Pennsylvania Epi Notes

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Inside this issue:

Measles Outbreak	1
Vaccine Coverage Rates and Vaccine Preventable Diseases	3
Insect-borne Diseases	4
Influenza in Long-Term Care Facilities	5
Disease Reporting	6
Employment Opportunities	6

Characteristic Measles Rash

Photo courtesy of CDC/ Brian W.J. Mahy, BSc, MA, PhD, ScD, DSc

A Measles Virus Particle

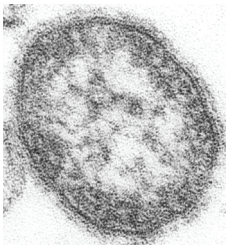


Photo courtesy of CDC/ Cynthia S. Goldsmith; William Bellini, PhD

Measles Outbreak — January 2011

Measles is a vaccine preventable disease and outbreaks are rare in Pennsylvania, the US, and other countries and regions of the world where vaccination coverage is high.[1] Despite that, in January 2011, Pennsylvania had a multi-county outbreak of measles. The initial case may have become infected while traveling outside the United States, but the source of exposure could not be determined. Within Pennsylvania, the outbreak included a total of 6 cases (primary, secondary, and tertiary—see Figure 1) and nearly 300 exposed individuals. There were a total of 13 points of potential exposure in a variety of settings: private homes, a church, community venues, a hospital, and a doctor's office.

Prevention and Containment Activities

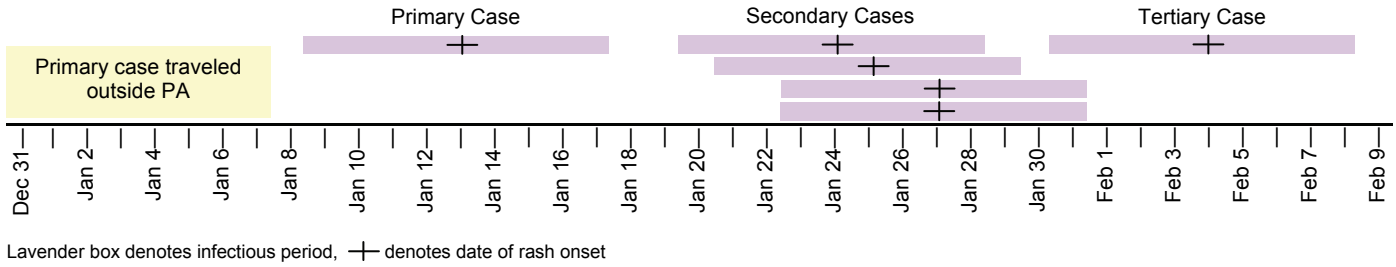
The outbreak occurred in a largely unvaccinated community, many of whom opposed both vaccination and post-exposure prophylaxis on philosophical or moral grounds. The number of exposed persons and the philosophical barriers of the community presented many challenges and required a multi-faceted approach to contain the outbreak. This included conducting extensive investigations to determine contact susceptibility; the establishment of clinics for the provision of immunizations and post-exposure prophylaxis (IG [immunoglobulin]); public announcements through print, audio, and visual media; provision of education and social marketing through community gatekeepers and business leaders; and containment or quarantine imposed by the Department of Health. These containment activities took place over approximately ten days.

Cost to the Public Health Infrastructure

The cost to the public health infrastructure to contain an outbreak of a vaccine preventable disease (in this case, measles) can be high. While individuals have a legal right to refuse vaccination based on religious or moral reasons, this refusal (if disease surfaces) can have a tremendous financial impact on the public health infrastructure. A study conducted in Iowa found that the cost of containing one case of measles (contact investigations, vaccination clinics, staff time, and travel reimbursement) was estimated at $142,452.[2] In contrast, the CDC cost to provide one dose of MMR to a public health department is roughly $18.[3]

(Continued)

