Maricopa County
Department of Public Health

2010 Outbreak Summary Report

Office of Epidemiology
August 2011

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Introduction

The purpose of this report is to provide an overview of the disease outbreaks reported throughout 2010 in Maricopa County, Arizona and the subsequent investigations led by the Maricopa County Department of Public Health (MCDPH). In Arizona, health care providers (HCPs), health care institutions (HCIs), correctional facilities (CFs), childcare establishments (CCEs), administrators of schools and shelters are all required to report outbreaks of infectious diseases to the MCDPH under Arizona Administrative Code A.A.C. R9-6-203 and ARS Title 36. Outbreaks involving certain illnesses require that facilities notify the health department within 24 hours after the existence of the illness is known. In addition, operators of hotels, motels, and resorts are required to notify the MCDPH regarding any reports of contagious, infectious, or epidemic disease within 24 hours "after the existence of the disease is known"[i] under Arizona Revised Statutes Title 36, Chapter 6, Article 2. Table 1 below displays the diseases requiring notification within 24 hours of receiving a report of a case, suspected case, or detecting an outbreak.

Table 1. Diseases requiring outbreak notification within 24 hours in Arizona

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

**Within 24 hours after detecting a case or suspecting a case (in a food handler, CCE worker or HCI worker)*

Investigation Methodology

Outbreaks occur when two or more unrelated cases (individuals showing signs and/or symptoms of the illness associated with the outbreak) are linked to a common exposure (e.g. two parties who are unknown to each other becoming ill after eating at the same restaurant or two friends who have not had contact with each other experiencing vomiting after dining at a restaurant together). MCDPH investigates outbreaks in order to identify the source of disease, quickly isolate and stop the spread of disease, and prevent future outbreaks. MCDPH also investigates single case reports of communicable diseases, which often leads to the identification of additional cases that may turn out to be part of an outbreak. After the identification of an outbreak, MCDPH provides educational materials to help stop the transmission and to provide information on preventing future disease outbreaks.

MCDPH investigates outbreaks in conjunction with other agencies in Maricopa County such as the Maricopa County Department of Environmental Services (ES) which also conducts investigations and inspections of facilities involved in the reports of outbreaks. Additionally, many outbreak investigations require the assistance of the Arizona Department of Health Services (ADHS) which provides epidemiological support and laboratory services for the specimens collected during an outbreak investigation. When indicated, and if possible, MCDPH and/or ES will collect biological and environmental specimens as part of these investigations to obtain precise laboratory information and facilitate intervention. All outbreak reports are submitted to ADHS, and then forwarded to the Centers for Disease Control and Prevention (CDC).

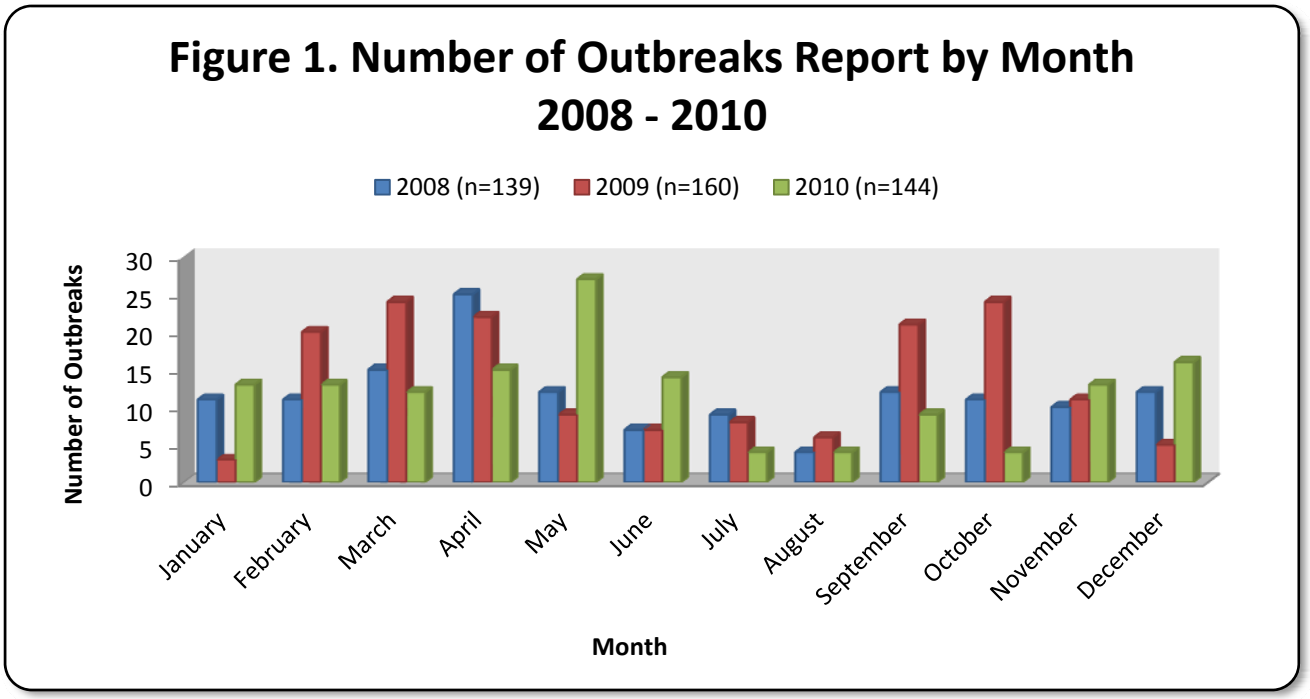
Due to limited resources, MCDPH cannot investigate all outbreaks that are reported. MCDPH epidemiologists conduct risk assessments to weigh several factors to determine if an outbreak will be investigated. The following factors are examined for each outbreak to determine whether an investigation should occur:

