A Linguistic Analysis of the Online Debate on Vaccines and Use of Fora as Information Stations and Confirmation Niche

Marianna Lya Zummo[1a]

Abstract

This study looks at the communication between users concerning health risks, with the aim of exploring their use of fora and assessing whether participants establish a niche with like-minded users during these exchanges. By integrating a corpus linguistic approach with content analysis and multiple studies on computer mediated health discourse, this study analyses the intense attention paid to the correlation between the Measles Mumps Rubella (MMR) vaccine and autism, as an example of elaboration of the message and risk of emotive amplification, with fora working as echo chambers. Results include: a) a qualitative analysis of the content of posts and their qualification, b) a focus on the type of concerns questioners raise, and c) a comparison of the qualifier proportions between the posts and the responses they get. The comparison between posts/responses investigates whether the forum works as an amplification station of emotions, or as a locus to establish a belief niche.

[1] Assistant Professor, Email: mariannalya.zummo@unipa.it
   Tel: +39-328-8017165
[a] University of Palermo, Italy

1. Introduction

According to the World Economic Forum (WEF), among the top issues concerned with the rise of tension in society is the concern over the rapid spread of misinformation online, and specifically the role of social media in this (Vis, 2014). The topic of vaccination falls under this area of discussion, being a controversial subject that has been leading to several disputes. On the one hand, governments promote information campaigns to persuade parents to overcome their reluctance to vaccinate their children thus, ensuring high levels of immunization. On the other, there are parents concerned with the individual cases (e.g., their children). Tension arises between medical science looking out for the collective well-being and each parent being concerned with his or her own child. To name just one consequence, there is what Ceccarelli has called *manufactured scientific controversy* (2011). As she explained, "a scientific controversy is 'manufactured' in the public sphere when an arguer announces that there is an ongoing scientific debate in the technical sphere about a matter for which there is actually an overwhelming scientific consensus" (Ceccarelli, 2011, p. 196). In the case of vaccines, medical experts are replaced with parents claiming an expertise of their own earned through their experience of parenthood. Consequently, there is a tremendous amount of information regarding immunization, with the medical community encouraging individuals to vaccinate and the public at large who exhibit hesitancy due to varying personal concerns or beliefs with regard to vaccine efficacy and safety. With the collaborative media, whose information does not necessarily come from reliable sources, the problem of getting valuable information becomes more serious. As such, when it comes to vaccines, anxiety levels increase and opinion groups standing against governments' guidelines emerge. These groups are organized as vaccine resistance movements and are determined to protest against the shots, since they are worried that the use of thimerosal (a compound that is used as a preservative in vaccines and contains mercury) may cause autism. The story began in 1998, when a scientific paper published by Dr. Andrew Wakefield et al. (1998) argued there was a link between the Measles Mumps Rubella (MMR) vaccine and autism. From that moment, a stream of misinformation has generated diatribes in courts, governments, and society at large. A number of activists and celebrities started taking anti-vaccination positions, and their visibility pushed the media to give them space and discuss their views. From a different perspective, experts and public health organizations claimed that noncompliance with MMR vaccination can involve measles outbreaks and vaccination must be considered as a public health priority. Considering the two opposite standpoints, the topic inflamed websites and as a consequence, the net became the place for an ongoing (sometimes misinformed) dialogue between pro- and anti-vaxxers.

The investigation of misinformation is considered both a "scientific activity and an expression of culture" (Kasperson et al., 1988, p. 177). This term refers to accurate information that becomes viral thanks to the sharing culture, the emotional triggers, and the relevant audience, changing its focus and its correspondence to the original source. With the growing popularity of online social networks and their (mis)information propagation potential, the ability to assess the credibility of information has become very important. User-generated content has meant a proliferation of self-publishers with no editing, no source check, and clearly no accountability. As the use of online networks increases, the abuse of this media to spread disinformation and misinformation (misleading information) also increases. In other words, online networks have made huge amounts of information, which propagates quickly, and with almost no accountability with regard to the accuracy of data and its sources. Thus, people could actually be transmitting misinformation, and have a role in the generation of emotive social response.

A linguistic approach can help understanding such response, thanks to the analysis of interactions, or by examining ideological representations of sickness and belief related to healthy life. This paper combines content analysis, corpus linguistics, and sentiment analysis in order to study the discourse around vaccine, in particular the discourse on its safety and risks as represented and debated by involved laymen, parents in particular. Since subjective impressions, opinions, and reactions

are relevant to the adoption of new ideas, the analysis of such reactions can provide insights into the process(es) of idea propagation through groups. Therefore, a sentiment analysis is used to derive participants' opinion, attitudes, and feelings about the topic of vaccine. Using the Linguistic Inquiry and Word Count (LIWC) software, the semantic orientation and polarity of comments is extracted, identified, and studied.

The goals of this paper are to: (a) discover what (and how) users communicate in online comments, and what sources they use; (b) focus on the main concerns they raise and how they represent them; (c) study the chat as an amplification station of emotion exploring the emotive load in the posts and the comments that follow.

