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

2008 Annual Report

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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) 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 2008.

ACTIVE DISEASE SURVEILLANCE

Active disease surveillance for giardiasis and cryptosporidiosis began in July 1993 and November 1994, respectively, and continued through 2008. This report presents the number of cases and case rates for both diseases in 2008 (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 also utilizes two 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; and an additional pharmacy system tracks daily sales of non-prescription anti-diarrheal medications at another drug store chain. In 2008 enhancements were made to the weekly medications monitoring program, several of which involved expansion of the dataset. Manipulation of the database to accommodate the expanded dataset resulted in an interruption in the weekly medications monitoring program. There were also three short term interruptions in the daily medications monitoring program. Retrospective review indicated that there was no unusual increase in anti-diarrheal sales in the daily program during any of the interruption periods. However, a slight increase was observed during the interruption period in the weekly program, which appeared to be due to issues involved with the data stream transition and not to an increase in gastrointestinal illness.

A summary of 2008 findings from all of the City's syndromic surveillance programs pertaining to GI illness is presented in this report. Signaling of syndromic systems was noted in January and February, and again in November and December, a pattern consistent with annual gastrointestinal viral trends. There was no evidence of a drinking water-related outbreak in New York City.

ACTIVATION OF *CRYPTOSPORIDIUM* ACTION PLAN IN RESPONSE TO DEP PATHOGEN LABORATORY FINDING

In mid-November 2008, unusually high numbers of *Cryptosporidium* oocyts and *Giardia* cysts were found in a sample collected from the New Croton Reservoir raw water effluent by the DEP Pathogen Laboratory. Although a quality assurance problem was immediately suspected, and the elevated numbers were ultimately attributed to laboratory error, the findings led to the activation of NYC's *Cryptosporidium* Action Plan. More details regarding the event and the steps taken in response are summarized in this report. With the recent attention surrounding the *Cryptosporidium* Action Plan, ideas for alterations to the Plan were discussed, and revisions are scheduled for 2009.

INFORMATION SHARING AND PUBLIC EDUCATION

Outreach and education efforts have continued. Presentations were made to health care providers and at schools of public health by DOHMH and DEP representatives. 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. Also, of interest, in 2008 DOHMH partnered with the Centers for Disease Control and Prevention in the development of a mass distributed poster and DOHMH webpage concerning recreational water illness prevention.

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 2008. For this report the population denominators used to calculate rates were obtained utilizing intercensal population estimates. For the years 1994 through 1999, intercensal population estimates per year were used based upon linear interpolation of the decennial US Census[1]. For the years 2000 through 2006, intercensal population estimates per year were used from data produced by DOHMH based on the US Census Bureau Population Estimate Program, and housing unit data obtained from the NYC Department of City Planning. For the years 2007 and 2008, the year 2006 intercensal population estimate was used because 2006 was the most recent year for which an intercensal population estimate was available. Because rates for the years 2000 through 2008 were calculated for this report using intercensal population estimates, they may differ from previously reported rates which were based on year 2000 US Census data. Other variations in data between this report and previous reports may be due to factors such as disease reporting delays, correction of errors, and refinements in data processing (for example, the removal of duplicate disease reports). All rates in this report are annual case rates. Caution must be exercised when interpreting rates based on very small case numbers.

Year 2000 US Census data included two race/ethnicity categories which had not been used in DOHMH disease surveillance data at that time. These race/ethnicity categories were: "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." When determining intercensal estimates since 2000, the US Census Bureau Population Estimate Program retained the race/ethnicity category "Non-Hispanic of Two or More Races" but did not include the category "Non-Hispanic of Single Race, other than White, Black/African American, Asian, Pacific Islander, American Indian and Alaskan Native." In this report, race/ethnicity-

[1] See https://a816-healthpsi.nyc.gov/epiquery/Census/index.html

specific case rates are based upon intercensal population estimates and include the race/ethnicity categories used by the US Census Bureau Population Estimate Program.

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.

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 2008. 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 2008, a total of 839 cases of giardiasis were reported to DOHMH and the annual case rate was 10.2 per 100,000. Annual case numbers decreased 1.4% from 2007 to 2008. From 1994 to 2008 annual case numbers decreased 66.6% (see Table 1 below, and Figure 1).

Table 1: Giardiasis, number of cases and case rates, active disease surveillance, New York City, 1994 - 2008

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	18.9
2002	1,423	17.5
2003	1,214	14.9
2004	1,088	13.3
2005	875	10.6
2006	938	11.4
2007	851	10.4
2008	839	10.2

The overall decrease in NYC giardiasis cases reported since 1994 has occurred in both sexes and across age groups, though the greatest decline in cases has occurred among females who are less than 10 years old and who are 20 to 44 years old. The overall decrease in giardiasis cases since 1994 does not appear to be related to the use of highly active antiretroviral therapy (HAART) for treating persons living with HIV. A preliminary review of the data suggests that the decrease in reported cases of giardiasis in NYC may be due to a decrease in testing rather than a decline in overall disease.

The following provides some highlights from the active surveillance data for giardiasis among New York City residents from January 1 through December 31, 2008. Additional data are presented in the tables that appear later in this report.

Borough of case-patient residence

Borough of case-patient residence was known for all 839 giardiasis case-patients who resided in New York City. In addition, there was one giardiasis case-patient for whom city of residence was unknown, and this case-patient is not included in this report. Manhattan had the highest borough-specific annual case rate (20.7 cases per 100,000 population) (Table 2). The highest UHF neighborhood-specific case rate was found in the Chelsea-Clinton neighborhood in Manhattan (58.6 cases per 100,000) (Map 1 and Table 3).

Sex

Information regarding sex was available for all cases. The number and rate of giardiasis cases were higher in males than females, with 555 males (14.2 cases per 100,000) and 284 females (6.6 cases per 100,000) reported. The highest sex- and borough-specific case rate was observed among males residing in Manhattan (31.1 cases per 100,000) (Table 2).

Age

Information regarding age was available for all cases. The highest age group-specific annual case rates were among children less than 5 years old (21.9 cases per 100,000) and children 5 to 9 years old (17.8 cases per 100,000) (Table 4). The highest age group- and sex-specific case rates were among males less than 5 years old (22.7 cases per 100,000), males 5-9 years old (21.2 cases per 100,000) and females less than 5 years old (21.0 cases per 100,000). The highest age group- and borough-specific case rates were among children less than 5 years old in Manhattan (30.5 cases per 100,000) and children 5-9 years old in the Bronx (27.1 cases per 100,000) (Table 5).

Race/Ethnicity

Information regarding race/ethnicity was available for 514 of 839 cases (61.3%). 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 many giardiasis disease reports, race/ethnicity findings pertaining to giardiasis cases diagnosed in 2008 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 2008. 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 2008, a total of 107 cases of cryptosporidiosis were reported to DOHMH and the annual case rate was 1.3 per 100,000. Annual case numbers increased 1.9% from 2007 to 2008. From 1995 to 2008 annual case numbers have declined 77.3% (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 - 2008

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	1.5
2004	138	1.7
2005	148	1.8
2006	155	1.9
2007	105	1.3
2008	107	1.3

* 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, 2008. Additional data are presented in the tables that appear later in this report.

Borough of case-patient residence

Information on borough of residence was available for all cases of cryptosporidiosis. Manhattan had the highest borough-specific annual case rate (2.9 cases per 100,000) (Table 7). The highest UHF neighborhood-specific case rate was in the Chelsea-Clinton neighborhood in

Manhattan (5.9 cases per 100,000) (Map 2 and Table 8). The next highest UHF neighborhood-specific case rate occurred in East Harlem in Manhattan (4.6 cases per 100,000).

Sex

Information regarding sex was available for all cases. The number and rate of cryptosporidiosis cases were higher in males than females, with 75 males (1.9 cases per 100,000) and 32 females (0.7 cases per 100,000) reported. The borough- and sex-specific case rate was highest for males in Manhattan (4.0 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 persons 20-44 years old (2.0 cases per 100,000) (Table 9). The highest age group- and sex-specific case rate was in males 20-44 years old (3.1 cases per 100,000). The highest age group- and borough-specific case rates occurred among children 5-9 years old in Manhattan (5.5 cases per 100,000) and children less than 5 years old in Manhattan (4.1 cases per 100,000) (Table 10).

Race/Ethnicity

Race/ethnicity information was available for 102 of 107 cases (95.3%). The racial/ethnic group-specific case rate was highest among Black non-Hispanics (1.7 cases per 100,000) and Hispanics (1.6 cases per 100,000) (Table 11). Hispanics in Manhattan had the highest race/ethnicity- and borough-specific case rate (4.4 cases per 100,000). The highest age group- and race/ethnicity-specific case rate was in 20-44 year old Black non-Hispanics (3.5 cases per 100,000) (Table 12). The next highest age group- and race/ethnicity-specific case rate was in children less than 5 years old in the grouping that includes non-Hispanic Asians, Pacific Islanders, American Indians and Alaskan Natives (3.1 cases per 100,000). However, this rate only represents 2 cases in that age group and racial/ethnic category.

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 47 in 2008, thus causing a decline in the overall number of cryptosporidiosis cases in New York City. However, during the years 1995 through 2008, 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).

An analysis of trends using a Poisson regression model demonstrates a significant decline in rates of cryptosporidiosis, from 1995-2008, 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 2008 was significantly greater in patients who were immunocompromised than in those who were not ($P<.01$).

Table 13: Cryptosporidiosis, number of cases by year and immune status, New York City, 1995-2008

Immune Status	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Persons with HIV/AIDS	392	244	80	79	118	91	65	94	76	95	67	69	50	47
Immunocompetent	71	83	83	122	139	79	54	47	48	38	72	71	51	52
Immunocompromised Other Than HIV/AIDS	4	3	7	2	3	2	2	7	2	5	9	14	4	5
Unknown Immune Status	5	4	2	5	1	0	1	0	0	0	0	1	0	3
Total	472	334	172	208	261	172	122	148	126	138	148	155	105	107

Cryptosporidiosis and Potential Risk Exposures

Of the 107 cryptosporidiosis cases diagnosed among NYC residents in 2008, questionnaires concerning potential exposures were completed in 82 (76.6%) cases. Reasons for non-completion of questionnaires were: unable to locate case-patient (15 cases, 14.0 %), refused (4 cases, 3.7%), unable to interview due to incapacitating illness (4 cases, 3.7%) and died (2 cases, 1.9%). Of the immunocompetent case-patients, interviews were completed for 50 (96.2%) case-patients. Among persons with HIV/AIDS, interviews were completed for 28 (59.6%) case-patients. Summary data for 1995 through 2008 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, $P=.06$; 2008, $P=.02$). There was no statistically significant difference between these two groups in the proportion of cases reporting animal contact in 2001 to 2008, or reporting high-risk sex in 2001 to 2005, and 2007. In 2006 and 2008, 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 utilizes two 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). 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 2008 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. 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.

