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

2011 Annual Report

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EXECUTIVE SUMMARY

The ongoing primary objectives of New York City's Waterborne Disease Risk Assessment Program are to: (a) obtain data on the rates of giardiasis and cryptosporidiosis, along with demographic and risk factor information on case-patients; and (b) provide a system to track diarrheal illness to ensure rapid detection of any outbreaks. The program, jointly administered by the Department of Health and Mental Hygiene (DOHMH) and the Department of Environmental Protection (DEP), began in 1993. This report provides an overview of program progress, and data collected, during 2011.

ACTIVE DISEASE SURVEILLANCE

Active disease surveillance for giardiasis and cryptosporidiosis began in July 1993 and November 1994, respectively, and continued through 2010. In January 2011 active laboratory surveillance for giardiasis and cryptosporidiosis was discontinued as it had been replaced by an electronic reporting system. This report presents the number of cases and case rates for giardiasis and cryptosporidiosis in 2011 (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. Giardiasis and cryptosporidiosis rates have been on a general downward trend over the years of this surveillance program. From 2010 to 2011, the giardiasis case rate decreased slightly from 11.3 per 100,000 population in 2010 to 11.2 per 100,000 (918 cases) in 2011, and the cryptosporidiosis case rate decreased from 1.3 per 100,000 to 1.1 per 100,000 (86 cases). In this report a socioeconomic measure, census tract poverty level, is introduced as part of the demographic description of giardiasis and cryptosporidiosis. Results indicate that census tract poverty level appears not to have been a determinant in the occurrence of either disease in New York City in 2011.

SYNDROMIC SURVEILLANCE / OUTBREAK DETECTION

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 potentially 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 four distinct and complementary outbreak detection systems. One system involves the tracking of chief complaints from hospital emergency department logs; under another system DOHMH monitors and assists in the investigation of GI outbreaks in eight sentinel nursing homes; and a third system tracks the number of stool specimens submitted to a clinical laboratory for microbiological testing. In the emergency department system, there were data transmission problems starting August 10, resulting in the exclusion of data from some emergency departments. These problems were resolved by August 31, and the previously missing data were provided. Otherwise, the three outbreak detection systems described above (involving data from emergency departments, nursing homes and a clinical laboratory) were in operation throughout 2011.

The fourth type of outbreak detection system in operation in the City involves monitoring of sales of over-the-counter or non-prescription anti-diarrheal medications. The City's anti-diarrheal medication monitoring activities have two components: the "ADM" system and the "OTC" system. The two systems monitor daily sales of non-prescription antidiarrheal medications at two separate major store chains. The ADM system is managed by DEP and the OTC system is managed by DOHMH. Regarding the OTC system, in 2011 there was a change in data management at the store chain that submits the data which affected the ability of the OTC system to detect signals in anti-diarrheal medication sales from mid-June to October 20. Starting October 21, OTC analysis was interrupted until the issue could be resolved. It is currently anticipated that OTC system analysis will resume in March 2012. The ADM system, operated by DEP, was in operation throughout 2011. Early in 2011, the ADM system experienced some data analysis and reporting delays. ADM data analysis and reporting timeliness was improved, and was very good, in the second half of 2011. Also, a metrics tracking system for the ADM system has been put in place by DEP, and an IT upgrade in 2011 improved system efficiency.

A summary of syndromic surveillance findings for 2011 pertaining to GI illness is presented. Sustained citywide signals in the ED system in February and December, along with two separate GI outbreaks in sentinel nursing homes in February and March, in which norovirus-positive stool specimens were obtained, are consistent with annual gastrointestinal viral trends. There was no evidence of a drinking water-related outbreak in New York City in 2011.

INFORMATION SHARING AND PUBLIC EDUCATION

Information sharing and education efforts have continued. A presentation was made to graduate students at a school of public health in April 2011. 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

The ongoing primary objectives of New York City's Waterborne Disease Risk Assessment Program (WDRAP) are to:

- obtain data on the rates of giardiasis and cryptosporidiosis, along with demographic and risk factor information on case-patients; and
- provide a system to track diarrheal illness to ensure rapid detection of any outbreaks.

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 2011. For this report the population denominators used to calculate rates were intercensal population estimates for all years except 2000, 2010 and 2011. 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 2001 through 2009, 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 2010 and 2011, the year 2010 US Census data were used.[3] Because rates for the years 2001 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.

For mapping purposes, 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, race/ethnicity-specific case rates for 2011 are based upon year 2010 Census race/ethnicity categories and population counts. In previous reports, there was one race/ethnicity category entitled "Asian, Pacific Islander, American Indian, Alaskan Native, non-Hispanic." In the current report there are separate categories for non-Hispanic Asians, non-Hispanic Pacific Islanders and Native Hawaiians, and non-Hispanic American Indians. In addition, there is a new,

[1] See http://sasebiweb100.health.dohmh.nycnet/EpiQuery/Census/index.html
[2] See http://sasebiweb100.health.dohmh.nycnet/EpiQuery/Census/index2001.html
[3] See http://2010.census.gov/news/press-kits/summary-file-1.html

separate race/ethnicity category entitled "Other Race, non-Hispanic," which pertains to non-Hispanics, of a single race which is not Black, White, Asian, Native Hawaiian, Pacific Islander, or American Indian.

This is the first WDRAP Annual Report to include a socioeconomic status (SES) measure as part of the demographic description of cases of giardiasis and cryptosporidiosis in NYC. Differences in SES among cases of a disease may indicate economically-related disparities in health. In February 2011, a working group of DOHMH epidemiologists proposed a standard demographic variable, neighborhood poverty, to measure disparities in disease for all routinely collected disease surveillance data that includes geolocating information on case-patients (i.e., street address and zip code). Neighborhood poverty is a potential proxy for individual SES and also may have an independent effect on the incidence of certain diseases. The poverty level of the neighborhood of case-patient residence is measured as the percentage of individuals in the neighborhood who live below the federal poverty level, as reported in census data. (The use of neighborhood poverty as an SES measure in public health surveillance is described further in: Krieger N, Chen JT, Waterman PD, Rehkopf DH, Subramanian SV. Painting a Truer Picture of US Socioeconomic and Racial/Ethnic Health Inequalities: the Public Health Disparities Geocoding Project. *American Journal of Public Health*. 2005; 95[2]: 312-323.)

The neighborhood unit that is analyzed and aggregated for the poverty level tables in this report is the NYC census tract. The percent of census tract residents with household income level below 100% of the federal poverty level is the unit of analysis. Four categories for data analysis were utilized: low neighborhood poverty (<10% of residents have household incomes that are below the federal poverty level), medium neighborhood poverty (10-19%), high neighborhood poverty (20-29%), and very high neighborhood poverty (>30%). In this report year 2000 Census data were used for census tract poverty levels, as year 2010 Census data for this measure were not yet available. The analysis utilized crude rates. Additional analysis of census tract poverty levels, utilizing age-adjusted rates for giardiasis and cryptosporidiosis, is planned for future reports.

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 through 2010. 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.

As reported in the WDRAP 2010 Annual Report, in January 2011 active laboratory surveillance for giardiasis and cryptosporidiosis was discontinued, as it had been replaced by an electronic reporting system. By January 2011 almost all NYC clinical laboratories were fully enrolled in the Electronic Clinical Laboratory Reporting System (ECLRS), which was developed in order to ensure rapid and more complete reporting of conditions such as giardiasis and cryptosporidiosis. Electronically reported health data is more timely than active surveillance, and is more complete than typical paper-based systems. This change in surveillance is not expected to have a significant impact on the program, or on the completeness or quality of giardiasis and cryptosporidiosis surveillance data.

During 2011, a total of 918 cases of giardiasis were reported to DOHMH and the annual case rate was 11.2 per 100,000. Annual case numbers decreased 0.5% from 2010 to 2011. From 1994 to 2011 annual case numbers declined 63.5% (see Table 1 and Figure 1).

The following provides some highlights from the surveillance data for giardiasis among New York City residents from January 1 through December 31, 2011. Additional data are presented in the tables, figures and maps that appear later in this report.

Borough of case-patient residence

Borough of case-patient residence was known for all 918 giardiasis case-patients who resided in New York City. Manhattan had the highest borough-specific annual case rate (21.6 cases per 100,000) (Table 2). The highest UHF neighborhood-specific case rate was found in the Chelsea-Clinton neighborhood in Manhattan (51.0 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 610 males (15.7 cases per 100,000) and 308 females (7.2 cases per 100,000) reported. The highest sex- and borough-specific case rate was observed among males residing in Manhattan (34.4 cases per 100,000) (Table 2).

Age

Information regarding age was available for all cases. The highest age group-specific case rates were among children less than 5 years old (23.4 cases per 100,000) and children 5 to 9 years old (17.3 cases per 100,000). The highest age group and sex-specific case rates were among females less than 5 years old (25.7 cases per 100,000) and males less than 5 years old (21.2 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 (32.6 cases per 100,000) and persons 45-59 years old in Manhattan (29.4 cases per 100,000) (Table 5).

Race/Ethnicity

Information regarding race/ethnicity was available for 126 of 918 cases (13.7%). 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 2011 are not presented in this report.

Census Tract Poverty Level

Case rates for giardiasis among four levels of census tract poverty, with gradients encompassing low poverty to very high poverty, ranged from 11.1 to 12.0 cases per 100,000 population (Table 6). Case rates for census tracts at all poverty levels were similar and close to the citywide giardiasis case rate (11.2 cases per 100,000). This close distribution of case rates among census tract poverty levels suggests that factors such as neighborhood poverty and level of household income have not been determinants in the occurrence of giardiasis in New York City in 2011. However, it must be noted that under-diagnosis of giardiasis may have occurred among individuals without health insurance. Such individuals are likely to have low household incomes, and may be under-reported for conditions such as giardiasis and cryptosporidiosis.

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 through 2010. As noted above with regard to giardiasis surveillance, active surveillance for cryptosporidiosis was also discontinued in January 2011 and replaced with electronic reporting.

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 2011, a total of 86 cases of cryptosporidiosis were reported to DOHMH and the annual case rate was 1.1 per 100,000. Annual case numbers decreased 19.6% from 2010 to 2011. From 1995 to 2011 annual case numbers have declined 81.8% (Table 7). The number of cases diagnosed each month for the period November 1994 to December 2011 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 2011 is presented in Figure 3.

The following provides some highlights from the surveillance data for cryptosporidiosis among New York City residents from January 1 through December 31, 2011. Additional data are presented in the tables, figures and maps 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 (2.3 cases per 100,000) (Table 8). The highest UHF neighborhood-specific case rate was in the Chelsea-Clinton neighborhood in Manhattan (6.9 cases per 100,000) (Map 2 and Table 9).

Sex

Information regarding sex was available for all cases. The number and rate of cryptosporidiosis cases were higher in males than females, with 64 males (1.6 cases per 100,000) and 22 females (0.5 cases per 100,000) reported. The borough- and sex-specific case rate was highest for males in Manhattan (3.8 cases per 100,000) (Table 8).

