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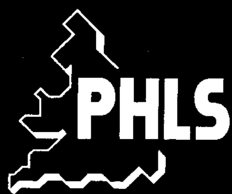

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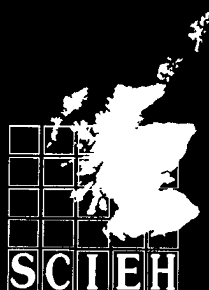

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Possible undetected outbreaks of cryptosporidiosis in areas of the North West of England supplied by an unfiltered surface water source

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Summary: *We report a ten-year retrospective analysis of laboratory reports of cryptosporidium infection in the North West of England. Weekly report data from six health authorities known to have been affected by outbreaks associated with a single supply were compared with data from other health authorities in the North West. Following graphical representation of report rates, it would appear that outbreaks in the six health authorities were considerably more common than the average recorded in the national outbreak surveillance system.*

Key words:
cryptosporidiosis
surface water reservoir
health authorities

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Introduction

During the ten years from 1991 to 1999 there were 22 general outbreaks (ie involving two or more households) of cryptosporidium infection in England and Wales associated with mains drinking water[1]. Five of these outbreaks occurred in the North West region. During the years 1997-99, there were three outbreaks of cryptosporidiosis in the North West region of England that have been linked with varying degrees of evidence to a single water supply[2]. This supply is a surface water reservoir in the English Lake district which supplies water to some 1.2 million people. Water from this reservoir is chlorinated but not filtered, and so cryptosporidium oocysts would not be removed. To investigate the possible impact of this supply on the epidemiology of cryptosporidium infection in the North West Region in more detail we conducted a retrospective analysis of laboratory reports.

Methods

Some six authorities were involved in the three outbreaks already mentioned (Morecambe bay, North West Lancashire, South Lancashire, Wigan and Bolton, Salford and Trafford, and Manchester). These six authorities represent about a third of the population within the North West region. They include inner city, urban and rural populations.

Data used in the analysis was from that reported to the PHLS Communicable Disease Surveillance Centre from laboratories in the North West Region of England. These reports were collected either by paper or by electronic reporting.

The time series of weekly reported cases for those six implicated health authorities and the remaining unaffected authorities were analysed to estimate crude rates of reporting. For each of the 522 weeks, we calculated the crude weekly rate of reporting, using population estimates and compared them using the standard paired t-test. Due to heavy skewness in the rate estimates, the t-test was performed on log-transformed rates. To study temporal patterns in the data we applied the locally robust loess smoothing procedure to weekly data for the combined six authorities and the combined other authorities[3].

Results

The average crude rate of case reporting in the six authorities was some 2.8 times greater than in the other health authorities in the region (table 1), 3.97 cases per week per 1 million population compared to 1.41 ($p<0.0001$). The maximum rate of reporting in a single week in the six authorities was 35.2 compared to 7.01 in the others. It is also notable that the six health authorities were ranked 1st, 2nd, 4th, 5th, 7th and 8th highest for mean annual incidence.

It is clear from the smoothed time series plot that the six authorities experienced major peaks in infection not seen in the rest of the region (figure

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1). Every year the six affected health authorities experienced at least one such large incidence peak.

Discussion

In the six health authorities, Cryptosporidium is in general rather more common than elsewhere in the region. The analysis presented here would suggest that this excess number of cases is due to recurrent peaks of infection. From a retrospective analysis of laboratory reports it is not possible to determine the cause of these earlier outbreaks. However, given that these peaks were restricted to those authorities receiving a large proportion of their water supply from an unfiltered surface water source that has been suggested on three occasions to be responsible for waterborne outbreaks, we consider that these peaks represent unrecognised outbreaks probably due to the same cause. It is unlikely that these peaks represent simple seasonal variation, as this variation was not seen in the non-affected authorities, and the timing of the peak varied from one year to another.

It is not clear why many of these earlier outbreaks were not recognised at the time. It may be because of the overall lower numbers of positive laboratory reports in the early years of this study. Another explanation may be that consultants in communicable disease control and environmental health officers in affected areas accepted that an incidence rise each spring was normal and so did not consider that the upsurges might be due to a recurring common source that merited investigation.

