Unexplained Death (UNEX) Investigations
Arizona Department of Health Services (ADHS)
Infectious Disease Epidemiology and Investigations Section
Annual Report 2008

Unexplained deaths with a history of fever (UNEX) have been reportable in Arizona since 2004. Health care providers (including hospitals and medical examiners (ME)) are required to report UNEX to their local health department within 24 hours of detection (A.A.C. R9-6-202), after which the local health agency must notify ADHS and initiate an investigation (A.A.C. R9-6-384). The purpose of these UNEX investigations is to identify deaths that might be of public health significance in order to prevent the spread of disease. This could include deaths due to infectious diseases transmitted person-to-person, those that require a public health intervention, that represent a new or emerging infection or that are due to an act of terrorism. These investigations involve close collaboration and coordination with outside health agencies including healthcare facilities and the medical examiners (ME) at various counties. The official cause of death is determined by the ME and is a separate process from the UNEX investigation led by public health agencies.

The Arizona Administrative Code defines an "unexplained death with a history of fever" as the "demise of an individual who has had a fever within 48 hours before death and whose illness has not been diagnosed at time of death". For public health purposes, we have further refined that definition to identify deaths most likely to be of public health significance. The case definition is met if a case meets at least one of the following criteria:

1. Hospital/facility-based death, no known cause **AND** history of fever (>100.4F) **OR** a temperature of <96.8F within 48 hours of death.
2. Patient-reported history of fever within 48 hours of death.
3. Clinical suspicion of infectious etiology by a health care provider or medical examiner.

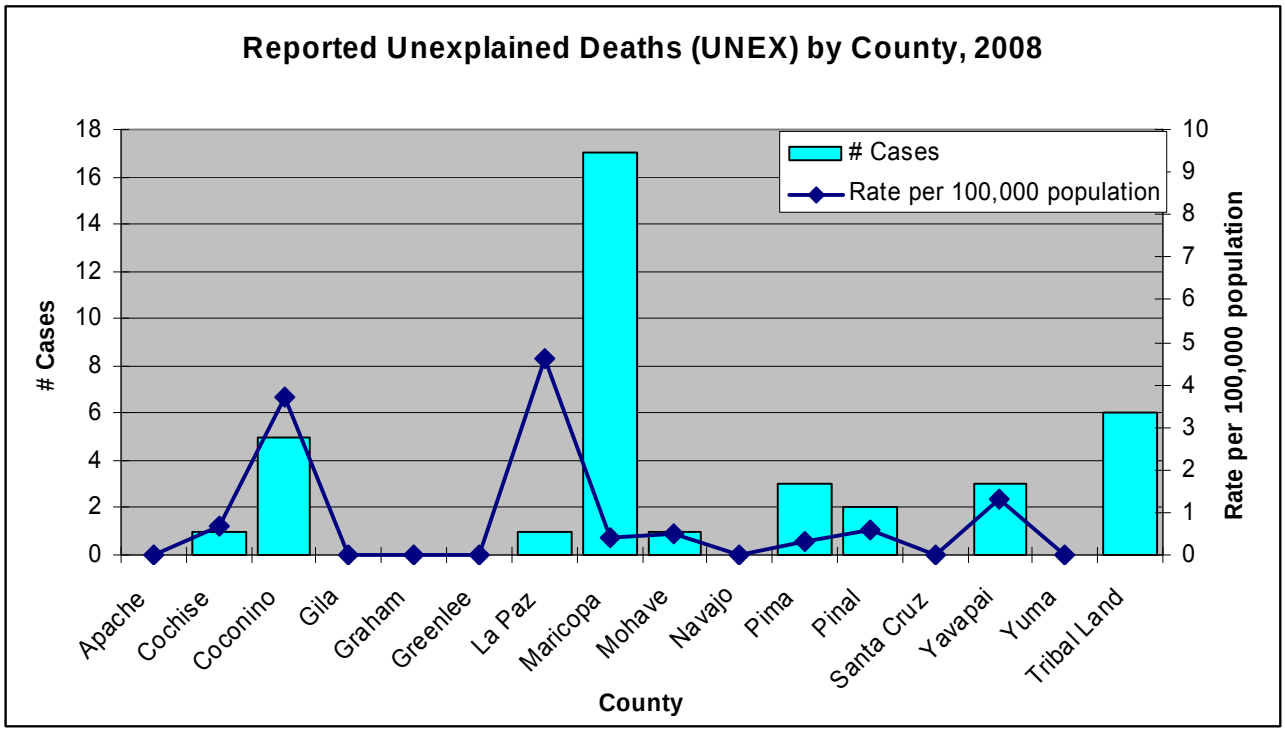
At the time of report, there may not be enough information available to identify whether a death meets the case definition or is of public health significance. For this reason, public health investigations are initiated on all UNEX reports. Once it is determined that the case definition has not been met or that a case is not of public health significance, the investigation may be stopped. The summary below details the UNEX investigations conducted by Arizona public health agencies in 2008. .

