

## Waterborne Disease Surveillance in New Mexico

Over 1,000 reports of infectious diseases that could be carried via water were recorded in both 2006 and 2007 in New Mexico. None of these cases, however, were confirmed as being associated with a contaminated drinking water source. There were four outbreaks associated with recreational water reported between 2003 and 2007, which caused 54 illnesses and two hospitalizations. Nationally, the number of waterborne disease outbreaks associated with recreational water sources has been increasing due to a number of factors (1).

The New Mexico Environment Department (NMED) and the New Mexico Department of Health (NMDOH) have collaborated on waterborne disease surveillance (WBDS) in New Mexico. The purpose of this collaboration is to have an established mechanism for routine communication between the two agencies (NMED and NMDOH) concerning public drinking water. WBDS in New Mexico is important in aiding the epidemiology of waterborne diseases, notifying epidemiologists at the NMDOH of changing trends in pathogens and risk factors associated with waterborne diseases, pinpointing areas with problems providing safe drinking water, maintaining communication with public health personnel from around the state and encouraging them to identify and report waterborne diseases and investigate cases, and collaborating with state and federal agencies on prevention of waterborne disease (1).

Notifiable conditions are reported to the NMDOH, and entered into the NM Electronic Disease Surveillance System (NMEDSS). The NMEDSS data on potential waterborne conditions are analyzed weekly to identify trends, clusters, and potential outbreaks in New Mexico, which are then investigated. In addition, weekly infectious disease reports are distributed to public health and healthcare personnel around the state and posted on the NMDOH website. Quarterly and annual reports on waterborne and infectious disease surveillance were distributed to the NMED, other interested parties, and posted on the NMDOH website. With re-

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gard to chemical and biologic contamination of public drinking water systems, the NMED notifies the NMDOH of the violation within one working day. This data is then forwarded on to public health personnel in the health region of concern who put out public drinking water advisories.

Potential waterborne conditions that WBDS in New Mexico focused on include data on two parasitic agents (*Cryptosporidium* sp. & *Giardia* sp.), four bacterial agents (*Campylobacter* sp., enterohemorrhagic *Escherichia coli*, *Salmonella* and *Shigella* sp.), and one viral agent (Hepatitis A). In addition, NMED monitors public drinking water systems for any maximum contaminant level (MCL) violations of microbiological organisms, chemicals, or nitrates and notifies the NMDOH of any such violations. The NMDOH uses CDC case definitions to identify cases of waterborne disease (2). About 90% of *Cryptosporidium* sp., 90% of *Giardia* sp., 20% of *Campylobacter* sp., 15% of *E. coli*, 5% of *Salmonella*, 80% of *Shigella* sp., and 95% of Hepatitis A cases are estimated to be spread through waterborne or person-to-person transmission.

The legal authority for the collection of WBDS data lies within the NMDOH and the NMED. According to New Mexico Administrative Code (NMAC) 7.4.3 all physicians, laboratories, health care professionals, and other persons having knowledge of disease or illness listed as notifiable (including all of the above listed waterborne illnesses) in the state of New Mexico must be reported to the NMDOH. New Mexico follows all federal regulations established by the Environmental Protection Agency's Safe Drinking Water Act. According to NMAC 20.7.10, the NMED monitors public drinking water systems for contaminants and the public is notified of potential contamination of their drinking

water via drinking water advisories.

WBDS is handled by both the NMDOH and the NMED. The infectious disease cases are entered into the NMEDSS where epidemiologists review them. The chemical agents and pathogens (measured by testing for fecal coliform bacteria as an indicator species) contaminating public drinking water systems are identified by the NMED and entered into the Safe Drinking Water Information System (SDWIS), and the NMDOH is notified of the violations.

This evaluation was conducted to determine how useful current WBDS is, and to identify changes that should be made to ensure that it is truly capturing and able to differentiate cases of waterborne disease in New Mexico.

### **Results**

During 2006 and 2007 there were no confirmed cases of waterborne disease associated with a water source in New Mexico since NMEDSS began being used in 2006, despite drinking water advisories being administered in the same geographical area, during the same time period as illness occurred. Using NMEDSS, however, WBDS would potentially be able to identify cases of waterborne disease because the questionnaires that the public health nurses use to investigate cases contain questions on both drinking water and recreational water exposures seven days prior to onset of illness. In addition, epidemiologists at the NMDOH look for clustering based on organisms, and investigate any potential outbreaks by re-interviewing cases with a more extensive questionnaire for common exposures. If cases are identified as waterborne, then NMDOH would coordinate with NMED to investigate the water source and work with water systems to correct problems, and steps would be taken to ensure that other people were not being exposed to the contaminant by putting out drinking water advisories, contacting health care providers, putting out an alert on the Health Alert Network, and conducting active surveillance to identify new cases. For quality assurance, guidelines stipulate that lab reports received by the NMDOH are entered into NMEDSS within 24 hours, and that investigations are initiated 24 hours after that and completed within 2 weeks. The NMDOH identifies reporting sources that are slow and works with them to improve their reporting rates and times by providing them feedback and informing them of the importance of report-