Age

Information regarding age was available for all cases. The highest age group-specific case rates were observed in children less than 5 years old (1.5 cases per 100,000), in children 5-9 (1.3 cases per 100,000) and in persons 20-44 years old (1.3 cases per 100,000). The highest age group- and sex-specific case rates were in males less than 5 years old (2.3 cases per 100,000) and males 20-44 years old (2.2 cases per 100,000) (Table 10). The highest age group and borough-specific case rates occurred in children less than 5 years old in Staten Island (3.5 cases per 100,000); however, there was only one case in this age group/borough category. The next highest age group and borough specific case rates occurred in persons 20-44 years old in Manhattan (2.7 cases per 100,000) and in persons 45-59 years old in Manhattan (2.7 cases per 100,000) (Table 11).

Race/Ethnicity

Race/ethnicity information was available for 76 of 86 cases (88.4%). The racial/ethnic group-specific case rate was highest among non-Hispanics of Other race (1.7 cases per 100,000); however, there was only one case in this race/ethnicity group. The next highest racial/ethnic group-specific case rate occurred among Hispanics and White non-Hispanics (1.1 cases per 100,000 in each race/ethnicity group). Black non-Hispanics in Manhattan had the highest race/ethnicity- and borough-specific case rate (3.4 cases per 100,000) (Table 12). The highest age group- and race/ethnicity-specific case rates occurred among persons 20-44 year old who were non-Hispanics of Other race (1 case, 4.3 cases per 100,000). The highest number of cases occurred among 20 to 44 year old non-Hispanic Whites (17 cases, case rate 1.6 per 100,000) (Table 13).

Census Tract Poverty Level

Case rates for cryptosporidiosis among four levels of census tract poverty ranged from 0.9 to 1.2 cases per 100,000 population (Table 14). Case rates for census tracts at the four poverty levels were similar and close to the citywide cryptosporidiosis case rate (1.1 cases per 100,000). As noted above for giardiasis, this close distribution of case rates among census tract poverty levels suggests that neighborhood poverty and level of household income have not been determinants in the occurrence of cryptosporidiosis in New York City in 2011.

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 42 in 2011, thus causing a decline in the overall number of cryptosporidiosis cases in New York City. However, during the years 1995 through 2011, the number of cases of cryptosporidiosis among immunocompetent persons has shown less variation, ranging from 33 cases in 2009 to 139 cases in 1999. In 2011, there were 38 cryptosporidiosis cases among immunocompetent persons (see Figures 4 and 5 and Table 15). An analysis of trends using Poisson regression to compare the number of cases of cryptosporidiosis among persons with

HIV/AIDS to the number of cases among the immunocompetent indicates that the overall decline from 1995 to 2011 was significantly greater in patients who were immunocompromised than in those who were not ($P<.01$). 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.

Cryptosporidiosis and Potential Risk Exposures

Of the 86 cryptosporidiosis cases diagnosed among NYC residents in 2011, questionnaires concerning potential exposures were completed in 67 cases (78%). Reasons for non-completion of questionnaires were: unable to locate case-patient (12 cases, 14%), refused (5 cases, 6 %), unable to interview due to incapacitating illness (2 cases, 2%). Of the immunocompetent case-patients, interviews were completed for 34 case-patients (89%). Among persons with HIV/AIDS, interviews were completed for 28 case-patients (67%). Summary data for 1995 through 2011 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 16 and 17, respectively. Information has also been collected regarding type of tap water consumption, and is presented in Tables 18 and 19. Tables 16 to 19 indicate the percentage of case-patients who reported engaging in each of the listed potential risk exposures for cryptosporidiosis 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 16 and 17 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 ($P<.01$ all years except 2009, $P<.05$), and to report exposure to recreational water in all years except 2003, 2006, 2007, and 2011 (2001-2002, $P<.01$; 2003, $P=.17$; 2004, $P<.05$; 2005, $P<.01$; 2006, $P=.24$; 2007, $P=.06$; 2008, $P<.05$; 2009-2010, $P<.01$, 2011, $P=.06$). There was no statistically significant difference between these two groups in the proportion of cases reporting animal contact in 2001 to 2011, or reporting high-risk sex in 2001 to 2005, 2007, and 2009 to 2011. 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, for most years, immunocompetent case-patients were 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 potentially 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 (ED) chief complaint logs to monitor for outbreaks. The City also utilizes two separate systems for monitoring sales of anti-diarrheal medications: one system is known as the ADM system and the other as the OTC system. All systems rely upon the voluntary participation of the organizations providing the syndromic data. A summary of syndromic surveillance findings pertaining to GI illness for 2011 is provided in the final section of this part, on pages 10 to 12.

Program Components – Overviews and Updates

A. 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 three or more patients on a single ward/unit within a seven-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*,viruses, and *Clostridium difficile* toxin testing. Though *C. difficile* is not a waterborne pathogen, *C. difficile* toxin testing was added in April 2010 in order to address a need expressed by infection control practitioners in the nursing homes, and was intended to help ensure compliance with the sentinel nursing home protocol.

DOHMH BCD staff facilitates transportation of the specimens to the City's Public Health Laboratory. Testing for culture and sensitivity occurs at the Public Health Laboratory. On May 1, 2011 the DOHMH Public Health Laboratory discontinued parasitology testing. Specimens for ova and parasites and *Cryptosporidium*, as well as for viruses and *C. difficile* toxin testing, are currently being sent to NYSDOH Wadsworth Center. 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. As feedback for their role in outbreak detection, participating nursing homes are provided with copies of Waterborne Disease Risk Assessment Program semi-annual and annual reports.

In December 2011 and January 2012, 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.

B. 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. In March 2010, one of the two clinical laboratories that were participating in the program discontinued operations. Clinical Laboratory Monitoring stool specimen submission data which previously would have been received from that laboratory is now included in data received from the laboratory that continued to participate in the program in 2010 and throughout the period of this report. That laboratory ("Laboratory A") transmits data by fax to DOHMH BCD daily to three times per week, indicating the number of stool specimens examined per day for: (a) bacterial culture and sensitivity, (b) ova and parasites, and (c) *Cryptosporidium.*

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. 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.)

C. 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.[4] 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

[4] 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.

(NRDM) system. 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 simply as a way to distinguish the two systems.)

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 store chain. As discussed in previous WDRAP reports, a number of significant enhancements have been made to DEP's ADM system since that time. In March 2010, DEP implemented an enhanced ADM system as a pilot program. That pilot program is still in operation and includes the following features: (a) ADM data is received in digital format on a daily basis; (b) More products and more stores are included; (c) Health and Beauty products sales volume data is now utilized in the analysis in an effort to "normalize" the data (e.g., to help account for changing store traffic on different days of the week); (d) Data on promotional sales vs. non-promotional sales is provided directly by the data provider; and (e) CDC's Early Aberration Reporting System (EARS) is used for analysis of signals. EARS uses three aberration detection methods which are based on a one-sided positive CUSUM calculation. Data is analyzed in terms of citywide sales and sales by borough.

The ADM system was in operation throughout 2011. An IT upgrade was achieved in 2011, which has significantly improved system efficiency of this program. Also, a metrics tracking system for the ADM system was implemented by DEP in 2011 (under the Water Security initiative) by which DEP monitors performance metrics, such as timeliness of reports. Early in 2011, the ADM system experienced some data analysis and reporting delays. ADM data analysis and reporting timeliness was improved, and was very good, in the second half of 2011.

The OTC System

The second drug monitoring system, 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 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, 32,000 nonprescription medication sales. A separate file is also sent daily by the same data provider which contains 7,100 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, 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.

Beginning in mid-June 2011, there was a decrease in the number of stores reporting medication sales to the OTC system. The decrease resulted from a disruption in data transmission that occurred because the store chain that submits the data was undergoing a revision to their data systems, and stores within the chain were being gradually moved over to the new system. This change affected the ability of the OTC system to detect signals in anti-diarrheal medication sales from mid-June to October 20. Starting October 21, and throughout the month of December, the OTC analysis was no longer run. It is currently anticipated that OTC system analysis will resume in March 2012, by which time data transmission issues should have been resolved.

D. Hospital Emergency Department Monitoring

NYC initiated monitoring of hospital emergency department visits as a public health surveillance system in 2001. At the start of 2011, DOHMH received electronic data from 49 of New York City's 54 EDs. By the end of the year, the same number of EDs (49 of 54) operating in NYC were participating in ED Syndromic Surveillance, reporting approximately 11,000 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.)

There were data transmission problems in the ED Syndromic Surveillance system starting August 10, resulting in the exclusion of data from some EDs. These problems were resolved by August 31, and the previously missing data were provided and entered into the database. On retrospective analysis, the only GI illness signals that occurred from August 10 to August 31 were a spatial hospital signal for the vomiting syndrome on August 24 and a spatial hospital signal for the diarrhea syndrome on August 26. Neither signal was sustained on subsequent days.

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 anti-diarrheal medication monitoring 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 a summary is presented of GI disease signals from NYC's syndromic surveillance systems in four figures: Figures 6 to 9. Figures 6 and 7 summarize ED system trends and signals for 2011. Figures 8 and 9 summarize signal results from all syndromic surveillance systems operated by DOHMH and DEP during 2011.

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, 2011. The graph also indicates the occurrence 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 citywide vomiting signals on February 6 and February 21, and from February 13-15, and citywide diarrhea signals from February 27-28. ED signals for vomiting and diarrhea in February are consistent with historical experience showing a seasonal increase in viral gastroenteritis. Sporadic citywide signals for diarrhea next occurred on March 20 and April 3. There were no ED citywide signals for the diarrhea syndrome in May and June or for the vomiting syndromes from February through October. Three-day city-wide diarrhea syndrome signals occurring from July 9-11 were driven by a single day increase in the diarrhea syndrome that occurred on July 9. City-wide signals for vomiting and diarrhea next occurred in November and December. Sustained signaling for vomiting occurred on December 18-20 and December 25-27, and for diarrhea on December 28-31. During this reporting period, no spatial signal was sustained in the same geographic location for more than one day. ED signals for vomiting and diarrhea occurring in February and again 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 NYC syndromic surveillance systems for the gastrointestinal syndrome covering the period January 1 to June 30, and July 1 to December 31, 2011, respectively. The systems included are the emergency department system, the clinical laboratory monitoring system, the OTC anti-diarrheal medication system operated by DOHMH, the ADM anti-diarrheal medication system operated by DEP, and the nursing home sentinel surveillance system. For the ED, ADM, and OTC systems, only citywide signals have been included. As discussed above, there was sustained citywide ED system signaling in February and December, most likely representing the seasonality of rotavirus and norovirus. There were two GI outbreaks in sentinel nursing homes, one in February and one in early March. Details concerning the outbreaks are presented below. In the clinical laboratory system, there were sporadic, non-sustained signals March through June and in August, September and November. In the OTC system, there was one non-sustained signal on May 15. As previously noted, there was a disruption in data transmission beginning mid-June which affected the ability of this system to detect signals through to October 19. Beginning October 20, OTC system analysis was discontinued, pending resolution of data transmission problems.

