

New York City Department of Environmental Protection

**WATERBORNE DISEASE RISK ASSESSMENT PROGRAM
1997 Annual Report**

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The New York City Waterborne Disease Risk Assessment Program was developed and implemented to: (a) obtain data on the rates of giardiasis and cryptosporidiosis, along with demographic and risk factor information on case patients; (b) provide a system to track diarrheal illness to assure rapid detection of any outbreaks; and (c) determine the contribution (if any) of tap water consumption to gastrointestinal disease. The 1997 program achievements and results are presented.

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EXECUTIVE SUMMARY

New York City's Waterborne Disease Risk Assessment Program was established to (a) obtain data on the rates of giardiasis and cryptosporidiosis, along with demographic and risk factor information on case patients, (b) provide a system to track diarrheal illness to assure rapid detection of any outbreaks, and (c) determine the contribution (if any) of tap water consumption to gastrointestinal disease. The program, jointly administered by the Departments of Health and Environmental Protection, began in 1993. This report provides an overview of the program achievements and progress made during 1997.

ACTIVE DISEASE SURVEILLANCE

Active disease surveillance for giardiasis and cryptosporidiosis began in July 1993 and November 1994, respectively. While figures for 1997 are still preliminary, the number of cases of giardiasis and cryptosporidiosis reported to date for this year are less than for any prior year of active disease surveillance. The number of cryptosporidiosis cases reported in 1997 (n = 173) is approximately one third the 1995 case count (n = 474). The cryptosporidiosis rate decline, which began in 1996, has been progressive and involves persons with HIV/AIDS. This decline parallels the decrease in the number of new cases of AIDS and the decline in AIDS mortality observed since the introduction of combination therapy to treat persons infected with HIV.

OUTBREAK DETECTION

Sentinel surveillance for gastrointestinal (GI) disease in the general population can provide valuable information regarding the occurrence of a diarrheal outbreak. Such programs for enhanced outbreak detection can play a significant role in limiting the extent of an outbreak of gastrointestinal illnesses by providing a rapid indication of a problem and by identifying the location of the condition. Three distinct and complementary surveillance systems have now been implemented in New York City. One system monitors the sales of anti-diarrheal medication. The second monitors the number of stool specimens submitted to clinical laboratories for microbiological testing. The third system relies on reports of new cases of GI disease observed by health care professionals in sentinel nursing homes.

RISK EXPOSURE INFORMATION / EPIDEMIOLOGICAL STUDIES

Telephone interviews of cases identified by active disease surveillance provide basic information regarding potential risk exposures. Currently, interviews are sought with all cases of cryptosporidiosis. However, to fully evaluate the significance of reported risk exposures, it is necessary to compare risk information collected from cryptosporidiosis cases against risk information collected from a comparable uninfected control population. To that end, a case-control study of giardiasis in the general population and a cross-sectional study of cryptosporidiosis in persons infected with HIV were initiated in 1995. During 1997, progress was made on the data analysis phase of both of these studies.

OUTREACH AND EDUCATION

Outreach and education efforts have continued. Presentations were made to health care professionals, and at local and international conferences. Requests for information from other health departments were answered. Cryptosporidiosis and giardiasis fact sheets have been made available on the Department of Health's web site.

INTRODUCTION

New York City's Waterborne Disease Risk Assessment Program was developed and implemented to:

- ! obtain data on the rates of giardiasis and cryptosporidiosis, along with demographic and risk factor information on case patients;
- ! provide a system to track diarrheal illness to assure rapid detection of any outbreaks; and
- ! determine the contribution (if any) of tap water consumption to gastrointestinal disease.

Two City agencies are involved in this effort: the Department of Environmental Protection (DEP) and the Department of Health (DOH). In addition to participation by staff from both agencies, an interagency unit, the Parasitic Disease Surveillance Unit, was established to implement major components of this program. The following is an overview of the program achievements and progress made during 1997.

