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

2013 Annual Report

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EXECUTIVE SUMMARY

The 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 2013.

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 In January 2011, active laboratory surveillance for giardiasis and cryptosporidiosis was discontinued as it had been replaced by an electronic reporting system.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 2013 (and includes data from past years for comparison). Also, demographic information for cases of giardiasis and cryptosporidiosis in 2013 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. The giardiasis case rate decreased from 10.7 per 100,000 population in 2012 to 9.2 per 100,000 (767 cases) in 2013, and the cryptosporidiosis case rate decreased from 1.5 per 100,000 to 1.0 per 100,000 (80 cases) during the same period.

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 (ED) logs; under another system DOHMH monitors and assists in the investigation of GI outbreaks in eight sentinel nursing homes; a third system tracks the number of stool specimens submitted to a clinical laboratory for microbiological testing; and a fourth system involves the monitoring of sales of over-the-counter or non-prescription anti-diarrheal medications.

The City's anti-diarrheal medication monitoring activities has had two components: the "ADM" system and the "OTC" system. The two systems monitor daily sales of non-prescription antidiarrheal medications at major store chains. The ADM has been managed by DEP and the OTC system by DOHMH. In 2012 the ADM and OTC systems were merged, though DEP continued to run the ADM system into 2013 to insure a smooth transition. An evaluation by

NYC of the impact of the merger of the two systems has been completed and a summary report is in preparation.

A summary of syndromic surveillance findings for 2013 pertaining to GI illness is presented. Sustained citywide signals in the ED system in January, February, November and December are consistent with annual gastrointestinal viral trends. There was no evidence of a drinking water-related outbreak in New York City in 2013.

INFORMATION SHARING AND PUBLIC EDUCATION

Information sharing and education efforts continued during 2013. 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. Educational outreach talks in 2013 included a presentation by DEP staff on the WDRAP program at two symposiums (NYC Watershed/Tifft Science & Technology conference, and a Westchester Water Works conference), and two more general talks at New York University for a college audience and open to the public.

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 2013. For this report the population denominators used to calculate rates were intercensal population estimates for all years except 2000 and 2010 to 2012. For the years 1994 through 1999, intercensal population estimates per year were used based upon linear interpolation between the 1990 and 2000 NYC Census.[1] For the years 2001 through 2009, and 2013, 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. For 2010 to 2012, the year 2010 NYC Census data were used.[2] Because rates for the years 2001 through 2009, and 2013 were calculated for this report using intercensal population estimates, they may differ from previously reported rates based on year 2000 and 2010 NYC 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 2013 are based upon intercensal population estimates and include the race/ethnicity categories used by the US Census Bureau Population Estimate program. In earlier reports, there was one race/ethnicity category entitled

[1] For 1994-2000 NYC intercensal data citywide, by borough, and by UHF neighborhood see https://a816-healthpsi.nyc.gov/EpiQuery/Census/index.html

[2] For 2010 NYC Census data by geographic area and demographic subgroup see https://a816-healthpsi.nyc.gov/EpiQuery/Census/index2010.html

"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, non-Hispanic American Indian and non-Hispanic of two or more races.

The WDRAP Annual Report now includes 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, American Community Survey 2008-2012 data were used for census tract poverty levels.

PART I: DISEASE SURVEILLANCE

Giardiasis

New York City implemented a program of active laboratory 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. Starting January 2011, such active surveillance was replaced by an electronic laboratory reporting system. Case rates and basic demographic findings were originally compiled and reported on a quarterly basis (through July 2002), then on a semi-annual basis (2003-2012), and now are compiled and reported on an annual basis (per NYC FAD discussions).

During 2013, a total of 767 cases of giardiasis were reported to DOHMH and the annual case rate was 9.2 per 100,000. Annual case numbers decreased 12.0% from 2012 to 2013. From 1994 to 2013 annual case numbers declined 68.8% (see Table 1 and Figure 1).

Since September 1995, case investigations for giardiasis are conducted only for case-patients who are in a secondary transmission risk category (e.g., food handler, health care

worker, child attending day care, or day care worker), or when giardiasis clusters or outbreaks are suspected. A total of 4 such cases of giardiasis were investigated in 2013.

The following provides some highlights from the surveillance data for giardiasis among New York City residents from January 1 through December 31, 2013. 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 767 giardiasis case-patients who resided in New York City. Manhattan had the highest borough-specific annual case rate (18.0 cases per 100,000) (Table 2). The highest UHF neighborhood-specific case rate was found in the Chelsea-Clinton neighborhood in Manhattan (41.2 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 542 males (13.6 cases per 100,000), 224 females (5.1 cases per 100,000), and 1 transgender person reported. The highest sex- and borough-specific case rate was observed among males residing in Manhattan (28.8 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 5 to 9 years old (14.1 cases per 100,000), children less than 5 years old (12.8 cases per 100,000) and persons 20-44 years old (11.5 cases per 100,000). The highest age group and sex-specific case rates were among males 20-44 years old (18.4 cases per 100,000) and females 5-9 years old (14.4 cases per 100,000) (Table 4). The highest age group- and borough-specific case rates were among persons 45-59 years old in Manhattan (21.8 cases per 100,000), persons 20-44 years old in Manhattan (21.4 cases per 100,000), children 5-9 years olds in Manhattan (20.5 cases per 100,000) and children less than 5 years old in the Bronx (20.4 cases per 100,000) (Table 5).

Race/Ethnicity

Information regarding race/ethnicity was available for 89 of 767 cases (11.6%). Ascertainment of race/ethnicity status for giardiasis cases was poor. As indicated above, giardiasis case-patients are not routinely interviewed unless they are in occupations or settings that put them at increased risk for secondary transmission or if they are part of a suspected cluster or outbreak. 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 2013 are not presented in this report.

Census Tract Poverty Level

Age-adjusted case rates for giardiasis among four levels of census tract poverty, with gradients encompassing low poverty to very high poverty, ranged from 7.9 to 10.4 cases per 100,000 population, with the lowest rate occurring in census tracts with high poverty levels

(Table 6). By contrast, in 2011, there was a more narrow distribution of giardiasis case rates among census tract poverty levels (range in 2011: 11.1 to 12.0 per 100,000). This variation in findings suggests that more years of data or further analysis may be needed to determine whether neighborhood poverty is associated with the occurrence of giardiasis in New York City. It must be noted that under-diagnosis of giardiasis may have occurred among individuals without health insurance who are less likely to access care and have laboratory testing done.

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. Starting in 2011, such surveillance was replaced by electronic laboratory reporting system.

Case interviews for demographic and risk factor data were initiated in January 1995 and are ongoing. Case rates and basic demographic findings were originally compiled and reported on a quarterly basis (through July 2002), then on a semi-annual basis (2003–2012), and are now compiled and reported on an annual basis (per NYC FAD).

Prior to last year, WDRAP annual reports included only confirmed cases of cryptosporidiosis. As explained in the WDRAP 2012 Annual Report, both confirmed and probable cryptosporidiosis cases are now included. This change is due to a revision made in 2011 to the CDC:CSTE[1,2] case definition for cryptosporidiosis to include two case classifications for cryptosporidiosis: confirmed and probable. Confirmed cases are those in which the laboratory method used has a high positive predictive value such as light microscopy of stained slide, enzyme immunoassay, polymerase chain reaction, and direct fluorescent antibody test. Probable cases are those in which the laboratory method used has a low positive predictive value (such as the immunochromatographic card/rapid test) or in which the method used for diagnostic testing was not known. Prior to the 2012 WDRAP Annual report, such cases were counted as confirmed cases. The new probable case classification for cryptosporidiosis also includes those cases in which laboratory confirmation was not obtained, but the case was epidemiologically linked to a confirmed case and clinical illness was consistent with cryptosporidiosis. DOHMH BCD reports both confirmed and probable cryptosporidiosis cases to the Centers for Disease Control and Prevention (CDC) through the National Electronic Telecommunications System for Surveillance.

During 2013, a total of 80 cases of cryptosporidiosis were reported to DOHMH. The annual case rate was 1.0 per 100,000. Annual case numbers decreased 36% from 2012 to 2013. From 1995 to 2013 annual case numbers have declined 83% (Table 7). The number of cases diagnosed each month for the period November 1994 to December 2013 is indicated in Figure 2.

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[1] For the 2011 CDC case definition for Cryptosporidiosis see http://wwwn.cdc.gov/nndss/script/conditionsummary.aspx?condID=38

[2] For the 2011 CSTE position statement for Cryptosporidiosis see http://c.ymcdn.com/sites/www.cste.org/resource/resmgr/PS/11-ID-14.pd

Because diagnosis may occur sometime 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 2013 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, 2013. 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 (2.2 cases per 100,000) (Table 8). The highest UHF neighborhood-specific case rate was in the Chelsea-Clinton neighborhood in Manhattan (5.4 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 57 males (1.4 cases per 100,000) and 23 females (0.5 cases per 100,000) reported. The borough- and sex-specific case rate was highest for males in Manhattan (3.5 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 persons 20-44 years old (1.6 cases per 100,000), in persons 45-59 years old (1.0 cases per 100,000), and in children less than five years old (0.9 cases per 100,000). The highest age group- and sex-specific case rates were in males 20-44 years old (2.3 cases per 100,000), males 45-59 years old (1.7 cases per 100,000) and males less than 5 years old (1.1 cases per 100,000) (Table 10). The highest age group and borough-specific case rates occurred in persons 20-44 years old in Manhattan (3.4 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 74 of 80 cases (92.5%). The racial/ethnic group-specific case rate was highest among non-Hispanics of two or more races (3.9 cases per 100,000); however, there were only five cases in this race/ethnicity group. The highest race/ethnicity and borough-specific case rate occurred among non-Hispanics of two or more races in Manhattan (10.3 cases per 100,000); however, there were only three case in this race group/borough category. The next highest race group and borough specific case rates occurred in Black-non-Hispanics in Manhattan (4.3 cases per 100,000) (Table 12). The highest age group and race/ethnicity-specific case rates occurred among 45-59 year old non-Hispanics of two or more races (2 cases, 10.4 cases per 100,000), followed by 20-44 year old non-Hispanics of two or more races (3 cases, 6.1 cases per 100,000) (Table 13).

Census Tract Poverty Level

Age-adjusted case rates for cryptosporidiosis among four levels of census tract poverty ranged from 0.8 to 1.3 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 (1.0 cases per 100,000). This fairly narrow 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 and diagnosis of cryptosporidiosis in New York City in 2013.

