

A teething problem: An examination of how the 2013 Waikato fluoridation debate was reported by the Waikato Times

Douglas Ashwell, Massey University (New Zealand), d.ashwell@massey.ac.nz

Abstract

The fluoridation of public water supplies has been an area of contention in many countries. In New Zealand in 2013 a debate about the fluoridation of the Waikato region's water supply occurred. This study investigates how the Waikato Times, the regional newspaper, reported the issue. The findings reveal the issue was reported primarily in the Letters to the Editor (LTEs) section and that some of these letters blurred the lines between those written by activists and the personal and emotionally charged stories preferred by editors. This is an area for further research. Moreover, the science behind fluoride was poorly reported giving the public little guidance to make an informed decision. While the Waikato Times reported the issue in a socially responsible manner the views of those opposed to fluoride were mainly reported in LTEs and as suggested this has implications for activist groups. The paper also suggests that more research into these types of public debates is required as they give important insights into how policies regarding science and health are debated in the wider community.

Introduction

The fluoridation of public water supplies has been a contentious issue in many countries, including New Zealand. Despite fluoridation of water supplies occurring over a number of years surveys “from a number of countries have shown that a considerable degree of misunderstanding remains about its purpose and effects” (Melbye & Armfield, 2013, p. 66). Recent debates about the fluoridation of public water supplies appear to indicate the public of New Zealand share these misunderstandings.

New Zealand's most recent debate about the fluoridation of public water supplies occurred in the city of Hamilton in the North Island. According to the New Zealand 2013 census Hamilton is New Zealand's fourth largest city with a population of 141,615 (Statistics New Zealand, 2013). In June 2013 the Hamilton City Council, after a 4-day tribunal, voted 7-1 in favour of removing fluoride from the city's water supply. This removal was short-lived, with a public referendum in October 2013 resulting in 68% of those voting supporting the reintroduction of fluoride into the water supply. The Council voted to reintroduce fluoride into the water supply on the 27 March 2014. However, fluoride was not reintroduced until June 2014 after a bid by Safe Water Alternative New Zealand for an interim injunction against The Hamilton City Council reintroducing fluoride, failed. Since this incident anti-fluoride campaigners have targeted other councils around New Zealand, including Kapiti Coast District Council, South Taranaki District Council and the Auckland Council. Before moving to the purpose of the current study it is useful to give some background to the two sides of the fluoride debate.

The debate

Those in favour of fluoridation argue fluoride is a naturally occurring element that is found in the air, water, soil and some foods and therefore is not a medicine or drug (Hamilton City Council, 2013). It is also argued that fluoridation is a safe and cost effective method to protect against tooth decay and after 60 years of research there is no evidence fluoridation causes illness and that at its current level (0.7 to 1.0mg/litre) it is not toxic (Waikato Times, 2013; Hamilton City Council, 2013). However, despite these reassurances and the long period of research showing fluoridation to be safe, others argue against its use on a number of levels.

The argument against the fluoridation of public water supplies revolves around three main points: Lack of efficacy, lack of safety and lack of consumer choice. According to Fluoride Free NZ (2014) fluoride is ineffective because:

The overwhelming body of scientific and statistical evidence does not support fluoridation. Decay rates have been dropping all around the world in fluoridated and non-fluoridated countries at the same rate for many decades. Decay rates have dropped similarly in New Zealand in both the fluoridated and non-fluoridated areas. Decay rates have continued to drop in towns and cities when fluoridation is stopped. (Fluoride Free NZ, 2014)

Fluoride Free NZ also argues fluoride can cause a number of negative health effects including: dental fluorosis, increased likelihood of bone cancer in teenage boys, the likely reduction in children's intelligence and the disruption of enzymes amongst other adverse health effects. Finally, the organization argues the fluoridation of the water supply takes away people's right to avoid this chemical and that it is a form of mass medication to which people have not given their informed consent (Fluoride Free NZ, 2014).

