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Invasive *Streptococcus pneumoniae* (ISP) Disease in Ohio 1997-2003

by Katie Cibulskas-White, Epidemiologist, Infectious Disease Surveillance

Introduction

Streptococcus pneumoniae was first isolated from the saliva of a patient by Louis Pasteur in 1881; however, until the discovery of the gram stain in 1884, pneumococcal pneumonia was often confused with other types of pneumonia[1]. Although *S. pneumoniae* is a transient part of normal flora in humans, it causes serious disease throughout the world.

Streptococcus pneumoniae is a gram-positive, lancet-shaped cocci, usually seen in pairs. It is non spore-forming, nonmotile, and has the enzymatic ability to disrupt and disintegrate cells and cause autolysis. The organism uses a natural transformation system to exchange genetic material, and can take up DNA from the environment. *S. pneumoniae* can become transformed with DNA from related and unrelated bacteria. These characteristics paired with a fast growth rate increase the chance of a genetic mutation, and promote selection towards organisms resistant to antibiotics.

S. pneumoniae causes many clinical syndromes, depending on the site of infection. The Centers for Disease Control and Prevention (CDC) estimates *S. pneumoniae* causes the following each year in the United States:[2]

- 6 million cases of acute otitis
- 100,000-135,000 pneumonia-related hospitalizations
- 60,000-90,000 cases of bacteremia
- 3,300 cases of meningitis

Transmission of *S. pneumoniae* is person-to-person by droplet spread. The incubation period ranges from one to three days. *S. pneumoniae* infections affect all age groups, but the greatest number of infections occur in children and the elderly. The reservoir for pneumococci is presumably the nasopharnyx of asymptomatic human carriers. There are no animal or insect vectors. [1] Infection occurs in all climates and seasons, with the highest prevalence in winter and spring.

Significant resistance of pneumococci to penicillin had been infrequent prior to the early 1980s. In the past two decades, antimicrobial resistance has become a serious and increasing problem worldwide.[3] Invasive *S. pneumoniae* (ISP), exhibiting drug resistance, was added as a nationally notifiable condition by

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the CDC in 1995. Ohio added ISP, regardless of antimicrobial susceptibility, as a reportable condition effective July 1996. In 2001, the CDC added ISP, regardless of antimicrobial susceptibility, among children less than 5 years of age to the nationally notifiable disease list.

Invasive *S. pneumoniae* is a class (A)(3) disease in Ohio requiring case reports and positive laboratory results be reported to the local health department by the end of the work week. The Ohio Department of Health has a disease-specific surveillance report form (HEA 3822) and collects the information via the Ohio Disease Reporting System (ODRS). The ISP surveillance form is available in the online version of the Ohio Infectious Disease Control Manual at http://www.odh.ohio.gov/healthResources/infectiousDiseaseManual.aspx .

ISP Case Definitions:

Laboratory criteria for diagnosis:

Isolation of *S. pneumoniae* from **Blood** or Cerebrospinal Fluid**.***

Resistant / Intermediate: Isolates exhibiting resistance or intermediate resistance to one or more antibiotic.

Resistance Unknown or Non-resistant: Isolates susceptible to all antibiotics or antimicrobial susceptibility was not tested.

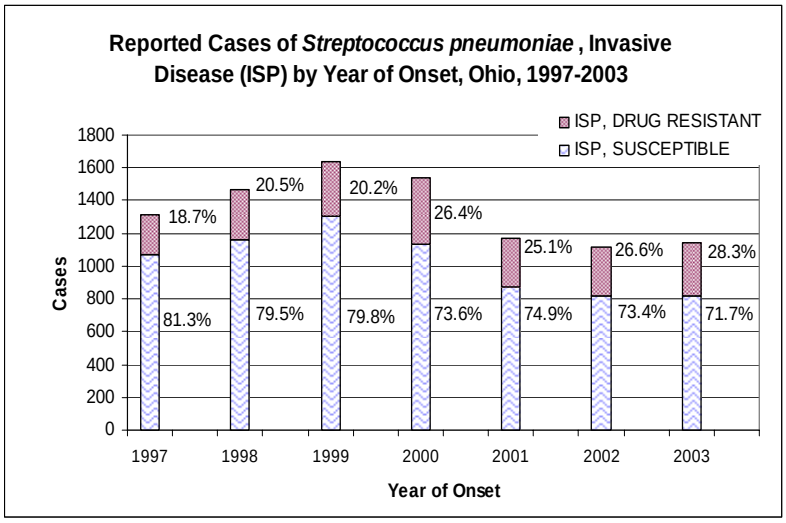
***On Jan. 1, 2006, the ISP laboratory criteria for diagnosis in Ohio changed from isolates from blood or CSF only to isolates from any normally sterile site.

