



NOROVIRUS EPIDEMIOLOGY - RHODE ISLAND 2005

Noroviruses are a major cause of epidemic, acute gastroenteritis in children and adults. Current estimations report that as much as two-thirds of all food-related outbreaks of illness may be caused by norovirus (1), but the precise burden of norovirus-caused endemic disease is unknown because simple and sensitive diagnostic assays are not readily available (2). However, with increased surveillance and development of a sensitive and simple laboratory diagnostic test effective prevention strategies may be devised and implemented.

Seasonality and Infection Rates:

In 2005, the Rhode Island Department of Health received 11 reports of norovirus outbreak with 695 people infected (positive test [RT-PCR] from stool sample or contact with a confirmed infected person) and a total of at least 2,804 people exposed. Overall, 24.8% of exposed individuals acquired an infection. Outbreaks occurred between the 7th (Feb 12-18) and 14th week (Apr 2-8) of the year with no definitive peak and no outbreaks reported after the 14th week. As of August 1, 2006, the Rhode Island Department of Health has received 23 reports of norovirus outbreaks with 742 people infected and a total of at least 2,638 people exposed. Overall, 28.1% of exposed individuals acquired an infection. Outbreaks occurred between the 12th (Mar 19-25) and 26th week (Jun 25-Jul 1) of the year with outbreaks peaking around the 14th (Apr 2-8) and 19th weeks (Mar 7-13) and tapering off after that point (See Figure 1).

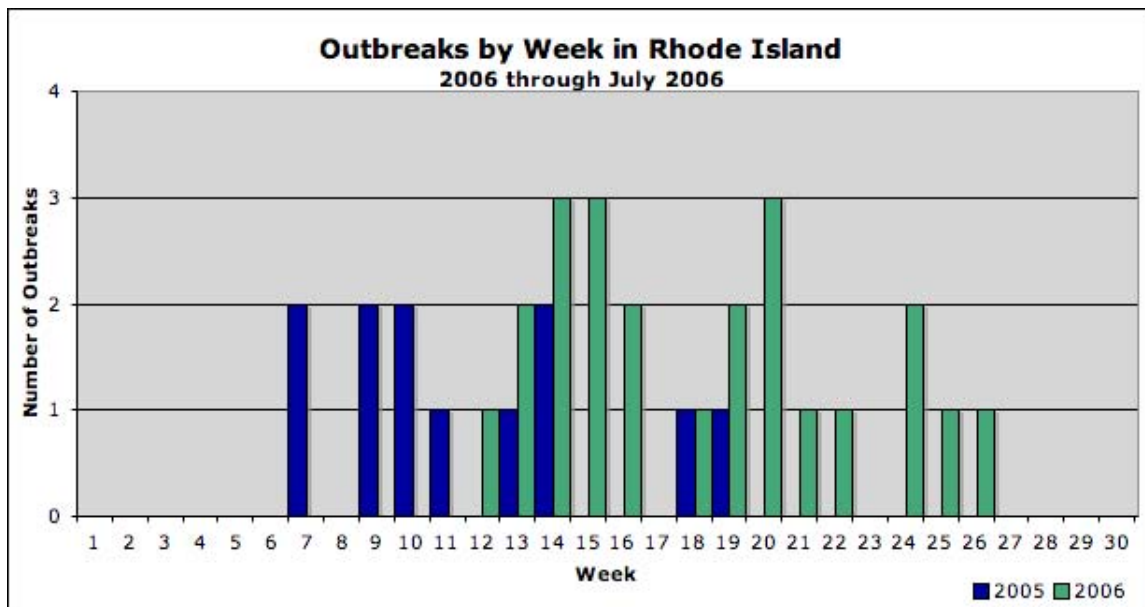


Figure 1. Outbreaks by Week in Rhode Island, 2005 – July 2006. Data source: RIDOH unpublished data

Since 2001, when the state of Rhode Island began testing for norovirus outbreaks, the trend within the state has followed the national trend; outbreaks spike in the winter and taper off in the

early spring. From 2001 to 2004, the majority of outbreaks occurred in December and January and no outbreaks were reported after March. In 2005, the trend changed slightly, no outbreaks were reported until February and none were reported after May. The trend in 2006 has distinct differences from the national trend; the major spike in cases in Rhode Island did occur in December (n=11), but a second spike in outbreaks occurred in April (n=8) and an additional outbreak was reported in July (See Figure 2).

