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Effect of a boil water notice on behaviour in the management of a water contamination incident

M O'Donnell, C Platt, R Aston

Summary: *In late 1998, the water supply of 878 households was affected by possible sewage contamination. A notice was issued to advise residents of the need to boil their water. This provided an opportunity to assess to what extent the boil water notice led people to avoid activities that might put them at risk of waterborne infection. A postal questionnaire sent to 350 randomly selected households in the affected area asked about timing and mode of receipt of the notice, risk behaviour (boiling water, brushing teeth, washing dishes, drinks for pets, preparation of food), and subsequent changes in drinking water consumption habits. Eighty-one per cent of the households surveyed engaged in behaviour likely to increase the risk of waterborne infection. Comments were collected from consumers on how to improve the management of future water contamination incidents.*

Key words:
behaviour
communicable disease control
education
water pollutants

Commun Dis Public Health 2000; 3: 56-9.

Introduction

The International Conference on Primary Health Care in Alma Ata in 1978 set a target for the year 2000 that all people would have access to safe drinking water and that pollution of water sources would no longer pose a threat to health¹. The World Health Organization (WHO) maintains that water intended for human consumption must be free from chemical substances or organisms that might represent a hazard to health², and that supplies of drinking water should be wholesome to drink³. Those who supply drinking water must protect consumers from possible contamination of water supplies, and provide an effective mechanism for dealing with episodes when water does become tainted. The United Kingdom government incorporated these standards *Water Supply (Water Quality) Regulations 1989* and the *Water Industry Act 1991*, both of which incorporate European Commission standards³.

When water contamination occurs it is vital to ensure that drinking water is adequately disinfected to safeguard public health while the primary source

of the infection is dealt with. In our area the water company issues a 'boil water notice', as recommended in its own quality procedures (QP40 regulations), instructing consumers to boil water for domestic use until the contamination has been dealt with, and the notice has been lifted.

A search carried out on Medline (and subsequently a general web search) using the following search terms – water contamination, sewage contamination of water, boil water, effectiveness of the boil water notice – found no studies on the effectiveness of boil water notices in altering the behaviour of consumers with regard to activities that might carry a risk of waterborne infection.

Late in 1998, an incident of possible sewage contamination of the mains water supply in our health district gave us the opportunity to assess the extent to which a boil water notice altered consumer behaviour⁵.

The incident

A water main was damaged in our health authority area on 19 November 1998 during investigations of sewage discharge into a road gully. Solid sewage was noticed in the trench surrounding the water main about three hours after the damage occurred. Exposure to possible contaminated water was likely to have occurred in the two to three hours when the water main was no longer under sustained pressure, but before the supply was cut off. The water company contacted the local consultant in communicable disease control and decided to issue a boil water notice at 1300 the same day. The notice, a red leaflet, was delivered by hand that day to each of 878 households in the distribution of the damaged water main (box). The notice included a telephone helpline number

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BOX | Information provided on 'boil water' leaflet

- **Boil water before use.**
- Do not drink your tap water without first bringing it to the boil and letting it cool.
- Do not use unboiled water for preparing food, cleaning your teeth, or washing wounds.
- Remember your pets – they should not drink unboiled water either.
- You can still use tap water for washing and bathing without having to boil it.
- You can still use tap water for general household purposes and toilet flushing.

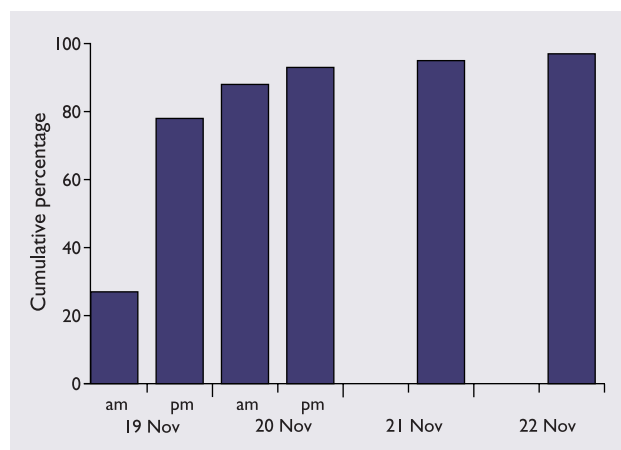
Note: The leaflet is bright red, includes a helpline phone number, and advises people to listen to local radio for information. Information is translated into several other languages on the back.