Regarding the two GI outbreaks in sentinel nursing homes, the first outbreak occurred in a nursing home in the Bronx. Thirty-three patients on four units were affected. Onset date was February 6, symptoms were vomiting, diarrhea, fever and abdominal pain, and symptom duration was approximately two days. There were two hospitalizations and no deaths. The facility sent six stool specimens from two nursing home residents to the Public Health Laboratory for testing. Two specimens were tested for ova and parasites, including *Cryptosporidium*, two for bacterial pathogens, and two for viruses and *C. difficile*. One of the specimens sent for ova and parasite testing was positive for *Cyclospora cayetanensis*. The *Cyclospora*-positive resident had no recent history of travel to countries in which *Cyclospora* is endemic, and had not consumed any uncooked produce that could harbor *Cyclospora*. No other residents or staff members were diagnosed with cyclosporiasis. It remains unclear how this resident acquired cyclosporiasis. The specimens sent for pathogenic bacteria were negative. Viral and *C. difficile* specimens were sent to the NYSDOH Wadsworth Virology Laboratory. The *C.difficile* specimens were negative. However, one specimen from the *Cyclospora*-negative resident was found to be positive for norovirus by polymerase chain reaction (PCR). Thus, based on symptoms and symptom duration, it appears that the etiology of the outbreak was norovirus.

The second GI outbreak occurred in a sentinel nursing home in Manhattan. Five patients were affected. Symptoms were diarrhea, nausea and vomiting, and the onset date was March 7. There were no deaths or hospitalizations. The facility sent six stool specimens from two patients to the Public Health Laboratory for testing. Two specimens were tested for ova and parasites including *Cryptosporidium*, two for bacterial pathogens and two for viruses and *C.difficile*. The specimens tested for ova and parasites and for bacteria were negative. The viral and *C.difficile* specimens were sent to NYSDOH Wadsworth Virology Laboratory. The *C.difficile* specimens were negative. The viral specimens were positive for norovirus by PCR.

With regard to the ADM system, Figures 8 and 9 indicate all dates of citywide signals from the pilot ADM EARS analysis. The EARS program uses several different baselines to identify different types of signals; all citywide signal results are combined in Figures 8 and 9 by date. During the period of this report, there were 41 days of citywide ADM signals, and 94 days total of ADM signals (i.e., 94 days on which there were either citywide signals, borough signals, or both). Many of the signal dates coincided with reported ADM product promotional events, but not all. All ADM results are shared with DOHMH upon completion of EARS analysis, and when signals or other unusual ADM sales results are observed, these results can be compared by DOHMH with results from the other syndromic systems.

In summary, for the period January through December 2011, there were multiple citywide signals for gastrointestinal illness in the ED system in February and again in December. Sustained citywide signals in the ED system in the beginning and end of the year, along with two separate GI outbreaks in sentinel nursing homes in February and March in which norovirus-positive stool specimens were obtained, are consistent with annual gastrointestinal viral trends. There was no evidence of a drinking water-related outbreak in New York City in 2011.

PART III: INFORMATION SHARING AND PUBLIC EDUCATION

Information sharing and education efforts continued during 2011. Educational outreach in 2011 included a presentation given by a DOHMH WDRAP team member to graduate students at a school of public health. 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

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

- *Waterborne Disease Risk Assessment Program's Annual Reports, 1997-2011*
  http://www.nyc.gov/html/dep/html/drinking_water/wdrap.shtml

- *New York City Drinking Water Supply and Quality Statement, 1997-2010*
  (Planned posting date for the 2011 report is May 31, 2012.)
  http://www.nyc.gov/html/dep/html/drinking_water/wsstate.shtml

Figure 1: Giardiasis, number of cases by month of diagnosis, New York City, July 1993 - December 2011

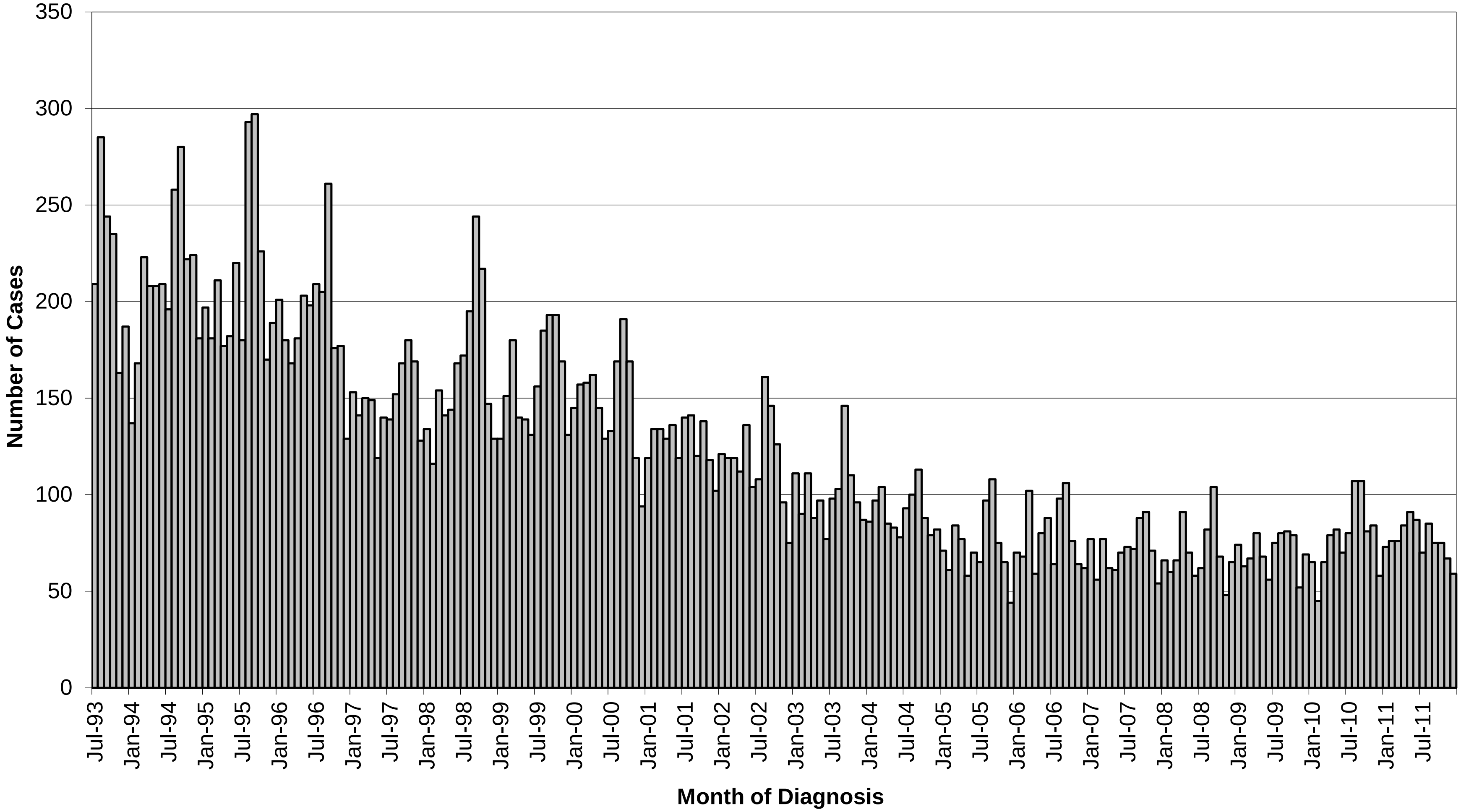


TABLE 1: **Giardiasis**, number of cases and case rates, New York City, 1994 - 2011*

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	937	11.4
2007	852	10.3
2008	840	10.0
2009	844	10.1
2010	923	11.3
2011	918	11.2

* Active disease surveillance for giardiasis began in July 1993. Starting January 2011, active laboratory surveillance was discontinued as it had been replaced by an electronic reporting system.

TABLE 2: **Giardiasis**, number of cases and annual case rate per 100,000 population by sex and borough of residence, New York City, 2011

	Borough of residence					
Sex	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Male	610 (15.7)	256 (34.4)	72 (11.1)	156 (13.2)	117 (10.8)	9 (4.0)
Female	308 (7.2)	87 (10.3)	62 (8.4)	93 (7.0)	58 (5.0)	8 (3.3)
Total	918 (11.2)	343 (21.6)	134 (9.7)	249 (9.9)	175 (7.8)	17 (3.6)

Map 1

Giardiasis annual case rate per 100,000 population
by UHF neighborhood - New York City (2011)

