless or unfair coverage (**Amend; Secko**, 2012). Studies have revealed that some of this distortion is attributable to ignorance or an inability to interpret and convey the nuanced results of clinical studies (**Dentzer**, 2009). In fact, many journalists consider themselves poorly trained when it comes to understanding clinical studies and statistics; indeed, this is considered a public health threat, as such reporting can lead people to make misguided choices that may put their health at risk (**Voss**, 2002). Therefore, the need for better training seems clear. In this regard, journalism specialties offer professionals a combination of academic training and practical experience. Health journalists are well equipped staff who can cover not only routine health topics but also unpredictable events, and particularly threats, such as the Ebola outbreak, or a bioterrorism incident, when the need arises (**Kennedy et al.**, 2011). Little research has been conducted to gauge the added value of health journalists compared to generalists. A previous study surveyed health journalists in order to characterise individual practices which lead to the development of health news (**Viswanath et al.**, 2008). Results describe the participants' education profile and reveal that the newsworthiness criteria were mostly based on "potential for public impact" and "new information or development". Another study combined in-depth interviews and a content analysis of *Twitter* to explore how health journalists monitor and use sources (**Deprez; Van-Leuven**, 2018). They revealed that *Twitter* is used in a basic fashion for news sourcing, mainly to stay updated and get new story ideas. They also found that top-down actors are overrepresented in the health journalists' sourcing practices, followed by health experts. Despite a large literature review conducted, we did not find studies comparing the coverage from health journalists with that of other generalists. We agree with **Amend and Secko** (2012), who argued that each journalist has his/her own "way of doing things", with trusted scientific sources, methods of collecting information, preferred formats and topics, and distinguishing styles. Still, we believe that there are some common professional patterns among those who are specialised in health topics in comparison with those who are not. Our paper will address this in order to shed light on the added value, if any, of the specialty health journalism.

Nowadays an anti-vaccine lobby thrives in our society

3. The vaccines in the media

During the last century, vaccination around the world has eliminated most of the diseases that used to cause high mortality rates (**Rappuoli et al.**, 2011). The decrease of infectious disease through vaccination is considered one of the most important public health interventions, but one that is reliant on a high level of uptake (**Dubé et al.**, 2013). Today, an anti-vaccine lobby thrives in our society. Vaccine adherence is becoming an increasing public health challenge, as recognised by the former *World Health Organization's* (WHO) Director-General Margaret Chan, who expressed concerns over what she called a "worrying" public mistrust of vaccines (**Chan**, 2011). A clear example can be found in the case of measles, which is one of the leading causes of death among young children, even though a safe and cost-effective

vaccine is available. According to the *WHO* (2017), in 2015 there were 134,200 measles deaths globally –approximately 367 deaths every day or 15 deaths every hour. In Europe, vaccine uptake is decreasing, and in some countries the level is close to the minimum required immunisation completion rate of 80%–90%, such as in Italy, France and Portugal (**Carriño-Santistevé; Lopalco**, 2012).

The topic of vaccines has attracted extensive media attention in recent years, owing in large part to now-discredited claims about safety. The media have been considered an important tool for communicating information about vaccines, increasing awareness, and motivating the public to make important decisions about their healthcare (**Casciotti et al.**, 2014b; **Catalán-Matamoros**, 2017). Following this media attention, scholars have investigated the media coverage of vaccines. A recent systematic review on media communication of vaccines (**Catalán-Matamoros; Peñafiel-Saiz**, 2018) analysed 24 studies and found that the majority of media analyses had focused on newspapers, and especially those from the United States. Moreover, negative messages and inaccurate information was found to be a common pattern in media coverage of vaccines. This review suggested a research agenda in the field, asking for in-depth analyses and studies focused on other geographical areas. As was shown in the systematic review, the United Kingdom is the only European country where content analyses of media coverage of vaccines have been conducted. In this case, the coverage of the MMR (measles, mumps and rubella) vaccine and the media role of HPV (Human Papilloma Virus) vaccine were analysed. Results revealed that information about MMR vaccine varied widely based on the media source and how news media attributed blame in health risk communication. In relation to HPV, there was a positive media coverage surrounding the introduction of the HPV vaccination programme. Our paper will help to advance this research field by analysing the coverage of vaccines in the national media of Spain –the fifth largest in the European Union by population.

