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

2009 Annual Report

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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).

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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 ensure 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 2009.

ACTIVE DISEASE SURVEILLANCE

Active disease surveillance for giardiasis and cryptosporidiosis began in July 1993 and November 1994, respectively, and continued through 2009. This report presents the number of cases and case rates for both diseases in 2009 (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. Giaridiasis and cryptosporidiosis rates have been on a general downward trend over the years of this surveillance program. Rates in 2009 for both of these illnesses were consistent with this general trend, with 2009 rates being either equal to or lower than 2008 rates.

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 participating 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 medications: one tracks the weekly volume of sales of non-prescription anti-diarrheal medications at a major NYC store chain; and an additional pharmacy system tracks daily sales of anti-diarrheal medications at another store chain. Regarding the weekly medications monitoring program, in 2009 DEP continued with evaluation/implementation of further system enhancements. A summary of syndromic surveillance findings for 2009 pertaining to GI illness is presented. Two GI outbreaks in sentinel nursing homes in January and February, apparently due to viral agents, and sustained citywide signals in the ED system in November and December, are consistent with annual gastrointestinal viral trends. Additionally, there were multiple signals in the ED system in April and May that appear to have been related to gastrointestinal symptoms associated with 2009 pandemic influenza A (H1N1) infection. 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 at public health/medical schools in NYC, and at the 2009 American Public Health Association's Annual Conference in Philadelphia. 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 ensure 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 (BCD). 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 DOHMH BCD but does not affect WDRAP operations.

Following below is a summary of program highlights and data for the year 2009. 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 between the 1990 and 2000 US Census[1]. For the years 2000 through 2008, intercensal population estimates for each 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[2]. For 2009, the year 2008 intercensal population estimate was used because 2008 was the most recent year for which an intercensal population estimate was available. Because rates for the years 2000 through 2009 were calculated for this report using intercensal population estimates, they may differ from previously reported rates 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

[1] See https://a816-healthpsi.nyc.gov/epiquery/EpiQuery/Census/index.html
[2] See https://a816-healthpsi.nyc.gov/epiquery/EpiQuery/Census/index2001.html

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

For presentation of geographic 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.

In this report, all tables, figures and maps are presented in the back of the report. In previous WDRAP reports, certain tables (such as Tables 1, 6 and 13) were included within the text portion of the report. This formatting change was made to accommodate the growing size of these tables over the years.

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 2009. 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 2009, a total of 837 cases of giardiasis were reported to DOHMH and the annual case rate was 10.0 per 100,000. Annual case numbers decreased 0.4% from 2008 to 2009. From 1994 to 2009 annual case numbers declined 66.7% (see Table 1 and Figure 1).

As reported in the WDRAP 2008 Annual Report, the overall decrease in NYC giardiasis cases reported since 1994 has occurred in both sexes and across age groups, and does not appear to be related to the use of highly active antiretroviral therapy for treating persons living with HIV. Analysis of available laboratory data through 2006 suggests that this decrease 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, 2009. 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 837 giardiasis case-patients who resided in New York City. In addition, there were 4 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 (19.3 cases per 100,000) (Table 2). The highest

UHF neighborhood-specific case rate was found in the Chelsea-Clinton neighborhood in Manhattan (39.8 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 563 males (14.1 cases per 100,000) and 274 females (6.3 cases per 100,000) reported. The highest sex- and borough-specific case rate was observed among males residing in Manhattan (29.8 cases per 100,000) (Table 2).

Age

Information regarding age was available for 836 of 837 cases (99.9%). The highest age group-specific annual case rates were among children less than 5 years old (20.1 cases per 100,000) and children 5 to 9 years old (16.8 cases per 100,000). The highest age group- and sex-specific case rates were among males less than 5 years old (23.4 cases per 100,000), males 20-44 years old (17.8 cases per 100,000) and females 5-9 years old (17.0 cases per 100,000) (Table 4). The highest age group- and borough-specific case rates were among children less than 5 years old in Manhattan (34.5 cases per 100,000) (Table 5).

Race/Ethnicity

Information regarding race/ethnicity was available for 179 of 837 cases (21.4%). 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 2009 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 2009. 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 2009, a total of 80 cases of cryptosporidiosis were reported to DOHMH and the annual case rate was 1.0 per 100,000. Annual case numbers decreased 25.2% from 2008 to 2009. From 1995 to 2009 annual case numbers have declined 83.1% (Table 6). The number of cases diagnosed each month for the period November 1994 to December 2009 is indicated in Figure 2. Because diagnosis may occur some time after onset, information is collected in the interview regarding date of symptom onset. The date of onset can be used more accurately than date of diagnosis to estimate when case-patients were likely exposed to *Cryptosporidium*. The

number of cryptosporidiosis cases by month of onset for the period January 1995 to December 2009 is presented in Figure 3.

The following provides some highlights from the active surveillance data for cryptosporidiosis among New York City residents from January 1 through December 31, 2009. 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 (1.8 cases per 100,000) (Table 7). The highest UHF neighborhood-specific case rate was in the Chelsea-Clinton neighborhood in Manhattan (7.1 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 61 males (1.5 cases per 100,000) and 19 females (0.4 cases per 100,000) reported. The borough- and sex-specific case rate was highest for males in Manhattan (2.8 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 (1.3 cases per 100,000) and in children 5-9 years old (1.2 cases per 100,000). The highest age group- and sex-specific case rate was in males 20-44 years old (2.1 cases per 100,000) (Table 9). The highest age group and borough-specific case rates occurred in children 5-9 years old in the Bronx (2.9 cases per 100,000) and in persons 20-44 years old in Manhattan (2.7 cases per 100,000) (Table 10).

Race/Ethnicity

Race/ethnicity information was available for 78 of 80 cases (97.5%). The racial/ethnic group-specific case rate was highest among non-Hispanics of two or more races (1.9 cases per 100,000); however, there were only 2 cases in this race/ethnicity group. The next highest racial/ethnic group-specific case rate occurred among Black non-Hispanics (1.3 cases per 100,000, 26 cases). Non-Hispanics of two or more races in the Bronx had the highest race/ethnicity- and borough-specific case rate (1 case, 8.3 cases per 100,000), followed by Bronx residents in the race/ethnicity group that includes Asians, Pacific Islanders, American Indians and Alaskan Natives (3 cases, 5.7 cases per 100,000) (Table 11). The highest age group- and race/ethnicity-specific case rates occurred among 45-59 year old non-Hispanics of two or more races (1 case, 6.0 cases per 100,000), children 5-9 years old in the grouping that includes Asians, Pacific Islanders, American Indians and Alaskan Natives (2 cases, 3.3 cases per 100,000), 20-44 year old non-Hispanics of two or more races (1 case, 2.6 cases per 100,000), and 20-44 year old Black non-Hispanics (16 cases, 2.3 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 43 in 2009, thus causing a decline in the overall number of cryptosporidiosis cases in New York City. However, during the years 1995 through 2009, the number of cases of cryptosporidiosis among immunocompetent persons has shown less variation, ranging from 32 cases in 2009 to 139 cases in 1999 (see Figures 4 and 5 and Table 13).

An analysis of trends using a Poisson regression model demonstrates a significant decline in rates of cryptosporidiosis, from 1995-2009, among patients who are immunocompromised due to HIV/AIDS ($P<.01$). This decline is generally thought to be due to highly active antiretroviral therapy 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 2009 was significantly greater in patients who were immunocompromised than in those who were not ($P<.01$).

Cryptosporidiosis and Potential Risk Exposures

Of the 80 cryptosporidiosis cases diagnosed among NYC residents in 2009, questionnaires concerning potential exposures were completed in 58 (72.5%) cases. Reasons for non-completion of questionnaires were: unable to locate case-patient (16 cases, 20%), refused (1 case, 1.3%), unable to interview due to incapacitating illness (1 case, 1.3%) and died (4 cases, 5%). Of the immunocompetent case-patients, interviews were completed for 29 case-patients (90.6%). Among persons with HIV/AIDS, interviews were completed for 26 case-patients (60.5%). Summary data for 1995 through 2009 on commonly reported potential risk exposures, obtained from case-patient interviews of persons with HIV/AIDS and from interviews of persons who are immunocompetent, are presented in Tables 14 and 15, respectively. Information has also been collected regarding type of tap water consumption, and is presented in Tables 16 and 17. Tables 14 to 17 indicate the percentage of case-patients who reported engaging in each of the listed potential risk exposures for cryptosporidiosis during the month before disease onset. However, it must be noted that the determination of an association between exposure to possible risk factors for cryptosporidiosis and acquisition of cryptosporidiosis cannot be made without reference to a suitable control population (i.e., non-*Cryptosporidium*-infected controls). As exposure data for a control population are not available, such determinations of association cannot be made.

Though no conclusions about association can be reached, in an attempt to assess if there are any patterns of interest, data has been compared between patients who are immunocompromised due to HIV/AIDS and patients who are immunocompetent. Looking at four potential risk categories from Tables 14 and 15 using the chi-square test for comparison of data since 2001, the following results were observed. Patients who were immunocompetent were significantly more likely to report international travel in all years ($P< .01$), and to report exposure to recreational water 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, $P<.05$; 2009, $P<.01$). There was no statistically significant difference between these two groups in the proportion of cases reporting animal contact in 2001 to 2009, or reporting high-risk sex in 2001 to 2005, 2007 and 2009. 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 have recreational water exposure than immunocompromised case-patients. International travel and exposure to recreational water may be more likely risk factors for the acquisition of cryptosporidiosis in the immunocompetent group. However, as noted above, the extent to which these risk factors may have been associated with cryptosporidiosis 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 store chain (referred to as the ADM system). An additional pharmacy system tracks daily sales at another 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 2009 is provided in the final section of this part, on pages 9 to 12.

