

Institution: King's College London		
Unit of Assessment: 23 Education		
Title of case study: When is it safe to drink the water? Ensuring effective health and risk communication around water use		
Period when the underpinning research was undertaken: 1 March 2005 – 31 July 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Gabriella Rundblad	Professor in Language & Cognition	From 01/09/2004
Period when the claimed impact occurred: 1 August 2013 – 31 December 2020		
Is this case study continued from a case study submitted in 2014? N		

1. Summary of the impact

During public health crises, the public's adherence to health guidelines plays a significant role in reducing illness and death. However, the public may misunderstand or be confused by health messages and fail to comply with guidance. Prof Rundblad's research at King's College London's School of Education, Communication and Society on safe water use has investigated the ways in which health messages should be communicated for optimal comprehension. Its findings have led to water and health bodies in North America and Australia making changes to the wording, phrasing and structuring of the advice they disseminate, resulting in reduced illness and death.

2. Underpinning research

Rundblad's research systematically examines the clarity of and compliance with health and safety guidance related to water use. Prior research in this area is limited and Rundblad's work has played a key role in developing new approaches to identify the optimal content and structure of communications to instil public trust and compliance.

Through four funded projects, Rundblad has devised and tested a new technique known as cognitive discourse analysis. This involves systematic analysis of messages through a focus on the interplay between explicit language construction, intended meaning and audience comprehension. For example, the use of metonymy was found to confuse audiences and cloud the lines of responsibility, resulting in reduced adherence to health advice [1]. (Metonymy is a figurative form of language where a linked term, eg 'the authorities' is used instead of stating what is actually meant, eg 'scientists working for the local water and health bodies'.) Rundblad's research has also identified significant communication shortfalls arising from the use of words, such as 'contaminant', which have a particular (often neutral) connotation in scientific contexts and a very different (often scary) everyday meaning [2].

To complement her linguistic analysis, Rundblad has analysed how such messages are understood by the intended recipients, the public, through comparison and correlation with analyses of additional qualitative and quantitative data. For example, a web-based questionnaire, in which participants were asked to respond to a hypothetical public health situation, was used to determine the likelihood of public compliance with official guidance [3]. In other studies, the percentage compliance with guidance was compared with the mode and provenance of the communication to determine the relative efficacy of message formats [4,5].

Rundblad's research directly addresses specific public health crises. For example, following the 2007 Gloucestershire flooding disaster, the Leverhulme Trust funded [7] research to examine the reasons for the dangerously low levels of compliance with public health recommendations relating to tap water consumption. Rundblad identified the use, misunderstanding and omission of particular words and instructions that resulted in unhealthy behaviours. For example, although

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individuals were told not to drink tap water, they were not told *not* to drink *boiled* tap water (contrary to common belief boiling does not always render water safe) [3,4].

Subsequent funding from the Department for Environment, Food and Rural Affairs [8] enabled the first ever comparison of compliance with official health recommendations relating to water use following natural disasters with those relating to human-error incidents [5]. The findings indicate that the public are more likely to follow precautions with respect to human-error incidents than with respect to natural disasters, as the latter normally give rise to multiple risks requiring multiple messages. These findings underscore the need for greater specificity of advice at times when the situation is complex and wide-reaching.

In two studies funded by the US Water Research Foundation [9,10], Rundblad compared the language used by the water industry, health authorities and the media. In the first study, Rundblad found that the form and simplicity of language in media reports adversely affected public perceptions of water contamination [1,6]. For example, she found that, without the full scientific explanation of terms, the public were uneasy with processes described as 'unregulated' and that the inclusion of the term 'unknown' in communication messages resulted in significantly less trust in the content of such statements. In the second study, Rundblad researched ways of ameliorating messaging shortcomings identified in the initial study. For example, attention was directed to the efficacy of communications targeted at women, and recommendations were made about how specific terms should be used to avoid the communication of ambiguous messages [6].

3. References to the research

- [1] Rundblad, G., Tang, C., Knapton, O., Ragain, L., Myzer, M., Tytus, A. E., Breedlove, J. & Cooke, R. (2013). *Consumer Perceptions and Attitudes Toward EDCs and PPCPs in Drinking Water*. Water Research Foundation.
- [2] Tang, C. & Rundblad, G. (2020). A media brew of implied, hidden and unknown risk claims: cognitive discourse analysis of public health communication. In Demjén, Z. (Ed.) *Applying Linguistics in Illness and Healthcare Contexts* (pp. 242-268). London: Bloomsbury Academic. DOI: 10.5040/9781350057685.0018
- [3] Rundblad, G. (2008). The semantics and pragmatics of water notices and the impact on public health. *Journal of Water and Health*, 6(S1), 77-86. DOI: 10.2166/wh.2008.130
- [4] Rundblad, G., Knapton, O. & Hunter, P. R. (2010). Communication, perception and behaviour during a natural disaster involving a 'Do Not Drink' and a subsequent 'Boil Water' notice: a postal questionnaire study. *BMC Public Health*. 10, 641. DOI: 10.1186/1471-2458-10-641
- [5] Rundblad, G., Knapton, O. & Hunter, P. R. (2014). The causes and circumstances of drinking water incidents impact consumer behaviour: comparison of a routine versus a natural disaster incident. *International Journal of Environmental Research and Public Health*, 11(11), 11915-11930. DOI: 10.3390/ijerph111111915
- [6] Rundblad, G. (2017). *Terminology Guidance for Water Professionals (or, What You Say Is Not What People Hear...)*. Water Research Foundation.