In September and October 2008, a staff member from DOHMH BCD made site visits to all eight nursing homes participating in the Nursing Home Sentinel Surveillance system. 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 2008. Frequency of data transmission is currently daily to three times per week 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 potentially 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[2]. Modifications to NYC's anti-diarrheal surveillance program have been made over the years, and in 2002 NYC's program was enhanced by two additional drug-tracking systems, the OTC system and the National Retail Data Monitor (NRDM) system. The participation of DOHMH in the NRDM system was discontinued in November 2007. Currently NYC utilizes two separate systems to monitor sales of anti-diarrheal medications: the ADM system and the OTC system. (NOTE: the program names "ADM" and "OTC" are abbreviations for "Anti-diarrheal Medications" and "Over-the-Counter." Both

[2] 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.

systems involve the tracking of over-the-counter or non-prescription anti-diarrheal medications, but the program names were chosen as a way to distinguish the two.)

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. Under this program, weekly sales volume data for loperamide and non-loperamide anti-diarrheal medications from electronic store scanners has been sent to DEP where it is entered into a database, sorted into drug formulation categories, and graphed and visually compared to historic data. Sales volume data is examined citywide, by borough, and by drug formulation category. Information is also obtained on promotional sales of ADM products, so that such information can be considered in interpreting the sales volume data. In 2008, a number of significant enhancements, transitions, and other events occurred, as summarized below.

As discussed in the WDRAP 2007 Annual Report, in early 2008 it was determined that the promotional sales information that had been collected since 1996 could not be reliably matched to the pharmacy chain whose volume-of-sales were tracked by DEP. Once this discrepancy was discovered, the following 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. The corrective action evaluation was completed on May 14, 2008.

In January 2008, DEP began receiving weekly ADM data reports by electronic transmission, a significant program improvement over the previous means of data transmission which was by fax. As mentioned in the WDRAP 2007 Annual Report, the pharmacy chain which had been providing ADM sales data to DEP was acquired by another company in December 2007. Following this merger, in Spring 2008, the pharmacy chain transitioned from their old data system into the new company's data system. The corporate transition, as well as their data system transition, provided a good opportunity for DEP to work with the pharmacy chain to achieve significant data stream enhancements in 2008. DEP also began piloting a program to incorporate the following improvements into the ADM analysis:

- data are now received electronically rather than by fax;
- data are now received in an Excel format as opposed to PDF;
- data are received daily rather than weekly (daily data are confirmed or corrected in a weekly report);
- data are now received from a larger number of stores (from 19 stores in 1 store chain to 61 stores in 5 store chains);
- product count was expanded from 29 to 75 (i.e., additional ADM products and formulations have been incorporated into the program);
- itemized counts of products bought on sale (i.e., at promotional prices) are received directly from the store chain, rather than DEP staff having to look up weekly promotions on the store chain's website, or pick up weekly sales flyers at a store.

With this new expanded dataset now being received, a new database system was needed to hold and analyze the data because it was no longer compatible with the earlier database. To

address this matter and to achieve other data system benefits, a new data management system was set up in Microsoft Office Access. Also during 2008, NYC began evaluating two new programs for data analysis: SatScan and CDC's Early Aberration Reporting System (EARS) (the latter in both Excel and SAS). However, as this data analysis program evaluation is not yet complete, and historic trends for the new dataset are not available, the earlier data analysis protocol was used throughout 2008. In order to apply the new expanded dataset to the earlier analysis protocol, a data translation system was required, and this resulted in an interruption in the ADM system during a transition period (week ending July 26, 2008 through week ending August 30, 2008). Daily analyses were conducted within DEP during this transition period using the expanded dataset under the pilot EARS program. However, it was too early in the trial of this pilot program to have full confidence in the interpretation of results. In any case, a retrospective analysis was done for the transition period using a translated dataset, and the results of this analysis are reported in the "Findings: Summary of Syndromic Surveillance Signals" section below.

The OTC System

The second of the currently operating drug monitoring systems, the OTC system, was started in 2002 by DOHMH. This system involves the monitoring of anti-diarrheal medication sales at a second large pharmacy chain. In developing the new OTC system, the goal was to develop a system that would provide more timely and detailed data than the ADM tracking system in place at the time. Also, the OTC system collects data on other medicines, including fever and allergy medications, for broader bioterrorism and emerging infectious disease surveillance purposes. Each daily electronic file contains data for, on average, 27,000 nonprescription medication sales. A separate file is also sent daily by the same data provider which contains 7,800 prescription medication sales. However, the prescription 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.

During this reporting period there were three short-term interruptions in the OTC system. Sales data for the periods February 1-5 and 6-10 were delayed, apparently due to the installation of a new firewall at DOHMH, which created a security barrier. On retrospective review, there were no signals during these interruption periods. DOHMH notified DEP of these interruptions on February 6 and February 12 respectively. A third interruption in the OTC system occurred after data for April 16 were received. The File Transfer Protocol (FTP) site was changed by the pharmacy chain while performing server maintenance. DOHMH BCD was not notified, and the data were not updated because transfers are only accepted by DOHMH from known FTP servers. The system went back on line on April 21, and all missing data were retrieved. There were no signals in the OTC system from April 16 to April 21. DOHMH notified DEP of this interruption on April 21.

Hospital Emergency Department Monitoring

At the start of 2008, DOHMH received electronic data from 46 of a total of 61 New York City emergency departments (EDs). By the end of the year, 52 of 60 EDs operating in NYC were participating in ED Syndromic Surveillance. Currently DOHMH receives electronic data from 50 of New York City's 58 EDs, reporting approximately 10,000 visits per day, roughly 95% of all 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.)

Findings: 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 four of our syndromic surveillance systems together in four figures (Figures 6-9). Figures 6 and 7 summarize ED system trends for 2008. 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, 2008. 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 one citywide signal for the vomiting syndrome and three citywide signals for diarrhea occurred in late January. There were no citywide vomiting or diarrhea signals for the remainder of the year until early November through December, when there were several citywide signals for both diarrhea and vomiting. 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 four syndromic surveillance systems for the gastrointestinal syndrome covering the period January 1 to June 30, and July 1 to December 31, 2008, respectively. The systems included are the emergency department system, the clinical laboratory monitoring system, the OTC anti-diarrheal medication system, 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 in late January and again in November and December, most likely representing norovirus and rotavirus seasons. There were three GI outbreaks in sentinel nursing homes. Two sentinel nursing home outbreaks, which occurred in January and February, appear to have been caused by viral agents. A third nursing home outbreak, which occurred in April, may have been caused by *Clostridium difficile*. Details are presented below. In the OTC system, there were three signals in December: a two-day signal at the beginning of the month, and a one-day signal at the end of the month. Otherwise, there was only one other OTC system signal in 2008, occurring in early July. There were sporadic signals in the clinical laboratory system throughout the year.

Regarding the three GI outbreaks in sentinel nursing homes, the first occurred in a nursing home in Manhattan, beginning on January 2. Eight patients on one unit were affected, and symptoms were vomiting and diarrhea. There were no deaths or hospitalizations. The facility sent eight stool specimens to facility-affiliated laboratories. These specimens were submitted for bacterial, *C. difficile,* and viral study. Results were negative. An additional nine specimens were sent to the DOHMH Public Health Laboratory for testing on January 7. Three specimens were tested for ova and parasites, including *Cryptosporidium*, three for bacterial pathogens, and three for viruses. The specimens tested for ova and parasites and for pathogenic bacteria were negative. The viral specimens were sent to the NYSDOH Wadsworth Virology Laboratory, and all three were found to be positive for calicivirus by polymerase chain reaction (PCR).

The second GI outbreak occurred in a sentinel nursing home in the Bronx, beginning on February 15 and ending on February 17. Eight residents and seven staff members were affected. The symptoms were diarrhea, nausea, vomiting, abdominal pain and fever. Three residents were transferred to an affiliated acute care facility. There were no deaths. Stool specimens were collected from six persons; these specimens were sent to an affiliated hospital. Each person was tested for ova and parasites, including *Cryptosporidium*, for bacterial pathogens, and for *C. difficile*. All results were negative. No specimens were collected for viral studies. Stool specimens were not sent to the Public Health Laboratory because the outbreak occurred on the weekend when infection control staff members were off-site. The nursing home infection control staff documented on the NYSDOH Outbreak Report Form that the suspect causative agent was "Norovirus/Calicivirus."

The third GI outbreak occurred on April 12 in another Bronx sentinel nursing home. It involved 25 patients on four units. No employees were affected. Symptoms were diarrhea (13 cases), vomiting (5 cases), and diarrhea and vomiting (7 cases). Duration of illness was one to five days. There were no deaths. Two residents were transferred to an acute care facility. A total

of 10 specimens were collected from 6 residents, and sent to a private laboratory, contrary to Sentinel Surveillance Protocol. These specimens were tested for *C. difficile* (3 specimens), for ova and parasites (3 specimens) and for bacterial culture (4 specimens). One specimen was positive for *C. difficile*. All other specimens were negative. Ova and parasite specimens were not tested for *Cryptosporidium,* and no viral studies were done. No additional cases occurred after April 21. DOHMH BCD staff members reviewed the Sentinel Surveillance Protocol with the Director of Nursing at the nursing home to help ensure that, in the event of future outbreaks, specimens are tested at the Public Health Laboratory.

With regard to the ADM system, during this reporting period there were no major spikes in ADM sales, however, there were some weeks where sales appeared slightly above background range (i.e., based upon a retrospective review of all 2008 weekly data). These included the weeks ending: January 5, April 12, July 26, October 11, and December 27. Citywide total ADM sales for 2008 were highest during the week ending January 5, which may be due to the seasonal trend of higher enteric virus rates seen in winter months. (For reference, this week did correspond with an outbreak in a sentinel nursing home that began on January 2, and was determined to be caused by calicivirus.) This seasonal gastrointestinal virus trend may also account for the higher citywide sales seen during the week ending December 27. Elevated sales during the week ending April 12 were determined to be most likely a reflection of general "noise" inherent in the system. Elevated sales for the week ending July 26 may be explained by an apparent increase in store numbers included in the ADM system that occurred with the transition to the expanded data stream. Elevated sales for the week ending October 11 did not correspond with signals in any of the other syndromic surveillance systems, and may be explained by an increase in promotional ADM sales during that week.

