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National Surveillance for Infection with *Cryptosporidium Parvum*, 1995–1998: What Have We Learned?

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SYNOPSIS

Objective. Infection with *Cryptosporidium parvum* generally causes a self-limiting diarrheal illness. Symptoms can, however, last for weeks and can be severe, especially in immunocompromised individuals. In 1994, the Council of State and Territorial Epidemiologists (CSTE) recommended that cryptosporidiosis be a nationally notifiable disease. Forty-seven states have made infection with *C. parvum* notifiable to the Centers for Disease Control and Prevention (CDC), and laboratories in the three remaining states report cases to state health departments, which may report them to the CDC. To see what the data show about patterns of infection, the authors reviewed the first four years of reports to the CDC.

Methods. The authors analyzed reports of laboratory-confirmed cases of cryptosporidiosis for 1995–1998.

Results. During 1995–1998, 11,612 laboratory-confirmed cases of cryptosporidiosis were reported to the CDC. All ages and both sexes were affected. An increase in case reporting was observed in late summer during each year of surveillance for people <20 years of age.

Conclusion. The first national data on laboratory-confirmed cryptosporidiosis cases, although incomplete, provide useful information on the burden of disease in the nation as well as provide baseline data for monitoring of future trends.

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Cryptosporidium parvum, a coccidian protozoan parasite, has been recognized as a human pathogen and a cause of gastrointestinal illness since 1976.[1] In the last 20 years, numerous outbreaks have occurred in the United States, associated with drinking water, recreational water use, contaminated foods, contact with animals, and child care facilities.[2–8] A 1993 outbreak in Milwaukee, in which an estimated 400,000 people became ill after consuming contaminated city drinking water, brought national attention to the disease.[9]

Infections in humans occur through the ingestion of *C. parvum* oocysts excreted in human or animal feces—by person-to-person, animal-to-person, or environmental transmission.[10] Although *C. parvum* generally produces a self-limited diarrheal illness, symptoms can be severe, lasting for several weeks. In addition, in people who are immunocompromised, infection can result in a chronic, severe illness that may be fatal.[11]

Although public health awareness of cryptosporidiosis has increased due to outbreaks, the lack of national surveillance for the disease prior to the mid-1990s means that few data have been available on the geographic distribution and burden of the disease. Recognizing the need for better estimates of the disease burden, in late 1994 the Council of State and Territorial Epidemiologists (CSTE) recommended that cryptosporidiosis be a nationally notifiable disease. In early 1995, the first states began to follow this recommendation, reporting cases of infection with *C. parvum* to the Centers for Disease Control and Prevention (CDC) through the National Electronic Telecommunications System for Surveillance (NETSS).

In those states that have made infection with *C. parvum* notifiable, state health departments report all new cases of cryptosporidiosis on a weekly basis to CDC via NETSS. Information transmitted for each case patient includes age, sex, race/ethnicity, and week of report to the state health department. Infection with *C. parvum* must be laboratory-confirmed for a case to be included in the NETSS notification system. Laboratory confirmation requires demonstration of *Cryptosporidium* oocysts in stool, intestinal fluid, or in a small bowel biopsy specimen, or demonstration of *Cryptosporidium* antigen in stool by a specific immunodiagnostic test such as enzyme-linked immunosorbent assay (ELISA).[12]

By the end of 1998, 47 states had made cryptosporidiosis reportable according to CSTE. Only Idaho, Pennsylvania, and Washington State had elected not to follow the CSTE recommendation. Some physicians and laboratories in these states elected to report cases of *C. parvum* infection to their state health departments, which in turn notified CDC.

This report summarizes cryptosporidiosis surveillance data for the nation for 1995–1998.

METHODS

We used NETSS data to calculate annual notification rates by state for 1995–1998. For each of the 47 state rates in which cryptosporidiosis was nationally reportable, we used the number of cases reported to the CDC as the numerator and the 1997 Census estimate of the state's population[13] as the denominator.