Funding

- [7] Rundblad, G. (2008-10). *The impact of language and cognition on compliance during a natural disaster*. Leverhulme Trust: GBP93,472.
- [8] Rundblad, G. (2009-10). *The Impact of language and cognition on compliance during a natural disaster - Improving communication on cryptosporidium and 'Boil Water' notices: lessons from Pitsford*. Department for Environment, Food and Rural Affairs: GBP12,000.
- [9] Rundblad, G. (2011-2013). *Consumer perceptions and attitudes towards EDCS and PPCPS in drinking water*. US Water Research Foundation: GBP117,592.
- [10] Rundblad, G. (2015-2019). *Terminology for Improved Communication Regarding CECs*. US Water Research Foundation: GBP61,308.

4. Details of the impact

Rundblad's research has helped improve compliance with public health messages in the US and informed the construction of risk communication protocols by national and state agencies in the US, Canada and Australia.

Improving compliance with public health messages

Crafting effective health messages involves making decisions about content and rhetorical structure: what should be revealed, and what concealed? The efficacy of a message can be gauged by the public's compliance and their trust in the issuing and/or mediating authority. Rundblad's research has highlighted the importance of consistency in use of terms, and the need to explain why particular measures must be taken and what will happen if measures are not heeded. These insights and the more specific findings from her research have directly fed into the construction of guidance by water authorities in the US, preventing illness and death from waterborne diseases and other water-related morbidities, and concomitantly reducing levels of anxiety and stress. This impact has been achieved through Rundblad's work with the Water Research Foundation, a charitable research and development organisation, part funded by individual water companies, which has sponsored Rundblad's research and invited her to present her findings at water industry conferences, and to lead professional training programmes through a series of workshops and webcasts, resulting in her recommendations being widely taken up.

For example, Rundblad's recommendations were adopted during a *Legionella* outbreak in Arkansas in 2018. *Legionella* bacteria are spread through droplets and can cause Legionnaires' disease – a kind of pneumonia with a high mortality rate. The local water company, Central Arkansas Water – the largest purveyor in the state covering around 450,000 people – used Rundblad's research to create new consistent messaging, particularly taking note of her findings regarding choice of words, the use of explicit instructions and the quantification of risks [4,6]. This new messaging was specifically noted for its role in effectively communicating appropriate actions and was described as having diffused a *“volatile situation” regarding the public's reaction to the threat and having prevented Legionella-caused mortalities [A]. In a statement expressing appreciation of Rundblad's research, the company commented that “our most valuable commodity is trust from our customers... [W]e have benefited from the work Rundblad has done and we have dealt with a lot of controversial issues in which the guidelines have been a dream” [A].*

The Philadelphia Water Department (PWD), serving water to 1.7 million residents, used Rundblad's research [1,6] on the appropriate use of terms and the need for explicit messaging to shape its communication strategy during the 2015–2016 nationwide public health scare concerning lead contamination of water. In particular, the research informed the Department's use of key words such as 'chemical' and 'plumbing system' to ensure that consumers were 'savvier' in their decisions to reduce their exposure to lead [B]. PWD Director of Laboratory Services credits Rundblad's work [2] for the Department's new approach to their communications with the news media and public, stating that *“Rundblad's work has made us reconsider the use of certain terms and phrases as she found that they are perceived by consumers to be ‘scary’. Instead, we have matured our communication materials to use wording that Rundblad's work indicates will be well-received by the public” [B].*

The Metropolitan Washington Council of Governments (COG), an independent, non-profit association made up of 24 local governments, including Maryland and Virginia state legislatures, used Rundblad's research [1,4] when communicating with their 5.5 million consumers and governmental agencies including the US Congress and the Pentagon. The Principal Water Resources Planner at COG stated, *“outputs from Rundblad's publications and consultations, whether they take the form of tangible guidelines or training and presentations, have the singular forceful message that clarity in language and thought are integral to communicating to the public... [T]he importance of such work can be further gauged by the way it has been mobilized at the various local and national levels to communicate with a total of 300 million Americans about the water they consume” [C].* In 2019, COG partnered with the Centers for Disease Control and Prevention and the National Association of County and City Health Officials to use Rundblad's research [4,5] in risk communication to train 110 members how to respond to and communicate with consumers if there was a water outage. Rundblad has also advised COG on how best to communicate messages around either low or high levels of endocrine-disrupting compounds and

pharmaceuticals, and personal care products, that may be present in drinking water due to farming and industry pollutants or wastewater contamination.