ISP Case definition

Ohio Trends in ISP

The general ISP reporting trends in Ohio between 1997, the first full year of reporting, and 2003 are shown in Figure 1. The highest number of cases reported during the seven-year period was 1,636 in 1999. While the total number of ISP cases reported declined between 2000 and 2001 it has remained relatively stable since (1,540; 1,189; 1,168; and 1,186 for 2000; 2001; 2002; and 2003, respectively). The percentage of reported cases resistant to one or more antibiotics has been increasing during the same time period.

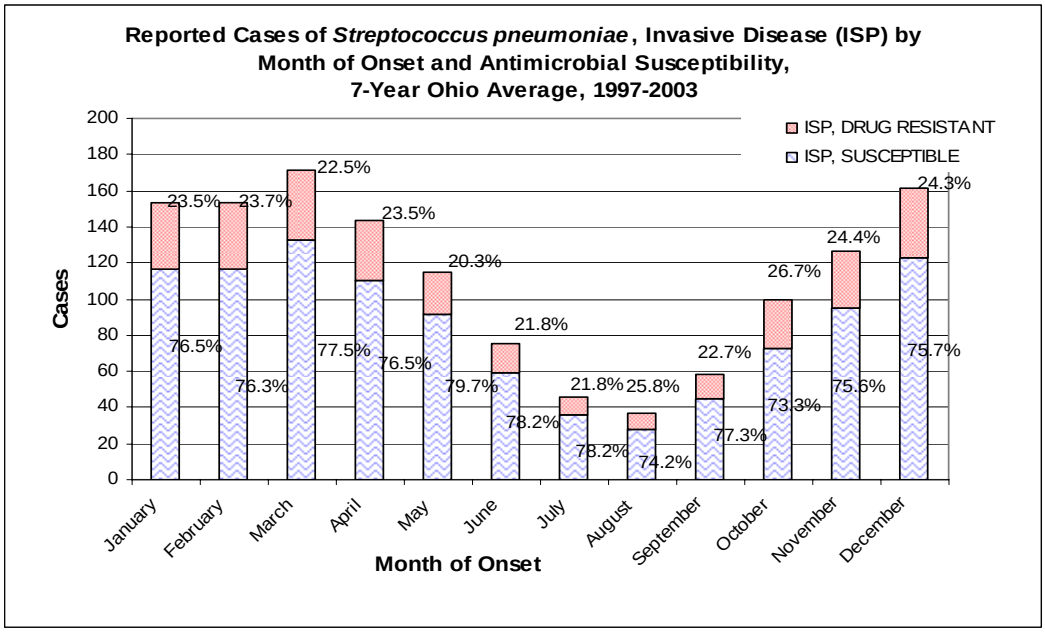
Figure 1.



Invasive *Streptococcus pneumoniae* (ISP) Disease in Ohio 1997-2003 —continued

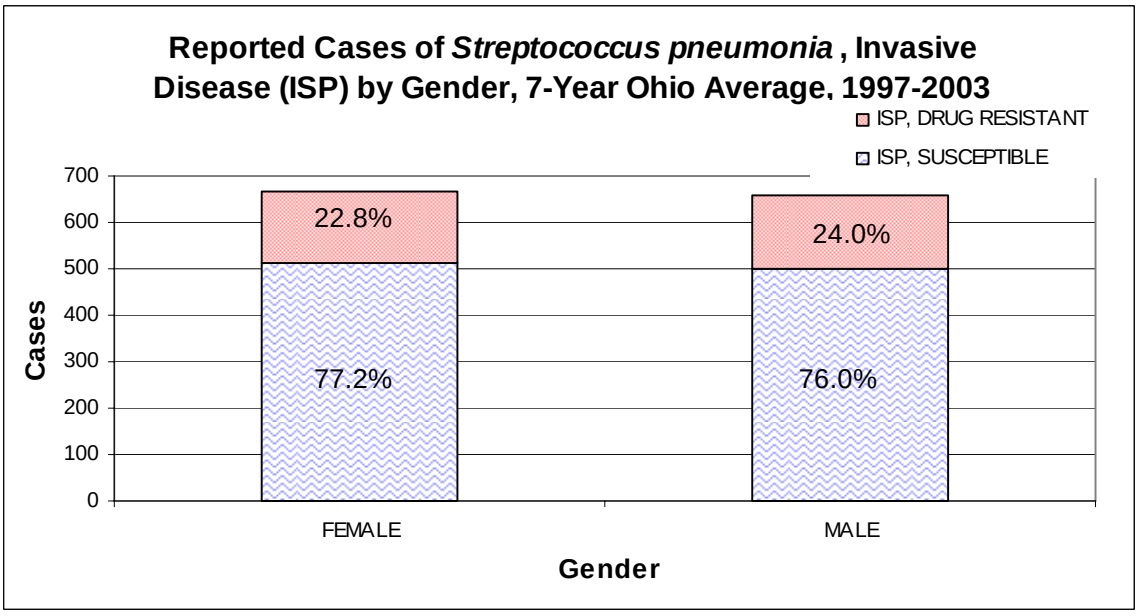
Like many respiratory diseases, ISP exhibits a seasonal trend and occurs primarily in the winter and early spring (see Figure 2). The majority of cases reported over the seven-year period had an onset between November and March (65 percent). Most cases were reported in March, and the fewest in August, when looking at the seven-year average (March: 172 cases [12.8 percent]; August: 37 cases [2.8 percent]). Figure 2 does not demonstrate seasonality among the proportion of drug resistant cases. On average, 23 percent of all cases reported each month exhibited resistance to one or more antibiotics.