RESULTS

During the first four years of national surveillance, 1995–1998, 11,612 cases of infection with *C. parvum* were reported to the CDC (see Table). Fifty-seven percent (6565) of patients were male, and 43% (4917) were female. Race/ethnicity was reported for 66% of case patients; in more than 80% of these cases, the patient was white.

All age groups were represented; 61.3% of cases were in people ≥ age 20. For each year of surveillance, the greatest proportion of case patients were in the 0–9 age group (see Figure 1).

During the four years of surveillance, there was little difference between years in the number of cases reported or in the age distribution of case patients. The overall notification rate ranged from 1.0 per 100,000 population to 1.2 per 100,000 population over the four years. The annual reporting rate in a state for a given year reflected whether an outbreak occurred. For example, Nebraska's rate was 29.0 per 100,000 in 1995, a year in which the state experienced an outbreak. Three states had mean four-year notification rates ≥3.0 per 100,000 persons: New York (3.0 per 100,000 population), Vermont (3.57 per 100,000 population), and Nebraska (8.7 per 100,000 population) (Figure 2). Two states reported no cases. Cases were reported during all months of the year, with increases noted in the summer and early fall during all four years of surveillance (Figure 3). People younger than age 20 accounted for the highest percentages of cases from early summer through early fall (Figure 4). This was true for both male and females. The sex distribution of cases by week did not differ by time of year.

DISCUSSION

What have we learned? The analysis of the first national data on *C. parvum* indicate that cryptosporidiosis in the

Table. Laboratory-confirmed cases of cryptosporidiosis reported to the Centers for Disease Control and Prevention, 1995–1998, by age group and by sex (N = 11,612)

Age (years)	Male	Female	Unknown	Total cases: Number	Total cases: Percent
<4	1,325	1,029	37	2,391	20.6
5–9	609	559	10	1,178	10.1
10–19	490	439	5	934	8.0
20–29	675	679	6	1,360	11.7
30–39	1,816	987	25	2,828	24.4
40–49	1,020	549	13	1,582	13.6
50–59	312	238	2	552	4.8
≥60	244	357	4	605	5.2
Unknown	74	80	28	182	1.6
Total	6,565	4,917	130	11,612	100.0

US is geographically widespread and affects both sexes and all age groups.

The data show increases in notification during the summer months. A seasonal trend in *C. parvum* infection has also been observed at the state and local levels.[14] The increased reporting could be related to increased transmission among young people due to recreational water use during the summer months. To test this hypothesis, beginning in the spring of 1999, sites participating in FoodNet (a collaborative effort among CDC, the Department of Agriculture, the Food and Drug Administration, and selected health departments[15,16]) began a case-control study of sporadic cases of cryptosporidiosis to identify risk factors for infection. Information being collected includes water use and consumption, travel, contact with child-care attendees, and contact with animals. It is hoped that this study will help identify the cause of the seasonal increase, which will help CDC develop public health interventions. Interestingly, similar seasonal differences in notification at the national level have also been

Figure 1. Age distribution, cases of crytosporidiosis reported to the Centers for Disease Control and Prevention, 1995–1998

