Maricopa County
Department of Public Health

2008 Outbreak Summary Report

Submitted By

Division of Disease Control
Office of Epidemiology
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Introduction

The purpose of this report is to provide a general overview of the disease outbreak investigations that were reported during 2008 in Maricopa County, Arizona. In Arizona, health care providers (HCP), health care institutions (HCI), correctional facilities (CF), childcare establishments (CCE), administrators of schools, and shelters are all required to report outbreaks of infectious diseases to the Local Public Health Authority under Arizona Administrative Code A.A.C. R9-6-203 and ARS Title 36. Outbreaks involving certain diseases (e.g. Hepatitis A) require that facilities notify the health department within 24 hours in the event of an outbreak (Table 1). Also, hotels, motels, and resorts are required to report contagious or epidemic diseases occurring in their establishments within 24 hours under Arizona Revised Statutes Title 36, Chapter 6, Article 2.

Table 1. Diseases requiring outbreak notification within 24 hours

Disease/Condition	Reporting by HCPs, HCIs, and CFs	Reporting by Schools, CCEs, and Shelters
Amebiasis	X	
Campylobacteriosis	X	
Conjunctivitis: acute	X	X
Cryptosporidiosis	X	
Diarrhea, Nausea, or Vomiting	X	X
Giardiasis	X	
Hepatitis A	X	
Hepatitis E	X	
Salmonellosis	X	
Scabies		X
Shigellosis	X	
Streptococcal Group A Infection		X
Taeniasis	X	
Vibrio Infection	X	
Yersiniosis	X	

Outbreak Investigation Methodology

Outbreaks are investigated in order to stop the spread of disease quickly, identify the source of disease, and prevent future outbreaks. Educational materials are provided to the public in order to help stop transmission and educate the public on safe practices. If possible and when indicated, biological and environmental specimens are collected as part of these investigations to obtain precise laboratory information and facilitate intervention. Maricopa County Department of Public Health (MCDPH) investigates outbreaks in conjunction with other agencies in Maricopa County such as the Environmental Services Department (ES). Single case reports of communicable diseases often lead to the identification of additional cases that may turn out to be part of an outbreak. Many outbreak investigations require the assistance of the Arizona Department of Health Services (ADHS), especially when laboratory services are necessary. All

outbreak reports are submitted to ADHS and then forwarded to the Centers for Disease Control and Prevention (CDC). These reports are available by request.

MCDPH cannot investigate all outbreaks that are reported. MCDPH nurses and epidemiologists conduct risk assessments to weigh several factors to determine whether to investigate an outbreak. They consider the following factors:

- Size of the outbreak
- Severity of the illness
- Whether the outbreak resulted in hospitalizations and/or deaths
- Timely reporting
- Ability to test specimens
- The level of vulnerability of affected individuals
- Type of facility
- The degree to which the outbreak is under control

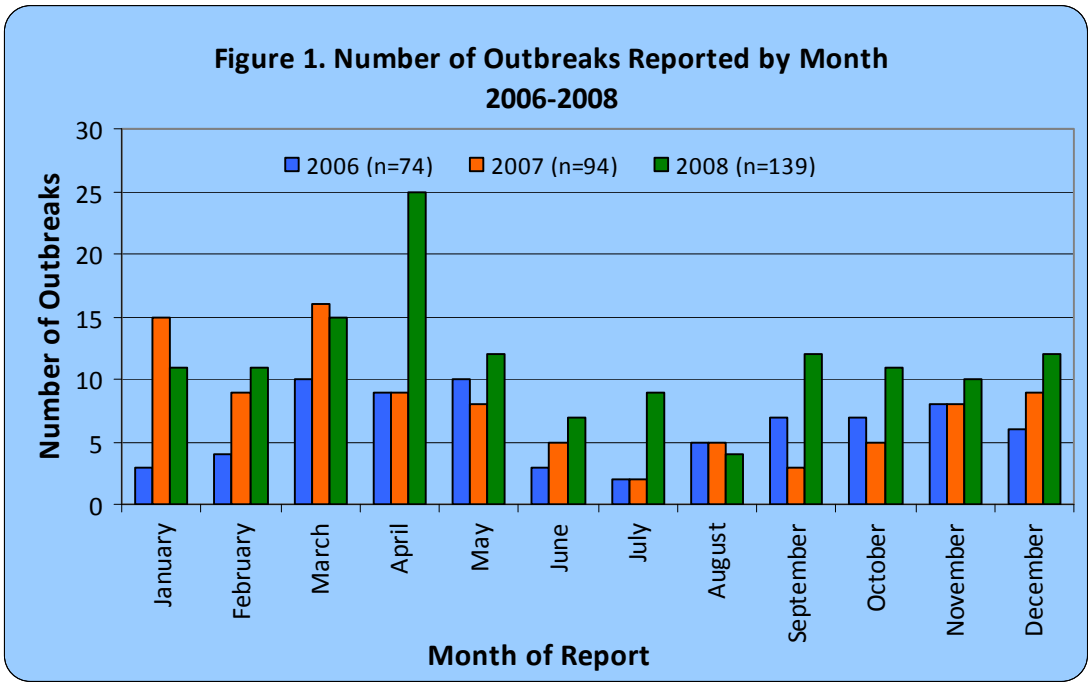
The features mentioned above are seriously considered when deciding whether or not an investigation will occur as a shortage of staff frequently acts as a limiting factor. Please refer to the discussion section for more information on this issue.