Figure 1: Timeline of Reported Cases During Measles Outbreak



(Measles continued)

Causes

Measles is a febrile rash illness caused by a virus that grows in the back of the throat and lungs.[1] Measles infection can be prevented with the Measles, Mumps, and Rubella (MMR) vaccine. Due to high immunization rates, measles is generally rare in industrialized nations. However, it remains common in many developing countries and affects more than 30 million people worldwide each year. In countries like the United States where measles vaccination rates are high and measles infections are rare, international travel and imported cases are the most common sources of infection.[4]

Transmission

Measles is highly contagious and is spread through the air by breathing, coughing, or sneezing. Measles can also be acquired by touching an object which is contaminated with measles virus particles. The virus can live on contaminated surfaces for up to two hours. Measles is so contagious that anyone who is exposed to it who is not immune (meaning they have not had the disease in the past, nor have they been vaccinated) will probably get the disease. Measles can be spread by a person four days before and four days after their rash appears.[5]

Symptoms

Measles symptoms usually begin about 7 to 14 days after a person is infected and begin with a mild to moderate fever, cough, runny nose, and conjunctivitis (red or pink watery eyes). Two to three days after the initial symptoms, white spots (Koplik's spots) appear inside the mouth. One to two days later a rash begins on the person's face and then spreads to their neck, trunk, arms, and feet. When the rash begins, a person's fever may go to as high as 104 degrees Fahrenheit, but usually subsides after a few days as the rash fades.[6] Occasionally, measles results in complications like pneumonia, encephalitis and death. Four days after the rash begins infected persons are no longer contagious.[5]

Vaccine recommendations

Measles vaccine is included in the combined Measles, Mumps, and Rubella (MMR) vaccine. The Advisory Committee on Immunization Practices (ACIP) recommends routine vaccination of all children with two doses of the MMR vaccine. The first dose is recommended at 12 to 15 months of age, and the second dose is recommended prior to school entry at 4 to 6 years of age.[7]

References

[1] Centers for Disease Control and Prevention (2011). *Measles.* Retrieved March 2, 2011 from www.cdc.gov/measles/about/overview.html.

[2] Dayan GH, Ortega-Sanchez IR, LeBaron CW, et al. Pediatrics. 2005 Jul;116(1):e1-4. *The Cost of Containing one case of measles: the economic impact on the public health infrastructure–Iowa, 2004.* Retrieved March 3, 2011 from www.ncbi.nlm.nih.gov/pubmed/15995008.

[3] CDC Vaccine Price List, March 2011. Retrieved March 3, 2011 from www.cdc.gov/vaccines/programs/vfc/cdc-vac-price-list.htm.

[4] Centers for Disease Control and Prevention (2011). Manual *for the Surveillance of Vaccine-Preventable Diseases (4th Edition, 2008), Chapter 7: Measles.* Retrieved March 4, 2011 from www.cdc.gov/vaccines/pubs/surv-manual/chpt07-measles.htm.

[5] Centers for Disease Control and Prevention (CDC). *Transmission of Measles.* Retrieved March 4, 2011 from www.cdc.gov/measles/about/transmission.html.

[6] Centers for Disease Control and Prevention (CDC). *About Measles: Signs and Symptoms.* Retrieved March 4, 2011 from www.cdc.gov/measles/about/signs-symptoms.html.

[7] Centers for Disease Control and Prevention (CDC). Measles, mumps, and rubella—vaccine use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 1998;47 (No. RR-8):1–57.