ACTIVE DISEASE SURVEILLANCE

Giardiasis

New York City implemented a program of active disease surveillance for giardiasis in July 1993. The program provides for the collection of more accurate and thorough data on disease incidence and risk factors than the passive surveillance program which was in place from 1986 to 1993. Active laboratory surveillance to insure complete reporting of cases is on-going, and telephone calls are made to obtain missing demographic information from case reports. Interviews of giardiasis cases to identify potential risk exposures were conducted from July 1993 to August 1995. Case rates and demographic findings are compiled and reported on a quarterly basis.

The number of cases and the case rate presented here for 1997 are preliminary since the number of cases for the last quarter of 1997 will not be finalized until March 1998. During 1997, a total of 1,753 cases were reported to DOH and the annual case rate was 23.9 per 100,000. Both the number of cases and case rate were lower in 1997 than in previous years (Table 1 and Chart 1).

Table 1: Number of Cases and Case Rates for Giardiasis, Active Disease Surveillance, New York City 1994 - 1997

<i>Year</i>	<i>Number of Cases</i>	<i>Case Rate per 100,000</i>
1994	2,456	33.5
1995	2,485	33.9
1996	2,289	31.2
1997	1,753*	23.9*

* Preliminary data for 1997.

The following points provide highlights of the preliminary findings from the active disease surveillance program for giardiasis from January 1 through December 31, 1997.

- The number and rate of giardiasis cases were highest in Manhattan.
- Cases appeared to cluster in number and rate in certain zip codes in Manhattan and the Bronx.
- The number and rate of giardiasis cases were greater in males than females.
- Overall, 5-9 years olds and 1-4 year olds had the highest age-specific case rates. In these age groups, the racial/ethnic grouping which is comprised of Asian/Pacific Islanders and American Indians/Alaskan Natives had the highest rate.

Cryptosporidiosis

Cryptosporidiosis was added to the Reportable Disease List in the New York City Health Code, effective January 1994. Active disease surveillance, including regular laboratory visits or telephone contact, began in November 1994. Case interviews were initiated in January 1995 and are ongoing.

The number of cases and the case rate for 1997 are preliminary since the number of cases for the last quarter of 1997 will not be finalized until March 1998. During 1997, a total of 173 cases were reported to the Department of Health and the annual case rate was 2.4 per 100,000. Both the number of cases and the case rate were lower in 1997 than in previous years (Table 2 and Chart 2).

Table 2: Number of Cases and Case Rates for Cryptosporidiosis, Active Disease

Surveillance, New York City 1994 - 1997

<i>Year</i>	<i>Number of Cases</i>	<i>Case Rate per 100,000</i>
1994	289*	3.9*
1995	474	6.5
1996	332	4.5
1997	173**	2.4**

* Active disease surveillance began in November 1994.

** Preliminary data for 1997.

The decline observed between 1995 and 1996 in the overall number of cryptosporidiosis cases was found to be due to a decline in cases among persons with AIDS. Cryptosporidiosis cases among persons with AIDS declined from 397 in 1995 to 231 in 1996 (Chart 3). Cases among non-HIV infected persons did not decline (67 cases in 1995 and 77 in 1996). Data on the number of persons with AIDS among the cryptosporidiosis cases diagnosed in 1997 is not available at this time. While no seasonality was observed among persons with cryptosporidiosis and AIDS, cryptosporidiosis incidence in the non-HIV infected population increased in the late summer during 1995 and 1996.

A report summarizing the demographic and potential risk factor information of 1997 cases will be prepared once the final number of cases is confirmed, case interviews completed and results tabulated. An analysis of the 1995 and 1996 data shows the following: among interviewed cases (n = 510), the most commonly reported potential risk exposures during the month before disease onset were contact with an animal (36%), high-risk sexual activity (26%), providing care to a person with diarrhea (20%), recreational water exposure (15%), and international travel (15%). Principal sources of drinking water were tap water (66%), bottled water (10%), filtered water (9%), and boiled water (8%); 16% denied even incidental tap water consumption.

DISEASE OUTBREAK DETECTION

The monitoring of gastrointestinal disease in the general population can provide valuable information regarding the development of an outbreak. Such programs for enhanced outbreak detection can play a significant role in limiting the extent of an outbreak of gastrointestinal illnesses by providing a rapid indication of a problem and by identifying the location of the condition.