For further evaluation of ADM trends, monthly averages of ADM sales were calculated to compare sales over the 12-month reporting period. These averages generally reflect the historical seasonal enteric virus trend, with higher averages (i.e., suggesting more GI illness) in January, February, and December. Averages were slightly lower in March, April, and July-November, and lowest in May and June. (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 2008, there was signaling of multiple systems in January and February and again in November and December, consistent with annual gastrointestinal viral trends. Two nursing homes participating in sentinel surveillance reported GI outbreaks in January and February, which appear to have been caused by viral agents. 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: ACTIVATION OF *CRYPTOSPORIDIUM* ACTION PLAN IN RESPONSE TO DEP PATHOGEN LABORATORY FINDING

On November 18, 2008, DEP's Pathogen Laboratory observed and reported to regulators the detection of unusually high numbers of C*ryptosporidium* oocysts and *Giardia* cysts in a sample collected on November 13 at the New Croton Reservoir raw water effluent. Although it was quickly suspected (and later corroborated) that the elevated sample results were due to a laboratory error, NYC's *Cryptosporidium* Action Plan was activated on November 18, though with some modifications per interagency agreement. A more complete account of this testing and response episode is provided in an After Action Report (NYCDEP, February 2009); a brief synopsis is provided here for reference.

Following the elevated pathogen detection, as required under the NYC *Cryptosporidium* Action Plan, public health agencies, including DOHMH, NYSDOH, and EPA, were notified, and pathogen monitoring was increased. Also, routine WDRAP programs were consulted, and some additional public health assessment measures were taken, in an effort to determine whether these data indicated a rise in diarrheal illness that may have resulted from *Cryptosporidium* or *Giardia* contamination. Enhanced WDRAP efforts included: implementation of a pilot daily ADM assessment system utilizing CDC's EARS for signal analysis; contact with infection control staff members at the five sentinel nursing homes located in the Bronx and Manhattan to verify that there had been no GI outbreaks since November 13 (as the Bronx and Manhattan were the service areas for the Croton System at the time of the sample collection); and comparison of giardiasis and cryptosporidiosis case numbers during the period November 13, 2008 to December 13, 2008 with the same period in 2006 and 2007. Public health assessment results for this period appeared consistent with historical experience showing a seasonal increase in viral gastroenteritis, and did not appear to indicate a waterborne disease outbreak.

As discussed in the After Action Report, through further investigation (including CDC genotyping work), DEP was able to conclude on December 13 that the elevated *Cryptosporidium* and *Girardia* levels were attributable to a laboratory error. With approval from the regulators, the protozoan data from November 13 were entered into DEP's records as "Laboratory Error".

An outcome from this activation of NYC's *Cryptosporidium* Action Plan is that the Plan will be reviewed and modified, including revisions to account for escalation and de-escalation in situations where quality assurance problems are encountered or suspected.

PART IV: INFORMATION SHARING AND PUBLIC EDUCATION

Information sharing and education efforts continued during 2008. Over the year, program staff participated in presentations to discuss the City's Waterborne Disease Risk Assessment Program and related issues. Educational outreach in 2008 included several presentations by DOHMH or DEP representatives at public health and/or medical schools located in NYC. Such talks serve to enhance awareness of waterborne diseases, and may lead to more complete disease diagnosis and reporting.

In May 2008, to address National Recreational Water Illness (RWI) Prevention Week (May 19-25), staff members from DOHMH BCD and Public Health Engineering partnered with the Centers for Disease Control and Prevention (CDC) in the development of health promotion materials for NYC swimming pool users and pool operators. This effort was undertaken in response to the increasing numbers of RWI outbreaks in the US caused by *Cryptosporidium*. The materials developed by DOHMH/CDC included a poster outlining steps that pool patrons can take to prevent RWI, which was mailed to each of NYC's more than 800 public swimming pools in July 2008 (see Attachment 1). Each mailing included a cover letter addressed to pool operators, which provided additional information regarding RWI, particularly cryptosporidiosis, and which noted that even well maintained pools can transmit *Cryptosporidium* if pool patrons do not participate in healthy swimming habits. In addition, DOHMH developed a National Recreational Water Illness Prevention Week webpage which outlined measures to prevent recreational water illness, and which included links to other websites for additional information for members of the public, aquatics staff members, and health care providers. This webpage can be found at:
http://home2.nyc.gov/html/doh/html/cd/rwn.shtml

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://home2.nyc.gov/html/dep/html/drinking_water/pathogen.shtml

- *1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007 and 2008 Waterborne Disease Risk Assessment Program's Annual Reports*
  http://home2.nyc.gov/html/dep/html/drinking_water/wdrap.shtml

- *1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007 and 2008 New York City Drinking Water Supply and Quality Statement (Planned posting date for the 2008 report is May 31, 2008.)*
  http://home2.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 2008

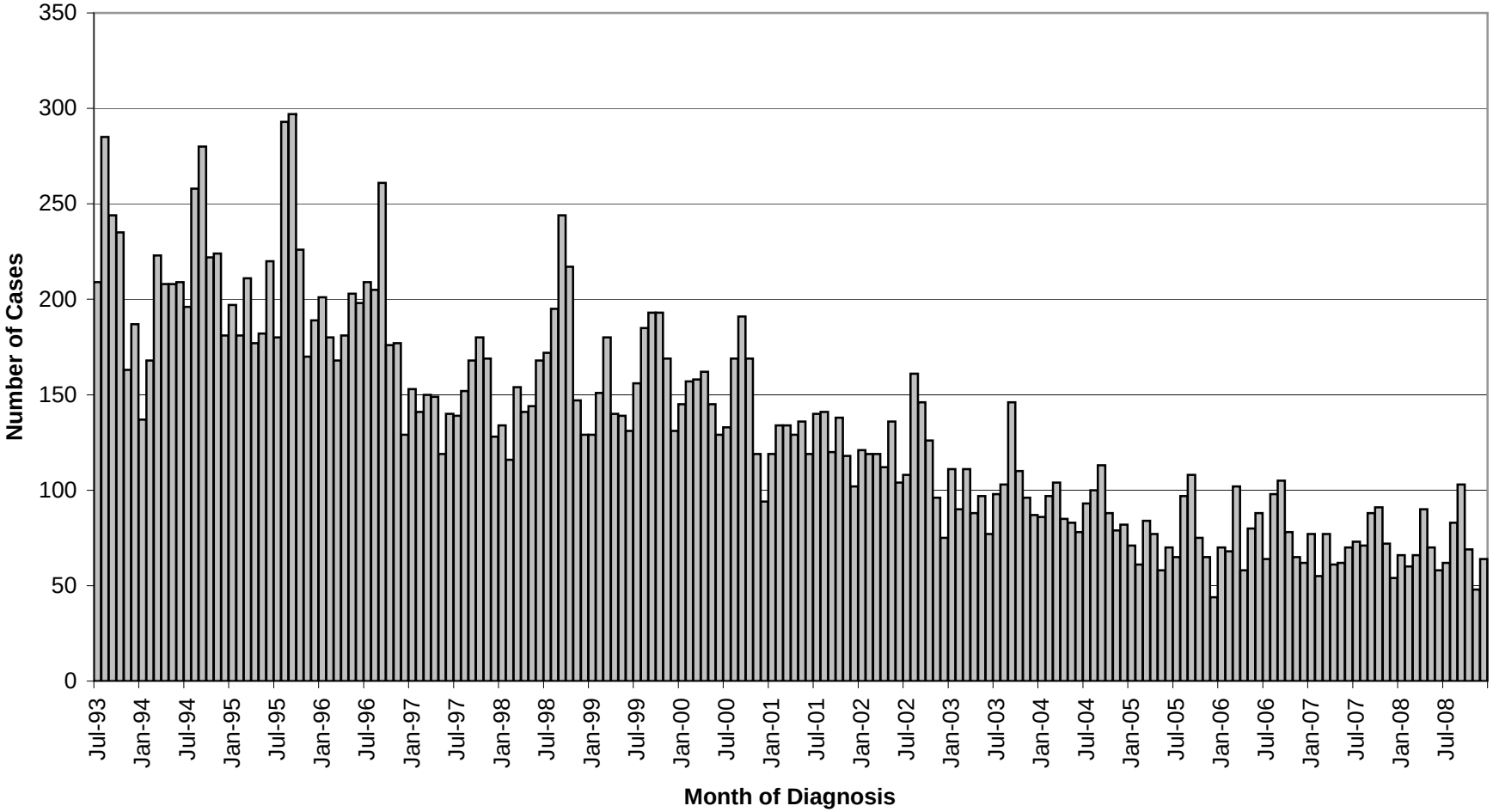


TABLE 2: **Giardiasis**, number of cases and annual case rate per 100,000 population by sex and borough of residence - active surveillance in New York City (2008)

	Borough of residence					
Sex	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Male	555	239	86	117	104	9
	(14.2)	(31.1)	(13.5)	(9.9)	(9.5)	(3.9)
Female	284	94	44	89	52	5
	(6.6)	(11.1)	(6.1)	(6.7)	(4.5)	(2.0)
Total	839	333	130	206	156	14
	(10.2)	(20.7)	(9.5)	(8.2)	(6.9)	(2.9)

Map 1

Giardiasis annual case rate per 100,000 population by UHF neighborhood - Active surveillance data for New York City (2008)