First, I describe how the topic of vaccination has been treated socially, and how it has been studied in linguistic and sociological research. Then, I describe the corpus under analysis, and explain the criteria of choice and what methodologies are involved in the analysis. In the result section, I analyse the content of the exchanges according to a coding of postings and the collocations around a selected node to see what representation emerges, and I study data using sentiment analysis software. Afterward, I identify and discuss the linguistic means through which the exchange is construed. I discuss the results and attempt to understand what concerns emerge in these exchanges, the level of misinformation that is involved and how users deal with the content of these posts. The comparison between original posts and replies tells us about the kind of emotions and information contained in these forums. Finally, quantitative and qualitative methods are combined to examine some of the linguistic choices made by online websites dealing with vaccines and by contributors when communicating dilemmas to professionals about whether to undergo vaccination.

2. Theoretical Framework

Research on vaccine-related information is not new. Some anti-vaccination websites were analyzed by Kata (2010), who focused on the information that is offered, its accuracy and on the discourses that make these vaccine objections appealing. Her study demonstrated

the use of numerous anti-vaccination themes, notably: belief in alternative models of health, promotion of parental autonomy and responsibility, and suspicions about medical expertise. According to Poland and Spier (2010, p. 2361) people "have moved from evidenced-based, to media- and celebrity-based medicine". The authors blamed some elements of the press, which seemed to be inadequate in balancing report and risk communication. Nyhan, Reifler, Richey, and Freed (2014) showed how the effectiveness of institutional communication relating vaccines depended on parental attitudes toward antigenic substances and as such, messages might increase misperceptions. From the same perspective, Archer (2015) examined parental discourses on vaccines and showed that vaccine decisions derive from complex risk evaluation that considers the diseases being vaccinated against, the public health threats in an individual's local environment and the perceived vulnerability of one's child, as means for gauging whether the risks posed by vaccines outweigh the risks of not vaccinating. Moreover, his rhetorical analysis of mothers' discourses revealed that while they explicitly deny believing in vaccine-induced autism, language choices reveal that a sense of doubt about the issue remains. Richardson (2005) explored the use made of Usenet newsgroups to share information and opinions on health risks (mobile phones and cancer, Severe Acute Respiratory Syndrome (SARS), MMR vaccine, and autism), and used the results in an assessment of the value of newsgroups for risk communication. Skea, Entwistle, Watt, and Russell (2008) conducted a thematic analysis to explore how participants discussed 'avoiding harm to others' when dealing with MMR vaccination. Parents took critical positions against those who did not vaccinate healthy children, applying for social responsibility.

From a different perspective, corpus analysis, a quantitative approach that provides information on occurrences and the semantic environment around node words, has provided important insights into the linguistic aspects of the discourse around vaccine. Recently, Baroiant (2015) examined how immunization information was presented to the public by online medical and media websites. She found that the term 'vaccine' was associated with positive notions that revolved around

community and family, whereas in the media corpus, a greater degree of concern was evoked for autism, and the safety and efficacy of vaccines.

Research has also evidenced online users to be more often exposed to complexity, since content seems to go beyond true-false, verifiable-falsifiable, and thus increases uncertainty. In Quattrociocchi and Vicini (2016), the notions of echo chambers, confirmation bias, and ultimately misinformation emerge as a result of a study on social networks and the propagation of information. Net users tend to participate actively or passively to online debates only with compatible communities sharing the same narratives (echo chambers), looking for, and interpreting information in a way that confirms ones' antecedent hypothesis and beliefs with little consideration for alternative options (confirmation bias). The more the uncertainty on a topic, the more narratives are employed to fill the gaps and support the original claim. Such narratives contribute to misinformation or, in more current and dramatic words, to the rise of a post-truth society.

Risk, in particular, is one of the favorite topics of online exchanges. Chew and Eysembach (2010) showed the potential of using social media and semantic analysis to study how information is disseminated and how it is perceived. They studied the trend and the proportion of tweets containing resources, personal experiences, and other categories as they increased and decreased over time during the H1N1 crisis. They found that the public concern and engagement increased during the threat of the outbreak and decreased when the risk declined. As studied by Kasperson et al. (1988), the concept of risk "focuses on the probability of events and the magnitude of specific consequences" (1988, p. 177). Its assessment depends on the impacts in terms of direct harm (death, disease, and damage) or indirect impacts (liability, alienation, and costs) in relation to time (future generations), space (Nimby phenomenon), or social groups (e.g., black blocks). Experts also take into account the feedback of the public that actually determines the effectiveness of risk communication. Fora may be particularly dangerous because the repetition of the story directs the public attention toward the risk