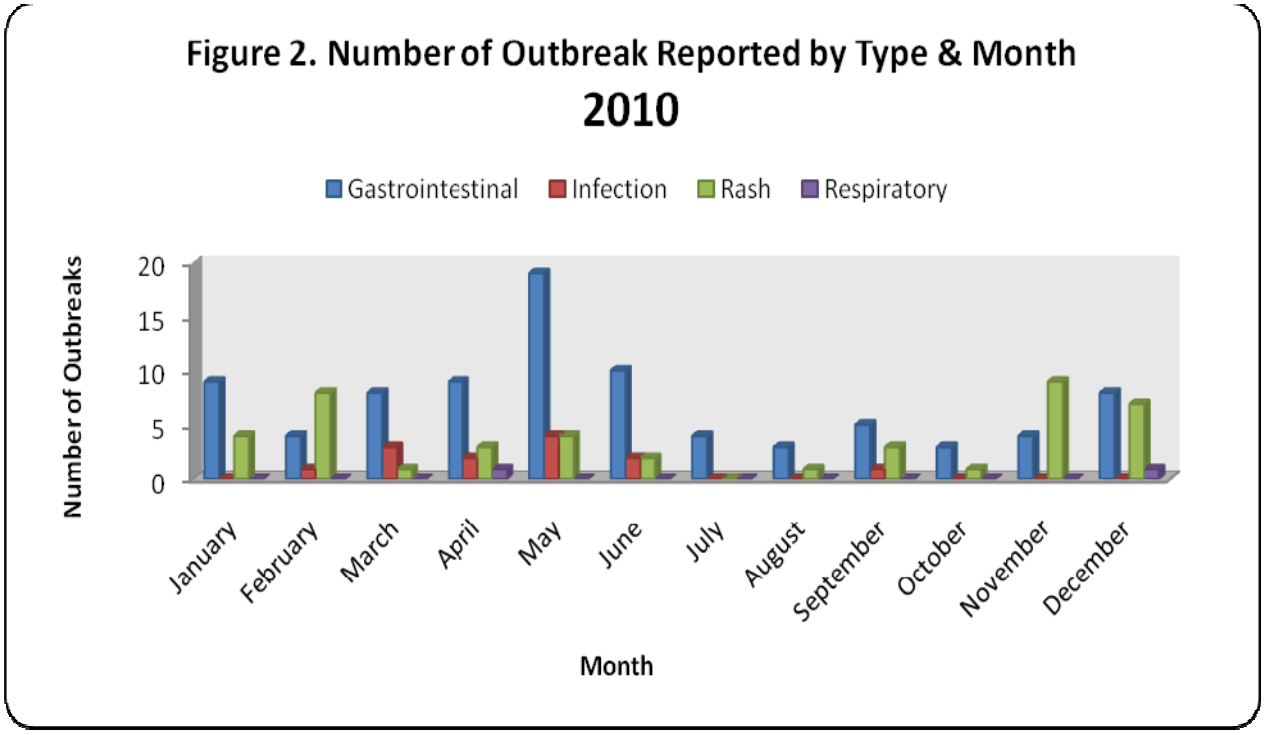
- Number of people ill
- Severity of illness
- Illness resulting in death, disability, or hospitalization
- Timeliness of the report
- Availability of specimens
- The level of vulnerability of affected individuals
- Type of facility
- The degree to which the outbreak is under control

The timely collection of stool specimens from ill individuals is essential in identifying the etiology of gastrointestinal outbreaks. Specimens need to be collected while the pathogen (infectious agent) can be isolated in the stool sample. Without a stool specimen, the identity of the pathogen that caused the illness will probably not be identified.

Investigation Analysis

In 2010, there were 144 outbreaks investigated in Maricopa County or an average of 12 outbreaks per month, with the number of outbreaks peaking in April and May and again in November and December (see Figure 1); this is a decrease from the monthly average of 13.3 in 2009. In 2008, there were 139 outbreaks, an average of 11.6 per month ranging from 4 to 25 per month. As shown in Figure 1, reports of outbreaks from 2008 to 2009 followed a bimodal distribution with peaks in the spring and fall months, while 2010 was more typically distributed with an increase in outbreaks in April and May. In 2009, MCDPH encouragement and media reports on the novel H1N1 influenza pandemic caused schools to increase reporting on influenza-like illnesses (ILIs), which most likely contributed to the increase in outbreak reporting during the spring and fall of 2009. In 2010, gastrointestinal illnesses predominated as 19 of the 27 reports of outbreak in May were for gastrointestinal illness (see Figure 2.) This pattern is more typical of outbreak reporting patterns prior to 2009.





In 2010, the median number of persons ill per outbreak was 23, which was less than it was in 2009 (median = 28.5) and 2008 (median = 24). In 2010, 116 of the 144 outbreaks (81%) affected 20 or fewer persons (see Figure 3).

