Group A Streptococcus Surveillance Summary 2016

Oregon Active Bacterial Core Surveillance (ABCs)

Center for Public Health Practice

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Background

The Active Bacterial Core surveillance (ABCs) program is a core component of the Emerging Infections Program (EIP) Network sponsored by the Centers for Disease Control and Prevention (CDC). The purpose of the ABCs program is to determine the incidence and epidemiologic characteristics of invasive disease due to *Haemophilus influenzae*, *Neisseria meningitidis*, group A streptococcus (GAS), group B streptococcus (GBS), and *Streptococcus pneumoniae*. The entire EIP Network for invasive GAS disease represents 33 million persons in 10 surveillance areas around the United States. More information on the EIP/ABCs Network is found at: http://www.cdc.gov/abcs/index.html.

In Oregon, the surveillance area for invasive GAS (*Streptococcus pyogenes*) disease comprises the tri-county (Clackamas, Multnomah, and Washington) Portland metropolitan area, with a 2015 estimated population of 1,779,244.* More information on the Oregon ABCs program is found at: http://public.health.oregon.gov/DiseasesConditions/CommunicableDisease/EmergingInfections/Pages/ActiveBacterialCoreSurveillance.aspx.

Methods

Invasive GAS disease (IGAS) is defined as the isolation of GAS from a normally sterile body site or fluid, or from a wound accompanied by necrotizing fasciitis or toxic shock syndrome in a tri-county resident. Cases are reported via Electronic Laboratory Reporting (ELR). Additional cases are identified through regular laboratory record reviews. Tri-county hospital laboratories submit GAS isolates to the Oregon State Public Health Laboratory, which forwards them to CDC for typing. Health record reviews of each case allow standardized reports of demographic characteristics, clinical syndrome manifestations, underlying illnesses or conditions, and illness outcome.

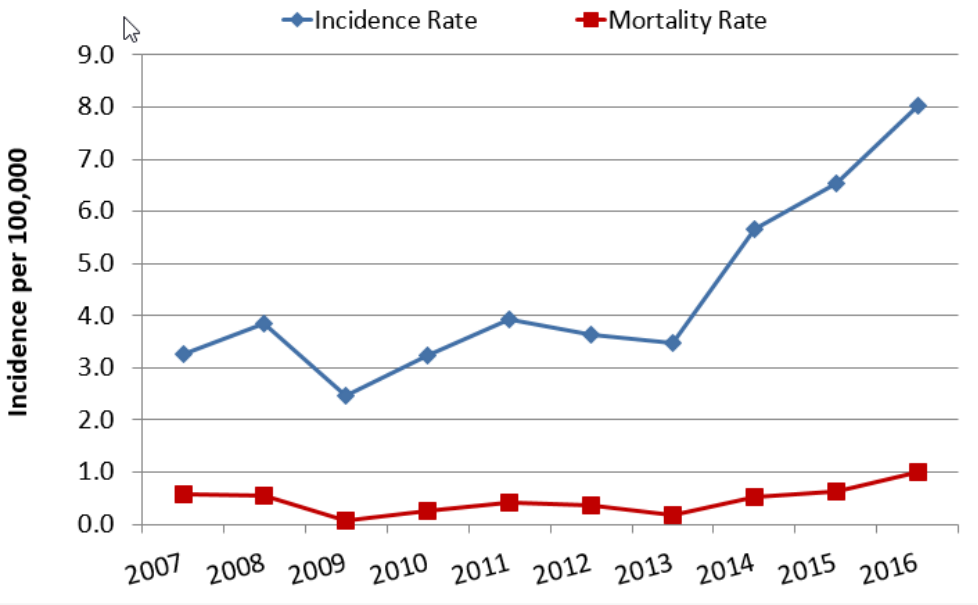
* Source: Portland State University Population Research Center (http://www.pdx.edu/prc/)