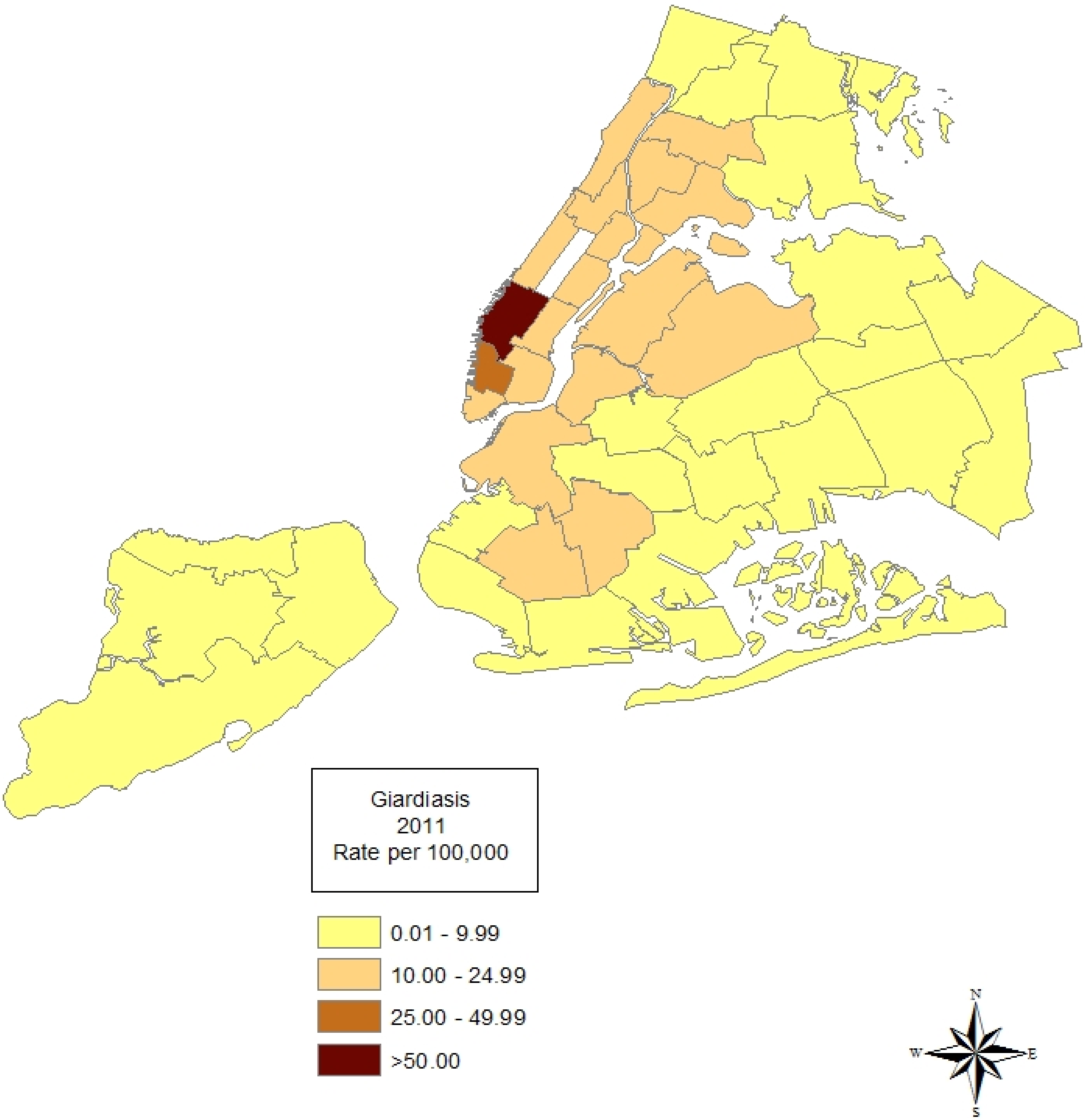


Table 3: Giardiasis, number of cases and annual case rate per 100,000 by UHF neighborhood of residence, New York City, 2011*

UHF Neighborhood	Borough	Number	Population	Rate
Chelsea-Clinton	Manhattan	74	145000	51.0
Greenwich Village-Soho	Manhattan	29	83749	34.6
Union Sq-Lower East Side	Manhattan	45	198781	22.6
Greenpoint	Brooklyn	27	127051	21.3
Upper West Side	Manhattan	45	220080	20.4
Downtown-Heights-Slope	Brooklyn	44	224199	19.6
Gramercy Park-Murray Hill	Manhattan	25	134522	18.6
Upper East Side	Manhattan	38	220962	17.2
East Harlem	Manhattan	17	109972	15.5
Long Island City-Astoria	Queens	31	204715	15.1
Lower Manhattan	Manhattan	8	53159	15.0
C.Harlem-Morningside Hgts	Manhattan	24	162652	14.8
Washington Heights-Inwood	Manhattan	36	248508	14.5
High Bridge-Morrisania	Bronx	30	207631	14.4
Crotona-Tremont	Bronx	29	206116	14.1
Borough Park	Brooklyn	44	331983	13.3
West Queens	Queens	59	480501	12.3
East Flatbush-Flatbush	Brooklyn	34	296583	11.5
Hunts Point-Mott Haven	Bronx	14	136591	10.2
Fordham-Bronx Park	Bronx	25	252655	9.9
East New York	Brooklyn	18	187855	9.6
Willowbrook	Stat Island	8	85510	9.4
Ridgewood-Forest Hills	Queens	22	245746	9.0
Coney Island-Sheepshead Bay	Brooklyn	24	285502	8.4
Fresh Meadows	Queens	8	96831	8.3
Flushing-Clearview	Queens	20	259767	7.7
Williamsburg-Bushwick	Brooklyn	16	210468	7.6
Northeast Bronx	Bronx	13	190668	6.8
Pelham-Throgs Neck	Bronx	19	297927	6.4
Bensonhurst-Bay Ridge	Brooklyn	12	199271	6.0
Bed Stuyvesant-Crown Hgts	Brooklyn	19	318898	6.0
Sunset Park	Brooklyn	7	127863	5.5
Rockaway	Queens	6	114978	5.2
Southwest Queens	Queens	13	266265	4.9
Kingsbridge-Riverdale	Bronx	4	90892	4.4
Southeast Queens	Queens	6	195724	3.1
Port Richmond	Stat Island	2	70387	2.8
Jamaica	Queens	8	289314	2.8
Stapleton-St. George	Stat Island	3	123648	2.4
Bayside-Littleneck	Queens	2	87972	2.3
South Beach-Tottenville	Stat Island	4	189185	2.1
Canarsie-Flatlands	Brooklyn	4	195027	2.1

* This table does not include two cases of giardiasis occurring in Manhattan residents in which UHF neighborhood could not be determined.

<u>TABLE 4</u>: Giardiasis, number of cases and annual case rate per 100,000 population by age group and sex, New York City, 2011

	Sex		
Age group	Male number (rate)	Female number (rate)	Total number (rate)
<5 years	56 (21.2)	65 (25.7)	121 (23.4)
5-9 years	44 (18.2)	38 (16.4)	82 (17.3)
10-19 years	39 (7.6)	35 (7.1)	74 (7.4)
20-44 years	294 (19.1)	98 (5.9)	392 (12.3)
45-59 years	123 (16.5)	43 (5.1)	166 (10.5)
≥ 60 years	54 (9.3)	29 (3.5)	83 (5.9)
Total	610 (15.7)	308 (7.2)	918 (11.2)

<u>TABLE 5</u>: Giardiasis, number of cases and annual case rate per 100,000 population by age group and borough of residence, New York City, 2011

	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	121 (23.4)	25 (32.6)	24 (23.3)	43 (24.3)	27 (20.4)	2 (7.1)
5-9 years	82 (17.3)	12 (19.6)	23 (23.3)	28 (17.6)	19 (15.4)	0
10-19 years	74 (7.4)	13 (9.6)	17 (7.9)	25 (7.6)	16 (6.1)	3 (4.7)
20-44 years	392 (12.3)	167 (23.3)	42 (8.3)	102 (10.6)	74 (8.7)	7 (4.5)
45-59 years	166 (10.5)	87 (29.4)	19 (7.4)	27 (5.8)	30 (6.5)	3 (2.9)
≥ 60 years	83 (5.9)	39 (13.0)	9 (4.4)	24 (5.8)	9 (2.2)	2 (2.3)
Total	918 (11.2)	343 (21.6)	134 (9.7)	249 (9.9)	175 (7.8)	17 (3.6)

Table 6: Giardiasis, number of cases and case rates by census tract poverty level, New York City, 2011

Census Tract Poverty Level	Number of Cases	Case Rate per 100,000
Low[a]	232	11.1
Medium[b]	250	11.2
High[c]	206	12.0
Very high[d]	220	11.2
Total[e]	908	11.3

[a] Low poverty: <10% of residents have household incomes that are below 100% of the federal poverty level, per year 2000 Census.
[b] Medium poverty: 10-19% of residents have household incomes that are below 100% of the federal poverty level, per year 2000 Census.
[c] High poverty: 20-29% of residents have household incomes that are below 100% of the federal poverty level, per year 2000 Census.
[d] Very high poverty: >=30% of residents have household incomes that are below 100% of the federal poverty level, per year 2000 Census.
[e] Ten cases (1.1%) were excluded from the total 2011 case count because geolocating information for census tract identification was unavailable.

Table 7: Cryptosporidiosis, number of cases and case rates, New York City, 1994 – 2011*

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	81	1.0
2010	107	1.3
2011	86	1.1

* Active disease surveillance for cryptosporidiosis began in November 1994. Starting January 2011, active laboratory surveillance was discontinued as it had been replaced by an electronic reporting system.

Figure 2: Cryptosporidiosis, number of cases by month of diagnosis, New York City, November 1994 - December 2011