Setting:

Of the 34 outbreaks reported in Rhode Island in 2005 and 2006, outbreaks primarily occur in long-term care facilities, such as nursing homes (85% n=29); outbreaks also have occurred in restaurants or at catered events (6% n=2), schools (6% n=2) and a summer camp (3% n=1) (See Figure 3a). National data from 348 outbreaks of gastroenteritis reported to the Centers for Disease Control and Prevention from January 1996 through November 2000 finds that outbreaks occur primarily in restaurants or at catered events (39% n=136) and nursing homes (30% n=104), with other outbreaks occurring in schools (12% n=42), on vacation, including cruise ships (10% n=35), and other locations (9% n=31) (See Figure 3b) (3).

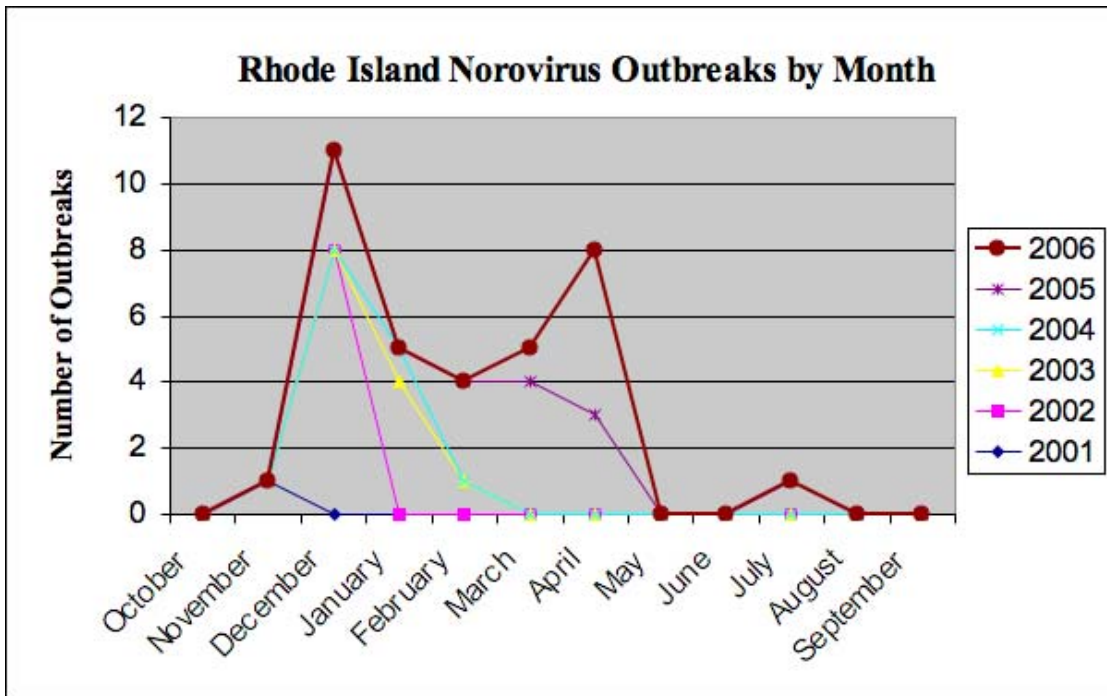


Figure 2. Outbreaks by Month in Rhode Island, 2001-2006. Graph used with permission from Deanna Simmons at the Rhode Island Department of Health Laboratory. Data source: State Lab unpublished data

The majority of outbreaks in Rhode Island from January 2005 through July 2006 occurred in Providence county (35.3% n=12), Kent county (26.5 n=9) and Newport county (23.5% n=8) with additional cases in Bristol county (8.8% n=3) and Washington county (5.9% n=2) (See Figure 4). Within the United States, from 1998 – 2000, the majority of outbreaks of norovirus infection occurred in Minnesota and Ohio (>20 cases in each). Ten other states reported between eleven and twenty outbreaks each (CA, FL, GA, IA, IL, MD, MI, NY, OR, WI); Rhode Island did not begin testing for norovirus until 2001 (4) (See Figure 5).