Figure 2: Measles Cases, United States, 1980-2007

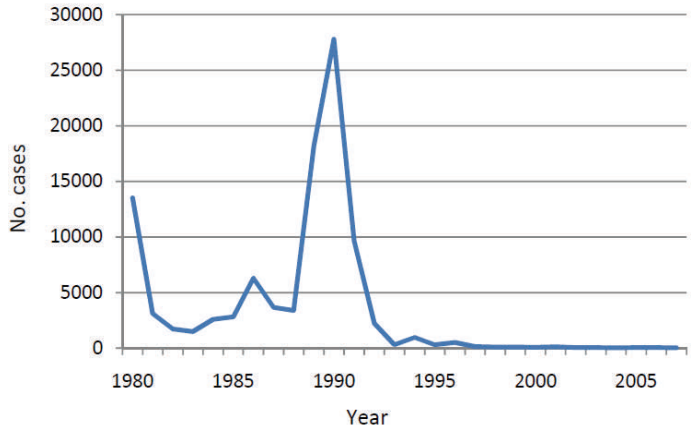
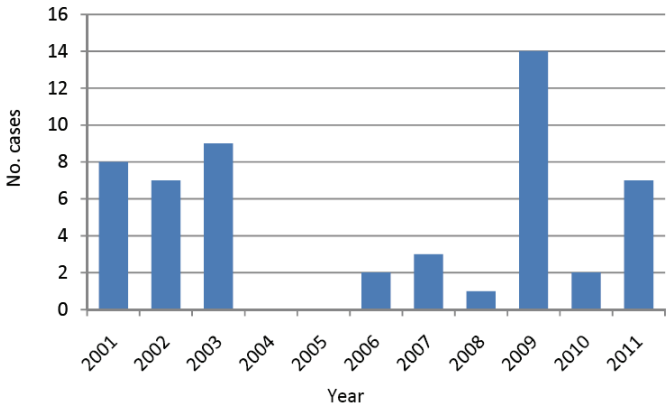


Figure 3: Pennsylvania Measles Cases, 2001-2011*



* Based on most current data as of 3/9/2011

Trends in Vaccine Coverage Rates in Pennsylvania

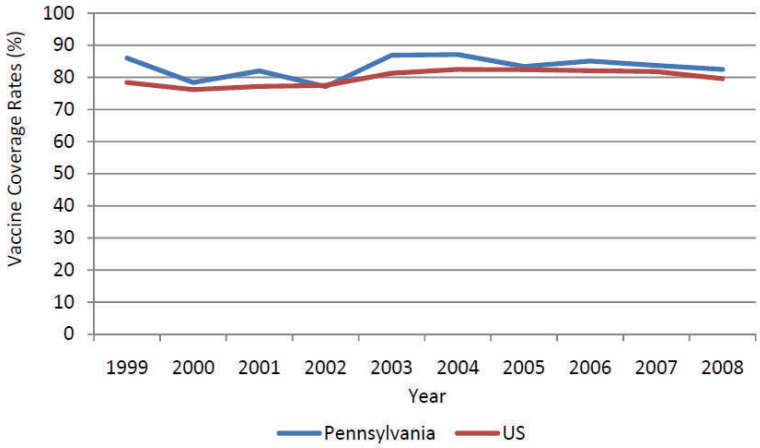
The January 2011 measles outbreak in Pennsylvania highlights the importance of vaccination in preventing disease. State vaccine coverage peaked in 2004 when 87.1% of 35 month old children had received the recommended number of doses of four vaccines: DTaP which protects against diphtheria, tetanus and pertussis; Hib which protects against *Haemophilus influenzae* type b; MMR which protects against measles, mumps and rubella; and poliovirus which protects against polio. Since that time, the overall vaccine coverage rate has decreased to 82.5% in 2008, the most recent year for which comparable coverage rates are available (Figure 1).

Decreasing vaccine coverage rates are not unique to Pennsylvania; this trend is being seen across the country. Figure 1 shows vaccine coverage rates for the United States as a whole in children 35 months of age and younger. Vaccine coverage in Pennsylvania children is consistent with vaccine coverage rates in the same age group in the United States.