Summary

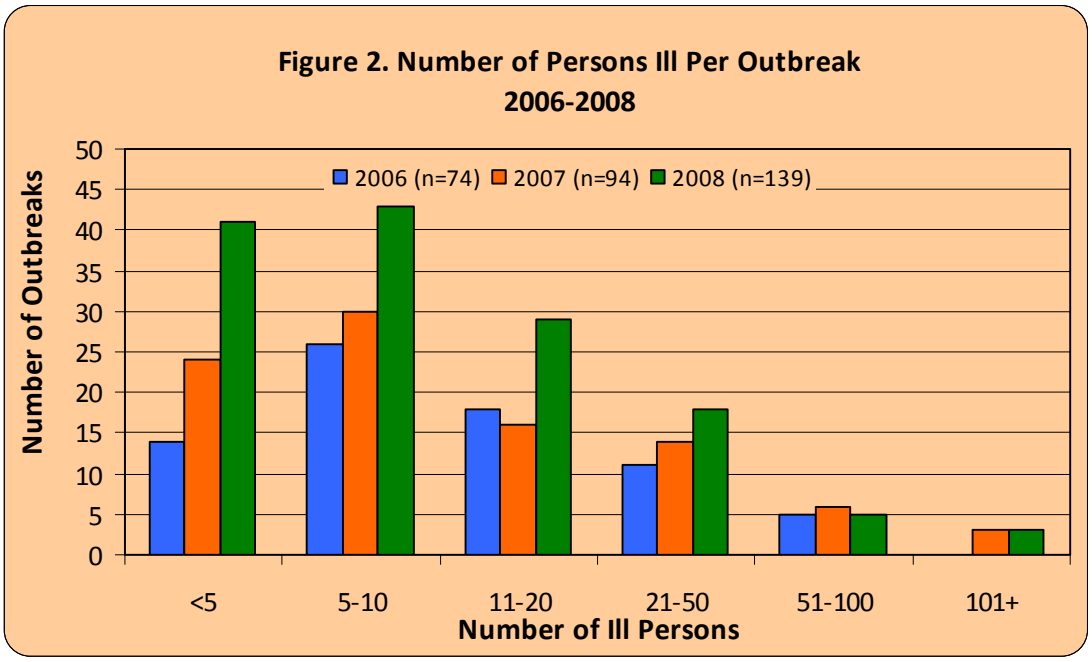
In 2008, there were 139 outbreaks investigated in Maricopa County, or an average of 11.6 outbreaks per month, with the largest number of outbreaks occurring in March and April. The outbreaks ranged in size from one to 110 ill persons, with over half of the reported outbreaks affecting 10 or fewer persons. The pathogen isolated in the most outbreaks was norovirus; however, just over 23% of outbreaks were of unknown etiology. Restaurants and schools were the most common type of facility associated with outbreaks, followed by long term care facilities (LTCFs) as the second most common.

Analysis

In 2008, the number of monthly outbreaks ranged between four (August) and 25 (April) and, as previously mentioned, there was an average of 11.6 outbreaks per month. This represents an increase over the previous two years. In 2007, the total was 94, an average of 7.8 per month, with a range of 2-16 per month; in 2006, the total was 74, an average of 6.2 per month, with a range of 2-10 per month. As shown in Figure 1, the pattern of outbreaks is a bimodal curve with peaks in late spring and winter months. The increased number of outbreaks in winter and spring may be due, in part, to the seasonality of pathogens such as norovirus, and to the influx of residents/visitors at that time of year.



The median number of persons affected per outbreak in 2008 was 7 (range 1-110); in 2007 the median number of persons ill per outbreak was 8 (range 2-154); and in 2006 the median number of persons affected per outbreak was 10 (range 2-78). In 2008, 113 of the 139 outbreaks (81%) involved 20 or fewer persons (see Figure 2).



As shown in Table 2 below, 23% of outbreaks in 2008 were of unknown etiology. In 2007, this was 30%, and in 2006, 38%. This decrease in the percent of outbreaks from unknown pathogens each year may be due to better specimen collection, improved testing technology and/or other factors. Table 2 shows the number of outbreaks by identified pathogen for the past three years. All but two of the 33 outbreaks of unknown etiology in 2008 were gastrointestinal in nature. The pathogen of interest remained unknown for these outbreaks for a variety of reasons, including inability to investigate an outbreak, failure to obtain specimens for testing, outbreaks that were reported too late for testing, and testing which did not identify a pathogen.