Figure 2:



ISP affects both males and females equally with a seven-year average of 666 (50.3 percent) of cases among females and 658 cases (49.7 percent) among males (Figure 3). Drug resistance appears to occur equally in both genders as well, with 22.8 percent of isolates from females exhibiting resistance and 24.0 percent of isolates from males exhibiting resistance to one or more antibiotics.

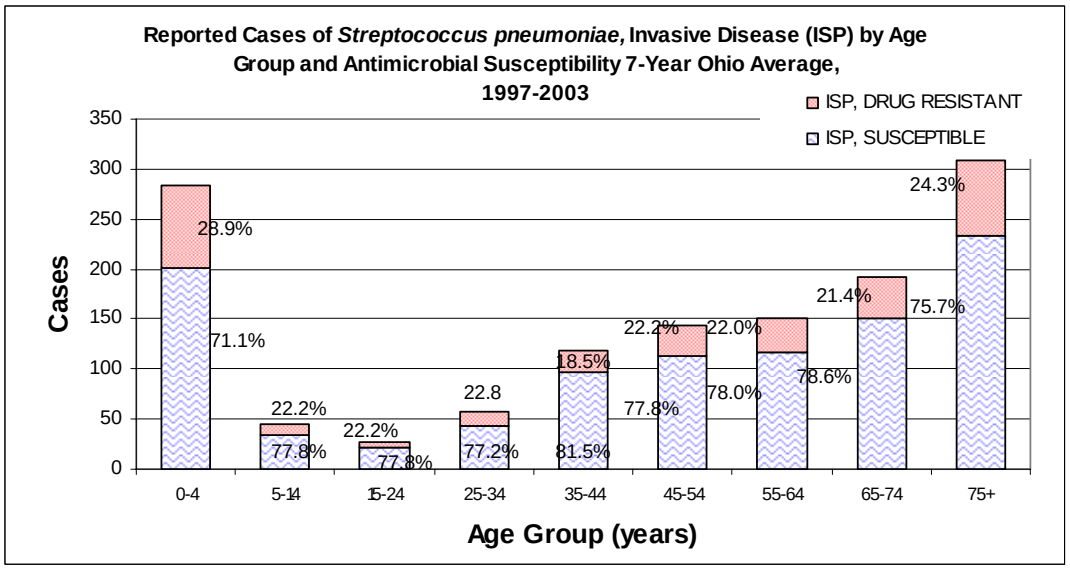
Figure 3:



Invasive *Streptococcus pneumoniae* (ISP) Disease in Ohio 1997-2003 —continued

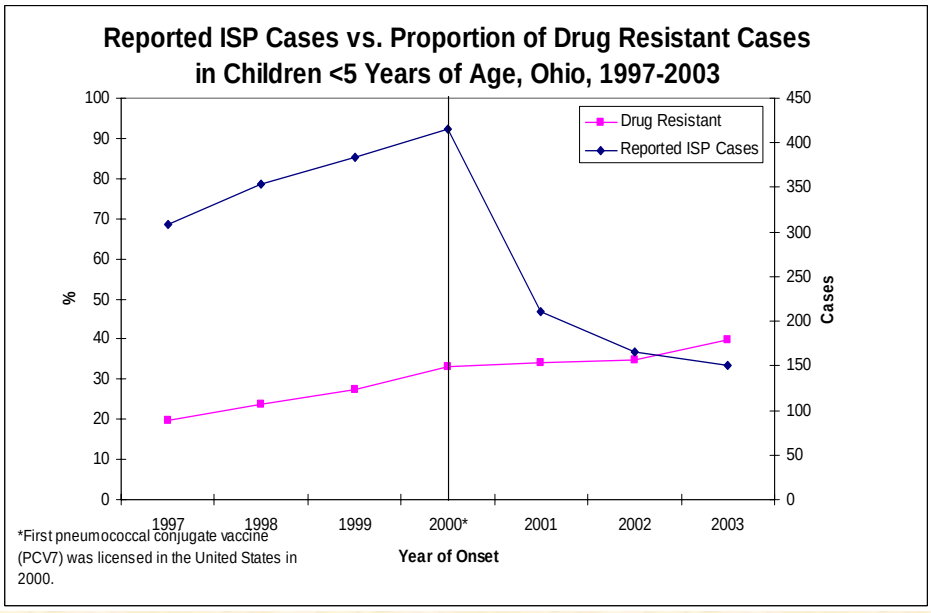
ISP affects a greater proportion of children less than 5 years of age and adults over the age of 64 than all other age groups combined. On average, 284 (21.4 percent) cases reported occurred in children less than 5 years of age, and 501 (37.8 percent) cases occurred in adults over the age of 64 years. In the children less than 5 years group, 28.9 percent of reported cases were resistant to one or more antibiotic compared to an average of 22.7 percent of cases showing resistance for all age groups (Figure 4).

Figure 4.



In 2000, a seven-valent polysaccharide conjugate vaccine was licensed for children less than 24 months of age. Since that time Ohio has seen a decrease in the number of cases reported for children less than 5 years of age from 415 cases in 2000 to 151 cases in 2003. While the number of cases of ISP in children less than 5 years of age has decreased, the percentage of cases exhibiting resistance to one or more antibiotic has increased (33.0 percent in 2000 to 39.7 percent in 2003) (Figure 5).

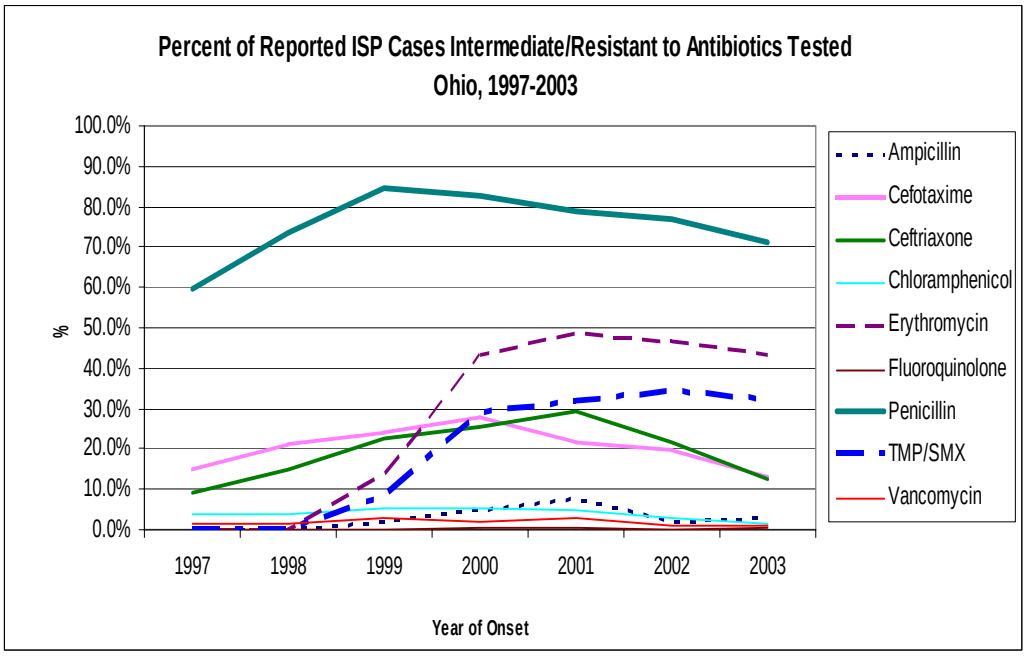
Figure 5:



Invasive *Streptococcus pneumoniae* (ISP) Disease in Ohio 1997-2003 —continued

Nine antibiotics are listed on the ISP surveillance report form. Of these nine antibiotics, three (erythromycin, penicillin and trimethoprim-sulfamethoxazole [TMP/SMX]) have exhibited decreased efficacy as more organisms have become resistant. Resistance to erythromycin has increased from 13.3 percent in 1999 to 43.3 percent in 2003 among isolates exhibiting resistance to at least one antibiotic. In 1997, 59.6 percent of resistant isolates showed intermediate resistance or were resistant to penicillin. Resistance to penicillin peaked in 1999 when 84.6 percent of isolates showed intermediate resistance or were resistant to penicillin. In 2003, 71.1 percent of resistant isolates showed resistance to penicillin. Isolates not susceptible to TMP/SMX increased from 8.1 percent in 1999 to 31.3 percent in 2003 (Figure 6).

