New York City Department of Health and Mental Hygiene
Bureau of Communicable Disease

and

New York City Department of Environmental Protection
Bureau of Water Supply

Waterborne Disease Risk Assessment Program

2007 Annual Report

March 31, 2008

Prepared in accordance with the November 2002 United States Environmental Protection Agency Filtration Avoidance Determination

Prepared by: Lisa Alleyne, MPA (DOHMH)
Sharon Balter, MD (DOHMH/DEP)
Daniel Cimini, RN, MPH (DOHMH)
Anne Seeley, MPH (DEP)

With: Miranda Jones, David Lipsky, Erin Murray, Trang Nguyen, Marc Paladini, and other members of the Waterborne Disease Risk Assessment Program Team

THE WATERBORNE DISEASE RISK ASSESSMENT PROGRAM TEAM

The Waterborne Disease Risk Assessment Program (WDRAP) is an interagency program involving the New York City Departments of Environmental Protection and Health and Mental Hygiene

- **New York City Department of Health and Mental Hygiene (DOHMH)**
  Bureau of Communicable Disease
  125 Worth Street, CN-22A, New York, NY 10013

  Marcelle Layton, M.D., Assistant Commissioner
  Don Weiss, M.D., M.P.H., Medical Director, Surveillance & Data Analysis Unit
  Sharon Balter, M.D., Medical Director (*WDRAP Coordinator for DOHMH)*
  Daniel Cimini, R.N., M.P.H., City Research Scientist (*WDRAP Asst. Coordinator)*
  Lisa Alleyne, M.P.A., Public Health Epidemiologist

  Bureau of Communicable Disease:
  Catherine Addei-Maanu, Erlinda Amoroso, Michael Antwi, Alice Baptist-Norville, Fazlul Chowdhury, Solomon Dada, Emily Lumeng, Muhammad Iftekharuddin, Lucretia Jones, Deborah Kapell, Yin Ling Leung, Ann Murray, Erin Murray, Trang Nguyen, Daniel Osuagwu, Marc Paladini, Jose Poy, Sara Sahl, Anna Smorodina, Rajmohan Sunkara

- **New York City Department of Environmental Protection (DEP)**
  Bureau of Water Supply
  59-17 Junction Blvd., 20th Floor, Flushing, NY 11373-5108.

  David Lipsky, Ph.D., Chief, Distribution Water Quality Science & Research Division
  Anne Seeley, M.P.H., Section Chief, Health Assessment & Policy Coordination (*WDRAP Coordinator for DEP)*
  Miranda Jones, M.H.S., Scientist (Water Ecology)

==========

Additional copies of WDRAP reports are available from Anne Seeley at the DEP address listed above, by phone (718-595-5346), or E-mail: aseeley@dep.nyc.gov

Copies of the questionnaires used for disease surveillance are available from Daniel Cimini at the DOHMH address listed above, by phone (212-788-4233), or E-mail: dcimini@health.nyc.gov

The authors wish to acknowledge the dedication of the other members of the Waterborne Disease Risk Assessment Program Team, and the assistance of Fran Guerriero (DEP), Glenette Houston (DOHMH), Giselle Merizalde (DOHMH), and Dana Patrick (DOHMH).

TABLE OF CONTENTS

Tables

Figures

Maps

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) attempt to determine the contribution (if any) of tap water consumption to gastrointestinal disease. The program, jointly administered by the Department of Health and Mental Hygiene and the Department of Environmental Protection, began in 1993. This report provides an overview of program progress, and data collected, during 2007.

ACTIVE DISEASE SURVEILLANCE

Active disease surveillance for giardiasis and cryptosporidiosis began in July 1993 and November 1994, respectively, and continued through 2007. This report presents the number of cases and case rates for both diseases in 2007 (and includes data from past years for comparison). Also, demographic information for cases of giardiasis and cryptosporidiosis was gathered and is summarized in this report. Telephone interviews of cryptosporidiosis case-patients to gather potential risk exposure information continued, and selected results are presented.

SYNDROMIC SURVEILLANCE / OUTBREAK DETECTION

The tracking of sentinel populations or surrogate indicators of disease can be useful in assessing gastrointestinal (GI) disease trends in the general population. Such tracking programs provide greater assurance against the possibility that a citywide outbreak would remain undetected. In addition, such programs can play a role in limiting the extent of an outbreak by providing an early indication of a problem so that control measures may be rapidly implemented.

The City maintains a number of distinct and complementary outbreak detection systems. One system monitors and assists in the investigation of GI outbreaks in sentinel nursing homes. Another system tracks the number of stool specimens submitted to two clinical laboratories for microbiological testing. A third system utilizes hospital Emergency Department chief complaint logs to monitor for outbreaks. The City has also been utilizing three separate systems for monitoring sales of anti-diarrheal medication: one tracks the weekly volume of sales of non-prescription anti-diarrheal medications at a major NYC drug store chain; an additional pharmacy system tracks daily sales of non-prescription anti-diarrheal medications at another drug store chain; and a third system tracked retail pharmacy data obtained from the National Retail Data Monitor. In November 2007, the City stopped receiving data from the National Retail Data Monitor. With regard to the weekly medications monitoring program, a company merger involving the data source occurred in 2007. Data flow has been maintained despite the resulting change in corporate ownership; however, the merger brought to light a problem with product promotion data which is described. The daily anti-diarrheal medication sales monitoring program remained in operation, though with an interruption from October 22 to November 21, 2007. A summary of syndromic surveillance findings for 2007 pertaining to GI illness is presented. Signaling of syndromic systems was noted in January and February, and again in December, a pattern consistent with annual gastrointestinal viral trends. A correction is noted with regard to certain NRDM signals that had been described in the latest WDRAP Semi-Annual Report. There was no evidence of a drinking water-related outbreak in New York City.

INFORMATION SHARING AND PUBLIC EDUCATION

Outreach and education efforts have continued. Presentations were made to health care providers and at schools of public health. Information on *Cryptosporidium* and *Giardia* continues to be available on New York City Department of Environmental Protection's and New York City Department of Health and Mental Hygiene's websites, including annual reports on program activities, fact sheets on giardiasis and cryptosporidiosis, and results from the Department of Environmental Protection's source water protozoa monitoring program.

INTRODUCTION

New York City's Waterborne Disease Risk Assessment Program (WDRAP) 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
- attempt to 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 and Mental Hygiene (DOHMH). In addition to participation by staff from both agencies, a special interagency unit, the Parasitic Disease Surveillance Unit, was established to implement major components of this program. In the year 2001, the staff of the Parasitic Disease Surveillance Unit was merged with staff from the DOHMH Bureau of Communicable Disease. Staff members employed by DEP and DOHMH now jointly work on WDRAP activities as well as on other communicable disease activities. This merger increases the efficiency of the office but does not affect WDRAP operations.

Following below is a summary of program highlights and data for the year 2007. Variations in data between this report and previous reports may be due to several factors, including disease reporting delays, correction of errors, and refinements in data processing (for example, the removal of duplicate disease reports). For this report, for calculation of rates, the base population figures used (i.e., denominators) were obtained from year 2000 U.S. Census data. In addition, case rates from prior years have been adjusted in this report to reflect 2000 U.S. Census data, utilizing intercensal population estimates for years 1994 -1999. All rates are annual case rates. Caution must be exercised when interpreting rates based on very small case numbers.

In this annual report, for the geographic breakdown of data, United Hospital Fund (UHF) neighborhood of case-patient residence was used. New York City is divided on the basis of zip code into 42 UHF neighborhoods. Maps illustrating annual rates by UHF neighborhood are included in this report.

Year 2000 U.S. Census data include two race/ethnicity categories that are not included in this report. These race/ethnicity categories are: "Non-Hispanic of Single Race, other than White, Black/African American, Asian, Pacific Islander, American Indian and Alaskan Native" and "Non-Hispanic of Two or More Races." In this report, race/ethnicity-specific case rates are based upon year 2000 Census data for the proportion of New York City residents who were categorized into one of the remaining four racial/ethnic groups (7,724,354 of 8,008,278 total population, or 96.5%). Because disease surveillance data categorizes all case-patients with a known race and ethnicity into one of four race/ethnicity categories, only four of six U.S. census race/ethnicity denominator categories were used to calculate race/ethnicity-specific rates. Race/ethnicity-specific case rates presented may therefore be somewhat elevated above the true rates.

PART I: ACTIVE DISEASE SURVEILLANCE

Giardiasis

New York City implemented a program of active surveillance for giardiasis in July 1993 to ensure complete reporting of all laboratory-diagnosed cases. Active laboratory surveillance (regular site visits or telephone contact with laboratories) continued in 2007. Also, mailings or telephone calls continued to be made to health care providers and laboratories to obtain basic demographic information missing from case reports. Case rates and basic demographic findings were compiled and reported on a quarterly basis through July 2002. Beginning January 2003, rates and demographic findings have been compiled on a semi-annual basis.

During 2007, a total of 855 cases of giardiasis were reported to DOHMH and the annual case rate was 10.7 per 100,000. Annual case numbers decreased 8.8% from 2006 to 2007. From 1994 to 2007 annual case numbers decreased 66.0% (see Table 1 below, and Figure 1).

Table 1: Giardiasis, number of cases and case rates*, active disease surveillance, New York City, 1994 - 2007.

Year	*Number of Cases*	*Case Rate per 100,000*
1994	2,514	33.1
1995	2,523	32.9
1996	2,288	29.6
1997	1,788	22.9
1998	1,961	24.9
1999	1,897	23.9
2000	1,771	22.1
2001	1,530	19.1
2002	1,423	17.8
2003	1,214	15.2
2004	1,088	13.6
2005	875	10.9
2006	938	11.7
2007	855	10.7

* For 1994-1999, rates were calculated using intercensal population estimates. For 2000-2007, 2000 Census data were used.

As has been noted in previous WDRAP reports, the overall decrease in NYC giardiasis cases reported since 1994 has occurred in both sexes and across age groups, and therefore does not appear to be related to the use of highly active antiretroviral therapy (HAART) for treating persons living with HIV. It is unclear why overall rates have declined.

The following provides some highlights from the active surveillance data for giardiasis among New York City residents from January 1 through December 31, 2007. Additional data are presented in the tables that appear later in this report.

Location of case-patient residence

Location of case-patient residence was known for all 855 giardiasis case-patients who resided in New York City. In addition, there were 21 giardiasis case-patients for whom city of residence was unknown, and these case-patients are not included in this report. Manhattan had the highest borough-specific annual case rate (22.1 cases per 100,000 population) (Table 2). The highest UHF neighborhood-specific case rate was found in the Chelsea-Clinton neighborhood in Manhattan (60.2 cases per 100,000) (Map 1 and Table 3).

Sex

Information regarding sex was available for 851 of 855 cases (99.5%). The number and rate of giardiasis cases were higher in males than females, with 561 males (14.8 cases per 100,000) and 290 females (6.9 cases per 100,000) reported. The highest sex- and borough-specific case rate was observed among males residing in Manhattan (32.6 cases per 100,000) (Table 2).

Age

Information regarding age was available for 853 of 855 cases (99.8%). The highest age group-specific annual case rates were among children less than 5 years old (22.0 cases per 100,000) and children 5 to 9 years old (16.4 cases per 100,000) (Table 4). The highest age group- and sex-specific case rates were among males less than 5 years old (23.9 cases per 100,000) and females less than 5 years old (19.3 cases per 100,000). The highest age group- and borough-specific case rates were among children less than 5 years old in Manhattan (31.6 cases per 100, 000) and children 5-9 years old in Manhattan (31.4 cases per 100,000) (Table 5).

Race/Ethnicity

Information regarding race/ethnicity was available for 185 of 855 cases (21.6%). Ascertainment of race/ethnicity status for giardiasis cases was poor. Giardiasis case-patients are not routinely interviewed unless they are in occupations or settings that put them at increased risk for secondary transmission (e.g., food handler, health care worker, child attending day care, or day care worker). For the majority of giardiasis cases, race/ethnicity information, when provided, is not based upon self-report, but rather upon the impressions of health care providers, which may be inaccurate. For this reason, and because race/ethnicity information was missing from most giardiasis disease reports, race/ethnicity findings pertaining to giardiasis cases diagnosed in 2007 are not presented in this report.

Cryptosporidiosis

Cryptosporidiosis was added to the list of reportable diseases in the New York City Health Code, effective January 1994. Active disease surveillance for cryptosporidiosis began in November 1994 and continued during 2007. Case interviews for demographic and risk factor data were initiated in January 1995 and are ongoing. Case rates and basic demographic findings were compiled and reported on a quarterly basis through July 2002. Beginning January 2003, rates and demographic findings have been compiled on a semi-annual basis.

During 2007, a total of 105 cases of cryptosporidiosis were reported to DOHMH and the annual case rate was 1.3 per 100,000. Annual case numbers decreased 32.3% from 2006 to 2007. From 1995 to 2007 annual case numbers have declined 77.8% (see Table 6 below, and Figures 2 and 3).

Table 6: Cryptosporidiosis, number of cases and case rates*, active disease surveillance, New York City, 1994 - 2007.