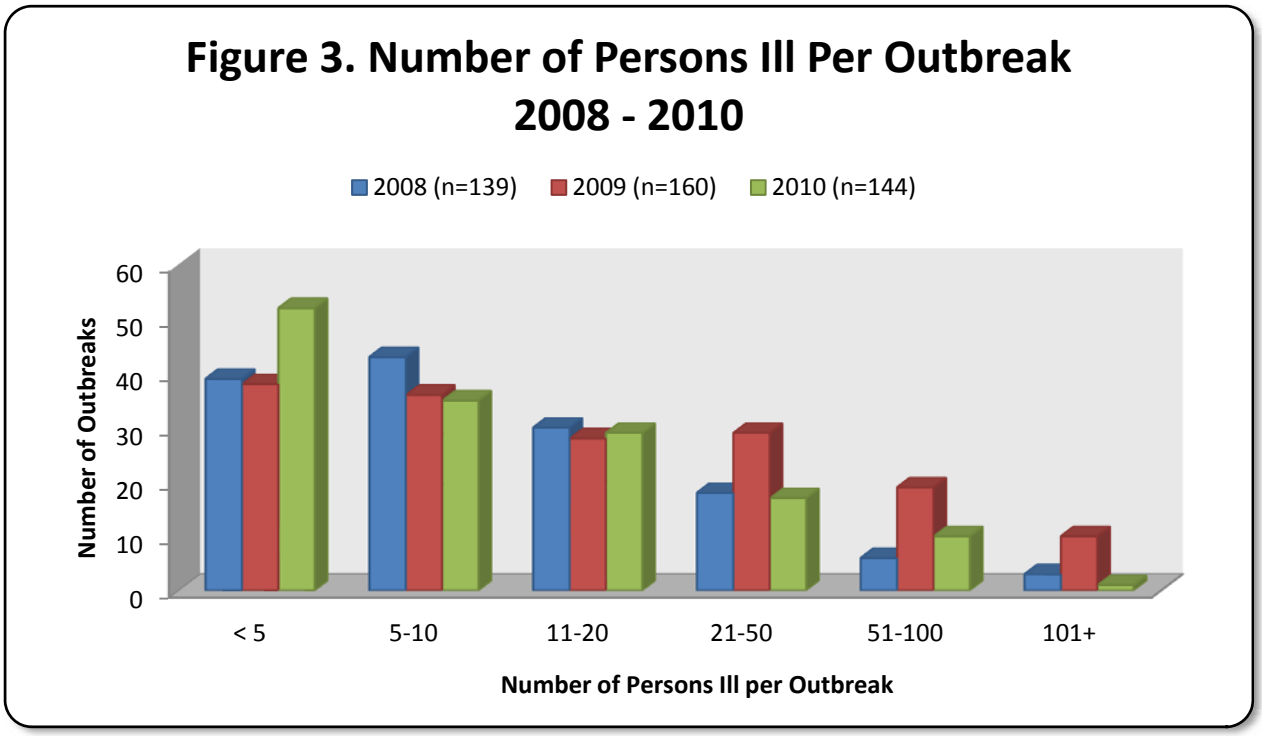


Table 2 shows the number of outbreaks by etiology for the past three years. Of the total 144 outbreaks investigated in 2010, there were 108 outbreaks in which the etiology was known (75% of the total), and 36 (25% of the total) of unknown etiology. Comparatively, in 2009, 13% of the outbreaks were of unknown etiology and in 2008, 23% were unknown. Influenza-like illness outbreaks are counted as known etiology since ILI surveillance is routinely conducted as a proxy for influenza activity. The classification of ILI outbreaks as "known etiology" increased the percentage of outbreaks with known etiology in 2009.

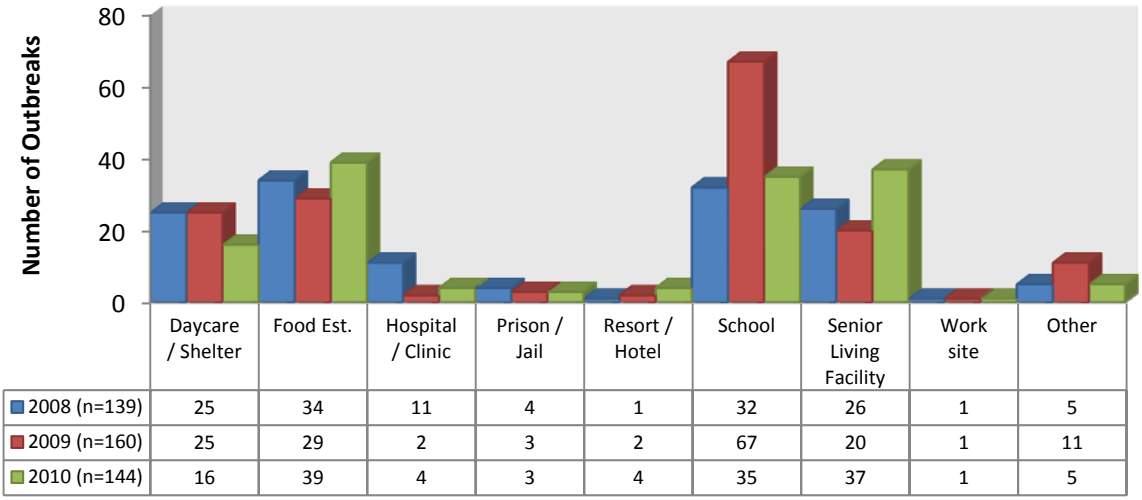
Table 2. Number of Outbreaks by Type and Etiology

	2008	2009	2010
Known/Unknown Etiology			
Unknown etiology	**33 (23%)**	**22 (13%)**	**36 (25%)**
Unknown (Gastrointestinal Illness)	33 (23%)	22 (13%)	35 (24%)
Unknown (Rash)	0 (0%)	0 (0%)	1 (1%)
Known etiology	**106 (77%)**	**138 (87%)**	**108 (75%)**
Outbreak by Known Etiology/Symptoms			
Gastrointestinal	**82(59%)**	**73 (46%)**	**86 (60%)**
Cryptosporidiosis	5 (4%)	0 (0%)	0 (0%)
E. coli	0 (0%)	1 (1%)	2 (1%)
Giardiasis	0 (0%)	1 (1%)	0 (0%)
Norovirus	33 (23%)	27 (17%)	44 (31%)
Rotavirus	1 (1%)	0 (0%)	0 (0%)
Salmonella	2 (1%)	12 (8%)	5 (4%)
Shigella	8 (6%)	10 (6%)	0 (0%)
Unknown (Gastrointestinal Illness)	33 (23%)	22 (14%)	35 (24%)
Infection	**6 (4%)**	**8 (5%)**	**13 (9%)**
Conjunctivitis	3 (2%)	2 (1%)	5 (4%)
Hand, Foot, and Mouth Disease	0 (0%)	1 (1%)	2 (1%)
Strep Group A (Strep Throat)	3 (2%)	5 (3%)	6 (4%)
Rash	**44 (32%)**	**22 (14%)**	**43 (30%)**
Fifths Disease (Human Parvovirus B19)	1 (1%)	1 (1%)	0 (0%)
Head Lice	6 (4%)	0 (0%)	4 (3%)
Methicillin-resistant Staphylococcus Skin Infection	2 (1%)	1 (1%)	0 (0%)
Scabies	11 (8%)	7 (4%)	16 (11%)
Varicella	24 (17%)	13 (8%)	22 15%)
Unknown (Rash)	0 (0%)	0 (0%)	1 (1%)
Respiratory	**6 (4%)**	**56 (35%)**	**2 (1%)**
ILI (Influenza-like Illness)	2 (1%)	50 (31%)	1 (1%)
Influenza	2 (1%)	2 (1%)	1 (1%)
Respiratory Syncytial Virus (RSV)	2 (1%)	4 (3%)	0 (0%)
Other	**1 (1%)**	**1 (1%)**	**0** (0%)
Aseptic Meningitis	1(1%)	0 (0%)	0 (0%)
Mercury contamination	0 (0%)	1 (1%)	0 (0%)
Grand Total	**139 (100%)**	**160 (100%)**	**144 (100%)**

While the specific etiology of an outbreak is not always determined, most outbreaks can be broadly classified based on the symptoms exhibited by cases. Table 2 shows that from 2008 through 2010, the most frequent outbreak type investigated by the MCDPH was gastrointestinal, although there were nearly as many respiratory outbreaks reported in 2009. The "other" category for outbreak type includes an outbreak of meningitis in 2008 and a mercury contamination that occurred in 2009. The pathogen that was most often isolated from specimens gathered from outbreaks was norovirus.