Science and the media

According to Schäfer (2011) the mass media are a major source of science information for many people. This leaves the media in a strong position to present selected science issues onto the public agenda (Schäfer, 2011). In terms of scientific controversy the media also play an important role with "some of the most important science debates...conducted on the front pages and in the headlines of the mainstream news" (UK Science and Media Expert Group 2010, p.3). Therefore, by reporting these issues the media can become a medium by which the public can come to understand the science involved in these issues and furthermore, encourage democratic debate about such scientific controversies. However, to create democratic debate about scientific controversies, such as the use of fluoride, the media should try to adhere to the principle of social responsibility by reporting the diversity of views on such issues (McQuail, 1987). Part of this endeavor will require the media to uphold their Fourth Estate role by holding scientists to account and exposing debates amongst scientists to public scrutiny (Salleh, 2008).

The Hamilton city fluoridation debate became a prominent news media issue being reported in both national and regional newspapers along with reports on national television news programs. The current research examines how the local newspaper the Waikato Times reported the issue. The Waikato Times is the largest regional newspaper in New Zealand with a circulation of 26,610 (NZ Audit Bureau of Circulation, 2014) and an average readership of 96,000 (Fairfax Media, 2015). The research examines the following questions:

How was the debate reported?

Who were the main sources quoted in the debate and was a diversity of views reported ?

Which arguments both positive and negative were reported in the stories and which dominated?

Was the science of fluoride explained well?

Methodology

The study uses content analysis to examine fluoridation texts published in the Waikato Times from the 1st January 2013 to 31st December 2013. Content analysis is a useful method to study newspaper content as it enables the researcher to make “replicable and valid inferences from texts (or other meaningful matter) to contexts of their use” (Krippendorff, 2004, p. 18).

Content analyses are replicable because the method is quantitative with the purpose of counting the frequency, “of specified characteristics or dimensions of texts, and through this, to be able to say something about the messages, images, representations of such texts to their wider social significance” (Hansen, Cottle, Negrine & Newbold, 1998, p. 95).

Using the Newztext New Zealand database all texts published by the Waikato Times between the 1/1/2013 and the 31/12/2013 mentioning the word fluoride were collected and examined. Each text was read to ensure that it discussed the fluoride debate rather than merely mentioning fluoride with no further discussion of the ongoing debate. This process resulted in a total sample of 373 texts.

These texts were then coded on a number of variables including: the number of words in each, where it appeared in the newspaper and the type of text it was for example, Front page, news story or Letter to the Editor (LTEs).

Next each text was coded according to whether it was pro, anti or neutral towards fluoridation. To ascertain the stance of a text each was read to examine what arguments were being put forward. Where a text only contained arguments promoting the benefits of fluoride it was coded as pro-fluoride and where a text only contained arguments against fluoride it was coded as anti-fluoride. Where texts contained arguments both for and against fluoride the texts were examined closely to establish whether these arguments were balanced. If so they were coded as neutral however, where the balance of arguments was either more pro or more anti fluoride they were coded accordingly.

The texts were also coded according to the source types quoted in the text. In addition, the main argument being put forward in the text and how these corresponded to the arguments promoted by both those for and against the fluoridation of public water supplies were also examined. Finally, the number of mentions of the science about fluoride was calculated. The results of these analyses are presented below.

Results

As noted, the Waikato Times published 373 texts between 1/1/2013 and 31/12/2013 discussing the fluoridation debate. The average word length of these texts was 213.34.

In terms of their position in the newspaper 16 texts appeared on the Front Page, while the rest appeared later in the newspaper. When analysed in terms of what section of the newspaper the texts appeared, the majority as shown in Table 1 below were LTEs 81.1% (302) and news items only comprised 15.5% (59) of all items published on the topic.

Table 1: Fluoride texts by newspaper section

Newspaper Section	Number
Front page	16 (4.4%)
News	43 (11.1%)
Feature	2 (0.6%)
Opinion	5 (1.4%)
Editorial	5 (1.4%)
Letter to the editor	302 (81.1%)
Total	373 (100.0%)

When the texts were analysed in terms of their stance towards fluoridation it was found that 41.8% (156) were anti-fluoride, 31.9% (119) were pro-fluoride, and 26.3% (98) were neutral towards fluoridation.