Year	*Number of Cases*	*Case Rate per 100,000*
1994	297**	3.9**
1995	472	6.2
1996	334	4.3
1997	172	2.2
1998	208	2.6
1999	261	3.3
2000	172	2.1
2001	122	1.5
2002	148	1.8
2003	126	1.6
2004	138	1.7
2005	148	1.8
2006	155	1.9
2007	105	1.3

* For 1994-1999, rates were calculated using intercensal population estimates. For 2000-2007, 2000 Census data were used.
** Active disease surveillance began in November 1994.

The following provides some highlights from the active surveillance data for cryptosporidiosis among New York City residents from January 1 through December 31, 2007. Additional data are presented in the tables that appear later in this report.

Location of case-patient residence

Information on location of residence was available for all cases of cryptosporidiosis. Manhattan had the highest borough-specific annual case rate (2.8 cases per 100,000) (Table 7). The highest UHF neighborhood-specific case rate was found in the Chelsea-Clinton neighborhood in Manhattan (8.1 cases per 100,000) (Map 2 and Table 8).

Sex

Information regarding sex was available for all cases. The number and rate of cryptosporidiosis cases were higher in males than females, with 69 males (1.8 cases per 100,000) and 36 females (0.9 cases per 100,000) reported. The borough- and sex-specific case rate was highest for males in Manhattan (3.6 cases per 100,000) (Table 7).

Age

Information regarding age was available for all cases. The highest age group-specific case rates were observed in children less than 5 years old (2.4 cases per 100,000) (Table 9). The highest age group- and sex-specific case rates occurred among males less than 5 years old (3.3 cases per 100,000) and males 20-44 years old (2.4 cases per 100,000). The highest age group and borough-specific case rates were among children less than 5 years old in Manhattan (9.2 cases per 100,000) (Table 10).

Race/Ethnicity

Race/ethnicity information was available for 99 of 105 cases (94.3%). The racial/ethnic group-specific case rate was highest among Black non-Hispanics (1.9 cases per 100,000) and Hispanics (1.5 cases per 100,000) (Table 11). Non-Hispanic Blacks in Manhattan had the highest race/ethnicity- and borough-specific case rate (5.1 cases per 100,000). The highest age group- and race/ethnicity-specific case rates occurred among Black non-Hispanic children less than 5 years old (3.4 cases per 100,000), Black non-Hispanics 20-44 years old (3.4 cases per 100,000) and among Hispanic children less than 5 years old (3.2 cases per 100,000) (Table 12).

Cryptosporidiosis and Immune Status

Trends observed over the years in reported number of cryptosporidiosis cases have differed between persons living with HIV/AIDS and those who are immunocompetent. Reported cryptosporidiosis cases among persons living with HIV/AIDS decreased considerably, from 392 in 1995 to 50 in 2007, thus causing a decline in the overall number of cryptosporidiosis cases in New York City. However, during the years 1995 through 2007, the number of cases of cryptosporidiosis among immunocompetent persons has remained more stable, ranging from 38 to 139 cases per year (see Table 13 below, and Figures 4 and 5).

Table 13: **Cryptosporidiosis, number of cases by year and immune status, New York City, 1995-2007**.

Immune Status	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Persons with HIV/AIDS	392	244	80	79	118	91	65	94	76	95	67	69	50
Immunocompetent	71	83	83	122	139	79	54	47	48	38	72	71	51
Immunocompromised Other Than HIV/AIDS	4	3	7	2	3	2	2	7	2	5	9	14	4
Unknown Immune Status	5	4	2	5	1	0	1	0	0	0	0	1	0
Total	472	334	172	208	261	172	122	148	126	138	148	155	105

An analysis of trends using a Poisson regression model demonstrates a significant decline in rates of cryptosporidiosis, from 1995-2007, among patients who are immunocompromised due to HIV/AIDS ($P<.01$). This decline is generally thought to be due to HAART which was introduced in 1996-1997 for persons living with HIV/AIDS. When Poisson regression was used to compare the number of cases of cryptosporidiosis among persons with HIV/AIDS to the number of cases among the immunocompetent, results indicated that the overall decline from 1995 to 2007 was significantly greater in patients who were immunocompromised than in those who were not ($P<.01$).

Cryptosporidiosis and Potential Risk Exposures

Of the 105 cryptosporidiosis cases diagnosed among NYC residents in 2007, questionnaires concerning potential exposures were completed in 83 (79.0%) cases. Reasons for non-completion of questionnaires were: unable to locate case-patient (18 cases, 17.1%), refused (3 cases, 2.9%) and died (1 case, 1.0%). Of the immunocompetent case-patients, interviews were completed for 45 (88.2%) case-patients. Among persons with HIV/AIDS, interviews were completed for 36 (72.0%) case-patients. Summary data for 1995 through 2007 on commonly reported potential risk exposures, obtained from case-patient interviews of persons who are immunocompetent and from interviews of persons with HIV/AIDS, are presented in Tables 14 and 15. Information has also been collected and presented regarding type of tap water consumption (Tables 16 and 17). It must be noted that the significance of risk exposures reported by cryptosporidiosis case-patients cannot be determined without reference to a suitable control population (i.e., non-*Cryptosporidium*-infected controls). Though we do not collect information from control patients, data can be compared between patients who are immunocompromised due to HIV/AIDS and patients who are immunocompetent. Looking at four main risk categories using the chi-square test for comparison of data since 2001, patients who were immunocompetent were significantly more likely to report international travel in all years ($P< .01$) and recreational water use in all years except 2003, 2006 and 2007 (2001-2002, $P<.01$; 2003, $P=.17$; 2004, $P<.05$; 2005, $P<.01$; 2006, $P=.24$; 2007, $P=.06$). There was no

statistically significant difference between these two groups in the proportion of cases reporting animal contact in 2001 to 2007, or reporting high-risk sex in 2001 to 2005, and 2007. In 2006, the proportion of cases reporting high-risk sex was significantly higher among persons with HIV/AIDS than among immunocompetent persons ($P<.01$). It should be noted that high-risk sex in this context refers to having a penis, finger or tongue in a partner's anus. Information about sexual practices is gathered via phone interview and may not be reliable. These data indicate that immunocompetent case-patients are more likely to travel internationally and use recreational water, which may be risk factors for the acquisition of cryptosporidiosis in this group. However, as noted above, the significance of these risks cannot be determined without comparison to a control population.

PART II: SYNDROMIC SURVEILLANCE / OUTBREAK DETECTION

Introduction

The tracking of sentinel populations or surrogate indicators of disease ("syndromic surveillance") can be useful in assessing gastrointestinal (GI) disease trends in the general population. Such tracking programs provide greater assurance against the possibility that a citywide outbreak would remain undetected. In addition, such programs can play a role in limiting the extent of an outbreak by providing an early indication of a problem so that control measures may be rapidly implemented. Over the past several years, the City has established and maintained a number of distinct and complementary outbreak detection systems. One system monitors and assists in the investigation of GI outbreaks in sentinel nursing homes. Another monitors the number of stool specimens submitted to participating clinical laboratories for microbiological testing, and a third system utilizes hospital Emergency Department chief complaint logs to monitor for outbreaks. The City also has utilized three separate systems for monitoring sales of anti-diarrheal medication. One tracks the weekly volume of sales of non-prescription anti-diarrheal medication at a major NYC drug store chain (referred to as the ADM system). An additional pharmacy system tracks daily sales at another drug store chain of over-the-counter anti-diarrheal medications (referred to as the OTC system). A third system tracked retail pharmacy data obtained from the National Retail Data Monitor (referred to as the NRDM system). In November 2007, DOHMH stopped receiving NRDM data; details are provided below. All systems rely upon the voluntary participation of the institutions providing the syndromic data. A summary of syndromic surveillance findings pertaining to GI illness for 2007 is provided in the final section of this part, on pages 11-13.

Nursing Home Sentinel Surveillance

The nursing home surveillance system began in March 1997 and was significantly modified in August 2002, at which time nine New York City nursing homes were participating. Under the current system, when a participating nursing home notes an outbreak of gastrointestinal illness that is legally reportable to the New York State Department of Health (NYSDOH), the nursing home also notifies DOHMH. Such an outbreak is defined as onset of diarrhea and/or vomiting involving 3 or more patients on a single ward/unit within a 7-day period, or more than the expected (baseline) number of cases within a single facility. All

participating nursing homes have been provided with stool collection kits in advance. When such an outbreak is noted, specimens are to be collected for bacterial culture and sensitivity, ova and parasites, *Cryptosporidium* and viruses. DOHMH Bureau of Communicable Disease (BCD) staff facilitates transportation of the specimens to the City's Public Health Laboratory. Testing for culture and sensitivity, ova and parasites, and *Cryptosporidium* occurs at the Public Health Laboratory. If preliminary tests for bacteria and parasites are negative, specimens are sent to the NYSDOH laboratories for viral testing. Participating nursing homes are provided with copies of Waterborne Disease Risk Assessment Program semi-annual and annual reports as feedback. There are currently eight nursing homes participating in the program. Three are in Manhattan, two are in the Bronx, two are in Queens, and one is in Brooklyn.

During the second half of 2007, a staff member from DOHMH BCD made site visits to seven of the eight nursing homes participating in Nursing Home Sentinel Surveillance. An eighth nursing home was visited in January 2008. During the site visits, the DOHMH staff member reviewed with nursing administration or infection control staff the rationale for the program and program protocol. In addition, the DOHMH staff member ensured that the nursing homes had adequate stool collection supplies on hand.

Clinical Laboratory Monitoring

The number of stool specimens submitted to clinical laboratories for bacterial and parasitic testing also provides information on gastrointestinal illness trends in the population. Participating laboratories transmit data by fax or by telephone report to DOHMH's BCD indicating the number of stool specimens examined per day for: (a) bacterial culture and sensitivity, (b) ova and parasites, and (c) *Cryptosporidium.* Participation of two clinical laboratories (Laboratory A and Laboratory B) continued during 2007. Frequency of data transmission is currently daily by Laboratory A and weekly by Laboratory B.

Clinical Laboratory Monitoring results are reviewed upon receipt. Beginning in August 2004, DOHMH started implementation of a computer model to establish statistical cut-offs for significant increases in clinical laboratory submissions. The model uses the entire historical dataset, that is, since November 1995 for Laboratory A and since January 1997 for Laboratory B. Sundays and holidays are removed because the laboratories do not test specimens on those days. Linear regression is used to adjust for average day-of-week and day-after-holiday effects as certain days routinely have higher volumes than other days. The cumulative sums (CUSUM) method is applied to a two-week baseline to identify statistically significant aberrations (or "signals") in submissions for ova and parasites and for bacterial culture and sensitivity. CUSUM is a quality control method that has been adapted for aberration-detection in public health surveillance. (CUSUM is described further in: Hutwagner L, Maloney E, Bean N, Slutsker L, Martin S. Using Laboratory-Based Surveillance Data for Prevention: An Algorithm for Detecting *Salmonella* Outbreaks. *Emerging Infectious Diseases*. 1997; 3[3]: 395-400.)

Anti-Diarrheal Medication Monitoring

The tracking of sales of anti-diarrheal medications is a useful source of information about the level of diarrheal illness in the community. NYC began tracking anti-diarrheal drug sales as

a public health indicator in 1995.* Modifications to NYC's anti-diarrheal surveillance program have been made over the years, and since 2002, NYC's program has been enhanced by the addition of two new drug-tracking systems. In 2007, one of the new systems was discontinued. However, for most of 2007, NYC utilized three separate systems to monitor sales of anti-diarrheal medications.

The ADM System

In 1996, NYC's ADM system was established, utilizing volume-of-sales information of non-prescription anti-diarrheal medications obtained weekly from a major drug store chain. Weekly sales volume data (i.e., electronic point-of-sale data for loperamide and non-loperamide anti-diarrheal medications) is entered into a database, sorted into drug formulation category, and is graphed and visually compared to historic data. Sales volume data is examined citywide, by borough, and by drug formulation category. In late 2007, DEP was notified that the drug store chain that has been the source of sales data for the ADM program was being acquired by another company. Due to concern of possible data interruption, DEP notified NYSDOH and EPA on December 4 of a possible program interruption. However, data flow has been successfully maintained. DEP continues to work with the new company's management to try to ensure the ongoing flow of timely information.

As a result of the merger of companies mentioned above, a discrepancy came to light involving the product promotions information that was being collected under the ADM program. The product promotions data that has been collected since 1996 cannot be reliably matched to the pharmacy chain whose sales are being tracked by DEP. The problem apparently resulted from a variety of circumstances including a company restructuring in 1995, as well as a company policy necessitating separation of data sources. While promotions data is not part of the core ADM data set, it has been used at times over the years in helping to interpret the ADM trend data. As soon as the discrepancy was noticed, corrective actions were taken: (a) staff altered collection of promotions data to include the correct source (effective February 16, 2008), and (b) work began on an assessment/corrective action evaluation. This evaluation is still in progress. In regard to the weekly volume of sales trends reports generated under the ADM program, some delays in data review have occurred. This problem was addressed effective February 2008 when a new staff member was hired at DEP.