The City has developed three independent and complementary systems to monitor for outbreaks. These surveillance systems involve partnerships with the pharmaceutical industry,

clinical laboratories and nursing homes. We appreciate the active and voluntary participation of our partners in these surveillance systems. The compilation of information provided daily or weekly from these three different systems has allowed us to compare the findings generated. Such comparisons provide important insights into the workings of each system. Two of the systems rely on reports of persons taking steps in response to diarrheal illness (self-medication and submission of a stool specimen to a clinical laboratory). The third system relies on reports of new cases of gastrointestinal disease observed by health care professionals in a monitored environment (nursing homes).

Anti-Diarrheal Medications Surveillance

The monitoring of sales of anti-diarrheal medications provides a valuable source of information about the level of diarrheal illness in the community. Large increases in sales of anti-diarrheal medicines have been reported during a number of U.S. and overseas outbreaks of gastrointestinal diseases. In New York City's program, volume-of-sales information is obtained from two drug distribution networks: a regional distributor and a chain of drugstores.

- Distribution network#1: Information on weekly shipments of Imodium® to 1265 pharmacies is provided by the largest metropolitan distributor of medicines to independent pharmacies. This data includes information on shipments to about one third of all pharmacies located in New York City. Weekly information has been received since May 1995 and monitoring is ongoing. The baseline is very stable and shipments during 1997 have been somewhat lower than shipments in 1996 and 1995. Seasonal variations have not been observed with the exception of a decrease in the number of shipments during the month of November.
- Distribution network #2: A chain with 38 drugstores located in New York City provides information on direct sales from check-out scanners of 22 anti-diarrheal medicines. Data are available for each of the five New York City boroughs, and also for four neighboring counties for comparison. Weekly sales figures have been received since February 1996 and monitoring is ongoing. A few increases of short duration above the baseline (20-30%) have been observed and were associated with promotional events affecting one specific package size at a time. The identification of these promotional events suggests that the tracking can identify small increases in purchases.

Clinical Laboratories Surveillance

The number of stool specimens submitted to clinical laboratories for microbiological testing also provides information on the prevalence of gastrointestinal illness in the population. Three clinical laboratories, including the largest laboratory in the metropolitan area, currently participate in New York City's monitoring program. The number of stool specimens examined for (a) bacterial culture and sensitivity, and (b) ova and parasites (O&P), is transmitted daily by fax to New York City's Parasitic Disease Surveillance Unit. Monitoring started in November 1995 and is ongoing.

Nursing Home Surveillance

Nursing home surveillance began in March of 1997. Participating nursing homes were selected from a group of nursing homes that had expressed a willingness to participate. Each nursing home provides information regarding the number and type of residents (e.g., elderly, AIDS or mixed), and the type of water provided to residents (e.g., tap, filtered, bottled). Additional criteria for selection included the borough and the source water (e.g., Croton vs Catskill/Delaware). Each nursing home provides daily, by fax, the number of new cases of gastrointestinal disease among residents on each ward.

Eleven nursing homes are currently participating in the surveillance program, representing approximately 3,000 residents. Data is analyzed daily. The first ten months of surveillance have shown the daily number of new cases of gastrointestinal disease to be very low (often no new cases). Site visits to each nursing home to evaluate the completeness of reporting were conducted during the Fall of 1997. The surveillance system is ongoing. Analysis of the data identified a small bacterial outbreak -- not waterborne related -- at one of the sentinel nursing homes during the Spring of 1997.

EPIDEMIOLOGICAL STUDIES

Although risk exposure information collected during case interviews may provide clues to the relationship between disease and risk exposures, it cannot conclusively demonstrate such relationships. The significance of reported risk exposures can, however, be evaluated by comparing risk information collected from cases with information collected from a comparable control population. To that effect, two epidemiological studies were initiated in 1995. Summary results of a case-control study of giardiasis in the general population and of a cross-sectional study of cryptosporidiosis in people infected with HIV are presented below. Reports of these studies are in preparation.