Table 2. Number of Outbreaks by Etiology

Etiology of Outbreaks	2006	2007	2008
Known Etiology – Subtotal	48	62	108
Aseptic Meningitis	0	0	1
Conjunctivitis	5	2	3
Cryptosporidiosis	0	1	5
E. coli O157:H7	1	0	0
Fifths Disease	0	0	1
Giardia	1	0	0
Hand, Foot, and Mouth Disease	0	2	0
Head Lice	0	2	6
Hepatitis A	1	0	0
Influenza	0	0	2
Influenza B	0	1	0
Influenza-like Illness	1	4	2
MRSA	2	2	2
Norovirus	21	26	33
Rotavirus	0	0	1
RSV	0	2	2
Salmonella	0	0	2
Scabies	7	6	11
Shigella	2	1	8
Staphylococcus (Skin Infections)	1	1	0
Strep group A (strep throat)	0	0	3
Varicella	4	12	24
Unknown Etiology – Subtotal	28	32	33
Unknown (GI)	26	32	31
Unknown (Rash)	2	0	2
Total	**74**	**94**	**139**

While a specific etiology is not always determined, most outbreaks can be broadly classified based on the symptoms exhibited by cases. As shown in Table 3, from 2006 through 2008, the majority of outbreaks investigated by the MCDPH were gastrointestinal in nature. The "other" category includes meningitis, conjunctivitis and head lice.

Table 3. Type of Outbreaks

Outbreak Type	2006	2007	2008
Gastrointestinal	51	60	82
Respiratory	1	7	38
Rash	17	23	9
Other	5	4	10
Total	74	94	139

As seen in Table 4, the record high number of outbreaks in 2008 reflected an increase in the number of outbreaks in all but two types of facilities. The largest numbers of reports for any one category were for restaurants and food establishments, followed by schools and senior living facilities (including assisted living centers, long term care facilities, and senior apartments). The "other" category includes sport teams and public pools.

Table 4. Number of Outbreaks by Facility

Facility Type	2006	2007	2008
Daycare/Shelter	8	14	25
Hospital/Clinic	5	7	11
Resort/Hotel	3	2	1
Schools	14	20	32
Worksite	4	1	1
Prison/Jail	1	3	4
Senior Living Facility	15	18	26
Restaurant/Food Est.	21	26	34
Other	3	3	5
Total	74	94	139

Figure 3 shows that the number of outbreaks reported at resort/hotels and worksites has decreased over the past three years, while an increase has been observed in all other facilities.

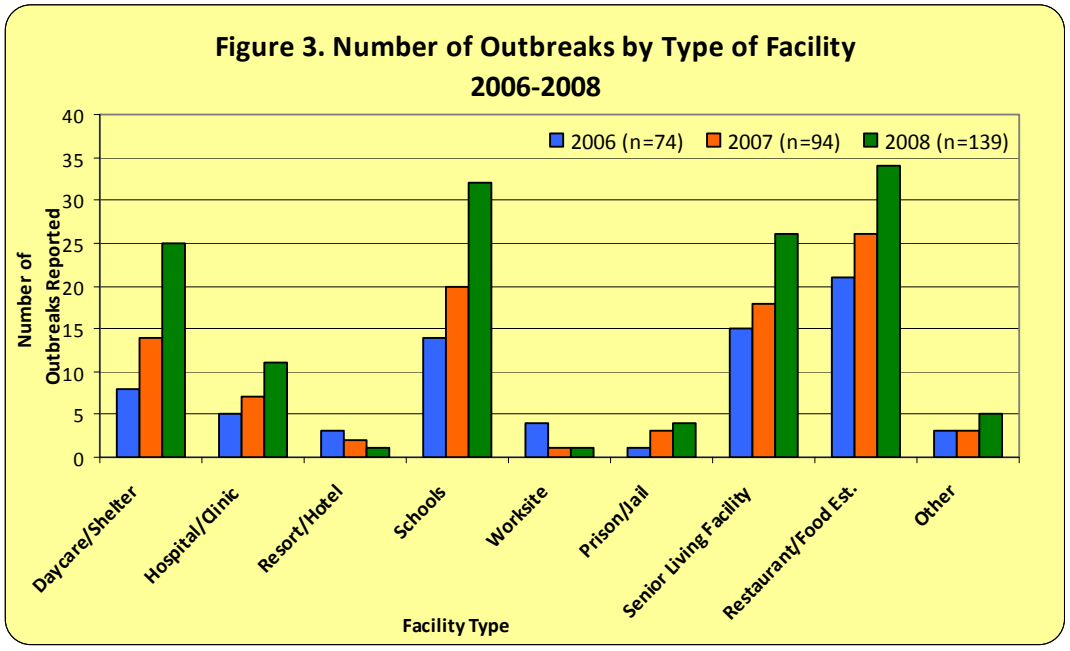


Figure 4 shows the number of outbreaks by type and facility for 2008. Gastrointestical illness outbreaks were the most common type of outbreak in daycare centers, hospitals, and restaurants. In contrast, outbreaks reported in jails and schools were more likely to be rash illness outbreaks rather than those that were gastrointestinal in nature. The most common type of rash outbreak in these facilities was varicella (chicken pox).