The OTC System

In August 2002, a new, more comprehensive system for monitoring drugstore sales of anti-diarrheal medications was established with a second large pharmacy chain. This system is referred to as the OTC (over-the-counter) system. The goal was to develop a system that would provide more timely and detailed data than the existing ADM tracking system. Also, the OTC system collects data on other medicines, including fever and allergy medications, for broader bioterrorism surveillance purposes. Each daily electronic file contains data for, on average, 32,000 non-prescription medication sales. A separate file is also sent daily by the same data provider which contains 6,000 prescription medication sales. However, the prescription

* The first NYC anti-diarrheal medication tracking system, involving data from a regional distributor serving independent pharmacies, was implemented in 1995. This system was discontinued in 2000 due to a diminishing data stream. This summary of NYC anti-diarrheal medication monitoring programs therefore begins with discussion of the ADM system which was implemented in 1996 and is ongoing.

medications have not been found to be as useful as the non-prescription medications for monitoring diarrheal illness in the OTC system. Routine daily analyses began in mid-December 2002. Drugs are categorized into key syndromes, and trends are analyzed for citywide increases in sales of non-prescription anti-diarrheal medications. The gastrointestinal category includes generic and brand name loperamide-containing agents and bismuth subsalicylate agents.

There was an interruption in data transmission in the OTC system beginning on October 22. The data stream for the weather data, i.e., temperature, used in the daily analysis, was lost. As a result, the daily analysis failed. On November 10, when an immediate solution could not be identified, DOHMH decided to halt daily OTC system analysis. The problem was rectified, and the system went back on line on November 21. On retrospective analysis once the data system was restored, it was determined that there were no signals in the OTC system during the interruption period. NYSDOH and EPA were notified of this interruption on November 16, 2007.

The NRDM System

In May 2003, DOHMH began receiving daily data from a third tracking program, the National Retail Data Monitor (NRDM). This system, based at the University of Pittsburgh, gathers retail pharmacy data from national chains for use in public health surveillance. The NRDM has been providing a daily file containing over-the-counter "stomach remedies" (bismuth subsalicylate, attapulgite, and loperamide) and electrolyte sales data from retail stores located in New York City. Electrolytes represent oral rehydration products that have shown the most utility in tracking citywide diarrheal illness affecting young children. Citywide counts are adjusted for day-of-week variability and analyzed using the CUSUM method with a two-week baseline.

There was an interruption in NRDM data transmission from July 31 through August 2. Data transmission resumed on August 3; however, missing data for the three-day interruption period were not fully restored until August 13. There were no signals during this time period. NYSDOH and EPA were notified of this interruption on August 7, 2007.

DOHMH stopped receiving NRDM data in November 2007 as a result of NYSDOH's decision to discontinue a state-wide license to procure and disseminate the data to health departments. DOHMH concurred with this decision as the data were primarily used as an adjunct to NYC's other systems and because this would have little impact on syndromic surveillance activities. The last date of complete and analyzable NRDM data received at DOHMH was on November 12. NYSDOH and EPA were formally notified of the program discontinuation on November 16, 2007 (though earlier communication on the matter had occurred between NYSDOH, DOHMH, and DEP).

Hospital Emergency Department Monitoring

In 2007 DOHMH received electronic data from 46 of New York City's 62 emergency departments (EDs), reporting approximately 9,000 visits per day, roughly 88% of ED visits citywide. Hospitals transmit electronic files each morning containing chief complaint and demographic information for patient visits during the previous 24 hours. Patients are classified

into syndrome categories, and daily analyses are conducted to detect any unusual patterns, or signals. The two syndromes used to track gastrointestinal illness are vomiting syndrome and diarrhea syndrome. Temporal ("citywide") analyses assess whether the frequency of ED visits for the syndrome has increased in the last one, two or three days compared to the previous fourteen days. Spatial analyses scan the data for geographic clustering in syndrome visits on the most recent day compared to the previous 14 days. Clustering is examined by both hospital location and residential zip code. Statistical significance is based on Monte Carlo probability estimates that adjust for the multiple comparisons inherent in examining many candidate clusters each day. The threshold of significance for citywide and spatial signals was set at $P<.01$, indicating that fewer than 1 out of every 100 analyses would generate a cluster due to chance alone. Beginning March 11, 2005, the threshold of significance for spatial signals was changed to $P<.005$, while the threshold of significance for citywide signals remained at $P<.01$. (The system is described further in: Hefferman R, Mostashari F, Das D, Karpati A, Kulldorf M, Weiss D. Syndromic Surveillance in Public Health Practice, New York City. *Emerging Infectious Diseases*. 2004; 10[5]: 858-864.)

Summary of Syndromic Surveillance Signals

Syndromic surveillance signals alone cannot be used to determine etiologic diagnoses. Also, experience has shown that most signals, especially localized spatial signals in the emergency department system or signals in the laboratory or OTC systems, may be statistical aberrations and not related to health events. The systems are therefore used in concert. A signal in one system is compared to other systems to see whether or not there are concurrent signals. Since September 2001, when the ED system was initiated, NYC syndromic surveillance data show annual, citywide increases in the vomiting and diarrheal signals consistent with seasonal trends in norovirus and other enteric viruses.

In this report we present the signals from five of our syndromic surveillance systems together in four figures (Figures 6-9). Figures 6 and 7 summarize ED system trends for 2007. Figure 6 shows a graphic representation of the ratio of daily ED visits for the vomiting syndrome to all daily ED visits not tracked by ED syndromic surveillance ("other visits") from January 1 to December 31, 2007. The graph also includes an indication of citywide signals and of the spatial residential zipcode and hospital signals. Figure 7 is the same graph for the syndrome of diarrhea. These graphs indicate that citywide signaling for the vomiting syndrome occurred primarily in late January and again in December, and signaling for diarrhea occurred primarily in late January through February, and again in December. This coincides with NYC's historical experience with seasonal norovirus and rotavirus outbreaks. No spatial signal was sustained in the same geographic location for more than one day.

Figures 8 and 9 are time-series plots of signals from five syndromic surveillance systems for the gastrointestinal syndrome covering the period January 1 to June 30, and July 1 to December 31, 2007. The systems included are: the emergency department system, the clinical laboratory monitoring system, the OTC anti-diarrheal medication system, the NRDM system for electrolytes sales, and the nursing home sentinel surveillance system. (The ADM system results are summarized separately below.) For the ED system, only citywide signals have been

included. As discussed above, the ED system signaled primarily in late January and February and again in December, most likely representing norovirus and rotavirus seasons. There were two GI outbreaks in January in sentinel nursing homes and one in December, all of which appear to have been caused by viral agents. Details are presented below. There was a two-day signal in the OTC system in mid-February, and increased OTC system signals in December. There was increased signaling in the NRDM electrolyte system in February, and a one-day signal in June. (Note: Figure 8 in this report and the above description correct an error that was made in the WDRAP 10th Semi-Annual Report, dated August 31, 2007, in which it was incorrectly indicated that NRDM electrolyte system signals occurred in January rather than February.) Signals next occurred in the NRDM system in September and October. Complete NRDM data were no longer available after November 12, as previously noted. There were sporadic signals in the clinical laboratory system throughout the year.

In late June 2007, a one-day signal in NRDM electrolyte sales coincided with a one-day signal in OTC anti-fever medication sales (this OTC signal does not appear in Figure 8 because it was a fever signal and not a GI illness signal). In addition, increases in ED data for GI illness among children less than 5 years old were noted in three EDs in one borough at around the same time. Because it is unusual to see these systems signaling at this time of year, and because the signals occurred at the same time as a multi-state outbreak of salmonellosis affecting young children, linked to a commercial product called Veggie Booty®, DOHMH conducted a case-control study to evaluate the signals. An increased odds ratio was noted for having eaten Veggie Booty® among patients who reported diarrhea at the time of the case-control interview compared to those who denied diarrhea, but this association was not statistically significant. Among other factors, limitations of this study included small sample size (interviews were completed for only 58 of the targeted 128 cases and controls [45.3%]), and possible poor recollection by parents at the time of interview regarding what their children ate prior to illness onset. Further details concerning this study are included in the WDRAP 10th Semi-Annual Report. The June signals in NRDM electrolyte sales and OTC anti-fever medication sales lasted only one day.

Regarding the two January GI outbreaks in sentinel nursing homes, the first occurred in a nursing home in Manhattan, beginning on January 6, and ending on January 10. There were 29 cases among residents on four units. Symptoms were vomiting and diarrhea, duration of illness was 12 to 48 hours, and there were no cases resulting in deaths or requiring transfer to acute care hospitals. DOHMH received a total of 21 stool specimens from nine patients pertaining to this outbreak. Of the 21 specimens, 11 were collected for shiga toxin testing (shiga toxin is produced by *Escherichia coli* O157:H7), eight were collected for bacterial pathogen testing, one was collected for ova and parasite testing (including *Cryptosporidium*), and one specimen was collected for viral testing at the NYSDOH laboratories. All results were negative. In addition to the above stool testing conducted by the DOHMH Public Health Laboratory and by NYSDOH, the nursing home also sent stool specimens to a commercial laboratory. The commercial laboratory subsequently reported that seven stool specimens were positive for norovirus.

The second January GI outbreak occurred in a sentinel nursing home in the Bronx, beginning on January 11, and ending on approximately January 16. Nine residents and five staff members (total cases: 14) on one unit were affected. Symptoms were diarrhea and abdominal

cramps, and there were no deaths or transfers to acute care facilities. DOHMH received a total of 29 stool specimens from eight persons pertaining to this outbreak. Of the 29 specimens tested, 10 were collected for bacterial pathogen testing, eight were collected for ova and parasite testing (including *Cryptosporidium*), and 11 were sent to the NYSDOH laboratories for viral testing. All specimens tested for bacterial pathogens and ova and parasites were found to be negative. Of the 11 specimens tested at the NYSDOH Virology Laboratory, seven were found to be positive by polymerase chain reaction (PCR) assay for Calicivirus, for genus norovirus.

A third GI outbreak occurred in a sentinel nursing home in Queens, beginning on December 20. Twenty-one residents and two staff members (total cases: 23) on four units were affected. Symptoms were vomiting and diarrhea. One ill resident required transfer to an acute care facility; there were no deaths. DOHMH was not notified of this outbreak until December 27, by which time the outbreak had resolved. DOHMH was not notified earlier because the Infection Control Nurse was off-duty during the time of the outbreak. Nursing home staff members collected three stool specimens. Two specimens were sent to an affiliated hospital laboratory, tested for bacterial pathogens, and found to be negative. One specimen was sent to a commercial laboratory for viral testing. The result was negative. However, clinicians at the nursing home reported that a viral agent was suspected as the cause of this outbreak.

With regard to the ADM system, citywide ADM sales were highest during the first week of this reporting period (week ending January 6, 2007), and levels moved in an overall downward direction in the following months. Weeks that appeared to have higher sales than normal were those weeks ending on the following dates: January 6, April 7, April 14, July 7, October 6, and December 29. Some of these ADM sales increases corresponded generally with the timing of signals in some of the other syndromic systems. However, the ADM sales increase that correlated with the strongest signaling in other syndromic systems occurred during the week ending December 29. During this week, concurrent signaling was recorded in other syndromic systems including: ED diarrhea, ED vomiting, Lab B clinical samples, and a sentinel nursing home. These coinciding signals are believed to be due to the seasonal trend of high rates of norovirus and rotavirus outbreaks during this time of year. For further evaluation of ADM trends, an average of ADM sales was calculated for each month to compare sales over this 12-month reporting period. This comparison showed ADM levels were generally higher in January – February, somewhat lower in March – April, and then lower still and maintaining a similar average for the rest of the year. (Note: For this analysis, data were grouped into "months" based upon the 7-day reporting schedule of the ADM system.)

In summary, for the period January through December 2007, there was signaling of multiple systems in January and February and again in December, consistent with annual gastrointestinal viral trends. Two nursing homes participating in sentinel surveillance reported GI outbreaks in January, which appear to have been caused by norovirus. A third sentinel nursing home reported a GI outbreak in December, which was also likely due to a viral pathogen. There were some clinical laboratory signals throughout the year which may represent underlying noise in that system. There was no evidence of a drinking water-related outbreak in New York City.

PART III: INFORMATION SHARING AND PUBLIC EDUCATION

Information sharing and education efforts continued during 2007. Over the year, program staff participated in presentations to discuss the City's Waterborne Disease Risk Assessment Program and related issues. Presentations were made to third year medical students, and to students at two schools of public health. Such talks serve to enhance awareness of waterborne diseases, and may lead to more complete disease diagnosis and reporting.