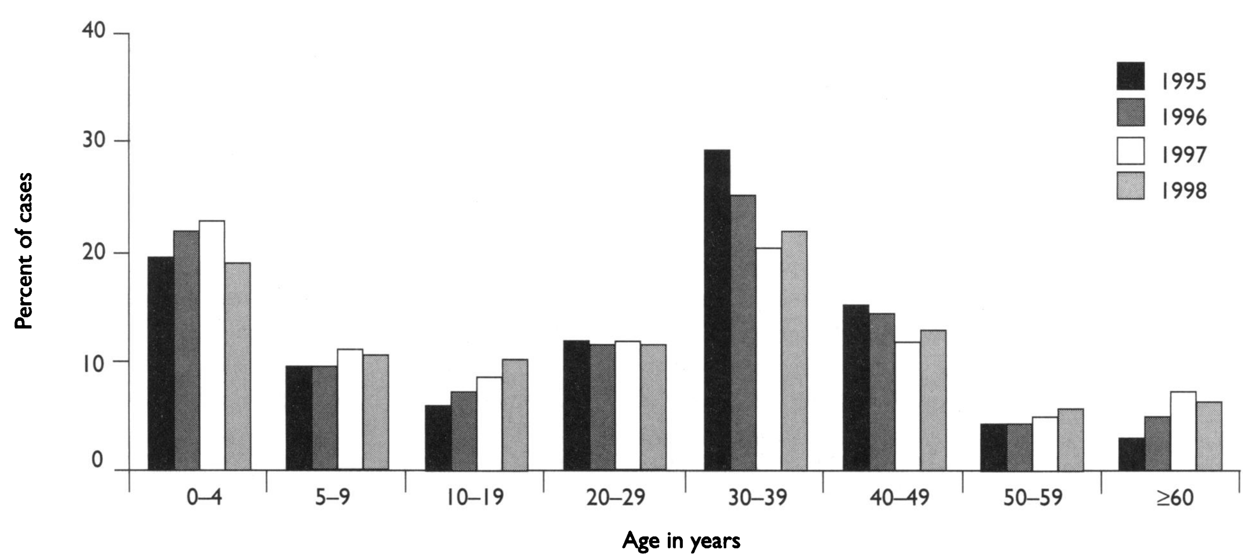
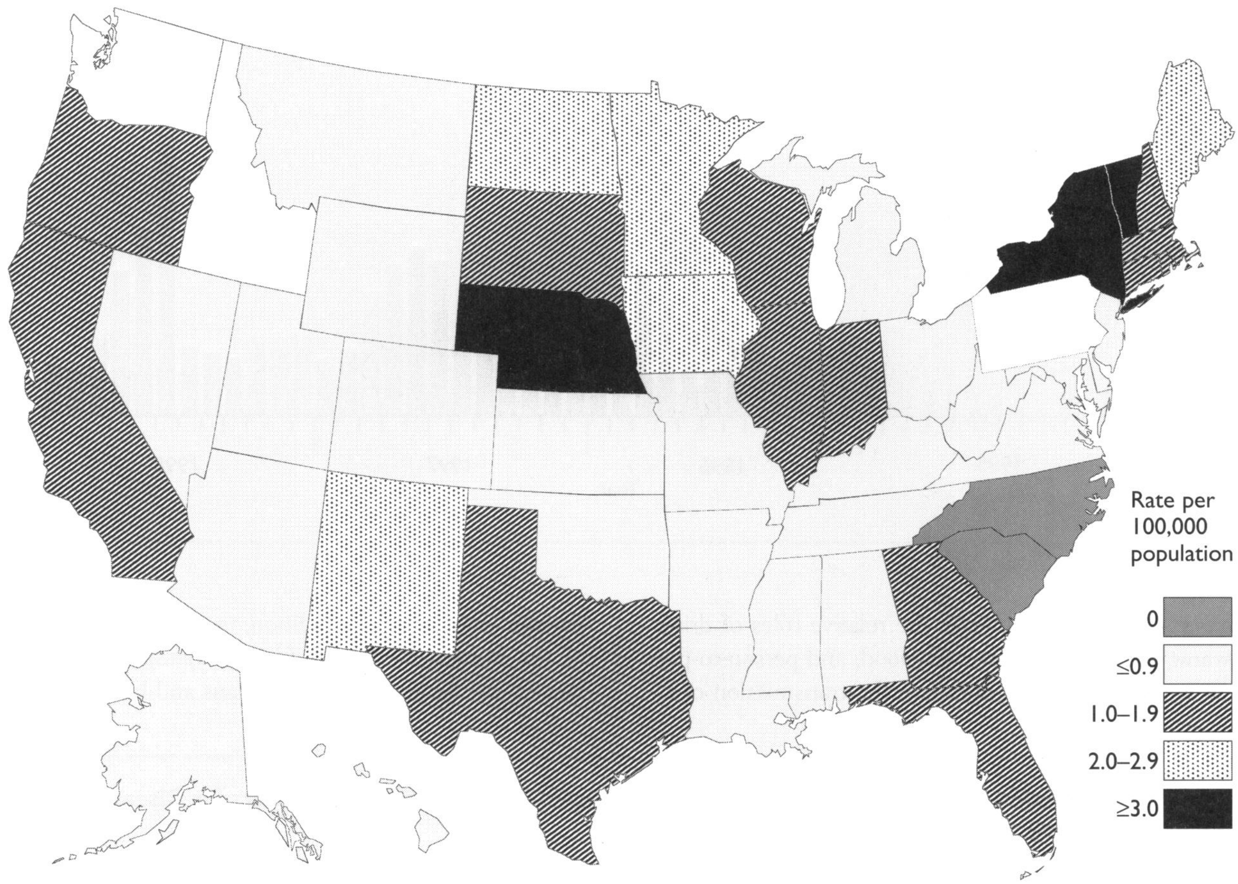