problem and away from the source of attention; the debates heighten uncertainty about what the facts really are and decrease the credibility of official spokespersons. Moreover, due to the community shaped environments, fora constitute echo chambers, in that a claim made by one participant is repeated by like-minded users, exaggerated, or distorted and repeated again until the original claim becomes a factual truth, which ultimately reinforces the community belief system. One particular powerful source of amplification is dramatization, which increases the memorability of an event and the perceived potential catastrophic effects. In fact, risk information that also contains emotional messages is perceived more and greatly influences the public (Slovic, Finucane, Peters, & MacGregor, 2010). Undoubtedly, some information spreads online and emotion has a viral role in the diffusion process. The expression of fear is fueled by the social media response and gets the highest viral attention. In fact, there is a good deal of evidence to suggest that strong sentiments are a key to viral sharing (Lakoff, 2008, Schell, 1997, Strassberg 2004). Expression of specific emotions, like fear or uncertainty, is particularly dangerous since they are potential triggers for making a message extremely viral and consequently increasing tension levels. A sentiment analysis is therefore useful to study the building blocks of sentiment expressions, to count words belonging to categories (including positive and negative ones) and to examine people social and psychological states. Moreover, corpus linguistics is also used in this paper, to study the claims on vaccine as they are found in online fora, by studying collocations and their polarization toward positive and negative representations.

3. Methodology

In order to look for message content, a qualitative manual coding of posts was adapted from several studies in the field (in particular Chew & Eysembach, 2010), to reflect the post's content, its qualifier, and the type of link posted. Only one content category was associated with each post but the same could contain more than one qualifier, defined by the use of specific keywords or phrases.

Corpus linguistics analysis was used to explore

the linguistic environment of selected nodes, which was understood to be the main concern in the posts. The comments were downloaded in separate files, named after the original website, and processed using Sketch Engine. The nodes were considered to be 'vaccines' and 'autism' since they both represent the main point under investigation in these exchanges. As such, the paper looks at collocations in order to see the relationship between the node word and the other lexical items in the corpus.

To study the chat as an amplification station of emotion, the emotive load in the posts and their replies were analyzed. A quantitative and qualitative comparison between the emotive loads in the comments and their replies were made in order to verify whether the responses had their emotive loads amplified, thus verifying if these messages help to reduce uncertainty, and finally help with managing the perceived threat. The sentiment analysis was performed by using LIWC, a content analysis tool that employs pre-defined linguistic categories to identify the emotions within the text. This analysis should identify the sentiment content in these comments, and see how people respond to the information/news item.

For the comment analysis, a set of 351 English web comments (approximately 59 thousand words) posted from March 2008 to November 2013 was considered. The researcher chose to remain in a purely observational mode, did not comment on any message nor contacted the site-users. In addition, these websites were open to non-members and posts were publicly available.

To make a comparison, four websites were chosen to, opting for the first that appeared on the Google search engine at the time of selection. These webpages are very different in terms of their goals and structure and may be thought of as old, but they were chosen because they were still the most accessible ones when looking for MMR at the time of selection (Table 1). The very first one that appeared was *babycentercommunity.com*, a net-community which, according to its website, "provides parents with information, advice from peers, and support at every stage of their child's development". The editorial team is made up of professional writers and editors offering advice from expert sources, such as pediatricians, psychologists, and fellow parents. Content is fact checked and reviewed by their own medical advisory board. The second blog is *netmums.com*, a community of mums providing information about local events and dealing with topics related to their children's lives. It is the most successful website in the UK based on the market share of visits (2010-2012). *Ehealthforum*, the only site which is conformed to the *hon* code standards for trustworthy health information, is an online health community that attracts more than 4,800,000 unique monthly visitors. The site hosts more than two hundred medical fora, which reproduce user-based health information. The site defines itself "an interactive, professionally moderated social network, with an administrative staff that reviews every post". Quite surprisingly, the fourth most accessed site is *Amazon*, a site for online shopping with a forum for customers. The thread discussion belongs to the amazon parenting forum. All these websites have commercial interests. One thread explicitly dealing with vaccine and autism was chosen from each webpage.

Table 1
Corpus: Websites Specifications and Data

	BABYCENTER COMMUNITY (BC)	**NETMUMS.COM (NM)**	**EHEALTHFORUM (EH)**	**AMAZON PARENTING FORUM (AM)**
Format	question/replies	question/replies	Thread discussion	Thread discussion
Reputable	content is fact checked and reviewed by their Medical Advisory board	no	Complies with the hon code standards for trustworthy health information	no
Evidence based	Own Medical board	no	yes	no

Commercial interest	Strict policy of separation	Policy of separation and appealing to members	yes	yes
Goal	Provides information, advice and support during child's development.	A community of mums giving information about local events and child development and growth.	The site hosts 200+ medical forums that generate user-based health information.	Information exchanges
N. post	1	1	1	1
N. replies	66	76	18	187
W. count post	180	182	84	86
W. count replies	7394	12400	4401	33815
From	2008	2011	2008	2010
To	2013	2013	2009	2013
Participants	58	32	11	64

Table 1 illustrates the corpus collection, particularly in terms of users and word counts and some information about the webpages from which the comments are taken.