SUMMARY of 2008 INVESTIGATIONS

For 2008, 39 unexplained deaths with a history of fever were reported from eight counties and the tribal lands of Arizona. Twenty-seven and 23 deaths were reported in 2006 and 2007, respectively.

Unexplained deaths were reported predominately in Maricopa and Coconino Counties as well as on tribal lands. This could partially be due to increased awareness of the reporting requirements for UNEX by those county medical examiner offices (MEO). Coconino and La Paz Counties had the highest rates of UNEX investigated cases at 3.7 and 4.6 per 100,000 population, respectively (Graph 1).

Graph 1. UNEX Reports by County, Arizona 2008



*Note: Rates for counties with small populations may be unreliable and should be viewed with caution. UNEX cases among residents of tribal lands are investigated by ADHS along with the tribal health agency or Indian Health Services and are thus listed separately; the county population denominators have not been adjusted accordingly.

The most UNEX cases were reported in January with 8 (20.5%) reports (Graph 2). Approximately half of the reports (51%) occurred within the first four months of the year. The median number of UNEX reports received was 3.5 per month with no cases reported in the month of December. The number of reports in each county by month is shown in Table 1.

Graph 2: UNEX Investigations by Month for Arizona using the local health department notification date.

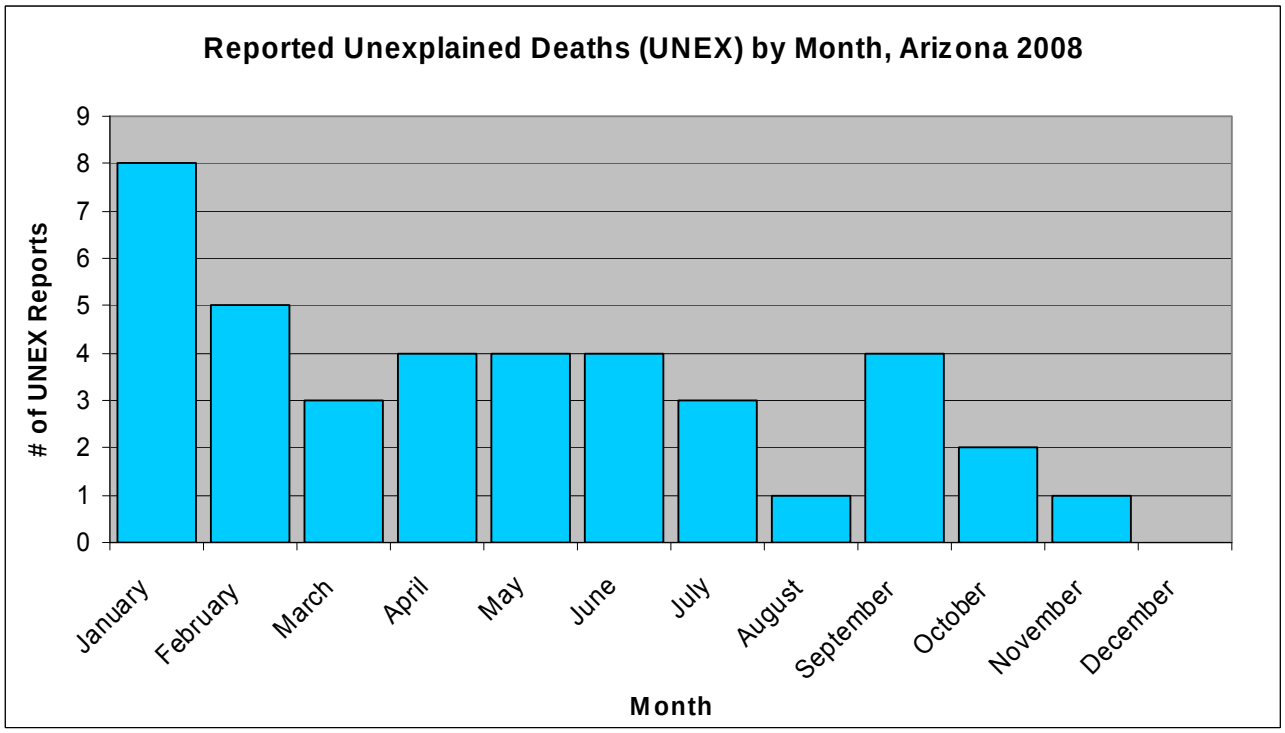
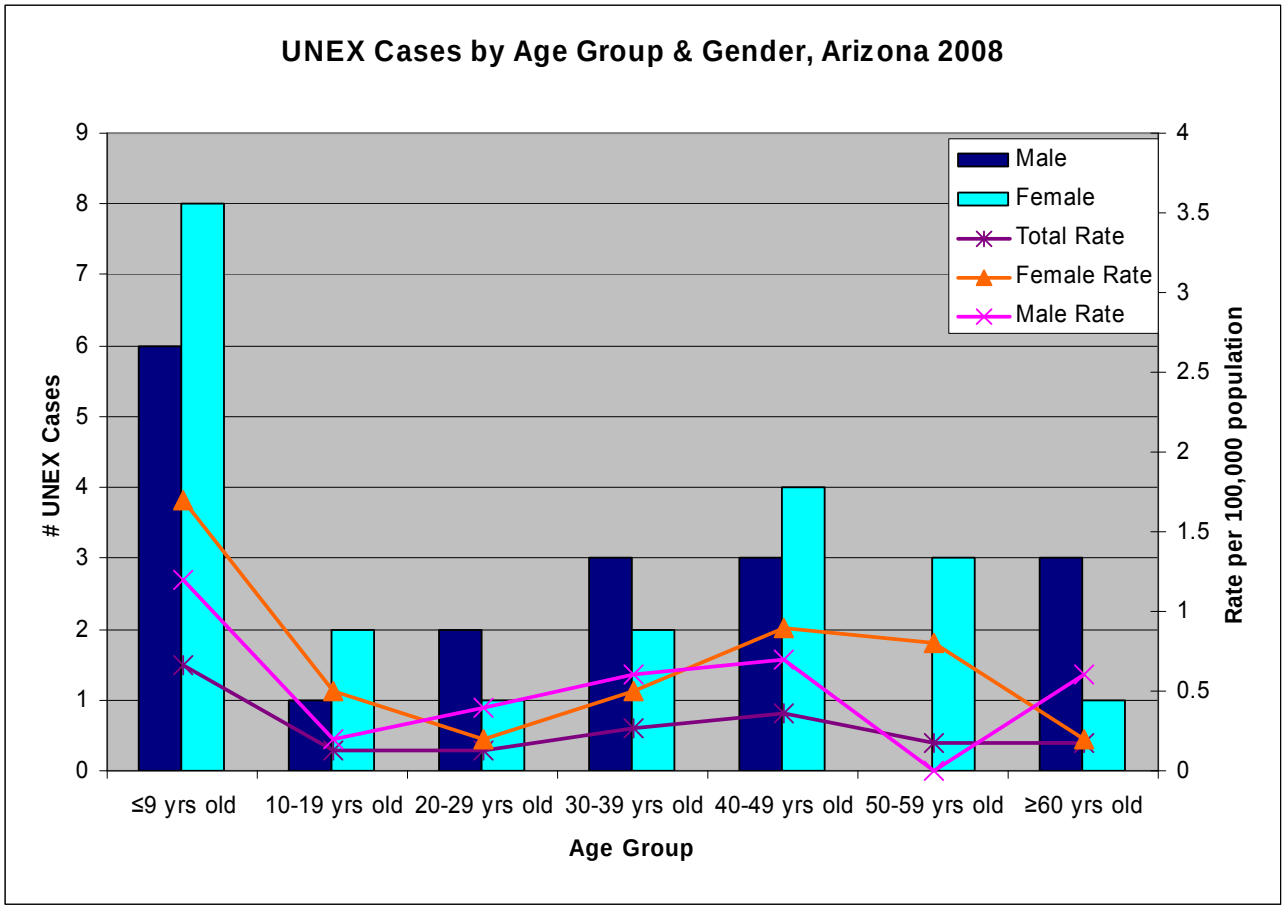