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 48 in 2013, thus causing a decline in the overall number of cryptosporidiosis cases in New York City. However, during the years 1995 through 2013, the number of cases of cryptosporidiosis among immunocompetent persons has shown less variation, ranging from a high of 139 cases in 1999 to a range of 29 to 75 cases in the years 2001 – 2013 (see figures 4, 5 and 6). 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 2013 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 80 cryptosporidiosis cases diagnosed among NYC residents in 2013, questionnaires concerning potential exposures were completed in 46 cases (57.5%). Reasons for non-completion of questionnaires were: unable to locate case-patient (17 cases, 21%), refused (15 cases, 18.7%), and unable to interview due to incapacitating illness (2 cases, 2.5%). Of the immunocompetent case-patients, interviews were completed for 21 case-patients (72.4%). Among persons with HIV/AIDS, interviews were completed for 24 case-patients (50%). Summary data for 1995 through 2013 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 15 and 16, respectively. Information has also been collected regarding type of tap water consumption, and is presented in Tables 17 and 18. Tables 15 to 18 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 15 and 16 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, 2012-2013, P=<.01). There was no statistically significant difference between these two groups in the proportion of cases reporting animal contact in 2001 to 2013, or reporting high-risk sex in 2001 to 2005, 2007, and 2009 to 2013. 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 years, beginning in the 1990s, 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 system monitors the number of stool specimens submitted to a participating clinical laboratory for microbiological testing, and a third system utilizes hospital emergency department (ED) chief complaint logs to monitor for outbreaks. The ED system is relied upon most for monitoring the burden of diarrheal illness in NYC. The City has also utilized two systems for monitoring sales of anti-diarrheal medications: the Anti-Diarrheal Monitoring System (ADM) and the Over-the-Counter medication (OTC) system. These pharmacy systems were merged in 2012 as the OTC-ADM system. (NOTE: both the ADM and OTC systems track sales of non-prescription anti-diarrheal medications. The program names were chosen simply as a way to distinguish the two systems).

Other than the ED system which is mandated under the New York City Health Code, 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 2013 is provided in the final section of this part, on pages 11 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.

During the months of October, November and December 2013, a WDRAP team member and a staff-member from DOHMH BCD made site visits to all eight nursing homes participating in the Nursing Home Sentinel Surveillance system. During the site visits, the DOHMH staff members reviewed with nursing administration or infection control staff the rationale for the program and program protocol. In addition, the DOHMH staff members 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 System

The number of stool specimens submitted to clinical laboratories for bacterial and parasitic testing also provides information on gastrointestinal illness trends in the population. NYC's Clinical Laboratory Monitoring program currently collects data from one large laboratory, designated as Laboratory A in this report. (The number of participating laboratories has changed over time, as reported in prior WDRAP reports.) 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, via a system operated by DEP.[3] Major enhancements to NYC's anti-diarrheal medication surveillance program have been made over the years, including: initiation and then expansion of DEP's ADM program; initiation of DOHMH's OTC program; and most recently, the merger of the ADM and the OTC systems. The merger of the ADM and OTC systems was planned for several years in order to simplify the processing and analysis of pharmacy data and combine the strengths of the two systems. The merger took effect in April 2012 and the combined OTC-ADM system is operated by DOHMH.

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. The ADM system includes 50-60 pharmacies and remained independently operated by DEP until the system merger. For a description of this system, see prior WDRAP reports. In 2012, the ADM and OTC systems were merged into one DOHMH-operated combined system. DEP continued to run the ADM system into 2013 to insure a smooth transition, and then discontinued the ADM system in September 2013.

The OTC System

The second of the drug monitoring systems in operation in recent years, the OTC system, was started in 2002 by DOHMH. This system involved the monitoring of anti-diarrheal medication sales at a second store chain. When the OTC system was initiated, the goal was to develop a system that would provide more timely and detailed data than the ADM tracking system that had been in place at the time. Also, the OTC system collects data on other

[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 began operation in 1996 .

medicines, including fever and allergy medications, for broader bioterrorism and emerging infectious disease surveillance purposes. Routine daily analyses for the OTC system began in mid-December 2002. Approximately 300 stores submit electronic file which contains data for 30,000-40,000 non-prescription medication sales. A separate file is also sent daily which contains approximately 12,000 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 sales data of prescription anti-diarrheal medications are not routinely analyzed. Drugs are categorized into key syndromes, and trends are analyzed for citywide increases in sales of non-prescription anti-diarrheal medications. Prior to 2012, the gastrointestinal category combined generic and brand name loperamide-containing agents and bismuth subsalicylate agents.

The Combined OTC-ADM system

The first full year of operation of the merged OTC-ADM system was 2013. Enhancements of the combined system include: an increased number of stores providing data into one database for analysis, broader geographic coverage in a single database, new analytic methods, and separate analyses for citywide increases in sales of over-the-counter, non-bismuth-containing anti-diarrheal medications and of bismuth subsalicylate medications. On average, 345 pharmacies (a range of 340-350) provide daily sales reports. DOHMH has completed an evaluation of the impact of the merger of the two systems, and a final report on the evaluation is under review and will be submitted separately. In 2013, there were 23 days when data transmission to the OTC-ADM system was incomplete. From February 8-18 and again on February 24, 25, and 27, one pharmacy chain experienced technical problems and was unable to send data. The five other days when problems occurred in data transmission were in May, June and August. While the analysis did not run on time on these 23 days, back data was received for 15 of the days. No unusual increases in diarrheal illness was detected in our mainstay ED system on the days that the OTC-ADM system experienced problems.

D. Hospital Emergency Department Monitoring

NYC initiated monitoring of hospital emergency department (ED) visits as a public health surveillance system in 2001. Throughout most of 2013, DOHMH received electronic data from 48 of New York City's 52 EDs reporting approximately 11,000 visits per day, roughly 98% 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 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. In this report, Figures 7 to 10 summarize GI disease signals from NYC's syndromic surveillance systems. Figures 7 and 8 summarize ED system trends and signals for 2013. Figures 9 and 10 summarize signal results from all syndromic surveillance systems operated by DOHMH during 2013.

Figure 7 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, 2013. The graph also indicates the occurrence of citywide signals and of the spatial residential zipcode and hospital signals. Figure 8 is the same graph for the syndrome of diarrhea. Figures 7 and 8 indicate that citywide signals for vomiting and diarrhea occurred primarily in January, February, November and December. There were sustained citywide vomiting signals from January 13-14, February 23-25, November 3-5, 17-19 and December 1-2; and citywide diarrhea signals January 20-22, August 18-19 and December 1-3. ED signals for vomiting and diarrhea in January, February, November and December are consistent with historical experience showing a seasonal increase in viral gastroenteritis due to norovirus and/or rotavirus

Figures 9 and 10 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, 2013, respectively. Results from all of the GI syndromic surveillance systems are included (i.e., the ED, clinical laboratory, OTC-ADM, and sentinel nursing home systems). For the ED and OTC-ADM systems, only citywide signals have been included. As discussed above, there was sustained citywide ED system signaling in January, February, November and December, likely representing the seasonality of rotavirus and norovirus. In the clinical laboratory system, there was sustained signaling on April 16-17, July 26-27, and July 30-31. During these periods, one specimen tested for *Cryptosporidium* was found to be positive. During this reporting period, no GI outbreaks were reported among the eight nursing homes participating in sentinel surveillance.

As noted in the section above concerning the OTC-ADM system, there were occasional disruptions in data transmission from February to August 2013 resulting in a decrease in the number of stores reporting to the system. Back-data was received for 15 of the 23 days, and there were no signals during any of the days for which we received the back data. There were sustained signals for non-bismuth containing anti-diarrheal sales from January 1, 2013 through

January 2, 2013, and sustained signals for bismuth subsalicylate sales from January 1, 2013 through January 3, 2013. These signals appear to be the result of a decrease in the number of stores reporting sales from December 22-24 when we did not receive data from one of the pharmacies.

In summary, for the period January through December 2013, there were multiple citywide signals for gastrointestinal illness in the ED system in January and February and again in late November and December. Sustained citywide signals in the ED system in the beginning and end of the year are consistent with annual gastrointestinal viral trends. There was no evidence of a drinking water-related outbreak in New York City in 2013.

PART III: INFORMATION SHARING AND PUBLIC EDUCATION

Information sharing and education efforts continued during 2013. Educational outreach in 2013 included a presentation by DEP staff on the WDRAP program at two symposiums (NYC Watershed/Tifft Science & Technology conference, and a Westchester Water Works conference), and two more general talks at New York University for a college audience and open to the public.

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/diseases/cdgia.shtml

- *Cryptosporidiosis fact sheet*
  http://www.nyc.gov/html/doh/html/diseases/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, 1997-2012*
  http://www.nyc.gov/html/dep/html/drinking_water/wdrap.shtml

- *New York City Drinking Water Supply and Quality Statement, 1997-2012*
  (Posting of the 2012 Statement is planned for May 2013.)
  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 2013

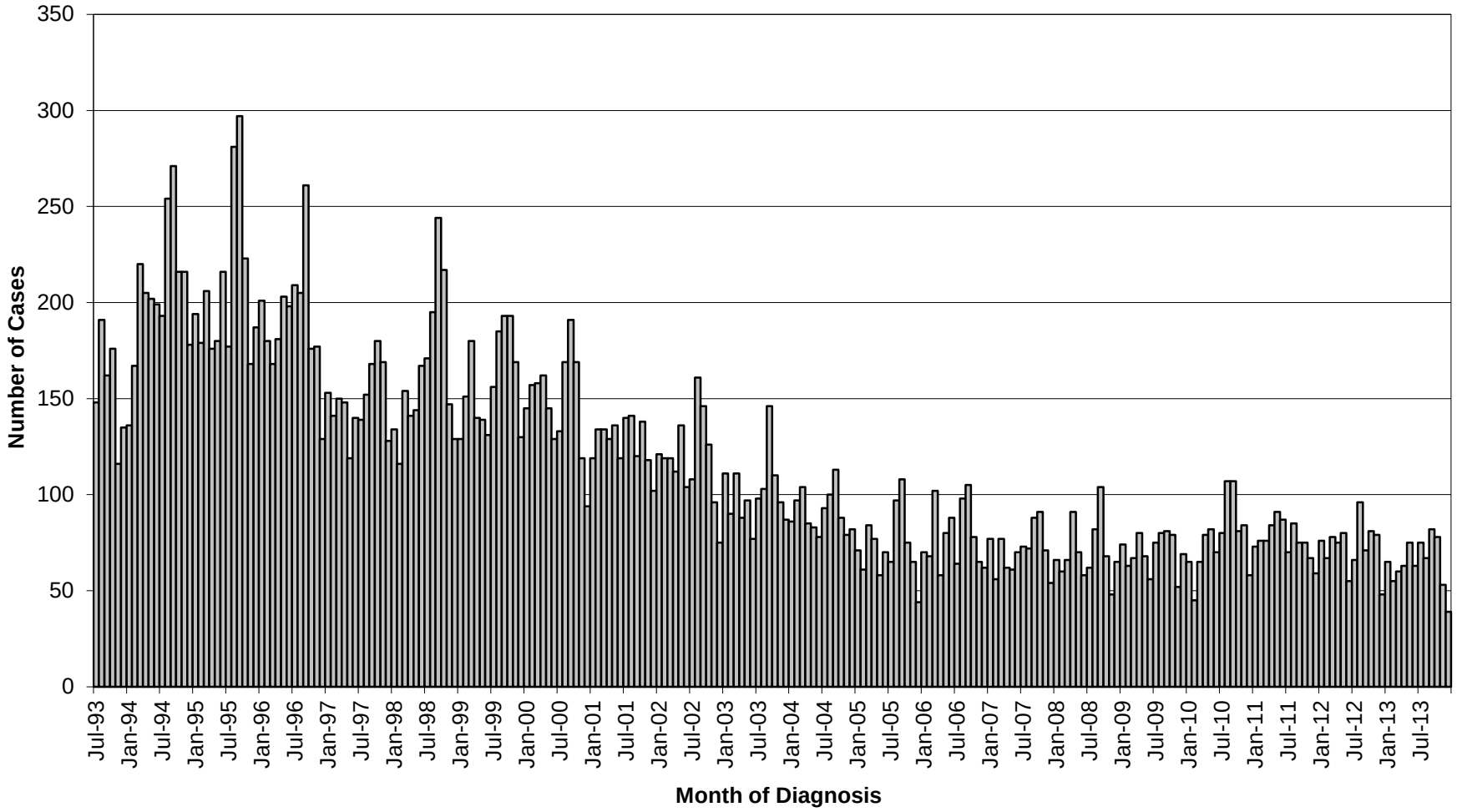


TABLE 1: **Giardiasis**, number of cases and case rates, New York City, 1994 - 2013