Information pertaining to NYC's Waterborne Disease Risk Assessment Program and related issues continues to be available on both the DEP and DOHMH websites, including results from the City's source water protozoa monitoring program. Documents on the websites include:

DOHMH Webpages:

- *Giardiasis fact sheet*
  http://www.nyc.gov/html/doh/html/cd/cdgia.shtml

- *Cryptosporidiosis fact sheet*
  http://www.nyc.gov/html/doh/html/cd/cdcry.shtml

DEP Webpages:

- *DEP Water Supply Testing Results for Giardia and Cryptosporidium (Data are collected and entered on the website each week. Historical data are also included.)*
  http://www.nyc.gov/html/dep/html/drinking_water/pathogen.shtml

- *1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006 and 2007 Waterborne Disease Risk Assessment Program's Annual Reports*
  http://www.nyc.gov/html/dep/html/drinking_water/wdrap.shtml

- *1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006 and 2007 New York City Drinking Water Supply and Quality Statement (Planned posting date for the 2007 report is May 31, 2008.)*
  http://www.nyc.gov/html/dep/html/drinking_water/wsstate.shtml

Figure 1: Giardiasis, number of cases by month of diagnosis, active surveillance, New York City, July 1993 - December 2007

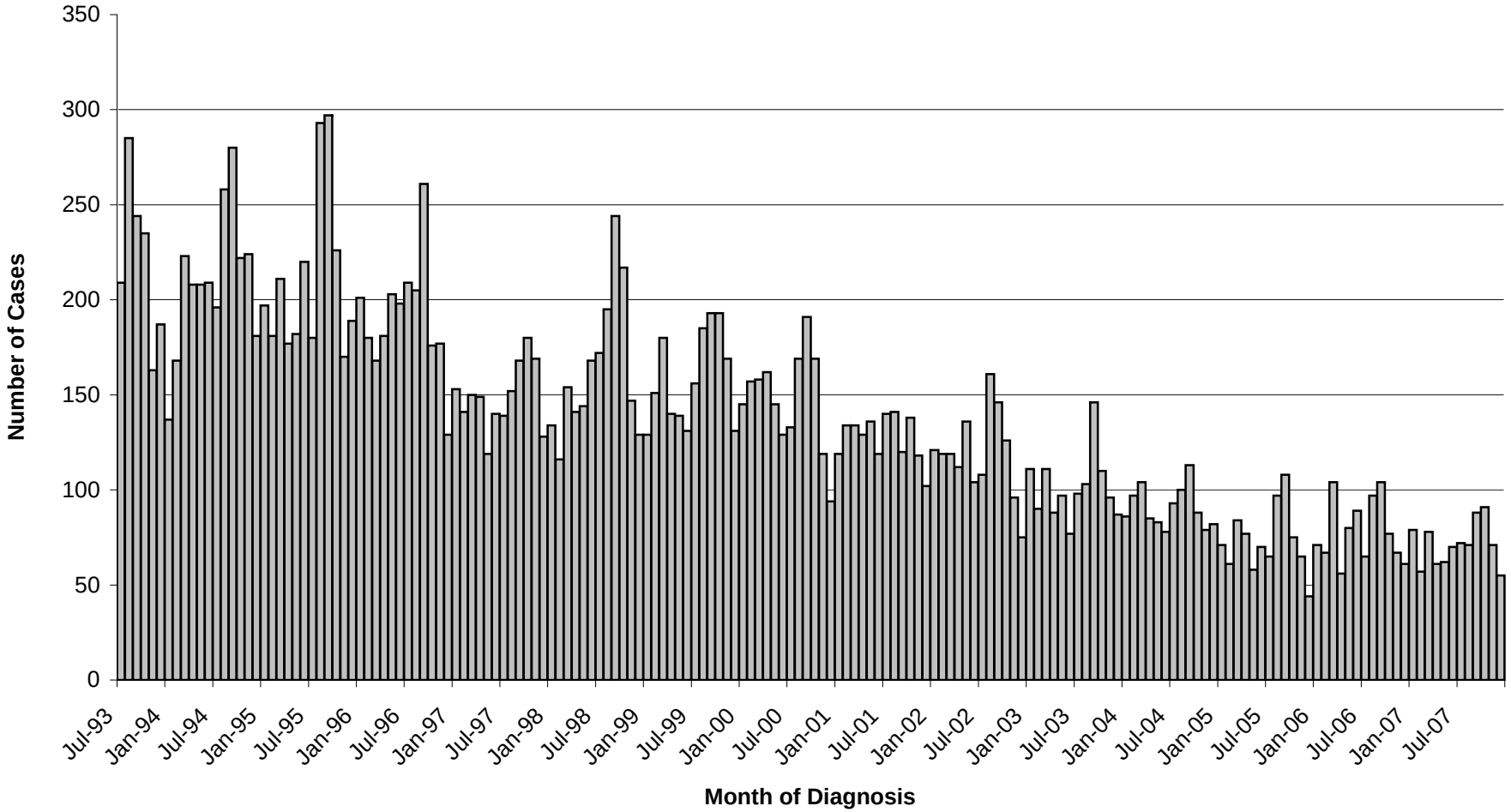


TABLE 2: **Giardiasis**, number of cases and annual case rate per 100,000 population by sex and borough of residence - active surveillance in New York City (2007)

	Borough of residence					
Sex	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Male	561	238	72	134	113	4
	(14.8)	(32.6)	(11.6)	(11.6)	(10.5)	(1.9)
Female	290	102	43	74	67	4
	(6.9)	(12.6)	(6.0)	(5.7)	(5.8)	(1.7)
Unknown	4	0	0	1	3	0
Total	855	340	115	209	183	8
	(10.7)	(22.1)	(8.6)	(8.5)	(8.2)	(1.8)

Map 1

Giardiasis annual case rate per 100,000 population by UHF neighborhood - Active surveillance data for New York City (2007)

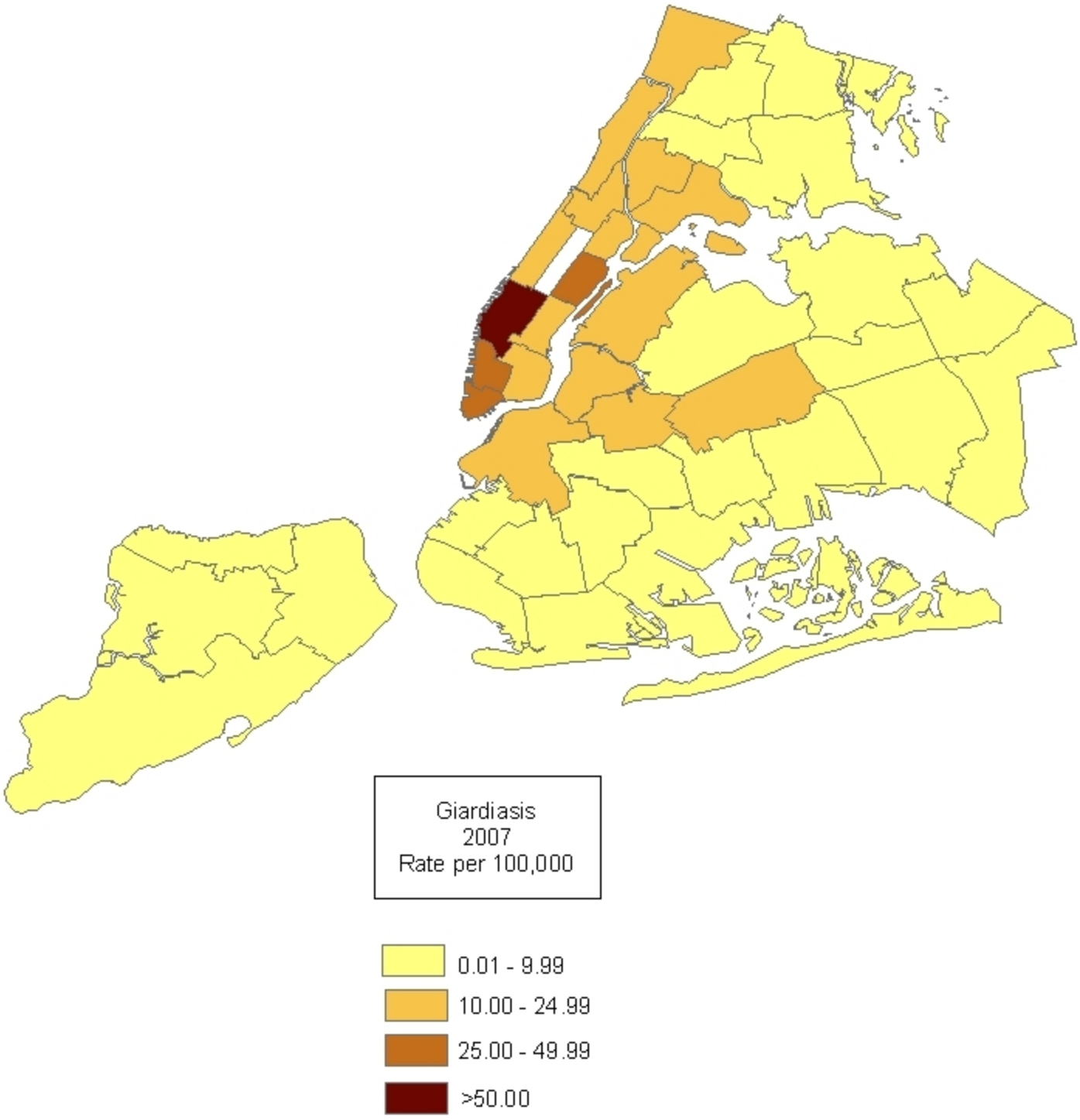


Table 3: Giardiasis, number of cases and annual case rate per 100,000 by UHF neighborhood of residence - active surveillance in New York City (2007)*

UHF Neighborhood	Borough	Number	Population	Rate
Chelsea-Clinton	Manhattan	74	122998	60.2
Greenwich Village-Soho	Manhattan	27	83709	32.3
Upper East Side	Manhattan	61	216441	28.2
Lower Manhattan	Manhattan	8	29266	27.3
Gramercy Park-Murray Hill	Manhattan	26	124468	20.9
Upper West Side	Manhattan	44	220706	19.9
Long Island City-Astoria	Queens	41	220960	18.6
Union Sq-Lower East Side	Manhattan	36	197138	18.3
Hunts Point-Mott Haven	Bronx	21	122875	17.1
C Harlem-Morningside Hgts	Manhattan	24	151113	15.9
Greenpoint	Brooklyn	19	124449	15.3
Kingsbridge-Riverdale	Bronx	11	88989	12.4
Williamsburg-Bushwick	Brooklyn	24	194305	12.4
High Bridge-Morrisania	Bronx	23	189755	12.1
Downtown-Heights-Slope	Brooklyn	26	214696	12.1
Ridgewood-Forest Hills	Queens	26	240901	10.8
Washington Heights-Inwood	Manhattan	28	270677	10.3
East Harlem	Manhattan	11	108092	10.2
West Queens	Queens	47	477516	9.8
Bensonhurst-Bay Ridge	Brooklyn	19	194558	9.8
Borough Park	Brooklyn	31	324411	9.6
Sunset Park	Brooklyn	11	120441	9.1
Bed Stuyvesant-Crown Hgts	Brooklyn	25	317296	7.9
East New York	Brooklyn	13	173716	7.5
Fordham-Bronx Park	Bronx	18	250491	7.2
Flushing-Clearview	Queens	18	255542	7.0
Crotona-Tremont	Bronx	14	199530	7.0
Pelham-Throgs Neck	Bronx	20	290052	6.9
Coney Island-Sheepshead Bay	Brooklyn	18	286901	6.3
Rockaway	Queens	6	106738	5.6
Southwest Queens	Queens	15	269952	5.6
Southeast Queens	Queens	10	198846	5.0
Jamaica	Queens	14	285339	4.9
East Flatbush-Flatbush	Brooklyn	15	316734	4.7
Northeast Bronx	Bronx	8	185998	4.3
Canarsie-Flatlands	Brooklyn	8	197819	4.0
Bayside-Littleneck	Queens	3	88164	3.4
Fresh Meadows	Queens	3	93148	3.2
Port Richmond	Stat Is	2	62788	3.2
Stapleton-St. George	Stat Is	2	116227	1.7
South Beach-Tottenville	Stat Is	3	179892	1.7
Willowbrook	Stat Is	1	84821	1.2

*This table does not include one case of giardiasis occurring in a Manhattan resident for whom UHF neighborhood could not be determined.