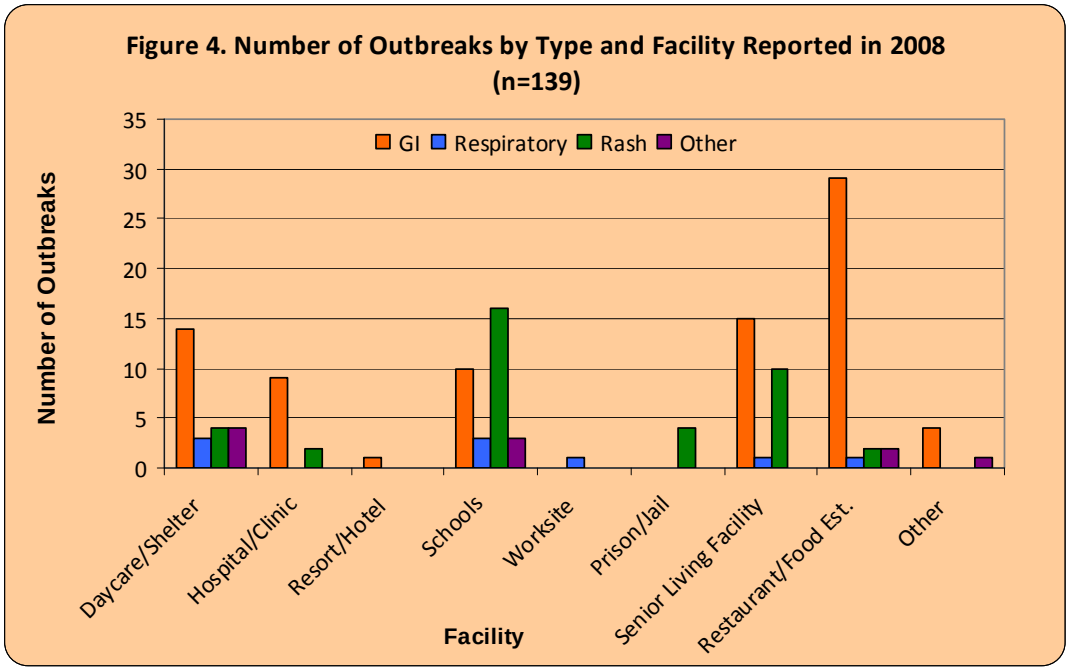


Figure 5 illustrates GI outbreaks in 2008 by type of facility. Among the 82 gastrointestinal Outbreaks reported in 2008, food establishments made up the largest percentage (33%), followed by senior living facilities (18%) daycare centers (17%). Outbreaks at pools accounted for 5% of the outbreaks in 2008 due to a cryptosporidiosis outbreak in the summer of 2008.

Figure 5. Percentage of GI Outbreaks by Facility 2008 (n=82)

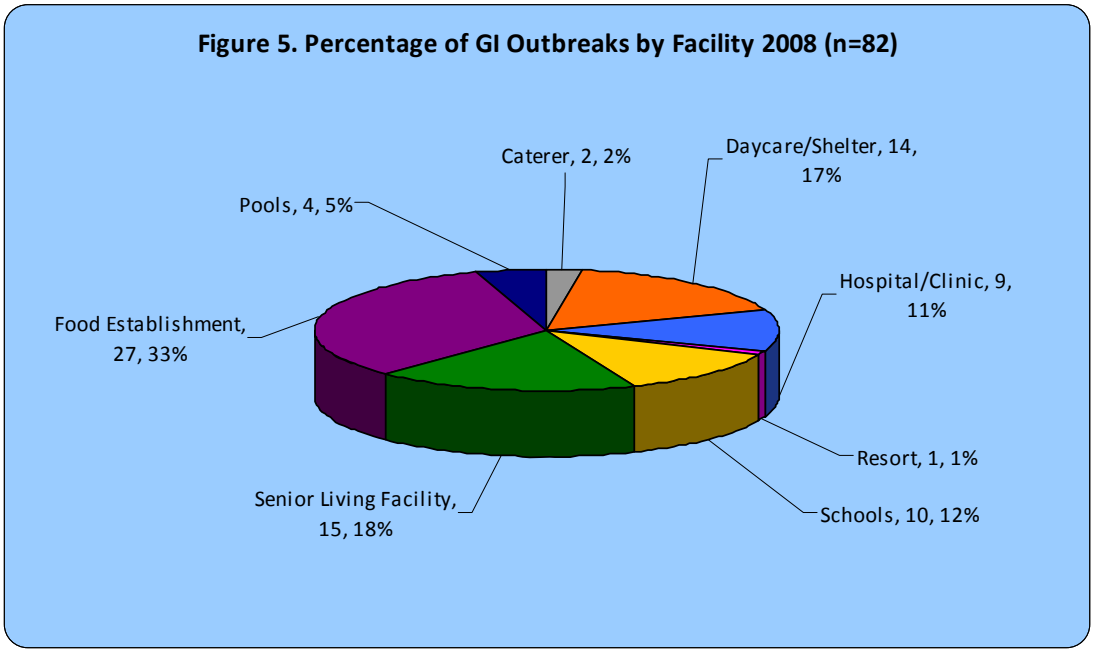


Figure 6 shows rash outbreaks by facility type for 2008. Schools (42%) and senior living facilities (26%) made up a large proportion of the rash outbreaks. Scabies was by far the most common type of rash at senior living facilities.