Figure 3a:
Outbreaks in Rhode Island by
setting: n=33
Data source: RIDOH unpublished
data

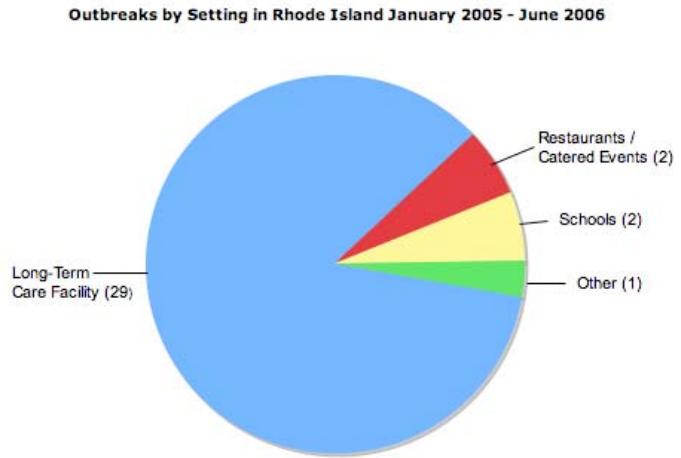


Figure 3b:
Outbreaks in the United States
by setting: n=348
(6)

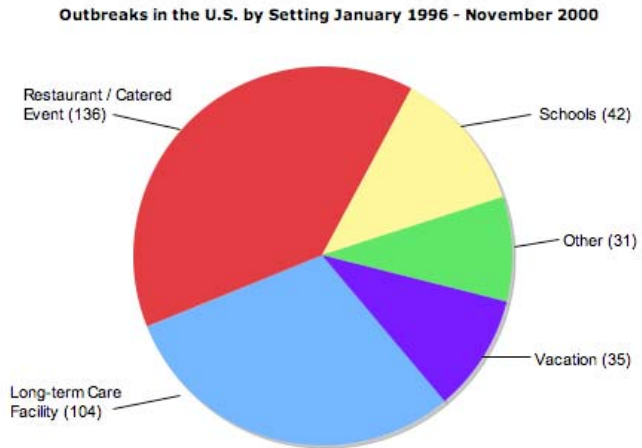
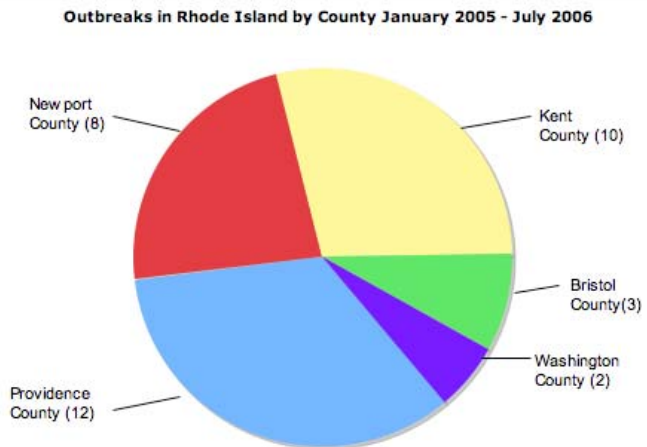


Figure 4. Norovirus
outbreaks in Rhode
Island by County
(n=34)
Data source: RIDOH
unpublished data



Discussion:

Despite possible inconsistencies in reporting measures and methods, it appears that the number of norovirus outbreaks in Rhode Island has increased in recent months. The overall number of outbreaks actually reported to the Rhode Island Department of Health is presumably a small portion of true norovirus activity throughout the state; the same is likely true in many other states as well as at the national level. It is unclear how much of the increase in norovirus outbreak reported in two years in Rhode Island is due to improvements in reporting and how much is due to a real increase. The view of clinicians, virologists, public health doctors and infection control nurses is fairly consistent, albeit anecdotal and not amenable to rigorous confirmation: is that at least part of the increase is real (5).