As seen in Figure 4, food establishments, senior living facilities, and schools were the most common type of facility for which outbreaks were reported. The daycare/shelter category included childcare facilities and shelters, the food establishment category included restaurants and caterers, the hospital/clinic category included psychiatric in-patient facilities and clinics, the prison/jail category included juvenile detention centers as well as adult prison facilities, and the schools category included preschools, public and private schools. The senior living facility category includes long-term care facilities, assisted living facilities and acute care facilities and the "other" category includes countywide outbreaks (for which no specific facilities were identified), sports teams, military bases and public pools.

Figure 4. Number of Outbreaks by Facility
2008 - 2010



	Daycare / Shelter	Food Est.	Hospital / Clinic	Prison / Jail	Resort / Hotel	School	Senior Living Facility	Work site	Other
2008 (n=139)	25	34	11	4	1	32	26	1	5
2009 (n=160)	25	29	2	3	2	67	20	1	11
2010 (n=144)	16	39	4	3	4	35	37	1	5

The number of outbreaks by type of outbreak and facility are shown in Figure 5. Rash illness outbreaks were the most common type of outbreak in schools and prisons/jails, with varicella ("chickenpox") being the most common illness. In contrast, outbreaks reported in daycares/ shelters, hospitals/clinics, resorts/hotels, senior living facilities, and food establishments were more likely to be gastrointestinal illness outbreaks, with norovirus again being the most

common gastrointestinal illness (see Figure 6). There were also outbreaks of infections reported in schools, daycares/shelters, hospitals/clinics, and senior living facilities (see Figure 9 for specific types of infections). The most common type of infection outbreak was strep throat, while there were only two reported outbreaks of respiratory illness (influenza and ILI) in a school and senior living facility, respectively. This is a decrease in respiratory outbreaks from 2009 (56 outbreaks), which were attributed to the novel H1N1 influenza pandemic mentioned earlier in the report.

It is important to note that while schools and senior living facilities are required by law to report outbreaks to Maricopa County, reports related to food establishments are gathered using a different method. As described earlier, individuals who believe they became ill from eating at a restaurant call the Department of Environmental Services. Sometimes it turns out that the complainant became ill from person-to-person spread or from food eaten elsewhere. Thus, some of the outbreaks here are only equivocally attributed to the food establishment.

Figure 5. Number of Outbreaks by Type and Facility 2010

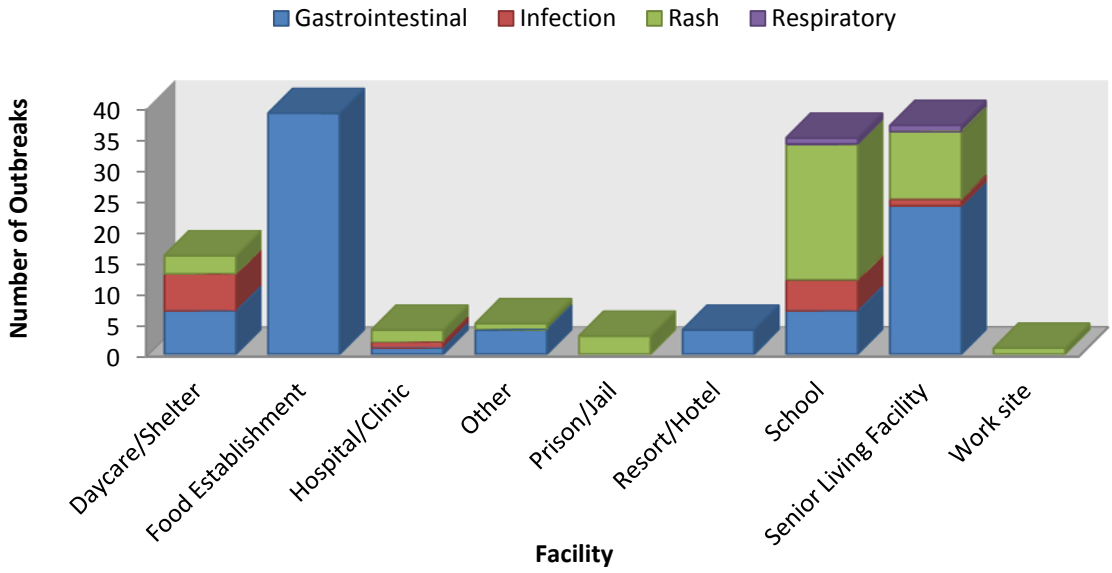


Figure 6 shows the number of gastrointestinal outbreaks by etiology and type of facility. The percentage of gastrointestinal outbreaks with an unknown etiology was most likely due to a lack of specimens for lab testing, or untimely reporting of outbreaks.