Figure 2 displays trends in Pennsylvania coverage rates for specific vaccines. More recent data are available for this analysis. In 2009, less than 90% of 35 month olds had been completely immunized for measles, mumps and rubella, the lowest rate in 10 years. The coverage rate for the diphtheria, tetanus and pertussis vaccine approached 80%, which was also a 10-year low. Nationwide shortages of Hib vaccine in late 2007 and 2009 contributed to a substantial decrease in Hib vaccine coverage rates.

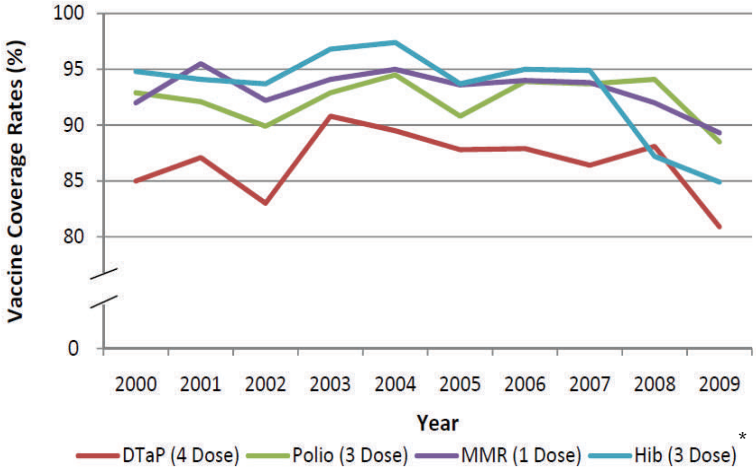
Vaccines are considered both safe and effective. Recent concerns regarding the safety of vaccines have likely led to the decrease in vaccine coverage. Primary among these concerns is the idea that vaccines, specifically thimerosal-containing vaccines and the MMR vaccine, cause autism. The CDC states that there is no relationship between thimerosal-containing vaccines and autism or the MMR vaccine and autism. Several studies have shown that there is no association.[7] Furthermore, the Institute of Medicine conducted a scientific review of epidemiologic studies examining the relationship between vaccines and autism and concluded a causal link was not supported.[8]

Figure 1: Pennsylvania vs. United States Vaccine Coverage Rates [a]



[a] 4 or more doses of DTaP, 3 or more doses of poliovirus, 1 or more doses of MMR, and 3 or more doses of *Haemophilus Influenzae* Type B vaccine (of any type) by 35 months of age[1]

Figure 2: Vaccine Coverage Rates by 35 Months of Age in Pennsylvania



* Nationwide shortages of the Hib vaccine occurred from late 2007 through 2009 contributing to substantial decreases in Hib vaccine coverage rates.

Although adverse events may be associated with vaccines, they are typically mild and self limited. They may include soreness at injection site, fever, rash, fussiness, and headache. More severe reactions are rare, but may include a high fever, an allergic reaction, or a febrile seizure.[9] In comparison, the risk of developing serious complications from vaccine preventable diseases is significant, especially in children. Table 1 shows the possible complications from selected vaccine preventable diseases.

In summary, although overall vaccine coverage rates in Pennsylvania remain high, the recent decrease in these rates is a serious concern. Suboptimal vaccination rates increase the likelihood of outbreaks and also endanger persons who are not able to be

(Continued)

(Vaccines continued)

vaccinated for medical reasons, such as newborns and immunocompromised individuals. Adhering to the current immunization schedule is the best way to prevent these potentially harmful diseases. The current vaccine schedule can be found on the CDC website.