TABLE 4: Giardiasis, number of cases and annual case rate per 100,000 population by age group and sex - active surveillance in New York City (2007)

	Sex			
Age group	Male number (rate)	Female number (rate)	Unknown	Total number (rate)
<5 years	66 (23.9)	51 (19.3)	2	119 (22.0)
5-9 years	50 (17.5)	42 (15.3)	0	92 (16.4)
10-19 years	46 (8.6)	30 (5.8)	0	76 (7.2)
20-44 years	263 (16.9)	92 (5.5)	0	355 (11.0)
45-59 years	90 (14.2)	42 (5.6)	0	132 (9.6)
≥ 60 years	45 (9.0)	33 (4.4)	1	79 (6.3)
Unknown	1	0	1	2
Total	561 (14.8)	290 (6.9)	4	855 (10.7)

TABLE 5: Giardiasis, number of cases and annual case rate per 100,000 population by age group and borough of residence - active surveillance in New York City (2007)

	Borough of residence					
Age group	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
<5 years	119	24	25	37	32	1
	(22.0)	(31.6)	(22.8)	(20.3)	(22.4)	(3.4)
5-9 years	92	23	18	31	18	2
	(16.4)	(31.4)	(15.0)	(16.3)	(12.4)	(6.1)
10-19	76	13	14	24	24	1
years	(7.2)	(9.0)	(6.7)	(6.7)	(8.7)	(1.6)
20-44	355	171	32	85	65	2
years	(11.0)	(24.1)	(6.3)	(9.0)	(7.2)	(1.2)
45-59	132	65	13	23	29	2
years	(9.6)	(22.9)	(6.4)	(5.6)	(7.4)	(2.3)
≥ 60	79	44	13	9	13	0
years	(6.3)	(17.6)	(7.2)	(2.4)	(3.5)	
Unknown	2	0	0	0	2	0
Total	855	340	115	209	183	8
	(10.7)	(22.1)	(8.6)	(8.5)	(8.2)	(1.8)

Figure 2: Cryptosporidiosis, number of cases by month of diagnosis, active surveillance, New York City, November 1994 - December 2007

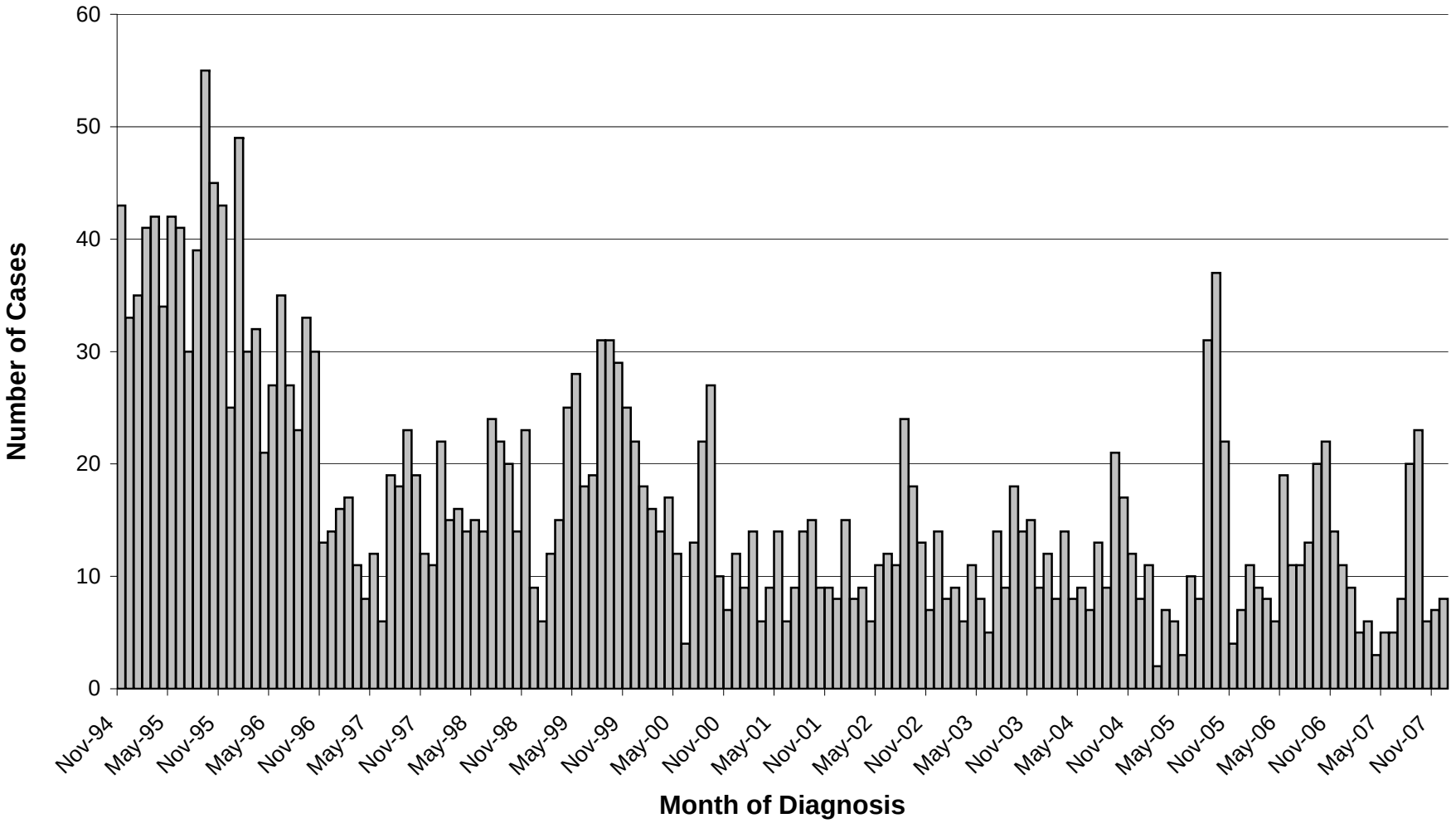
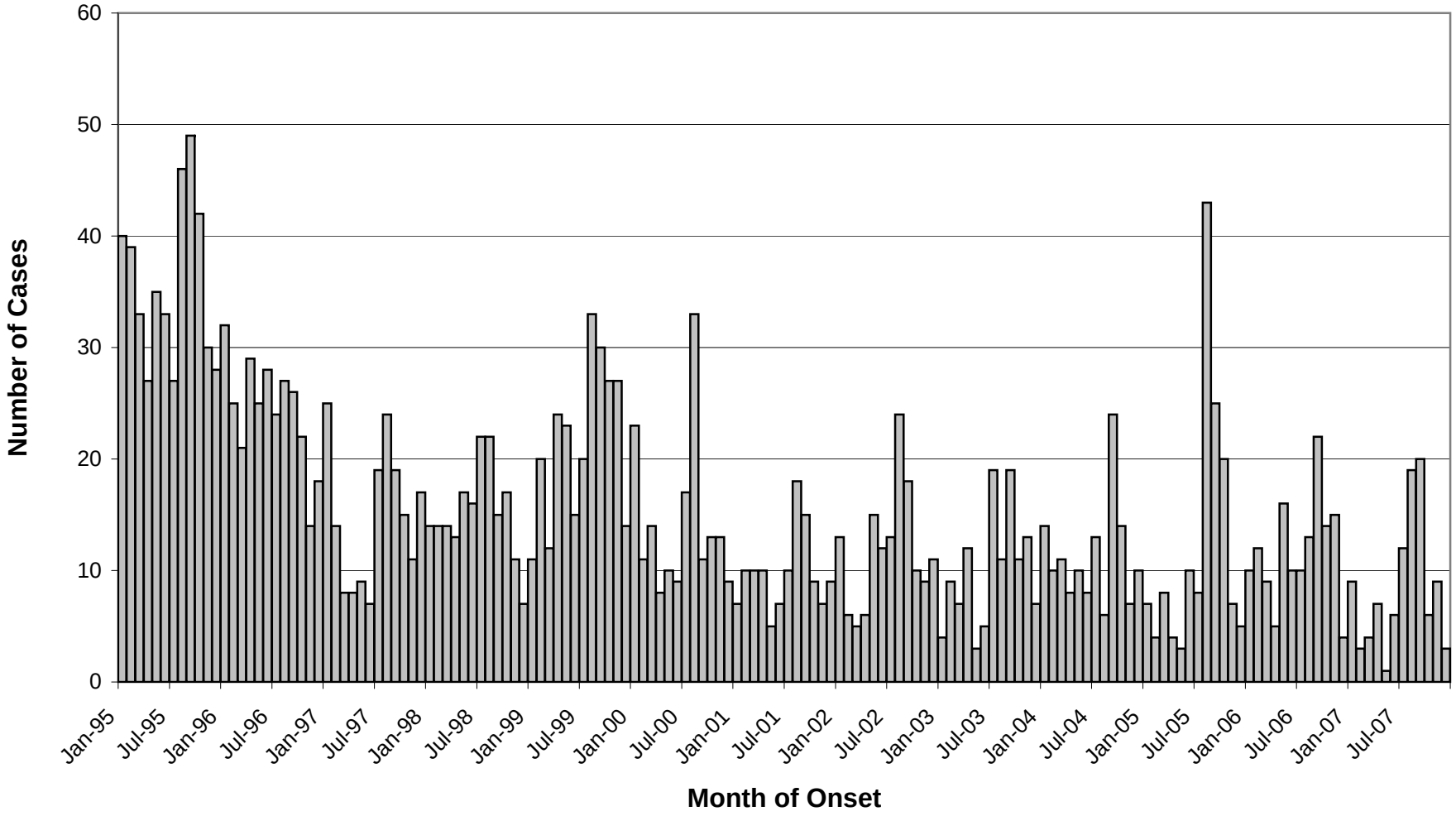


Figure 3: Cryptosporidiosis, number of cases by month of onset, active surveillance, New York City, January 1995 - December 2007*



* Chart does not include cases in which an onset date was unavailable.

TABLE 7: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by sex and borough of residence - active surveillance in New York City (2007)

	Borough of residence					
Sex	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Male	69	26	20	15	7	1
	(1.8)	(3.6)	(3.2)	(1.3)	(0.7)	(0.5)
Female	36	17	12	6	0	1
	(0.9)	(2.1)	(1.7)	(0.5)		(0.4)
Total	105	43	32	21	7	2
	(1.3)	(2.8)	(2.4)	(0.9)	(0.3)	(0.5)

Map 2

Cryptosporidiosis annual case rate per 100,000 population
by UHF neighborhood - Active surveillance data for
New York City (2007)

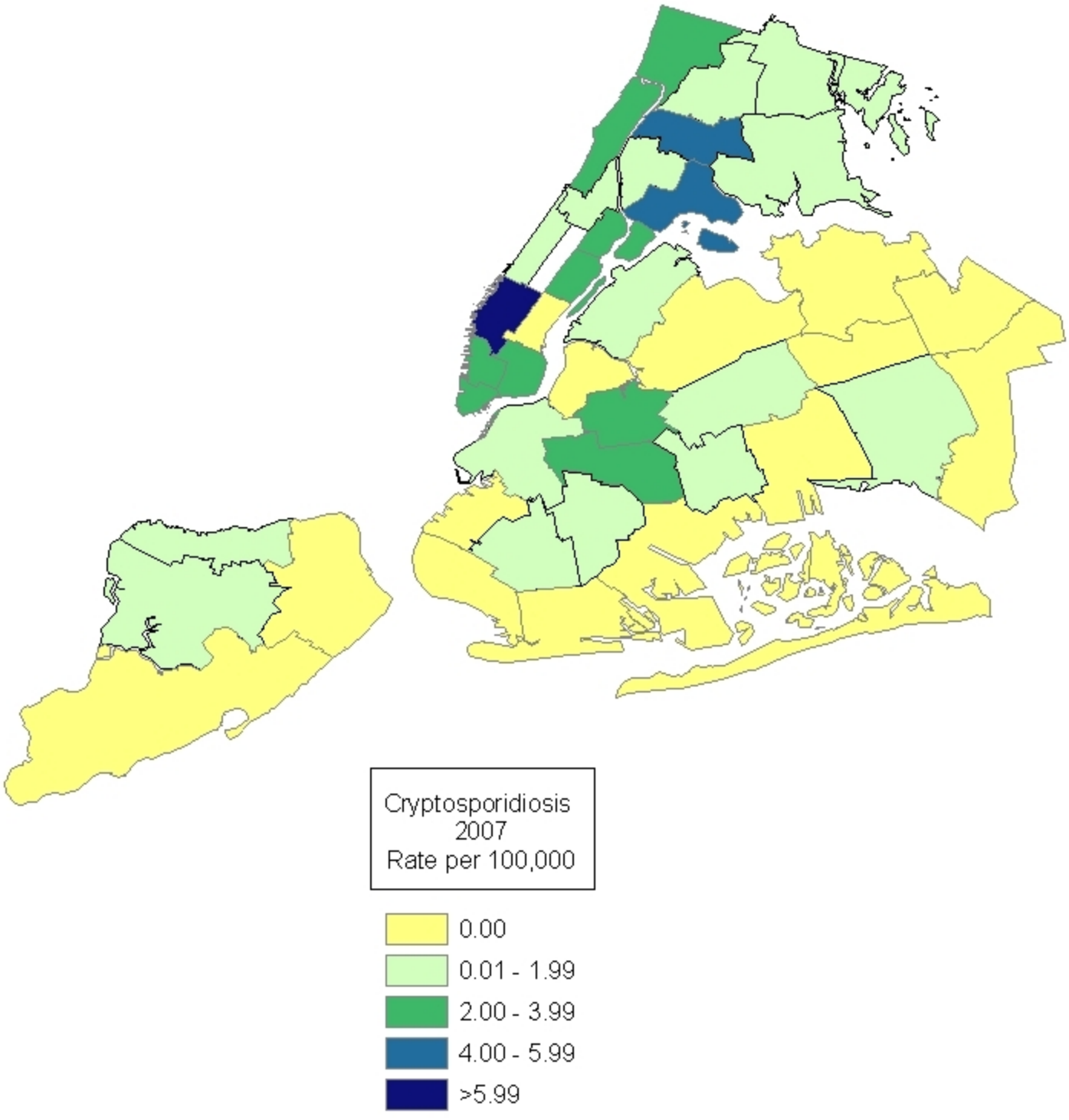


TABLE 8: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by UHF neighborhood of residence - active surveillance in New York City (2007)