4. Research questions

The above literature review demonstrates that little research has focused on the specialty of health journalism and the differences between this type of coverage and the coverage of generalists. Hence, the aim of the study is twofold: (1) to examine the professional patterns among health journalists and (2) to compare the extents to which these patterns differ with those among generalists. Therefore, in order to gain a more complete understanding of the specialised journalists' practices, we conducted content analysis to answer the following research questions.

First, despite the amount of attention given to the matter of health in the mass media and its implications for public health, an exhaustive search of the relevant literature in specialised journalistic practices yielded very few studies directly relevant to the present research; most of said studies involved surveys or interviews with health journalists. Thus, whether there is a difference in journalistic performance between health-specialists and generalists is a very pertinent research question, especially nowadays, when media organisations are replacing specialists with generalists. As research around this current professional issue is lacking, the present study will attempt to answer the following research questions:

RQ1: What are the characteristics of the media coverage of vaccines in terms of journalistic genres, tone, frames, and length of the article?

RQ2: Are there any differences between health specialised journalists and generalists in the coverage of news articles about vaccines?

The third research question will focus on the use of journalistic sources in the news. This analysis has become even more pertinent, as news corporations are ever-more profit conscious, meaning that the pressure to increase journalistic productivity has substantially intensified (**Davis**, 2002; **Tiffen et al.**, 2014). In light of this, time for the production of a news article is more limited, and there may be a risk of less rigorous verification and cross-checking. In this regard, **Tiffen et al.** (2014, p. 5) stated that a story based on a single source allows that source's view of events to remain unchallenged, and reflects an uncritical orientation. On the other hand, using multiple sources indicates an active news media orientation, providing checks on what is said and bringing more variety and balance to the views presented (**Guenther et al.**, 2017; **Holtzman et al.**, 2005). Thus, we have made the assumption that the use of none or one single source in a news article is considered an inappropriate journalistic practice, while the use of two or more sources could be a positive practice, as previously suggested by **Schneider** (2012). Therefore, a special emphasis on the empirical part of the current paper will test this assumption. Consequently, the following research question arises:

RQ3: What are the source patterns in terms of types and number of sources used by health journalists in comparison with generalists?

5. Methodology

To answer the study's research questions regarding the differences between health-specialised journalists and general journalists, we conducted a descriptive cross-sectional study based on a mixed quantitative and qualitative content analysis of stories about immunisation in selected major national newspapers in Spain. Content analysis is a research method that uses a set of categorisation procedures to systematically and objectively identify specific characteristics within a text (**Meyer et al.**, 2016). We examined specific patterns or variables for articles published over a 5-year period, from 2012 to 2017.

The online database *MyNews* was used to search the two paid general newspapers with the highest circulation rates in Spain according to the *General Media Study* (AIMC, 2017). *MyNews* is a professional media agency that inspects all national daily newspapers and provides copies of all articles. The newspapers *El País* and *El Mundo* were selected because both are flagship national newspapers in Spain (*El País* with a 1.080 and *El Mundo* with a 0.662 million daily readership rate). The databases were searched using the following search string in the Spanish language: [vacuna* OR inmuniza*]; this string had to be present in the headlines and subheadlines in order to obtain relevant articles about vaccines or vaccination. The article types selected were news articles, features, short articles, opinion articles (including editorials and letters to the editor), interviews, biographies and obituaries. While the word ‘article’ is used throughout this paper, it should be recognised that this includes the other article types just mentioned. Duplicate articles and those using the term ‘vaccine’ with a metaphoric meaning were excluded. We selected the print versions of the newspapers because, despite competition from online and social media, traditional media remains a popular and widely-trusted source of information (Catalán-Matamoros; Peña-fiel-Saiz, 2017).