Surveillance Results

Descriptive Epidemiology

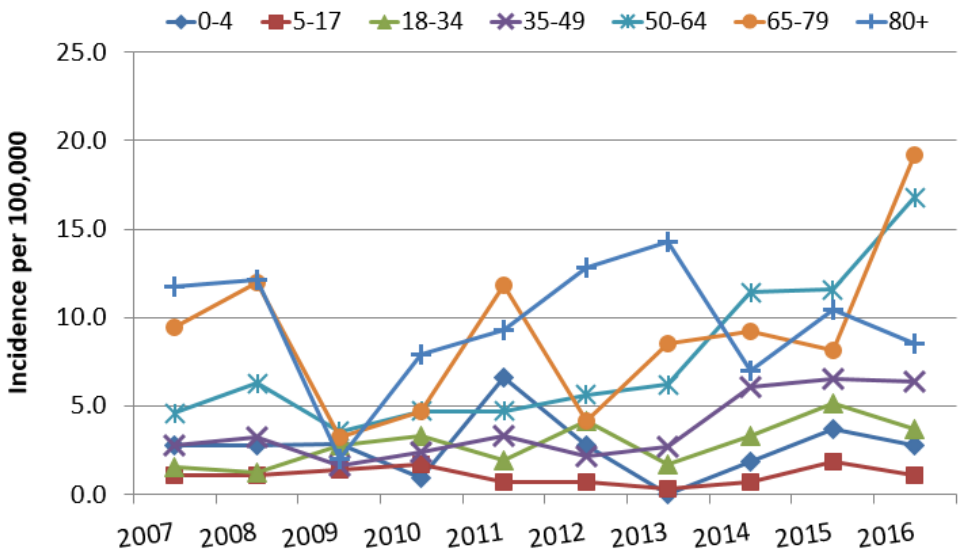
In 2016, 143 IGAS cases were reported in the tri-county Portland area, for an incidence rate of 8.04/100,000 persons (Figure 1). This is 38% higher than the 2016 national projection of invasive disease (5.8/100,000) and 73 percent higher than the average annual incidence rate in the Portland area from 2011-2015 (4.65/100,000).[1] Of these cases, there were eighteen deaths, for an annual mortality rate due to IGAS disease of 1.01/100,000 (Figure 1). This rate is 139% higher than the figures reported from 2011-2015 in the Portland area (0.42/100,000) and 74% percent higher than the most recent national projections (0.58/100,000).[1]

Figure 1: Incidence and Mortality Rates of IGAS Cases in Tri-county Area



The 2016 case fatality rate for IGAS in the Portland area was 13 percent, which is the 41% higher than the rate reported for 2010-2014 (9%), and 25 percent higher than projected rates (10%) for the nation in 2016.[1]

Figure 2: Incidence of IGAS Cases Tri-county Area by Age



The mean and median ages of IGAS cases Were 54 and 58 years, respectively (range: <1–93). Fifty-eight percent of cases were male. Race and ethnicity were obtained for 92% and 99% of cases, respectively; of 131 cases where race was known, 115 (88%) were white. Seven percent of the 141 cases with known ethnicity were Hispanic.

The 2016 incidence of IGAS was lowest in Clackamas county (3.46/100,000), followed by Washington county (3.94/100,000) and highest in Multnomah county (13.41/100,000). Compared with the previous five-year average, the 2016 incidence was78 percent higher in Clackamas, 53 percent higher in Multnomah, and 16 percent higher in Washington counties. Within the tri-county area, the burden of disease was highest in those 65-79 years of age (35 cases; 19.2/100,000 persons), followed by those 50-64 years of age (56 cases; 16.8/100,000) and ≥80 year of age (5 cases; 8.6/100,000) (Figure 2). The overall incidence has increased all age groups <65 years of age, compared to the previous 5 year average The age groups with the next largest increases in incidence in 2016 compared to the previous 5 year average are 5-17 year olds (107% increase), and 18-34 year olds (59% increase).

Clinical Manifestations

The clinical profile of IGAS in 2015 showed more bacteremia, meningitis, pneumonia, septic arthritis, and abscesses compared with the previous 5-year average. In 2016, five cases of necrotizing fasciitis and three cases of toxic shock syndrome were reported. All eight of these cases were hospitalized, and there were no fatal outcomes. One case of STSS had no underlying conditions. The two remaining cases has a history of diabetes and cardiovascular disease. Underlying conditions for the 5 NF cases included current injection drug use (n=1), diabetes (n=2), cardiovascular disease (n=1), obesity (n=1), and surgical wound (n=1). Among cases reported since 2009, the only clinical syndromes that significantly varied by age were cellulitis, septic arthritis, abscess and STSS (p=<.0001, p=0.0039, and p=0.05and, respectively), which are more common in adults than children. After adjusting for age, fatal outcome was significantly associated with bacteremia and cellulitis (p=<.0001, p=0.0002, respectively).

Table 1: Percent of IGAS Cases† Reporting Common Clinical Syndromes by Age Group

Syndrome	2016			2011-2015		
	<18 years (n=6)	18-64 years (n=97)	65+ years (n=40)	<18 years (n=28)	18-64 years (n=274)	65+ years (n=94)
Abscess	0	16	10	0	11	4
Bacteremia	50	28	35	54	33	37
Cellulitis	16	45	50	4	32	45
Meningitis	17	0	0	0	0.4	1
Necrotizing Fasciitis	0	4	3	0	7	1
Pneumonia	0	9	8	18	6	12
Septic Arthritis	0	8	3	7	8	2
Streptococcal Toxic Shock	17	1	3	4	3	0

† Some cases report more than one syndrome. Not all syndromes reported are shown here.