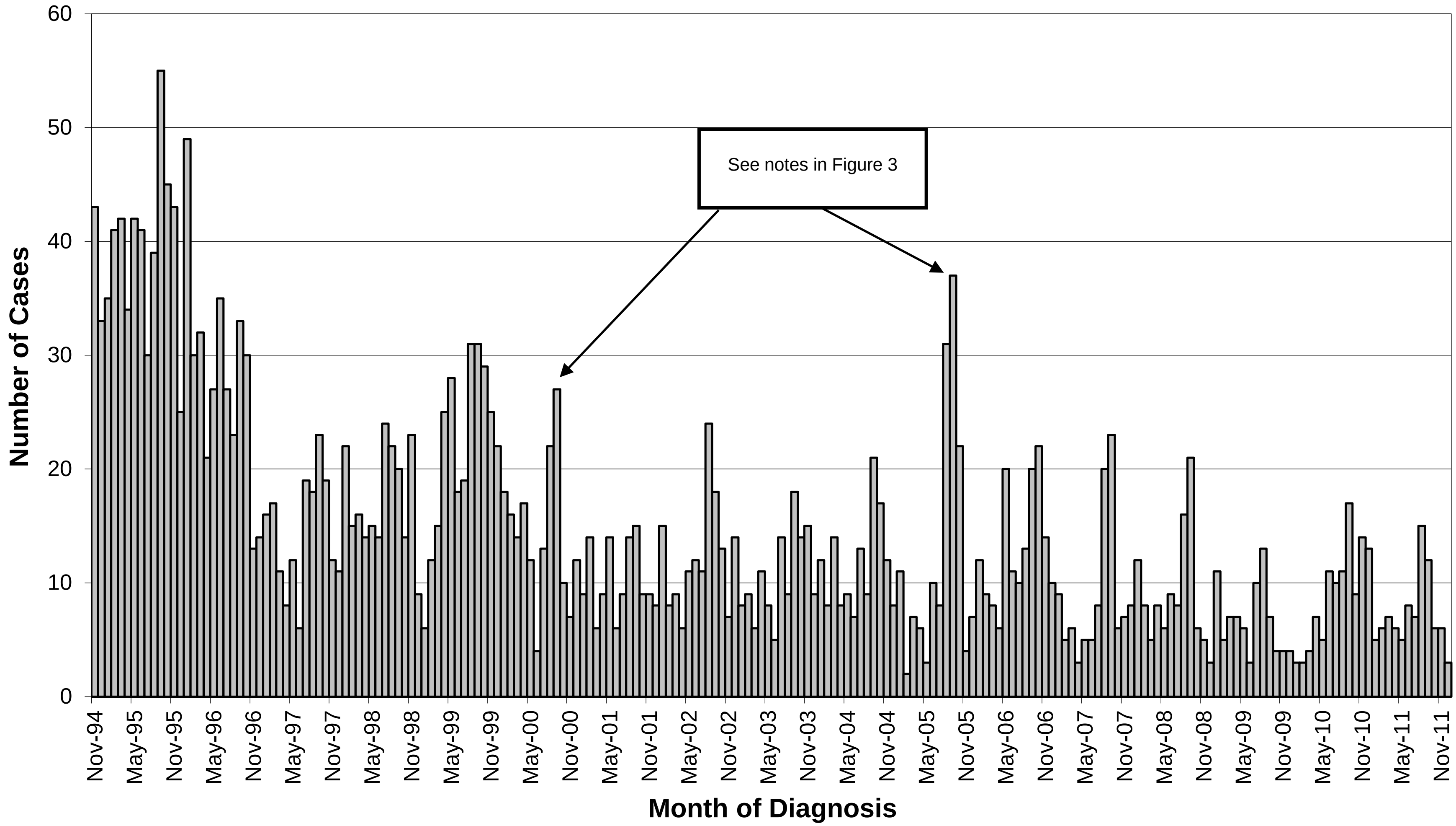
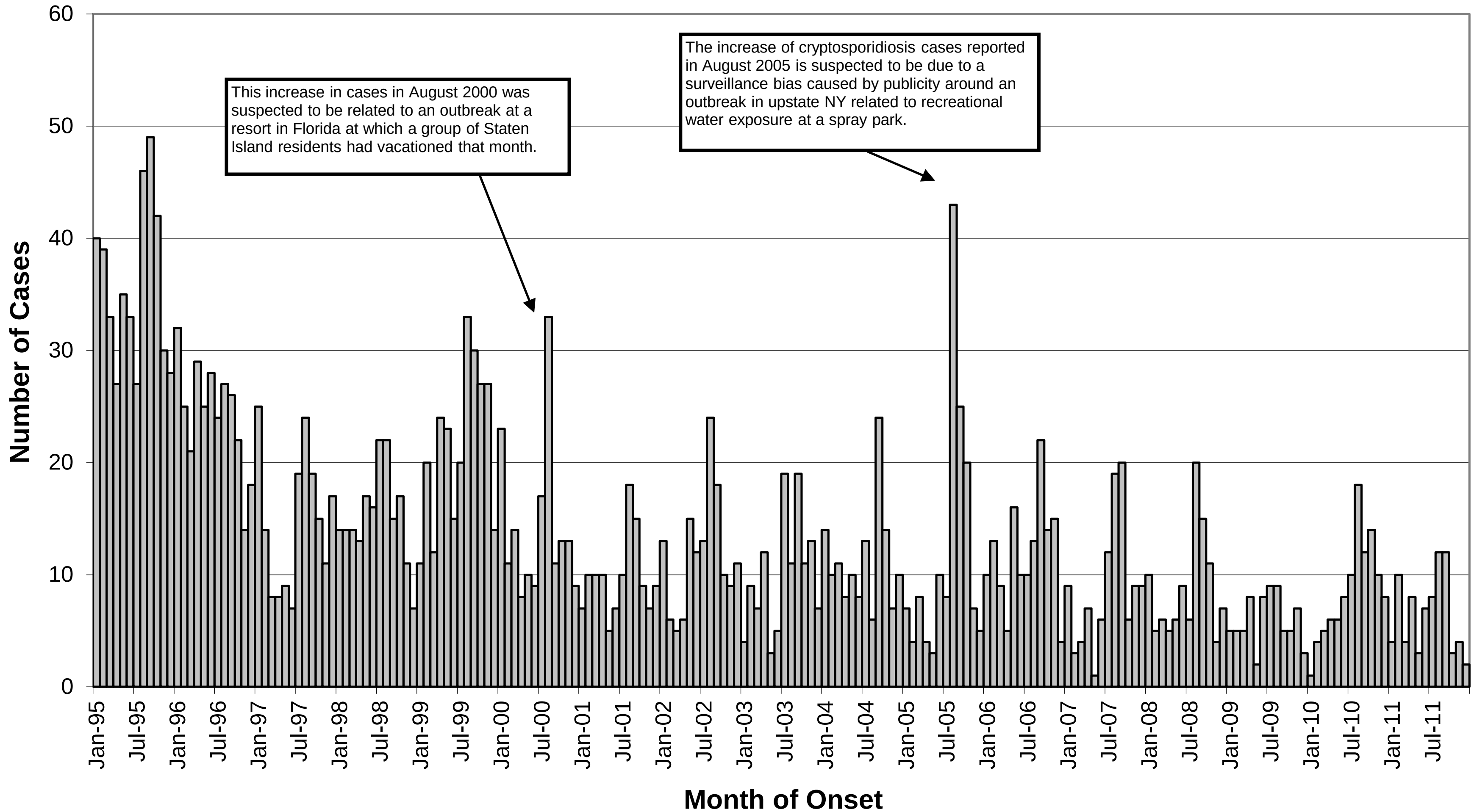


Figure 3: Cryptosporidiosis, number of cases by month of onset, New York City, January 1995 - December 2011*



* Chart does not include cases in which an onset date was unavailable: 175 cases (6%), January 1995 - June 2011.

TABLE 8: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by sex and borough of residence, New York City, 2011

	Borough of residence					
Sex	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Male	64	28	12	12	10	2
	(1.6)	(3.8)	(1.8)	(1.0)	(0.9)	(0.9)
Female	22	9	3	8	2	0
	(0.5)	(1.1)	(0.4)	(0.6)	(0.2)	
Total	86	37	15	20	12	2
	(1.1)	(2.3)	(1.1)	(0.8)	(0.5)	(0.4)

Map 2

Cryptosporidiosis annual case rate per 100,000 population
by UHF neighborhood - New York City (2011)

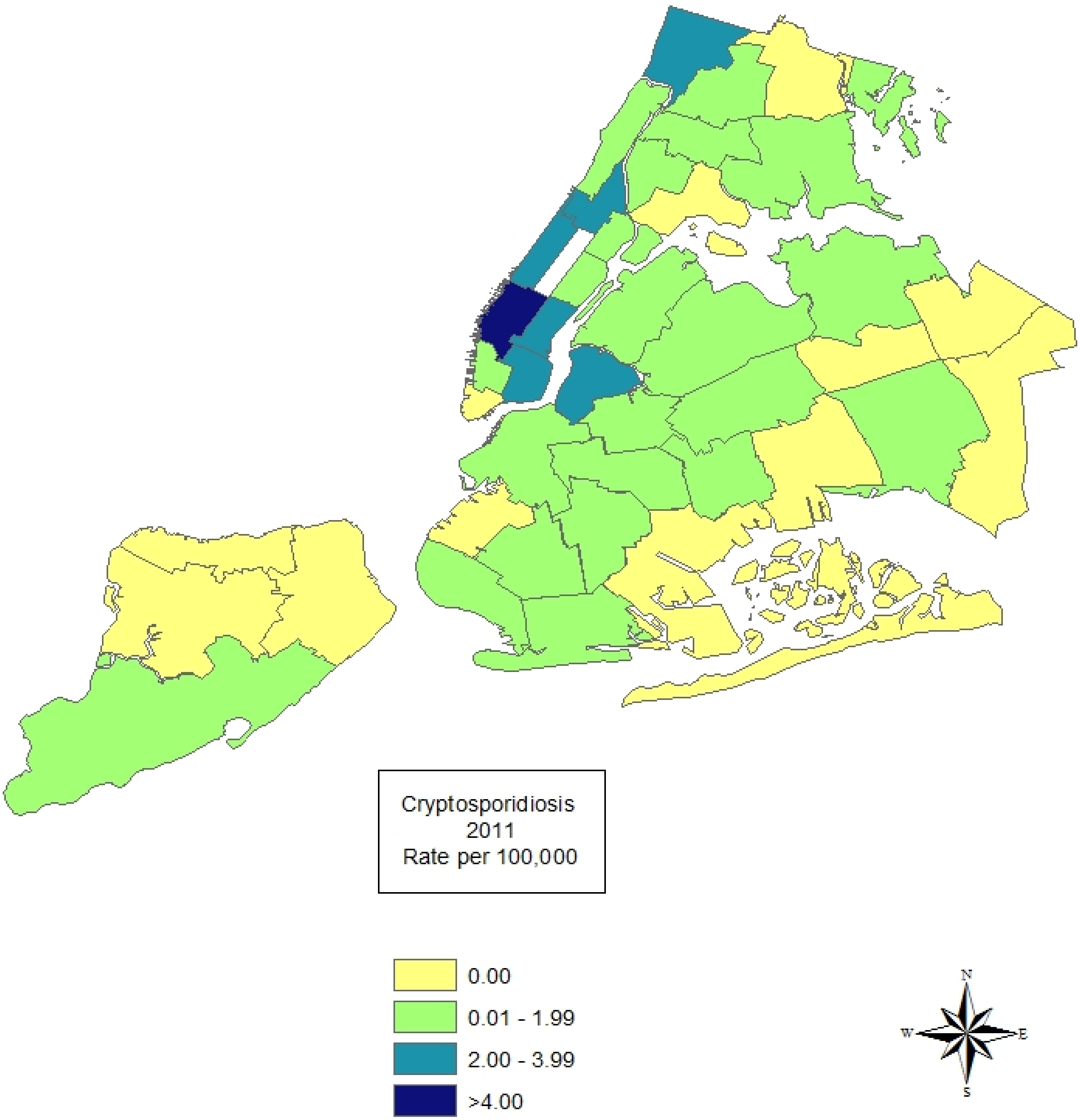


TABLE 9: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by UHF neighborhood of residence, New York City, 2011

UHF Neighborhood	Borough	Number	Population	Rate
Chelsea-Clinton	Manhattan	10	145000	6.9
Greenpoint	Brooklyn	4	127051	3.1
C Harlem-Morningside Hgts	Manhattan	5	162652	3.1
Gramercy Park-Murray Hill	Manhattan	4	134522	3.0
Upper West Side	Manhattan	5	220080	2.3
Kingsbridge-Riverdale	Bronx	2	90892	2.2
Union Sq-Lower East Side	Manhattan	4	198781	2.0
West Queens	Queens	8	480501	1.7
Washington Heights-Inwood	Manhattan	4	248508	1.6
Fordham-Bronx Park	Bronx	4	252655	1.6
Crotona-Tremont	Bronx	3	206116	1.5
High Bridge-Morrisania	Bronx	3	207631	1.4
Upper East Side	Manhattan	3	220962	1.4
Greenwich Village-Soho	Manhattan	1	83749	1.2
East New York	Brooklyn	2	187855	1.1
South Beach-Tottenville	Stat Is	2	189185	1.1
Pelham-Throgs Neck	Bronx	3	297927	1.0
Bensonhurst-Bay Ridge	Brooklyn	2	199271	1.0
Bed Stuyvesant-Crown Hgts	Brooklyn	3	318898	0.9
East Harlem	Manhattan	1	109972	0.9
Downtown Heights-Slope	Brooklyn	2	224199	0.9
Coney Island-Sheepshead Bay	Brooklyn	2	285502	0.7
East Flatbush-Flatbush	Brooklyn	2	296583	0.7
Borough Park	Brooklyn	2	331983	0.6
Long Island City-Astoria	Queens	1	204715	0.5
Williamsburg-Bushwick	Brooklyn	1	210468	0.5
Ridgewood-Forest Hills	Queens	1	245746	0.4
Flushing-Clearview	Queens	1	259767	0.4
Jamaica	Queens	1	289314	0.3