Figure 6:



As more isolates demonstrate resistance to one antibiotic, multidrug resistance has also become more frequent. In 1997, 68.5 percent of isolates exhibited resistance to penicillin only, 22.6 percent were resistant to penicillin and one other antibiotic, 7.5 percent were resistant to penicillin and two other antibiotics, and 1.4 percent of isolates were resistant to penicillin and three other antibiotics.

In 2003, the percentage of isolates resistant to only penicillin dropped to 39.8 percent, while the percentage resistant to penicillin and one other antibiotic rose to 29.9 percent, and the percentage resistant to penicillin and two other antibiotics rose to 18.2 percent. Also, 0.4 percent of isolates tested were resistant to penicillin and five other antibiotics (Figure 7).

Invasive *Streptococcus pneumoniae* (ISP) Disease in Ohio 1997-2003 —continued

Susceptibility patterns for TMP/SMX were not reported in 1997 or 1998. Testing for resistance to TMP/SMX was first reported in 1999 when 25.9 percent of isolates were resistant to only TMP/SMX, 11.1 percent were resistant to TMP/SMX and one other antibiotic and 25.9 percent were resistant to TMP/SMX and two other antibiotics. The percent of isolates resistant to only TMP/SMX decreased from 25.9 percent in 1999 to 17.1 percent in 2003, while the number of isolates resistant to TMP/SMX and one other antibiotic increased from 11.1 percent in 1999 to 32.4 percent in 2003. In 2000, one isolate exhibited resistance to TMP/SMX and six other antibiotics (Figure 8).

Figure 7. Number of isolates resistant to penicillin and other antibiotics (e.g., 1 = resistant to penicillin only, 2 = resistant to penicillin and one other antibiotic, …7 = resistant to penicillin and six other antibiotics).

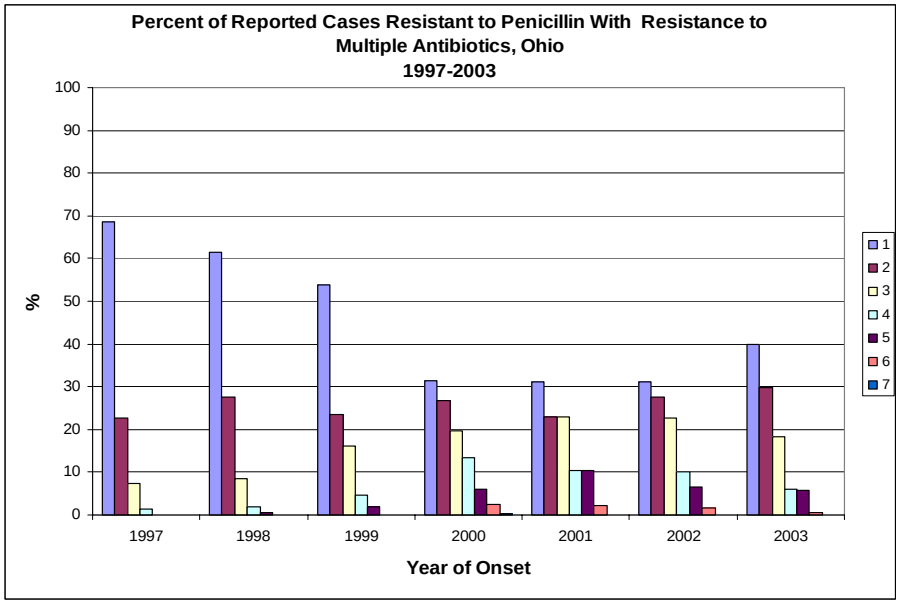
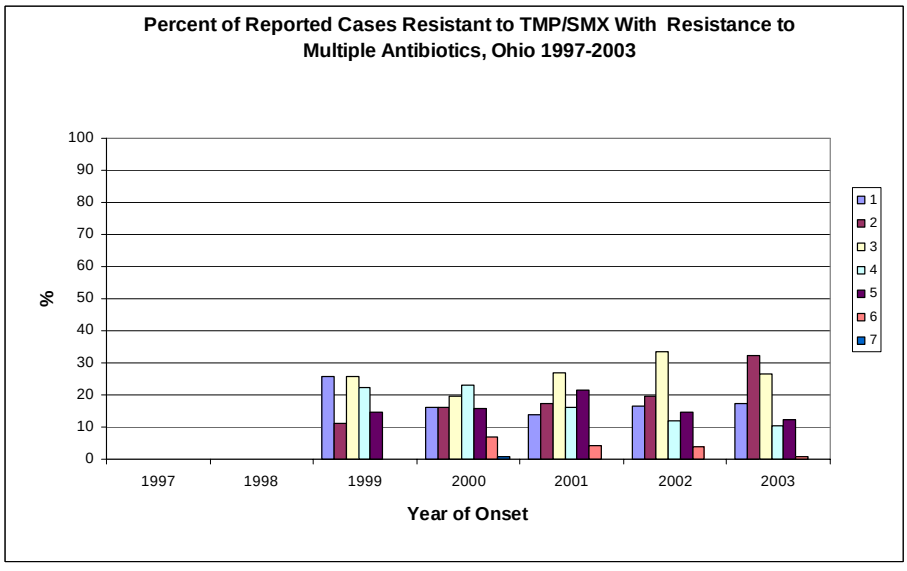