4. Results

4.1. Posts' and Replies' Content and Qualification

Data were grouped into four main content categories: (a) resources (e.g., news), (b) direct or indirect personal experiences (e.g., "I have all my children vaccinated"), (c) personal reactions or opinions (e.g., "I do believe that ..."), and (d) jokes/parodies. Applying previous analysis methodology (Chew & Eysembach, 2010), only one content category was attributed to each post while the same post could contain more than one qualifier. The use of specific keywords or phrases determined the qualification of the post, as indicated in Table 2. The links to other sites and URL categories grouped as personal blogs ("[…] is a great resource. So is Dr. Mercola's site"), governmental or public health websites ("please talk to your doctor and check out http://www.hhs.gov/nvpo/fs_toc.htm"), news websites, social networks, and academic journals were taken into account.

Table 2
Content Categories, and Qualifiers Adapted from Chew and Eysembach (2010). Examples of Search Patterns

Content	Specification	Example
Resources	Post contains news, updates, information	Some studies that have been completed on the long term effects of vaccines strongly suggest they may be the cause of many disease conditions that develop years later
Personal Experiences	Direct (personal) or indirect (friend, family) experiences with vaccines	I have all my children vaccinated because I do believe in what they represent.
Personal Opinions	Post expresses personal views, belief, judgments	I do believe that there are many possible causes of autism.
Jokes	Humorous opinion, parody	You anti-vacs are like a cult, with a rationalized defense and a scientifically twisted explanation for everything you can't really prove. Hey, it works for Tom Cruise.

Qualifiers		
Humor	Post is sarcastic or jokey	If I had six children and they all had autism, I'd certainly start checking labels!!
Relief	Post expresses happiness or sense of peace	I was sick as a child with those diseases, but I'm glad I had them and recovered.
Downplayed Risk	Post de-emphasizes the risks	Looking back at pics of my son at age 3 months, you could tell he's autistic and the MMR vaccines are not given until 12 months...
Concern	Post expresses fear, anxiety	I'm still getting my kids vaccinated, even though it still scared the heck out of me, autism or no autism
Frustration	Post expresses anger	I do believe there is a missing culprit.
Misinformation	Post contradicts the reference standard, expressions of distrust of authorities, speculates about conspiracy	When you compare the Autism rates in countries that don't use our vaccines to us, it is clear that vaccines are the cause of the autism epidemic.
Question	Post contains a question mark	Do you think that maybe they would have some sort of autism from that?

For this content analysis, posts and replies were divided into two groups (4 original posts, one for each forum and 347 replies in total) and their content has been manually analyzed.

In the original posts' corpus, vaccines resources were the most common type of content shared (75%), followed by personal experiences (25%). Posts which were coded with one or more qualifiers mostly display concern (41.5%) and questions (41.5%). A certain value is found for misinformation (16.5%) in two websites. Only one post contained a URL to a personal blog.

Replies mostly contained personal opinions (76.6), followed by personal experiences (36.39), sources (29.28), and jokes (3.9).

Concern (43.57), misinforming content (29.96) and frustration (22.87) were the most common features. Only a few comments displayed downplayed risk (17.9), humor (9.24), or relief (6.21). Some replies re-directed the question found in the post or used rhetorical questions as sarcasm (8.43). Only a few links were found in these replies, mostly redirecting to personal blogs (8.43), news websites (5.82), and a very small number to government or official public health pages (1.89), or social network pages (1.94). Only one reply displayed a link to an open access academic journal (0.33).

4.2. Typology of Concern

I used corpus linguistics techniques to study the term vaccine, its collocation, and concordances. Since I am interested in the typology of concern that is expressed in questions and how answerers reply, I divided my corpus into post and reply sub-corpora, and compared the results. I used an online corpus tool (Sketch Engine) that analyzes corpora and provides statistical models.

From the wordlist, the most used non grammatical word was 'autism', followed by 'MMR' in the post corpus. The same results were found in the reply corpus where 'autism', 'child', 'vaccine', and 'children' were the most common. Clearly, the frequency list revealed that autism is a central theme. The two sub-corpora were then analyzed for the most common collocations with the term 'vaccine', used as a subject, as an object and described with an adjective. Table 3 lists values for overall score frequencies and indicates them in brackets.

Table 3
Values for Overall Score Frequencies and Overall Frequencies

VACCINE	POST	REPLIES
As subject (129 – 3.30)	Be (3)	Cause (12), be (61), do (11), damage (5)
As object (123 – 2.00)	Link (2), prove (1), believe (1)	Get (15), give (10), receive (6), believe (5), have (14)
As adjective (23 – 4,20)	-	Safe (4), effective (3), available (3), harmful (2), due (2)

In the original posts, vaccine used as a subject has the highest overall frequencies for the verb 'to be', a linking verb used in statements which sets a correlation with autism, whether it is for or against, and is certainly intended to result in a discussion.

> For those of you who still believe the MMR **vaccine** *is* the cause of autism, please read this finding of the study that said that the **vaccines** *were* not the cause of autism because when… .

The replies dealt with the effects vaccines may have. In fact, the vaccine causes/is/does/ damage, as in the following examples:

> Meanwhile, there is no evidence that any **vaccine** *causes* autism. Therefore, parents who do use our vaccines to us it is clear that **vaccines** *are* the cause of the autism epidemic. Believe our brains, intestinal tract, liver, etc. **Vaccines** *are* toxic, in varying degrees, and how nothing. They now need to prove that the **vaccine** *does* not interact with other things babies … .