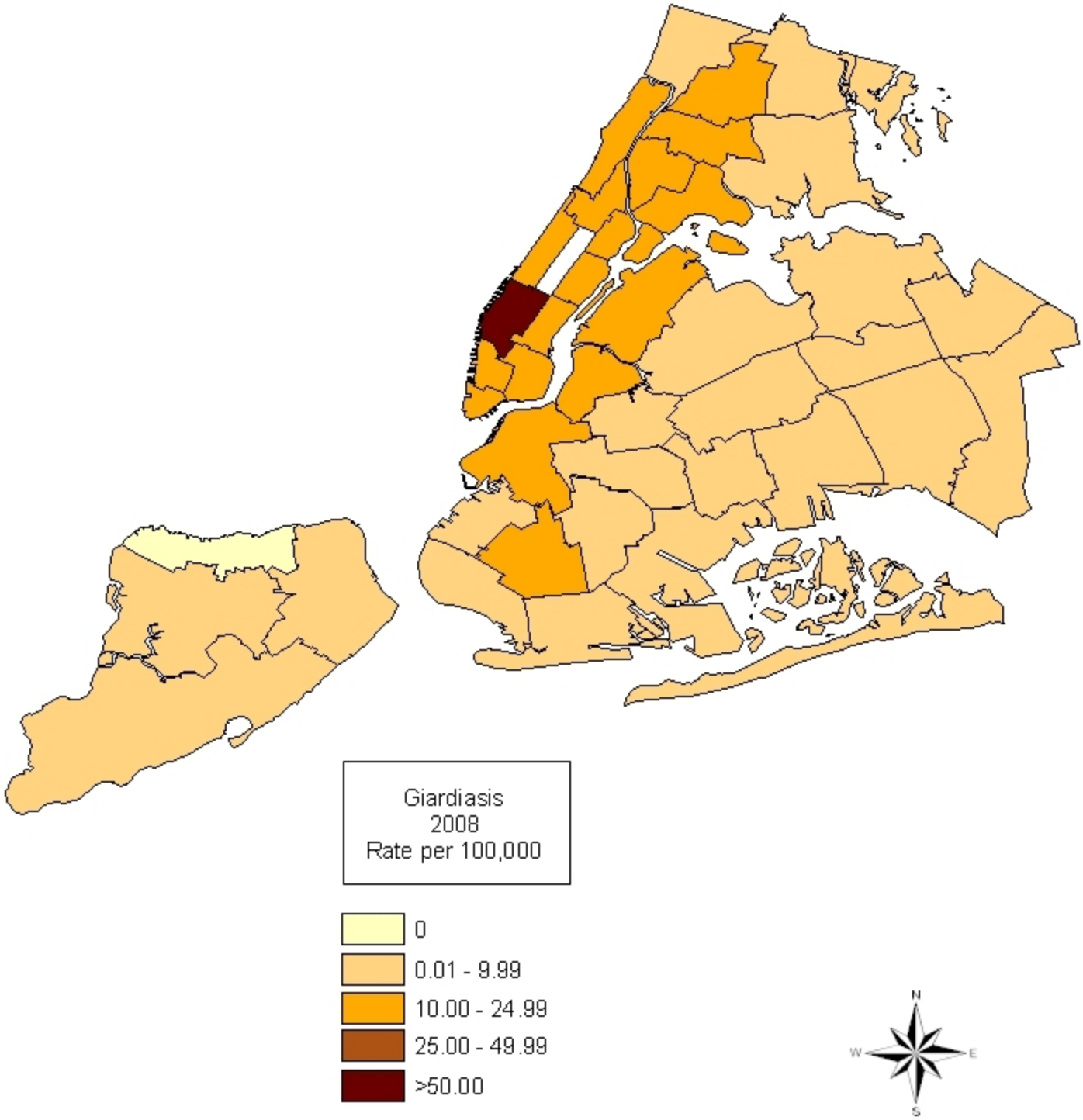


Table 3: Giardiasis, number of cases and annual case rate per 100,000 by UHF neighborhood of residence - active surveillance in New York City (2008)*

UHF Neighborhood	Borough	Number	Population	Rate
Chelsea-Clinton	Manhattan	79	134841	58.6
Gramercy Park-Murray Hill	Manhattan	30	132112	22.7
Union Sq-Lower East Side	Manhattan	43	212522	20.2
Greenwich Village-Soho	Manhattan	18	91402	19.7
Upper West Side	Manhattan	47	239377	19.6
Greenpoint	Brooklyn	25	128286	19.5
Downtown-Heights-Slope	Brooklyn	42	217476	19.3
Upper East Side	Manhattan	43	239585	17.9
C Harlem-Morningside Hgts	Manhattan	23	146047	15.7
Hunts Point-Mott Haven	Bronx	20	130437	15.3
High Bridge-Morrisania	Bronx	28	198289	14.1
Crotona-Tremont	Bronx	29	206635	14.0
Long Island City-Astoria	Queens	28	218012	12.8
Borough Park	Brooklyn	42	337357	12.4
Washington Heights-Inwood	Manhattan	33	265527	12.4
Lower Manhattan	Manhattan	4	34877	11.5
East Harlem	Manhattan	12	107731	11.1
Fordham-Bronx Park	Bronx	27	255012	10.6
Southwest Queens	Queens	24	270795	8.9
West Queens	Queens	43	499129	8.6
Ridgewood-Forest Hills	Queens	20	235386	8.5
Williamsburg-Bushwick	Brooklyn	15	196797	7.6
Fresh Meadows	Queens	7	92937	7.5
Sunset Park	Brooklyn	9	125789	7.2
Kingsbridge-Riverdale	Bronx	6	85665	7.0
Coney Island-Sheepshead Bay	Brooklyn	18	297518	6.1
Bed Stuyvesant-Crown Hgts	Brooklyn	19	314129	6.0
Pelham-Throgs Neck	Bronx	16	293785	5.4
Bensonhurst-Bay Ridge	Brooklyn	11	202660	5.4
Southeast Queens	Queens	9	201411	4.5
East Flatbush-Flatbush	Brooklyn	13	313869	4.1
Stapleton-St. George	Stat Is	5	128234	3.9
Rockaway	Queens	4	106414	3.8
Flushing-Clearview	Queens	10	267368	3.7
Bayside-Littleneck	Queens	3	88315	3.4
South Beach-Tottenville	Stat Is	6	187998	3.2
East New York	Brooklyn	5	176138	2.8
Jamaica	Queens	8	287998	2.8
Northeast Bronx	Bronx	5	186620	2.7
Canarsie-Flatlands	Brooklyn	5	198801	2.5
Willowbrook	Stat Is	2	89907	2.2

*This table does not include three cases of giardiasis, one occurring in a Manhattan resident, one in a Brooklyn resident, and one in a Queens resident, in which 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 (2008)

	Sex		
Age group	Male number (rate)	Female number (rate)	Total number (rate)
<5 years	67 (22.7)	59 (21.0)	126 (21.9)
5-9 years	56 (21.2)	36 (14.3)	92 (17.8)
10-19 years	26 (4.8)	35 (6.7)	61 (5.7)
20-44 years	253 (16.7)	89 (5.6)	342 (11.0)
45-59 years	107 (14.3)	45 (5.3)	152 (9.5)
≥ 60 years	46 (8.4)	20 (2.5)	66 (4.9)
Total	555 (14.2)	284 (6.6)	839 (10.2)

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 (2008)

	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	126 (21.9)	30 (30.5)	20 (18.5)	45 (23.4)	29 (19.6)	2 (6.9)
5-9 years	92 (17.8)	12 (16.4)	28 (27.1)	32 (18.4)	20 (14.7)	0
10-19 years	61 (5.7)	9 (6.4)	22 (9.8)	12.0 (3.3)	17 (6.2)	1 (1.5)
20-44 years	342 (11.0)	174 (24.5)	36 (7.2)	78 (8.7)	50 (6.0)	4 (2.4)
45-59 years	152 (9.5)	76 (24.2)	19 (8.1)	26 (5.4)	25 (5.4)	6 (5.8)
≥ 60 years	66 (4.9)	32 (11.5)	5 (2.6)	13 (3.2)	15 (3.8)	1 (1.3)
Total	839 (10.2)	333 (20.7)	130 (9.5)	206 (8.2)	156 (6.9)	14 (2.9)

Figure 2: Cryptosporidiosis, number of cases by month of diagnosis, active surveillance, New York City, November 1994 - December 2008