Figure 2. Mean four-year rates of cases of crytosporidiosis reported to the Centers for Disease Control and Prevention, by state, 1995–1998



seen for giardiasis, which, like cryptosporidiosis, is caused by a parasitic infection primarily via waterborne transmission (Unpublished data, Epidemiology Branch, Division of Parasitic Diseases, National Center for Infectious Diseases, CDC, 1996–1999).

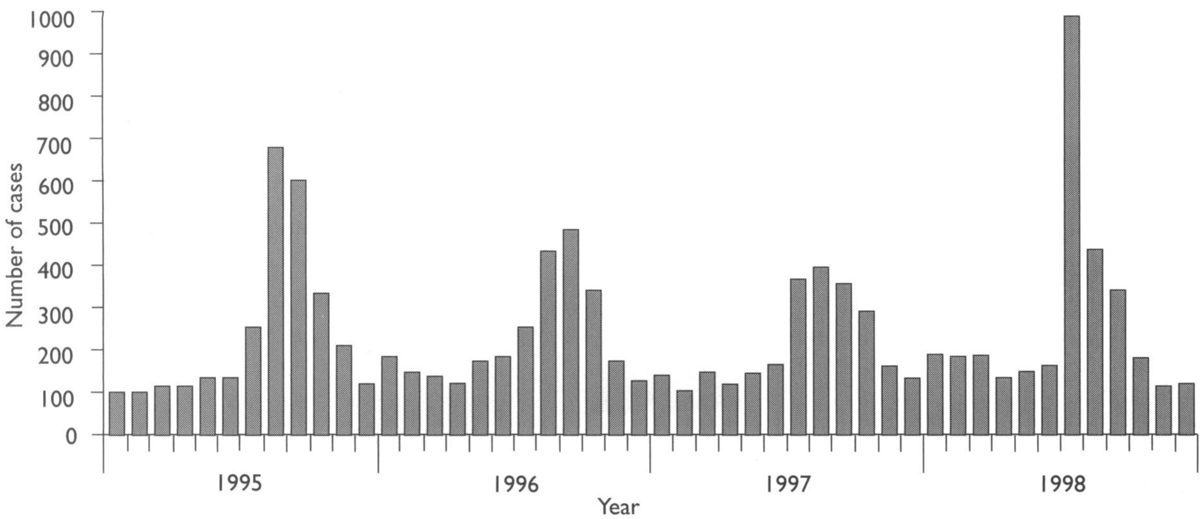
During the first four years of national surveillance, the highest notification rates were seen in eight states. Why these areas had the highest notification rates is not clear. This could represent a surveillance artifact, that is, better reporting by physicians or laboratories, or it could be related to difference in health care utilization by the local population or stool examination practices by providers.

A limitation of these data is that surveillance via NETSS is passive. The data are likely to underestimate the true magnitude of the disease and potentially its geographic distribution for several reasons. First, three states did not have mandatory reporting, while some states began reporting cases later than others. Second, not all physicians and laboratories report notifiable diseases as mandated by law. Third, not all people with diarrheal illnesses seek medical attention and not all providers order stool examinations or request examinations specifically for the detection of *C. parvum*.

