Background. Norovirus is a leading cause of acute gastroenteritis (AGE) across the age spectrum; candidate vaccines are in clinical trials. While norovirus diagnostic testing is increasingly available, stool testing may not be performed routinely, which can hamper surveillance and burden of disease estimates. Our objectives were to understand physicians' stool testing practices in outpatients with AGE, and physician knowledge of norovirus, in order to improve surveillance and prepare for vaccine introduction.

Methods. Internet and mail survey on AGE and norovirus conducted January to March 2018 among national networks of primary care pediatricians (Peds), family practice (FP) and general internal medicine (GIM) physicians.

Results. The response rate was 59% (820/1,383). During peak AGE season, physicians estimated they ordered stool tests for a median of 15% (interquartile range: 5–33%) of their outpatients with AGE. Stool tests were more often available for ova and parasites, *Clostridioides difficile*, and bacterial culture (>95% for all specialties) than for norovirus (6–33% across specialties); even when available, norovirus-specific tests were infrequently ordered. Most providers were unaware that norovirus is a leading cause of AGE across all age groups (Peds 80%, FP 86%, GIM 89%) or that alcohol-based hand sanitizers are ineffective against norovirus (Peds 51%, FP 66%, GIM 62%).

Conclusion. Physicians infrequently order stool tests for outpatients with AGE, and have knowledge gaps on norovirus prevalence and hand hygiene for prevention. Understanding the limitations of surveillance that relies on physician-ordered stool diagnostics, and closing physician knowledge gaps, can help support norovirus vaccine introduction.

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1625. Risk of Invasive Group A *Streptococcus*, Group B *Streptococcus*, and *Streptococcus pneumoniae* Infection Among Adults Experiencing Homelessness—Anchorage, Alaska, 2002–2015

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Background. People experiencing homelessness (PEH) have an increased risk of infectious disease. However, for many infections, this increased risk has not been clearly quantified. For example, the risk of invasive streptococcal infection has not been established among PEH in the United States.

Methods. We compared the incidence of detected cases of invasive group A *Streptococcus* (GAS) infection, group B *Streptococcus* (GBS) infection, and *Streptococcus pneumoniae* (pneumococcal) infection among adult PEH to that in the general adult population in Anchorage, Alaska from 2005 through 2015 using data from the CDC Arctic Investigations Program surveillance system, the US census, and the Anchorage Point in Time count (PIT [a yearly census of PEH]).

Results. During 2005–2015, the PIT counted a mean number of 970 adults (minimum 795, maximum 1486) in Anchorage who were homeless, which accounted for 0.4% of the total population. Compared with the general population, PEH were 53 times as likely to have invasive GAS infection (95% CI 47–61), 7 times as likely to have invasive GBS infection (95% CI 6, 8), and 36 times as likely to have invasive pneumococcal infection (95% CI 33, 40). Of all invasive GAS cases in Anchorage over the time period, 19% occurred within the homeless population, while 3% of invasive GBS cases and 14% of invasive pneumococcal cases were within the homeless population. Additionally, the predominant subtypes of GAS and pneumococcus differed among PEH compared with the general population.

Conclusion. A disproportionate burden of invasive streptococcal disease in Anchorage was detected among PEH, indicating a need for further focus on this high-risk group.

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1626. A Primary Amebic Meningoencephalitis Case Associated with Surfing in an Inland Surf Park

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Background. *Naegleria fowleri* is a thermophilic ameba that is found in freshwater and causes primary amebic meningoencephalitis (PAM; 0–8 infections per year in the United States) when it enters the nose and migrates to the brain. Patient exposure to water containing the ameba typically occurs in warm freshwater lakes and ponds during recreational water activities. In September 2018, a 29-year-old man died of PAM after visiting a Texas inland surf park.

Methods. To determine water exposures, we reviewed medical records and conducted interviews with family and individuals who had traveled with the patient. To further investigate the inland surf park as a possible exposure source, we visited the facility and collected water, biofilm, and sediment samples from the surf park and other venues (water slides, lazy river, and cable park) within the facility. We assessed water sources and treatment practices, performed water quality tests, and tested for the presence of *N. fowleri* by culture and real-time PCR.

Results. Interviews revealed that the case-patient's most probable water exposure in the 10 days before becoming ill occurred while surfing in an inland freshwater surf park where he fell off the surfboard into the water multiple times. The on-site investigation of the facility revealed a practice of manual chlorine treatment with monitoring, but no water filtering or record keeping to document water quality. Surf park water temperature was warm (25°C) and chlorine residual was negligible. *N. fowleri* was detected in 1 water and 1 sediment sample collected at the cable park venue, and viable thermophilic amebae were detected in all samples collected from the surf park, water slide, and cable park venues, as well from the sediment in the open-air groundwater reservoir feeding the venues.