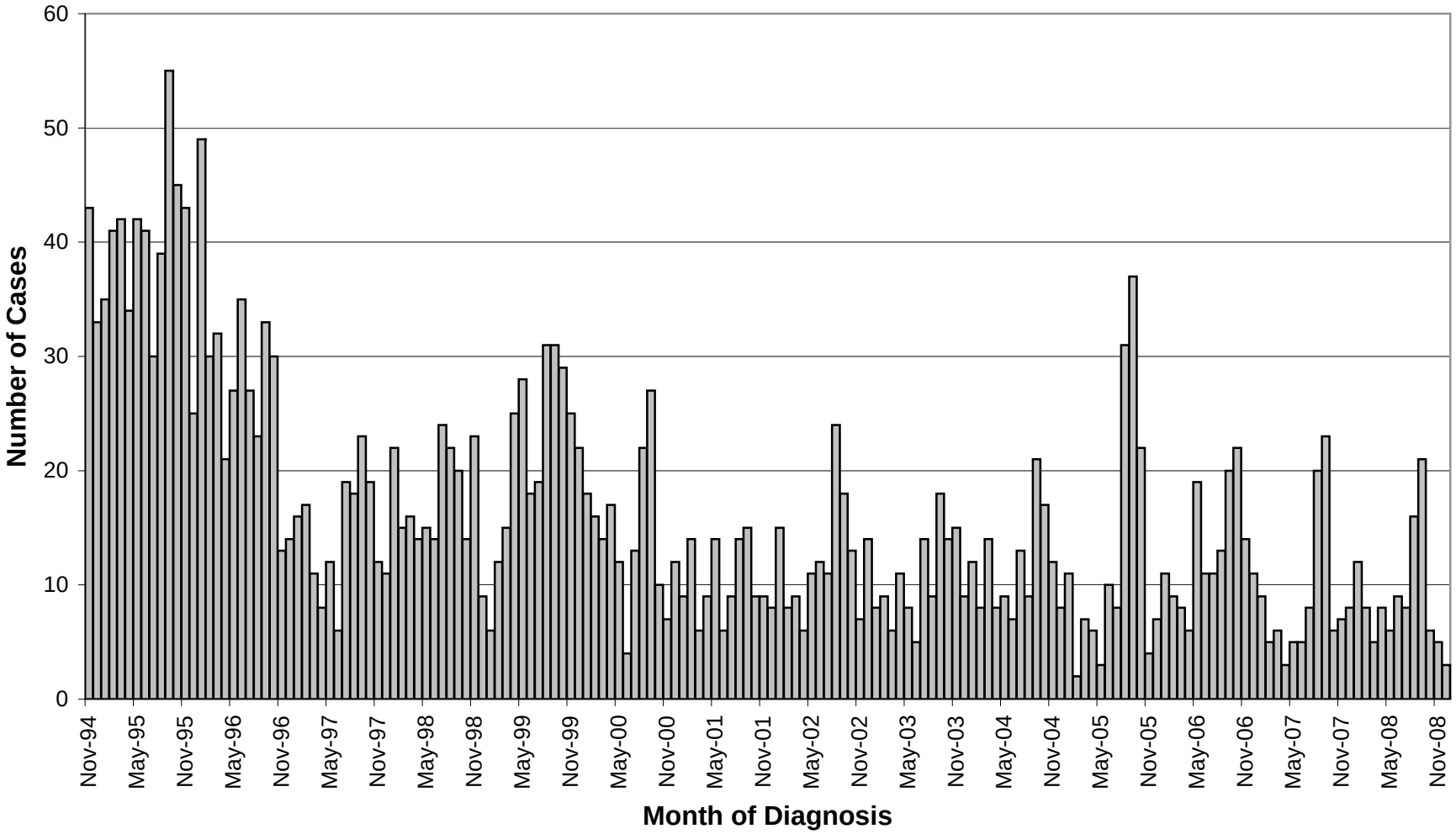
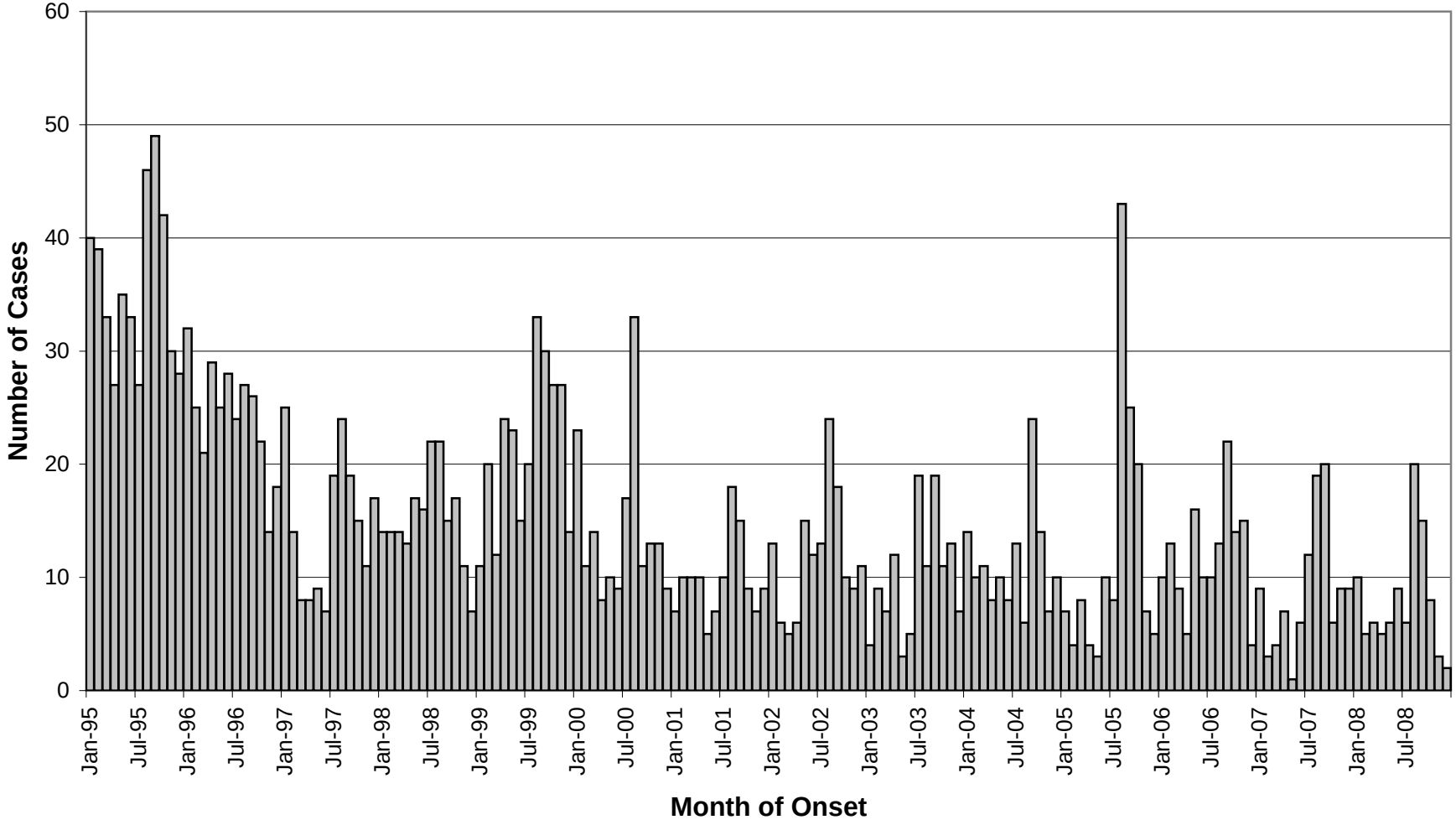


Figure 3: Cryptosporidiosis, number of cases by month of onset, active surveillance, New York City, January 1995 - December 2008*



* 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 (2008)

	Borough of residence					
Sex	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Male	75 (1.9)	31 (4.0)	14 (2.2)	22 (1.9)	8 (0.7)	0
Female	32 (0.7)	15 (1.8)	3 (0.4)	9 (0.7)	5 (0.4)	0
Total	107 (1.3)	46 (2.9)	17 (1.2)	31 (1.2)	13 (0.6)	0

Map 2

Cryptosporidiosis annual case rate per 100,000 population by UHF neighborhood - Active surveillance data for New York City (2008)

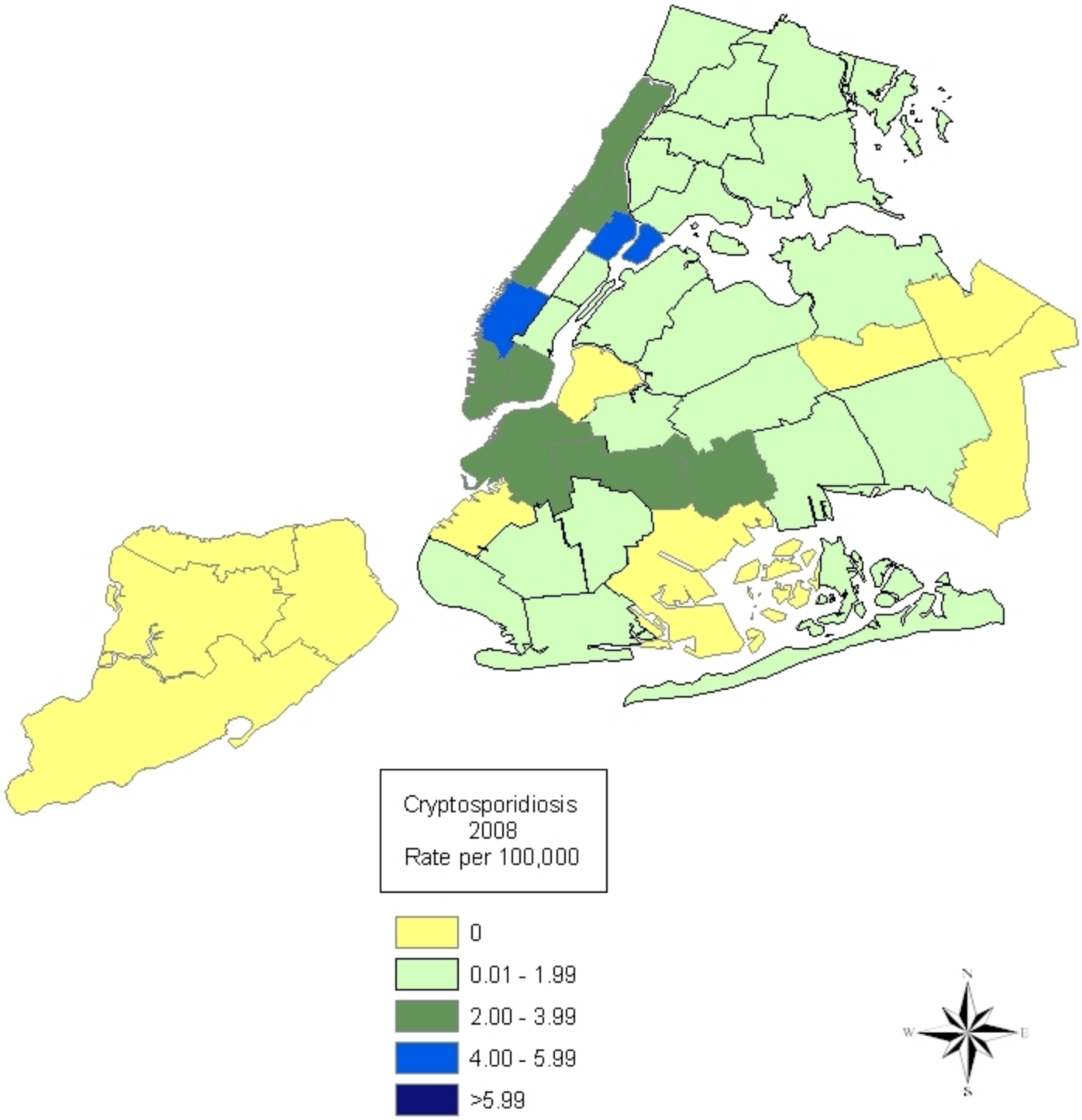


TABLE 8: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by UHF neighborhood of residence - active surveillance in New York City (2008)*

UHF Neighborhood	Borough	Number	Population	Rate
Chelsea-Clinton	Manhattan	8	134841	5.9
East Harlem	Manhattan	5	107731	4.6
C Harlem-Morningside Hgts	Manhattan	5	146047	3.4
Washington Heights-Inwood	Manhattan	9	265527	3.4
Union Sq-Lower East Side	Manhattan	7	212522	3.3
Lower Manhattan	Manhattan	1	34877	2.9
Downtown-Heights-Slope	Brooklyn	5	217476	2.3
East New York	Brooklyn	4	176138	2.3
Bed Stuyvesant-Crown Hgts	Brooklyn	7	314129	2.2
Greenwich Village-Soho	Manhattan	2	91402	2.2
Upper West Side	Manhattan	5	239377	2.1
Northeast Bronx	Bronx	3	186620	1.6
East Flatbush-Flatbush	Brooklyn	5	313869	1.6
Williamsburg-Bushwick	Brooklyn	3	196797	1.5
High Bridge-Morrisania	Bronx	3	198289	1.5
Crotona-Tremont	Bronx	3	206635	1.5
Upper East Side	Manhattan	3	239585	1.3
Fordham-Bronx Park	Bronx	3	255012	1.2
Kingsbridge-Riverdale	Bronx	1	85665	1.2
Pelham-Throgs Neck	Bronx	3	293785	1.0
Coney Island-Sheepshead Bay	Brooklyn	3	297518	1.0
West Queens	Queens	5	499129	1.0
Rockaway	Queens	1	106414	0.9
Ridgewood-Forest Hills	Queens	2	235386	0.8
Hunts Point-Mott Haven	Bronx	1	130437	0.8
Gramercy Park-Murray Hill	Manhattan	1	132112	0.8
Southwest Queens	Queens	2	270795	0.7
Borough Park	Brooklyn	2	337357	0.6
Bensonhurst-Bay Ridge	Brooklyn	1	202660	0.5
Long Island City-Astoria	Queens	1	218012	0.5
Flushing-Clearview	Queens	1	267368	0.4
Jamaica	Queens	1	287998	0.3

* This table does not include one case of cryptosporidiosis occurring in a Brooklyn resident in which UHF neighborhood could not be determined.