Table 2: Type of text by attitude towards fluoride

Type of text	Pro-fluoride	Anti-fluoride	Neutral	Totals
News	21 (35.5%)	6 (10.2%)	32 (54.3%)	59 (100.0%)
Feature	0	0	2 (100.0%)	2 (100.0%)
Column	1 (100.0%)	0	0	1 (100.0%)
Opinion	1 (25.0%)	3 (75.0%)	0	4 (100.0)
Editorial	2 (40.0%)	0	3 (60.0%)	5 (100.0%)
Letters to the Editor	94 (31.1%)	147 (48.7%)	61 (20.2%)	302 (100.0%)

Table 2 illustrates the results of a cross tabulation of the type of text and its attitude towards fluoride. As shown the majority of LTEs were anti-fluoride 48.7% (n=147) with only 31.1% (n= 94) being pro-fluoride (See Table 2). The news texts showed a different pattern with the majority being neutral at 54.3% (n=59) followed by pro-fluoride items at 35.5% (n=21) and 10.2% (n=6) were anti-fluoride. The two Feature texts were both neutral in their approach to the fluoride debate and the only Column was pro-fluoride. Of the four Opinion pieces 75.0% (n=3) were anti fluoride and 25.0 (n=1) were pro-fluoride. Finally, of the five Editorials 40.0% (n=2) were pro-fluoride and 75.0% (n=3) were neutral.

The news texts, including feature articles, were also examined in terms of the types of sources quoted and these results are presented in Table 3 below.

Table 3: Type of sources quoted in news story texts

Type of source	Number of sources
Anti-fluoride campaigners	25 (14.6%)
Politicians and policy makers	72 (42.1%)
Health officials/professionals	32 (18.7%)
Dental professionals	21 (12.3%)
Scientists	8 (4.7%)
Pro-fluoride campaigners	2 (1.2%)
Other	11 (6.4%)
Total	171

	(100.0%)
--	----------

As the table illustrates the largest source group with 72 sources (42.1%) were politicians and policy makers, the next largest group were health officials and professionals numbering 32 (18.7%) of all sources. Anti-fluoride campaigners with 25 sources (14.6%) were the next largest group and they were followed closely by dental professionals with 21 sources (12.3%) and as shown in the table this was the only other group making up more than 10% of all sources.

The next variable examined was the main theme or argument of each text including LTEs to find how much they reproduced the arguments used by the pro and anti-fluoride groups outlined in the introduction. The results of this thematic analysis are shown in Table 4 below.

Table 4: Main topics appearing in the texts

Main topic of text	Frequency of topics appearing
<i>Anti fluoride arguments</i>	
Fluoride is poisonous/ harmful to human health	61 (16.2%)
Science argues fluoride is harmful	34 (9.0%)
Lack of freedom of choice	34 (9.0%)
Mass medication	27 (7.2%)
Fluoride does not reduce tooth decay	6 (1.6%)
Using fluoride toothpaste is better than fluoridation	6 (1.6%)
Attacks against pro-fluoride campaigners	3 (0.8%)
<i>Pro fluoride arguments</i>	
Fluoride good for teeth and backed by science	56 (14.9%)
Attacks against anti-fluoride campaigners	25 (6.6%)
Anti fluoride arguments not scientific or based on good science	16 (4.2%)
<i>Political and democratic issues</i>	
Referendum, Tribunal and Surveys	38 (10.1%)
Anti democratic bad decision to remove fluoride	13 (3.4%)
Politics	9 (2.4%)

<i>Other topics</i>	
Fatigue with debate	14 (3.7%)
Scientific issues	9 (2.4%)
Call for more ethical debate	3 (0.8%)
Other	23 (6.1%)
Total	377 (100.0%)

As these results illustrate both the pro and anti- fluoride arguments presented in the introduction were also present in the reportage analysed. In terms of anti-fluoride the most prevalent arguments suggested fluoride was poisonous and harmful to human health (16.2%). Texts stating the latest science was proving fluoride to be harmful and fluoridation of water supplies prevented consumers having a freedom of choice followed these, both at 9% respectively. Smaller numbers of anti-fluoride texts argued fluoride did not reduce dental decay (1.6%) and an equal number of texts suggested the use of fluoride toothpaste was a better alternative (1.6%). A small number of texts attacked pro-fluoride campaigners (0.8%).