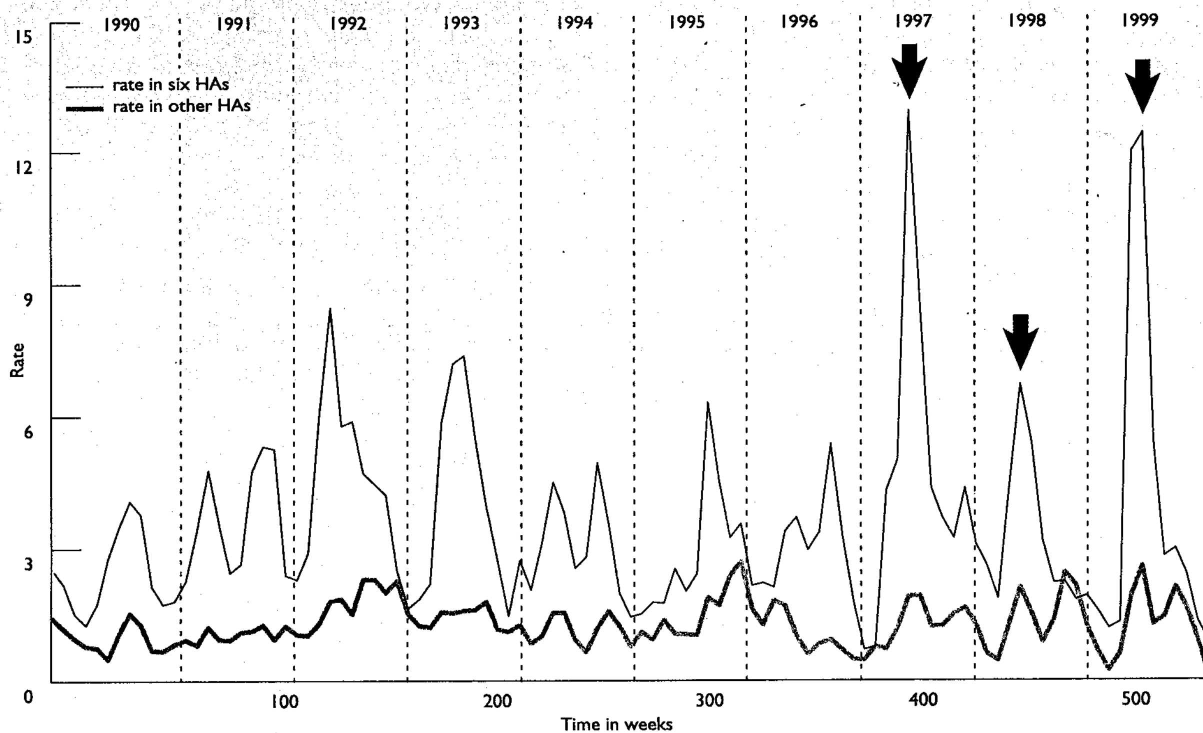
If it is correct that the excess rates of cryptosporidiosis in the affected health authorities represent outbreaks of infection associated with the suspect water supply, then this suggests that waterborne disease in the North West region is more common than previously believed. Indeed on the available data

TABLE 1 Annual incidence per 100 000 population for each health authority in the North West Region, based on reports to CDSC from NHS and PHLS laboratories.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Mean annual incidence
Bury & Rochdale	19.6	18.5	29.3	25.8	14.9	27.2	17.7	23.6	16.4	22.6	21.6
East Lancashire	7.8	14	28.7	21.8	20.9	20.3	12.9	19.9	13.3	8	16.8
Liverpool	3.5	5	3.3	2.1	2.1	2.1	4.7	0.6	1.3	0.2	2.5
Manchester	25.1	42.4	43.9	29.4	18.3	6.2	28.3	28.6	14.2	15.1	25.2
Morecambe Bay	8.6	18.8	37.9	19.9	15	17.5	16.2	23.6	17.8	9.7	18.5
North Cheshire	1.5	7	10	8.4	3.2	1.9	4.9	0.4	3.2	1.5	4.2
NWLancashire	34.2	34.5	56.1	37.2	50.6	62.7	24	62.5	42.6	56.1	46.1
Salford & Trafford	6.3	15.2	15.7	16.1	8.5	11.4	10.5	23.9	9.2	20.1	13.7
Sefton	2.7	4.1	5.1	4.4	7.2	4.1	3.1	7.2	2.1	2.4	4.2
South Cheshire	6	4.6	7.6	4.8	4.4	11.5	7.2	9	9.6	7.3	7.2
South Lancashire	1	0.6	6.5	11.3	2.3	4.5	6.1	9.1	15.8	45.6	10.3
St. Helens and Knowsley	0	1.1	0	0.2	0.7	0	0.2	2	2	0.4	0.7
Stockport	2.2	3.9	4.4	12.2	5.6	6.1	1.7	8.9	10	21.2	7.6
West Pennine	6.5	4	11.9	3.6	4	4.2	4.3	7	13.2	16.4	7.5
Wigan & Bolton	13.5	14.6	24.1	17.5	17.9	10.8	15.5	26.9	20.9	13.6	17.5
Wirral	0	0	0	0	0	0	0	0	0.9	1.2	0.2
North West Region	8.6	11.7	17.5	12.9	10.6	11.3	10	15.4	11.7	13.6	12.3
England & Wales	9.6	10.5	10.6	9.9	9.1	11.6	7.5	8.8	7.6	9.7	9.5

From 1990 to 1996 the incidence rate is based on laboratory reports in LabBase at CDSC Colindale.
From 1997 to 1999 electronic laboratory reports via COSURV to CDSC North West were used.

FIGURE 1: Reported weekly detection rates per/1 000 000 population for the six health authorities affected by outbreaks from a single source. The arrows indicate previously recognised outbreaks.



alone it can be calculated that the attributable risk associated with residing in the six health authorities and, by implication, with the consumption of drinking water from the particular reservoir, is 40% (95% CI 38.0-41.3%), ie of all the infections in the North West region, 40% are attributable to residence in the six authorieties.

The implications of one study for waterborne disease elsewhere in the UK are unclear. The fact that the North West still has a substantial proportion of its water supply from a surface water source that is not filtered may limit any generalisation of our finding. Nevertheless, the suggestion that waterborne outbreaks are under-recognised probably does apply more widely than in the North West. In any event cryptosporidiosis due to contaminated water is likely to be more common in the UK than is suggested by national outbreak reports alone.

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