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 (2008)

	Sex		
Age group	Male number (rate)	Female number (rate)	Total number (rate)
<5 years	3 (1.0)	7 (2.5)	10 (1.7)
5-9 years	7 (2.6)	1 (0.4)	8 (1.5)
10-19 years	4 (0.7)	4 (0.8)	8 (0.7)
20-44 years	47 (3.1)	14 (0.9)	61 (2.0)
45-59 years	9 (1.2)	2 (0.2)	11 (0.7)
≥ 60 years	5 (0.9)	4 (0.5)	9 (0.7)
Total	75 (1.9)	32 (0.7)	107 (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 (2008)

	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	10 (1.7)	4 (4.1)	3 (2.8)	3 (1.6)	0	0
5-9 years	8 (1.5)	4 (5.5)	1 (1.0)	2 (1.1)	1 (0.7)	0
10-19 years	8 (0.7)	3 (2.1)	1 (0.4)	0	4 (1.4)	0
20-44 years	61 (2.0)	25 (3.5)	11 (2.2)	19 (2.1)	6 (0.7)	0
45-59 years	11 (0.7)	7 (2.2)	1 (0.4)	3 (0.6)	0	0
≥ 60 years	9 (0.7)	3 (1.1)	0	4 (1.0)	2 (0.5)	0
Total	107 (1.3)	46 (2.9)	17 (1.2)	31 (1.2)	13 (0.6)	0

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 (2008)

	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	37 (1.6)	18 (4.4)	7 (1.0)	4 (0.8)	8 (1.3)	0
White, non-Hispanic	26 (0.9)	15 (1.9)	1 (0.6)	8 (0.9)	2 (0.3)	0
Black, non-Hispanic	34 (1.7)	9 (3.9)	6 (1.4)	17 (2.0)	2 (0.5)	0
Asian, Pac Islander, Amer Indian, Alaska Native, non-Hispanic	5 (0.5)	1 (0.6)	2 (3.9)	1 (0.4)	1 (0.2)	0
Two or more races, non-Hispanic	0	0	0	0	0	0
Unknown	5	3	1	1	0	0
Total	107 (1.3)	46 (2.9)	17 (1.2)	31 (1.2)	13 (0.6)	0

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 (2008)

	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	3 (1.6)	5 (2.9)	7 (2.0)	18 (2.0)	3 (0.8)	1 (0.4)	37 (1.6)
White, non-Hispanic	1 (0.6)	2 (1.4)	1 (0.4)	13 (1.3)	4 (0.7)	5 (0.8)	26 (0.9)
Black, non-Hispanic	3 (2.0)	0	0	25 (3.5)	4 (1.0)	2 (0.7)	34 (1.7)
Asian, Pac Islander, Amer. Indian, Alaska Native, non-Hispanic	2 (3.1)	1 (1.8)	0	2 (0.5)	0	0	5 (0.5)
Two or more races, non-Hispanic	0	0	0	0	0	0	0
Unknown	1	0	0	3	0	1	5
Total	10 (1.7)	8 (1.5)	8 (0.7)	61 (2.0)	11 (0.7)	9 (0.7)	107 (1.3)

Figure 4: Cryptosporidiosis, number of cases among persons living with HIV/AIDS by month of diagnosis, New York City, January 1995-December 2008

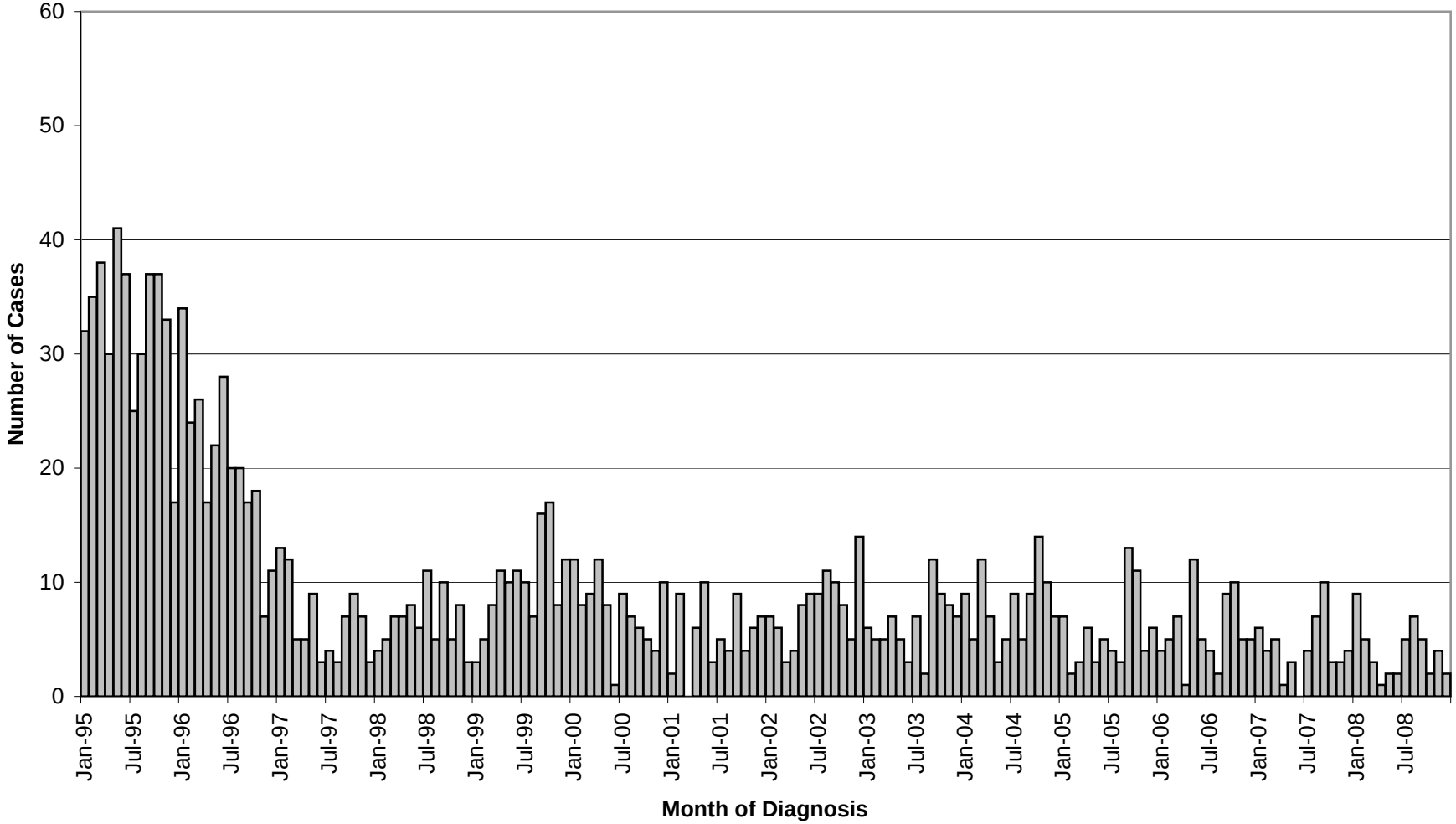


Figure 5: Cryptosporidiosis, number of cases among immunocompetent persons by month of diagnosis, New York City, January 1995-December 2008