Informing the construction of risk communication protocols

In the US, the Environmental Protection Agency requires public water utilities to issue drinking water 'advisories' when the water is, or may be, contaminated. In 2016, to support the utilities, the Centers for Disease Control and Prevention (CDC), the Environmental Protection Agency and other health and water organisations produced a Drinking Water Advisory Communication Toolbox, known as the CDC Toolbox [D1]. Drawing directly on recommendations from Rundblad's invited presentations to the CDC, and her publications [3,4], the CDC Toolbox comprises information about when to publish public alerts and examples of appropriate text to use. Providing guidance to the 151,000 public water systems in the US and also used across Canada, the toolbox has enabled the CDC to develop and refine risk communications around water-related emergencies, including: hurricanes Irma and Maria, wildfires in California, an earthquake in Puerto Rico in 2017 and flooding in Houston in 2019 [D2]. A CDC Deputy Branch Chief stated, *"Part of the value of the toolbox is giving local health and water utility leaders a framework for transparently communicating risk in a way that effectively addresses community concerns about the safety of their water... During crises, public health officials need science-based approaches based on good research"* [D2].

Rundblad's work [1] on message development and consumer behaviour also informed the production of a 2018 US-wide Risk Communications Toolkit for Cyanotoxins and other algal bloom-related water contamination. Half of all US states report harmful algal blooms in freshwater bodies each year, with incidence rising due to increased global temperatures. Toxins produced by algal blooms can affect the nervous system, brain and liver, and there is no treatment available for animals, including livestock and pets. The toolkit authors solicited the input of Rundblad to inform their framing of messages [E] but additionally note that she provided them with key insights regarding how vulnerable consumers are likely to perceive cyanotoxin risk management messages, and the importance of explaining why water should not be boiled (as this would concentrate the toxins). As with the CDC Toolbox, the Cyanotoxin Toolkit provides clear guidance to water and health practitioners drafting health messages about the framing of instructions and the potential for misunderstandings. The COG's Principal Water Resources Planner and a key stakeholder in the production of the Toolkit stated, *"When Rundblad consulted [o]n the Cyanotoxin risk Toolkit in 2017, the result was a clear guide for public health organizations, water utilities, and government bodies to follow when communicating to the public about algae blooms in water"* [C].

In Australia, Rundblad's research [3], communicated via invited presentations to New South Wales Health Water Unit informed the development of risk communication protocols for use across the state with its 8 million consumers. Specifically, Rundblad's work on compliance with health advice during different types of water incidents [4,5] guided the design of an 'alert template' that the Chief Health Officer uses to issue drinking water advisories, for example during seasonal bushfires or at times of drought. The Manager for Water Unit NSW Health explained; *"Through the protocol, consumers in New South Wales are provided with the facts in a way that's understood and that is a great reassurance to them. Rundblad's work enhanced our consumers' well-being and trust"* [F]. This manager also reported that the protocol and alert template have successfully prevented illness from waterborne diseases.

5. Sources to corroborate the impact

[A] Testimonial from: Compliance Manager, Central Arkansas Water, 3 June 2020.

[B] Testimonial from: Director Bureau of Laboratory Services, Philadelphia Water Department, 6 February 2020.

[C] Testimonial from: Principal Water Resources Planner, Metropolitan Washington Council of Governments, 17 June 2020.

[D] Documents corroborating the development and use of the Drinking Water Advisory Communication Toolbox: [D1] US Center for Disease Control and Prevention, the US Environmental Protection Agency, the American Water Works Association, the Association of State and Territorial Health Officials, the Association of State Drinking Water Administrators

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and the National Environmental Health Association (2016) *Drinking Water Advisory Communication Toolbox (CDC Toolbox)*, 3rd Edition; [D2] Testimonial from: Water Preparedness and Response Deputy Branch Chief, Waterborne Disease Prevention Branch, CDC's National Center for Emerging and Zoonotic Infectious Diseases, 26 March 2020.

[E] Water Research Foundation and American Water Works Association. (2018). *Four Steps to Effective Cyanotoxin Communications: A Risk Communications Toolkit*.

[F] Testimonial from: Manager, Water Unit, Environmental Health Branch, New South Wales Health, 26 March 2020.