UHF Neighborhood	Borough	Number	Population	Rate
Chelsea-Clinton	Manhattan	10	122998	8.1
Crotona-Tremont	Bronx	10	199530	5.0
Hunts Point-Mott Haven	Bronx	6	122875	4.9
Washington Heights-Inwood	Manhattan	10	270677	3.7
Greenwich Village-Soho	Manhattan	3	83709	3.6
Lower Manhattan	Manhattan	1	29266	3.4
Kingsbridge-Riverdale	Bronx	3	88989	3.4
East Harlem	Manhattan	3	108092	2.8
Union Sq-Lower East Side	Manhattan	5	197138	2.5
Upper East Side	Manhattan	5	216441	2.3
Bed Stuyvesant-Crown Hgts	Brooklyn	7	317296	2.2
Williamsburg-Bushwick	Brooklyn	4	194305	2.1
Upper West Side	Manhattan	4	220706	1.8
Northeast Bronx	Bronx	3	185998	1.6
Port Richmond	Stat Is	1	62788	1.6
High Bridge-Morrisania	Bronx	3	189755	1.6
Pelham-Throgs Neck	Bronx	4	290052	1.4
C Harlem-Morningside Hgts	Manhattan	2	151113	1.3
East Flatbush-Flatbush	Brooklyn	4	316734	1.3
Ridgewood-Forest Hills	Queens	3	240901	1.2
Fordham-Bronx Park	Bronx	3	250491	1.2
Willowbrook	Stat Is	1	84821	1.2
East New York	Brooklyn	2	173716	1.2
Downtown-Heights-Slope	Brooklyn	2	214696	0.9
Long Island City-Astoria	Queens	2	220960	0.9
Jamaica	Queens	2	285339	0.7
Borough Park	Brooklyn	2	324411	0.6

TABLE 9: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by age group and sex - active surveillance in New York City (2007)

	Sex		
Age group	Male number (rate)	Female number (rate)	Total number (rate)
<5 years	9 (3.3)	4 (1.5)	13 (2.4)
5-9 years	3 (1.0)	4 (1.5)	7 (1.2)
10-19 years	4 (0.7)	5 (1.0)	9 (0.9)
20-44 years	37 (2.4)	12 (0.7)	49 (1.5)
45-59 years	12 (1.9)	10 (1.3)	22 (1.6)
≥ 60 years	4 (0.8)	1 (0.1)	5 (0.4)
Total	69 (1.8)	36 (0.9)	105 (1.3)

TABLE 10: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by age group and borough – active surveillance in New York City (2007)

	Borough of residence					
Age group	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
<5 years	13 (2.4)	7 (9.2)	4 (3.6)	2 (1.1)	0	0
5-9 years	7 (1.2)	3 (4.1)	2 (1.7)	0	1 (0.7)	1 (3.0)
10-19 years	9 (0.9)	5 (3.5)	1 (0.5)	3 (0.8)	0	0
20-44 years	49 (1.5)	19 (2.7)	13 (2.6)	12 (1.3)	4 (0.4)	1 (0.6)
45-59 years	22 (1.6)	8 (2.8)	10 (4.9)	3 (0.7)	1 (0.3)	0
≥ 60 years	5 (0.4)	1 (0.4)	2 (1.1)	1 (0.3)	1 (0.3)	0
Total	105 (1.3)	43 (2.8)	32 (2.4)	21 (0.9)	7 (0.3)	2 (0.5)

TABLE 11: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by race/ethnicity and borough of residence - active surveillance in New York City (2007)*

	Borough of residence					
Race/Ethnicity	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Hispanic	33 (1.5)	9 (2.2)	18 (2.8)	4 (0.8)	1 (0.2)	1 (1.9)
White non-Hispanic	25 (0.9)	18 (2.6)	1 (0.5)	3 (0.4)	2 (0.3)	1 (0.3)
Black non-Hispanic	38 (1.9)	12 (5.1)	12 (2.9)	13 (1.5)	1 (0.2)	0
Asian, Pac Islander, Amer Indian, Alaska Native	3 (0.4)	0	1 (2.4)	0	2 (0.5)	0
Unknown	6	4	0	1	1	0
Total	105 (1.3)	43 (2.8)	32 (2.4)	21 (0.9)	7 (0.3)	2 (0.5)

* Because year 2000 U.S. Census data include race/ethnicity categories not included in disease surveillance data, 3.5% of the total population was not included in the denominator used to calculate rates by race/ethnicity. Rates pertaining to race/ethnicity may therefore be inflated.

TABLE 12: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by race/ethnicity and age group - active surveillance in New York City (2007)

	Age group						
Race /ethnicity	< 5 years number (rate)	5-9 years number (rate)	10-19 years number (rate)	20-44 years number (rate)	45-59 years number (rate)	≥ 60 years number (rate)	Total number (rate)
Hispanic	6 (3.2)	2 (1.0)	4 (1.1)	11 (1.2)	8 (2.5)	2 (1.0)	33 (1.5)
White non-Hispanic	1 (0.7)	3 (2.4)	2 (0.8)	10 (0.9)	6 (1.1)	3 (0.4)	25 (0.9)
Black non-Hispanic	5 (3.4)	1 (0.6)	2 (0.6)	25 (3.4)	5 (1.5)	0	38 (1.9)
Asian, Pac Islander, Amer. Indian, Alaska Native	0	1 (2.0)	0	2 (0.5)	0	0	3 (0.4)
Unknown	1	0	1	1	3	0	6
Total	13 (2.4)	7 (1.2)	9 (0.9)	49 (1.5)	22 (1.6)	5 (0.4)	105 (1.3)

* Because year 2000 U.S. Census data include race/ethnicity categories not included in disease surveillance data, 3.5% of the total population was not included in the denominator used to calculate rates by race/ethnicity. Rates pertaining to race/ethnicity may therefore be inflated.

Figure 4: Cryptosporidiosis, number of cases among persons living with HIV/AIDS by month of diagnosis, New York City, January 1995-December 2007

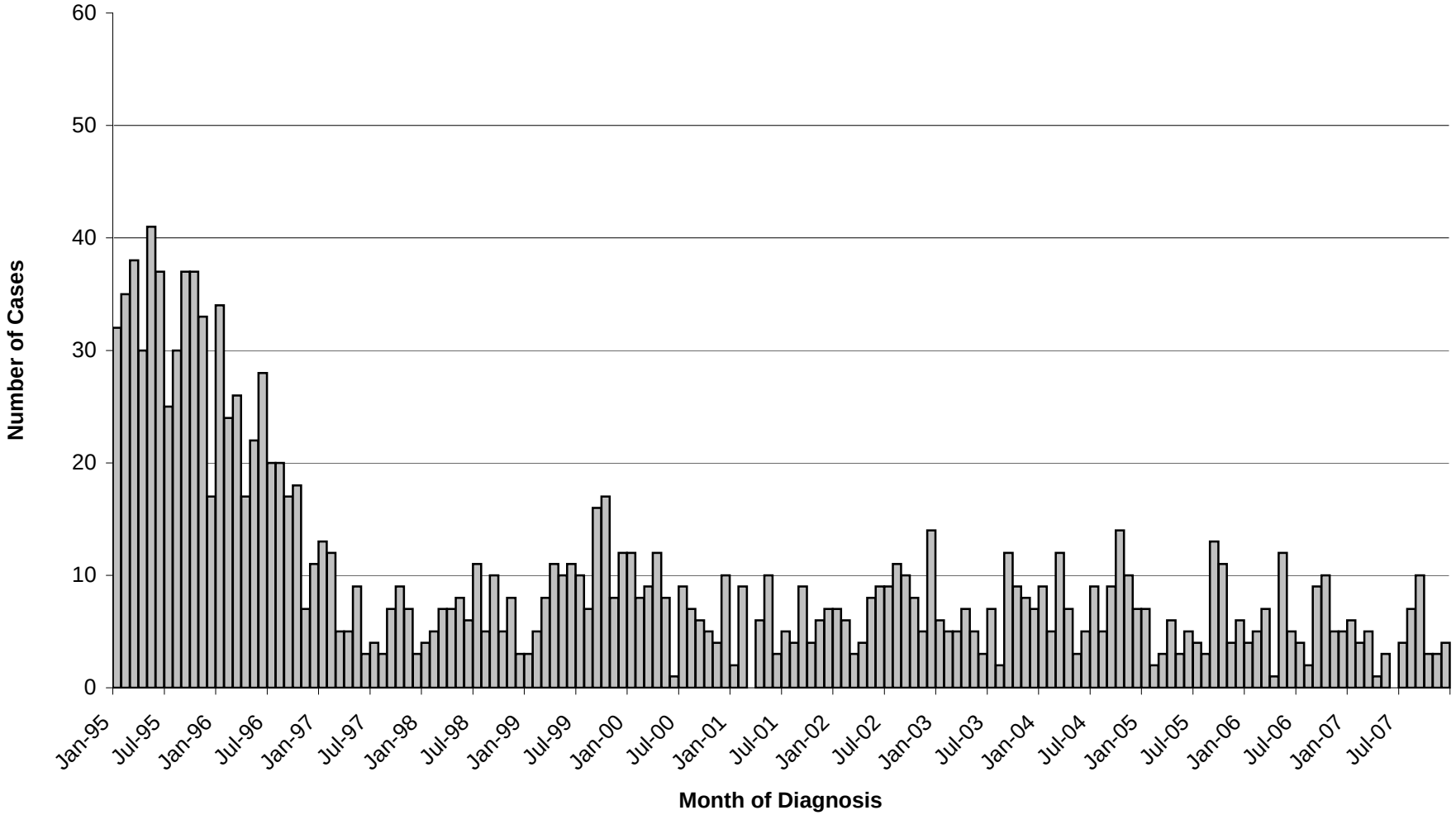


Figure 5: Cryptosporidiosis, number of cases among immunocompetent persons by month of diagnosis, New York City, January 1995-December 2007

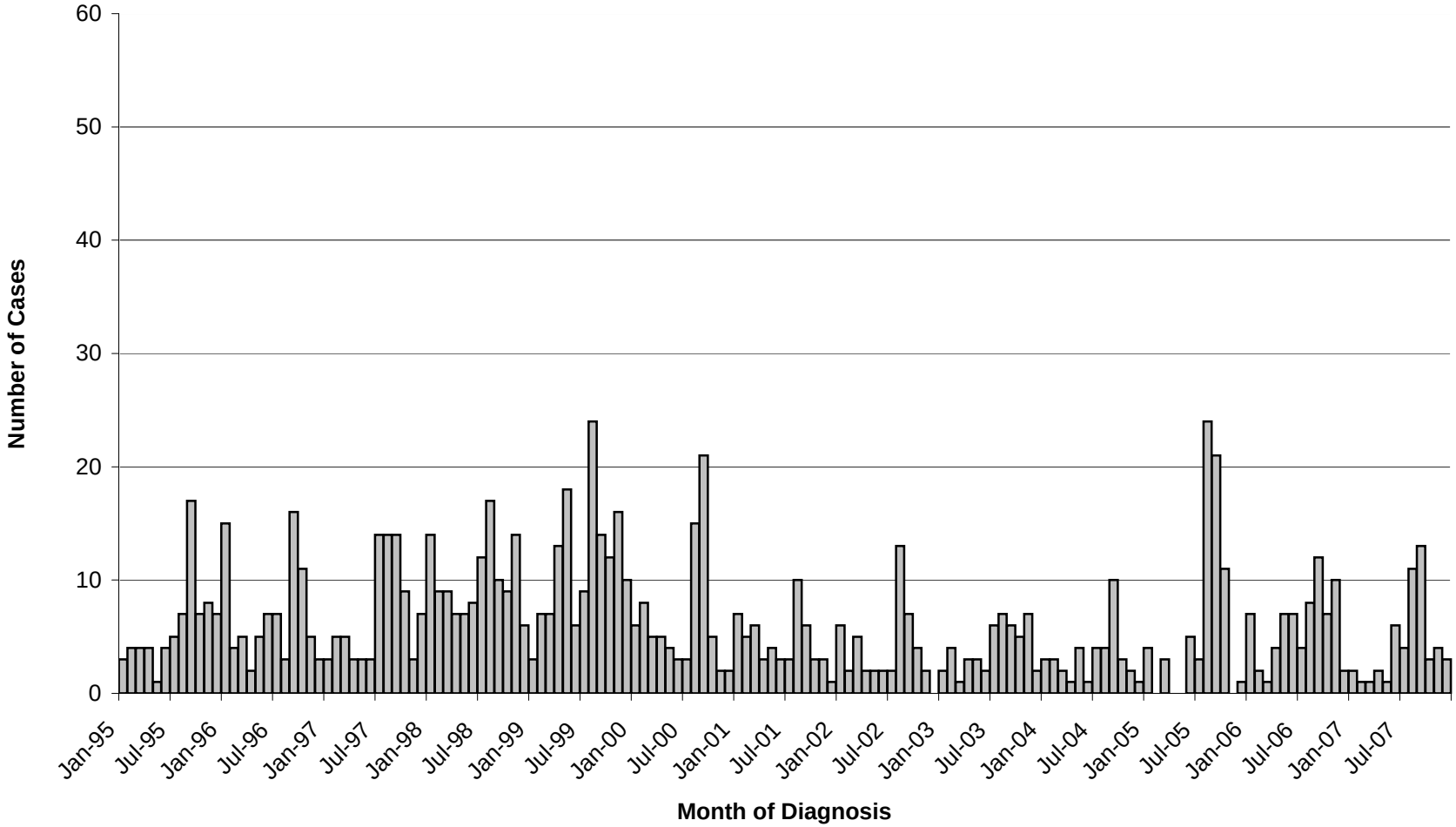


Table 14: Percentage of interviewed c**ryptosporidiosis** case-patients reporting selected potential risk exposures in the month before disease onset, persons with HIV/AIDS, New York City, 1995-2007.