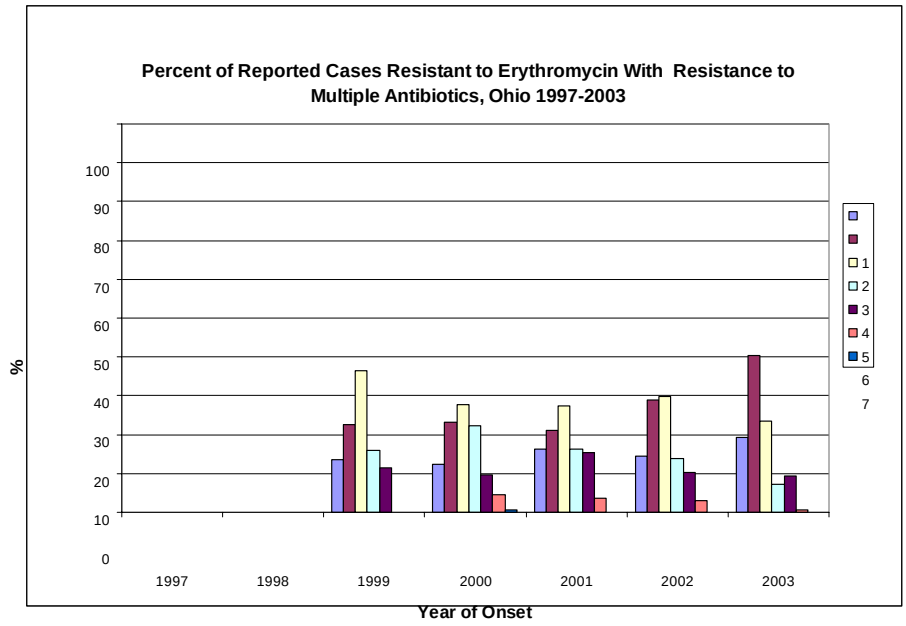
Figure 8: Number of isolates resistant to TMP/SMX and other antibiotics (e.g., 1 = resistant to TMP/SMX only, 2 = resistant to TMP/SMX and one other antibiotic, …7 = resistant to TMP/SMX and six other antibiotics)



Invasive *Streptococcus pneumoniae* (ISP) Disease in Ohio 1997-2003 —continued

In 1997 and 1998, no cases were reported with resistance to erythromycin. In 1999, 13.6 percent of cases reported were resistant to only erythromycin, 22.7 percent were resistant to erythromycin and one other antibiotic and 36.4 percent of isolates tested were resistant to erythromycin and two other antibiotics. The number of isolates resistant to erythromycin and one other antibiotic increased from 22.7 percent in 1999 to 40.4 percent in 2003. (Figure 9).

Figure 9: Number of isolates resistant to erythromycin and other antibiotics (e.g., 1 = resistant to erythromycin only, 2 = resistant to erythromycin and one other antibiotic, …7 = resistant to erythromycin and six other antibiotics).



Conclusion

Antibiotic resistance is a growing problem. Invasive *S. pneumoniae* causes millions of cases of illness in the United States each year. The ability of *S. pneumoniae* to become resistant to antibiotics used today is increasing. While the percentage of Ohio cases resistant to individual drugs appears to be stable at present, the number of cases reported with multiple drug resistance has increased. Invasive *S. pneumoniae* shows a seasonal trend with more cases reported during winter and spring than other seasons of the year. Males and females are equally affected with the heaviest burden of disease among children less than 5 years of age and adults over the age of 64. The number of cases of ISP reported among children less than 5 has decreased since the conjugate vaccine was licensed in 2000; however, the percent of cases exhibiting resistance in this age group continues to increase.