Underlying Conditions and Behavioral Risk Factors

In 2015, no children had underlying conditions listed in their medical record. Among adults, the profile of underlying conditions reported in 2016 was similar to that reported from 2009-2015. Younger adults were more likely to report intravenous drug use (IDU), chronic liver

disease/cirrhosis, or no underlying conditions, while older adults were more likely to have diabetes, obesity, cardiovascular disease, or COPD (Table 2). Reports of IDU increased in 2016 compared to 2010-2015. In 2016, 20% of cases reported IDU, compared to 13% of cases from 2010-2015.

Table 2: Underlying Conditions and Behavioral Risk Factors Reported Among Adult IGAS Cases by Age Group, 2009-2016

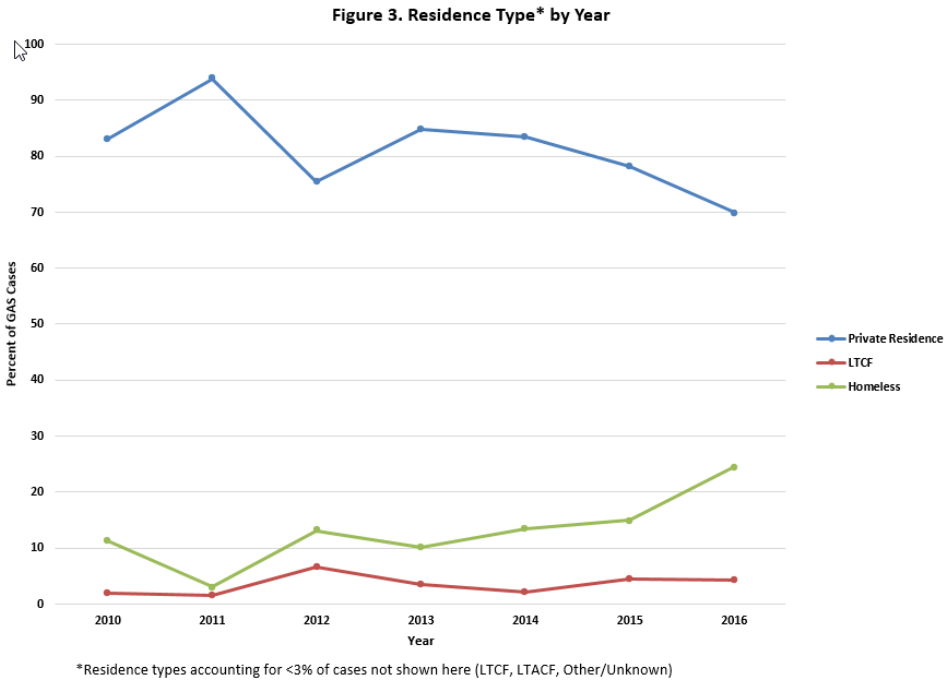
Underlying Condition	18-64 years (n=483) n (%)	65+ years (n=149) n (%)
Asthma	52 (11)	11 (7)
Blunt trauma	35 (7)	16 (11)
Burns	9 (2)	0 (0)
Cardiovascular disease*	64 (13)	58 (39)
Chronic liver disease/cirrhosis*	76 (16)	7 (5)
COPD*	27 (6)	32 (21)
Diabetes*	111 (23)	62 (42)
Dialysis	12 (2)	6 (4)
Immunosuppression	31 (6)	8 (5)
Intravenous drug use (IDU)*	90 (19)	2 (1)
Nephrotic syndrome	5 (1)	3 (2)
Obesity*	71 (15)	34 (23)
Penetrating trauma	28 (6)	4 (3)
Surgical wound	13 (3)	6 (4)
None*	92 (19)	13 (9)

* Significant difference by age group ($p<0.05$).

After adjusting for age, no underlying conditions were associated with fatal outcome. In terms of clinical manifestation, after adjusting for age, septic arthritis was associated with blunt trauma (OR 4.3, CI 1.7, 10.8), abscess was associated with IDU (OR 5.7, CI 3.0, 10.8), and cellulitis was associated with IDU (OR 1.8, CI 1.1, 3.1).

Homelessness

Homelessness among GAS cases continues to increase since Oregon began collecting residence type in 2010 (Figure 3). In 2016, 24% of cases reported homelessness, an increase of 64% compared to the previous year and an increase of 116% compared to the 2010-2015 average.



emm Type Analysis

The surface M protein – a known virulence factor for disease – has been the basis for GAS strain typing for decades. Since 1995, CDC has determined the M protein type through sequencing the DNA of the corresponding gene (*emm*), providing an *emm* type.[2] In 2015, 17 *emm* types were determined for isolates from 49 cases (43%)[§]. The most frequent *emm* types reported in 2015 were 89 (14%), 01 (10%), 12 (10%), and 92 (10%).