Exposure Type	HIV/AIDS												
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007
Contact with an Animal[a]	35%	35%	33%	36%	35%	43%	24%	42%	40%	31%	33%	38%	31%
High-risk Sexual Activity[b] (≥ 18 years old)	22%	22%	9%	15%	20%	25%	16%	23%	24%	34%	27%	31%	21%
International Travel[c]	9%	9%	9%	13%	18%	14%	10%	11%	13%	15%	17%	9%	6%
Recreational Water Contact[d]	16%	8%	16%	12%	16%	15%	8%	10%	21%	13%	5%	18%	17%

Note: • The significance of risk exposures reported by cryptosporidiosis case-patients cannot be determined without reference to a suitable control population (i.e., non-*Cryptosporidium*-infected controls).
• Format of case interview form changed on 1/1/1997, 5/11/2001 and 8/21/2002. Details on Exposure Types and changes from 1995-2007 are noted below.

[a] Contact with an Animal - Includes having a pet, or visiting a farm or petting zoo (1995-1996); expanded to include: or visiting a pet store or veterinarian office (1997-2007).

[b] High-risk Sexual Activity - Includes having a penis, finger or tongue in sexual partner's anus (1995-2007).

[c] International Travel - Travel outside the United States (1995-2007).

[d] Recreational Water Contact - Includes swimming in a pool, or swimming in or drinking from a stream, lake, river or spring (1995-1996); expanded to include: or swimming in the ocean, or visiting a recreational water park (1997-2007).

* Year 2000 percentage of interviewed cryptosporidiosis cases does not include 14 cases associated with a point source exposure at a swimming pool in Florida.

Table 15: Percentage of interviewed **cryptosporidiosis** case-patients reporting selected potential risk exposures in the month before disease onset, immunocompetent persons, New York City, 1995-2007.

Exposure Type	Immunocompetent												
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007
Contact with an Animal[a]	42%	41%	41%	32%	35%	26%	37%	35%	23%	34%	36%	36%	34%
High-risk Sexual Activity[b] (≥ 18 years old)	16%	25%	12%	10%	12%	23%	15%	30%	13%	31%	17%	3%	19%
International Travel[c]	30%	29%	26%	28%	28%	40%	47%	33%	45%	47%	45%	40%	47%
Recreational Water Contact[d]	21%	27%	40%	24%	22%	32%	35%	35%	34%	33%	52%	28%	36%

Note: • The significance of risk exposures reported by cryptosporidiosis case-patients cannot be determined without reference to a suitable control population (i.e., non-*Cryptosporidium*-infected controls).
• Format of case interview form changed on 1/1/1997, 5/11/2001 and 8/21/2002. Details on Exposure Types and changes from 1995-2007 are noted below.

[a] Contact with an Animal - Includes having a pet, or visiting a farm or petting zoo (1995-1996); expanded to include: or visiting a pet store or veterinarian office (1997-2007).

[b] High-risk Sexual Activity - Includes having a penis, finger or tongue in sexual partner's anus (1995-2007).

[c] International Travel - Travel outside the United States (1995-2007).

[d] Recreational Water Contact - Includes swimming in a pool, or swimming in or drinking from a stream, lake, river or spring (1995-1996); expanded to include: or swimming in the ocean, or visiting a recreational water park (1997-2007).

* Year 2000 percentage of interviewed cryptosporidiosis cases does not include 14 cases associated with a point source exposure at a swimming pool in Florida.

Table 16: Percentage of interviewed **cryptosporidiosis** case-patients by type of tap water exposure reported in the month before disease onset, persons with HIV/AIDS, New York City, 1995-2007.

Exposure Type	HIV/AIDS												
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007
Plain Tap[a]	69%	70%	71%	64%	66%	63%	55%	54%	77%	49%	76%	67%	67%
Filtered Tap[b]	12%	9%	10%	18%	20%	20%	14%	22%	13%	21%	7%	18%	11%
Boiled Tap[c]	7%	7%	3%	5%	3%	6%	6%	0%	4%	6%	5%	7%	0%
Incidental Plain Tap Only[d]	11%	15%	16%	15%	8%	12%	16%	19%	4%	15%	10%	4%	17%
No Tap[e]	3%	2%	2%	0%	5%	4%	6%	4%	2%	5%	2%	2%	6%

Note: The significance of risk exposures reported by cryptosporidiosis case-patients cannot be determined without reference to a suitable control population (i.e., non-*Cryptosporidium*-infected controls).

• Format of case interview form changed on 1/1/1997, 5/11/2001, and 8/21/2002. Details on Tap Water Exposure and changes from 1995-2007 are noted below.

[a] Plain Tap - Drank unboiled/unfiltered NYC tap water (1995-5/10/2001); or drank greater than 0 cups of unboiled/unfiltered NYC tap water (5/11/2001-12/31/2007).

[b] Filtered Tap - Drank filtered NYC tap water (1995-5/10/2001); or drank greater than 0 cups of filtered NYC tap water, and 0 or more cups of boiled NYC tap water, and no unboiled /unfiltered NYC tap water (5/11/2001-12/31/2007).

[c] Boiled Tap - Drank boiled NYC tap water (1995-5/10/2001); or drank greater than 0 cups of boiled NYC tap water, and no unboiled /unfiltered NYC tap water, and no filtered NYC tap water (5/11/2001-12/31/2007).

[d] Incidental Plain Tap Only - Did not drink any NYC tap water but did use unboiled/unfiltered NYC tap water to brush teeth, or to wash vegetables/fruits, or to make ice (1995-1996); expanded to include: or to make juice from concentrate (1997-2007)

[e] No Tap - Did not drink any NYC tap water and did not use unboiled/unfiltered NYC tap water to brush teeth, or to wash vegetables/fruits, or to make ice (1995-1996); expanded to include: or to make juice from concentrate (1997-2007).

* Year 2000 percentage of interviewed cryptosporidiosis cases does not include 14 cases associated with a point source exposure at a swimming pool in Florida.

Table 17: Percentage of interviewed **cryptosporidiosis** case-patients by type of tap water exposure reported in the month before disease onset, immunocompetent persons, New York City, 1995-2007.

Exposure Type	Immunocompetent												
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007
Plain Tap[a]	58%	63%	58%	67%	56%	56%	43%	33%	36%	27%	30%	30%	27%
Filtered Tap[b]	18%	17%	21%	21%	25%	17%	31%	44%	36%	30%	25%	20%	22%
Boiled Tap[c]	11%	10%	8%	3%	4%	2%	4%	0%	2%	7%	5%	8%	4%
Incidental Plain Tap Only[d]	7%	9%	12%	8%	11%	8%	16%	21%	16%	13%	25%	28%	18%
No Tap[e]	2%	4%	4%	3%	7%	17%	6%	2%	9%	21%	14%	14%	27%

Note: The significance of risk exposures reported by cryptosporidiosis case-patients cannot be determined without reference to a suitable control population (i.e., non-*Cryptosporidium*-infected controls).

• Format of case interview form changed on 1/1/1997, 5/11/2001, and 8/21/2002. Details on Tap Water Exposure and changes from 1995-2007 are noted below.

[a] Plain Tap - Drank unboiled/unfiltered NYC tap water (1995-5/10/2001); or drank greater than 0 cups of unboiled/unfiltered NYC tap water (5/11/2001-12/31/2007).

[b] Filtered Tap - Drank filtered NYC tap water (1995-5/10/2001); or drank greater than 0 cups of filtered NYC tap water, and 0 or more cups of boiled NYC tap water, and no unboiled /unfiltered NYC tap water (5/11/2001-12/31/2007).

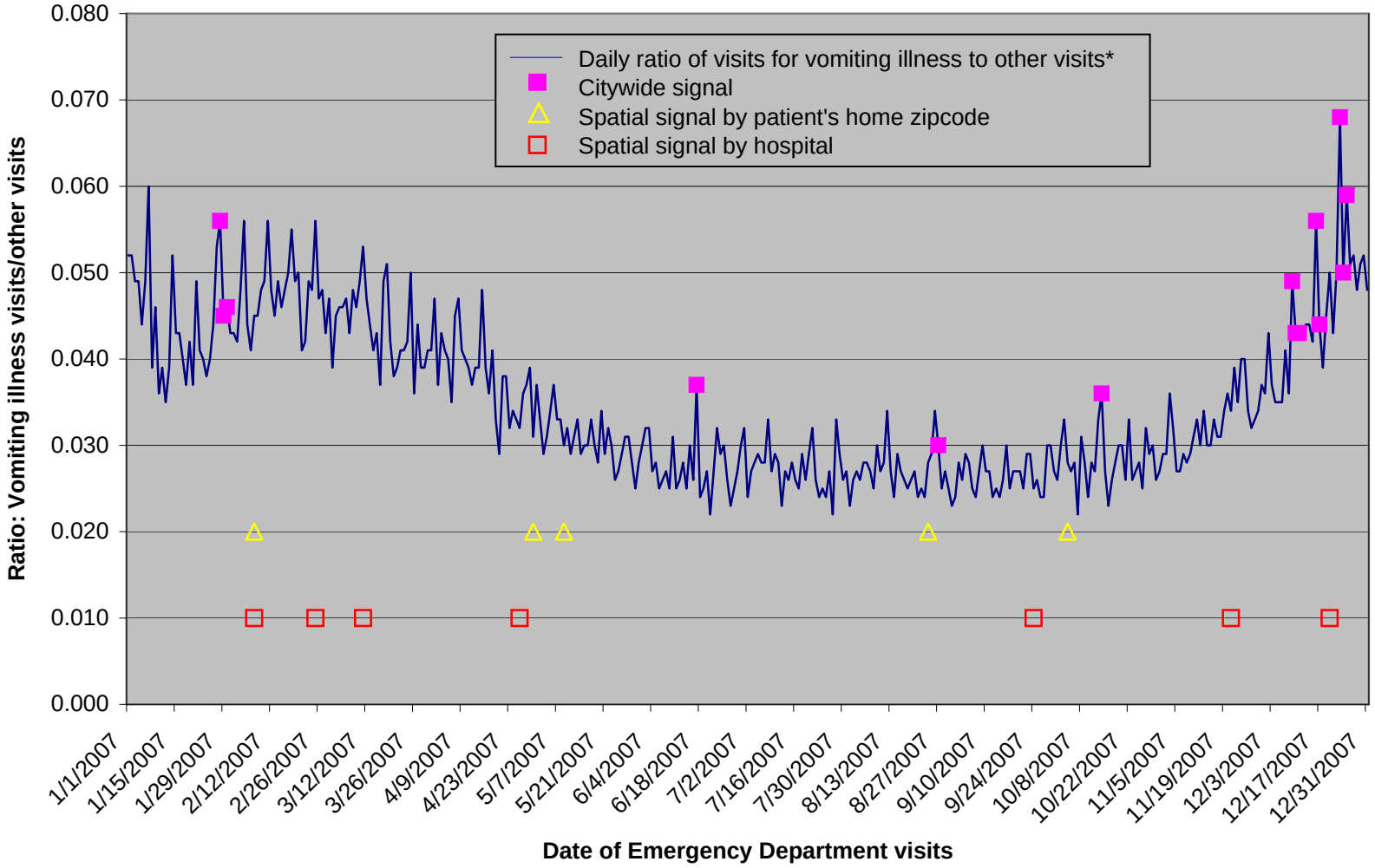
[c] Boiled Tap - Drank boiled NYC tap water (1995-5/10/2001); or drank greater than 0 cups of boiled NYC tap water, and no unboiled /unfiltered NYC tap water, and no filtered NYC tap water (5/11/2001-12/31/2007).