Nursing Home Sentinel Surveillance

The nursing home surveillance system began in March 1997 and was significantly modified in August 2002. Under the current protocol, 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 designated WDRAP team members working in the DOHMH BCD. 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 testing for bacterial culture and sensitivity, ova and parasites, *Cryptosporidium* and viruses. DOHMH 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 Wadsworth Center Virology Laboratory 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 October and November 2009, a WDRAP team 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 verified that the nursing homes had adequate stool collection supplies on hand. All participating nursing homes are visited at least once a year to help ensure compliance with the program protocol.

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 2009. Frequency of data transmission was 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[3]. 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 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.

As discussed in the 2008 WDRAP Annual Report, significant enhancements to the ADM system were initiated in 2008. Not all data enhancements were utilized immediately due to the need for numerous program adjustments and evaluations to accommodate these improvements. In 2009, DEP continued to follow its weekly analysis and reporting protocol per historical practice, and additionally, in the case of unexplained signals of potential concern in other surveillance systems, DEP implemented the use of its newly enhanced daily dataset and CDC's Early Aberration Reporting System (EARS) analysis program as an additional analysis to the standard weekly one. Also, in 2009 DEP continued evaluation and program adjustments toward the goal of implementing the above system enhancements on a routine basis, rather than just in response to unexplained signals in other systems.

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 store 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

[3] 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.

the non-prescription medications for monitoring diarrheal illness in the OTC system, and therefore the prescription sales data of diarrheal medications are not routinely analyzed. 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.

Hospital Emergency Department Monitoring

NYC initiated monitoring of hospital emergency department visits as a public health surveillance system in 2001. At the start of 2009, DOHMH received electronic data from 52 of a total of 57 New York City emergency departments (EDs). By the end of the year, 50 of 55 EDs operating in NYC were participating in ED Syndromic Surveillance. (Two NYC EDs closed during 2009, and thus dropped out of the system). Currently DOHMH receives electronic data from 50 of New York City's 55 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 public 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 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 2009. Figure 6 shows a graphic representation of the ratio of daily ED visits for the vomiting syndrome to all other daily ED visits for syndromes not tracked by ED syndromic surveillance ("other visits") from January 1 to December 31, 2009. 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. Figures 6 and 7 indicate that there were no citywide signals for diarrhea or vomiting until late April. From April 27 through May 2, there were citywide signals for the diarrhea syndrome, as well as one citywide signal for the vomiting syndrome on May 3. Single-day citywide signals for the diarrhea syndrome next occurred on May 21 and May 25. These signals appear to have been related to the initial occurrence in NYC of 2009 pandemic influenza A (H1N1) infection, which may lead to gastrointestinal symptoms in 30 to 40% of patients[4]. Throughout this time, there were also sustained citywide signals in the ED system for the syndromes of fever/influenza and respiratory illness related to 2009 H1N1 influenza. Interviews conducted in early May of NYC residents with mild illness due to confirmed 2009 H1N1 influenza (n=108) indicated that over one third reported gastrointestinal symptoms, including diarrhea (reported by 30% of respondents)[5].

Citywide signals for vomiting and diarrhea next occurred primarily in November and December. There were citywide diarrhea signals from November 13 to November 15 and from November 29 to November 30, and citywide vomiting signals from November 28 to November 29. During this time, there were hospital location diarrhea signals from November 20 to November 21, occurring in a UHF neighborhood in Manhattan, the Upper East Side. In December, there were citywide diarrhea signals from December 26 to December 28 and citywide vomiting signals from December 20 to December 23 and from December 25 to December 27. ED signals for vomiting and diarrhea occurring in November and December are consistent with NYC's historical experience with seasonal norovirus and rotavirus outbreaks.

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, 2009, 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 in Figures 8 and 9. As discussed above, there was citywide ED system signaling in late April and May, likely related to 2009 H1N1 influenza, and again in November and December, consistent with norovirus and rotavirus seasons. There were three GI outbreaks in sentinel nursing homes in 2009. Two sentinel nursing home GI outbreaks occurred in January. For one January nursing home outbreak the causative pathogen appears to have been human calicivirus, and for the other the suspected pathogen was *Clostridium difficile*. A third nursing home outbreak, which occurred in February, appears to have been caused by calicivirus, genus norovirus. Details are presented below. In the OTC system, there were signals during the period April 7 to April 9 which appear

[4] See, for example, Jain S et al. Hospitalized Patients with 2009 H1N1 Influenza in the United States, April-June 2009. *The New England Journal of Medicine*. 2009; 361(20): 1935-1944.

[5] See 2009 NYCDOHMH Health Alert #17: Novel H1N1 Influenza Update May 12, 2009. Available at: http://nyc.gov/html/doh/downloads/pdf/cd/2009/09md17.pdf

to have been related to a mild increase in the sale of bismuth products on April 7. The sale of loperamide products remained at baseline. There were OTC system signals again on May 18 to May 19, which may have been due to gastrointestinal illness associated with 2009 H1N1 influenza. The OTC system next signaled July 2 to July 4, due to an increase in antidiarrheal medication sales on July 2. Such an increase has generally been noted around the July 4 holiday. Sustained signaling in the OTC system next occurred in late December during the holiday season. 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 the Bronx, beginning on January 3. Eleven patients on one unit were affected, and symptoms were nausea, vomiting and diarrhea. There was one hospitalization and no deaths. The facility sent 18 stool specimens from five patients to the Public Health Laboratory for testing. Six specimens were tested for ova and parasites, including *Cryptosporidium*, six for bacterial pathogens, and six 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 were reported as positive for calicivirus by polymerase chain reaction.

The second GI outbreak occurred in a sentinel nursing home in Queens beginning on January 25. Thirty-seven patients and 12 staff members were affected. Symptoms were diarrhea, nausea and vomiting. There were two hospitalizations and no deaths. The facility notified DOHMH BCD of the outbreak, but the BCD staff member who took the call did not realize that the facility was a sentinel nursing home, and referred the caller to NYSDOH. Consequently stool specimens were collected, but were sent to an affiliated hospital laboratory rather than to the Public Health Laboratory. Fourteen specimens were tested for *C. difficile*, and six specimens were tested for other bacterial pathogens. No specimens were tested for ova and parasites or for virus. Five specimens were found to be positive for *C. difficile*. Specimens tested for other bacteria were negative. To prevent a recurrence of a failure to appropriately respond to a report of an outbreak in a sentinel nursing home site, the following actions were taken:

- On November 30, 2009, a WDRAP team member working in DOHMH BCD notified staff members at the NYSDOH Metropolitan Area Regional Office who are responsible for responding to GI outbreaks among NYC nursing homes of the Sentinel Nursing Home Program rationale and protocol and of participating facilities.
- On December 29, 2009, all clinicians and supervisors at DOHMH BCD who may receive notification of a GI outbreak in a NYC nursing home were provided with a list of nursing homes currently participating in sentinel surveillance, and with the program protocol.
- On January 12, 2010 the Nursing Home Sentinel Surveillance Program was discussed during the weekly outbreak meeting of the DOHMH BCD.

The third GI outbreak occurred in a sentinel nursing home in Manhattan, beginning on February 23. Thirteen residents were affected. Symptoms were vomiting, diarrhea, and abdominal pain. There were no deaths or hospitalizations. At the time of the outbreak, the facility did not notify DOHMH BCD. Consequently stool specimens were sent to laboratories other than the Public Health Laboratory. Eleven specimens were tested for bacterial pathogens other than *C. difficile*, nine for virus, eight for *C. difficile*, and three for ova and parasites. Ova and parasite testing did not include testing for *Cryptosporidium*. All results were negative,

except viral testing results which indicated that seven specimens were "positive for norovirus antigen," thus suggesting that the outbreak was due to norovirus. With regard to enhancing compliance with program protocol, on March 4 a WDRAP team member in DOHMH BCD reviewed the sentinel nursing home protocol with the Assistant 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. On October 27, a DOHMH BCD WDRAP team member made a site visit to this nursing home and met with the Director of Infection Control and all Infection Control staff members to review the Sentinel Nursing Home protocol.

With regard to the ADM system, during this reporting period there were no major spikes in ADM sales. However, there were some weeks in which sales appeared slightly above background range (i.e., based upon a retrospective review of all 2009 weekly data). These included the weeks ending January 3, February 21, and August 8. Citywide ADM sales in 2009 for loperamide and non-loperamide products combined were highest during the week ending January 3, which may be due to the seasonal trend of increased enteric virus cases seen in winter months, or to illness associated with the New Year holiday. The seasonal gastrointestinal virus trend may also account for the higher citywide sales seen during the week ending February 21; however, based on ED system trends, GI illness in late February, while still elevated, seemed to be on the decline (see Figures 6 and 7). Elevated sales during the week ending August 8 did not correspond with multiple signals in other syndromic surveillance systems, and therefore appear to reflect some factor other than community GI illness.

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 and February, and somewhat lower averages throughout 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 2009, there were multiple citywide signals for gastrointestinal illness in the ED system in late April and in May. Sustained signaling also occurred in the OTC system in May. Concurrent signals in late April and May appear to be related to a gastrointestinal illness component of 2009 H1N1 influenza infection. Two GI outbreaks in sentinel nursing homes in January and February, which appear to have been caused by human calicivirus, along with sustained citywide signals in the ED system in November and December, are consistent with annual gastrointestinal viral trends. 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 2009. Over the year, program staff participated in presentations to discuss the City's Waterborne Disease Risk Assessment Program and related issues. Educational outreach in 2009 included presentations by DOHMH representatives at public health/medical schools located in NYC, and a presentation by a DEP representative in Philadelphia in November 2009 at the annual American Public Health

Association conference. Such talks serve to enhance awareness of waterborne diseases, and also may lead to more complete disease diagnosis and reporting.