Giardiasis Case-Control Study

A case-control study of giardiasis was conducted by the New York City Department of Health in June and July 1995 to evaluate the risk factors for giardiasis in the general population.

Methods

Cases for the study were selected from the active disease surveillance program, which includes all laboratory-confirmed cases of giardiasis. The case definition for the study, however, was strengthened to include only persons with three or more stools within a 24-hour period for at least three consecutive days. Controls were selected using random digit dialing. Cases and controls were matched on sex, age group and by language of interview.

Results

From a total of 295 subjects identified by active disease surveillance during the study period, only 120 (40.7%) cases met the stricter case definition. On univariate analysis, the association of illness with various risk factors among study participants was examined. The strongest risk association was the presence of a self reported immuno-suppressing condition. Case-patients were 13.5 times more likely to have decreased function of their immune system

compared to controls (Matched Odds Ratio (MOR) = 13.5; 95% Confidence Interval (CI), 3.2-56.8). In the 30 days before illness, case-patients were less likely to have anyone in the household with diarrhea (MOR = 0.4; 95% CI, 0.2-0.9) and to garden or handle dirt (MOR = 0.5; 95% CI, 0.2-0.9), when compared to controls. Other risk factors, including recent travel within the United States, drinking New York City tap water, drinking water directly from a lake or stream, swimming in fresh water or a swimming pool, eating at restaurants or salad bars, and visiting/playing with animals/pets, travel to Puerto Rico or outside the United States (excluding recent immigration) were not found to be associated with giardiasis.

Cryptosporidiosis Cross-Sectional Study

A cross-sectional study was conducted to determine the prevalence of current infection, and past exposure (seroprevalence) to *Cryptosporidium* among HIV-infected persons in New York City and to assess the association between cryptosporidial infection and various risk factors, including exposure to drinking water. The study was conducted by Dr. R. Soave at The New York Hospital-Cornell Medical Center, in collaboration with the New York City Department of Health, and funded by the Centers for Disease Control and Prevention and the New York City Department of Environmental Protection.

Methods

The study was conducted from October 1995 to July 1997. Subjects included HIV-positive New York City residents over 18 years of age who were patients at the Center for Special Studies (CSS - an outpatient practice for the care of HIV-infected individuals) or the Cornell Clinical Trials Unit (CCTU), both at The New York Hospital-Cornell Medical Center. Upon entry with the study, patients were asked to submit stool and serum specimens and were verbally administered a 17-page questionnaire. Stool samples were examined for cryptosporidial antigen using a commercially available enzyme-linked immunoabsorbent assay (ELISA). In order to optimize compliance with submission of stool specimens, a home pick-up service was provided by the New York City Department of Health Transportation System for those subjects not able to submit a specimen on the day of enrollment. Sera from patients were analyzed for anti-cryptosporidial immunoglobulin G using an ELISA test that was developed by the CSS's laboratory. The questionnaire was verbally administered to all subjects. Information was obtained on a variety of potential risk factors, including, but not limited to: sources of drinking water, exposure to surface or recreational water, sexual practices, other types of person-to-person contact, animal contact, and travel.

Preliminary Results

405 HIV-infected New York City residents were enrolled in the study between October 1995 and July 1997. This is approximately half of the CSS/CCTU patient population.

- Prevalence of cryptosporidial infection by stool exam: 331 of 405 (82%) subjects enrolled in the study submitted stool specimens. Four of the 331 (1.2%) stool specimens were positive for cryptosporidial antigen. All four positive subjects were Hispanic and had a CD4⁺ count below 100. Although all four had a history of diarrhea, only one was symptomatic at the time of interview. An additional five patients showed some positivity which was not high enough to meet a cut-off criteria and were considered negative.

- Seroprevalence: 379 of the 405 (93%) subjects submitted a serum sample. 107 of the 379 (28%) serum samples were positive for anti-cryptosporidial immunoglobulin G by ELISA.
- Risk factor analysis: Because of the low prevalence of stool positivity, the association between consumption of tap water and other risk factors, and enteric infection could not be assessed. Analysis of the correlation between risk factors and seropositivity is currently in progress. Water consumption data obtained from the questionnaire indicate that tap water avoidance is uncommon, and rarely absolute.