provided by the water company from 19 to 26 November. The area affected was mainly residential but also had several business premises including a nursing home and five food premises (cafes and shops). The main was repaired, superchlorinated, and flushed through. The supply was restored 11 hours later. The sewer was repaired in the next three days, and the boil water notice was lifted on 25 November 1998 at 1400. Seventy-one water samples were examined between 19 and 25 November 1998. All but one sample had satisfactory water quality; one sample taken on 19 November from a household adjacent to the damaged water main showed total coliforms of 1 colony forming unit (cfu)/100mL.

Methods

The Communicable Disease Unit surveyed responses to the boil water notice by posting a structured questionnaire to a sample of householders in the affected area, requesting that one member of the household should fill out the questionnaire on behalf of the entire household. The water company compiled a list of households by street name. Each household was given a 3-digit code and a random number generator was used to select 350 house code numbers, a total that included almost half of the affected population. The questionnaire had 16 questions, and was phrased simply to aid and quicken its completion. The questions asked when the boil water notice had been received, its mode of receipt (red leaflet, word of mouth, news media), whether the notice was clear, what the respondent felt on finding out about the notice, how members of the household had altered risk behaviour (defined as one or more of: boiling water, brushing teeth, washing dishes, drinks for pets, preparation of food). The questionnaire also asked about changes in drinking water consumption and for the number of house occupants and their ages.

The questionnaires were posted on 2 December. A second copy was sent to non-responders on 10 December. Each mailing envelope contained a

FIGURE Spread of awareness of boil water notice

stamped addressed envelope, a covering letter, and a questionnaire. The questionnaires were coded numerically and respondents were guaranteed anonymity and confidentiality. Completed questionnaires were returned over the following three weeks, coded by the investigator, entered into a database, and analysed using SPSS software.

Results

Completed questionnaires were returned from 69% (241) of the 350 households (204 in the first round and 37 in the second). All but one of the 241 households knew that the boil water notice had been issued: 85% (204) of them found out through receiving the red leaflet, 10% (24) by word of mouth, and the remainder by reading a notice in the evening paper. The figure shows when households became aware of the notice.

Behavioural effects of the boil water notice

Sixty-eight per cent (164) of the 241 householders who replied reported individuals who felt anxious (49% (119) slightly and 19% (45) very), 12% of households (28) included individuals who felt calm and reassured, and 19% (46) were unaffected.

Seventy-three per cent (176/241) householders said the leaflet was easy to understand, and 22% (53) said they would have liked more information. Members of 51 households (21%) telephoned the helpline and most (84%; 43) found it helpful.

On the day of the incident, 136 of the households (56%) surveyed drank unboiled water, *after* the incident, and *before* receiving the boil water notice. While the notice was in place, members of 49 households (20%) at some stage forgot to boil the water before drinking it. Members of 130 households (54%) brushed their teeth with unboiled water. Thirty-one households (13%) gave their pets unboiled water to drink. Seventeen per cent of households (42) used unboiled water to prepare foods that were not to be cooked before eating, such as washing a salad.

Members of 64% of households that replied (154/241) took some form of risk as defined by the boil water notice they had been sent (table 1). Sixty-two per cent

TABLE 1 Number and percentage of households (n=241) where unsafe behaviour occurred

Behaviour	Number	Percentage
Forgot to boil the water	49	20
Brushed teeth with unboiled water	130	54
Prepared food with unboiled water (e.g. salads)	42	17
Washed dishes with unboiled water	149	62
Gave unboiled water to pets to drink	31	13

of households (149) were reported to have washed dishes with unboiled water: if this was included as a unsafe behaviour (not cited specifically in the notice), the total number of households where individuals were put at risk would be 196 (81%). A comparison of unsafe behaviour according to the time of receipt of the boil water notice (<24 hours or >24 hours after the incident) found no significant difference in the incidence of these activities (63% vs. 60% respectively, $\chi^2 = 0.24$, $p = ns$). Similarly, the receipt of the red leaflet appeared to be no more effective than other means of finding out that a boil water notice had been issued (62% vs. 75%, respectively, $\chi^2 = 2.26$, $p = ns$).