Year	Number of Cases	Case Rate per 100,000
1994	2,457	32.3
1995	2,484	32.4
1996	2,288	29.6
1997	1,787	22.9
1998	1,959	24.9
1999	1,896	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	844	10.1
2010	923	11.3
2011	918	11.2
2012	872	10.7
2013	767	9.2

Note:

- 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.
- Case numbers in this table conform to case numbers as they appear in the finalized NYC Department of Health and Mental Hygiene Bureau of Communicable Disease surveillance data bases for the years 1989-2011, and rates have been accordingly adjusted. Yearly case numbers and rates in this table may therefore differ from case numbers and rates that appeared in prior WDRAP reports.

TABLE 2: **Giardiasis**, number of cases and annual case rate per 100,000 population by sex and borough of residence, New York City, 2013

	Borough of residence					
Sex	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Male	542 (13.6)	220 (28.8)	60 (9.0)	143 (11.8)	104 (9.4)	15 (6.6)
Female	224 (5.1)	72 (8.4)	38 (5.1)	60 (4.4)	51 (4.4)	3 (1.2)
Trans-gender	1	0	0	0	1	0
Total	767 (9.2)	292 (18.0)	98 (7.0)	203 (7.9)	156 (6.9)	18 (3.8)

Map 1

Giardiasis annual case rate per 100,000 population
by UHF neighborhood - New York City (2013)

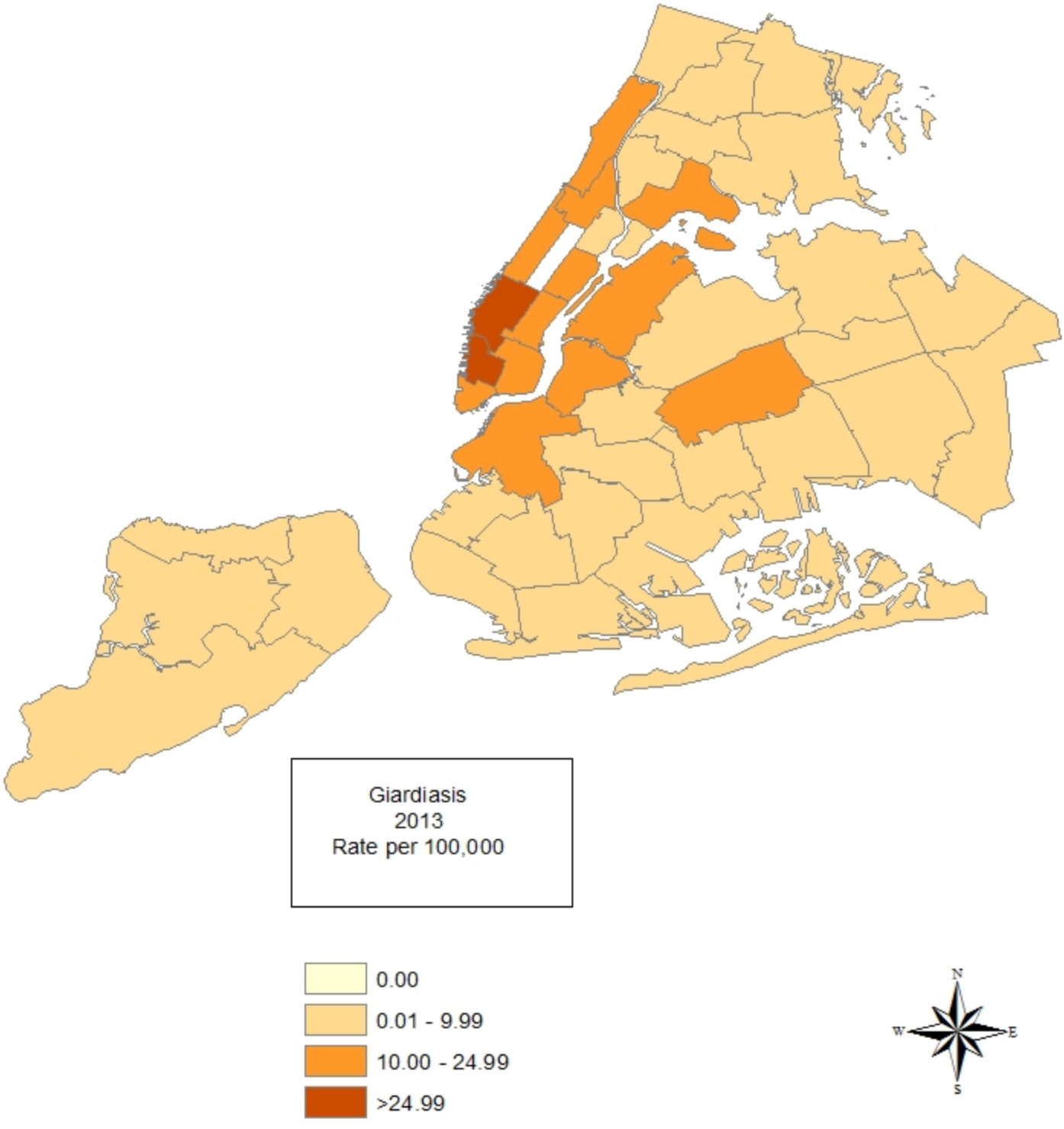


Table 3: Giardiasis, number of cases and annual case rate per 100,000 by UHF neighborhood of residence, New York City, 2013

UHF Neighborhood	Borough	Number	Population	Rate
Chelsea-Clinton	Manhattan	61	147967	41.2
Greenwich Village-Soho	Manhattan	24	85349	28.1
Greenpoint	Brooklyn	28	127826	21.9
Gramercy Park-Murray Hill	Manhattan	23	136402	16.9
Washington Heights-Inwood	Manhattan	42	254534	16.5
Upper West Side	Manhattan	36	224570	16.0
Upper East Side	Manhattan	36	225908	15.9
Union Sq-Lower East Side	Manhattan	32	202756	15.8
Downtown-Heights-Slope	Brooklyn	35	227431	15.4
Long Island City-Astoria	Queens	27	214967	12.6
Hunts Point-Mott Haven	Bronx	17	139723	12.2
C.Harlem-Morningside Hgts	Manhattan	19	165446	11.5
Ridgewood-Forest Hills	Queens	27	246252	11.0
Lower Manhattan	Manhattan	6	54752	11.0
East Harlem	Manhattan	11	112669	9.8
Fordham-Bronx Park	Bronx	25	257315	9.7
High Bridge-Morrisania	Bronx	20	211512	9.5
Borough Park	Brooklyn	30	343853	8.7
Williamsburg-Bushwick	Brooklyn	17	212420	8.0
Bed Stuyvesant-Crown Hgts	Brooklyn	25	320426	7.8
East Flatbush-Flatbush	Brooklyn	23	299842	7.7
Crotona-Tremont	Bronx	16	209824	7.6
West Queens	Queens	37	498223	7.4
Fresh Meadows	Queens	7	97755	7.2
Southwest Queens	Queens	19	268895	7.1
Bensonhurst-Bay Ridge	Brooklyn	13	216213	6.0
Canarsie-Flatlands	Brooklyn	11	197486	5.6
Kingsbridge-Riverdale	Bronx	5	92323	5.4
Coney Island-Sheepshead Bay	Brooklyn	16	299409	5.3
Rockaway	Queens	6	115234	5.2
Stapleton-St. George	Stat Is	6	124666	4.8
Bayside-Littleneck	Queens	4	88590	4.5
Flushing-Clearview	Queens	11	264146	4.2
Pelham-Throgs Neck	Bronx	12	302976	4.0
Jamaica	Queens	11	292525	3.8
South Beach-Tottenville	Stat Is	7	189074	3.7
Southeast Queens	Queens	7	197333	3.5
Willowbrook	Stat Is	3	85992	3.5
Port Richmond	Stat Is	2	70996	2.8
East New York	Brooklyn	4	189012	2.1
Northeast Bronx	Bronx	3	192364	1.6
Sunset Park	Brooklyn	1	131717	0.8

*This table does not include two cases of giardiasis occurring in Manhattan residents 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, New York City, 2013

	Sex			
Age group	Male number (rate)	Female number (rate)	Trans-gender (rate)	Total number (rate)
<5 years	38 (13.6)	32 (12.0)	0	70 (12.8)
5-9 years	34 (13.8)	34 (14.4)	0	68 (14.1)
10-19 years	38 (7.8)	20 (4.2)	0	58 (6.0)
20-44 years	291 (18.4)	84 (5.0)	1	376 (11.5)
45-59 years	100 (13.2)	30 (3.5)	0	130 (8.1)
≥ 60 years	41 (6.7)	24 (2.8)	0	65 (4.4)
Total	542 (13.6)	224 (5.1)	1	767 (9.2)

TABLE 5: Giardiasis, number of cases and annual case rate per 100,000 population by age group and borough of residence, New York City, 2013

	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	70	11	22	19	17	1
	(12.8)	(13.2)	(20.4)	(10.1)	(12.3)	(3.6)
5-9 years	68	13	12	20	20	3
	(14.1)	(20.5)	(12.0)	(12.3)	(15.8)	(10.2)
10-19	58	11	18	10	17	2
years	(6.0)	(8.4)	(8.8)	(3.2)	(6.8)	(3.3)
20-44	376	156	32	115	65	8
years	(11.5)	(21.4)	(6.2)	(11.5)	(7.5)	(5.1)
45-59	130	65	9	28	24	4
years	(8.1)	(21.8)	(3.4)	(5.9)	(5.1)	(3.9)
≥ 60	65	36	5	11	13	0
years	(4.4)	(11.5)	(2.3)	(2.5)	(3.1)	
Total	767	292	98	203	156	18
	(9.2)	(18.0)	(7.0)	(7.9)	(6.9)	(3.8)

Table 6: Giardiasis, number of cases and case rates by census tract poverty level, New York City, 2013

Census Tract Poverty Level	Number of Cases	Case Rate per 100,000	Age-adjusted rate per 100,000
Low[a]	216	9.6	9.6
Medium[b]	250	10.4	10.4
High[c]	141	7.9	7.9
Very high[d]	157	9.0	8.9
Total[e]	764	9.4	

[a] Low poverty: <10% of residents have household incomes that are below 100% of the federal poverty level, per American Community Survey 2008-2012.
[b] Medium poverty: 10-19% of residents have household incomes that are below 100% of the federal poverty level, per American Community Survey 2008-2012.
[c] High poverty: 20-29% of residents have household incomes that are below 100% of the federal poverty level, per American Community Survey 2008-2012.
[d] Very high poverty: >=30% of residents have household incomes that are below 100% of the federal poverty level, per American Community Survey 2008-2012.
[e] Three cases (0.4%) were excluded from the total 2013 case count because geolocating information for census tract identification was unavailable.