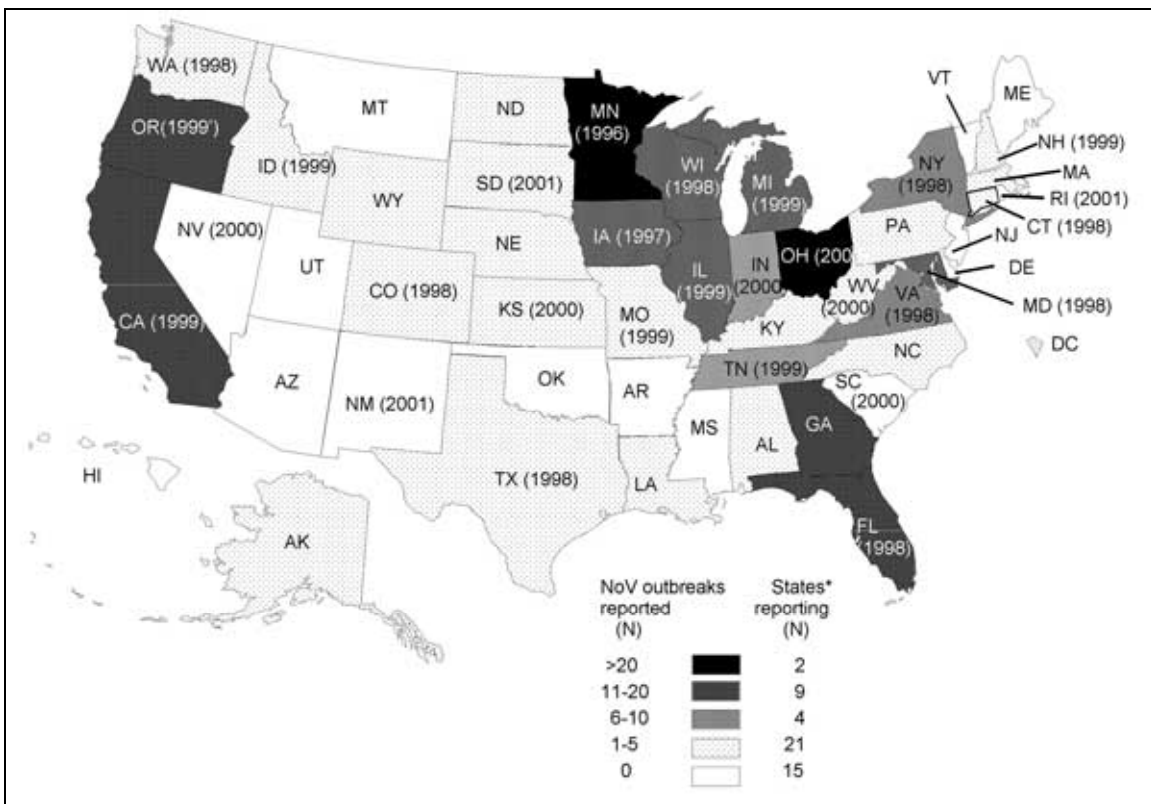


Figure 5 – Norovirus-confirmed foodborne outbreaks by state, United States 1998-2000 (n=305). Years in parentheses indicate first year a state public health laboratory developed molecular assays for norovirus (as of December 2001). (4).

The incidence of norovirus infection in Rhode Island showed a large increase from 2005 to 2006. CDC laboratories have thoroughly documented the seasonality of norovirus infections, finding that outbreaks are most common in the first and fourth quarters (5). It is noteworthy, however, that this seasonality is less pronounced in Rhode Island as of June 2006. From 2001 through 2004, outbreaks centered on very late winter through very early spring; in 2006, outbreaks peaked in December, as expected, but outbreaks continue to occur through the spring and into the summer. This shift from the generally accepted risk period of the winter and early spring months may suggest either an increase in infection or simply improved reporting measures.

The greater proportion of outbreaks in Providence county as compared to Kent county is somewhat misleading due to the fact that 59.3% of the state's population reside in Providence county while only 15.9% reside in Kent county. This may be due to the proportion of long-term care facilities between the counties (6).