Conclusion. This investigation documents a novel exposure in an inland surf park as the likely exposure causing PAM. Conditions in the surf park were conducive to amebic growth. Novel types of recreational water venues that do not meet traditional definitions of swimming pools, such as this surf park, might not meet the water quality standards for pools or similar treated venues. Clinicians and public health officials should remain vigilant for nontraditional exposures to water.

Disclosures. **All authors:** No reported disclosures.

1627. Outbreaks of *Klebsiella pneumoniae* in Special Care Nurseries (SCN) in Jamaica: Role of Whole-Genome Sequencing

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Background. *Klebsiella pneumoniae* is a frequent cause of neonatal sepsis and carries a high mortality rate in lower and middle-income countries (LMICs). From March-November 2015, two Jamaican hospitals experienced *K. pneumoniae* outbreaks in their Special Care Nurseries (SCNs). New admissions to both SCNs were temporarily halted while additional infection control strategies were implemented. 31 babies were infected, of which 15 died. International collaboration was requested to help investigate if the sepsis cases were nosocomial transmission, repeated introductions from the community, or both using whole-genome sequencing

Methods. We sequenced DNA from 19 outbreak isolates (n = 13 from Hospital A, n = 6 from Hospital B) on an Illumina HiSeq2500 instrument and assembled short-reads using SPAdes. We used ResFinder v3.1.0 to screen resistance genes and assigned MLSTs using in-house scripts. To compare the outbreak isolates, we selected a reference genome from among the assembled isolates, aligned raw reads using the Burrows–Wheeler Aligner (BWA), identified SNPs using GATK UnifiedGenotyper, and removed the recombined regions using Gubbins v2.3.4. We further contextualized the 19 outbreak isolates against a global collection of more than 300 *K. pneumoniae* genomes.

Results. All 13 isolates from Hospital A appeared to be from a single source. All were ST45 and encoded $bla_{\text{CTX-M-15}}$, which confers extended-spectrum β-lactam (ESBL) resistance. Five of 6 isolates from Hospital B appeared to be from a separate, single source. These 5 isolates were ST268 and susceptible to most antibiotics. 1 isolate from Hospital B was ST628, encoded $bla_{\text{CTX-M-15}}$, and grouped separately from other Hospital B outbreak isolates. Hospital A and B outbreak isolates formed independent, unique clades within a global *K. pneumoniae* collection.

Conclusion. Our findings indicate nosocomial transmission was responsible for both neonatal *K. pneumoniae* outbreaks, rather than repeat introductions from the community. The main sequence types we detected (ST45 and ST268) are not known pandemic clones and may circulate regionally. Multifaceted infection control measures were implemented for effectively halting outbreaks.

Disclosures. **All authors:** No reported disclosures.

1628. Clinical, Epidemiological and Microbiological Characterization of Invasive *Streptococcus pneumoniae* Disease in Hospitalized Adults from 5 Tertiary Hospitals in Bogotá, Colombia: A Descriptive Study

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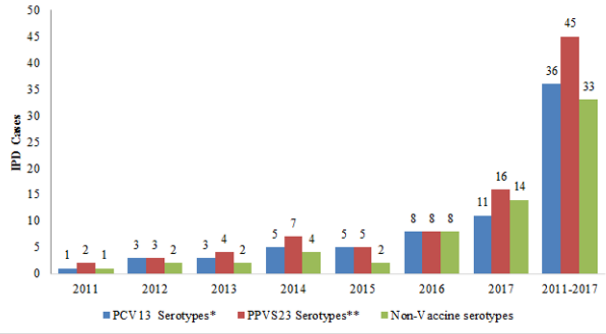
Background. In Colombia, clinical characteristics related to invasive pneumococcal disease (IPD) and circulating pneumococcal serotypes (ST) in adults are scarce. We aimed to describe the clinical and microbiological characteristics of IPD in hospitalized adults ≥18 years old in 5 tertiary hospitals in Colombia from 2011 to 2017.

Methods. A descriptive, observational, retrospective study was conducted in 5 tertiary care hospitals during a 7-year period. Demographic, clinical data and in-hospital outcomes were collected through chart review from all culture-confirmed invasive S. pneumoniae cases in each hospital. The National Health Institute laboratory database was assessed to obtain information about ST (Quellung) and antimicrobial susceptibility (Broth microdilution).