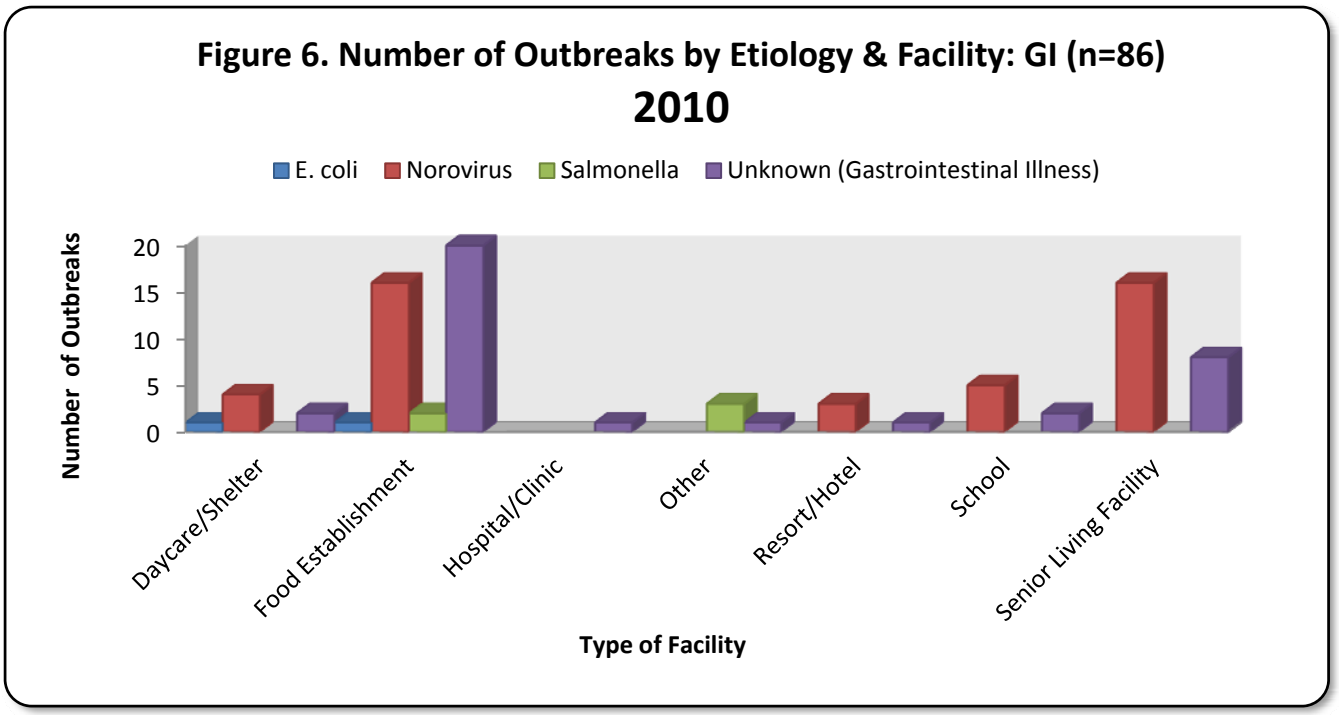
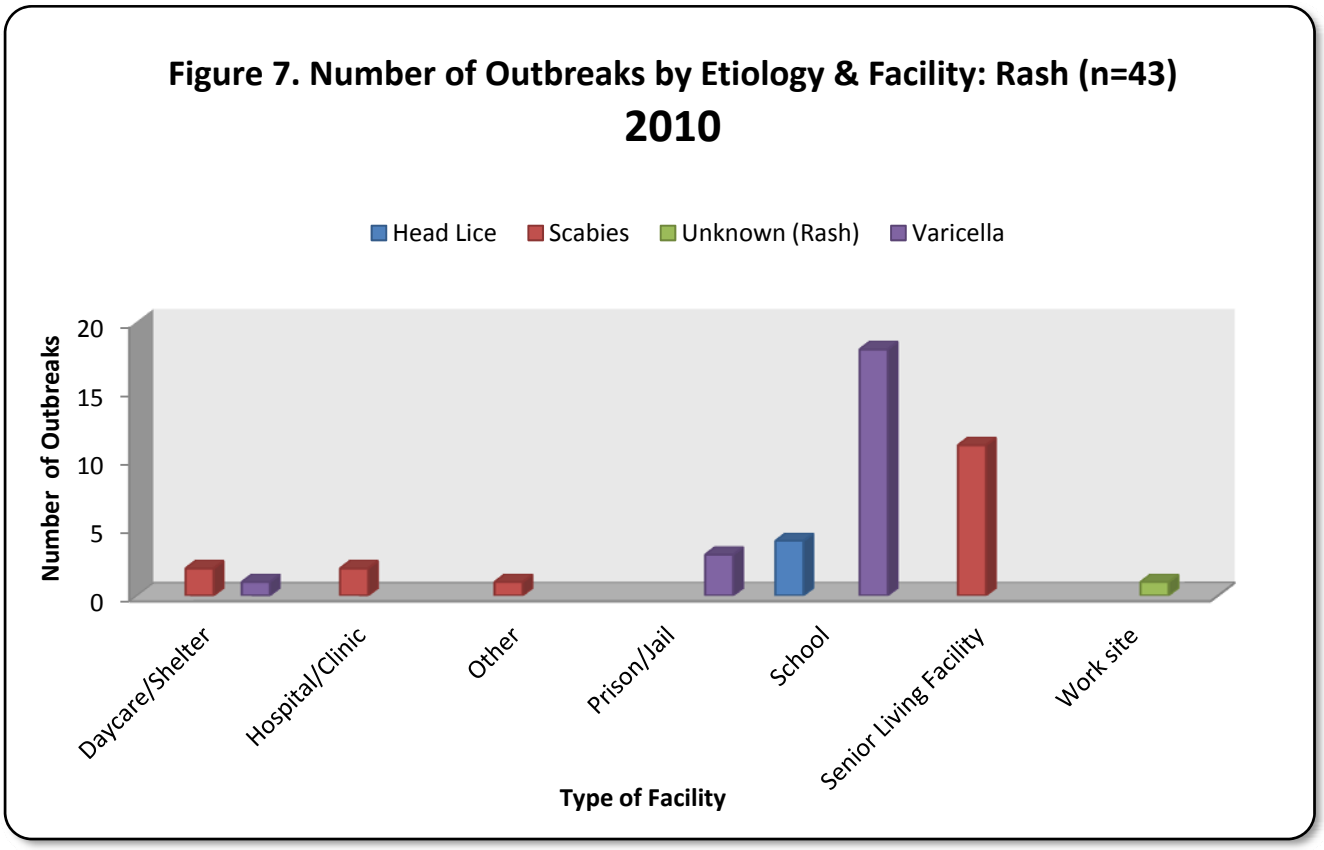


Figure 7 shows the number of rash outbreaks by etiology and facility type for 2010. Varicella and scabies were the most common etiologies with schools and senior living facilities having the highest number of outbreaks. All of the rash outbreaks at senior living facilities were scabies, while schools had reports of varicella and head lice.



In Figures 8 and 9 respiratory and infection outbreaks by facility are shown for 2010. Again, schools were the most common locations for these types of outbreaks with most of the etiologies being common childhood illnesses.