Information pertaining to NYC's Waterborne Disease Risk Assessment Program and related issues continue 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

- *Recreational Water Illness Prevention fact sheet*
  http://www.nyc.gov/html/doh/html/cd/rwn.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, 2007, 2008 and 2009 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, 2007, 2008 and 2009 New York City Drinking Water Supply and Quality Statement (Planned posting date for the 2009 report is May 31, 2010.)*
  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 2009

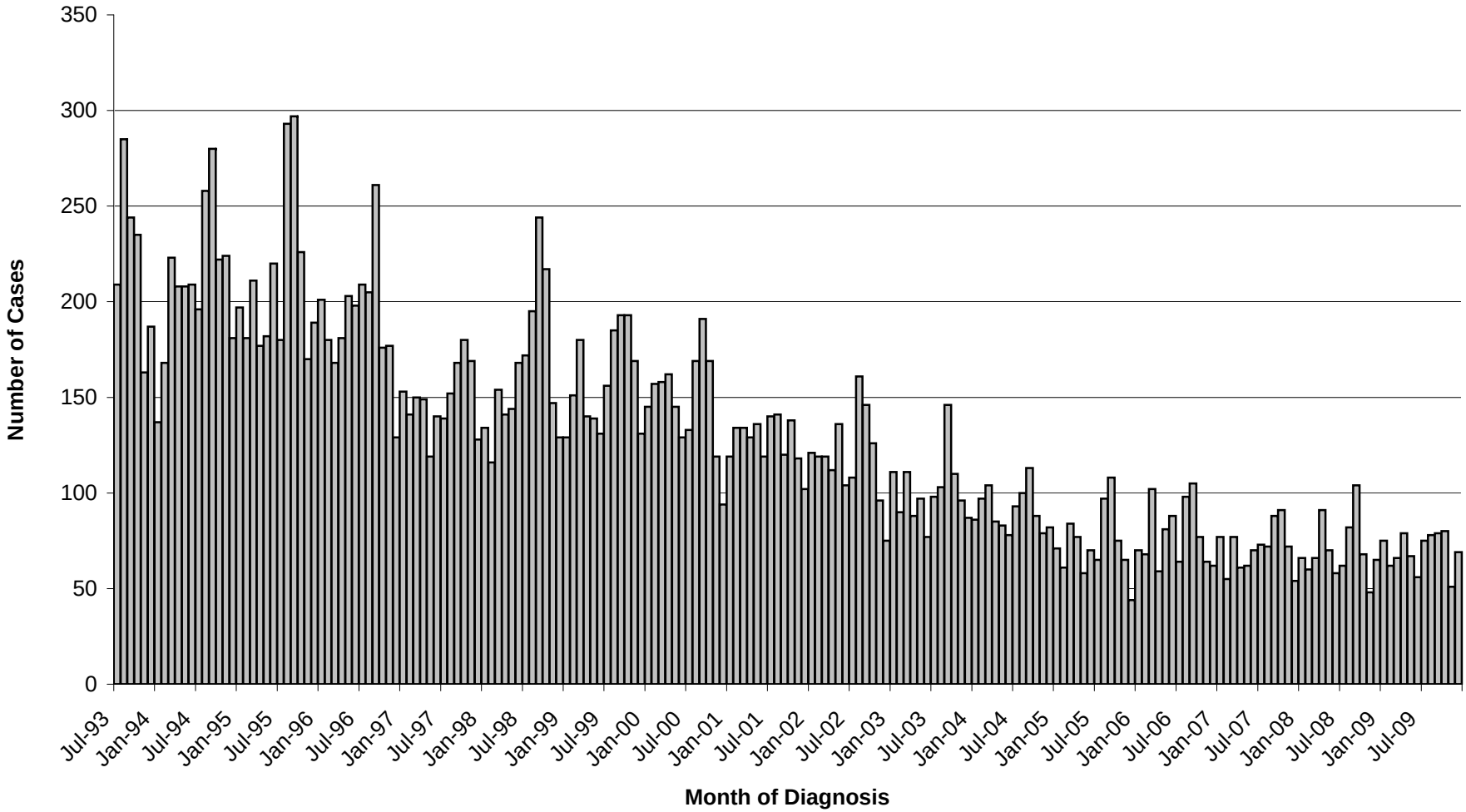


TABLE 1: **Giardiasis**, number of cases and case rates, active disease surveillance, New York City, 1994 - 2009

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	19.0
2002	1,423	17.6
2003	1,214	15.0
2004	1,088	13.4
2005	875	10.7
2006	938	11.4
2007	852	10.3
2008	840	10.0
2009	837	10.0

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 (2009)

	Borough of residence					
Sex	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Male	563	233	66	142	113	9
	(14.1)	(29.8)	(10.1)	(11.8)	(10.1)	(3.8)
Female	274	82	40	72	70	10
	(6.3)	(9.6)	(5.4)	(5.3)	(5.9)	(4.0)
Total	837	315	106	214	183	19
	(10.0)	(19.3)	(7.6)	(8.4)	(8.0)	(3.9)

Map 1

Giardiasis annual case rate per 100,000 population by UHF neighborhood - Active surveillance data for New York City (2009)

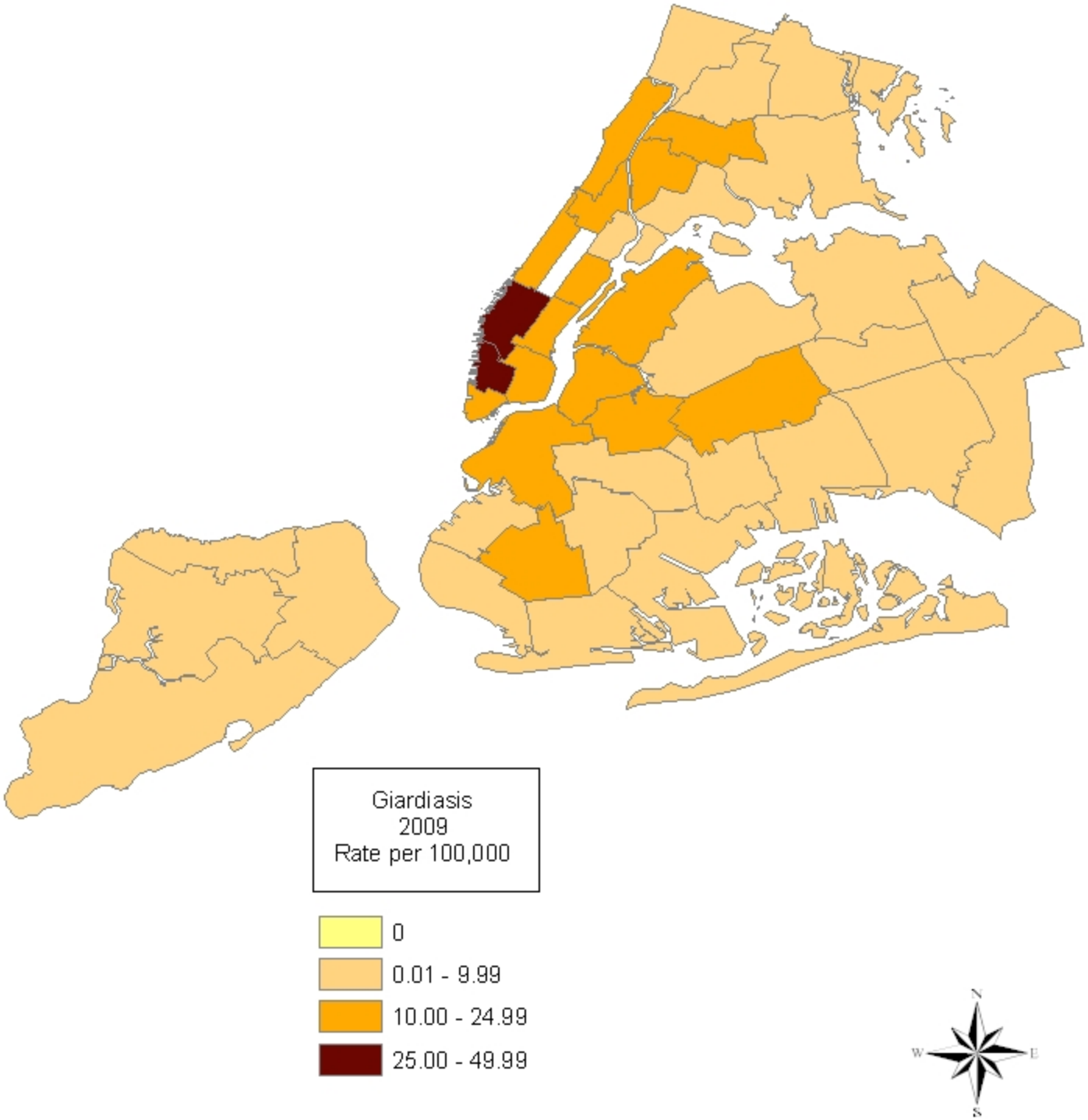


Table 3: Giardiasis, number of cases and annual case rate per 100,000 by UHF neighborhood of residence - active surveillance in New York City (2009)*