“ This study examines specific professional patterns among health journalists ”

Articles were imported to *QSR NVivo 11 plus*. This program allows for the categorisation and identification of code frequencies. A trained person conducted the content analysis by using a standardised data-collection instrument to record the author, journalistic genre (news article, feature, opinion article, etc.), vaccine type, number of words, tone and frames. Following previous research (Hilton *et al.*, 2010), the tone was employed primarily to assess whether, from a public health perspective, vaccine was being supported or advocated. For coding ‘tone’ we followed a previous study (Tsuda *et al.*, 2016), where positive tone was coded if the articles focused on benefits (such as disease prevention), neutral if they were not in favour of or were against vaccination, and negative if they focused on risks (such as adverse events and discouragement of the vaccination). The frames were also coded following a deductive method. The following five news frames, which have been used in previous studies, were thus deductively investigated (Semetko; Valkenburg, 2000): conflict, human interest, economic consequences, morality and responsibility. Moreover, a source was identified as a person or institution from whom or which reporters derived story information. The sources were classified according to the affiliation of the individual in the following categories:

- “government scientific organisations” such as the *National Regulatory Medicines Agency* and the *National Health Institute Carlos III*;
- “government organisations”, such as the *Ministry of Health* (Minister, State Health Secretary, etc.) and the health regional administrations and international organisations;
- “scientific companies”, including industrial companies such as those from the pharmaceutical and health technology sectors;
- “university scientists”, including researchers affiliated with any university or research centre;
- “clinicians”, including any health professional working at any healthcare centre;
- “scientific journals”, including any scientific peer-reviewed publication;
- “media”, such as press agencies and media channels;
- professional associations, including any organisations composed of health professionals as members, such as the *Spanish Association of Pediatrics* (AEP, for its Spanish acronym), and the *Spanish Society of Public Health and Health Administration* (Sespas, for its Spanish acronym);
- “consumer groups”, including representatives from patients or users’ associations;
- “NGOs”, including any non-governmental organisation used as a source.

The category “other” was used when a source was not able to be included in any of these categories.

Each article was read and re-read, all the while looking for keywords, metaphors, phrases and sentences related to the above study variables. After the first reading and coding, the next step was to identify the connotative or latent meaning of the text. This process of coding enabled us to move beyond the surface meaning of the stories to their underlying meaning.

In order to ensure reliability in coding, data was coded by one author (DCM), and a second coder (CSO) randomly reviewed 15% of the articles to determine intercoder reliability. The average simple agreement for all variables included in the study was found to be 82% (range: 71% – 100%). The formula outlined by Miles and Huberman (1994) is reliability = number of agreements (same coding)/total codes (agreements + disagreements). The average kappa score was 0.75. After intercoder reliability testing was completed, changes were made to the coding scheme to reflect any disagreements that had been identified. All discrepancies were resolved with the support of a third researcher (CPS) when necessary.

Finally, data was further analysed using *MS Excel* and *SPSS 24th ed.* *Excel* was used to conduct the data descriptive analyses while *SPSS* was used to find *p* values to check the significance of results. When possible,

“ 52% of authors of vaccines in newspapers were specialised health journalists ”

chi-square goodness of fit and t-test analyses were performed to determine whether the category distribution significantly differed from the expected even distribution, and to compare the dependent variables between the two groups: specialised versus general journalists. To create these two groups, we reviewed all articles authors in order to recogni-

se their specialisation either in health or science journalism. We judged whether an author was a specialised journalist according to these two indicators:

1) the journalist has written a large number of health- or science-related articles over the last years,

2) the journalist has clearly expressed a specialisation in science or health journalism in his/her curriculum vitae or on his/her social network profiles (i.e. *Twitter*).

Therefore, the group "specialised journalists" included those journalists who met the previous criteria, while the group "other authors" included those journalists who did not meet the previous criteria. In addition, articles from press agencies that did not include the name of the journalist, and from guest authors such as scientists, politicians, managers, etc., were also considered as "other authors".

6. Results

The search yielded 159 articles. Of these, 28 were not included because they were duplicates, were mentioned in the list of contents, or because the term "vaccine" had a metaphoric meaning, such as "Brexit, more vaccine and less infection" (*El País*, 17.07.2016). Therefore, the final sample included 131 articles. *El País* printed 75 articles and *El Mundo* 56, with no significant differences among them ($\chi^2 = 2.756$; $p = 0.97$; $df = 1$). Table 1 shows the characteristics of the study sample in terms of journalistic genre, tone of the article, type of vaccine, frames and length of the article. According to the authors, 68 articles were written by health/science specialised journalists and 63 were written by other authors. In total, we identified 14 specialised journalists, the most frequent being Mr. Emilio de Benito ($n = 12$, *El País*), Ms. Clara Marín ($n = 8$, *El Mundo*) and Ms. Elena G. Sevillano ($n = 6$, *El País*).