Results. 128 cases of IPD were included in this interim analysis, 70(54.7%) were males. The median age was 58 ± 16.7 years. Main underlying conditions were cardiovascular disease (32%), smoking (27.9%), diabetes (20.3%), autoimmune diseases (18.8%), and cancer (18%). The main clinical presentation was bacteremic pneumonia (66.4%), followed by meningitis (14.8%), bacteremia (14.1%) and other (3.1%). Critical care management was required in more than half of the patients: ICU (60.2%), mechanical ventilation (53%) and inotropic support (51.6%). The overall in-hospital mortality rate was 43% and was 39%, 52.6% and 61% for pneumonia, meningitis and bacteremia, respectively. ST was known for 82(64%) cases, most frequent ST were: 3(10.9%), 14(7.3%), 19A(6,1%), 1(4.8%), 4/8/11A/22F (3.65% for each one). ST contained in 13-valent conjugate vaccine (PCV13), 23-valent pneumococcal vaccine (PPVS23) and non-vaccine serotypes accounted for 43.9%, 54.9%, and 40.2% of IPD cases, respectively (Figure 1). 83% and 80.7% strains were susceptible to penicillin and ceftriaxone, respectively.

Conclusion. Pneumonia is the most common clinical presentation of IPD among adults. The clinical outcome was severe with high mortality rate and need of critical care management. ST contained in PCV13 and PPVS23 accounted for 43.9% and 54.9% of IPD cases. This study highlights the importance to strengthen local surveillance and the implementation of pneumococcal immunization programs in high-risk population.

Figure 1: Serotype distribution in adult IPD cases between 2011 and 2017.



* PCV13: 1,3,4,5,6A,6B,7F, 9V, 14, 18C, 19A, 19F and 23F
** PPVS23: 1,2, 3,4,5,6B,7F,8, 9N,9V,10A,11A,12F,14, 15B, 17F,18C, 19A, 19F, 20, 22F, 23F, and 33f

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1629. Herpes Zoster Risk in Immunocompromised Adults in the United States: A Systematic Review

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Background. The two known primary risk factors for herpes zoster (HZ) are age and immunodeficiency yet estimates of HZ risk by immunocompromising medical condition have not been well characterized. We undertook a systematic review of the literature to estimate HZ risk in six categories of immunocompromised patients.

Methods. We conducted a systematic review of evidence for HZ in patients with hematopoietic cell transplants (HCT), cancer (blood and solid tumor), HIV, and solid-organ transplant (SOT; kidney and other). We identified studies in Pubmed, Embase, Cochrane, Scopus and clinicaltrials.gov using the following outcome search terms: Herpes Zoster, Shingles, VZV, chickenpox, Varicella-zoster virus, or opportunistic infection. We included articles that presented original data from studies in the United States on risk of HZ in adults and were published after 1992 (1996 for HIV). Case reports and conference abstracts were excluded. We assessed risk of bias with Cochrane (clinical trials) or GRADE (observational) methods and categorized studies as high, medium, or low risk.

Results. We identified and screened 3,765 records; 57 articles were abstracted and 34 deemed low or moderate risk of bias (Figure 1). All articles reported at least one estimate of HZ cumulative incidence, which ranged from 0% to 41%. Thirteen studies estimated HZ incidence, which varied widely within and between immunocompromised populations (Figure 2). The highest estimates were seen in HCT (median = 52 HZ cases/1000 patient-years), followed by blood cancers and SOT, and then solid tumor cancers and HIV (median = 13 HZ cases/1,000 patient-years). Among 17 studies of HCT patients, longer follow-up time and absent or <1 year of post-transplant antiviral prophylaxis were associated with higher HZ cumulative incidence (Figure 3).

Conclusion. HZ is common among all immunocompromised populations studied—exceeding expected HZ incidence in immunocompetent middle-age adults. Antiviral prophylaxis among HCT patients has an ameliorating effect but long-term HZ risk following discontinuation is unclear. Better evidence for incidence and severity of HZ in immunocompromised populations is needed to inform economic and HZ vaccine policy analyses.

Figure 1. Literature Search Flow Diagram

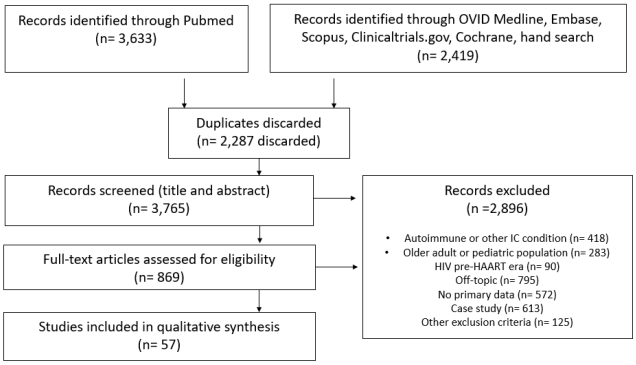

Figure 2. Herpes Zoster incidence rates by immunocompromised populations