[d] Incidental Plain Tap Only - Did not drink any NYC tap water but did use unboiled/unfiltered NYC tap water to brush teeth, or to wash vegetables/fruits, or to make ice (1995-1996); expanded to include: or to make juice from concentrate (1997-2007)

[e] No Tap - Did not drink any NYC tap water and did not use unboiled/unfiltered NYC tap water to brush teeth, or to wash vegetables/fruits, or to make ice (1995-1996); expanded to include: or to make juice from concentrate (1997-2007).

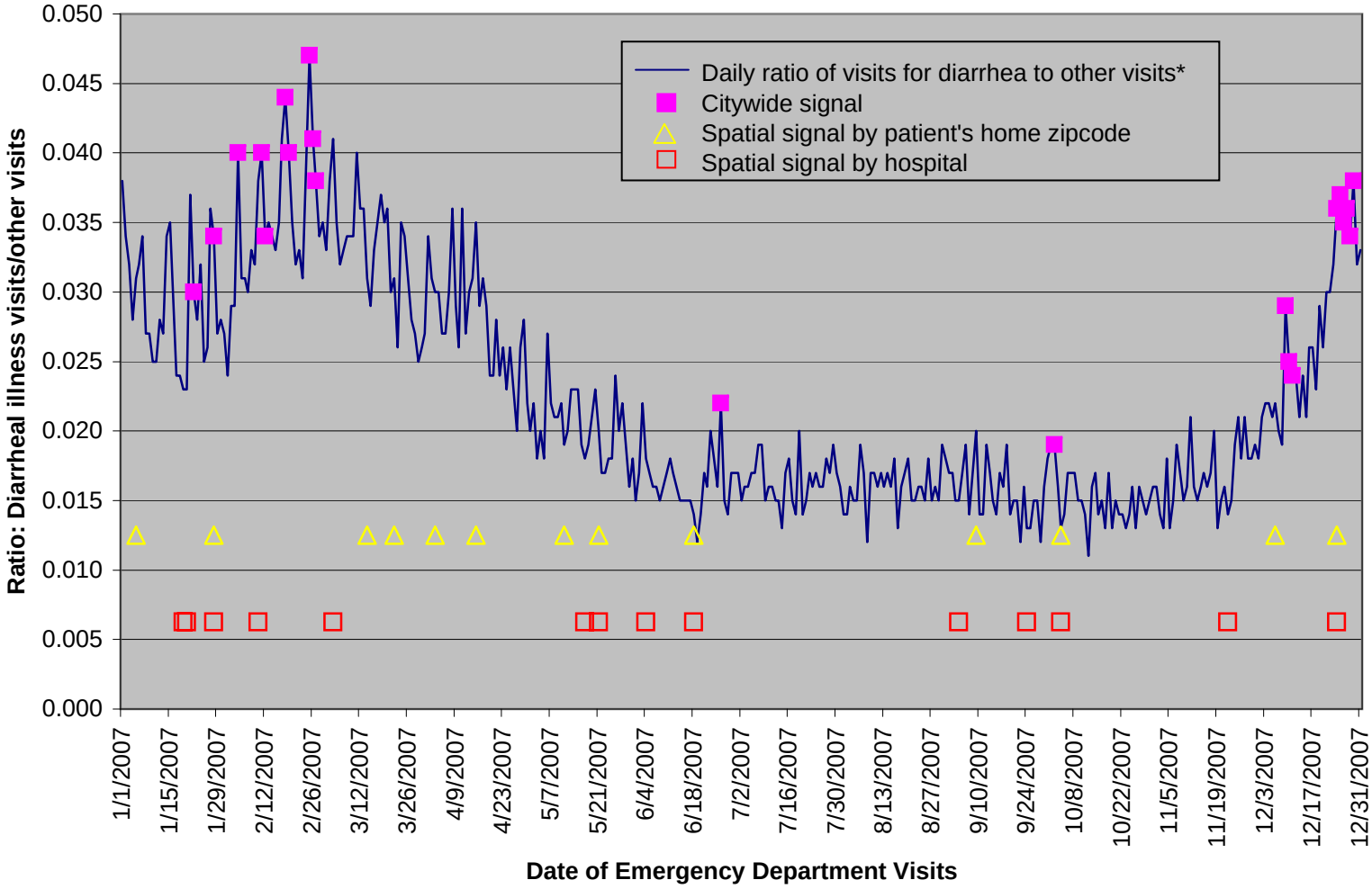
* Year 2000 percentage of interviewed cryptosporidiosis cases does not include 14 cases associated with a point source exposure at a swimming pool in Florida.

Figure 6: Emergency Department Syndromic Surveillance, trends in visits for the vomiting syndrome, New York City, January 1, 2007 - December 31, 2007



*Other visits=visits to participating ED for conditions that do not fit in to one of the eight tracked syndromes (diarrhea, vomiting, respiratory, fever/influenza, asthma, sepsis, cold, rash).

Figure 7: Emergency Department Syndromic Surveillance, trends in visits for the diarrhea syndrome, New York City, January 1, 2007 - December 31, 2007



*Other visits=visits to participating ED for conditions that do not fit in to one of the eight tracked syndromes (diarrhea, vomiting, respiratory, fever/influenza, asthma, sepsis, cold, rash).

Figure 8: Signals for Gastrointestinal Illness, Department of Health & Mental Hygiene, Syndromic Surveillance Systems, New York City, January 1, 2007 - June 30, 2007

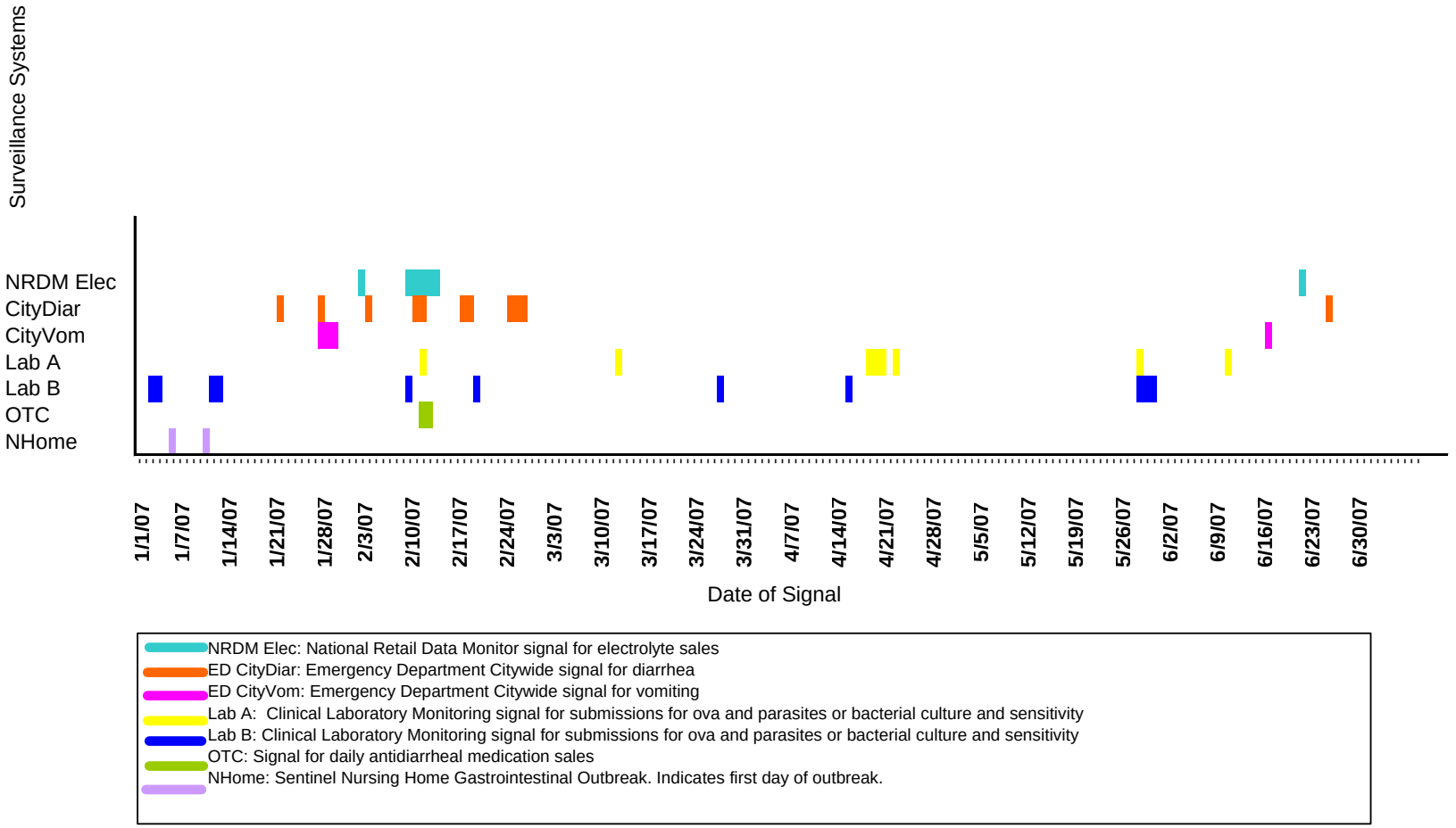
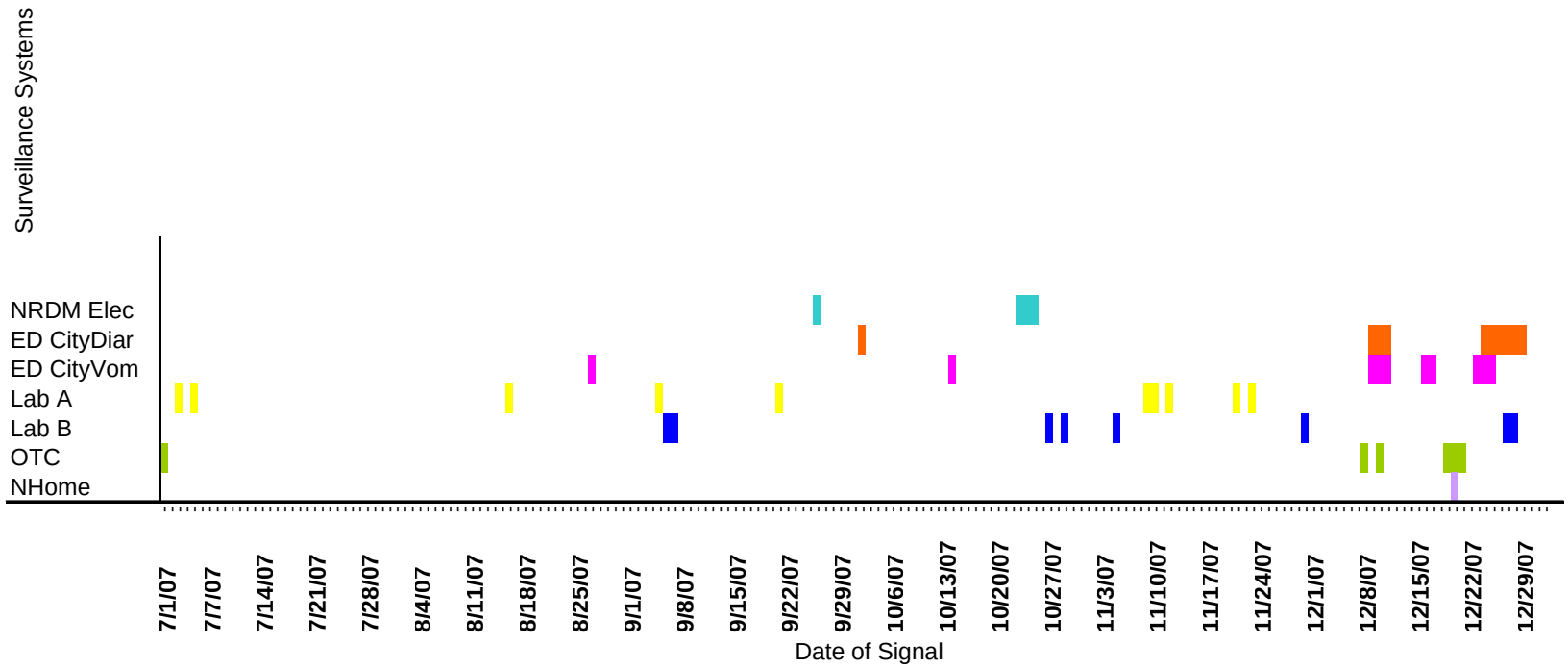


Figure 9: Signals for Gastrointestinal Illness, Department of Health and Mental Hygiene, Syndromic Surveillance Systems, New York City, July 1 - December 31, 2007



NRDM Elec: National Retail Data Monitor signal for electrolyte sales. Note: Last date of complete data 11/12/07. See details in text.
ED CityDiar: Emergency Department Citywide signal for diarrhea
ED CityVom: Emergency Department Citywide signal for vomiting
Lab A: Clinical Laboratory Monitoring signal for submissions for ova and parasites or bacterial culture and sensitivity
Lab B: Clinical Laboratory Monitoring signal for submissions for ova and parasites or bacterial culture and sensitivity
OTC: Signal for daily antidiarrheal medication sales
NHome: Sentinel Nursing Home Gastrointestinal Outbreak. Indicates first day of outbreak.