UHF Neighborhood	Borough	Number	Population	Rate
Chelsea-Clinton	Manhattan	56	140822	39.8
Greenwich Village-Soho	Manhattan	27	94324	28.6
Lower Manhattan	Manhattan	9	37168	24.2
Upper West Side	Manhattan	56	245133	22.8
Gramercy Park-Murray Hill	Manhattan	28	136696	20.5
Long Island City-Astoria	Queens	43	222673	19.3
Greenpoint	Brooklyn	25	136024	18.4
C Harlem-Morningside Hgts	Manhattan	25	142910	17.5
Union Sq-Lower East Side	Manhattan	37	216765	17.1
Downtown-Heights-Slope	Brooklyn	37	225670	16.4
Upper East Side	Manhattan	36	247145	14.6
High Bridge-Morrisania	Bronx	26	206046	12.6
Borough Park	Brooklyn	41	346205	11.8
Williamsburg-Bushwick	Brooklyn	24	202686	11.8
Washington Heights-Inwood	Manhattan	30	259708	11.6
Ridgewood-Forest Hills	Queens	26	237164	11.0
Crotona-Tremont	Bronx	23	212303	10.8
West Queens	Queens	48	511581	9.4
East Harlem	Manhattan	10	106809	9.4
Fordham-Bronx Park	Bronx	20	259424	7.7
Bensonhurst-Bay Ridge	Brooklyn	16	209242	7.6
Flushing-Clearview	Queens	19	276171	6.9
East Flatbush-Flatbush	Brooklyn	21	310616	6.8
East New York	Brooklyn	12	179174	6.7
Southwest Queens	Queens	18	275149	6.5
Pelham-Throgs Neck	Bronx	19	297585	6.4
Kingsbridge-Riverdale	Bronx	5	86309	5.8
Bayside-Littleneck	Queens	5	89847	5.6
Bed Stuyvesant-Crown Hgts	Brooklyn	17	313876	5.4
Hunts Point-Mott Haven	Bronx	7	136347	5.1
Stapleton-St. George	Stat Is	6	131323	4.6
Rockaway	Queens	5	109628	4.6
Jamaica	Queens	13	289100	4.5
South Beach-Tottenville	Stat Is	8	191893	4.2
Sunset Park	Brooklyn	5	127997	3.9
Coney Island-Sheepshead Bay	Brooklyn	11	305900	3.6
Willowbrook	Stat Is	3	90399	3.3
Northeast Bronx	Bronx	6	188507	3.2
Fresh Meadows	Queens	3	94719	3.2
Canarsie-Flatlands	Brooklyn	5	199208	2.5
Southeast Queens	Queens	3	199672	1.5
Port Richmond	Stat Is	1	73792	1.4

*This table does not include two cases of giardiasis, one occurring in a Manhattan resident, and one in a Staten Island 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 (2009)

	Sex		
Age group	Male number (rate)	Female number (rate)	Total number (rate)
<5 years	69 (23.4)	47 (16.7)	116 (20.1)
5-9 years	44 (16.6)	43 (17.0)	87 (16.8)
10-19 years	33 (6.2)	31 (6.0)	64 (6.1)
20-44 years	273 (17.8)	99 (6.2)	372 (11.8)
45-59 years	99 (12.6)	36 (4.2)	135 (8.2)
≥ 60 years	45 (7.7)	17 (2.0)	62 (4.3)
Unknown	0	1	1
Total	563 (14.1)	274 (6.3)	837 (10.0)

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 (2009)

	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	116	34	13	36	29	4
	(20.1)	(34.5)	(11.8)	(18.7)	(20.0)	(13.7)
5-9 years	87	10	27	16	33	1
	(16.8)	(12.4)	(26.3)	(9.3)	(24.7)	(3.3)
10-19	64	12	13	17	21	1
years	(6.1)	(8.8)	(5.8)	(4.8)	(7.7)	(1.5)
20-44	372	172	35	93	68	4
years	(11.8)	(24.1)	(6.9)	(10.1)	(8.1)	(2.4)
45-59	135	66	11	34	19	5
years	(8.2)	(20.6)	(4.5)	(6.9)	(3.9)	(4.7)
≥ 60	62	21	7	18	13	3
years	(4.3)	(7.3)	(3.4)	(4.2)	(3.1)	(3.5)
Unknown	1	0	0	0	0	1
Total	837	315	106	214	183	19
	(10.0)	(19.3)	(7.6)	(8.4)	(8.0)	(3.9)

Table 6: Cryptosporidiosis, number of cases and case rates, active disease surveillance, New York City, 1994 – 2009

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
2008	107	1.3
2009	80	1.0

* Active disease surveillance began in November 1994.

Figure 2: Cryptosporidiosis, number of cases by month of diagnosis, active surveillance, New York City, November 1994 - December 2009

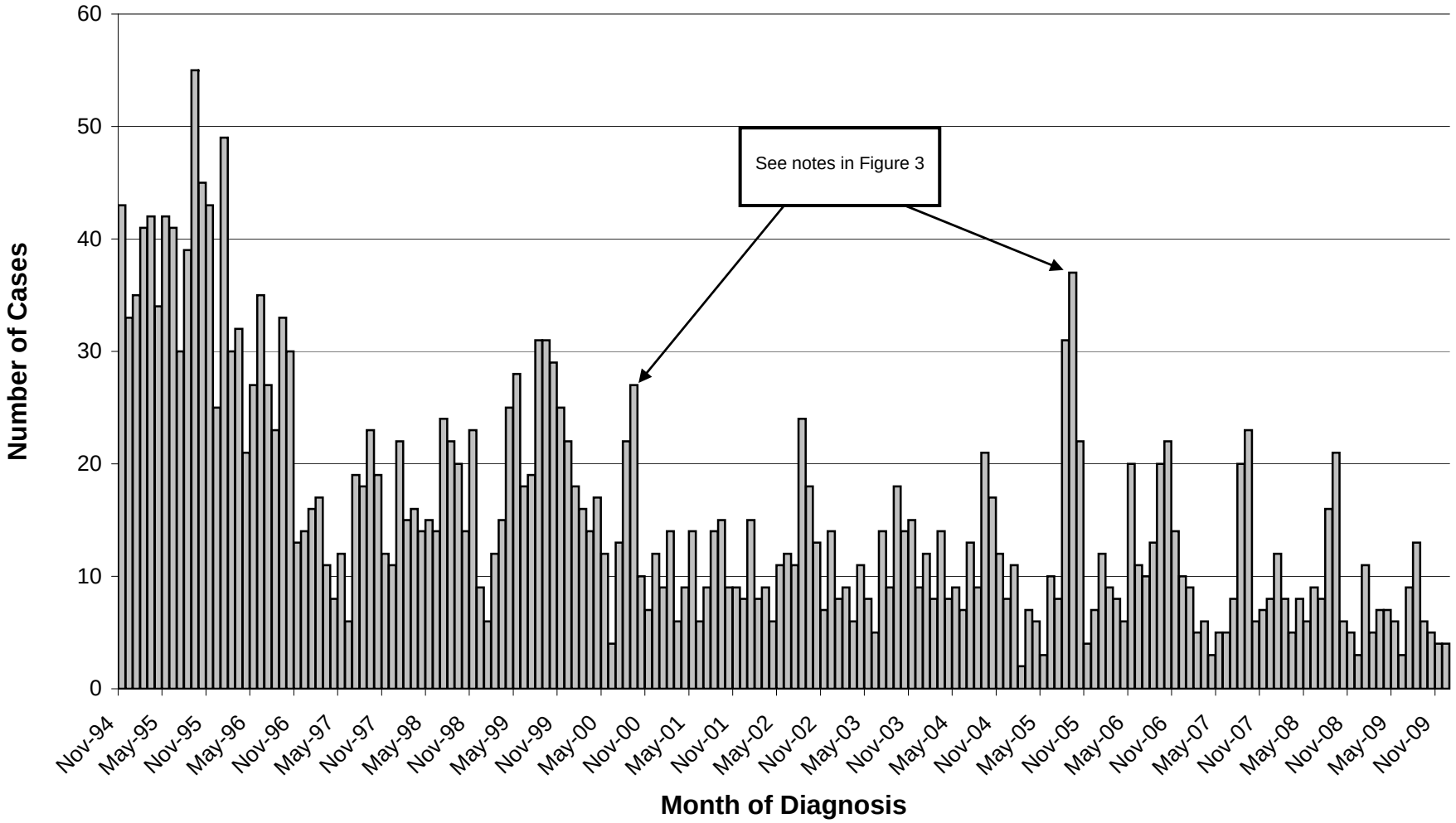
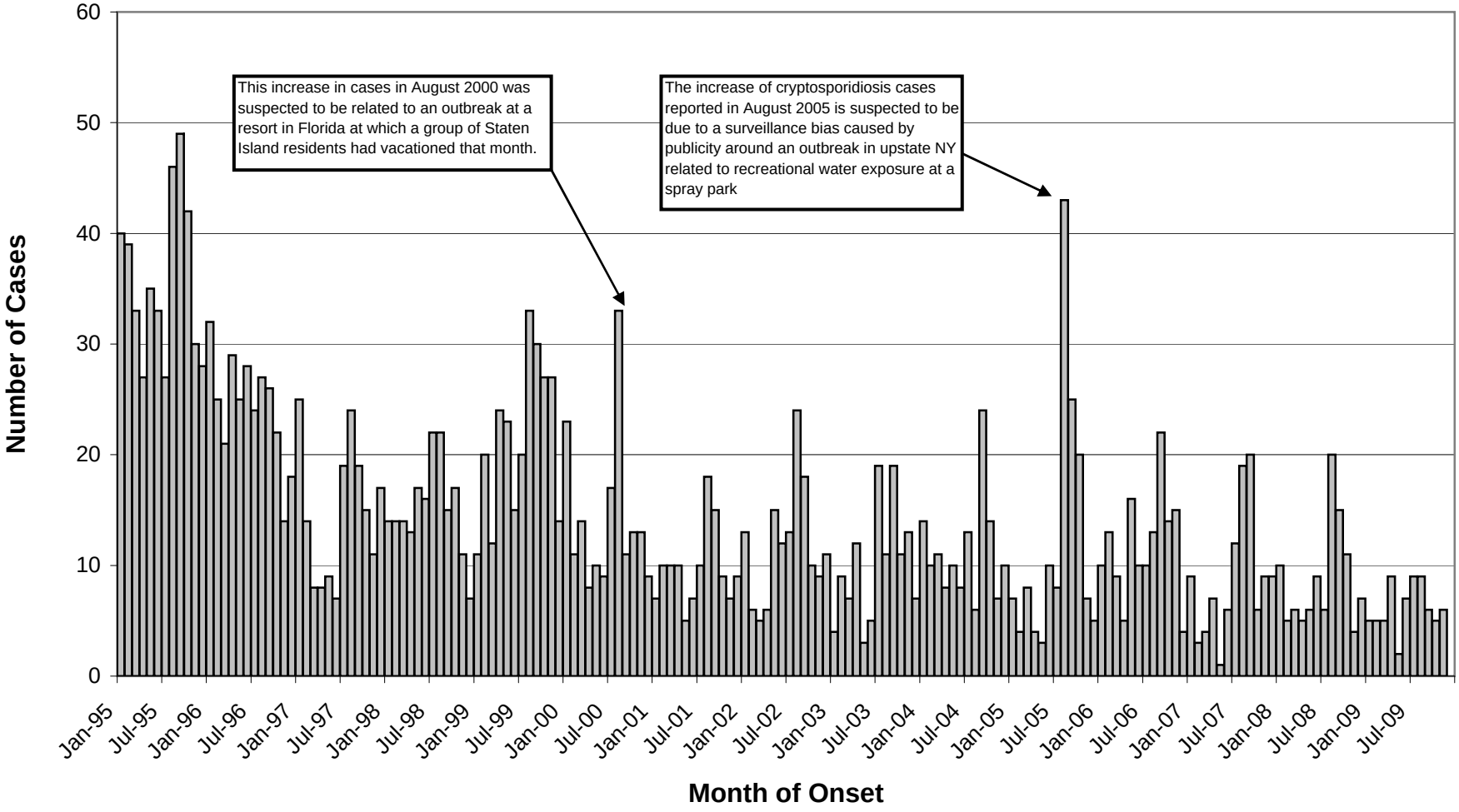