Verbs were both linking and action verbs, and they were mostly used to show the relationship between vaccines and autism.

As an object, the highest overall frequency in the post corpus is for the word 'link', and 'prove', all action verbs, again used in sentences that correlate vaccine to autism.

> … will find that the study *linking* the MMR **vaccine** to autism was not only sponsored by a party to gain a lot from an outcome where the **vaccine** was *proven* unsafe.

The verbs *get* and *give* were the most often used ones and co-occurred with vaccine as an object.

> Even if your child *gets* the **vaccine**, they can still get the disease. My doctor (physician) says that children should not be *given* **vaccines** until their bodies (immune system) are still on the market. I have had no more **vaccines** *given* to my children. They are now 12 and … .

The construction get + direct object is a pattern with the meaning of receiving. In the examples above it is clear that children are the main subjects of vaccines, and vaccines prevent but don't exclude getting the disease. These examples show the posters' awareness about what a vaccine is and what results from receiving it. In addition, they show the parents' active participation and positioning in their children's health choices ("I have had no more...").

No attribute is given to vaccines in the original posts, while in the replies the vaccine is said to be (not) safe, effective, available, and also harmful:

> … believe that's all the proof they need that **vaccines** are *safe* . They aren't safe for everyone of whooping cough decreased by over 99%. **Vaccines** are *effective* at preventing us from believe in giving children every single **vaccine** *available* or recommended by the government hearing people argue against the fact that **vaccines** are *harmful*. Although any parent wants …

These statements confirm that vaccines are effective at preventing diseases but their safety is dubious because of the components that are injected, which mean they may be harmful, at least for some child.

4.3. Emotive Content

Posts and replies were entered into the LIWC software and analyzed separately. Texts were analyzed according to the LIWC variables (see utpsyc.org): I words (words that make reference to the speaker), social words (that make reference to other people), positive words (e.g., happy, love, good), negative (e.g., sad, afraid) words, and cognitive words (words that denote active thinking).

In addition, four variables were added to the analysis of posts: analytical thinking (logical or personal thinking), clout (attempted style or confidence), authenticity (associated with a more honest way of talking), and tone (style that determines hostility or a positive attitude), as in Table 4.

Table 4
Results for LIWC Analysis in Original Sample of Posts for Each Site (EH, NM, BC, AM)

	EH	NM	BC	AM	LIWC average for social media
I WORDS	6.3	8.2	6.0	0	5.51
SOCIAL WORDS	11.4	9.3	15.1	7.8	9.71
POSITIVE EMOTION	2.5	1.6	1.2	2.9	4.57
NEGATIVE EMOTION	1.3	2.7	1.2	1.0	2.10
COGNITIVE PROCESSES	12.7	9.8	13.3	11.8	10.77
ANALYTIC T.	30.0	47.7	19.5	91.8	55.92
CLOUT	73.7	45.6	74.6	75.4	55.45
AUTHENTICITY	61.7	44.8	79.3	4.5	55.66
TONE	49.3	11.6	25.8	62.9	63.35

From the results in Table 4, we can get information about the users asking for advice and/or starting a thread. The users tend to write many self-references (I, me, my), and cognitive words. These aspects show that the general user asking for advice seems to be insecure and nervous, but they are actively thinking about the topic of their writing. Results for social words are not homogeneous but tend to have a similar or higher than average value suggesting that they have talked with other persons. Values for emotion reveal generally pessimistic linguistic behavior linked to anxiety. Users also tend to show high expertise in confident talk, although this talk is based on personal stories. The values for the emotional tone suggest users tend to be ambivalent, and this confirms values for authenticity that show a more guarded form of discourse.

Replies underwent the same analysis with particular attention to the following variables: I-words, social words, positive and negative emotions, cognitive words, and big words (more than 6 letters, a variable used to determine how emotionally distant a speaker is), as in Table 5.

Table 5
Results for LIWC Analysis in Replies Posts' Sample

	EH	NM	BC	AM	LIWC Average for Social Media
I WORDS	3.89	3.65	3.62	3.72	5,51
SOCIAL WORDS	8.58	8,78	10.79	10.85	9.71
POSITIVE EMOTION	1.53	1,27	1.60	1.54	4,57
NEGATIVE EMOTION	0.78	1.11	1.40	1.31	2.10
COGNITIVE PROCESSES	7.62	6.50	6.41	6.54	10,77
BIG WORDS	21.52	17.28	18.31	18.87	13.1

From the analysis, it can be seen that there is not a significant difference between the posts with regard to emotion, although they have a lower value than the average emotive content on social media, in particular for positive emotion. Unlike posts, replies tend to offer confident statements. However, these statements are often self-referential and based on personal narrative thinking, although they do keep an emotional distance.