Since 2006, 46 *emm* types were determined for 564 isolates. The most frequent *emm* types seen over this time are presented in Table 3.

Table 3: Selected Demographic and Clinical Attributes of IGAS Disease by *emm* Type, 2010-2014

emm Type	Total (n=364) n (%)	Fatal outcome (n=40) n (%)	65+ years (n=104) n (%)	Necrotizing fasciitis (n=25) n (%)	Abscess (n=37) n (%)
1	63 (17)	1 (2)	1 (1)	0	0
89	48 (13)	2 (5)	11 (11)	4 (26)	3 (8)
92	33 (9)	4 (1)	6 (6)	2 (8)	7 (19)
28	28 (8)	3 (7)	9 (9)	2 (8)	2 (5)
59	28 (8)	2 (5)	4 (4)	0	1 (3)

* Percentages are number of isolates with displayed *emm* type out of the total number of isolates in that category. Since only the top 5 *emm* types are shown in this table, the numbers in each column do not sum to the total at the top of each column.

[§]Lab data for Jan-July, 2015

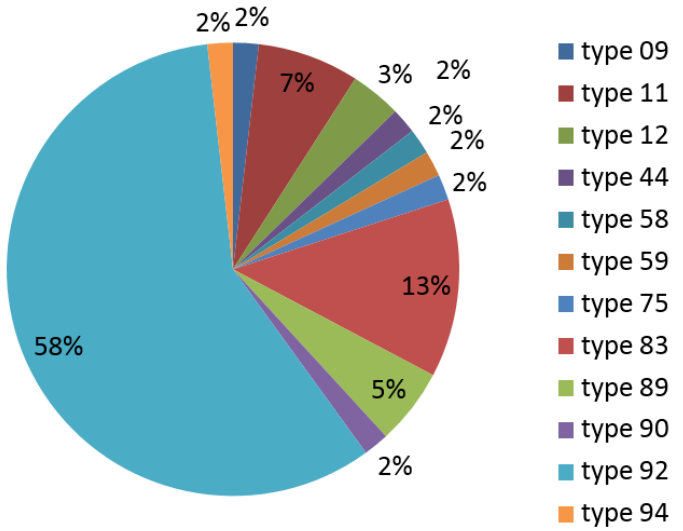
Emm type 92 is positively associated with abscess (OR 3.2, CI 1.2, 8.1). Other associations between *emm* types and clinical syndromes were not statistically significant. No significant associations were seen between *emm* types and fatal outcome.

Antibiotic Susceptibility

The antibiotic susceptibility profile of invasive GAS strains has been assessed at several points since the beginning of ABCs. Antibiotic susceptibility results are available for 362 isolates obtained from 2010-2015. Of these, 100 percent were susceptible to penicillin, ampicillin, cefotaxime, and vancomycin. Fifty-seven isolates (16%) exhibited some level of antibiotic resistance: 49 displayed full resistance to erythromycin alone; eight were resistant to erythromycin and clindamycin. Erythromycin- resistance was associated with bacteremia (p=0.05), but was not associated with a fatal outcome.

Figure 3 shows the percentage of erythromycin-resistant isolates by *emm* type. Since 2009, *emm* types 11, 83, and 92 have accounted for the largest percentage (78%) of the erythromycin-resistant isolates.

Figure 3: Percentage of Erythromycin-Resistant Isolates by emm Type 2009-2015 (N=61)



Summary

We have documented increasing rates of IGAS in the Portland Tri-county area for three consecutive years. Although IGAS is common in the elderly, the increase is largely attributable to increased rates in younger age groups, many of whom report infection drug use and homelessness.

Monitoring trends in necrotizing fasciitis and toxic shock syndrome as well as potentially-preventable nosocomial infections (such as surgical wound infections) have also been objectives of IGAS surveillance through the ABCs network. In general, most clinical manifestations have remained relatively stable over the past few years. Trends will continue to be monitored by the Oregon ABCs surveillance program.

References

1. Centers for Disease Control and Prevention. 2016. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, Group A *Streptococcus*, 2016. Available via the Internet: https://www.cdc.gov/abcs/reports-findings/survreports/gas16.pdf. Accessed 26 Apr 2018.
2. Beall B, Facklam RR, Thompson T. Sequencing *emm*-specific PCR products for routine and accurate typing of group A streptococci. *J Clin Microbiol* 1996;34:953-8.
3. Factor SH, Levine OS, Schwartz B, et al. Invasive Group A Streptococcal Disease: Risk Factors for Adults. *Emerg Infect Dis* 2003;8:970–7.