Because cases in the community seldom seek medical attention, public health offices and laboratory surveillance considerably underestimate the true burden of norovirus infection. A study in New England and Wales in the early 1990s concluded that as many as 1,500 cases of gastroenteritis occur in the community for every one that is confirmed and reported (5). It is unlikely that the situation in the United States and Rhode Island differs to any great extent from this estimation, emphasizing that the incidence of gastroenteritis due to norovirus infection is far greater than that captured by surveillance.

Recommendations:

In order to fully understand the burden of outbreaks of norovirus infection in Rhode Island, we recommend the following measures:

- *Increase Reporting and Surveillance State-Wide*

Norovirus infection is not a reportable disease, but outbreaks or clusters of infection are reportable. The state of Rhode Island has specific rules and regulations pertaining to reporting these outbreaks. Section 2.5 of the *Rules and Regulations Pertaining to the Reporting of Communicable, Environmental and Occupational Diseases* describes what should be reported in detail:

Any person who is required or recommended to report and has knowledge of an outbreak of infectious disease... or a cluster of unexplained illness, infectious or non-infectious... shall promptly report the facts to the Department of Health.... Outbreaks or clusters are therefore identified by significant increases in the usual incidence of the disease in the same area... at the same season of the year. Some examples of outbreaks are as follows: 1. *Foodborne/poisoning*: the occurrence of two (2) or more cases of a similar illness resulting from the ingestion of a common food; 2. *Institutional*: cluster of similar illness in institutional settings, such as nursing homes, hospitals, schools, day care centers, etc.; 3. *Waterborne*: at least two (2) persons experiencing a similar illness after ingestion of water and epidemiologic evidence that implicates water as the probable source of the illness (7).

The increased use of diagnostics along with improved surveillance, such as sentinel sites, will permit identification of new strains and shifts in the epidemiology of the disease. Also, with the coordination between the Office of Disease Control, the Office of Food Protection and the State Laboratory, data for each outbreak will be more complete and therefore easier to analyze.

- *Begin Real Time Database Population*

If outbreaks are added to the database as they occur, instead of at the end of the outbreak season, trends within the state will become apparent as they develop and control measures will likely be more effective.

- *Begin Compiling Long-Term Database*

Lack of consistent retrospective data is presently one of the major difficulties in determining trends within Rhode Island. With complete data for multiple years, it will be possible to analyze the effectiveness of Rhode Island's prevention and control measures compared to other states and then change public policy to improve protection.

References:

1. Widdowson M-A, Monroe S, Glass R. [Are Noroviruses Emerging?](#) Emerg Infect Dis 2005; 11:735-737.
2. Louisiana. Department of Public Health & Hospitals – Infectious Disease Epidemiology. [Norovirus Infections](#). State of Louisiana, 2004.
3. Centers for Disease Control and Prevention. [“Norwalk-like viruses:” public health consequences and outbreak management](#). MMWR 2001; 50(No. RR-9).
4. Widdowson M-A, Sulka A, Bulens SN, Beard RS, Chaves SS, Hammond R, et al. Norovirus and foodborne disease, United States, 1991–2000. Emerg Infect Dis [serial on the Internet]. 2005 Jan [date cited]. Available from <http://www.cdc.gov/ncidod/EID/vol11no01/04-0426.htm>
5. Cowden J, Smith-Palmer A, Kilpatrick C. [Norovirus infection in Scotland](#). Scottish Centre for Infection and Environmental Health 2004; 38(20): 118-20.
6. Census 2000 data for Rhode Island. US Census Bureau. 2000. US Census Bureau. 21 Aug. 2006 <<http://www.census.gov/census2000/states/ri.html>>.
7. State of Rhode Island and Providence Plantations. Rhode Island Department of Health. Rules and Regulations Pertaining to the Reporting of Communicable, Environmental and Occupational Diseases. Feb 2006. State of Rhode Island. 21 Aug 2006. <http://www2.sec.state.ri.us/dar/regdocs/released/pdf/DOH/DOH_3844.pdf>

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