Figure 3: Cryptosporidiosis, number of cases by month of onset, active surveillance, New York City, January 1995 - December 2009*



* 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 (2009)

	Borough of residence					
Sex	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Male	61	22	11	20	8	0
	(1.5)	(2.8)	(1.7)	(1.7)	(0.7)	
Female	19	7	3	3	6	0
	(0.4)	(0.8)	(0.4)	(0.2)	(0.5)	
Total	80	29	14	23	14	0
	(1.0)	(1.8)	(1.0)	(0.9)	(0.6)	

Map 2

Cryptosporidiosis annual case rate per 100,000 population
by UHF neighborhood - Active surveillance data for
New York City (2009)

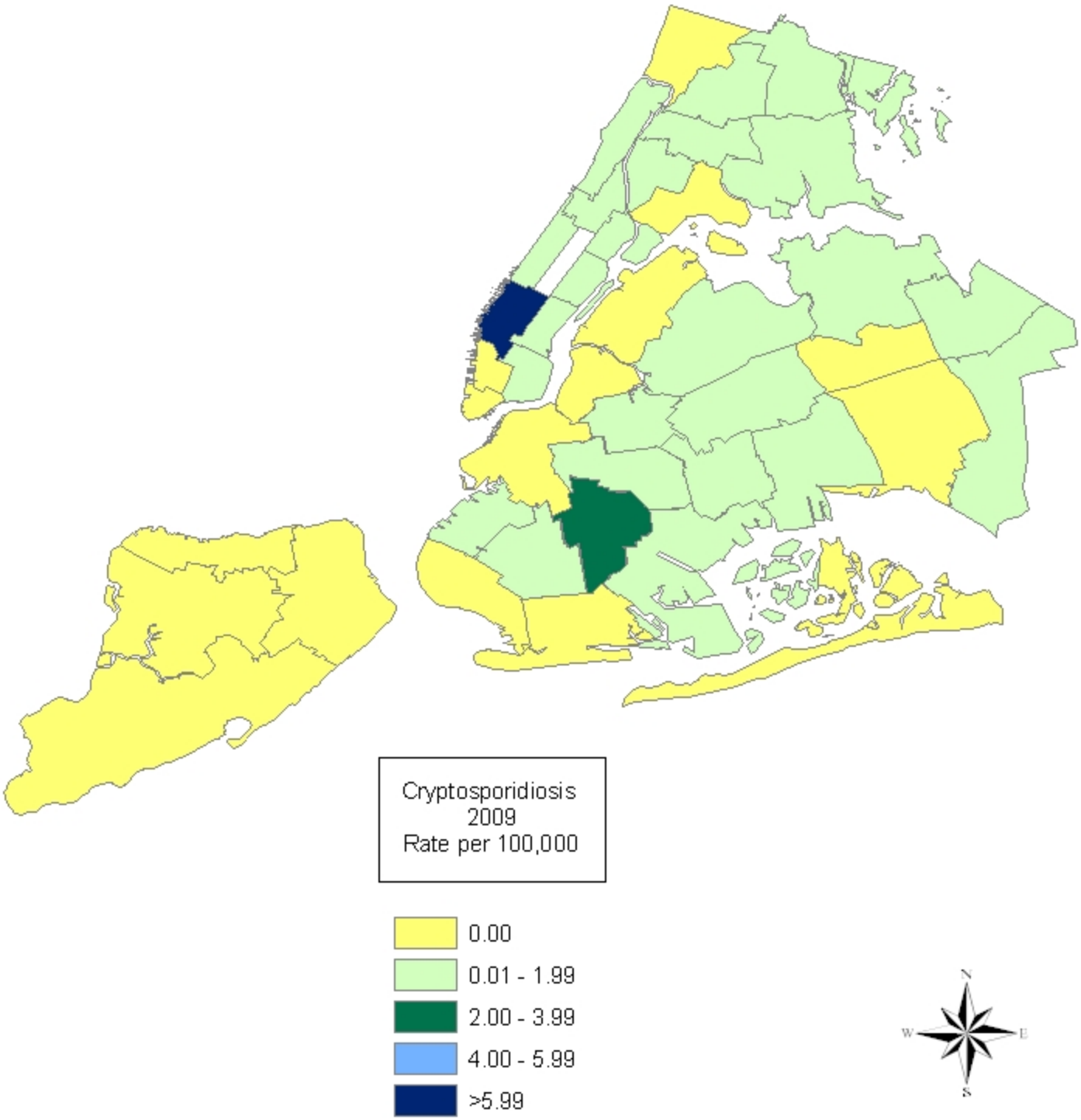


TABLE 8: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by UHF neighborhood of residence - active surveillance in New York City (2009)

UHF Neighborhood	Borough	Number	Population	Rate
Chelsea-Clinton	Manhattan	10	140822	7.1
East Flatbush-Flatbush	Brooklyn	7	310616	2.3
Williamsburg-Bushwick	Brooklyn	4	202686	2.0
High Bridge-Morrisania	Bronx	4	206046	1.9
Washington Heights-Inwood	Manhattan	5	259708	1.9
Bed Stuyvesant-Crown Hgts	Brooklyn	6	313876	1.9
Union Sq-Lower East Side	Manhattan	4	216765	1.8
Ridgewood-Forest Hills	Queens	4	237164	1.7
Northeast Bronx	Bronx	3	188507	1.6
Fordham-Bronx Park	Bronx	4	259424	1.5
C Harlem-Morningside Hgts	Manhattan	2	142910	1.4
Upper West Side	Manhattan	3	245133	1.2
Upper East Side	Manhattan	3	247145	1. 2
East New York	Brooklyn	2	179174	1.1
Bayside-Littleneck	Queens	1	89847	1.1
Flushing-Clearview	Queens	3	276171	1.1
Canarsie-Flatlands	Brooklyn	2	199208	1.0
East Harlem	Manhattan	1	106809	0.9
West Queens	Queens	4	511581	0.8
Sunset Park	Brooklyn	1	127997	0.8
Gramercy Park-Murray Hill	Manhattan	1	136696	0.7
Pelham-Throgs Neck	Bronx	2	297585	0.7
Southeast Queens	Queens	1	199672	0.5
Crotona-Tremont	Bronx	1	212303	0.5
Southwest Queens	Queens	1	275149	0.4
Borough Park	Brooklyn	1	346205	0.3

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 (2009)

	Sex		
Age group	Male number (rate)	Female number (rate)	Total number (rate)
<5 years	5 (1.7)	1 (0.4)	6 (1.0)
5-9 years	4 (1.5)	2 (0.8)	6 (1.2)
10-19 years	3 (0.6)	2 (0.4)	5 (0.5)
20-44 years	33 (2.1)	7 (0.4)	40 (1.3)
45-59 years	13 (1.7)	4 (0.5)	17 (1.0)
≥ 60 years	3 (0.5)	3 (0.4)	6 (0.4)
Total	61 (1.5)	19 (0.4)	80 (1.0)