The most important datum obtained in these analysis of posts and replies, however, is what emerges when comparing the results, in particular for emotion words. A comparison between posts and replies reveals that replies have less positive emotion words (values: 2.05 for posts; 1.48 for replies), which implies a higher level of anxiety in replies. This result means that a higher level of concern and tension in replies is involved, which leads to the corroboration that the passages of information from posts to replies include an amplification of emotions.

4.4. Sharing Opinion or Making a Standpoint?

In this study, vaccination is confirmed to cause concern and sometimes anxiety, in particular in terms of its relation to autism. The posts discuss updated news and information, combining them with personal experience. The linguistic choices made by speakers suggest that vaccine and autism are correlated in one way or another, but no standpoint is taken. The user seems to be troubled and eager to find some other opinions, maybe to confirm their original belief in some sort of confirmation bias procedure. Questioners try to display ambivalence, which results in a guarded form of discourse although they use informal styles.

Replies, on the other hand, do position vaccines, either as a good thing (vaccines are safe, effective, and available) or a bad thing (vaccination is harmful), and represent vaccination as something that has an effect on children (therefore vaccines cause a condition, whether it be autism or other ailments). From these data, a factual participation in the debate and in the health choices emerges, and a concern about vaccines also surfaces. Vaccines may be harmful for some children, for some reason, or at least may not be totally safe:

(1) You nay sayers go ahead keep blindly stabbing your kiddos with these toxic concoctions. Severe reactions do exist. I will admit that not every child will be injured by a vaccine but to dismiss the evidence that many and I do mean many more than the pharmaceutical companies will admit to, are injured, is irresponsible. By the way in spite of having had the MMR vaccine my son also ended up getting measles and mumps!

(2) Everyone's body is different. We all react differently to different things. That is why vaccines are so dangerous. They inject every child with the same dosage and because not every child gets autism from their vaccines that means that vaccines cannot possibly be the cause of autism? That's absurd. Vaccines may be 'harmless' and 'safe' to some children and deadly to other children.

(3) That is because everyone is different and everyone reacts to the toxic metal differently. Maybe one had a better immune system than the other did on the day of the shots. I'm so sorry about your child, I think it is so evil that the government lies to us.

In these examples, vaccination is deeply discussed as a dangerous thing (ex. 2) that is imposed by mistrusted sources (e.g., governmental authorities that lie as in ex. 3 and pharmaceutical industries that deny the risks on safety on health as in ex.1). In addition, the vaccine is inferred as having no expected effects on health (ex.1: "my son ended up getting measles and bumps") and has consequently no reason to exist, since it does not prevent the disease. The general assumption is therefore of a somewhat negative tool, which is not effective and may even be unsafe. It is even suggested that it is a governmental and industrial product that is given to the population for conspiratorial reasons and for money:

(4) Based on my research I have arrived at the inevitable conclusion that vaccination is an organized criminal enterprise dressed up as disease prevention by means of junk science. There is NO WAY I would let anyone with a vaccine come near me or any child of mine and if

parents knew the truth about vaccines they would probably all say "Over my dead body!" There are in fact quite a number of doctors who are opposed to vaccinations and refer to vaccination as a gigantic hoax, a massive fraud, child abuse, and a crime against humankind. If not even doctors agree on whether vaccines are of benefit, why should parents trust what the medical authorities tell them? The entire vaccine industry should in my opinion have been shut down for good many decades ago, but I guess the money they make from this disgusting racket is just too good to make such a sensible move.

The post is written by a parent who describes vaccination as an 'organised criminal enterprise' which makes good money from 'the disgusting racket' and which even doctors are opposed to. Mistrust is here transferred from the product to society at large. Within comments that contradict the reference standards in more or less aggressive tones (content, capitalized typing, engagement, and rhetorics), others appear on the same page as feedbacks, with users posting replies and engaging in personal exchanges, such as this:

(5) Yup. I am absolutely an attorney paid by The Conspiracy to twist reality by referring people to hard science and documented, reproducible, and peer-reviewed factual research that is publically available... how did you uncover my dark, dark secret?!?

Wait, wasn't the link between vaccines and autism and research supposedly discovered and proven by a Researcher?!? Yet he was trying to prove a pet theory, in a biased environment, producing biased results, which have been disproven countless times by other researchers on both sides of the debate (those trying to support him and those trying to discredit him). That's how the bad research on the supposed link between vaccines and autism was uncovered and discredited a thousand times over! Egad!

I suppose I'm not earning my admittedly exorbitant secret attorney's fee very well. The cigarette smoking man must not be

pleased with me.

Copyleft (c) 2010 - The Secretive and Nefarious Conspiracy to Reduce Stubborn Ignorance in the General Population (muhahaha)

Using sarcasm, the post tries to demolish the supposed 'scientific-ness' of the link between vaccine and autism by dismantling Wakefield et al.'s (1998) scientific reputation and referring to documented academic research.