TABLE 10: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by age group and sex, New York City, 2011

	Sex		
Age group	Male number (rate)	Female number (rate)	Total number (rate)
<5 years	6 (2.3)	2 (0.8)	8 (1.5)
5-9 years	2 (0.8)	4 (1.7)	6 (1.3)
10-19 years	3 (0.6)	0	3 (0.3)
20-44 years	34 (2.2)	8 (0.5)	42 (1.3)
45-59 years	13 (1.7)	4 (0.5)	17 (1.1)
≥ 60 years	6 (1.0)	4 (0.5)	10 (0.7)
Total	64 (1.6)	22 (0.5)	86 (1.1)

<u>TABLE 11</u>: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by age group and borough, New York City, 2011

	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	8 (1.5)	2 (2.6)	1 (1.0)	1 (0.6)	3 (2.3)	1 (3.5)
5-9 years	6 (1.3)	0	2 (2.0)	3 (1.9)	1 (0.8)	0
10-19 years	3 (0.3)	1 (0.7)	1 (0.5)	1 (0.3)	0	0
20-44 years	42 (1.3)	19 (2.7)	7 (1.4)	11 (1.1)	5 (0.6)	0
45-59 years	17 (1.1)	8 (2.7)	3 (1.2)	4 (0.9)	2 (0.4)	0
≥ 60 years	10 (0.7)	7 (2.3)	1 (0.5)	0	1 (0.2)	1 (1.2)
Total	86 (1.1)	37 (2.3)	15 (1.1)	20 (0.8)	12 (0.5)	2 (0.4)

TABLE 12: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by race/ethnicity and borough of residence, New York City, 2011

	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	26 (1.1)	5 (1.2)	12 (1.6)	6 (1.2)	3 (0.5)	0
White, non-Hispanic	29 (1.1)	18 (2.4)	0	7 (0.8)	2 (0.3)	2 (0.7)
Black, non-Hispanic	16 (0.9)	7 (3.4)	1 (0.2)	6 (0.8)	2 (0.5)	0
Asian, non-Hispanic	4 (0.4)	0	1 (2.1)	0	3 (0.6)	0
Pacific Islander, Native Hawaiian, non-Hispanic	0	0	0	0	0	
American Indian, non-Hispanic	0	0	0	0	0	0
Other, non-Hispanic	1 (1.7)	0	0	0	1 (3.1)	0
Two or more races, non-Hispanic	0	0	0	0	0	0
Unknown	10	7	1	1	1	0
Total	86 (1.1)	37 (2.3)	15 (1.1)	20 (0.8)	12 (0.5)	2 (0.4)

TABLE 13: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by race/ethnicity and age group, New York City, 2011

	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 (1.1)	3 (1.8)	1 (0.3)	12 (1.3)	6 (1.5)	2 (0.7)	26 (1.1)
White, non-Hispanic	2 (1.4)	1 (0.8)	2 (0.9)	17 (1.6)	3 (0.6)	4 (0.6)	29 (1.1)
Black, non-Hispanic	2 (1.8)	2 (1.7)	0	6 (0.9)	5 (1.3)	1 (0.3)	16 (0.9)
Asian, non-Hispanic	2 (3.6)	0	0	0	0	2 (1.4)	4 (0.4)
Pacific Islander, Native Hawaiian, non-Hispanic	0	0	0	0	0	0	0
American Indian, non-Hispanic	0	0	0	0	0	0	0
Other, non-Hispanic	0	0	0	1 (4.3)	0	0	1 (1.7)
Two or more races, non-Hispanic	0	0	0	0	0	0	0
Unknown	0	0	0	6	3	1	10
Total	8 (1.5)	6 (1.3)	3 (0.3)	42 (1.3)	17 (1.1)	10 (0.7)	86 (1.1)

Table 14: Cryptosporidiosis, number of cases and case rates by census tract poverty level, New York City, 2011

Census Tract Poverty Level	Number of Cases	Case Rate per 100,000
Low[a]	22	1.1
Medium[b]	22	1.0
High[c]	15	0.9
Very high[d]	24	1.2
Total[e]	83	1.0

[a] Low poverty: <10% of residents have household incomes that are below 100% of the federal poverty level, per year 2000 Census.
[b] Medium poverty: 10-19% of residents have household incomes that are below 100% of the federal poverty level, per year 2000 Census.
[c] High poverty: 20-29% of residents have household incomes that are below 100% of the federal poverty level, per year 2000 Census.
[d] Very high poverty: >=30% of residents have household incomes that are below 100% of the federal poverty level, per year 2000 Census.
[e] Three cases (3.5%) were excluded from the total 2011 case count because geolocating information for census tract identification was unavailable.

Figure 4: Cryptosporidiosis, number of cases among persons living with HIV/AIDS by month of diagnosis, New York City, January 1995-December 2011

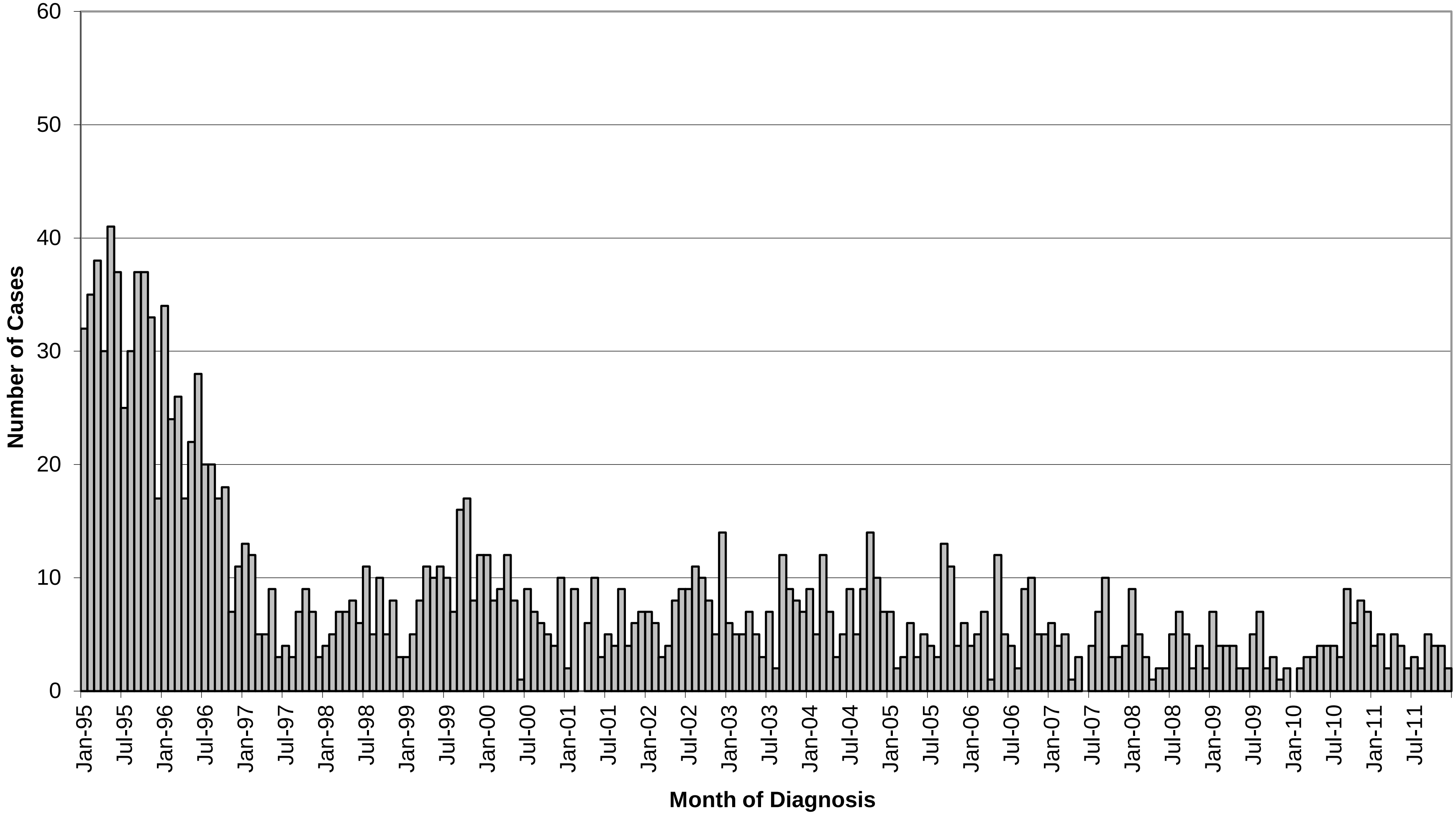


Figure 5: Cryptosporidiosis, number of cases among immunocompetent persons by month of diagnosis, New York City, January 1995-December 2011