The most common pro-fluoride texts argued fluoride did reduce dental decay and fluoride was supported by science (14.9%). Texts attacking anti-fluoride campaigners (6.6%) followed this with the final group of pro-fluoride texts arguing the case against fluoride was not based on sound science (4.2%).

Other topics were concerned with the original 4 day tribunal that saw the Waikato City Council cease fluoridating its water, the referendum seeing fluoride returned to the water supply and other texts referring to opinion polls about the issue (10.1%). A smaller group of texts argued the original decision to remove the fluoride was undemocratic (3.4%) and these were followed by a smaller number of texts discussing local body politics and the influence of the fluoride debate on the local body elections (2.4%). Other topics included people who were fatigued with the debate in the LTE section (3.7%), scientific issues, including calls for more research into the issue (2.4%) and calls for more ethical debate (0.8%). Finally, there were a number of singular topics that did not fit any of these categories (6.1%).

Only 37 of all the texts contained any discussion about the research or facts about fluoride. These texts consisted of one column, one opinion piece, one feature, two news stories and 32 LTEs. Of these texts 18 were pro-fluoride, 14 were anti-fluoride and five were neutral. These results appear to illustrate that those who were pro-fluoride were more likely to invoke science to make their case.

Discussion

As the results illustrate the Waikato fluoridation debate was reported, in the main, in the LTE section of the Waikato times with 81% (n=302) of all texts appearing in that section. News texts appearing both on the front and news pages made up only 16.35% of all texts. The remaining percentage of items consisted of editorials and opinion pieces.

In the view of Kapoor and Botan (1992) the LTE section is one of the “few outlets available to public for voicing opinion” (p. 5). However, Wahl-Jorgensen (2002, 2001) argues the ‘public’ and the ‘public opinion’ appearing in the LTE sections of newspapers are actually social constructions resulting from which letters editors select for publication. Editors privilege the publication of letters displaying “individual expression over the expression of activist groups” and they prefer to publish letters giving “emotionally charged, personal stories of individuals” (Wahl-Jorgensen, 2001, p.304).

When reading the LTEs to determine who wrote them and the topics discussed many of them appear to fit the model of emotionally charged and personal stories of individuals with many written by anti-fluoride activists. In contrast, dental nurses and dentists wrote LTEs sharing their own personal experiences of treating tooth decay which could have been prevented had water in the area they were working been fluoridated. Therefore, in the case of the fluoridation debate it appears that activist groups and individuals opposed to fluoride used both the emotionally charged and personal story genres to express their views on the issue. The results appear to indicate that activists used the mode of telling personal stories as a way of getting into the LTE section and this appears to be at odds with the findings of Wahl-Jorgensen. How often this may occur in public debates such as this and whether or not it is a deliberate strategy on behalf of activists groups is an area for further research.

Other researchers have examined how representative the opinion contained in LTEs is of those in the wider community. Most of these studies have found that LTEs are only “hazy reflections of public opinion” (Grey & Brown, 1970). Furthermore, Volgy, Krigbaum, Langan and Moshier (1977) found writers of LTEs were more likely to be older males and not entirely representative of the general public. While this research does not examine the demographic characteristics of the LTE writers, the largely anti-fluoride sentiment contained in the LTEs did not appear to reflect the opinion of the wider public of Waikato. This was illustrated in the results of the referendum held in October 2013 that coincided with the local body elections, seeing a majority of voters wanting fluoride returned to the water supply. Therefore, the large percentage of LTEs having a negative view towards fluoride could suggest those choosing the LTEs for publication had misread the opinion of the wider public with regard to fluoride.

Alternatively, the larger number of anti-fluoride letters could simply be a true reflection of the number of such letters being received by the newspaper. Another suggestion is the Waikato Times may have published these letters so the writers, who may considered less credible sources in terms of more mainstream news texts, were given space to air their views on what was a very contested topic in the region. Indeed activists often have difficulty having their voices included in news stories, as they have to

overcome the implicit assumption “that their positions are (almost by definition) beyond the pale of rational thought” (Hornig-Priest, 2001, p. 3). Whether views of the letter writers were perceived by the editor as irrational or viewed through the “idiom of insanity” (Wahl-Jorgensen, 2002, p. 189) is beyond the scope of this paper and yet may be an area for further investigation.