Figure 8. Number of Outbreaks by Etiology & Facility: Respiratory (n=2) 2010

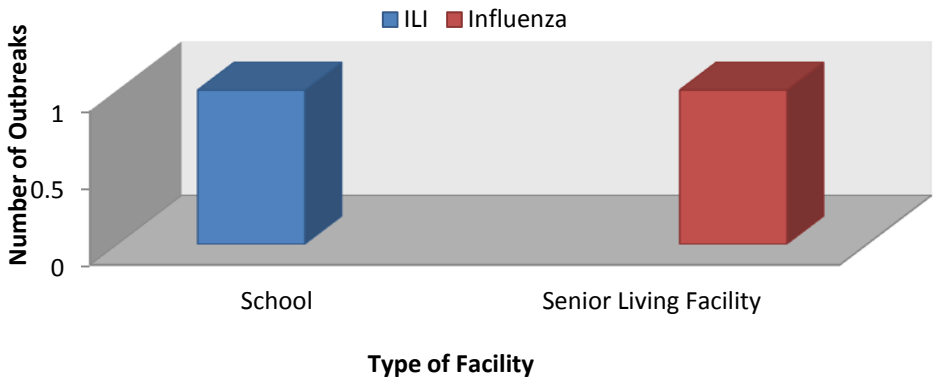
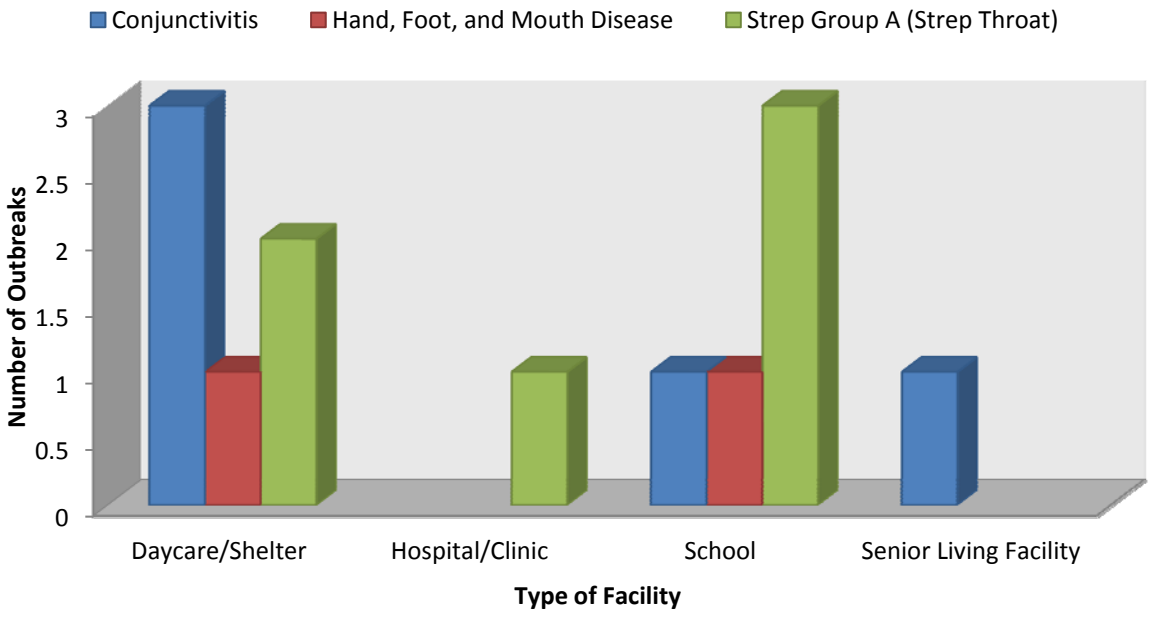


Figure 9. Number of Outbreaks by Etiology & Facility: Infection (n=13) 2010



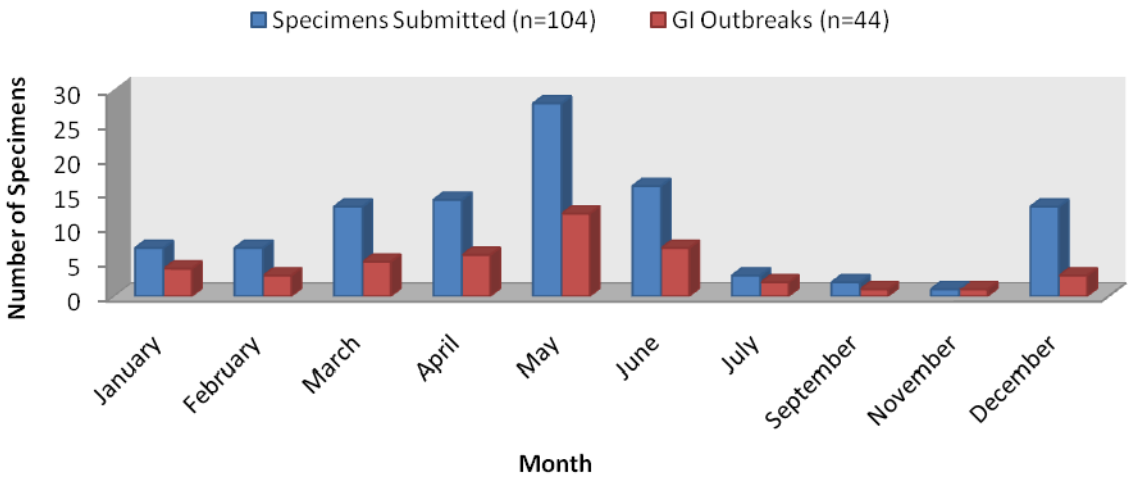
Specimen Collection

MCDPH was able to collect one or more specimens for 61 of the 86 gastrointestinal outbreaks that were reported in 2010. This is at least one specimen for 71% of the GI outbreaks. A total of 104 stool specimens were collected for the 61 outbreaks; this is an average of 1.7 specimens per outbreak.

Specimens were not collected for 25 of the 86 GI outbreaks. The most likely reasons specimens were not obtained were too much time elapsing between an event and the report of illness, unwillingness by some cases to provide a specimen for testing, and/or the inability by MCDPH to contact some of the cases involved in an outbreak.

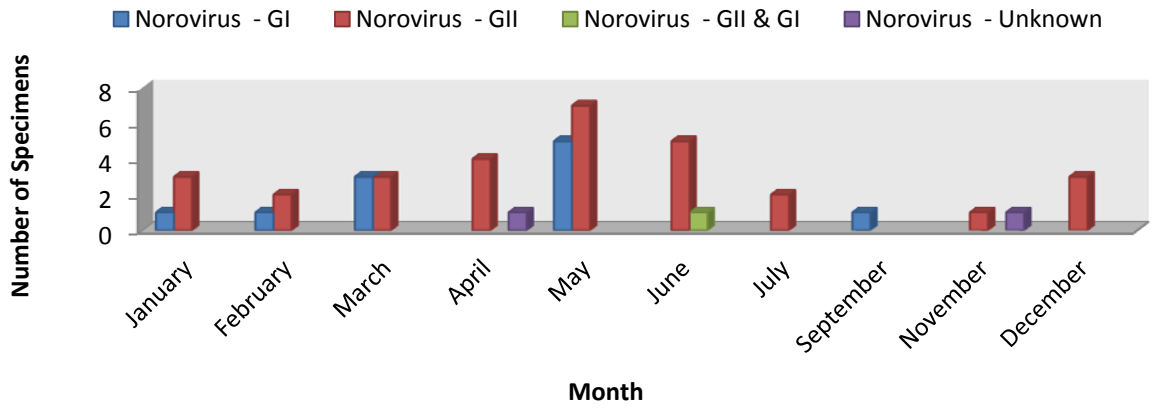
There were 123 specimen collection kits provided to cases by MCDPH, with a range of 1-5 kits provided per outbreak. Of the 123 kits delivered, 104 or 84% of the recipients returned stool specimens for analysis. These specimens were submitted for testing to the Arizona State Laboratory (ASL). Figure 10 shows the distribution of specimens submitted and tested at ASL in 2010 by month.