ADDITIONAL INFORMATION GATHERING EFFORTS

Active disease surveillance is an effective tool for capturing all laboratory-diagnosed cases of a disease. However, it is believed that cryptosporidiosis is significantly under-diagnosed. This is due to the fact that: (a) people with cryptosporidiosis may not seek medical care, (b) physicians do not order an ova and parasite test for each of their patients with gastrointestinal symptoms, and (c) many laboratories that perform the ova and parasite tests do not include *Cryptosporidium* in the routine examination. It is also likely that the proportion of reported cryptosporidiosis cases who are HIV-positive is high because cryptosporidiosis is an AIDS-defining disease and HIV-positive persons presenting with diarrhea are more likely to be tested for cryptosporidiosis than persons who are HIV-negative. As part of our effort to provide a more complete picture of cryptosporidiosis prevalence, two additional sources of information have been utilized.

New York City DOH Bureau of Laboratories - Stool Testing

A pilot program was initiated in September 1995 by New York City DOH's Bureau of Laboratories. At that time, all stool specimens sent by Child Health Clinics began to be tested for *Cryptosporidium*. While the clinics' population is not representative of the New York City population (the clinics serve 80,000 children), results provide information on the prevalence of *Cryptosporidium* in this age group. A total of 4,223 samples were tested between January and December 1997, none of these specimens were positive for *Cryptosporidium*. In 1996, only three specimens tested positive for *Cryptosporidium* out of a total of 3,444 samples tested (0.09%).

New York State-Wide Cryptosporidium Testing and Trends

The State Department of Health is responsible for the licensing of clinical laboratories performing O&P testing. In January 1997, the State sent questionnaires to clinical laboratories to obtain information on: the number of tests performed, the analytical methods used and the findings.

Among the State's findings was a marked decrease in *Cryptosporidium* positives in stool tests. Statewide, the number of positive *Cryptosporidium* tests decreased from 3,244 in 1995 to 1,824 in 1996, while the total number of tests for *Cryptosporidium* increased from 126,807 in 1995 to 170,395 in 1996. The number of *Cryptosporidium* tests increased even though the

number of O & P tests decreased (from 627,095 in 1995 to 562,320 in 1996).

INFORMATION SHARING AND EDUCATION

Information sharing and education efforts continued during 1997.

Over the year, program staff participated in a number of meetings and presentations to discuss NYC's Waterborne Disease Risk Assessment Program and related issues. Numerous presentations were made to groups of physicians and/or other health care professionals, and at local and international conferences. Such talks serve to enhance awareness of cryptosporidiosis and should lead to more complete disease diagnosis (including laboratory evaluation) and reporting. Additionally, information was provided to several State and County Health Departments and others who requested information on the development and implementation of the anti-diarrheal medication monitoring, clinical laboratory and nursing home surveillance programs.

An important forum for the active exchange of information between health professionals, water utilities, researchers and others --- on topics including waterborne disease agents, reported outbreaks around the country and overseas, and treatment methods --- is the Working Group on Waterborne Cryptosporidiosis, coordinated by the federal Centers for Disease Control and Prevention. Program staff participated in several Task Forces which prepared chapters for *Cryptosporidium* and Water: A Public Health Handbook, which was published in 1997 by the Centers for Disease Control and Prevention. The City continues to be an active participant in the Working Group.

New York City Department web sites have been developed from which certain relevant information is available. Fact sheets on giardiasis and cryptosporidiosis are now available on the web site of the Department of Health:

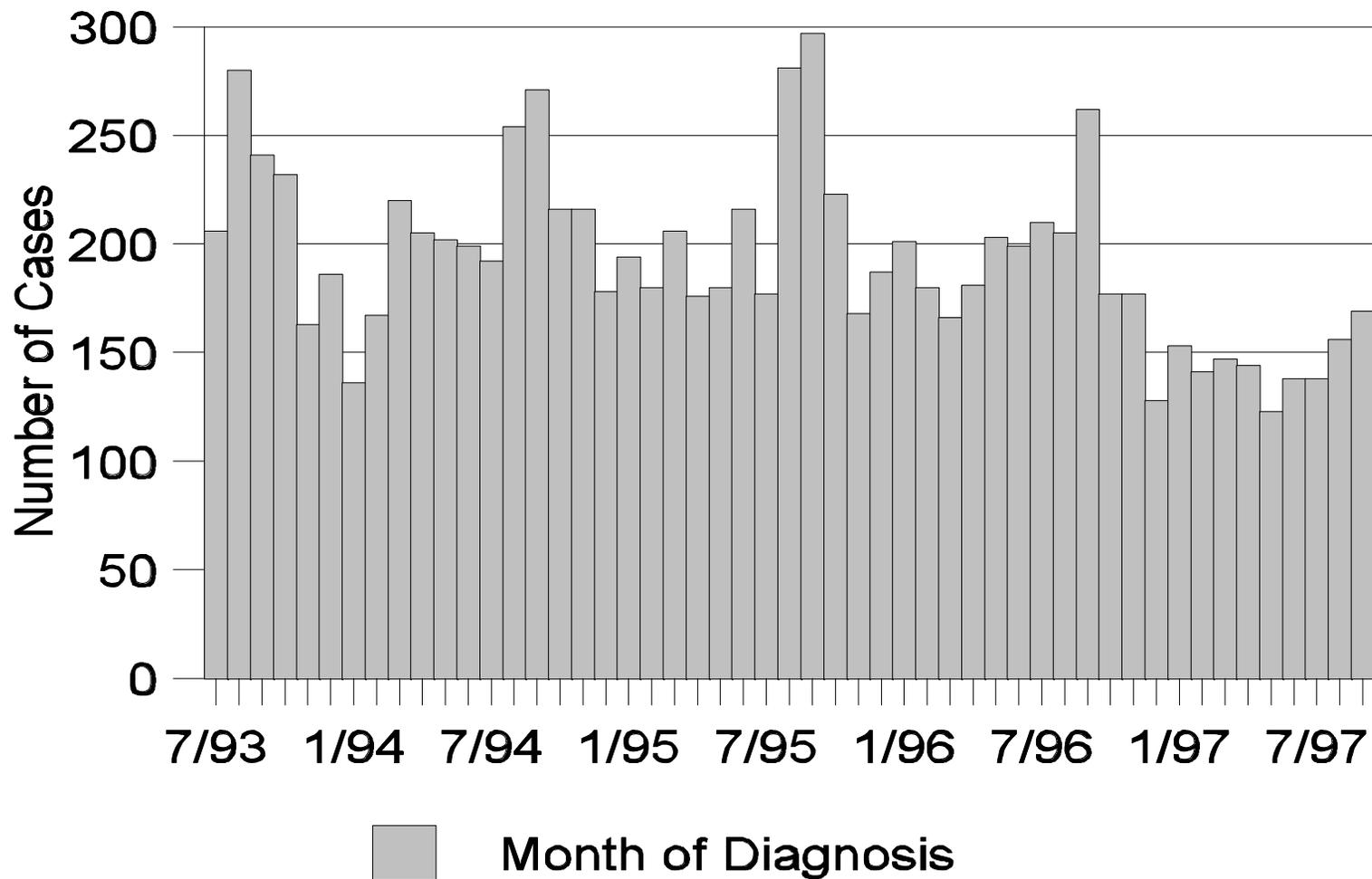
- <http://www.ci.nyc.ny.us/html/doh/html/cd/cdgia.html>
- and
- <http://www.ci.nyc.ny.us/html/doh/html/cd/cdcry.html>

Information regarding New York City Water Supply is available on DEP's web site:

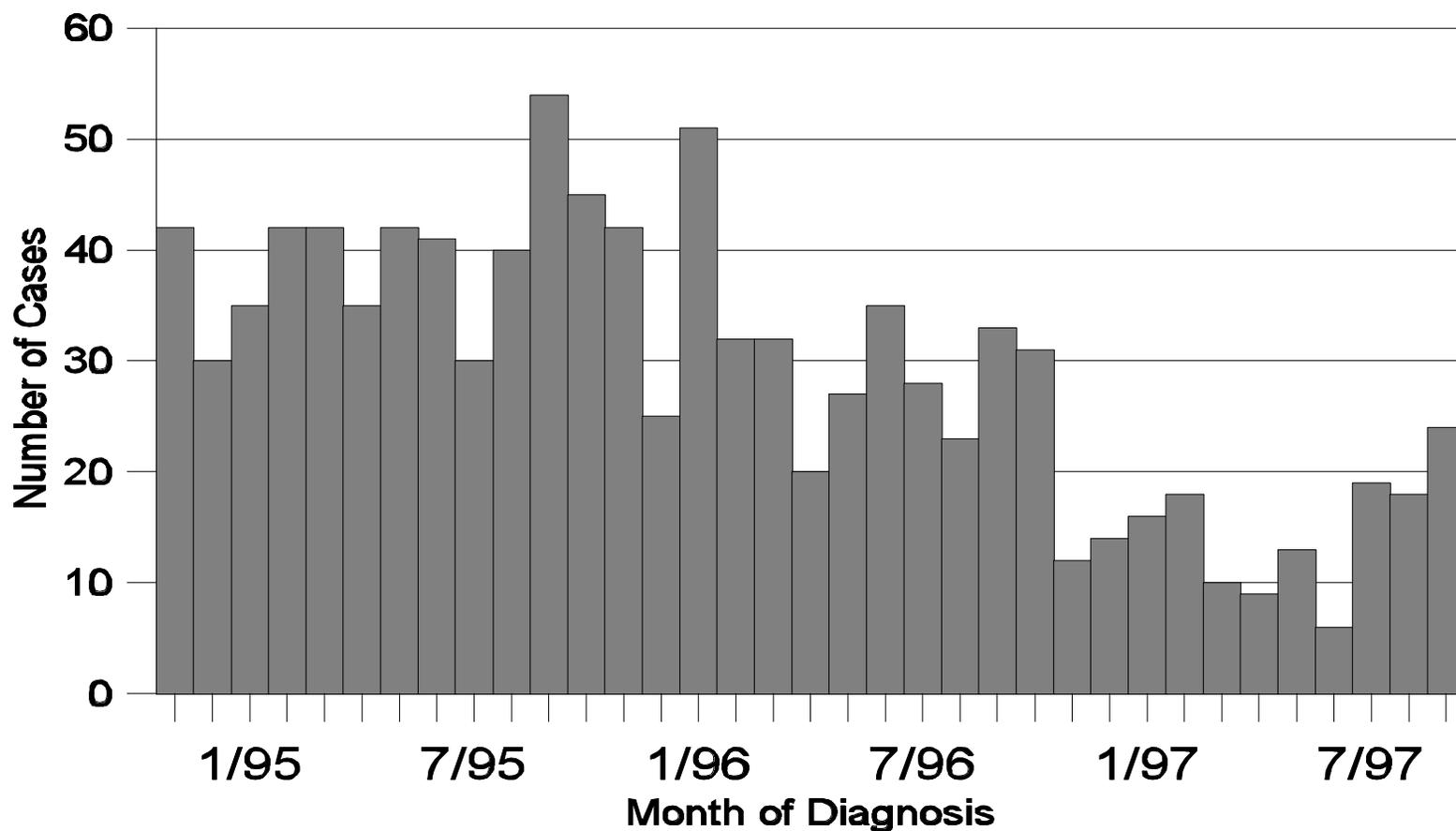
- <http://www.ci.nyc.ny.us/html/dep/>

Additional information regarding the Waterborne Disease Risk Assessment Program will be added to these web sites as it become available.

**CHART 1: Active Surveillance for Giardiasis by Month
New York City, July 1993-September 1997**



**CHART 2: Active Surveillance for Cryptosporidiosis by Month
New York City, November 1994-September 1997**



**CHART 3: Cryptosporidiosis Among HIV-positive Persons by Month
New York City, 1995-1996**