Figure 6. Percentage of Rash Outbreaks by Facility 2008 (n=38)

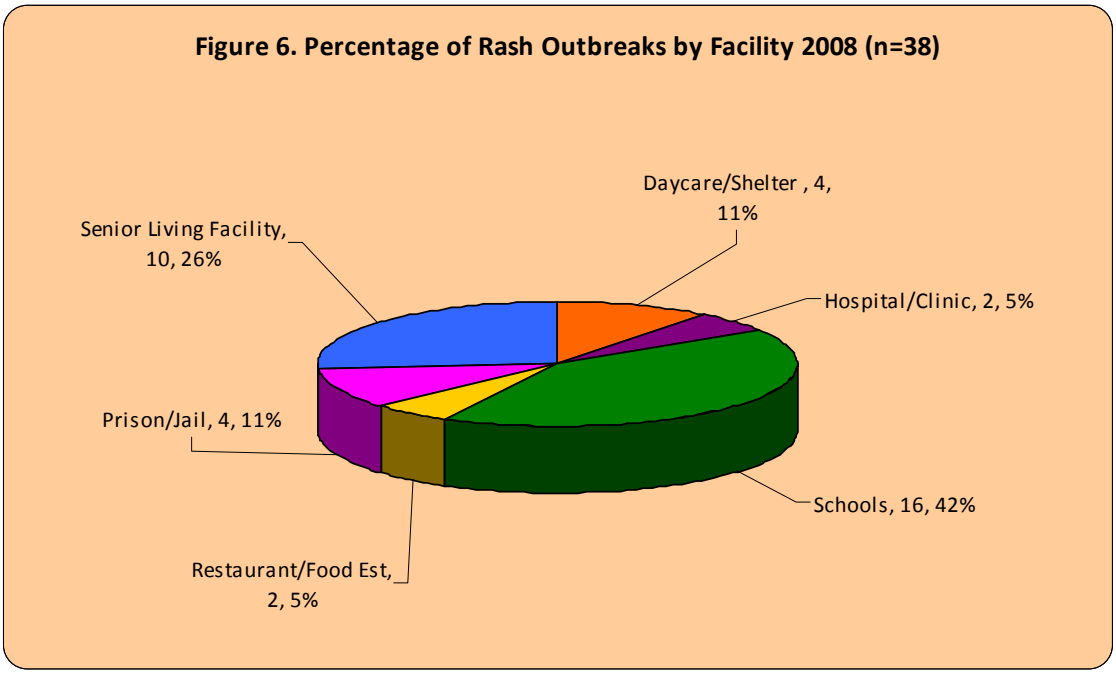
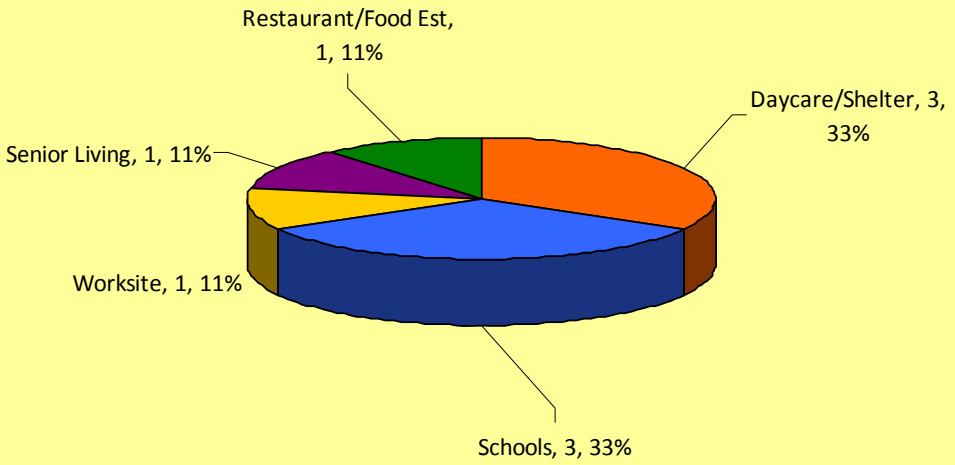


Figure 7 represents respiratory outbreaks in 2008 by facility. Not surprisingly, respiratory outbreaks were most prevalent at school and daycare facilities. This is likely due to the population of young children who tend to spread respiratory illness quickly in the classroom setting as well as the willingness of schools and daycare centers to report this type of outbreak.