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4. Rubella Complications. Centers for Disease Control and Prevention. www.cdc.gov/vaccines/vpd-vac/rubella/in-short-adult.htm#comp
5. Hib Complications. Centers for Disease Control and Prevention. www.cdc.gov/vaccines/vpd-vac/hib/in-short-adult.htm#comp
6. Pertussis Complications. Centers for Disease Control and Prevention. www.cdc.gov/pertussis/about/complications.html
7. Concerns About Autism. January 15, 2010. Centers for Disease Control and Prevention. www.cdc.gov/vaccinesafety/Concerns/Autism/Index.html
8. Immunization Safety Review: Vaccines and Autism. May 14, 2004. Institute of Medicine Review. www.iom.edu/Reports/2004/Immunization-Safety-Review-Vaccines-and-Autism.aspx
9. Vaccine Safety. February 7, 2011. Centers for Disease Control and Prevention. www.cdc.gov/vaccinesafety/index.html

Table 1: Potential Complications from Vaccine Preventable Diseases

Disease	Complications	Frequency
Measles (complications seen in children)[2]	Pneumonia	1 in 20
	Ear infection	1 in 10
	Diarrhea	8%
	Death	1 in 1000
Mumps[3]	Meningoencephalitis	<2 in 100,000
	Deafness	1 in 20,000
Rubella[4]	Damage to fetus in pregnant woman	20% if infected early in pregnancy
Hib meningitis[5]	Permanent brain damage	10-30%
	Death	1 in 20
Pertussis (complications seen in infants <1 year of age)[6]	Pneumonia	1 in 5
	Convulsions	1 in 100
	Apnea	1 in 2
	Encephalopathy	1 in 300
	Death	1 in 100

Click here to view CDC's Immunization Schedules.

Tick- and Insect-borne Diseases in Pennsylvania

Disease: Lyme Disease
Insect: Ticks
Description: Causes flu-like symptoms and many patients notice a bull's-eye rash at site of tick bite. Untreated infections may result in joint, heart, and nervous system problems. Antibiotic treatment, especially if initiated early, will clear most cases.
Confirmed cases per year: 3,500-4,500

Disease: Rocky Mountain Spotted Fever (RMSF)
Insect: Ticks
Description: Initially causes flu-like symptoms, rash and joint pain will follow. Despite the name, few cases of RMSF actually occur in the Rocky Mountain area; most cases occur in the south Atlantic region of the U.S.
Confirmed cases per year: 0-15

Disease: Tularemia
Insect: Ticks, deer flies
Description: Can cause flu-like symptoms. Disease commonly found in rodents and rabbits, carried by ticks who feed on those animals. Primarily found in western and south central U.S. states, but can be found in all U.S. states except Hawaii.
Confirmed cases per year: ≤1

Disease: West Nile Virus
Insect: Mosquito
Description: May cause flu-like symptoms and potentially neurologic symptoms. Most commonly seen in the summer and early fall.
Confirmed cases per year: 10-20

Prevention: Use insect repellant and wear long pants, long sleeves, and socks when outdoors. For mosquito-borne illnesses, drain standing water and install or repair screens in the home. For tick-borne diseases, avoid areas with high, bushy grasses and check for ticks immediately after having been outdoors. Promptly remove any ticks that are found on the body. For tularemia, do not handle sick or dead rodents or rabbits.

Mosquito on a Human Finger

Photo courtesy of CDC/ William Brogdon

Species of Tick Known to Transmit RMSF

Photo courtesy of CDC/ Dr. Christopher Paddock

Erythema Migrans (Bull's-Eye Rash) on Upper Arm of Lyme Disease Patient

Photo courtesy of CDC/James Gathany

Influenza in Long-Term Care Facilities *

* All data are provisional and subject to change. Based on most current data as of 03/25/2011.