ing. The NMDOH is able to estimate the magnitude of morbidity and mortality from waterborne diseases and run reports directly into the NMEDSS or to export data to software packages to conduct analyses.

Cases that meet the CDC case definitions are considered confirmed if they are laboratory confirmed and probable if they are epidemiologically-linked to another case. For each case, data are collected by personnel that have been trained to do so. About 70% of cases are reported directly to the NMDOH central office in Santa Fe by reporting sources, while the other 30% of cases are reported to the regional and local public health offices, which then notify the central office. The amount of time spent collecting data and on follow-up for cases varies with the complexity of the case and the number of cases detected from 20 minutes up to hours and days.

The NMEDSS requires necessary fields to be completed before the person entering the data can complete the case investigation. Thus, necessary information is almost always completed in NMEDSS. Since the NMDOH requires lab confirmation or an epidemiological link to a case to be considered as a confirmed or probable case the data quality of cases is high. Data entered into the system is reviewed by epidemiologists at the state to ensure that data quality is high. Not all drinking water advisories are reported from the NMED to the NMDOH, thus information exchange between NMED and NMDOH could be improved to better serve the public.

The willingness of health care providers and organizations to report to the NMDOH varies by personnel and by facility. Indian Health Service (IHS) and Veterans Administration (VA) facilities within New Mexico do report to the NMDOH, but they vary in their timeliness as they are not required to do so. As mentioned above, the NMDOH works with facilities to educate them on the importance of reporting all reportable conditions including waterborne diseases, which leads to better and timelier reporting.

As mentioned above, no waterborne cases have been linked to contaminated water in 2006 and 2007; however, in 2006 and 2007, 27 cases of waterborne disease match geographically and temporally to drinking water advisories for fecal coliform bacteria, which are used as a proxy for bacterial contamination. The ability to

identify outbreaks depends on the number of cases and severity of illness, but the current case definitions are not sensitive enough to differentiate between individual cases of waterborne, foodborne, and person-to-person disease. Sensitivity cannot be calculated (or equals zero) for WBDS in New Mexico due to lack of waterborne disease confirmation. Theoretical (best case) sensitivity for 2006-2007 is between 1.1% and 25.7% (calculated by using geographically and temporally-linked potential waterborne disease cases and the number of cases estimated to be attributed to drinking water).

The amount of time from onset of illness to reporting of cases of waterborne disease to the NMDOH varies by the severity of the illness. Median times from onset of symptoms to reporting of cases to the NMDOH were calculated for *Campylobacter* sp., *Salmonella* sp., and *Shigella* sp. in 2006 to be approximately 10 days. The overall timeline for these conditions from onset of symptoms to completion of interviews was approximately 16 days in 2006. Cases are examined by pulsed-field gel electrophoresis (PFGE) to determine clusters (2 or more cases are considered an outbreak) on a daily basis. In addition, weekly reports are run, and if cases of waterborne disease exceed one standard deviation they are examined to detect outbreaks. Some outbreaks may go undetected, however, if there are low numbers of cases or if people do not seek care.

### Discussion

Waterborne disease has the potential to affect large numbers of people causing illnesses and deaths. Current surveillance and case definitions in New Mexico are not effective in differentiating diseases that were transmitted via water from other modes of transmission. Information exchange between NMED and NMDOH is not always complete, and should be improved. Waterborne disease surveillance is fractured; drinking water violations should be better integrated with NMEDSS.

In order to improve WBDS in New Mexico several steps should be taken. Completeness of information exchange between NMED and NMDOH should be improved. Data on recreational water contamination should be integrated into WBDS. There should be better investigation into cases temporally and geographically linked to drinking water advisories. A database that incorporates drinking water advisories and all

cases of waterborne disease should be designed which includes cases transmitted through recreational water sources. The sensitivity of case definitions should be improved in order to differentiate between waterborne and foodborne cases. Potential sewage exposures in exposure investigation should be included. Finally, reporting rates and timeliness of reporting should be improved.

### References

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## Rates of Potential Waterborne Disease by Region, NM 2006-2007