Table 7: Cryptosporidiosis, number of cases and case rates, New York City, 1994 – 2013

Year	Number of Cases	Case Rate per 100,000
1994	288	3.8
1995	471	6.1
1996	334	4.3
1997	172	2.2
1998	207	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
2012	125	1.5
2013	80	1.0

Note:

- 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.
- Case numbers in this table conform to case numbers as they appear in the finalized NYC Department of Health and Mental Hygiene Bureau of Communicable Disease surveillance data bases for the years 1989-2011, and rates have been accordingly adjusted. Yearly case numbers and rates in this table may therefore differ from case numbers and rates that appeared in prior WDRAP reports.

Figure 2: Cryptosporidiosis, number of cases by month of diagnosis, New York City, November 1994 - December 2013

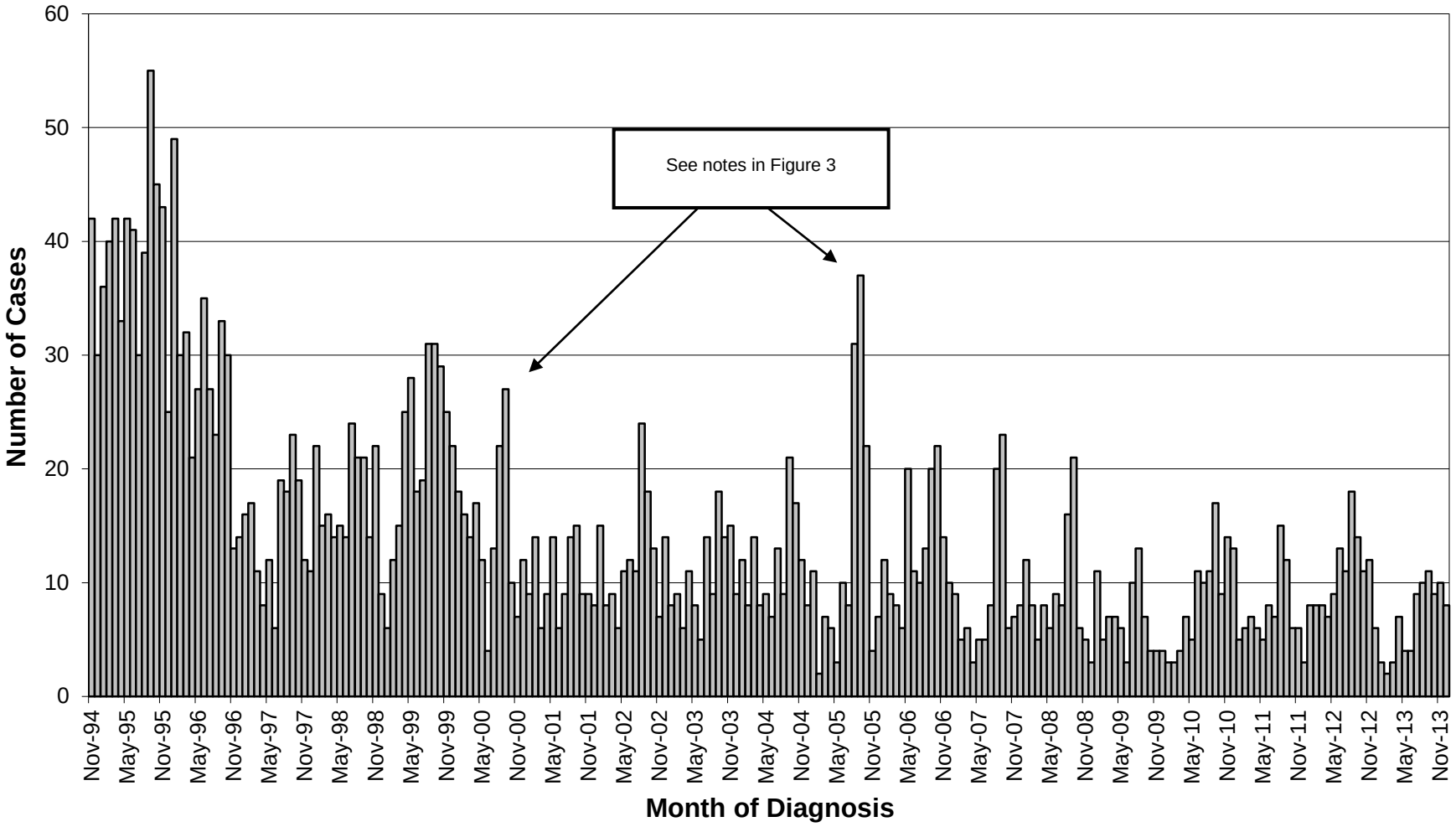
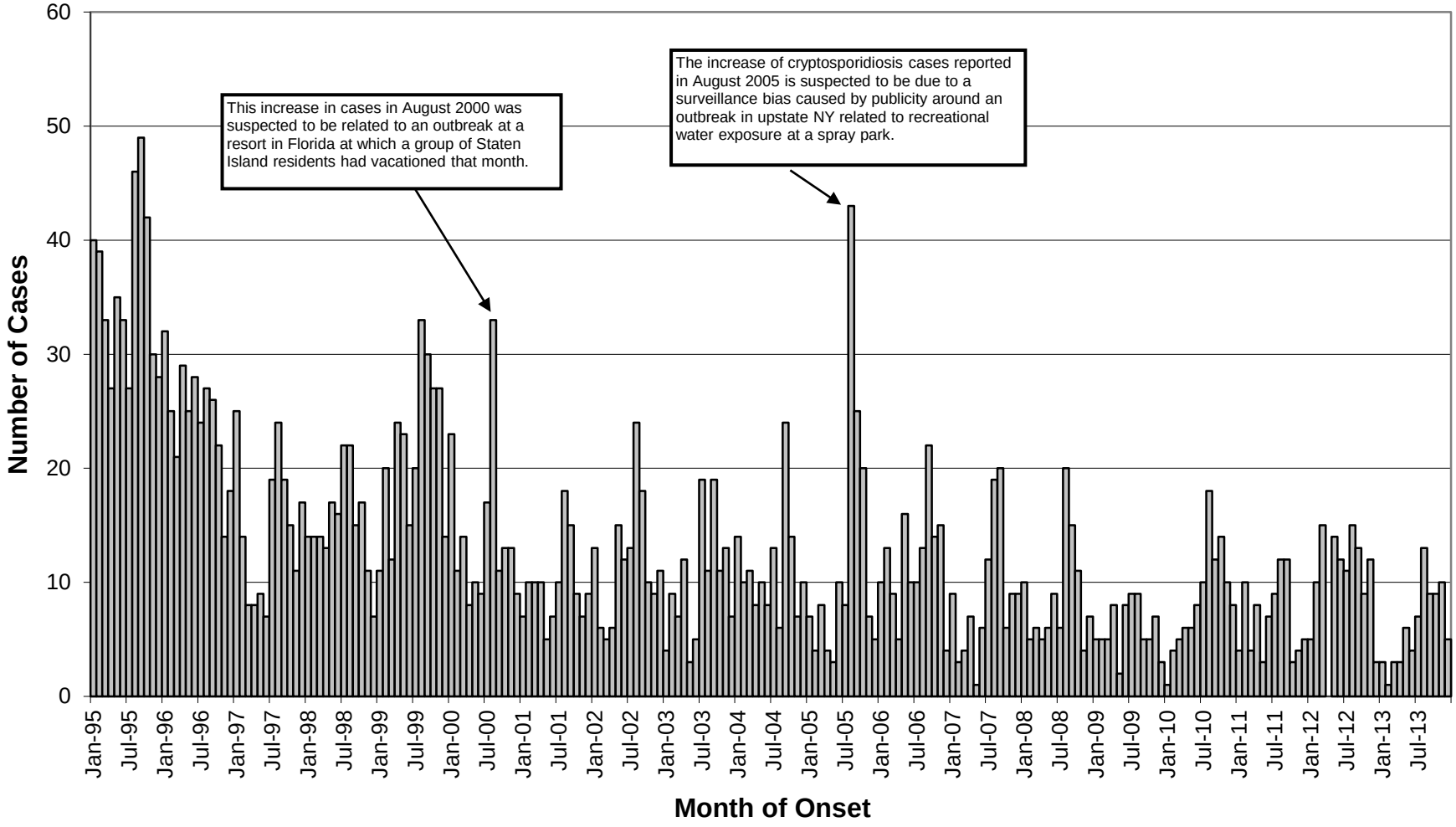


Figure 3: Cryptosporidiosis, number of cases by month of onset, New York City, January 1995 - December 2013*



* Chart does not include cases in which an onset date was unavailable: 181 cases (6%), January 1995 - December 2013.