Figure 10. Specimens Submitted and GI Outbreaks by Month 2010



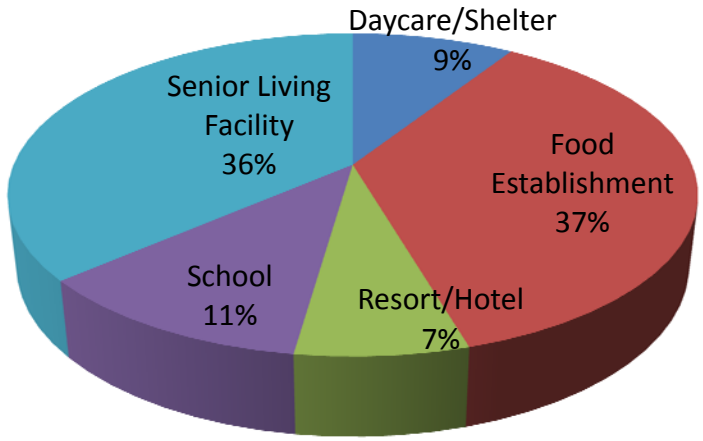
Of the 104 stool specimens submitted to the Arizona State Laboratory for testing, 101 (97%) were tested for norovirus alone or norovirus and other pathogens, and three (3%) were tested for influenza. Among the 101 specimens tested for norovirus, 12 (or 12%) were also tested for bacterial pathogens (*E. coli*, *Campylobacter*, *Shigella*, and *Salmonella*), and one specimen was tested for rotavirus. In total, 78 specimens tested positive for norovirus (see distribution in Figure 11). In addition to these laboratory tests performed at the Arizona State Laboratory (ASL), there was one test performed at a laboratory other than the ASL. This sample did not result in the positive identification of a pathogen.

Figure 11. Total Number of Specimens that Tested Positive for Norovirus by Month (n=44) 2010



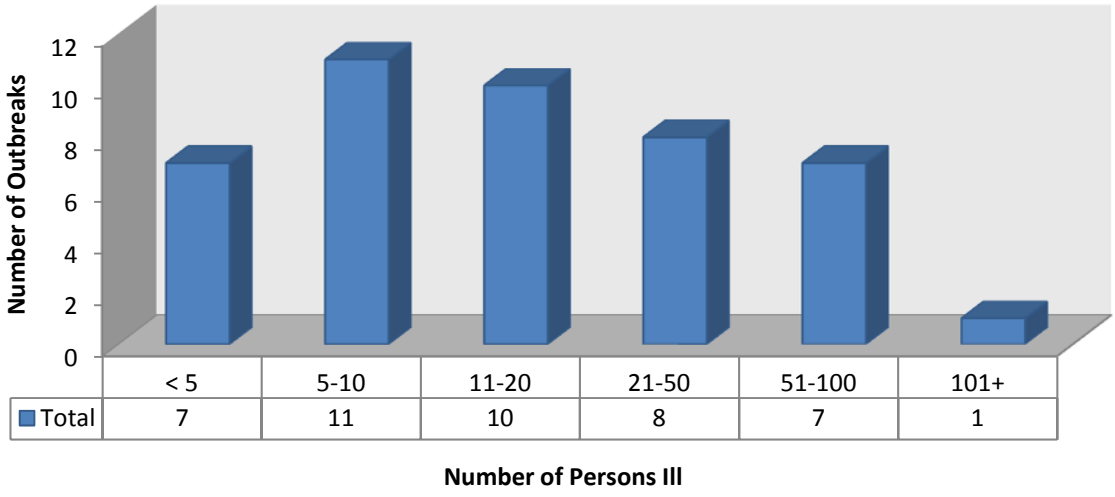
Outbreaks of norovirus were most common in senior living facilities and food establishments, as shown in Figure 12. Again, please note that the outbreaks attributed to food establishments may include some outbreaks for which the source was not actually a food establishment but rather person-to-person spread or food from another source. These are listed in this report as associated with a food establishment because they were identified by individuals who, at least initially, believed they became sick from a food establishment.

Figure 12. Number of Norovirus Outbreaks by Facility (n=44) 2010



The numbers of reported norovirus outbreaks by number of persons ill are shown in Figure 13. The majority of outbreaks (69%) affected more than 10 individuals, with eight occurring in groups of greater than 50 individuals.