In comparison to the LTEs 54.3% (n=32) of the news stories published were neutral, 35.5% (n=21) were pro-fluoride and anti-fluoride stories were 10.2% (n=6). While most of the news texts were neutral it is interesting to note that the rest of the stories were just over three-to-one in favour of fluoride. As may be expected the two feature texts were balanced giving both sides of the debate. Of the five editorials two were pro-fluoride and the other three neutral. The only column piece was pro-fluoride and of the four opinion pieces three were anti-fluoride and one pro. These results seem to illustrate that outside of the LTE section the Waikato Times, while appearing to adhere to the norms of journalistic balance, had a pro-fluoride stance.

This stance may be a reflection of the sources appearing in the news texts. As Table 3 illustrates the largest groups of sources were traditional primary definers (Hall, Critcher, Jefferson, Clarke, & Roberts 1978) many of whom were in favour of fluoridation. These three groups combined comprised 73.1% of all news text sources compared to anti-fluoride campaigners who only comprised 14.6% (n=25) of sources in the news texts. Therefore, those in favour of fluoride appeared to be in a better position to frame the issue in accordance with their pro-fluoride views.

In contrast, to the news texts, the LTEs comprising 81.1% (302) of all texts on the issue, were predominantly anti-fluoride 48.7% (n=147). While this appears to be good coverage for the anti-fluoride campaign it is not really the case due to the increasing numbers of people who now access their news online through sites such as Stuff.co.nz. While these sites reproduce news stories published by newspapers, they do not reproduce LTEs on their websites. Therefore, the message of the anti-fluoride campaigners may be reaching a slowly shrinking audience.

The dominance of anti-fluoride sources in the LTE section of the Waikato Times is clear when the frequency of topics appearing in the reportage is examined. The anti-fluoride arguments from Fluoride Free NZ (2014) illustrated in the introduction were well represented in the overall reportage. The most frequent anti-fluoride topic to appear with 61 mentions (16.2%) was ‘fluoride was poisonous and harmful to human health’. The next most frequently mentioned anti-fluoride topics, with 34 mentions each (18.0%) were ‘science has proved fluoride to be harmful’ and ‘the fluoridation of water supplies takes away a person’s freedom of choice to drink un-fluoridated water’. These arguments were closely followed by the argument that ‘fluoridation was a form of mass medication’ which had 27 mentions (7.2%). These mentions combined with the other three anti-fluoride arguments presented in Table 4 make up 45.4% of all topics appearing in the texts examined.

In contrast the appearance of pro-fluoride arguments only comprised 25.7% of all mentions. The most frequently pro-fluoride topic with 56 mentions (14.9%) was ‘fluoride prevented tooth decay and was backed by science’. Closely related to this was the argument that ‘anti-fluoride arguments were

'unscientific or based on poor science' with 16 mentions (4.2%). The only other pro-fluoride topic appearing were attacks made against anti-fluoride campaigners with 25 mentions (6.6%). However, as noted these topics were more likely to occur in news stories that are reproduced on news aggregation Internet sites like Stuff.co.nz.

Another possible reason for the low number of pro-fluoride topics is the apparent reluctance on the part of pro-fluoride people to engage in debate with anti-fluoride campaigners. This reluctance to engage was noted a number of times in texts and LTEs by anti-fluoride campaigners.

The reluctance of experts to engage with activist groups have been noted in other controversies, especially when there is an accepted scientific consensus as appears to be in the case of fluoridation (Mikulak, 2011). Furthermore, some scientists argue that activist groups have "power to halt the progress of research" (Burchell, Franklin & Holden, 2009, p.33). Therefore, some experts may be reluctant to engage with anti-fluoride campaigners for fear of giving their views too much publicity, thereby increasing the power of that group.

Other topics of note were political and democratic issues, when combined, making up 15.9% (60) of all topics. This result is in line with the fact that fluoride had become an issue for local body politicians in the lead up to the local body elections held in 2013.