In relation to the journalistic genre, comparisons between both groups revealed significant differences ($p < 0.01$). The greatest differences were found in features, which were used more by specialised journalists (21 vs 8), while opinion articles were mostly written by other authors (8 vs 1). According to the tone of the article, significant differences ($p < 0.01$) indicated that specialised journalists wrote neutral articles more frequently (37 vs 18) while other authors wrote more positive articles (36 vs 22). In relation to the type of vaccine, differences were also found ($p < 0.05$). The greatest differences were shown in the vaccines for "chickenpox" and "cancer", which were more frequently covered by specialised journalists, while the vaccine for "diphtheria" was more covered by other authors. No significant differences were found in relation to the frames, where we can see that "human interest" and "conflict" were the most frequent frames in both groups. Regarding the length of the

Table 1. Journalistic genre, tone, vaccine, frame and length comparisons between specialised journalists versus other authors (N = 131)

Journalistic genres	N	%	Specialised	Other
News	57	43.5	34	23
Feature	29	22.1	21	8 [†]
Short news	23	17.6	8	15
Opinion	15	11.5	1	14 [†]
Interview	4	3.1	2	2
Obituary	1	0.8	1	0
Biography	2	1.5	1	1
Total	131	100.0	68	63
χ^2 (df = 6) = 22.19, $p < 0.01$				
Tone of the article	N	%	Specialised	Other
Positive	58	44.3	22	36 [†]
Neutral	55	42.0	37	18 [†]
Negative	18	13.7	9	9
Total	131	100.0	68	63
χ^2 (df = 2) = 9.76, $p < 0.01$				
Type of vaccine	N	%	Specialised	Other
Ebola	13	9.9	7	6
Chickenpox	12	9.2	11	1 [†]
Diphtheria	8	6.1	1	7 [†]
Meningitis	8	6.1	5	3
Influenza	7	5.3	2	5
Malaria	7	5.3	6	1
Cancer	6	4.6	6	0 [†]
Zika	6	4.6	3	3
Measles	6	4.6	2	4
Tuberculosis	5	3.8	4	1
HIV	5	3.8	1	4
Smallpox	4	3.1	2	2
Hepatitis	3	2.3	2	1
Whooping cough	3	2.3	1	2
Human Papillomavirus	3	2.3	0	3
Polio	3	2.3	1	2
Pneumococcus	2	1.5	1	1
Alzheimer diseases	1	0.8	1	0
Autism	1	0.8	1	0
Dengue	1	0.8	1	0
Yellow fever	1	0.8	1	0
Gonorrhoea	1	0.8	1	0
Mumps	1	0.8	0	1
General (No identified)	24	18.3	8	16 [†]
Total	131	100.0	68	63
χ^2 (df = 23) = 41.07, $p < 0.05$				
Frames	N	%	Specialised	Other
Human interest	69	52.7	41	28
Conflict	43	32.8	20	23
Responsibility	9	6.9	3	6
Economic	6	4.6	3	3
Morality	4	3.1	1	3
Total	131	100.0	68	63
χ^2 (df = 4) = 4.47, $p = 0.34$				
Length (number of words)	N		Specialised	Other
Min	32		32	32
Max	2158		2158	1224
Mean	502.1		564	435*
Median	480		514	383
Standard deviation	332.0		335.0	293.0
t (df = 129) = 2.26, $p < 0.05$				

Significant differences between specialised and general journalists * $p < 0.05$

** $p < 0.01$ *** $p < 0.001$

[†]Residual values < -1.96 or > 1.96 showing a greater discrepancy (MacDonald; Gardner, 2000)

article, significant differences ($p < 0.05$) between both groups were also found, revealing that specialised journalists wrote longer articles on average: 564 vs 435 words per article.