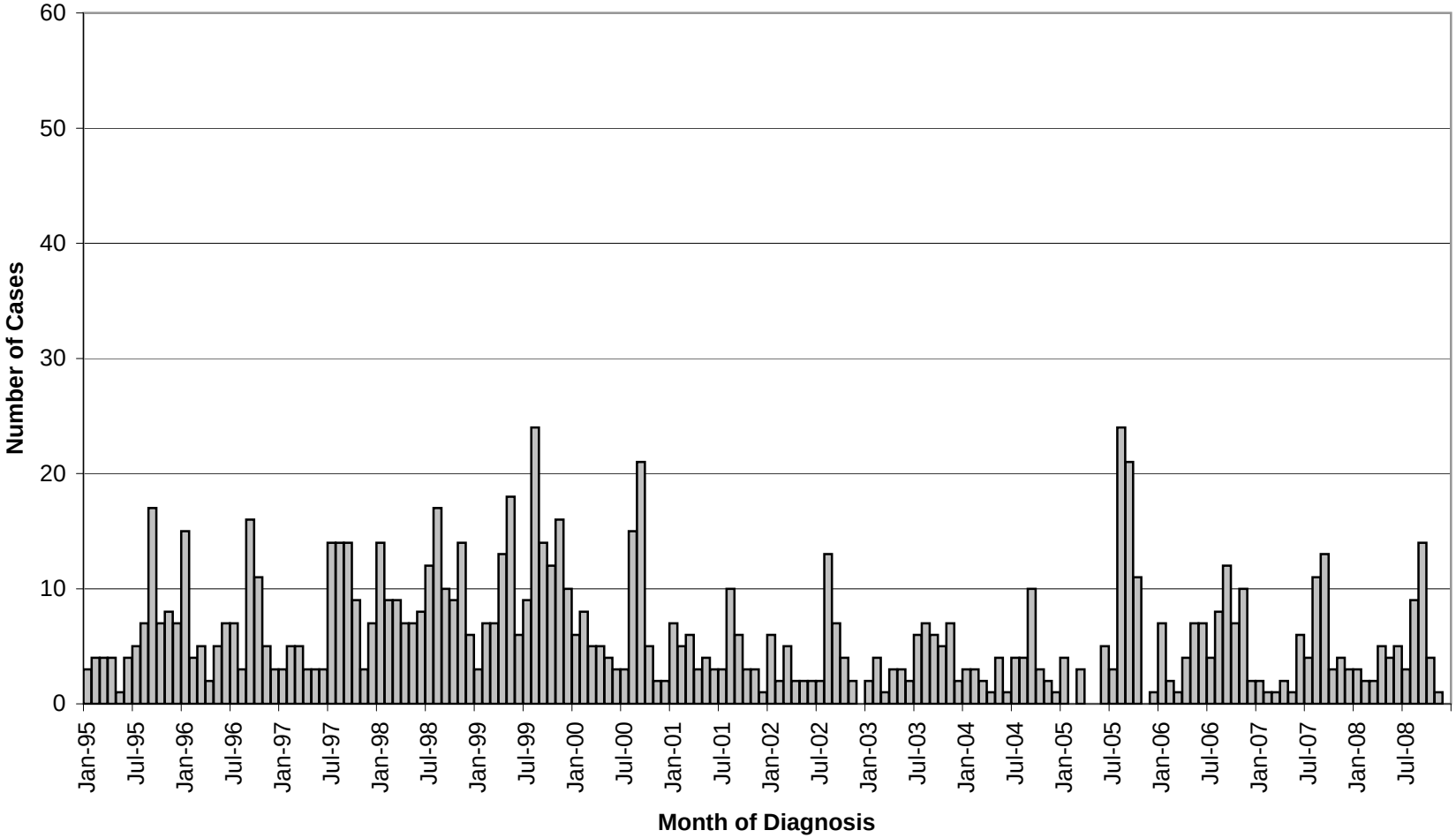


Table 14: Percentage of interviewed c**ryptosporidiosis** case-patients reporting selected potential risk exposures in the month before disease onset, persons with HIV/AIDS, New York City, 1995 - 2008.

Exposure Type	HIV/AIDS													
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008
Contact with an Animal[a]	35%	35%	33%	36%	35%	43%	24%	42%	40%	31%	33%	38%	31%	44%
High-risk Sexual Activity[b] (≥ 18 years old)	22%	22%	9%	15%	20%	25%	16%	23%	24%	34%	27%	31%	21%	39%
International Travel[c]	9%	9%	9%	13%	18%	14%	10%	11%	13%	15%	17%	9%	6%	7%
Recreational Water Contact[d]	16%	8%	16%	12%	16%	15%	8%	10%	21%	13%	5%	18%	17%	14%

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 1995-2008 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 (1997-2008).

[b] High-risk Sexual Activity - Includes having a penis, finger or tongue in sexual partner's anus (1995-2008).

[c] International Travel - Travel outside the United States (1995-2008).

[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 (1997-2008).

* 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 - 2008.

Exposure Type	Immunocompetent													
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008
Contact with an Animal[a]	42%	41%	41%	32%	35%	26%	37%	35%	23%	34%	36%	36%	34%	28%
High-risk Sexual Activity[b] (≥ 18 years old)	16%	25%	12%	10%	12%	23%	15%	30%	13%	31%	17%	3%	19%	7%
International Travel[c]	30%	29%	26%	28%	28%	40%	47%	33%	45%	47%	45%	40%	47%	52%
Recreational Water Contact[d]	21%	27%	40%	24%	22%	32%	35%	35%	34%	33%	52%	28%	36%	40%

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 1995-2008 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 (1997-2008).

[b] High-risk Sexual Activity - Includes having a penis, finger or tongue in sexual partner's anus (1995-2008).

[c] International Travel - Travel outside the United States (1995-2008).

[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 (1997-2008).

* 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 - 2008.

Exposure Type	HIV/AIDS													
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008
Plain Tap[a]	69%	70%	71%	64%	66%	63%	55%	54%	77%	49%	76%	67%	67%	64%
Filtered Tap[b]	12%	9%	10%	18%	20%	20%	14%	22%	13%	21%	7%	18%	11%	14%
Boiled Tap[c]	7%	7%	3%	5%	3%	6%	6%	0%	4%	6%	5%	7%	0%	11%
Incidental Plain Tap Only[d]	11%	15%	16%	15%	8%	12%	16%	19%	4%	15%	10%	4%	17%	7%
No Tap[e]	3%	2%	2%	0%	5%	4%	6%	4%	2%	5%	2%	2%	6%	4%

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 1995-2008 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 (5/11/2001-12/31/2008).

[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 (5/11/2001-12/31/2008).

[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 (5/11/2001-12/31/2008).

[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 (1997-2008)

[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 (1997-2008).

* 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 - 2008.

Exposure Type	Immunocompetent													
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008
Plain Tap[a]	58%	63%	58%	67%	56%	56%	43%	33%	36%	27%	30%	30%	27%	30%
Filtered Tap[b]	18%	17%	21%	21%	25%	17%	31%	44%	36%	30%	25%	20%	22%	30%
Boiled Tap[c]	11%	10%	8%	3%	4%	2%	4%	0%	2%	7%	5%	8%	4%	14%
Incidental Plain Tap Only[d]	7%	9%	12%	8%	11%	8%	16%	21%	16%	13%	25%	28%	18%	14%
No Tap[e]	2%	4%	4%	3%	7%	17%	6%	2%	9%	21%	14%	14%	27%	12%

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 1995-2008 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 (5/11/2001-12/31/2008).

[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 (5/11/2001-12/31/2008).

[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 (5/11/2001-12/31/2008).

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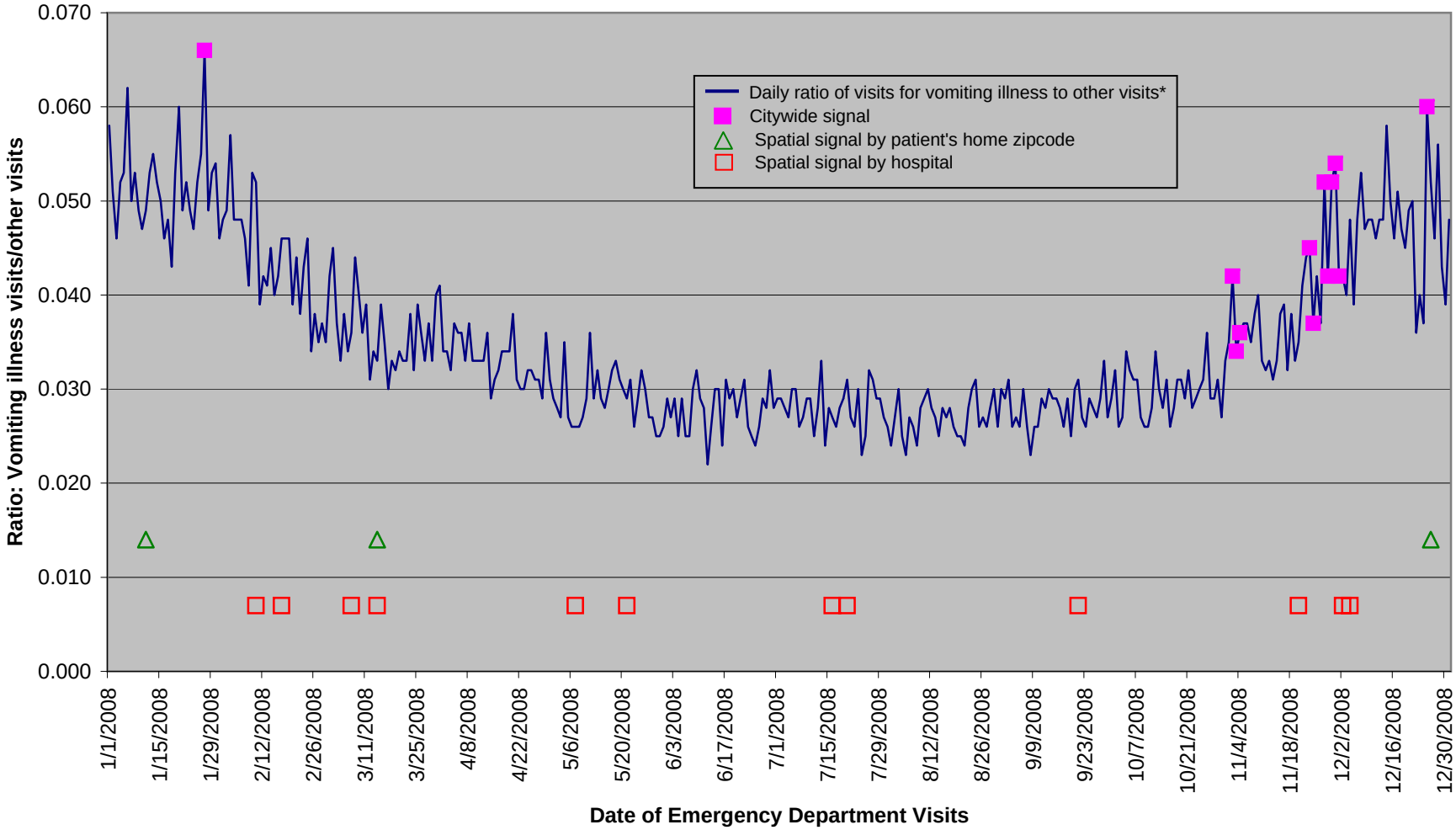
[e] No Tap - Did not drink any NYC tap water and did not use unboiled/unfiltered NYC tap water to brush teeth, or to wash vegetables/fruits, or to make ice (1995-1996); expanded to include: or to make juice from concentrate (1997-2008).