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 (2009)

	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	6 (1.0)	2 (2.0)	2 (1.8)	1 (0.5)	1 (0.7)	0
5-9 years	6 (1.2)	0	3 (2.9)	1 (0.6)	2 (1.5)	0
10-19 years	5 (0.5)	0	1 (0.4)	1 (0.3)	3 (1.1)	0
20-44 years	40 (1.3)	19 (2.7)	2 (0.4)	16 (1.7)	3 (0.4)	0
45-59 years	17 (1.0)	6 (1.9)	5 (2.0)	4 (0.8)	2 (0.4)	0
≥ 60 years	6 (0.4)	2 (0.7)	1 (0.5)	0	3 (0.7)	0
Total	80 (1.0)	29 (1.8)	14 (1.0)	23 (0.9)	14 (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 (2009)

	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	22 (1.0)	8 (2.0)	5 (0.7)	3 (0.6)	6 (1.0)	0
White, non-Hispanic	24 (0.8)	14 (1.7)	0	3 (0.3)	7 (1.0)	0
Black, non-Hispanic	26 (1.3)	6 (2.7)	3 (0.7)	17 (2.0)	0	0
Asian, Pac Islander, Amer Indian, Alaska Native, non-Hispanic	4 (0.4)	0	3 (5.7)	0	1 (0.2)	0
Two or more races, non-Hispanic	2 (1.9)	1 (4.4)	1 (8.3)	0	0	0
Unknown	2	0	2	0	0	0
Total	80 (1.0)	29 (1.8)	14 (1.0)	23 (0.9)	14 (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 (2009)

	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	2 (1.0)	2 (1.2)	3 (0.9)	12 (1.3)	3 (0.8)	0	22 (1.0)
White, non-Hispanic	2 (1.3)	2 (1.3)	0	10 (0.9)	5 (0.8)	5 (0.7)	24 (0.8)
Black, non-Hispanic	1 (0.7)	0	1 (0.3)	16 (2.3)	8 (2.0)	0	26 (1.3)
Asian, Pac Islander, Amer. Indian, Alaska Native, non-Hispanic	1 (1.5)	2 (3.3)	1 (0.9)	0	0	0	4 (0.4)
Two or more races, non-Hispanic	0	0	0	1 (2.6)	1 (6.0)	0	2 (1.9)
Unknown	0	0	0	1	0	1	2
Total	6 (1.0)	6 (1.2)	5 (0.5)	40 (1.3)	17 (1.0)	6 (0.4)	80 (1.0)

Figure 4: Cryptosporidiosis, number of cases among persons living with HIV/AIDS by month of diagnosis, New York City, January 1995-December 2009

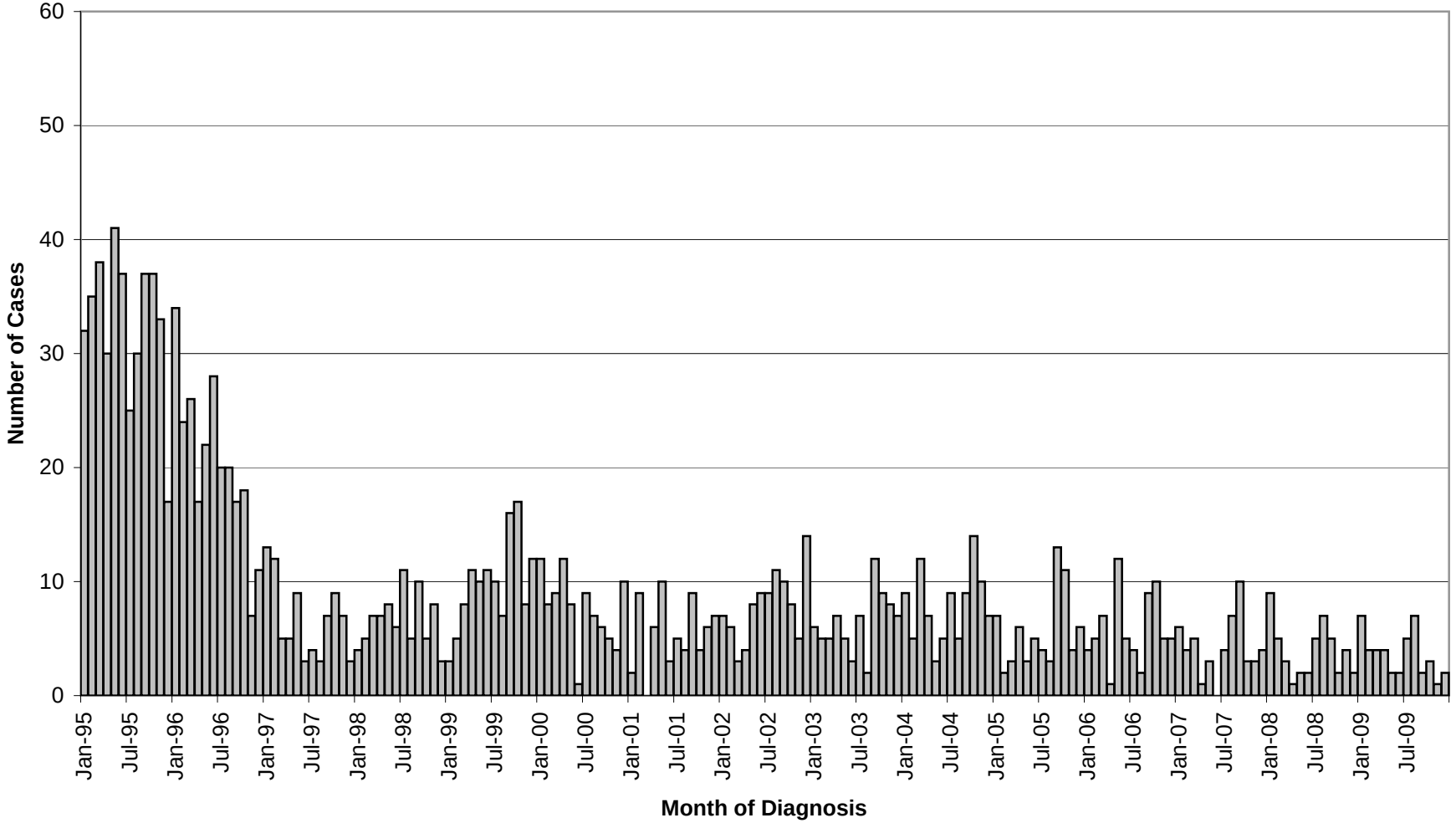


Figure 5: Cryptosporidiosis, number of cases among immunocompetent persons by month of diagnosis, New York City, January 1995-December 2009

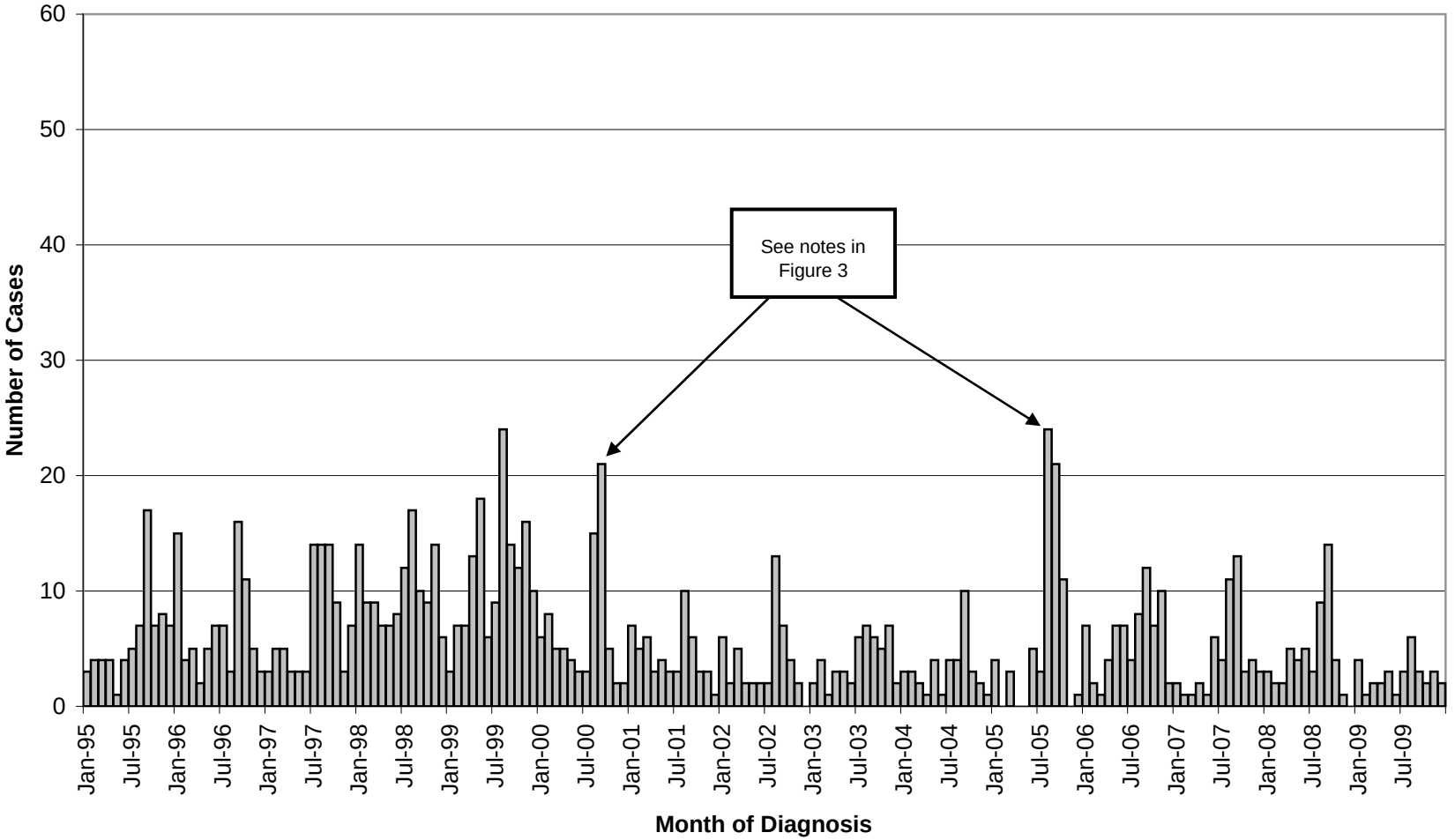


Table 13: Cryptosporidiosis, number and percent of cases by year and immune status, New York City, 1995 - 2009