Table 2 shows the source patterns exhibited in both groups of authors. In general, significant differences between both groups were found in the selection of sources ($p < 0.01$). Specifically, we found that specialised journalists used more sources (234 vs 140, $p < 0.001$). By analysing each of the source categories, we found that sources related to professional associations and scientific journals ($p < 0.001$ and $p < 0.01$ respectively) were more used by specialised journalists. By grouping the sources into either “scientific sources” or “other sources” we found that scientific sources were more used by specialised journalists ($p < 0.001$). Finally, in relation to the sources count in each article for either “0-1 sources” or “ ≥ 2 sources”, we also found significant differences ($p < 0.01$), thus indicating that specialised journalists more frequently used ≥ 2 sources per article (54 vs 33), while other authors used none or only one source more frequently (30 vs 14).

7. Discussion

This paper set out to explore the practices of journalists when covering health topics, with special attention paid to the health specialised journalists by means of content analysis. The aim of the study was to examine specific professional patterns among health journalists, and compare the extents to which these patterns differed from those among generalists. Taken together, our findings show key journalistic patterns in the coverage of vaccines and confirm that health journalists perform differently in terms of journalistic genre, tone of the article, sources and length of the article. More specifically, our content analysis shows that health journalists, in comparison with other authors, write more features and less opinion articles, from a more neutral perspective, using a wider number of sources from the scientific field, especially from professional associations and scientific journals.

In relation to the first and second research questions, our study sheds light on the characteristics of the media coverage of vaccines as well as interesting differences between health journalists and generalists. First, we found that “news” was the most common journalistic genre or style in our study sample in both groups of authors. However, the groups differed significantly in “feature stories” – a style which is more used by health journalists, and “opinion articles”, which are more used by other authors. “Feature stories” are more elaborated narrative stories relying upon objectivity and subjectivity to make an emotional connection with the readers; they are, however, truthful and based upon facts and expert sources (Garrison, 2010). In contrast, opinion articles mainly reflect the author’s opinion and thus objectivity and expert sources are not mandatory. Our group, “other authors”, not only included general journalists but also others such as scientists and policymakers, who were invited to write an article for the newspaper; indeed, this could be the reason why said journalistic style is significantly higher in this group when compared with health journalists.

Our findings confirm that health journalists tend to write in a more neutral tone, while other authors write in a more positive tone towards vaccines or vaccination. Writing health articles in a positive tone has received criticism (Amend; Secko, 2012) as it is a tendency that can mislead messages about research findings. It is also relevant to point out that the negative tone was less frequent in both groups. This finding is in contrast with a recent sys-

Health journalists use a wider number of scientific sources, especially those from professional associations and scientific journals

Table 2. Frequency counts for sources and comparisons between specialised journalists versus other authors

Sources	N	%	Specialised	Other
Government scientific organizations ^{ss}	95	25.4	59	36
Professional associations ^{ss}	62	16.5	54	8***
Government organizations ^{os}	57	15.2	32	25
Scientific companies ^{ss}	39	10.4	21	18
University scientists ^{ss}	39	10.4	24	15
Scientific journals ^{ss}	30	8.0	19	11**
Clinicians ^{ss}	25	6.6	14	11
NGOs ^{os}	15	4.0	8	7
Media ^{os}	6	1.6	1	5
Consumer groups ^{os}	3	0.8	2	1
Others ^{os}	3	0.8	0	3
Total	374	100	234	140***
t (df = 10) = 3.92, p < 0.01				
Category of sources				
Scientific sources	290	77.5	191	99***
Other sources	84	22.5	43	41
Total	374	100	234	140***
t (df = 130) = 9.76, p < 0.001				
Sources number in each article				
0-1	44	33.6	14	30†
≥ 2	87	66.4	54	33†
Total	131	100	68	63
χ^2 (df = 1) = 10.71, p < 0.01				

Significant differences between specialised and general journalists * $p < 0.05$ ** $p < 0.01$

*** $p < 0.001$

† Residual values <-1.96 or >1.96 showing a greater discrepancy (MacDonald; Gardner, 2000)

^{ss}Scientific source, ^{os}Other source

tematic review which found a majority of studies with a dominance of media articles which contained negative messages about vaccines or vaccination (**Catalán-Mata-moros; Peñafiel-Saiz, 2018**).