References

1. Epidemiology and Prevention of Vaccine-Preventable Diseases, Eighth Edition, January 2004: Department of Health and Human Services, Centers for Disease Control and Prevention.
2. National Center of Infectious Disease, Division of Bacterial and Mycotic Diseases, 2004.
3. Evans, Alfred S. and Brachman, Philip S. *Bacterial Infections of Humans Epidemiology and Control*, 3rd ed. New York, NY: Kluwer Academic/Plenum Publishers, 1998.

World Aids Day: December 1, 2006

by Crystal L. Willis, MSED, BSW, Ohio HIV Prevention Community Planning Group (OCPG) Capacity Building Coordinator

The first World AIDS Day was declared by the World Health Organization in 1988 and has grown into one of the most successful international days. Each year it draws attention to HIV/AIDS issues worldwide. In the weeks leading up to Dec. 1, there is an upsurge in media coverage of HIV/AIDS issues and the state of the epidemic. Awareness-raising activities take place in almost all countries around the world, often with mass non-restrictive participation. Today, World AIDS Day has achieved such a level of recognition that it is set to remain a primary vehicle for reinforcing AIDS awareness at the international and national level regardless of the theme or level of United Nations participation.

World AIDS Day: Focusing on Accountability

The theme for World AIDS Day is accountability. This will be the theme of the World AIDS Campaign from 2005 through 2010, and was reinforced Dec. 1 with this year's slogan, ***"Stop AIDS. Keep the Promise."*** The theme of accountability was developed by the World AIDS Campaign support team, based on previous lessons and ongoing work around World AIDS Day. Ending the pandemic will require keeping promises and commitments in the fight against HIV and AIDS.

Ohio Department of Health HIV/STD Prevention Program in collaboration with Cincinnati STD/HIV Prevention Training Center and Pennsylvania Mid Atlantic AIDS Education and Training Center, hosted the 11th Annual World AIDS Day Conference Nov. 28, 2006.

Retirement Announcement

The Ohio Department of Health Immunization Program thanks Tony Payton for three decades of dedication to public health. He served in the ODH Immunization Program for more than 30 years, most recently as the Immunization Program manager. We wish Tony a happy and healthy retirement!

Assessment, Feedback, Incentives, and Exchange (AFIX) Awards and Exchange

by Carolyn Parry, MPH, CDC Public Health Adviser, Immunization Program

On Oct. 5, 2006, the Ohio Department of Health (ODH), Immunization Program hosted the first Assessment, Feedback, Incentive, and Exchange (AFIX) Awards and Exchange conference. J. Nick Baird, M.D, director, ODH and Carolyn Parry, MPH, Centers for Disease Control and Prevention (CDC) public health adviser, AFIX coordinator, presented AFIX Awards to private and public practices recognizing outstanding performance in attaining high immunization rates and/or improving immunization rates. Immunization rates were based on the

4 DTaP, 3 Polio, 1 MMR, 3 HIB and 3 Hepatitis B (4:3:1:3:3) series. The awards were presented for 2005.

Dr. Melinda Wharton, MD, MPH, deputy director, National Center for Immunization and Respiratory Diseases, CDC, gave the keynote address titled *Childhood Vaccination: Opportunities and Challenges*. During the exchange portion of the conference, attendees heard from three private practices and three local health districts about ways they have improved and/or sustained high immunization rates. Attendees heard from Barbara Smurda, RN, BSN, Cincinnati City Health Department, Cincinnati; Christy Vickers, MS, RN, CPNP, Coshocton County Health Department, Coshocton; Frances Meeks, RN, Hancock County Health Department, Findlay; Stephanie Coffey, MSW, Hopple Street Neighborhood Health Center, Cincinnati; Ryan Vogelgesang, MD, Preferred Pediatrics, Inc., Parma; and Mark Wilson, MD, Sniffles and Smiles Pediatrics, St. Clairsville. For the final portion of the conference, attendees broke into two groups, rural and urban, for a smaller discussion of best practices, where attendees shared information about their successes and asked questions of other practices and clinics.

The AFIX Project for Ohio is a continuous quality improvement program for practices to determine and improve the immunization rates of their 2-year-olds. AFIX is a free service provided by the ODH Immunization Program and participating local health districts. For more information or to request an AFIX visit, contact the ODH Immunization Program at (614) 466-4643/(800) 282-0546 or contact your local health district.

Congratulations to all the award winners.

AFIX 90% Club Award

This is awarded to those practices who achieve 90 or higher immunization rates by 24 months of age.