Most anti-vaccination posts use personal experiences and medical information to demonstrate their opinions are valid ones:

(6) Someone asked why Autism has gone up since mercury has been removed from most childhood vaccines. It's because Aluminum is even more dangerous when injected into the body. Guess what they replaced the Mercury with? Tons of Aluminum! *Do your research folks. Aluminum is a known toxin*. (My italics)

(7) It is now recommended that when cats have vaccinations, it be done in their back leg, because if it turns into cancer (which it too frequently does) you can have that leg removed - in the more common (shoulder) spot, there is no saving the animal. *So yes, your tumor may very likely have been caused by a vaccination.* (My italics)

(8) *I am a nurse* also and I still feel that certain vaccines can trigger autism, especially starting to vaccinate right away, and get so many shots on the same day. Maybe it is better to wait until the child is 2 or 3, when their brain has been fully developed. I think it's unnecessary to vaccinate babies. They just need the mothers' breast milk. (My italics)

These posts are conceived as personal opinion resulting from personal experiences. When confronted with the question 'should I have my child vaccinated', replies show an emotive content that results in a somewhat 'mum knows best' kind of attitude.

(12) Every child is different. You are the mother and you know what's best. Go

with your gut.

(13) I suggest you trust your instincts Carra811 and don't believe anyone with a vested interest in vaccinations. [...] My own son is completely vaccine-free and very healthy!

Unlike posts originating the threads, replies offer confident statements conceived mostly on personal experiences and supported by news websites, blogs, official government pages, and even academic journals. Most of these posts contradict official standard, express distrust of authorities (of whatever nature), speculate about conspiracies, all using aggressive (mediated) tones. On the opposite ground, there are comments that show trust in scientific research and faith in institutions but, even in this case, the use of sarcasm and the sneering attitude suggest a sort of participants' aggressive tones. Beside the factual information, then, the personal endorsement in the debate is based on emotional responses, the 'mum knows best' attitude, conspiratorial tones and sarcasms, which makes relevant the personal non-dialogic standpoint on the subject matter. In fact, these comments do not seem to aim to a dialogue between the parts (pro and anti-vaxxers), but at construing new narratives in favor or against one's belief on vaccines.

5. Concluding Remarks

This paper analyzes the flow of communication that takes place on health forums dealing with the MMR vaccine as an example of elaboration of the message and of emotive risk amplification. Risk communication is an interdisciplinary area of study focused partly on the sources, partly on mass media as intermediaries between sources and the public, and partly on what people make of what they hear and read about risks (Kasperson et al., 1988). When it comes to health information, the quality and credibility of information is paramount as it has been proven that people change their attitude and behavior according to the information they read online (Fox & Jones, 2009). Concerns regarding vaccine safety and side effects were among the most cited reasons for not choosing to vaccinate (Eastwood, Durrheim, Jones, & Butler, 2010; Schwarzinger, Flicoteaux, Cortarenoda, Obadia, & Moatti,, 2010; Seale et al., 2010), suggesting vaccines were a risk

factor for children's health, and having repercussions in social health at large. Fora, considered as a fast means of creation and dissemination of information and opinion, generate problems when a legitimate opinion is produced or perceived as a fact, an information to be trusted. Online participants, for the same use and nature of online debates, do not focus on the accountability of online data, nor do they rely on fact-checking or source control. Recently, researchers have worked on the notion of disinformation linked to echo chambers and generated by confirmation bias (Quattrociocchi & Vicini, 2016). The echo chamber is a sort of echo-system in which the truth value of the information is not salient, what matters is whether the information fits in one's narrative that consequently becomes of a paramount centrality. Consequently, posts are conceived as a personal narration of events/ideas, where particular rhetorical/ persuasive features (trust issues, expertise, emotional involvement) are employed to have success in the debate (Quattrociocchi & Vicini, 2016). One central issue of concern is that of trust, and why some sources are trusted more than others. Because it is interactional, the online group discourse represented in my data gives a perspective on the negotiation of trust in one particular context, as contributors in their different ways articulate their credentials to speak on particular subjects and are variously challenged or accepted in doing so. Similarly, Richardson (2005) analyzed the discourse strategies used to display/construct expertise in the newsgroups, as well as the strategies used in responding to displayed expertise. She found that references to mass media sources in these conversations helped the negotiation of trust/skepticism, whereas results in this paper show that advocacy, logical thinking, and trust in scientific and academic transmission of knowledge (peer-reviewed journals, scientific approach to the topic, specialist discourse) are the main tools used to persuade the reader of the accuracy of one's own information. In line with what was previously found by Kata (2010), who studied numerous anti-vaccination themes (belief in alternative models, parental autonomy, and suspicions about medical expertise), this study also quantifies the level of misinformation that is articulated in three themes: suspicions about government and pharmaceutical industries and mistrust of health centers, the vulnerability of one's own child,

and promotion of parental responsibility. Emotive strategies are used in this sense to underline the unique role of a mother, who relies on what she 'naturally feels', as well as frustration and angry talk to display challenge, and sarcasm to display skepticism. An additional perspective on the credibility of the posts/comments is given by the use of links, as contributors variously cite other sources in relation to their own doubts and beliefs (news websites, blogs, webpages, and online journals). The message that comes from reading these posts confirms that people use emotions to validate their comments on vaccines. As suggested by Zhu (2015), emotional content in language is of a crucial value and mostly relies on linguistic metapragmatical abilities. This paper seems to validate these statements since comments are found to transmit high emotive intensity, relying on language-specific and metapragmatical means in a computer-mediated context. However, the dialogic nature of newsgroups makes emotive content a potential risk within the transmission of information that occurs in fora because they build an amplification station which may result in an actual echo chamber.