Another point that should be taken into account is the length of the article, as our findings indicate that health journalists write longer articles. This is relevant because nowadays there is less space to tell a story in traditional media outlets (**Kennedy et al., 2011**) and thus the number of words may be limited because of external factors. However, we could also reflect that this imbalance in article length may indicate inequivalent amounts of elaboration across conditions in terms of offering deeper analyses of health issues, such as providing facts, context, bias and mobilising messages for the public. Our study found, on average, 502 words per article in total, with 564 words for those written by health journalists and 435 for those written by other authors. Previous content analyses of print news about vaccines have found slightly larger average counts per article: 485, 725 and 765 words (**Krakow; Rogers, 2016; Pérez et al., 2016; Quintero-Johnson; Sionean; Scott, 2011**). In order to identify any difference in the elaboration of contents, we would suggest further careful qualitative content analyses to clarify the reasons for these length differences within both groups of authors, as well as among countries, as has just been shown in relation to other studies.

Regarding the third research question, it is interesting to confirm different sourcing patterns between both groups of authors. First we found that professional associations and scientific journals were used most commonly by health journalists. This is not surprising, as both types of sources may require a thoughtful knowledge of scientific literature and databases. For example, searching, reading and understanding scientific papers is not an easy task for journalists; this is a specific subject for the training of health journalists. Our findings are aligned with previous research which pointed out that health journalists working in national media organisations have a great reliance on scientific journals and use them frequently, especially to find their initial idea (**Viswanath et al., 2008**). It is also important to highlight that our study revealed that health journalists use more scientific sources in general. This finding may show that other journalists or authors could have an alternative focus in the health topic, such as legal aspects, political issues or economics. However, previous studies have pointed out that scientific sources are preferred for reasons of contextualisation and interpretation of technical and compound health information (**Len-Ríos et al., 2009**). Another important fact is related to the number of sources used in each article, since health journalists included, in general, two or more sources in their articles. The use of multiple sources has been supported by different authors as a way of bringing about more balance and better checks on the views presented (**Guenther et al., 2017; Holtzman et al., 2005**). In our study, the other authors differed from this; indeed, the findings showed that approximately 50% of articles used none or only one source. Not presenting a range of expert opinions has been criticised (**Holtzman et al., 2005**), as the danger of this generation of stories is that the news media may act simply as passive conveyors of dominant sources' views. This line of criticism has been previously cited under the concept of "churnalism" (**Johnston; Forde, 2017**), where pressure on journalists to speed up and escalate their production of news leads to less balancing and verifying of different views.

Despite these interesting findings, some potential limitations of the study should be taken into account. First, the findings of our study cannot be generalised to the broader population of health journalists due to the limited scope of our sample (vaccine media coverage by 14 journalists specialised in health in Spain). Research including more journalists in different health areas and in different countries is necessary. Another limitation is that our study only analysed media coverage in newspapers. Thus, future studies may focus on health journalists working in other media formats, such as radio or television, and particularly those with a different journalistic practice. However, newspapers can be a rather good indicator, thereby providing insight into what could be felt elsewhere (**Meyer et al., 2016**). Nevertheless, the findings in this study are a starting point for developing a more comprehensive portrait of the work of journalists engaged in health. In attempting to create a profile of health journalists, we learned that they are similar to generalists in several ways, although there are some key differences that could represent the added value of the health journalism specialty. We may well encourage further research to test the hypothesis that journalists with knowledge of how best to communicate about health are better equipped to tell the story than general-assignment reporters with no health-writing experience. Indeed, we have tried to paint a more complete picture of the nature of the work of health journalists; this is a different view from the common sense assumption that journalists aim to "sell news" or to "sensationalise" to increase audience numbers. Moreover, findings from this study have important public health implications given the critical role of news media as gatekeepers between researchers and the public.

With this study, we contributed to the theoretical and practical development of journalism studies. This systematic analysis of health journalists, one of the first of its kind, characterises how those with a health journalism specialty

Health journalists perform significantly differently than other authors in terms of journalistic genre, tone, sources and length of the article

Health journalists wrote more features and less opinion articles, from a more neutral perspective

perform differently from those without such a specialty. Collectively, these findings provide insights into the process of health journalism, and identify potential aspects to further develop the profession for the broad dissemination of health news to the public.

8. References

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