Immune Status	Year														
	1995 No. (%)	1996 No. (%)	1997 No. (%)	1998 No. (%)	1999 No. (%)	2000 No. (%)	2001 No. (%)	2002 No. (%)	2003 No. (%)	2004 No. (%)	2005 No. (%)	2006 No. (%)	2007 No. (%)	2008 No. (%)	2009 No. (%)
Persons with HIV/AIDS	392 (83.1)	244 (73.1)	80 (46.5)	79 (38)	118 (45.2)	91 (52.9)	65 (53.3)	94 (63.5)	76 (60.3)	95 (68.8)	67 (45.3)	69 (44.5)	50 (47.6)	47 (43.9)	43 (53.8)
Immunocompetent	71 (15)	83 (25)	83 (48.3)	122 (58.7)	139 (53.3)	79 (45.9)	54 (44.3)	47 (31.8)	48 (38.1)	38 (27.5)	72 (48.6)	71 (45.8)	51 (48.6)	52 (48.6)	32 (40)
Immunocompromised, Not HIV/AID	4 (0.8)	3 (0.9)	7 (4.1)	2 (1)	3 (1.1)	2 (1.2)	2 (1.6)	7 (4.7)	2 (1.6)	5 (3.6)	9 (6.1)	14 (9)	4 (3.8)	5 (4.7)	3 (3.8)
Immune status unknown	5 (1.1)	4 (1.2)	2 (1.2)	5 (2.4)	1 (0.4)	0	1 (0.8)	0	0	0	0	1 (0.6)	0	3 (2.8)	2 (2.5)
Total	472	334	172	208	261	172	122	148	126	138	148	155	105	107	80

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 - 2009

Exposure Type	HIV/AIDS														
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008	2009
Contact with an Animal[a]	35%	35%	33%	36%	35%	43%	24%	42%	40%	31%	33%	38%	31%	44%	42%
High-risk Sexual Activity[b] (≥ 18 years old)	22%	22%	9%	15%	20%	25%	16%	23%	24%	34%	27%	31%	21%	39%	35%
International Travel[c]	9%	9%	9%	13%	18%	14%	10%	11%	13%	15%	17%	9%	6%	7%	8%
Recreational Water Contact[d]	16%	8%	16%	12%	16%	15%	8%	10%	21%	13%	5%	18%	17%	14%	8%

Note:

- **Determination of an association between exposure to possible risk factors for cryptosporidiosis and acquisition of cryptosporidiosis cannot be made 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 1995-2009 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 (1997-2009).
  - [b] High-risk Sexual Activity - Includes having a penis, finger or tongue in sexual partner's anus (1995-2009).
  - [c] International Travel - Travel outside the United States (1995-2009).
  - [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 (1997-2009).

* 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 - 2009

Exposure Type	Immunocompetent														
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008	2009
Contact with an Animal[a]	7%	41%	41%	32%	35%	26%	37%	35%	23%	34%	36%	36%	34%	28%	41%
High-risk Sexual Activity[b] (≥ 18 years old)	14%	25%	12%	10%	12%	23%	15%	30%	13%	31%	17%	3%	19%	7%	13%
International Travel[c]	30%	29%	26%	28%	28%	40%	47%	33%	45%	47%	45%	40%	47%	52%	38%
Recreational Water Contact[d]	21%	27%	40%	24%	22%	32%	35%	35%	34%	33%	52%	28%	36%	40%	48%

Note:

- **Determination of an association between exposure to possible risk factors for cryptosporidiosis and acquisition of cryptosporidiosis cannot be made 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 1995-2009 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 (1997-2009).
  - [b] High-risk Sexual Activity - Includes having a penis, finger or tongue in sexual partner's anus (1995-2009).
  - [c] International Travel - Travel outside the United States (1995-2009).
  - [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 (1997-2009).

* 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 - 2009

Exposure Type	HIV/AIDS														
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008	2009
Plain Tap[a]	69%	70%	71%	64%	66%	63%	55%	54%	77%	49%	76%	67%	67%	64%	58%
Filtered Tap[b]	12%	9%	10%	18%	20%	20%	14%	22%	13%	21%	7%	18%	11%	14%	15%
Boiled Tap[c]	7%	7%	3%	5%	3%	6%	6%	0%	4%	6%	5%	7%	0%	11%	8%
Incidental Plain Tap Only[d]	11%	15%	16%	15%	8%	12%	16%	19%	4%	15%	10%	4%	17%	7%	15%
No Tap[e]	3%	2%	2%	0%	5%	4%	6%	4%	2%	5%	2%	2%	6%	4%	0%

Note:

- **Determination of an association between exposure to possible risk factors for cryptosporidiosis and acquisition of cryptosporidiosis cannot be made 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 1995-2009 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 (5/11/2001-12/31/2009).
  [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 (5/11/2001-12/31/2009).
  [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 (5/11/2001-12/31/2009).
  [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 (1997-2009)
  [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 (1997-2009).

* 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 - 2009

Exposure Type	Immunocompetent														
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008	2009
Plain Tap[a]	58%	63%	58%	67%	56%	56%	43%	33%	36%	27%	30%	30%	27%	30%	45%
Filtered Tap[b]	18%	17%	21%	21%	25%	17%	31%	44%	36%	30%	25%	20%	22%	30%	24%
Boiled Tap[c]	11%	10%	8%	3%	4%	2%	4%	0%	2%	7%	5%	8%	4%	14%	0%
Incidental Plain Tap Only[d]	7%	9%	12%	8%	11%	8%	16%	21%	16%	13%	25%	28%	18%	14%	28%
No Tap[e]	2%	4%	4%	3%	7%	17%	6%	2%	9%	21%	14%	14%	27%	12%	3%

Note:

- **Determination of an association between exposure to possible risk factors for cryptosporidiosis and acquisition of cryptosporidiosis cannot be made 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 1995-2009 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 (5/11/2001-12/31/2009).

  [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 (5/11/2001-12/31/2009).

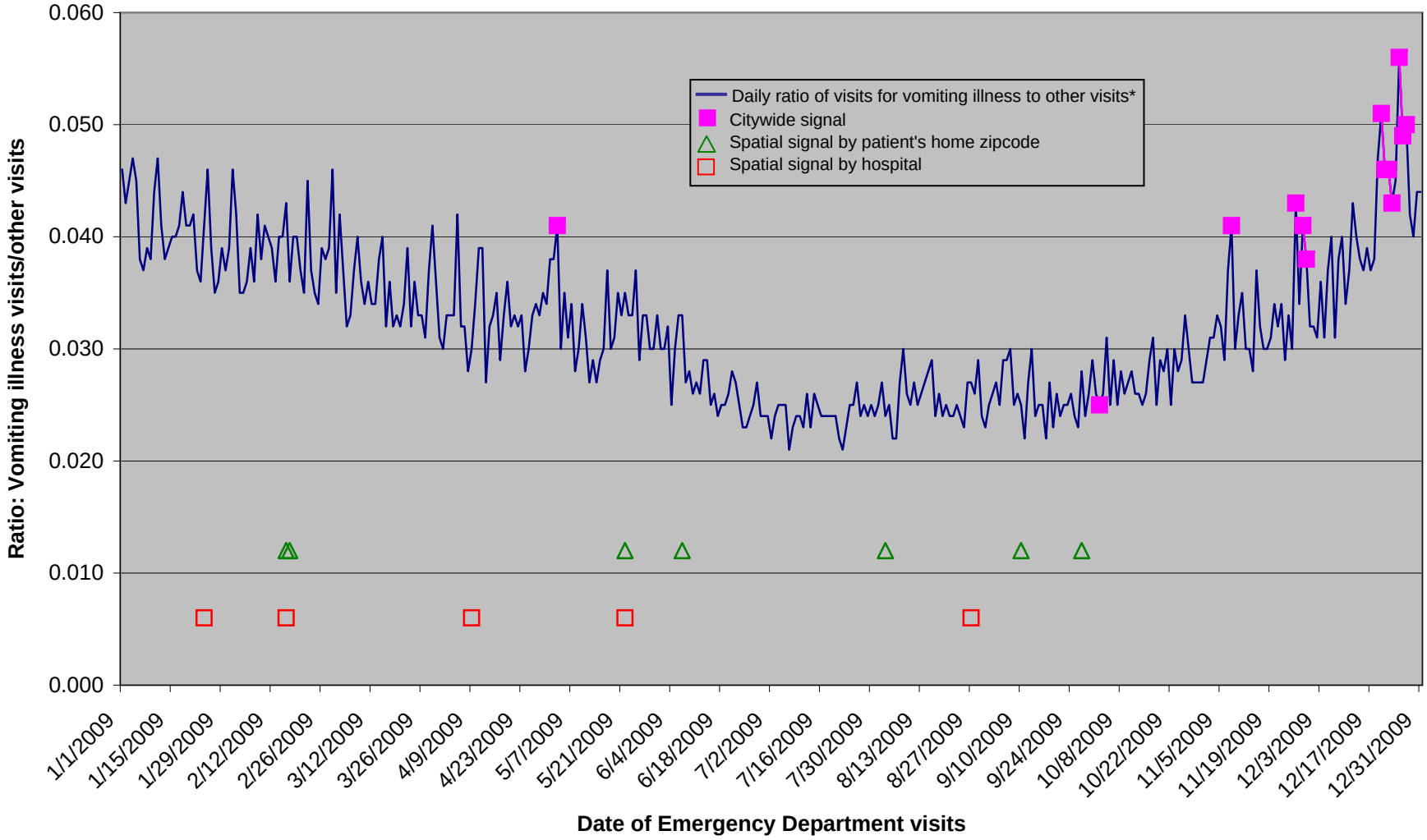
  [c] Boiled Tap - Drank boiled NYC tap water (1995-5/10/2001); or drank greater than 0 cups of boiled NYC tap water, and no unboiled /unfiltered NYC tap water, and no filtered NYC tap water (5/11/2001-12/31/2009).