TABLE 8: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by sex and borough of residence, New York City, 2013

	Borough of residence					
Sex	Citywide number (rate)	Manhattan number (rate)	Bronx number (rate)	Brooklyn number (rate)	Queens number (rate)	Stat Is number (rate)
Male	57	27	8	13	7	2
	(1.4)	(3.5)	(1.2)	(1.1)	(0.6)	(0.9)
Female	23	9	6	1	6	1
	(0.5)	(1.1)	(0.8)	(0.1)	(0.5)	(0.4)
Total	80	36	14	14	13	3
	(1.0)	(2.2)	(1.0)	(0.5)	(0.6)	(0.6)

Map 2

Cryptosporidiosis annual case rate per 100,000 population
by UHF neighborhood - New York City (2013)

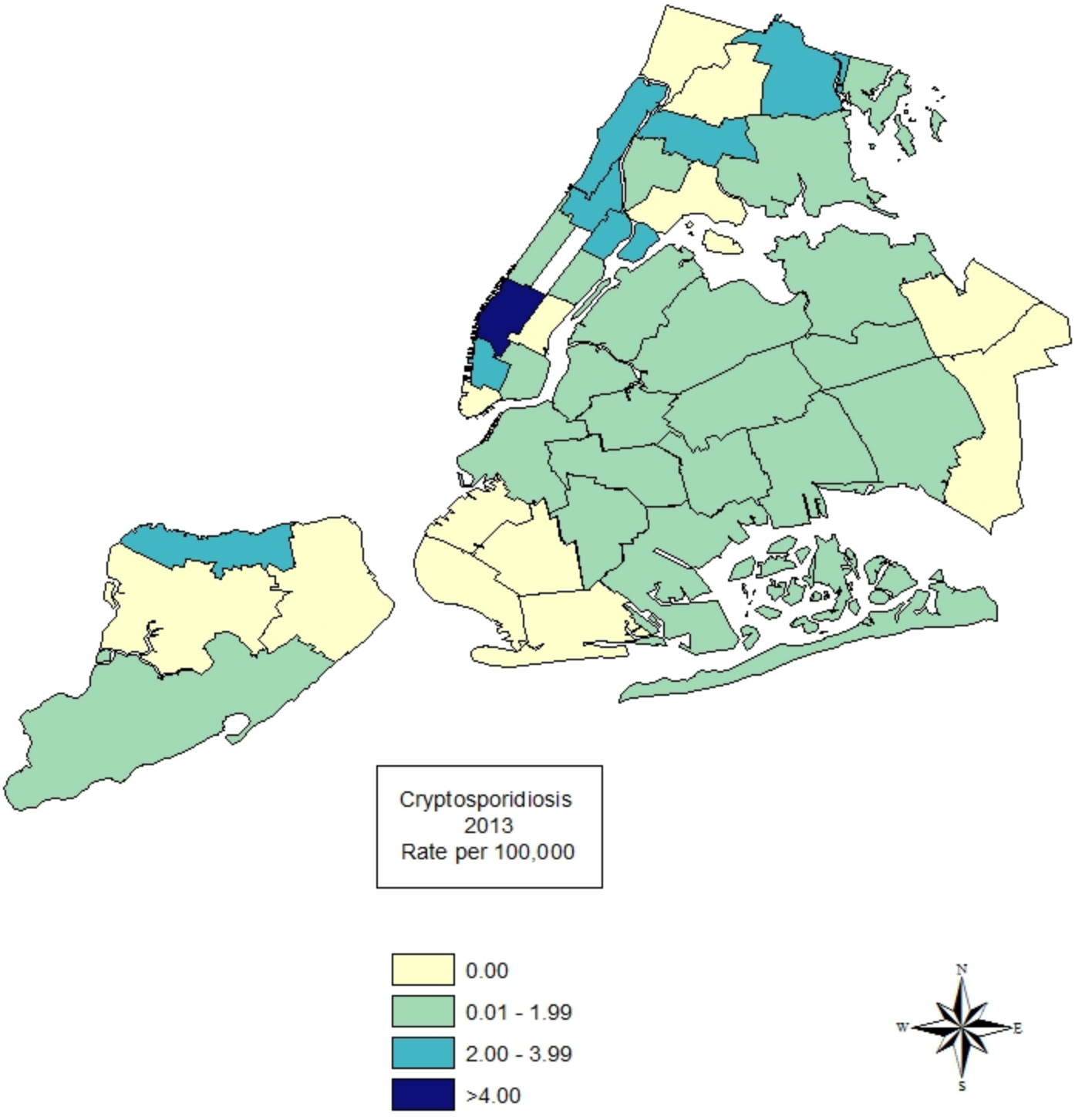


TABLE 9: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by UHF neighborhood of residence, New York City, 2013

UHF Neighborhood	Borough	Number	Population	Rate
Chelsea-Clinton	Manhattan	8	147967	5.4
C Harlem-Morningside Hgts	Manhattan	6	165446	3.6
Crotona-Tremont	Bronx	6	209824	2.9
Port Richmond	Staten Is	2	70996	2.8
East Harlem	Manhattan	3	112669	2.7
Washington Heights-Inwood	Manhattan	6	254534	2.4
Greenwich Village-Soho	Manhattan	2	85349	2.3
Northeast Bronx	Bronx	4	192364	2.1
Upper West Side	Manhattan	4	224570	1.8
Upper East Side	Manhattan	4	225908	1.8
Union Sq-Lower East Side	Manhattan	3	202756	1.5
High Bridge-Morrisania	Bronx	3	211512	1.4
East Flatbush-Flatbush	Brooklyn	4	299842	1.3
Bed Stuyvesant-Crown Hgts	Brooklyn	4	320426	1.2
Ridgewood-Forest Hills	Queens	3	246252	1.2
Fresh Meadows	Queens	1	97755	1.0
Williamsburg-Bushwick	Brooklyn	2	212420	0.9
Long Island City-Astoria	Queens	2	214967	0.9
Rockaway	Queens	1	115234	0.9
Greenpoint	Brooklyn	1	127826	0.8
Jamaica	Queens	2	292525	0.7
East New York	Brooklyn	1	189012	0.5
South Beach Tottenville	Staten Is	1	189074	0.5
Canarsie-Flatlands	Brooklyn	1	197486	0.5
Downtown Heights-Slope	Brooklyn	1	227431	0.4
West Queens	Queens	2	498223	0.4
Flushing-Clearview	Queens	1	264146	0.4
Southwest Queens	Queens	1	268895	0.4
Pelham-Throgs Neck	Bronx	1	302976	0.3

TABLE 10: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by age group and sex, New York City, 2013

	Sex		
Age group	Male number (rate)	Female number (rate)	Total number (rate)
<5 years	3 (1.1)	2 (0.8)	5 (0.9)
5-9 years	1 (0.4)	1 (0.4)	2 (0.4)
10-19 years	2 (0.4)	2 (0.4)	4 (0.4)
20-44 years	36 (2.3)	15 (0.9)	51 (1.6)
45-59 years	13 (1.7)	3 (0.4)	16 (1.0)
≥ 60 years	2 (0.3)	0	2 (0.1)
Total	57 (1.4)	23 (0.5)	80 (1.0)

TABLE 11: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by age group and borough, New York City, 2013

	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	5 (0.9)	0	1 (0.9)	2 (1.1)	2 (1.4)	0
5-9 years	2 (0.4)	1 (1.6)	0	0	1 (0.8)	0
10-19 years	4 (0.4)	2 (1.5)	2 (1.0)	0	0	0
20-44 years	51 (1.6)	25 (3.4)	8 (1.6)	8 (0.8)	8 (0.9)	2 (1.3)
45-59 years	16 (1.0)	8 (2.7)	3 (1.1)	3 (0.6)	2 (0.4)	0
≥ 60 years	2 (0.1)	0	0	1 (0.2)	0	1 (1.1)
Total	80 (1.0)	36 (2.2)	14 (1.0)	14 (0.5)	13 (0.6)	3 (0.6)

TABLE 12: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by race/ethnicity and borough of residence, New York City, 2013

	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	21 (0.9)	4 (1.0)	8 (1.0)	2 (0.4)	6 (0.9)	1 (1.2)
White, non-Hispanic	25 (0.9)	16 (2.1)	0	3 (0.3)	5 (0.8)	1 (0.3)
Black, non-Hispanic	21 (1.1)	9 (4.3)	5 (1.2)	6 (0.7)	1 (0.2)	0
Asian, non-Hispanic	2 (0.2)	1 (0.5)	1 (1.9)	0	0	0
Pacific Islander, Native Hawaiian, non-Hispanic	0	0	0	0	0	
American Indian, non-Hispanic	0	0	0	0	0	0
Two or more races, non-Hispanic	5 (3.9)	3 (10.3)	0	2 (5.3)	0	0
Unknown	6	3	0	1	1	1
Total	80 (1.0)	36 (2.2)	14 (1.0)	14 (0.5)	13 (0.6)	3 (0.6)

TABLE 13: Cryptosporidiosis, number of cases and annual case rate per 100,000 population by race/ethnicity and age group, New York City, 2013

	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	1 (0.5)	1 (0.6)	2 (0.6)	13 (1.4)	4 (0.9)	0	21 (0.9)
White, non-Hispanic	2 (1.3)	0	1 (0.4)	15 (1.4)	5 (1.0)	2 (0.3)	25 (0.9)
Black, non-Hispanic	2 (1.6)	1 (0.9)	1 (0.4)	13 (1.9)	4 (1.0)	0	21 (1.1)
Asian, non-Hispanic	0	0	0	2 (0.4)	0	0	2 (0.2)
Pacific Islander, Native Hawaiian, non-Hispanic	0	0	0	0	0	0	0
American Indian, non-Hispanic	0	0	0	0	0	0	0
Two or more races, non-Hispanic	0	0	0	3 (6.1)	2 (10.4)	0	5 (3.9)
Unknown	0	0	0	5	1	0	6
Total	5 (0.9)	2 (0.4)	4 (0.4)	51 (1.6)	16 (1.0)	2 (0.1)	80 (1.0)

Table 14: Cryptosporidiosis, number of cases and case rates by census tract poverty level, New York City, 2013

Census Tract Poverty Level	Number of Cases	Case Rate per 100,000	Age-adjusted rate per 100,000
Low[a]	20	0.9	0.9
Medium[b]	22	0.9	0.9
High[c]	15	0.8	0.8
Very high[d]	23	1.3	1.3
Total[e]	80	1.0	

[a] Low poverty: <10% of residents have household incomes that are below 100% of the federal poverty level, per American Community Survey 2008-2012.
[b] Medium poverty: 10-19% of residents have household incomes that are below 100% of the federal poverty level, per American Community Survey 2008-2012.
[c] High poverty: 20-29% of residents have household incomes that are below 100% of the federal poverty level, per American Community Survey 2008-2012.
[d] Very high poverty: >=30% of residents have household incomes that are below 100% of the federal poverty level, per American Community Survey 2008-2012.