Details about the science and research about fluoride was only mentioned in just under 10% of all texts and of these 32 were LTEs. Therefore, members of the public who wished to understand more about the science behind fluoridation were poorly served by the reportage in the Waikato Times. Furthermore, texts mentioning the science behind fluoridation were near equally split between those stating science supported fluoridation and those stating science was against the use of fluoride. While this result does uphold the media's Fourth Estate role of illustrating the scientific debate around fluoride it would probably only serve to confuse those members of the public genuinely interested in understanding the science of fluoridation. As Nelkin (1995) notes, such apparently balanced coverage gives "readers little guidance about the scientific significance of different views" (p. 88).

Finally, the Waikato Times did appear to adhere to report the issue in a socially responsible manner by reporting all views on the issue. However, the views of anti-fluoride campaigners were mainly voiced in LTEs and as noted such texts are not normally reproduced by online news services like Stuff.co.nz. Therefore, while on the surface the Waikato Times appeared to report the issue in a socially responsible manner it only did so to those who read the print version of the newspaper. Given the declining readership of print newspapers this may mean activist groups may need to reconsider how they try to publicise their message to reach a wider audience.

Conclusion

Despite the apparent scientific consensus as to the safety and efficacy of fluoridation in the prevention of tooth decay the fluoridation of public water supplies has been an area of contention for many years in a number of countries. The 2013 Waikato fluoridation debate clearly illustrated both sides of this ongoing debate.

The Waikato Times primarily reported this debate throughout 2013 as a series of LTEs with just over 81% of all texts appearing in that section. In so doing the overall reportage was primarily anti-fluoride with many activists writing LTEs. This was despite the fact that the wider public appeared to be pro-fluoride voting for a return to fluoridation in a public referendum later in 2013. Why the Waikato Times chose to report the debate in this manner is unclear from the results of this study and further research is required. However, the split between LTEs written by activists and the personal and emotionally charged stories preferred by editors as suggested by Wahl-Jorgensen (2001) seemed to be blurred in the reportage of this issue with many activists writing LTEs in a personal and emotive manner to put their point of view across. This blurring of the line between activism and personal stories and how often it may occur is an area for further investigation.

In terms of news texts it did appear the Waikato Times had a pro-fluoride stance with anti-fluoride sources being given little space in news texts in comparison to more traditional primary definers, for example politicians, health officials and dental professionals.

While an examination of the overall coverage illustrated all sides of the debate were reported the scientific aspects of fluoridation were reported poorly. Just fewer than 10% of texts contained any scientific information about fluoride and these texts were near evenly split between those suggesting science supported fluoride and those stating science did not support fluoride. Therefore, readers seeking to understand the science of fluoridation would have been confused rather than guided on how to judge the issue. Moreover, while all sides of the debate were covered much of the anti-fluoride debate occurred in the LTEs. While the anti-fluoride lobby groups may be pleased with their views being published, LTEs do not appear in online news websites and when this is considered against the backdrop of declining readership of print newspapers their message may be reaching a shrinking audience. This has implications for lobby groups as they may now have to find alternative ways to get their message disseminated to the wider public.

The debate about fluoridation in the Waikato is just one example of a number of debates about the use of science and technology in society. How these debates are reported in the media is an important area for investigation as it sheds light on how science is debated in the wider community and the media's role in such debates. It is suggested further research examining how issues, such as vaccination or 1080 poison use, amongst others, are reported would be a useful comparison to this study.