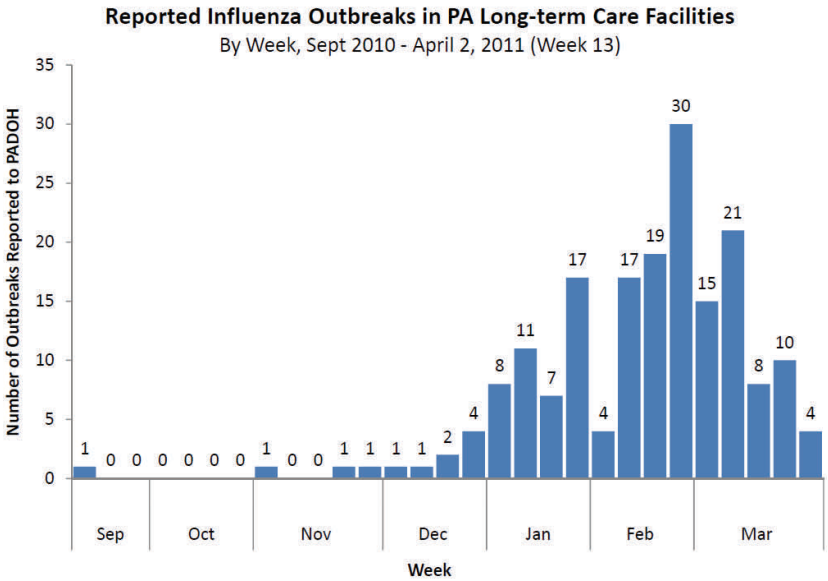
Influenza can cause substantial illness and death among long-term care facility (LTCF) residents. Vaccination of employees and residents of LTCFs can help reduce the impact of influenza. Among older persons who live in LTCFs, influenza vaccination is most effective at preventing severe illness, secondary complications such as hospitalizations, and fatal outcomes. Vaccination rates of 80% or more among nursing home residents can help to reduce the risk of influenza outbreaks at their facility.[1]

Surveillance of influenza outbreaks in long-term care facilities has been ongoing in Pennsylvania since the 2007-2008 flu season. When Department of Health disease investigation staff learn of one or more influenza case(s) in long-term care facilities, they work with the facility to give recommendations for control and management of the outbreak. Surveillance data are collected and submitted to the Bureau of Epidemiology.

Overview of Outbreaks Reported During 2010-2011 Influenza Season

Between September 2010 and April 2, 2011, 183 outbreaks of influenza in LTCFs were reported. The number of outbreaks reported per week peaked in late February.

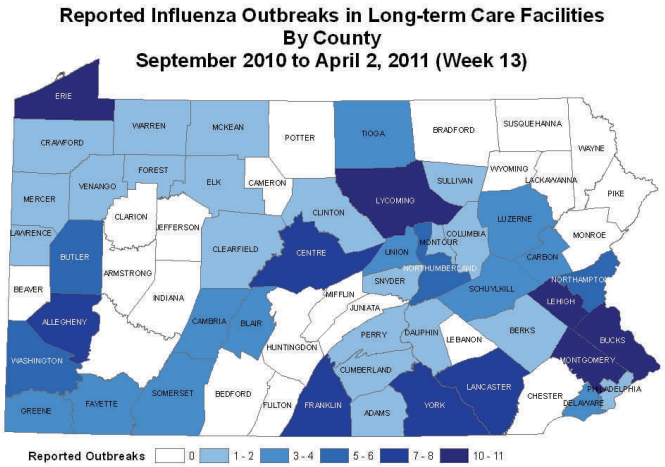
- These 183 outbreaks included a total of 1,412 ill residents; the average was 8 per outbreak, with a range of 1–77 per outbreak.
- A total of 239 ill employees were reported; the mean was 2 per outbreak and ranged from 0–19 ill employees per outbreak.
- In about 84% of outbreaks, ill patients had been treated with appropriate antiviral medication at the time of initial report. In about 36% of outbreaks, exposed residents were also given prophylactic antivirals.
- Eighty-five percent (85%) of outbreaks were Influenza A; 9% were influenza B; the remaining 6% had not been subtyped at the time of report.
- 48 outbreaks (26%) included only a single ill resident; 111 outbreaks (61%) included no reported employee illness.



Geographic Distribution of Outbreaks

Long-term care influenza outbreaks were focused in the eastern regions of the state during December and the beginning of January. In mid-January outbreaks were more frequently reported in the Northcentral region, and by the end of January also reported in the Southcentral region. By mid-February, outbreaks were being consistently reported from all regions of the state, and this trend has continued to the present.