Figure 13. Number of Norovirus Outbreaks by Number of Persons Ill (n=44) 2010

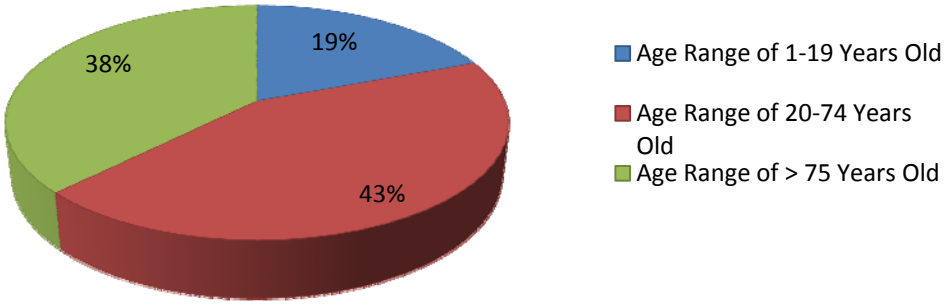


Specimen Demographics

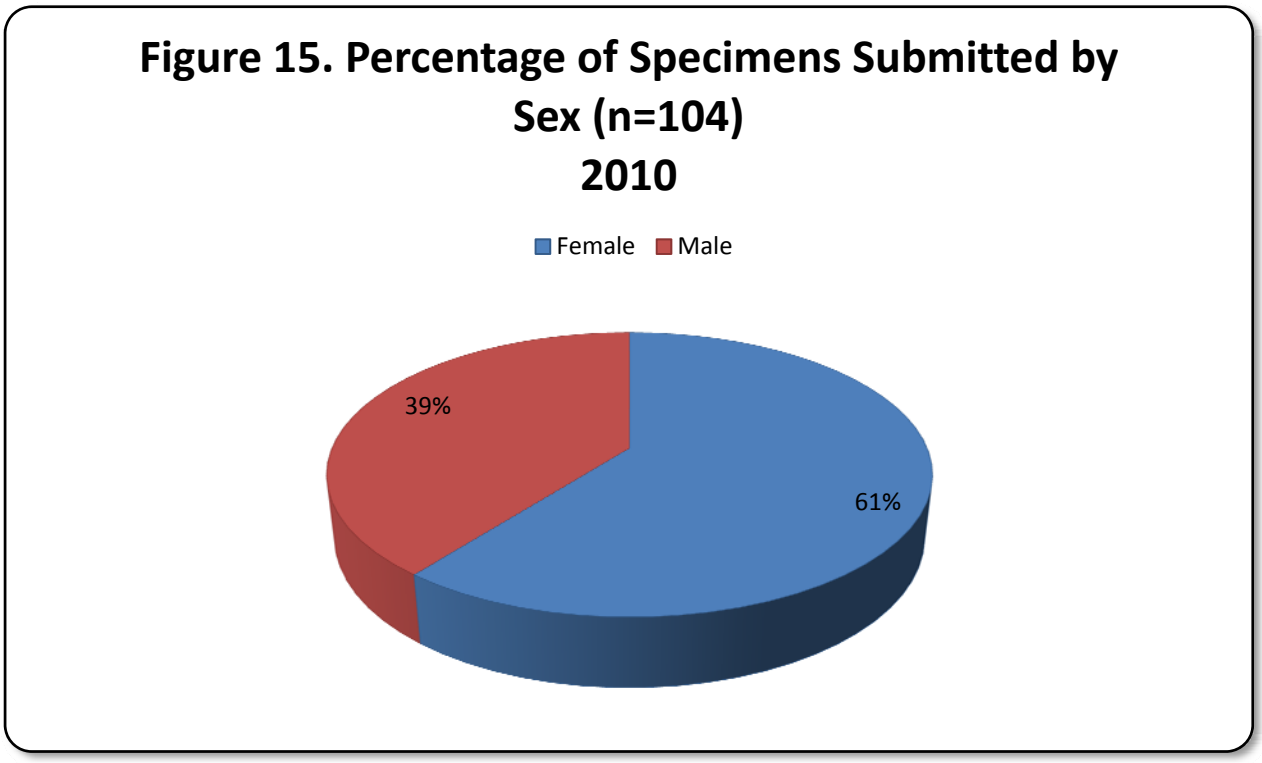
As shown in Figure 14, of the specimens submitted, most (43%) were from cases between the ages of 20 and 74 followed by cases over the age of 75 (38%). This correlates with Figure 12 above, which shows that 36% of the specimens submitted were from senior living facilities.

Figure 14. Percentage of Specimens Submitted by Age Range of Donors (n=104)

2010



As shown in Figure 15, females (61%) were more likely to submit a specimen than males (39%); even though individuals involved in outbreaks were evenly split between males and females (43% Female versus 42% Male) as seen in Figure 15.



Conclusions and Recommendations

- Foodborne and waterborne illnesses are common in Maricopa County and the data shown here represent just a fraction of the outbreaks that actually occur. For example, the Centers for Disease Control (CDC) and Prevention estimate that in the United States, more than 21 million cases of acute gastroenteritis each year are due to norovirus infection, and more than 50% of all foodborne disease outbreaks can be attributed to noroviruses; however, only 600 outbreaks were confirmed by the CDC between 1994 and 2006.[ii] Norovirus is not a nationally notifiable condition because testing for the disease is not generally available in hospitals and doctor's offices; norovirus is usually diagnosed only when an outbreak (the occurrence of two or more similar illnesses resulting from ingestion of a common food") occurs.[iii]

- Norovirus was the pathogen that was most frequently positively identified as contributing to illness outbreaks. Given the prevalence of norovirus in outbreaks and presumably in the community, more effort should be expended on educating the public on preventing the spread of gastrointestinal illness and communicable illnesses in general (e.g. proper handwashing practices, how and when to use antibacterial gel, etc.).

- In 2010, outbreaks commonly occurred where people were congregated for long periods each day – long-term care facilities, schools, etc. Appropriate control measures should be encouraged in these settings, which includes, but is not limited to, proper hand washing, routine cleanliness in areas at risk of contamination (e.g. kitchens, bathrooms, etc.), removal or cleanliness of shared items (especially in a classroom setting), use of chlorine based cleaners, isolating ill persons to limit transmission, and ensuring that all food handlers with signs of illness (e.g. diarrhea or vomiting) are excluded from work.

- The percent of outbreaks with an unknown etiology started to decline in 2007 due to an increase in specimen submissions; however, outbreaks of unknown etiology increased slightly between 2009 (13%) and 2010 (25%). MCDPH intends to continue its attempts at collecting specimens for as many outbreaks as possible in order to resume the downward trend. As bacterial pathogens are very rarely isolated during testing of stool specimens, bacterial testing is limited only to instances where evidence for a bacterial pathogen exists (e.g., when a case has bloody stools or the incubation period is consistent with a bacterial pathogen).

- Since 2007, there has been a steady rise in the number of outbreaks each year; although, the number of outbreaks in 2010 (144) was less than the number of outbreaks reported

in 2009 (160) due to the influenza pandemic in 2009. Additional resources are needed in order for MCDPH to investigate each outbreak adequately and in order to handle unexpected outbreaks associated with emerging and/or pandemic diseases such as the 2009 Influenza Pandemic. The number of uninvestigated outbreaks will likely increase annually if appropriately trained staff members are not added.

[i] Arizona State Legislature: http://www.azsos.gov/public_services/Title_09/9-06.htm
[ii] Centers for Disease Control: http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-factsheet.htm
[iii] Centers for Disease Control: http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-surv-disease-burden.htm