Figure 7. Precentage of Respiratory Outbreaks by Facility 2008 (n=9)

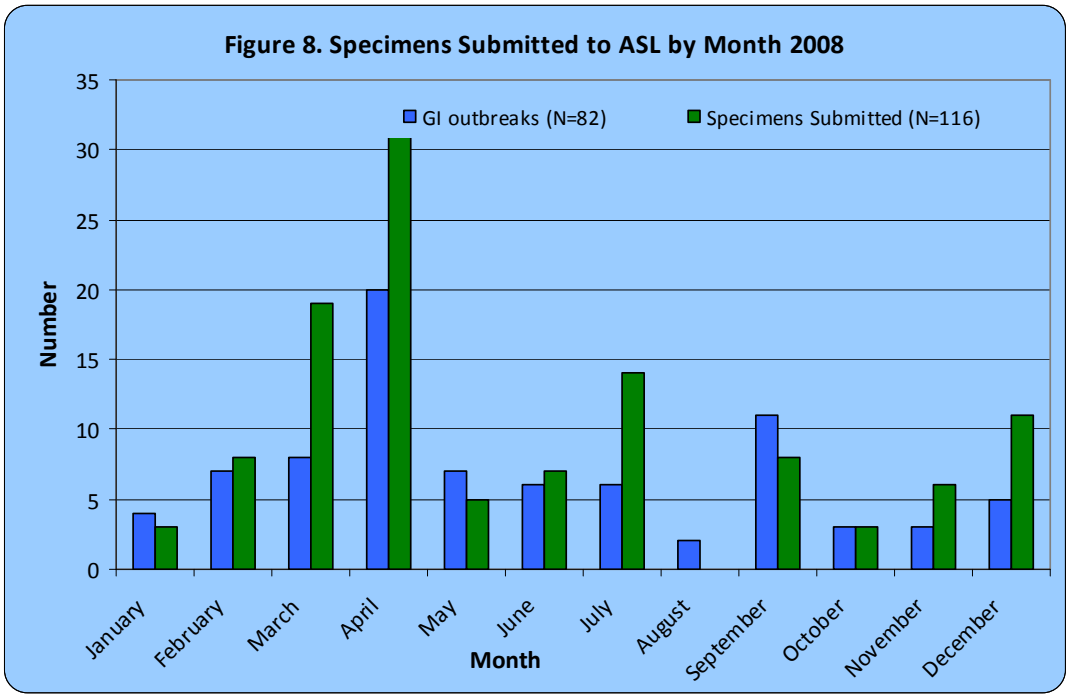


Specimens

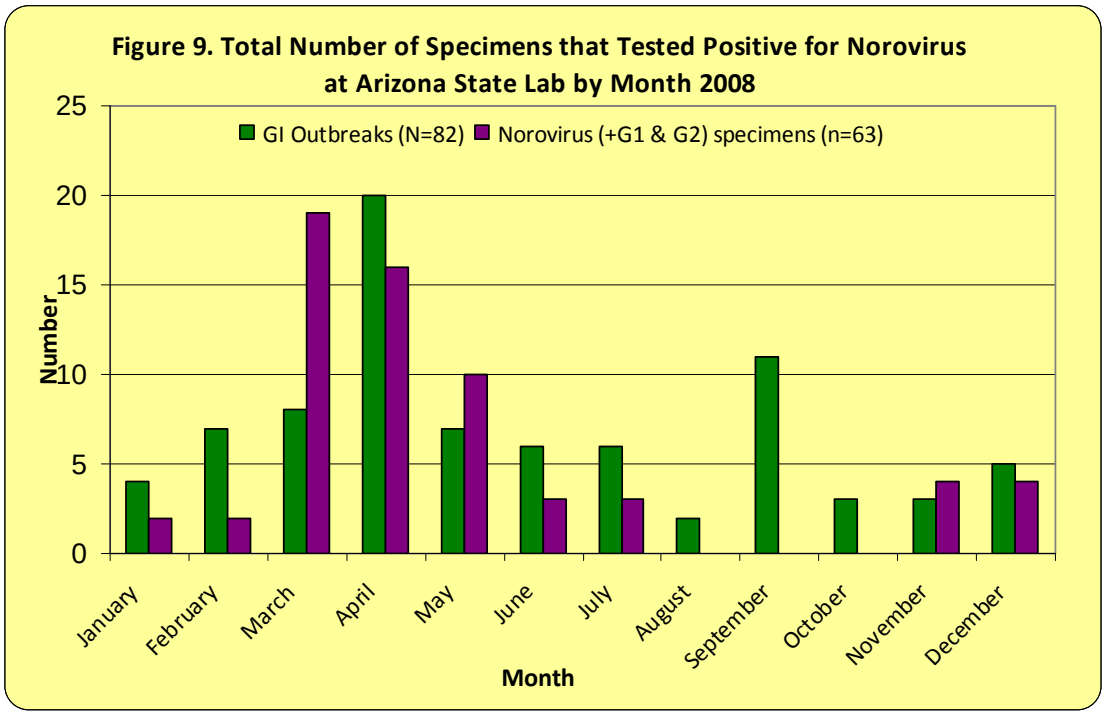
Collecting stool specimens from ill individuals is essential in identifying the etiology of an outbreak. MCDPH was able to collect one or more specimens for 54 of the 82 gastrointestinal outbreaks in 2008. This is at least one specimen for 66% of the GI outbreaks. A total of 116 stool specimens were collected for the 54 outbreaks; a little over two specimens per outbreak, on average.

Specimens were not collected for 28 of the 82 GI outbreaks for several reasons: too much time elapsed between an event and reports of illness (thereby making it difficult to find a pathogen in the stool), some individuals were unwilling to provided specimens, or some cases could not be contacted.