References

- Burchell, K.; Franklin, S. & Holden, K. (2009) Public Culture as Professional Science. Scientists on Public Engagement: from Communication to Deliberation? BIOS (Centre for the Study of Bioscience, Biomedicine, Biotechnology and Society) London School of Economics: London
- Fairfax Media (2015). Waikato Times. <http://www.fairfaxmedia.co.nz/portfolio-nz/advertising-in-newspapers/metro-dailies/waikato-times>
- Fluoride Free NZ (2014). Fluoride doesn't work. Fluoride Free NZ. Retrieved August 8 from <http://fluoridefree.org.nz/information/research/fluoridation-doesnt-work/>
- Fluoride Free NZ (2014) Fluoridation is unethical. Fluoride Free NZ. Retrieved August 8 from <http://fluoridefree.org.nz/information/research/fluoridation-is-unethical/>
- Fluoride Free NZ (2014) Fluoridation is not safe. Fluoride Free NZ. Retrieved August 8 from <http://fluoridefree.org.nz/information/research/fluoridation-is-not-safe/>
- Hall, S., Critcher, C., Jefferson, T., Clarke, J., & Roberts, B. (1978). Policing the Crisis: Mugging, the State, and Law and Order. London: MacMillan Education.
- Hamilton City Council, (2013) Fluoride Referendum Information. [Brochure]
Hamilton City Council Retrieved August 14, 2014 from
<http://www.hamilton.govt.nz/our-council/elections-2013/Documents/Elections%20Fluoride%20Brochure.pdf>
- Hansen, A., Cottle, S., Negrine, R., & Newbold, C. (1998). Mass Communication Research Methods. New York: New York University Press.
- Hornig-Priest, S. (2001). Grain of Truth: The Media, the Public and Biotechnology. Lanham: Rowman and Littlefield Publishers.
- Kapoor, S. & Botan, C. (1992). Studies Compare how Editors use Letters. The Masthead, 44 (1), p. 5.
- Krippendorff, K. (2004). Content Analysis: An Introduction to its Methodology (2nd ed.). Thousand Oaks: Sage Publications.
- McQuail, D. (1987). Mass communication theory: An introduction. London: Sage.
- Melbye, M.L.R. & Armfield, J. M. (2013). The Dentist's Role in Promoting

Community Water Fluoridation: A call to action for dentists and educators. *Journal of American Dental Association*, 144 (1), pp. 65-75

Mikulak, A. (2011) Mismatches between 'Scientific' and 'Non-scientific' ways of Knowing and their Contributions to the Public Understanding of Science. *Integrative psychological and behavioural science*, Vol. 45, pp. 201-215.

New Zealand Audit Bureau of Circulation. (2014) Newspaper Audit Result. Retrieved March 7, http://newspaper.abc.org.nz//audit.html?mode=embargo&npa_admin=1&org=npa&publicationtype=19&publicationid=219&memberid=158&type=21

Salleh, A. (2008). The fourth estate and the fifth branch: the news media, GM risk and democracy in Australia. *New Genetics and Society*, 27 (3), 233-250.

Schäfer, M.S. (2011) Sources, Characteristics and Effects of Mass Media Communication on Science: A Review of the Literature, Current Trends and Areas for Future Research. *Sociology compass*. 5 (6), pp. 399-412.

Statistics New Zealand (2013). 2013 Census Usually Resident Population Counts. Statistics New Zealand. Retrieved August, 8 from http://www.stats.govt.nz/browse_for_stats/population/census_counts/2013CensusUsuallyResidentPopulationCounts_HOTP2013Census/Commentary.aspx
UK Science and the Media Expert Group. (2010). Science and the Media: Securing the Future. Retrieved 2014, August 29 12 from <http://webarchive.nationalarchives.gov.uk/20121205091100/http://scienceandsociety.bis.gov.uk/media/files/2010/01/Science-and-the-Media-Securing-the-Future.pdf>.

Volgy, T J.; Krigbaum, M.; Langan, M.K. & Moshier V. (1977) Some of my Best Friends are Letter Writers: Eccentrics and Gladiators revisited. *Social science quarterly*, Vol 58, (2), pp. 321-327.

Wahl-Jorgensen, K. (2002). The Construction of the Public in Letters to the Editor: Deliberative Democracy and the Idiom of Insanity. *Journalism*, Vol 3, (2), pp. 183-204

Wahl-Jorgensen, K. (2002). Understanding the Conditions for Public Discourse: Four Rules for Selecting Letters to the Editor. *Journalism Studies*. Vol 3, (2). pp. 69-81.

Wahl-Jorgensen, K. (2001) Letters to the Editor as a Forum for Public Deliberation: Modes of Publicity and Democratic Debate. *Critical Studies in Media communication*, Vol. 18 (3), pp. 303-320