Reports from 58% of households (140) said that they had not changed their consumption of water as a result of the boil water notice; 17% of respondents' households (40%) said that they drank a little less tap water; and 14% (33) said that they would drink bottled water only in future.

A selection of householders' opinions about alternative ways of managing a similar incident is listed in table 2. Many people requested more information at the start of such an incident and would have liked more progress reports about the repairs and the expected date of lifting of the boil water notice. Several people commented on the similarity of the notice to a circular and how they almost threw it out without reading it. Some suggested that a loud-hailer or a billboard at the end of the street could alert householders more quickly.

Discussion

Twenty-two outbreaks of waterborne infectious intestinal disease in England and Wales between 1992 and 1995 were attributed to drinking water supplies^{6,7}. A boil water notice is often considered during such incidents as it is a control measure at the point of use. Boil water notices are the most comprehensive control measure at the point of use, but they cause public anxiety, may not be heeded, and boiling water may cause scalds and other accidents^{8,9}.

One of the most interesting findings in this qualitative study of the boil water notice is that, even though most households received it at an early stage, 64% of the households (79% if washing dishes is included) ignored the advice recommended. Those who received the notice promptly were just as likely

TABLE 2 Householders' (n=86) recommendations for managing a similar incident

Specific change recommended	Number of households that recommended the change
Attend to the needs of older people	5
Consider those with visual impairment	4
A loud-hailer may notify people more quickly	14
Knock on the door when the notice is delivered to attract attention	12
Provide more information at the start of an incident; describe health effects	40
Provide more interim information on the progress of repairs and the expected date of lifting the boil water notice	30
A billboard on the street with daily updates would reduce the need to ring the helpline	7

to behave in a way that could be unsafe as those who received it late. The red leaflet appeared to be no more effective than word of mouth or news media.

Respondents' suggestions of alternative ways of managing a similar incident were valuable. Elderly, disabled, and visually impaired people experienced difficulty in reading and understanding the notice and asked for attention to be paid to their needs, which they felt had not been addressed. Some respondents suggested that a knock on the door when the notice was delivered would help, as people might not notice its arrival for some time. Some said that an announcement through a loud-hailer might have prevented people from drinking the water during that day. Several people commented on the similarity of the notice to a circular and said that they had nearly thrown it out without reading it. Requests were made for more information at the start about the cause of the incident and about symptoms to look out for. Many people wanted to be told when the notice was likely to be lifted and about the progress of repairs. It was suggested that a billboard on the street could be updated daily.

Even if a perfect leaflet could be produced the results of this study suggest that its effectiveness might be limited. At least 62% who received and read the boil water notice put their health at risk by using unboiled water. Further research into notification procedures and the provision of specific information about the health effects of drinking contaminated water could be undertaken.

Acknowledgements

We thank Drs Ros Stanwell-Smith and Sarah O'Brien of the PHLS Communicable Disease Surveillance Centre and Professor Paul Hunter, regional epidemiologist and director of Chester Public Health Laboratory, for their advice.

References

1. Editorial. Slow drip of progress on safe water for all. *Lancet* 1999; **353**: 2171-2.
2. World Health Organization. Guidelines for drinking-water quality 2nd edition: Volume 1. Recommendations. Geneva: WHO, 1993.
3. The Water Supply (Water Quality) Regulations 1989. (SI No. 1147) London: HMSO, 1989.
4. The Water Industry Act 1991. London: HMSO, 1991.
5. CDSC. Possible sewage contamination of drinking water in Bolton. *Commun Dis Rep CDR Wkly* 1998; **8**: 431.
6. Tillet HE, de Louvois J, Wall PG. Surveillance of outbreaks of waterborne infectious disease: categorising levels of evidence. *Epidemiol Infect* 1998; **120**: 37-42.
7. Furtado C, Adak GK, Stuart JM, Wall PG, Evans HS, Casemore DP. Outbreaks of waterborne infectious intestinal disease in England and Wales, 1992-1995. *Epidemiol Infect* 1998; **121**: 109-19.
8. Mayon White RT, Frankenberg RA. 'Boil the water'. *Lancet* 1989; **i**: 216.
9. Willlocks L, Crampin A, Milne L, Seng C, Susman M, Gair R, et al. A large outbreak of cryptosporidiosis associated with a public water supply from a deep chalk borehole. *Commun Dis Public Health* 1998; **1**: 239-43.