  [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 (1997-2009)

  [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 (1997-2009).

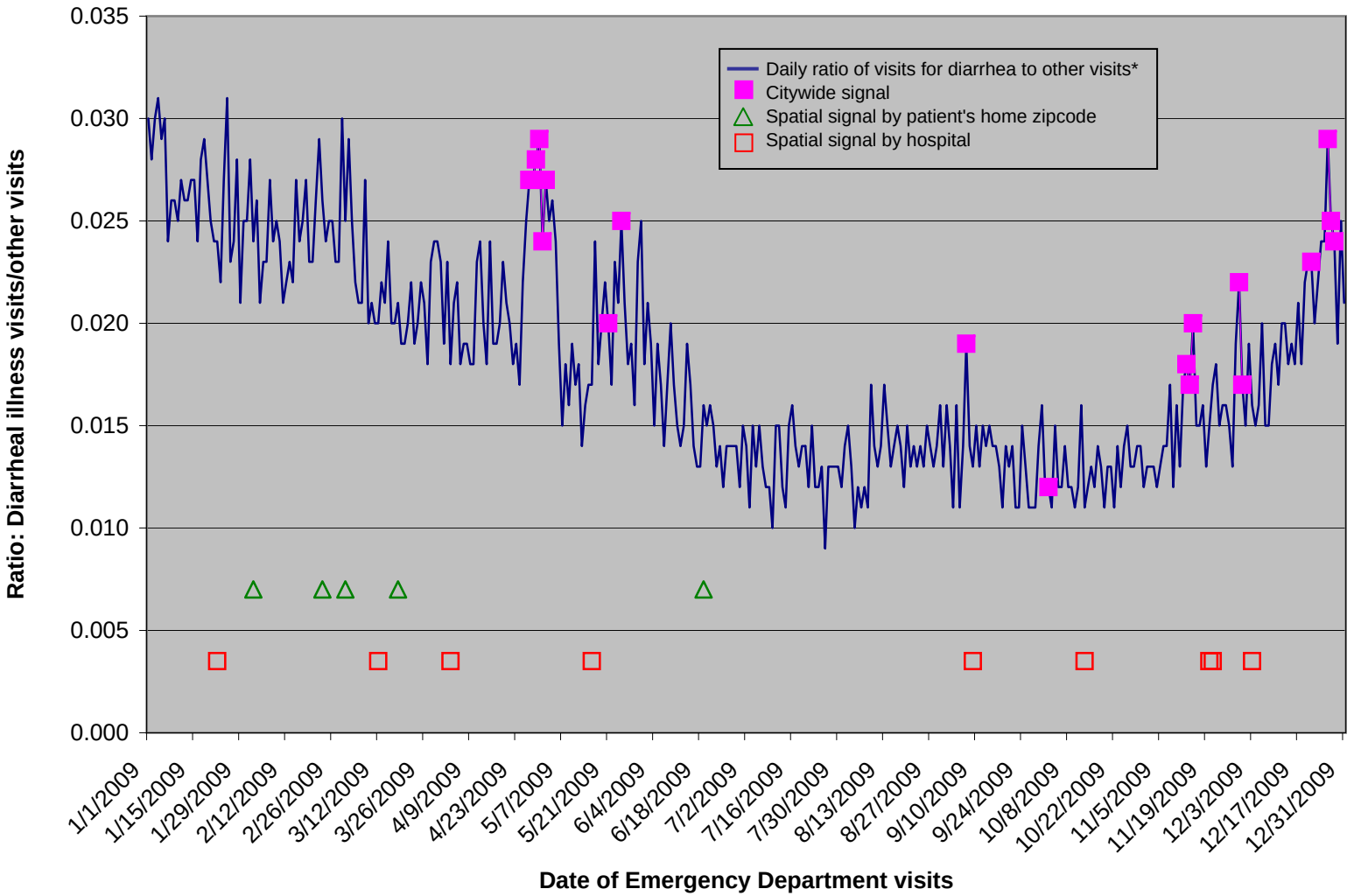
* Year 2000 percentage of interviewed cryptosporidiosis cases does not include 14 cases associated with a point source exposure at a swimming pool in Florida.

Figure 6: Emergency Department Syndromic Surveillance, Trends in visits for the vomiting syndrome, New York City, January 1, 2009 - December 31, 2009



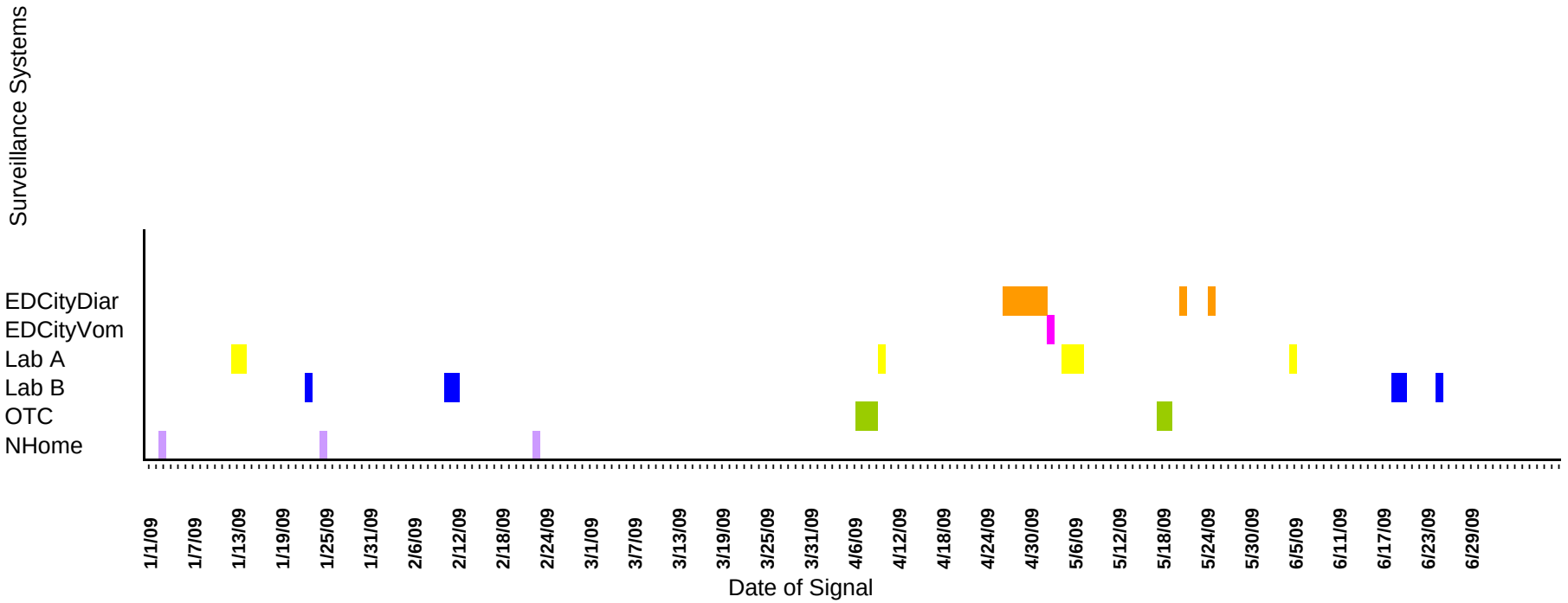
*Other visits=visits to participating ED for conditions that do not fit in to one of the eight tracked syndromes (diarrhea, vomiting, respiratory, fever/influenza, asthma, sepsis, cold, rash).

Figure 7: Emergency Department Syndromic Surveillance, Trends in visits for the diarrhea syndrome, New York City, January 1, 2009 - December 31, 2009



*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 and Mental Hygiene, Syndromic Surveillance Systems, New York City, January 1, 2009 - June 30, 2009



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 the first day of the outbreak.

Figure 9: Signals for Gastrointestinal Illness, Department of Health & Mental Hygiene, Syndromic Surveillance Systems, New York City, July 1, 2009 - December 31, 2009