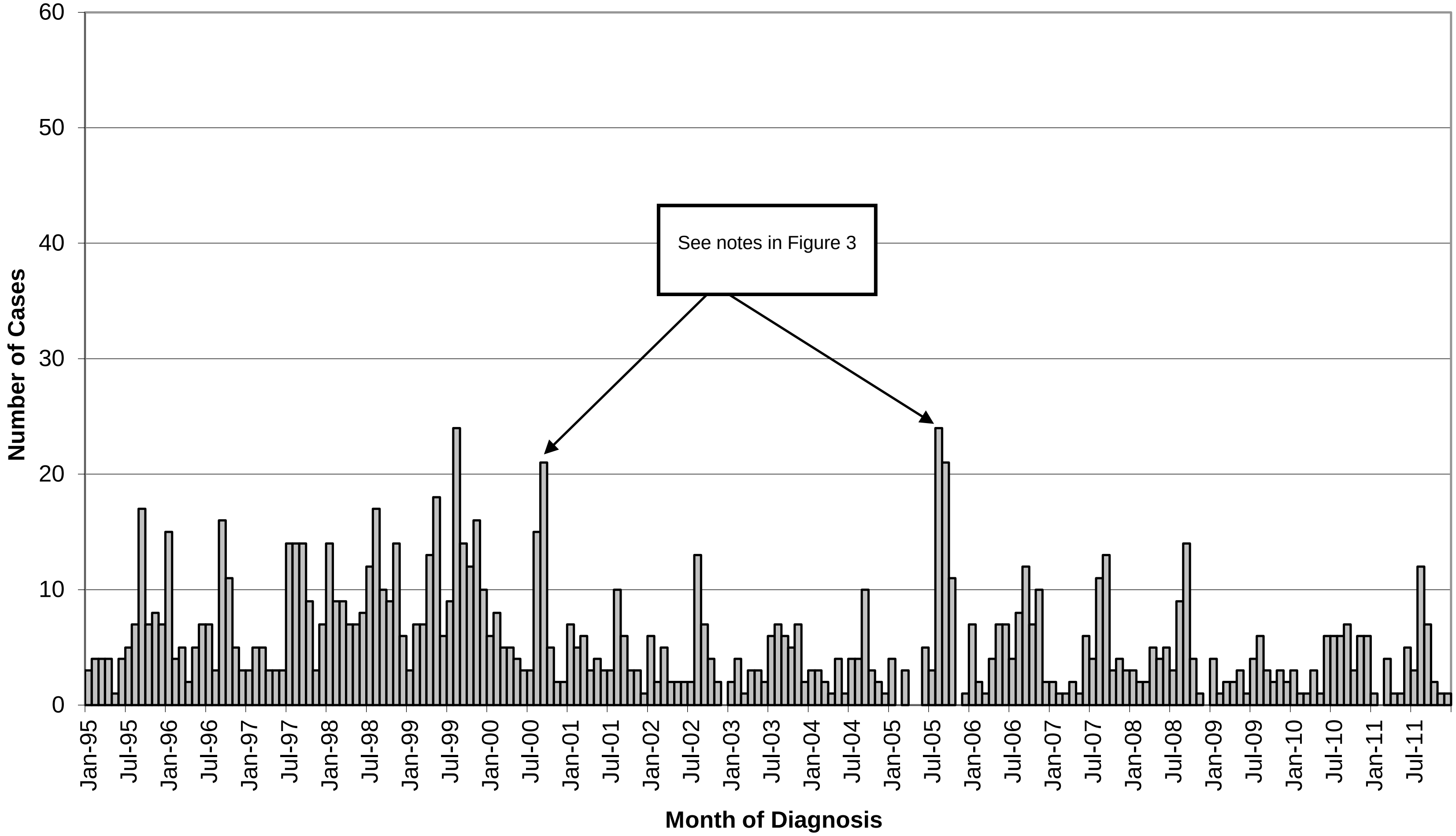


Table 15: **Cryptosporidiosi**s, number and percent of cases by year and immune status, New York City, 1995 - 2011

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. (%)	2010 No. (%)	2011 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 (53.1)	53 (49.5)	42 (48.8)
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)	33 (40.7)	49 (45.8)	38 (44.2)
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 (3.7)	4 (3.7)	4 (4.7)
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)	1 (0.9)	2 (2.3)
Total	472	334	172	208	261	172	122	148	126	138	148	155	105	107	81	107	86

<u>Table 16:</u> Percentage of interviewed c**ryptosporidiosis** case-patients reporting selected potential risk exposures before disease onset,[a] persons with HIV/AIDS, New York City, 1995 - 2011

Exposure Type	Persons with HIV/AIDS																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Contact with an Animal[b]	35%	35%	33%	36%	35%	43%	24%	42%	40%	31%	33%	38%	31%	44%	42%	20%	36%
High-risk Sexual Activity[c] (≥ 18 years old)	22%	22%	9%	15%	20%	25%	16%	23%	24%	34%	27%	31%	21%	39%	35%	7%	14%
International Travel[d]	9%	9%	9%	13%	18%	14%	10%	11%	13%	15%	17%	9%	6%	7%	8%	7%	4%
Recreational Water Contact[e]	16%	8%	16%	12%	16%	15%	8%	10%	21%	13%	5%	18%	17%	14%	8%	10%	14%

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, 8/21/2002, and 4/26/2010. Details regarding changes made to the interview form and Exposure Types from 1995-2011 are noted below.

[a] From 1/1/1995 to 4/25/2010, case-patients were asked about potential risk exposures during the month before disease onset. Starting 4/26/2010, case-patients were asked about potential risk exposures during the 14 days before onset.

[b] 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 (1997-2011).

[c] High-risk Sexual Activity - Includes having a penis, finger or tongue in sexual partner's anus (1995-2011).

[d] International Travel - Travel outside the United States (1995-2011).

[e] 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 (1997-2011).

<u>Table 17:</u> Percentage of interviewed **cryptosporidiosis** case-patients reporting selected potential risk exposures before disease onset,[a] immunocompetent persons, New York City, 1995 - 2011

Exposure Type	Immunocompetent Persons																
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Contact with an Animal[b]	7%	41%	41%	32%	35%	26%	37%	35%	23%	34%	36%	36%	34%	28%	40%	18%	41%
High-risk Sexual Activity[c] (≥ 18 years old)	14%	25%	12%	10%	12%	23%	15%	30%	13%	31%	17%	3%	19%	7%	18%	4%	5%
International Travel[d]	30%	29%	26%	28%	28%	40%	47%	33%	45%	47%	45%	40%	47%	52%	37%	44%	35%
Recreational Water Contact[e]	21%	27%	40%	24%	22%	32%	35%	35%	34%	33%	52%	28%	36%	40%	50%	33%	35%

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, 8/21/2002, and 4/26/2010. Details regarding changes made to the interview form and Exposure Types from 1995-2011 are noted below.
  [a] From 1/1/1995 to 4/25/2010, case-patients were asked about potential risk exposures during the month before disease onset. Starting 4/26/2010, case-patients were asked about potential risk exposures during the 14 days before onset.
  [b] 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 (1997-2011).
  [c] High-risk Sexual Activity - Includes having a penis, finger or tongue in sexual partner's anus (1995-2011).
  [d] International Travel - Travel outside the United States (1995-2011).
  [e] 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 (1997-2011).

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

<u>Table 18:</u> Percentage of interviewed **cryptosporidiosis** case-patients by type of tap water exposure before disease onset,[a] persons with HIV/AIDS, New York City, 1995 - 2011

Exposure Type	Persons with HIV/AIDS																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Plain Tap[b]	69%	70%	71%	64%	66%	63%	55%	54%	77%	49%	76%	67%	67%	64%	58%	63%	50%
Filtered Tap[c]	12%	9%	10%	18%	20%	20%	14%	22%	13%	21%	7%	18%	11%	14%	15%	12%	25%
Boiled Tap[d]	7%	7%	3%	5%	3%	6%	6%	0%	4%	6%	5%	7%	0%	11%	8%	2%	4%
Incidental Plain Tap Only[e]	11%	15%	16%	15%	8%	12%	16%	19%	4%	15%	10%	4%	17%	7%	15%	15%	18%
No Tap[f]	3%	2%	2%	0%	5%	4%	6%	4%	2%	5%	2%	2%	6%	4%	0%	3%	4%

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, 8/21/2000, and 4/26/2010. Details regarding changes made to the interview form and Tap Water Exposure Types from 1995-2011 are noted below.

[a] From 1/1/1995 to 4/25/2010, case-patients were asked about Tap Water Exposure during the month before disease onset. Starting 4/26/2010, case-patients were asked about Tap Water Exposure during the 14 days before onset.

[b] Plain Tap - Drank unboiled/unfiltered NYC tap water (1995-5/10/2001); or drank greater than 0 cups of unboiled/unfiltered NYC tap water (5/11/2001-12/31/2011).

[c] 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 (5/11/2001-12/31/2011).

[d] 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 (5/11/2001-12/31/2011).

[e] Incidental Plain Tap Only - Did not drink any NYC tap water but <u>did</u> 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 (1997-2011)

[f] No Tap - Did not drink any NYC tap water and <u>did not</u> 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 (1997-2011).

Table 19: Percentage of interviewed **cryptosporidiosis** case-patients by type of tap water exposure before disease onset,[a] immunocompetent persons, New York City, 1995 - 2011

Exposure Type	Immunocompetent Persons																
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Plain Tap[b]	58%	63%	58%	67%	56%	56%	43%	33%	36%	27%	30%	30%	27%	30%	47%	33%	44%
Filtered Tap[c]	18%	17%	21%	21%	25%	17%	31%	44%	36%	30%	25%	20%	22%	30%	23%	27%	18%
Boiled Tap[d]	11%	10%	8%	3%	4%	2%	4%	0%	2%	7%	5%	8%	4%	14%	0%	7%	3%
Incidental Plain Tap Only[e]	7%	9%	12%	8%	11%	8%	16%	21%	16%	13%	25%	28%	18%	14%	27%	22%	15%
No Tap[f]	2%	4%	4%	3%	7%	17%	6%	2%	9%	21%	14%	14%	27%	12%	3%	11%	21%

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, 8/21/2000, and 4/26/2010. Details regarding changes made to the interview form and Tap Water Exposure Types from 1995-2011 are noted below.

[a] From 1/1/1995 to 4/25/2010, case-patients were asked about Tap Water Exposure during the month before disease onset. Starting 4/26/2010, case-patients were asked about Tap Water Exposure during the 14 days before onset.

[b] Plain Tap - Drank unboiled/unfiltered NYC tap water (1995-5/10/2001); or drank greater than 0 cups of unboiled/unfiltered NYC tap water (5/11/2001-12/31/2011).

[c] 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 (5/11/2001-12/31/2011).