Figure 4: Cryptosporidiosis, number of cases among persons living with HIV/AIDS by month of diagnosis, New York City, January 1995 - December 2013

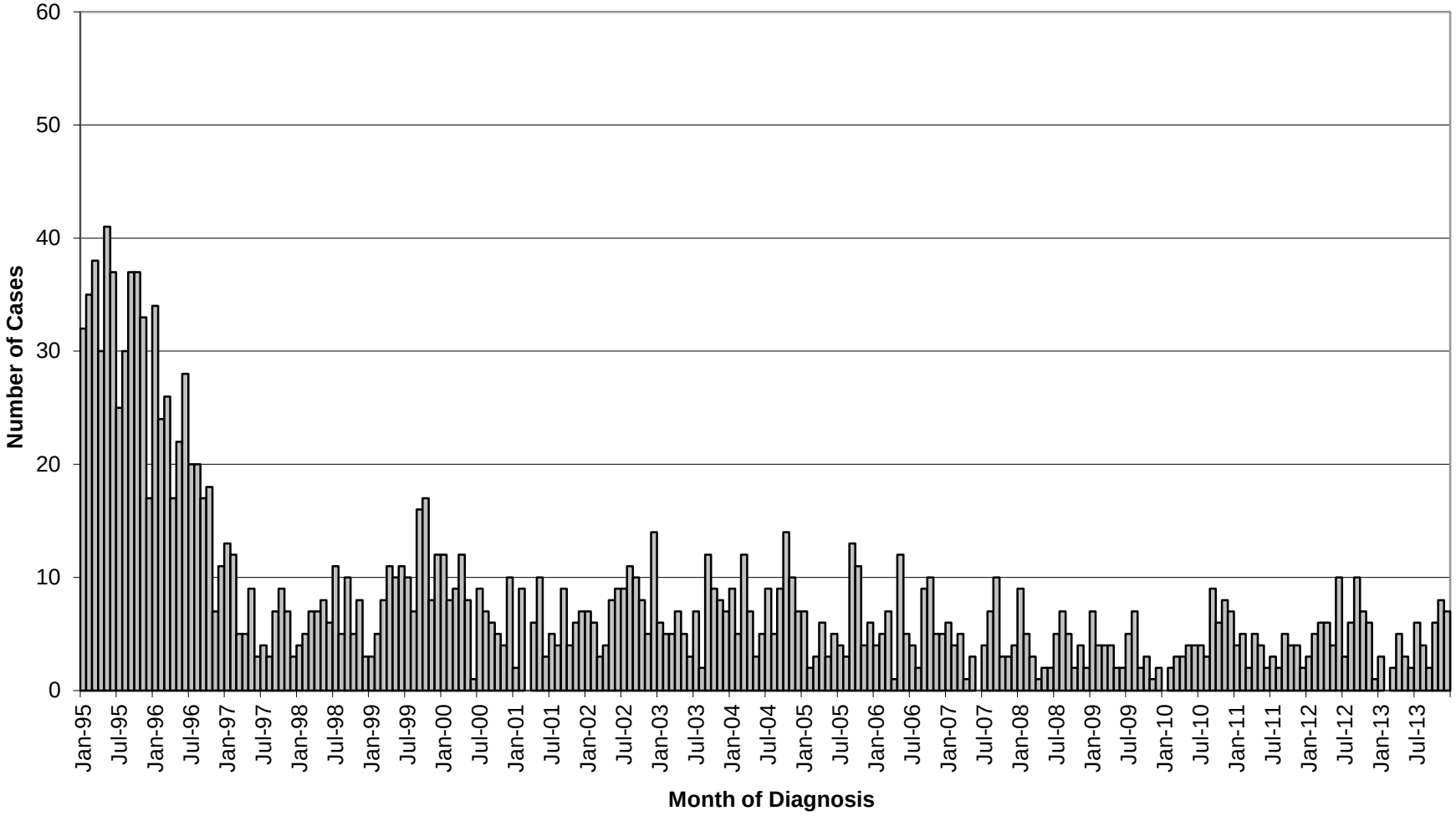


Figure 5: Cryptosporidiosis, number of cases among immunocompetent persons by month of diagnosis, New York City, January 1995 - December 2013

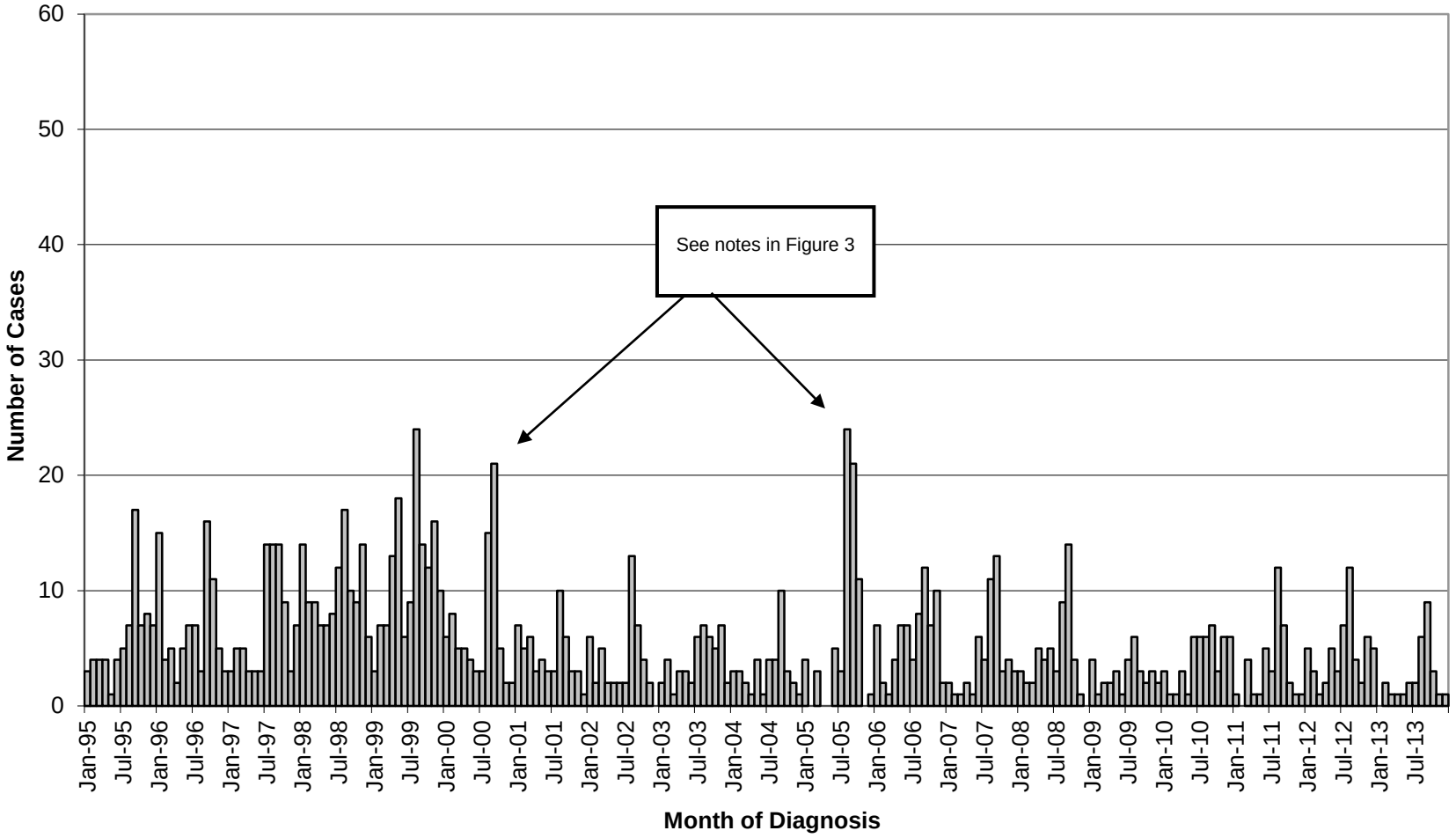


Figure 6: Cryptosporidiosis, number of cases by year of diagnosis and immune status, New York City, 1995 - 2013

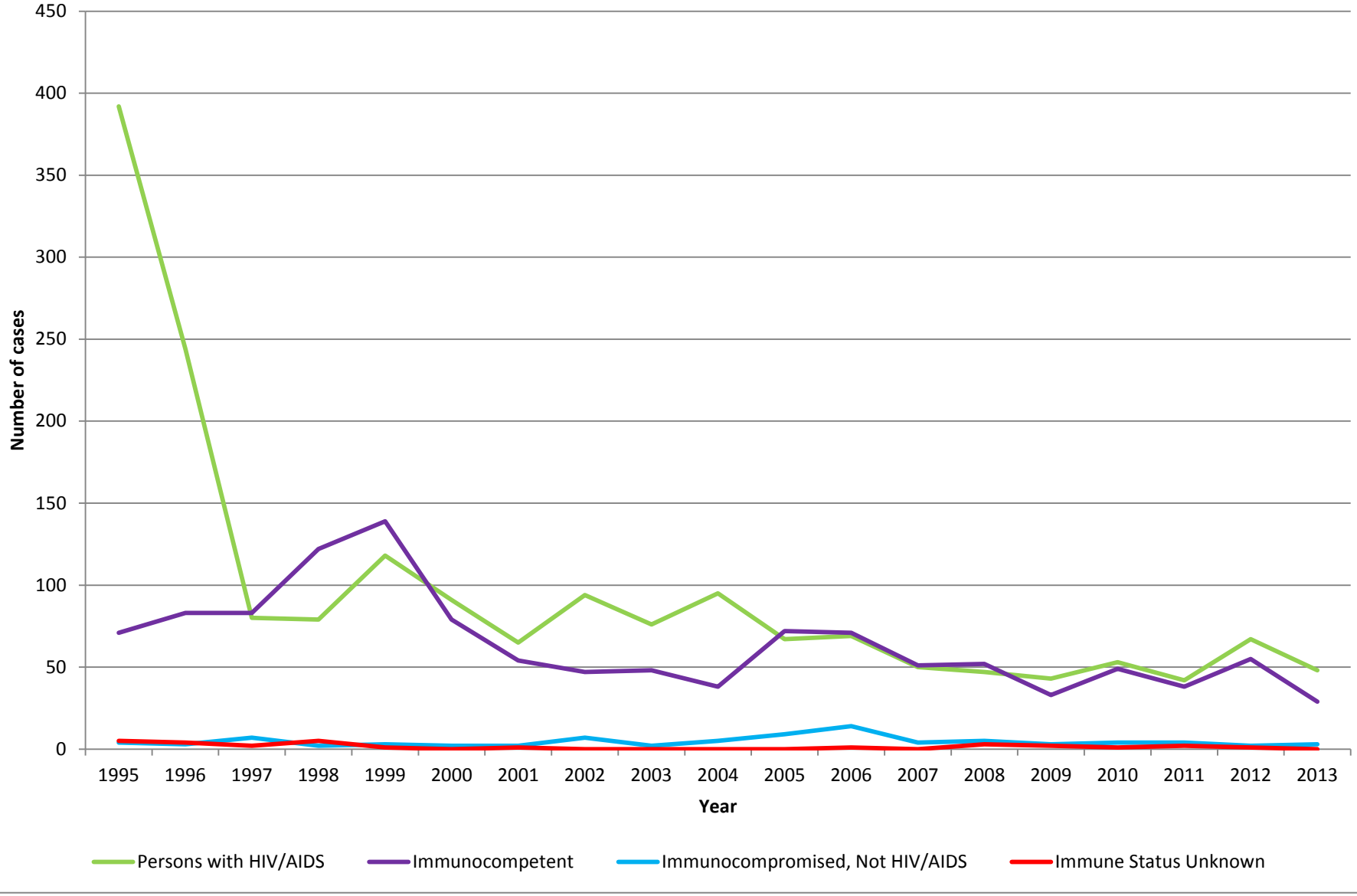


Table 15: Percentage of interviewed c**ryptosporidiosis** case-patients reporting selected potential risk exposures before disease onset,[a] persons with HIV/AIDS, New York City, 1995 - 2013

Exposure Type		Persons with HIV/AIDS																	
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Contact with an Animal[b]	35%	35%	33%	36%	35%	43%	24%	42%	40%	31%	33%	38%	31%	44%	42%	20%	36%	34%	29%
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%	23%	17%
International Travel[d]	9%	9%	9%	13%	18%	14%	10%	11%	13%	15%	17%	9%	6%	7%	8%	7%	4%	6%	13%
Recreational Water Contact[e]	16%	8%	16%	12%	16%	15%	8%	10%	21%	13%	5%	18%	17%	14%	8%	10%	14%	8%	13%

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 1995-2013 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 (1997-2012); or other animal exposure (2013).
  - [c] High-risk Sexual Activity - Includes having a penis, finger or tongue in sexual partner's anus (1995-2013).
  - [d] International Travel - Travel outside the United States (1995-2013).
  - [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 (1997-2012); or swimming in a hot tub or swimming or drinking water from a pond or body of water (2013).