Chesterland Pediatrics, Willoughby

Cincinnati City Health Department, Cincinnati

Euclid Pediatrics, Inc., Mentor

Judy Romano, MD, Martins Ferry

Leroy Eberly, MD, Boardman

Louis Brine, MD, Boardman

Madison County-London City Health District, London

Mid-City Pediatrics, Inc., Cincinnati

Ohio Pediatrics, Inc.-North, Huber Heights

Oxford Pediatrics and Adolescents, Oxford

Parma Pediatrics, Inc., Parma

Pediatric Associates of Dayton-Englewood, Englewood

Preferred Pediatrics, Inc., Parma

Queen City Physicians, Cincinnati

Sniffles and Smiles Pediatrics, St. Clairsville

University Suburban Pediatrics, South Euclid

AFIX Improvement Award

This is awarded for outstanding improvement in immunization rates to five practices in the state with the largest increase in rates between 2003 and 2005.

Forest Park Health Center, Forest Park

Hamilton County General Health District, Cincinnati

Mid-City Pediatrics, Inc., Cincinnati

Oxford Pediatrics and Adolescents, Oxford

Western Family Physicians, Cincinnati

Quarterly Summary of Selected Reportable Infectious Diseases, Ohio

Third Quarter, 2006*

June 25, 2006 - September 30, 2006

REPORTABLE CONDITION	QUARTER	YEAR
AMEBIASIS	0	7
BOTULISM, INFANT	2	2
CAMPYLOBACTERIOSIS	461	838
COCCIDIOIDOMYCOSIS	0	4
CREUTZFELDT-JAKOB DISEASE (CJD)	8	10
CRYPTOSPORIDIOSIS	181	283
CYTOMEGALOVIRUS (CMV), CONGENITAL	7	12
E COLI O157:H7	83	119
E COLI, SHIGA TOXIN PRODUCING, NOT O157:H7	1	7
E COLI, SHIGA TOXIN PRODUCING, UNKNOWN SEROTYPE	10	17
ENCEPHALITIS, POST OTHER INFECTION	2	6
ENCEPHALITIS, PRIMARY VIRAL	12	27
GIARDIASIS	273	599
HAEMOPHILUS INFLUENZAE, INVASIVE	20	65
HEMOLYTIC UREMIC SYNDROME (HUS)	9	12
HEPATITIS A	8	44
HEPATITIS B, ACUTE	40	103
HEPATITIS B, CHRONIC	84	323
HEPATITIS C, ACUTE	1	5
HEPATITIS C, PAST OR PRESENT	2029	6465
HEPATITIS E	0	1
KAWASAKI DISEASE	8	21
LEGIONELLOSIS	103	169
LISTERIOSIS	18	34
MENINGITIS, ASEPTIC	404	675
MENINGITIS, OTHER BACTERIAL	18	44
MENINGOCOCCAL DISEASE	9	37
MUMPS	4	31
PERTUSSIS	121	392
SALMONELLOSIS	437	949
SHIGELLOSIS	46	128
STREPTOCOCCAL DISEASE, GROUP A, INVASIVE	37	202
STREPTOCOCCAL DISEASE, GROUP B, IN NEWBORN	21	45
STREPTOCOCCAL TOXIC SHOCK SYNDROME (STSS)	2	15
STREPTOCOCCUS PNEUMONIAE, INVASIVE, DRUG RESISTANT/INTERMEDIATE (ALL AGES)	43	287
STREPTOCOCCUS PNEUMONIAE, INVASIVE, DRUG SUSCEPTIBLE/UNKNOWN (CHILDREN < 5 YEARS)	16	61
TETANUS	2	2
TOXIC SHOCK SYNDROME (TSS)	2	5
TOXOPLASMOSIS, CONGENITAL	0	1
TYPHOID FEVER	6	8
VARICELLA	420	6685
VIBRIO PARAHAEMOLYTICUS INFECTION	3	3
YERSINIOSIS	6	22
TOTAL	2256	4759

*2006 data include confirmed, probable and suspected cases reported to the Centers for Disease Control and Prevention (CDC). This report includes both quarter-specific and year-through-quarter cumulative frequencies for each disease. Quarter is determined by the MMWR week the case was sent to the CDC. This report includes only selected Class A reportable diseases. Data were reported to the Ohio Department of Health via the Ohio Disease Reporting System. Some reportable conditions may be under investigation. Therefore, all data in this report are provisional, but current as of Oct. 2, 2006.

Source: Ohio Department of Health, Infectious Disease Surveillance

ODH Infectious Diseases Quarterly is published by the Bureau of Infectious Disease Control of the Ohio Department of Health.

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