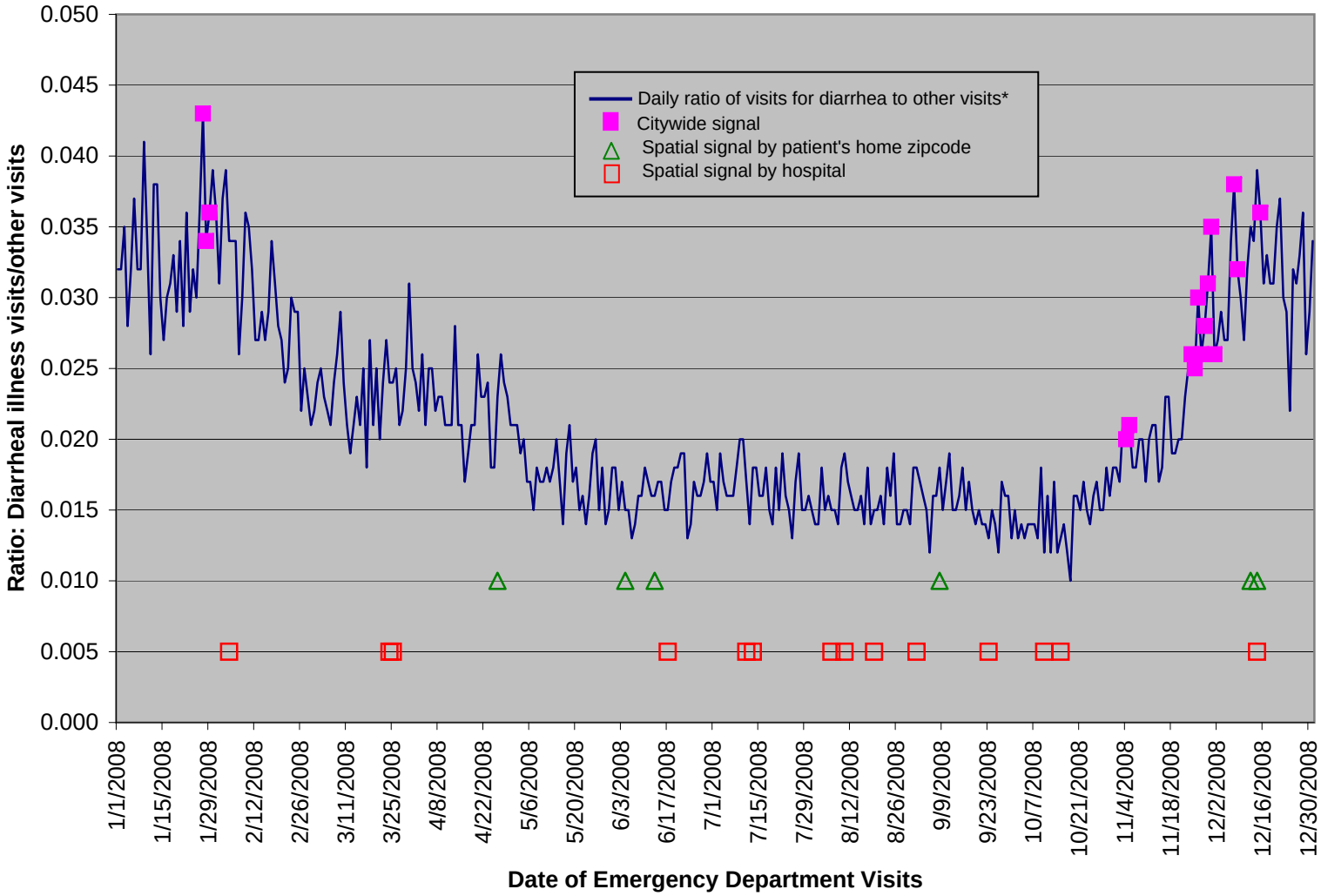
* Year 2000 percentage of interviewed cryptosporidiosis cases does not include 14 cases associated with a point source exposure at a swimming pool in Florida.

Figure 6: Emergency Department Syndromic Surveillance, trends in visits for the vomiting syndrome, New York City, January 1, 2008 - December 31, 2008



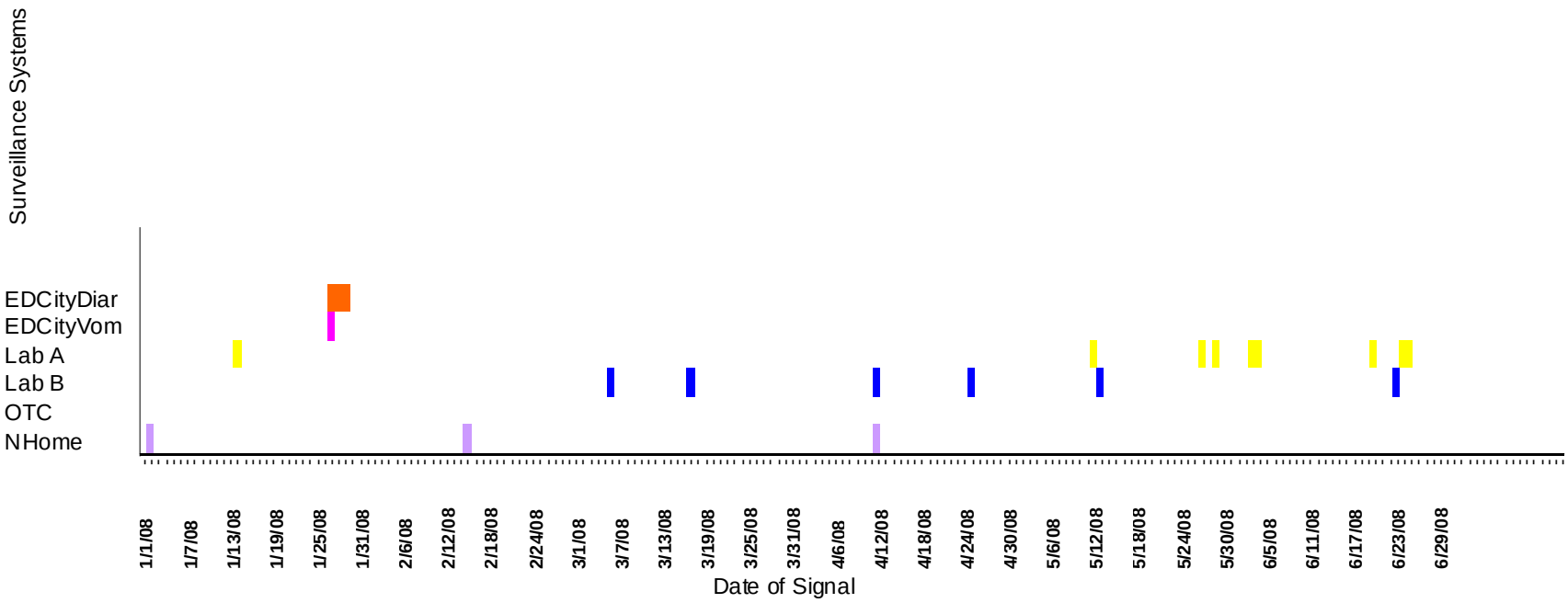
*Other visits=visits to participating ED for conditions that do not fit into one of the eight tracked syndromes (diarrhea, vomiting, respiratory, fever/influenza, asthma, sepsis, cold, rash).

Figure 7: Emergency Department Syndromic Surveillance, trends in visits for the diarrhea syndrome, New York City, January 1, 2008 - December 31, 2008



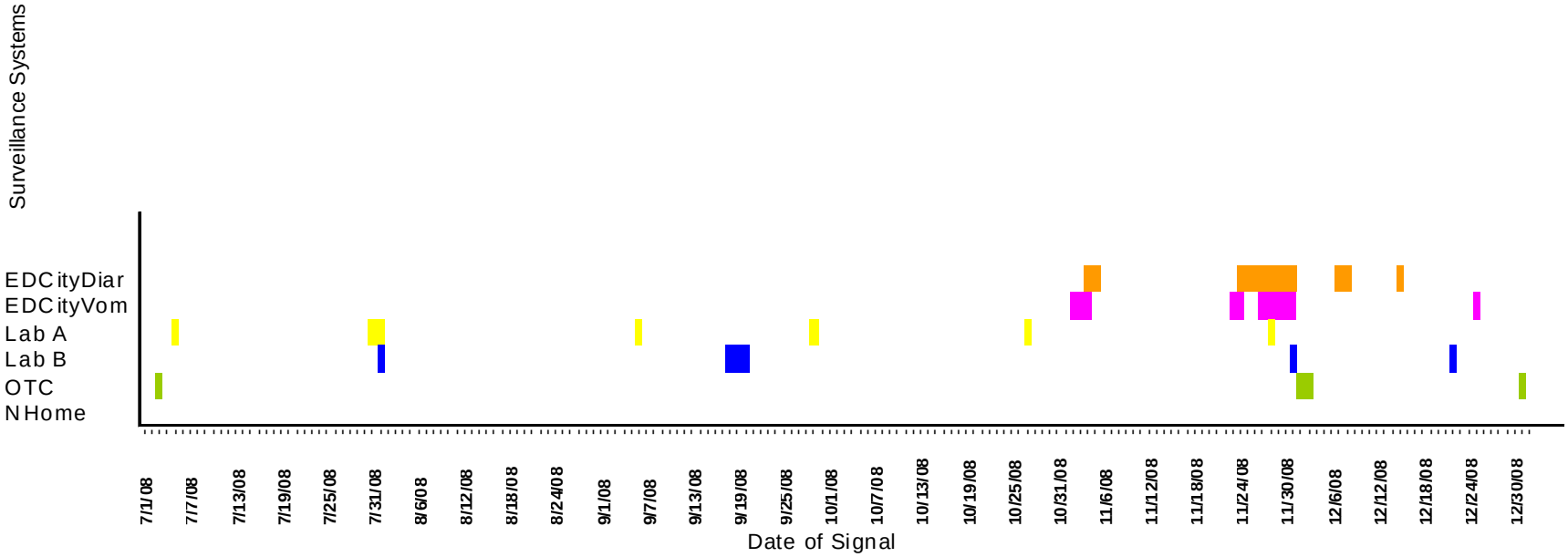
*Other visits=visits to participating ED for conditions that do not fit into one of the eight tracked syndromes (diarrhea, vomiting, respiratory, fever/influenza, asthma, sepsis, cold, rash).

Figure 8: Signals for Gastrointestinal Illness, Department of Health & Mental Hygiene, Syndromic Surveillance Systems, New York City, January 1, 2008 - June 30, 2008



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.

Figure 9: Signals for Gastrointestinal Illness, Department of Health & Mental Hygiene, Syndromic Surveillance Systems, New York City, July 1, 2008 - December 31, 2008



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OTC: Signal for daily antidiarrheal medication sales
NHome: Sentinel Nursing Home Gastrointestinal Outbreak. Indicates first day of outbreak

There are some things you would rather NOT share.

Rules for Healthy Swimming:

- Stay out of the pool if you have diarrhea or feel sick.
- Shower before swimming. Wash well with soap and water (especially the rear end).
- Take kids on bathroom breaks often.
- Change swim diapers in the bathroom - not by the pool.
- Wash your hands after using toilet or changing diapers.
- Don’t swallow pool water.

NYC Health

Special thanks to the Centers for Disease Control and Prevention • Healthy Swimming • www.cdc.gov/healthyswimming