Table 16: Percentage of interviewed **cryptosporidiosis** case-patients reporting selected potential risk exposures before disease onset,[a] immunocompetent persons, New York City, 1995 - 2013

Exposure Type		Immunocompetent Persons																	
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Contact with an Animal[b]	7%	41%	41%	32%	35%	26%	37%	35%	23%	34%	36%	36%	34%	28%	40%	18%	41%	33%	38%
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%	11%	8%
International Travel[d]	30%	29%	26%	28%	28%	40%	47%	33%	45%	47%	45%	40%	47%	52%	37%	44%	35%	50%	62%
Recreational Water Contact[e]	21%	27%	40%	24%	22%	32%	35%	35%	34%	33%	52%	28%	36%	40%	50%	33%	35%	46%	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, 8/21/2002, and 4/26/2010. Details regarding changes made to the interview form and Exposure Types from 1995-2013 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 (1997-2012); or other animal exposure (2013).

[c] High-risk Sexual Activity - Includes having a penis, finger or tongue in sexual partner's anus (1995-2013).

[d] International Travel - Travel outside the United States (1995-2013).

[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 (1997-2012); or swimming in a hot tub or swimming or drinking water from a pond or body of water (2013).

* 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 before disease onset,[a] persons with HIV/AIDS, New York City, 1995 - 2013

Exposure Type		Persons with HIV/AIDS																	
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Plain Tap[b]	69%	70%	71%	64%	66%	63%	55%	54%	77%	49%	76%	67%	67%	64%	58%	63%	50%	63%	71%
Filtered Tap[c]	12%	9%	10%	18%	20%	20%	14%	22%	13%	21%	7%	18%	11%	14%	15%	12%	25%	8%	8%
Boiled Tap[d]	7%	7%	3%	5%	3%	6%	6%	0%	4%	6%	5%	7%	0%	11%	8%	2%	4%	4%	8%
Incidental Plain Tap Only[e]	11%	15%	16%	15%	8%	12%	16%	19%	4%	15%	10%	4%	17%	7%	15%	15%	18%	20%	8%
No Tap[f]	3%	2%	2%	0%	5%	4%	6%	4%	2%	5%	2%	2%	6%	4%	0%	3%	4%	4%	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 1995-2013 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 (5/11/2001-12/31/2012).

[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 (5/11/2001-12/31/2013).

[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 (5/11/2001-12/31/2013).

[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 (1997-2013)

[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 (1997-2013).

Table 18: Percentage of interviewed **cryptosporidiosis** case-patients by type of tap water exposure before disease onset,[a] immunocompetent persons, New York City, 1995 - 2013

Exposure Type		Immunocompetent Persons																		
	1995	1996	1997	1998	1999	2000*	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Plain Tap[b]	58%	63%	58%	67%	56%	56%	43%	33%	36%	27%	30%	30%	27%	30%	47%	33%	44%	30%	29%
Filtered Tap[c]	18%	17%	21%	21%	25%	17%	31%	44%	36%	30%	25%	20%	22%	30%	23%	27%	18%	26%	24%
Boiled Tap[d]	11%	10%	8%	3%	4%	2%	4%	0%	2%	7%	5%	8%	4%	14%	0%	7%	3%	2%	0%
Incidental Plain Tap Only[e]	7%	9%	12%	8%	11%	8%	16%	21%	16%	13%	25%	28%	18%	14%	27%	22%	15%	15%	19%
No Tap[f]	2%	4%	4%	3%	7%	17%	6%	2%	9%	21%	14%	14%	27%	12%	3%	11%	21%	26%	29%

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 1995-2013 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 (5/11/2001-12/31/2013).

[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 (5/11/2001-12/31/2013).

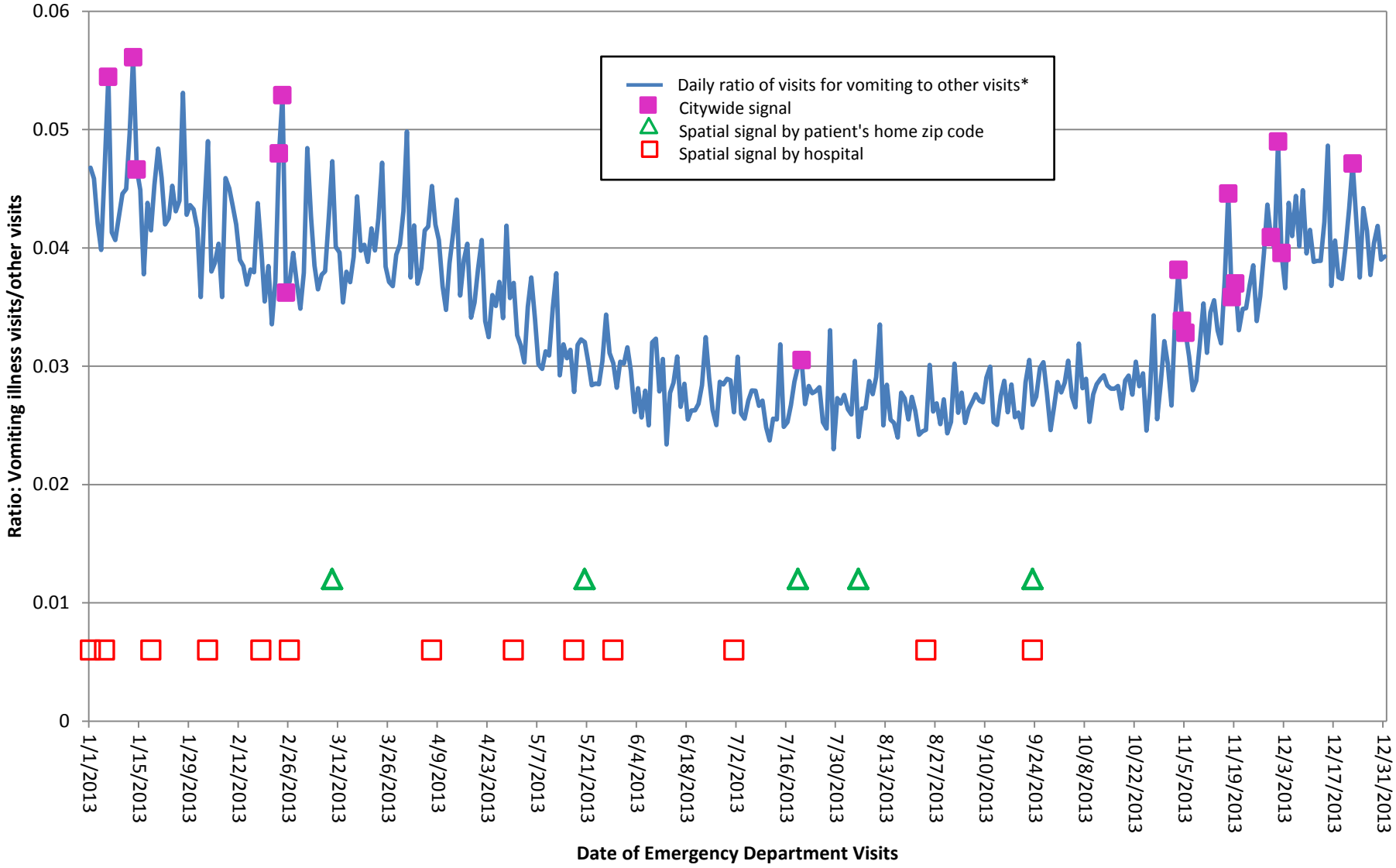
[d] Boiled Tap - Drank boiled NYC tap water (1995-5/10/2001); or drank greater than 0 cups of boiled NYC tap water, and no unboiled /unfiltered NYC tap water, and no filtered NYC tap water (5/11/2001-12/31/2013).

[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 (1997-2013)

[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 (1997-2013).