Table 1. UNEX Investigations by County & Month, Arizona 2008

	Cochise	Coconino	La Paz	Maricopa	Mohave	Pima	Pinal	Yavapai	Tribal Land	TOTAL
January	0	0	0	6	0	0	1	1	0	**8**
February	0	1	0	1	0	1	1	0	1	**5**
March	1	0	0	1	0	0	0	0	1	**3**
April	0	0	0	2	0	1	0	0	1	**4**
May	0	0	0	3	0	0	0	0	1	**4**
June	0	1	1	2	0	0	0	0	0	**4**
July	0	0	0	1	0	1	0	0	1	**3**
August	0	0	0	1	0	0	0	0	0	**1**
September	0	2	0	0	0	0	0	1	1	**4**
October	0	1	0	0	0	0	0	1	0	**2**
November	0	0	0	0	1	0	0	0	0	**1**
December	0	0	0	0	0	0	0	0	0	**0**
TOTAL	**1**	**5**	**1**	**17**	**1**	**3**	**2**	**3**	**6**	**39**

Approximately 64% of the investigated UNEX deaths occurred in people less than 40 years old (Graph 3). The average age at time of death was 27 (median=29; female median=20.5; male median=35). Females represented 56 % of the cases (22 of 39). The rates for each gender were similar across age groups. The highest rate for reported UNEX cases occurred in the age group ≤9 years old for both genders with 1.2 and 1.7 per 100,000 population for males and females, respectively, or 1.5 cases per 100,000 for both genders combined (Graph 3).

Graph 3. UNEX Investigations by Age Group & Gender, 2008



An autopsy was conducted for 82% (34/39) of the reports. Hospital deaths accounted for 80% (31/39) of the case death locations (Table 2) and the primary reporting source were the county medical examiner offices (MEO) throughout the state (Table 3). Specimen collection and testing at the Arizona State Health Laboratory (ASHL) and/or the Centers for Disease Control and Prevention (CDC) was conducted

in 21 (54%) of the investigations to determine whether the cause was due to an agent of public health significance (Table 4). Laboratory testing as part of the public health investigation was not conducted for 18 (46%) of these investigations either because no laboratory testing was deemed necessary, no specimens were available for laboratory testing or hospital laboratory testing was sufficient to rule out any potential agents of public health significance.

Table 2. Death Location of UNEX Cases

Location of Death	N (%)
Hospital	31 (80)
Residence	6 (15)
Other	2 (5)

Table 3. Reporting Source for UNEX Cases

Reporting Source	N (%)
Medical Examiner Office (MEO)	32 (82)
Hospital	7 (18)
Other	0 (0)

Table 4. Specimen Collection and Testing for UNEX Investigations

Specimen Collection	N (%)
No Public Health Lab Testing Conducted*	18 (46)
Specimen Sent to ASL and/or CDC for testing	21 (54)
Specimen to ASL only	17 (44)
Specimen to CDC only	1 (3)
Specimen to ASL & CDC	3 (8)

*Specimens not available, testing not necessary, or hospital laboratory testing sufficient.

During the investigation of UNEX reports, the local and state health departments work with the MEO and health care providers to identify potential agents of public health significance. The public health investigation includes creating a differential diagnosis through consultation with the MEO, supporting selected laboratory testing to identify agents of public health significance, and, if applicable, implementing control measures. Case investigations may be closed at different points of an investigation. Additional laboratory or clinical findings may be identified which show that the case does not meet the case definition or does not seem to be of public health significance. At the close of each investigation, 28 (72%) of the 39 reports met the case definition. In 2008, no deaths were identified that were due to an agent of public health significance or for which there was concern of the spread of disease. Some of the findings for the 2008 UNEX investigations are shown in Table 5.

Table 5: UNEX Investigation Findings. This is not a complete list of all the public health investigation findings. These agents were not necessarily considered the official cause of death but results that indicated the cause of death to not be of public health significance.

Public Health UNEX Investigation Findings
Staphylococcus spp. (including MRSA)
Streptococcus spp.
Encephalitis, unknown etiology
Escherichia coli sepsis
Necrotizing fasciitis
Drug Overdose
Dilated cardiomyopathy assoc. with parvovirus myocarditis
Cardiac arrhymia

In the two previous years, deaths of public health significance were identified through UNEX investigations, including hantavirus, Rocky Mountain spotted fever, meningococcal disease, and plague. These findings allowed public health follow-up and control to occur to prevent additional cases. The most common finding for infectious disease UNEX investigation presentations continues to be infections due to *Streptococcus* and *Staphylococcus* bacteria. The etiology of eight (20%) cases in 2008 remained unexplained after a public health investigation; however, laboratory testing ruled out any agents of public health significance that fit the clinical presentation.