Currently, outbreaks are geographically distributed throughout the state of Pennsylvania. The Southwest region of the state has had the greatest share of outbreaks (22%). Approximately 20% of outbreaks occurred in the Northcentral, 12% in the Northeast, 12% in the Northwest, 14% in the Southcentral, and 20% in the Southeast. Differences in reporting practices may account for some of the variation between regions.



Influenza Vaccination

Vaccination of employees and residents of long-term care facilities can help reduce the impact of influenza. The Healthy People 2010 objective is to achieve 80% vaccination rate for residents and 60% for staff. Based on these goals, among facilities reporting influenza outbreaks, about 75% of facilities reported adequate resident vaccination rates, while only 41% of facilities reported adequate employee vaccination coverage.

[1] Centers for Disease Control and Prevention (CDC). Flu Vaccine Effectiveness: Questions and Answers for Health Professionals. Accessed March 04, 2011 at www.cdc.gov/flu/professionals/vaccination/effectivenessqa.htm.

Cases of Select Notifiable Diseases in Pennsylvania (as of 3/30/2011)*

Disease	Total cases reported for previous 5 years				
	2011 †	2010 †	2009	2008	2007
Chlamydia	11059	47,518	43,068	42,233	42,469
Gonorrhea	2659	12,883	10,138	11,071	12,706
Campylobacter	240	1,624	1,542	1,554	1,359
Salmonella	184	1,799	1,701	1,721	1,866
Pertussis (whooping cough)	150	763	468	368	257
Giardia	147	786	837	873	751
Cryptosporidiosis	70	491	465	326	939
Varicella (chicken pox)	45	373	461	853	1,821
Legionella	29	326	383	408	308
Shigella	22	633	1,201	248	171

* Confirmed cases only

† Case counts for 2010 and 2011 are provisional and subject to change.

Disease Reporting

Healthcare practitioners, healthcare facilities, and clinical laboratories are required to report certain diseases to the Pennsylvania Department of Health. In addition to the diseases on the list, all disease outbreaks and/or unusual occurrences of disease are reportable within the Commonwealth. In most cases, reporting must be done electronically via Pennsylvania's version of the National Electronic Disease Surveillance System (PA-NEDSS). To request a PA-NEDSS account, healthcare providers may email PA-NEDSS@state.pa.us; please include your contact information and the name and address of the facility for which you will be reporting.

Employment Opportunities

The Pennsylvania Department of Health Bureau of Epidemiology is currently accepting applications for the following positions:

- Epidemiologist
- Epidemiologist Manager
- Epidemiology Program Specialist
- Epidemiology Research Associate
- Public Health Physician

To apply, click on the links above or visit the Pennsylvania State Civil Service Commission website and click on Job Seekers.

Complete a civil service application for employment for each test announcement for which you are interested. The Commission will send you the results of your examination or rating. If you meet the minimum requirements and pass the test, your name will be placed on the list of eligible candidates (eligible list) for that job title according to your score. Positions in the merit system are filled from this pool of eligible candidates. When a job vacancy occurs, the hiring agency requests an eligible list from which to interview for that job title. If you are ranked high enough on the eligible list, you will be contacted for a job interview.

See How to Get a Civil Service Job for more information.

Coming up in the next issue (Summer 2011)

- Outbreak of Group A Strep in a Long-Term Care Facility
- Burden of Asthma in Pennsylvania

Pennsylvania Epi Notes

Editors:
Leah Lind, MPH
Chandra Marriott, MPH

Contributors:
Aaron Smee, MPH
Erica Smith, MPH

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To subscribe electronically, send an email request to epinotes@state.pa.us.

Bureau of Epidemiology
Pennsylvania Department of Health

Health & Welfare Building, Room 933
625 Forster Street
Harrisburg, PA 17108
Phone: 717-787-3350
For inquiries, call 877-PA-HEALTH