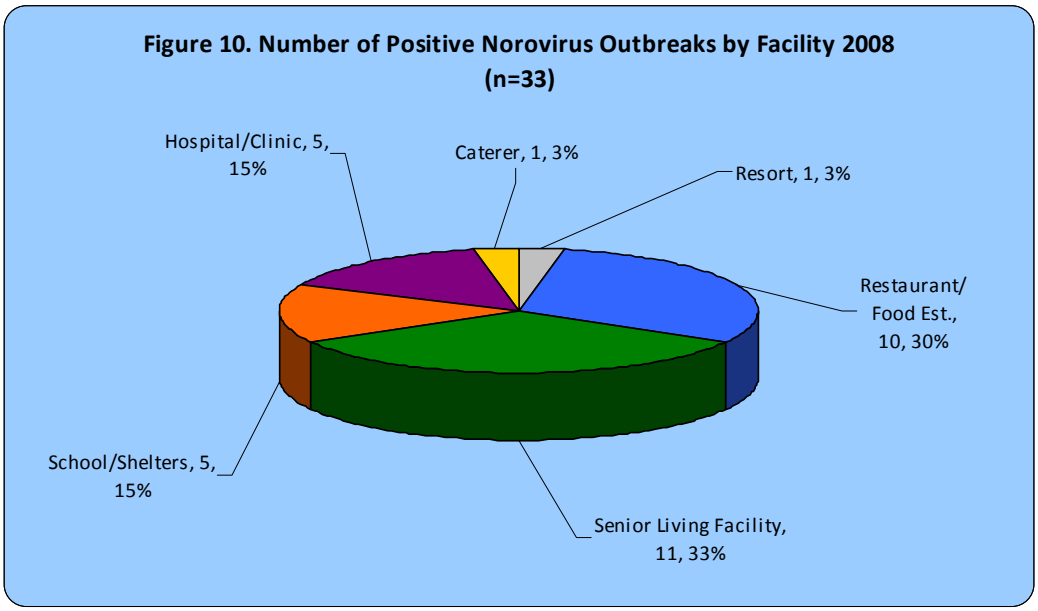
One hundred forty-one specimen collection kits were provided to ill individuals with a range of 1-6 kits per outbreak. Of these, 116 (82%) of the recipients provided stool specimens, which were submitted for testing at the Arizona State Laboratory. An additional 17 specimens were generated at facilities such as hospitals and long-term care facilities without using kits provided by MCDPH. Figure 8 shows the distribution of specimens submitted and tested in 2008.



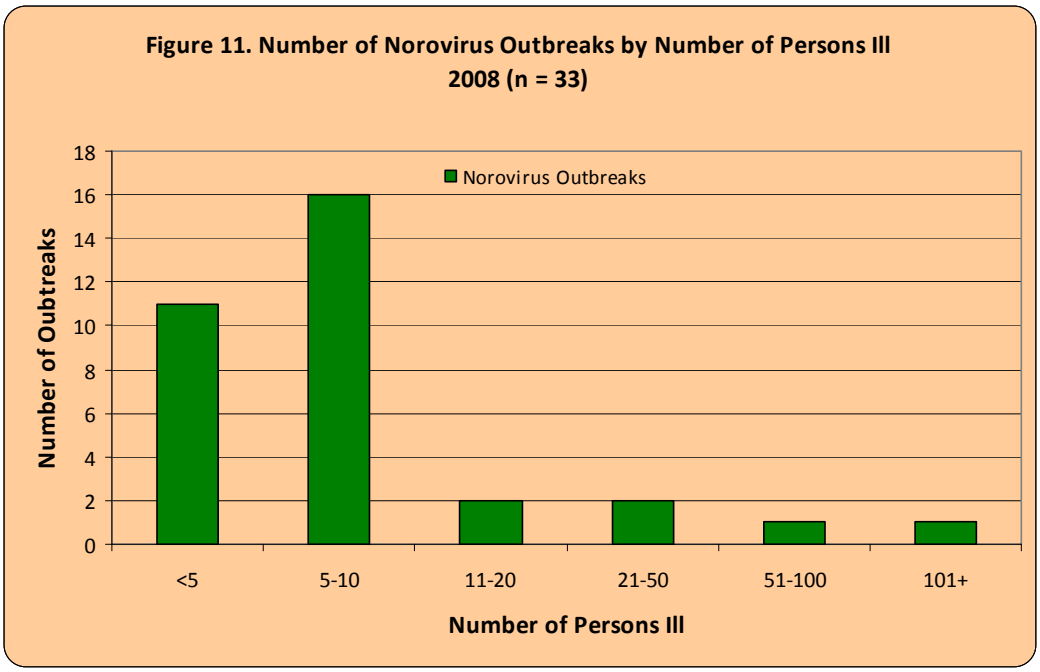
Norovirus testing was conducted on 108 specimens (93%); 63 specimens (58%) were positive for norovirus. For the 63 norovirus positive specimens whose strains were identified, one specimen was typed as norovirus G1 and the other 62 (98%) specimens typed as norovirus G2. Each of the 42 specimens submitted for general enteric testing was negative for bacterial pathogens (E.Coli, campylobacter, shigella and salmonella). Figure 9 shows the distribution of GI outbreaks and positive norovirus (G1 & G2) specimens by month.