The true extent of under-diagnosis and under-reporting of cryptosporidiosis is not known. Thus, the true magnitude of the disease is unknown. However, recent estimates suggest that up to 300,000 infections are occurring each year in the US, many in individuals who do not seek medical attention.[17] Yet even with the above limitations, national surveillance data provide useful information to monitor national trends.

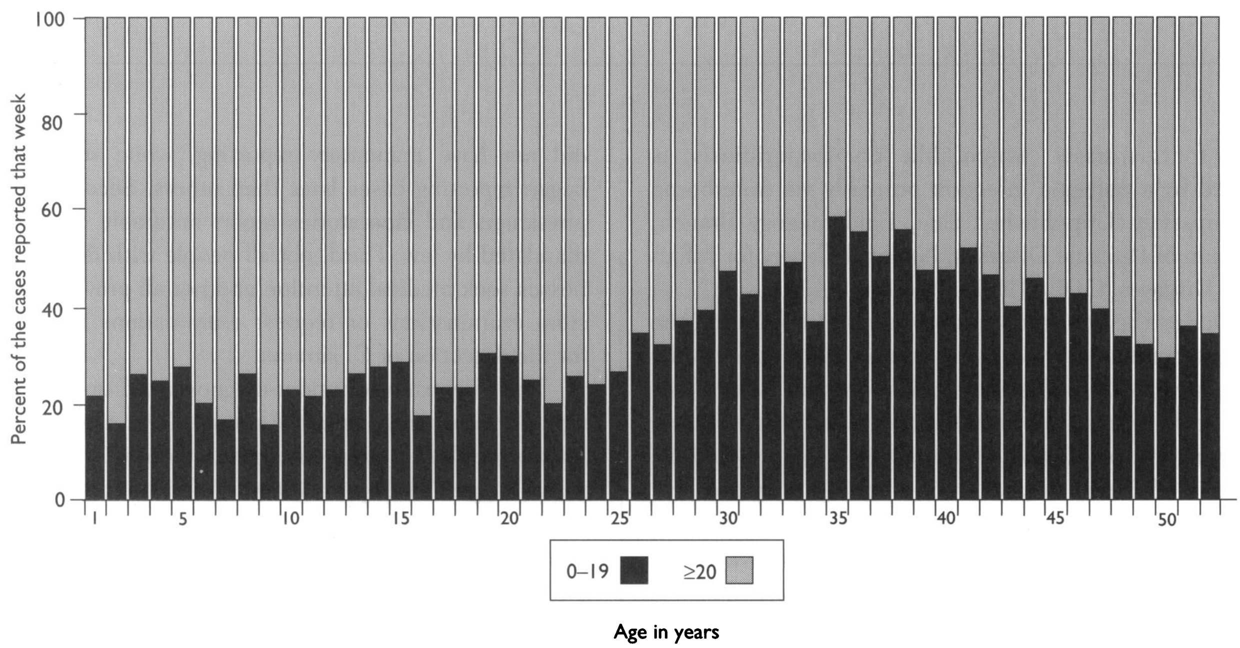
Much remains to be learned about the epidemiology of

Figure 3. Number of cases of crytosporidiosis reported to the Centers for Disease Control and Prevention, by month of report, 1995–1998



cryptosporidiosis. For example, the relative roles of drinking water, recreational water use, food, and person-to-person or animal-to-person contact in the transmission of C. *parvum* are unclear. In addition, to obtain better estimates of the burden of disease from *Cryptosporidium*, surveillance must be improved. Physicians and laboratories must

Figure 4. Distribution of crytosporidiosis cases in people age <20 reported to the Centers for Disease Control and Prevention, by week of report, 1995–1998



ensure that all cases are reported and low rates of stool specimen collection and testing for the parasite must be addressed by the public health community. The addition of *C. parvum* to FoodNet surveillance activities, currently underway in eight states, with all laboratories in the surveillance area contacted regularly, will improve the reporting of cryptosporidiosis and represent an important step in the refinement of surveillance activities. Finally, continued surveillance coupled with molecular studies to determine the genotypes associated with disease in humans would be of benefit to better understand the disease.

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