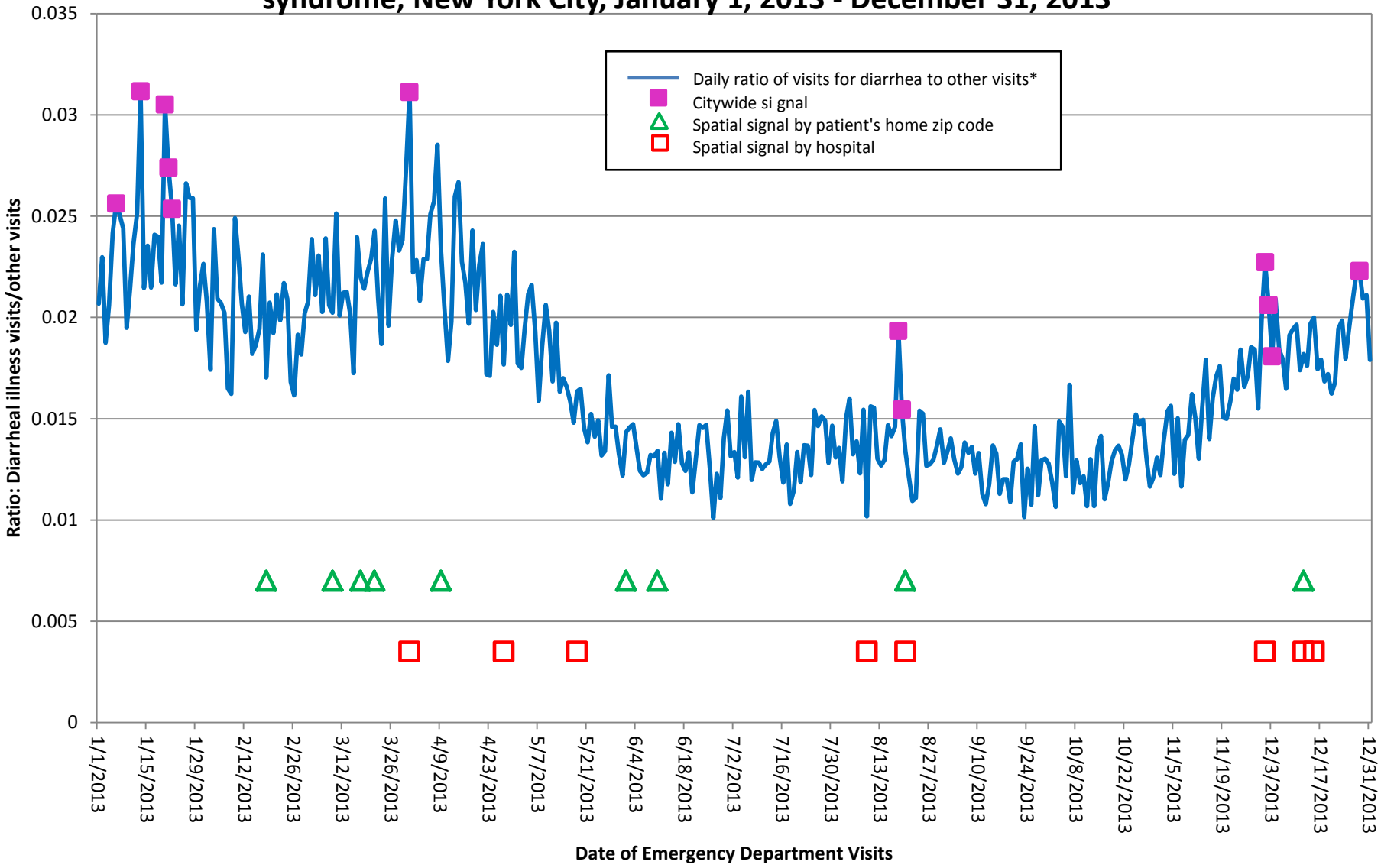
* Year 2000 percentage of interviewed cryptosporidiosis cases does not include 14 cases associated with a point source exposure at a swimming pool in Florida.

Figure 7: Emergency Department Syndromic Surveillance, Trends in visits for the vomiting syndrome, New York City, January 1, 2013 - December 31, 2013



*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).

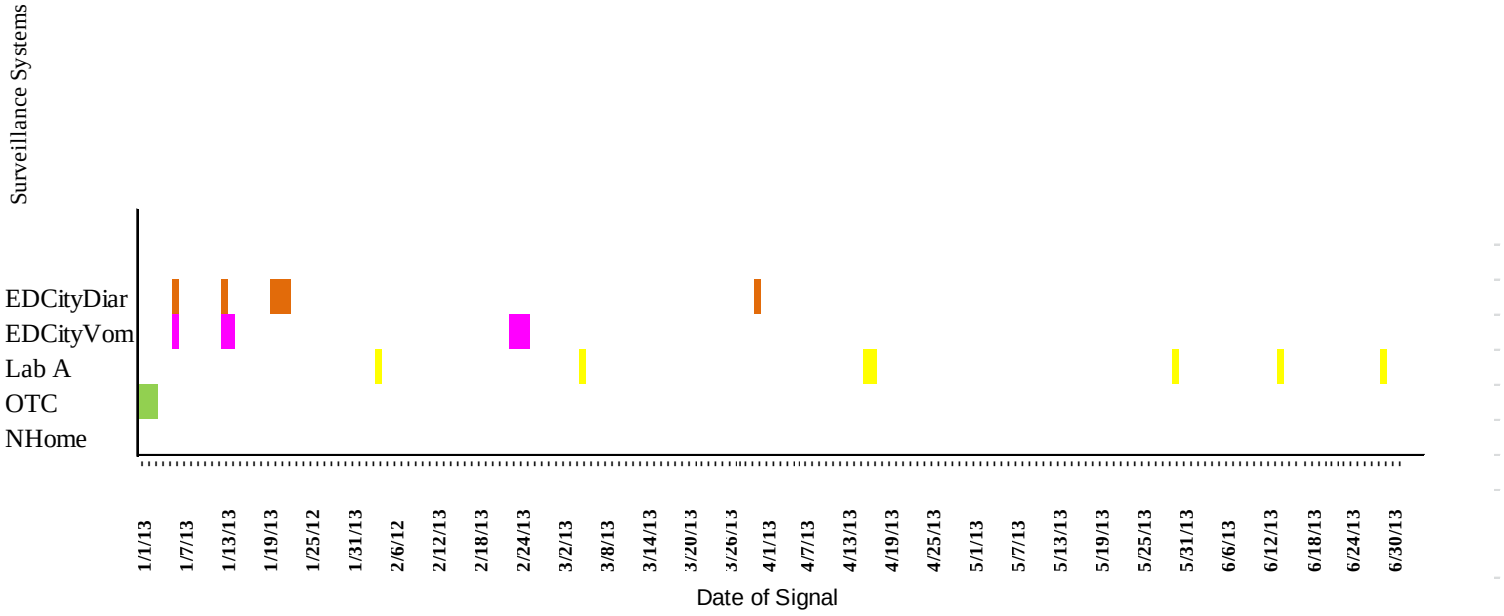
Figure 8: Emergency Syndromic Surveillance, Trends in visits for the diarrhea syndrome, New York City, January 1, 2013 - December 31, 2013



*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 9: Signals for Gastrointestinal Illness, Syndromic Surveillance Systems

New York City, January 1, 2013 - June 30, 2013



ED CityDiar: Emergency Department Citywide signal for diarrhea

ED CityVom: Emergency Department Citywide signal for vomiting

Lab A: Clinical Laboratory Monitoring signal for stool submissions for ova and parasites or bacterial culture and sensitivity

ADM: Citywide signal for daily antidiarrheal medication sales in DEP system

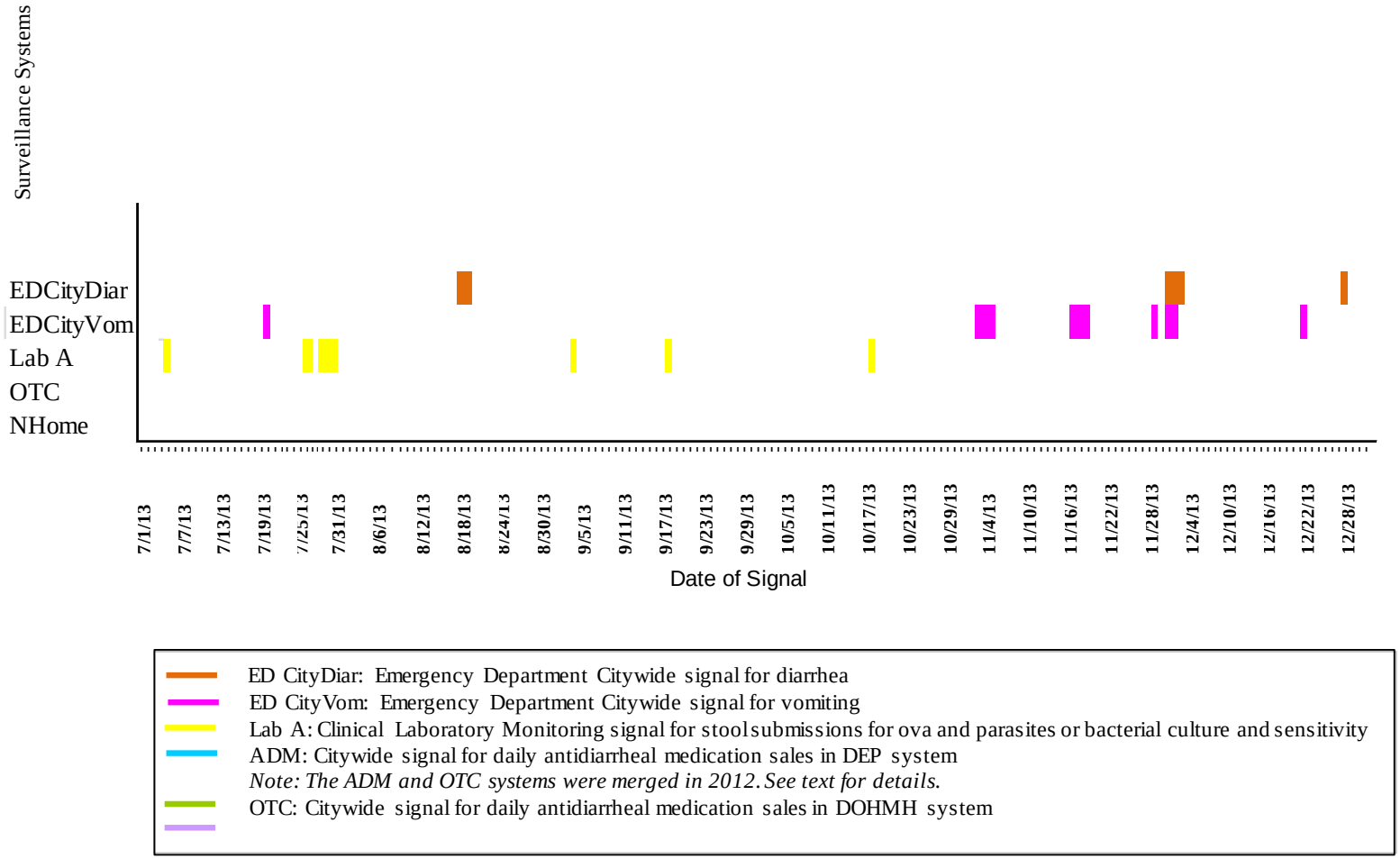
Note: The ADM and OTC systems were merged in 2012. See text for details.

OTC: Citywide signal for daily antidiarrheal medication sales in DOHMH system

NHome: Sentinel Nursing Home Gastrointestinal Outbreak. Indicates the first day of the outbreak.

Figure 10: Signals for Gastrointestinal Illness, Syndromic Surveillance Systems

New York City, July 1, 2013 - December 31, 2013



ED CityDiar: Emergency Department Citywide signal for diarrhea

ED CityVom: Emergency Department Citywide signal for vomiting

Lab A: Clinical Laboratory Monitoring signal for stool submissions for ova and parasites or bacterial culture and sensitivity

ADM: Citywide signal for daily antidiarrheal medication sales in DEP system

Note: The ADM and OTC systems were merged in 2012. See text for details.

OTC: Citywide signal for daily antidiarrheal medication sales in DOHMH system