Outbreaks of norovirus occurred in all types of facilities, most commonly in senior living facilities followed by restaurant/food establishments as shown in Figure 10. The distribution observed in Figure 10 is somewhat different from the distribution of total gastrointestinal outbreaks by facility (Figure 5) which showed restaurant/food establishments as most common followed by senior living facilities. This may reflect the fact that is often easier to collect stool specimens from hospitals and clinics than from patrons of restaurants reporting an outbreak.



Reported Norovirus outbreaks by number of persons ill are shown in Figure 11. Many norovirus outbreaks affected fewer than 10 individuals (82%) and only two outbreaks occurred in groups of more than 50 individuals. This follows the pattern for all outbreaks in general.



Special Topic: Cryptosporidiosis Outbreaks in Maricopa County (2008)

In the summer of 2008 several outbreaks of *Cryptosporidium* occurred in Maricopa County Arizona. The Maricopa County Department of Public Health (MCDPH) identified five outbreaks from 7/3/08 through 9/26/08 occurring in two public swimming pools, one children's splash-and-play area, and two daycare centers.

The first swimming pool related outbreak occurred in a large municipal pool system involving members of a swim team. Parents of ill children called to report the large number of illnesses in team members and pool staff members. Stool specimen analysis revealed the presence of *Cryptosporidium* oocysts. Media became involved in the case and the City of Phoenix decided to close all pools for hyperchlorination. Information collected during interviews revealed that almost all swimmers had been in multiple pools both before and immediately after illness. No swimmers admitted to swimming during the acute phase of infection however all admitted to resuming swimming immediately after symptoms resolved. MCDPH conducted 89 interviews from an original list of 194 complaints and identified a total of 5 confirmed and 52 probable cases.

The second swimming pool related outbreak also involved a municipal pool system and the illness complaint was initiated by a different swim team. The entire team of 18 persons were reported ill, of those 12 were interviewed. Four confirmed cases were identified and 7 cases were deemed probable. The municipality also immediately closed and hyperchlorinated all pools.

The next outbreak involving recreational water occurred in a children's splash area at a local park run by a third municipality. Confirmed cases that reported individually to MCDPH were linked to the same water exposure. The water subsequently tested positive for *Cryptosporidium* oocysts. A total of four confirmed and 5 probable cases were linked to that outbreak.

Two outbreaks were identified in daycare centers. The first daycare associated outbreak occurred when a child attendee was reported to MCDPH as a confirmed case of cryptosporidiosis. The first case was the only confirmed case identified during the investigation, although an additional six symptomatic children were identified at the same daycare center. Cases were asymptomatic at the time of investigation and no specimens were able to be collected. The second daycare was associated with another confirmed case. Four additional symptomatic children were identified in the daycare but no specimens were collected.

Other jurisdictions have reported that outbreaks of cryptosporidiosis were communitywide with large numbers of cases. These outbreaks are very difficult to control as there is no specific target for intervention. Because the cryptosporidiosis outbreaks that occurred in Maricopa County were associated primarily with specific swimming venues, they may have been easier to bring under control. In addition, the jurisdictions involved chose to hyperchlorinate all of their swimming venues reducing the survival of the pathogen and the media attention may have added to individual prevention practices. All of these reasons could help to explain why these outbreaks never widened to include the entire community.

The Maricopa County Department of Public Health was unprepared for the cryptosporidiosis outbreaks for two reasons. First, plans and procedures specific to *Cryptosporidium* were not in place at the beginning of the outbreaks. Second, there were not enough staff members to handle the initial wave of complaints (190) and follow-up with interviews among complainants. For the 2009 summer season, protocols have been put in place and both the public health and environmental health communities have joined to institute prevention measures.

Discussion

The following are conclusions and implications based on the findings presented in this report.

- Norovirus was by far the most prevalent pathogen identified as contributing to illness outbreaks. Given the prevalence of norovirus in outbreaks and presumably in the community, more effort should be expended on preventive measures.
- Outbreaks are most commonly occurring where people are congregated for long periods each day – long term care facilities, schools, etc. Appropriate control measures should be encouraged in these settings and include proper hand washing, routine clean-up of areas at risk of contamination, removal of shared items (especially in a classroom setting), use of bleach cleaners, isolating ill persons to limit transmission and ensuring that all food handlers with diarrhea or vomiting are excluded from work.
- Since 2005, the number of outbreaks of unknown etiology has decreased and MCDPH intends to collect specimens for as many outbreaks as possible in order to maintain this trend. As bacterial pathogens are very rarely isolated during testing of stool specimens, bacterial testing should be limited only to instances where evidence for a bacterial pathogen exists (e.g. when a case has bloody stool).
- Since 2003, there has been a steady rise in the number of outbreaks each year – a 70% increase since 2003 – and additional resources are needed in order for MCDPH to adequately investigate each one. The number of uninvestigated outbreaks should be expected to increase annually without the addition of appropriately trained staff members.