The present study was designed to determine the effect of posting a much discussed and emotional theme online, and to establish the impact it has on the active online audience by analyzing the replies. The observation of data may support the hypothesis that the message is elaborated in online contexts as risk amplification or attenuation. The monitoring of false information and its dispersion is an emerging field of study. Despite these promising outcomes, questions remain. These findings may be somewhat limited by the number of included posts and replies that have been looked at, and further work is required to establish the viability of this encouraging result and develop a full picture of this important issue.

References

Archer, L. R. (2015). *Validating vaccines: Understanding the rhetorical dynamics of expertise amid a manufactured controversy* (Unpublished doctoral dissertation). University of Washington, Washington, USA.

Baroiant, T. (2015). *Combining critical discourse analysis and corpus linguistics to examine the term 'vaccine' in online news media* (Unpublished master's thesis). San Francisco State University, San Francisco, USA.

Ceccarelli, L. (2011). Manufactured scientific controversy: Science, rhetoric, and public debate. *Rhetoric and Public Affairs, 14*(2), 195-228.

Chew, C., & Eysembach, G. (2010). Pandemics in the age of twitter: Content analysis of tweets during the 2009 H1N1 outbreak, *PlosOne*, *5*(11). Retrieved from http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014118

Eastwood, K., Durrheim, D., Jones, A., & Butler, M. (2010). Acceptance of pandemic (H1N1) 2009 influenza vaccination by the Australian public. *Medical Journal of Australia, 192*(1), 33-36.

Fox, S., & Jones, S. (2009). *The social life of health information. Pew internet & American life project*. Retrieved from http://www.webcitation.org/5qmyENVj0

Kasperson, R., Renn, O., Slovic, P., Brown, H., Emel, J., Goble, R., … Ratick, S. (1988). The social amplification of risk: A conceptual framework. *Risk Analysis*, *8*(2), 177-187.

Kata, A. (2010). A postmodern pandora's box: Anti-vaccination misinformation on the Internet. *Vaccine, 28*, 1709-1716.

Lakoff, A. (2008). The generic biothreat, or, how we became unprepared. *Cultural Anthropology, 23*, 399-428.

Nyhan, B., Reifler, J., Richey, S., & Freed, G. (2014). Effective messages in vaccine promotion: A randomized trial. *Pediatrics*, *133*(4), 835-842.

Poland, G. A., & Spier, R. (2010). Fear, misinformation, and innumerates: How the Wakefield paper, the press, and advocacy groups damaged the public health. *Vaccine*, *28*(12), 2361-2362.

Quattrociocchi, W., & Vicini, A. (2016). *Misinformation. Guida alla società dell'informazione e della credulità*. Milano: FrancoAngeli.

Richardson, K. (2005). *Internet discourse and health debates*. London*:* Palgrave MacMillan.

Schwarzinger, M., Flicoteaux, R., Cortarenoda, S., Obadia, Y., & Moatti, J. P. (2010). Low acceptability of A/H1N1 pandemic

vaccination in French adult population: Did public health policy fuel public dissonance? *PlosOne, 5*(4). Retrieved from http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0010199

Seale, H., Heywood, A., McLaws, M.-L., Ward, K., Lowbridge, C., Van, D., & MacIntyre, C. R. (2010). Why do I need it? I am not at risk! Public perceptions towards the pandemic (H1N1) 2009 vaccine. *BioMedCentral Infectious Disease*, 10(1). Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2864274/

Schell, H. (1997). Outburst! A chilling true story about emerging-virus narratives and pandemic social change. *Configuration, 5*(1), 93-133.

Skea, Z. C., Entwistle, V. A., Watt, I., & Russell, E. (2008). Avoiding harm to others' considerations in relation to parental measles, mumps and rubella (MMR) vaccination discussions - An analysis of an online chat forum. *Social Science Medicine, 67*(9), 1382-1390.

Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2010). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk and rationality. In P. Slovic (Ed.), *The feeling of risk: New perspectives on risk perception* (pp. 21-36). New York: Taylor & Francis.

Vis, F. (2014, April 24). To tackle the spread of misinformation online we must first understand it. *Guardian*. Retrieved from https://www.theguardian.com/commentisfree/2014/apr/24/tacle-spread-misinformation-online

Wakefield, A. J., Murch, S. H., Anthony, A., Linnel, J., Casson, D. M., Malik, M. … & Walker-Smith, J. A. (1998). Ileallymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *Lancet, 351*, 637-641.

Zhu, L. (2015). Language, emotion and metapragmatics: A theory based on typological evidence. *International Journal of Society, Culture & Language, 4*(2), 119-134.