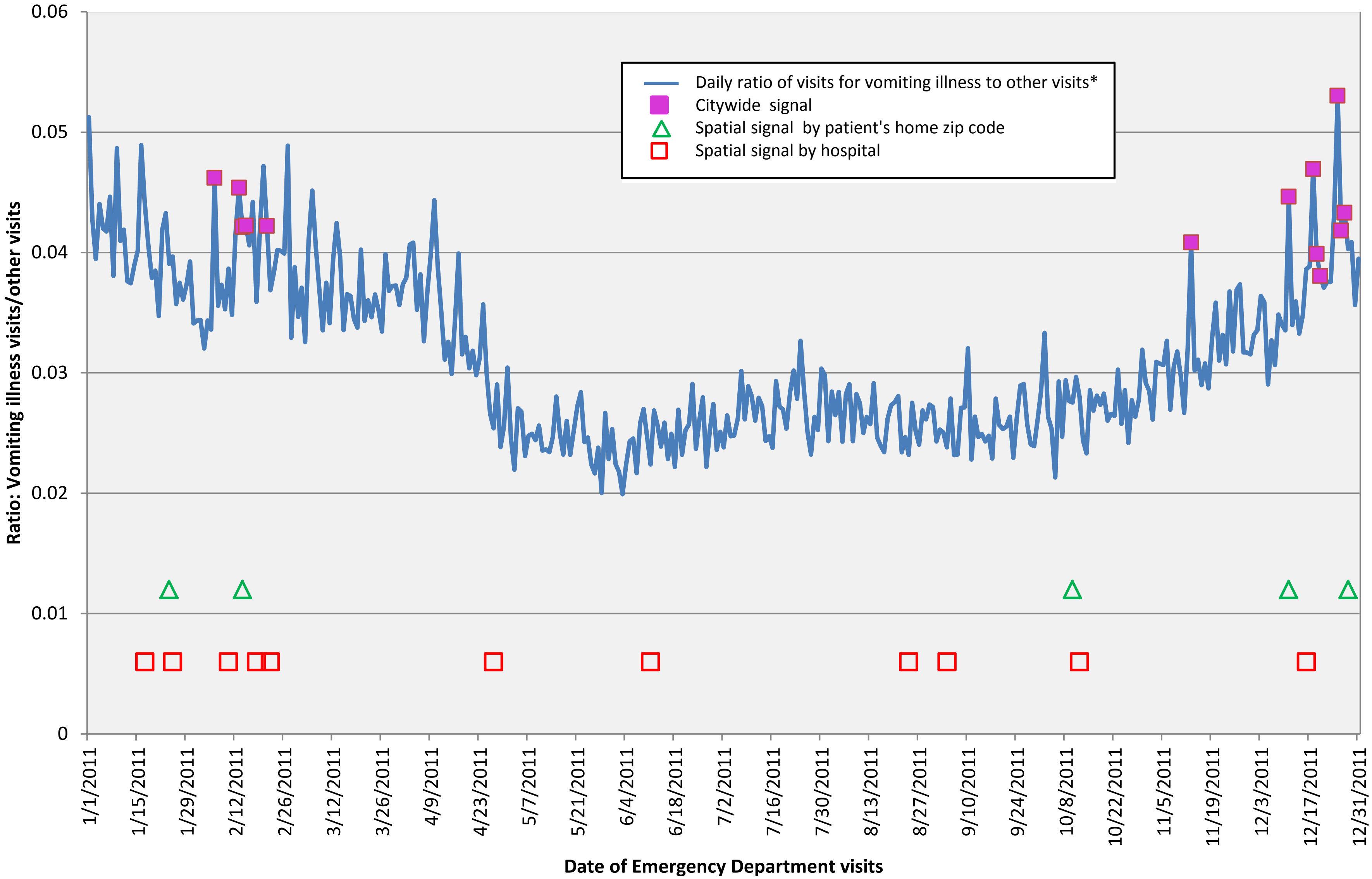
[d] Boiled Tap - Drank boiled NYC tap water (1995-5/10/2001); or drank greater than 0 cups of boiled NYC tap water, and no unboiled /unfiltered NYC tap water, and no filtered NYC tap water (5/11/2001-12/31/2011).

[e] 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 (1997-2011)

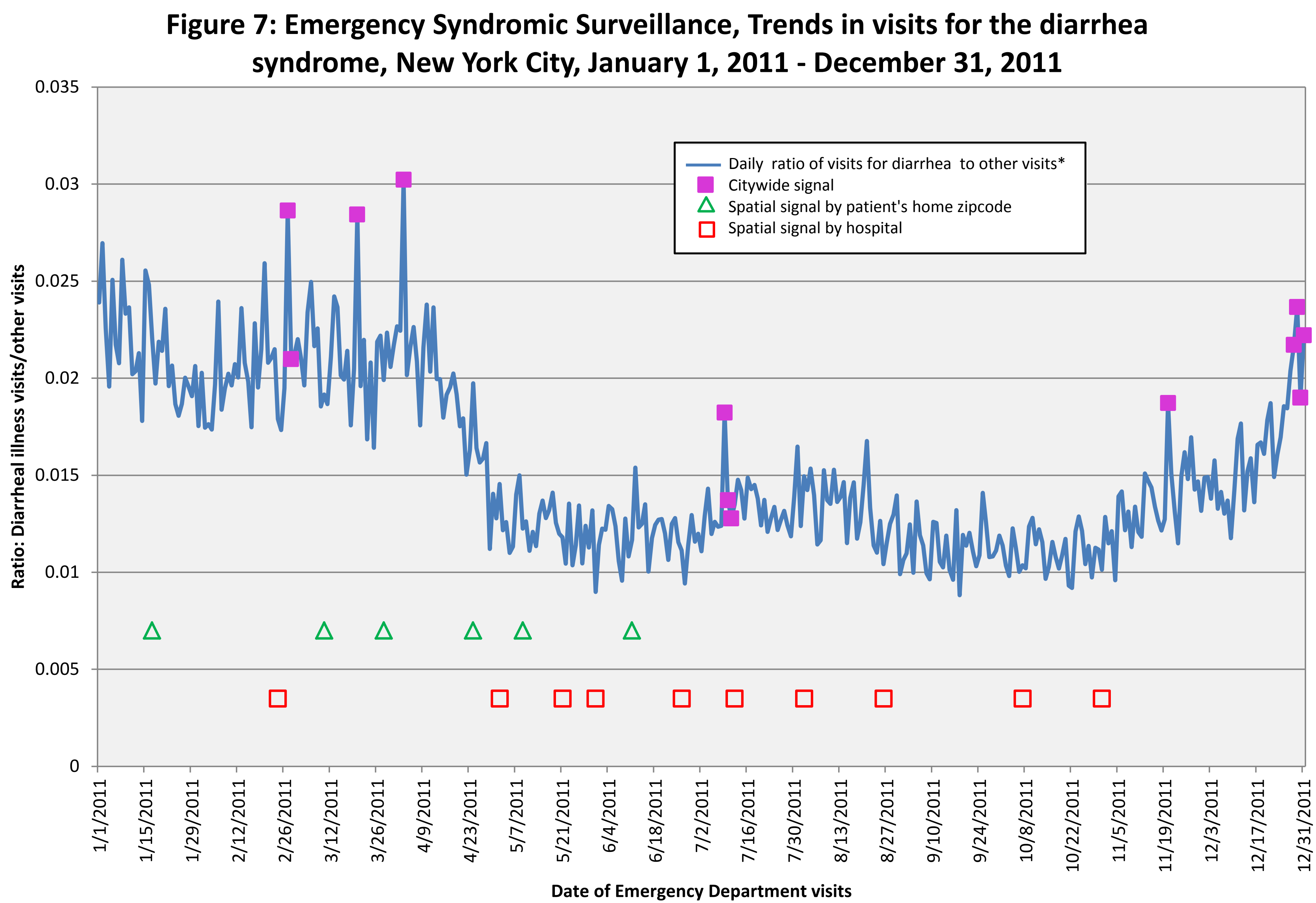
[f] No Tap - Did not drink any NYC tap water and did not use unboiled/unfiltered NYC tap water to brush teeth, or to wash vegetables/fruits, or to make ice (1995-1996); expanded to include: or to make juice from concentrate (1997-2011).

* 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, 2011 - December 31, 2011

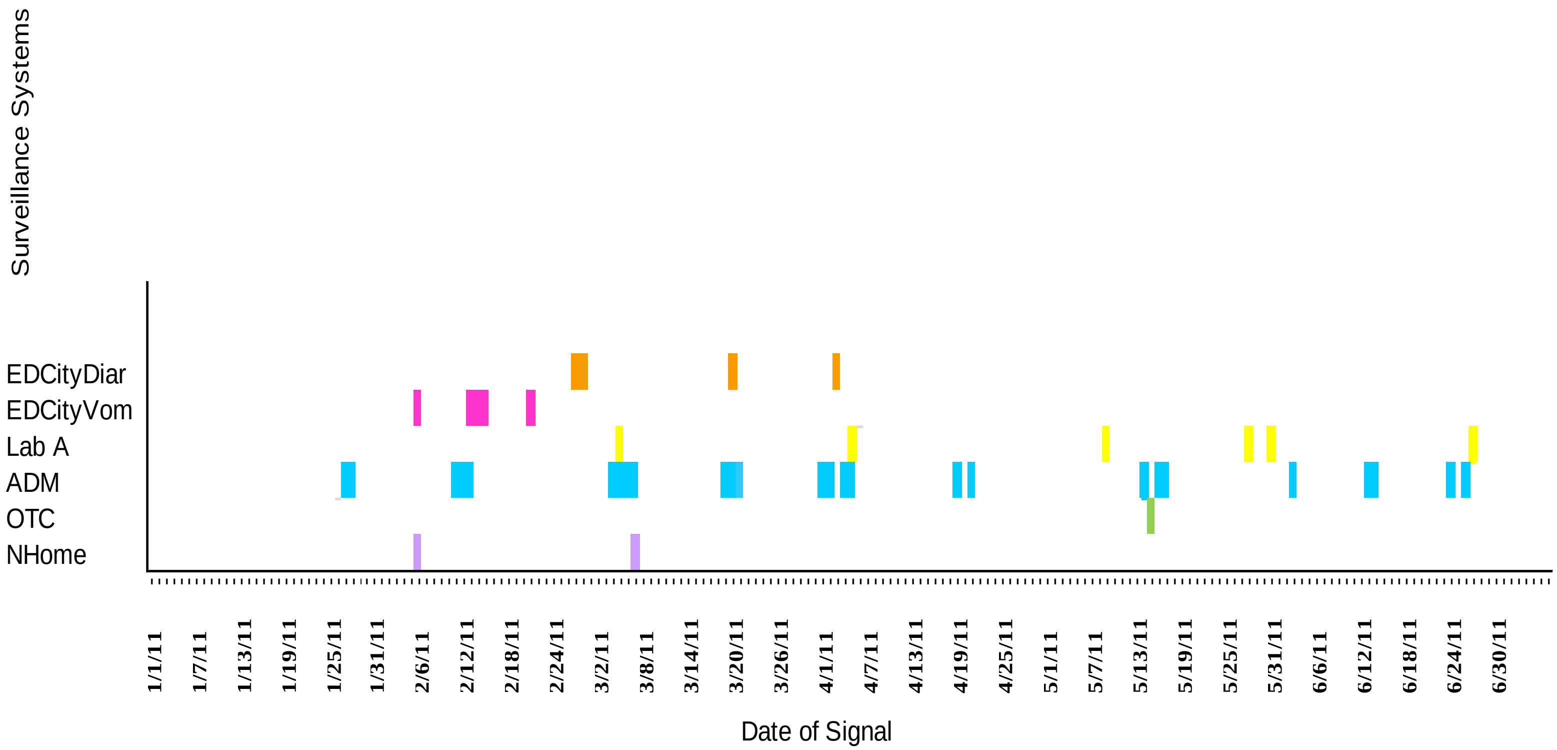


*Other visits=visits to participating ED for conditions that do not fit in to one of the eight tracked syndromes (diarrhea, vomiting, respiratory, fever/influenza, asthma, sepsis, cold, rash).



*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, Syndromic Surveillance Systems
New York City, January 1, 2011 - June 30, 2011



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
ADM: Citywide signal for daily antidiarrheal medication sales in DEP system
OTC: Citywide signal for daily antidiarrheal medication sales in DOHMH system
Note: Data transmission disruption in the OTC system mid-June to October 20 affected signal detection. OTC system analysis was not run October 21 - December 31. See text for details.
NHome: Sentinel Nursing Home Gastrointestinal Outbreak. Indicates the first day of the outbreak.

Figure 9: Signals for Gastrointestinal Illness, Syndromic Surveillance Systems
New York City, July 1, 2011 - December 31, 2011