

## Background

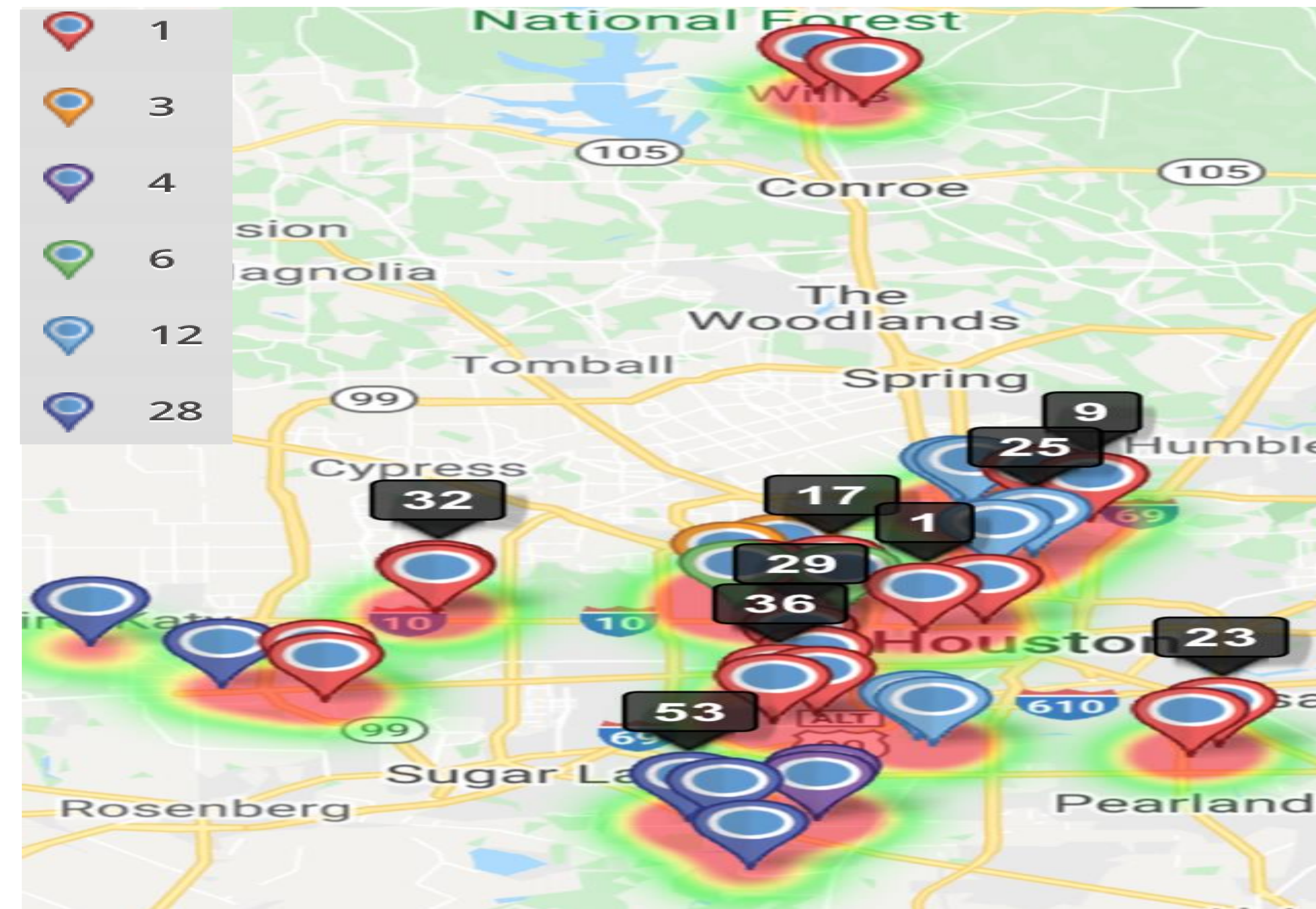
- Disease due to group A *Streptococcus* (GAS) occurs frequently in children and usually manifests as pharyngitis or superficial skin infections.
- However, invasive disease (iGAS) such as necrotizing fasciitis or streptococcal toxic shock syndrome is responsible for significant morbidity and mortality.
- National-level surveillance at the Centers for Disease Control and Prevention (CDC) estimates >10,000 cases and ~1,500 deaths due to iGAS occur annually in the US.
- Much interest revolves around the ability to detect potential transmission events (PTEs) of GAS disease using surveillance data as such information may change recommendations for chemoprophylaxis of close contacts.
- Studies by the CDC have shown a secondary attack rate from 66.1 to 102 /100,000, primarily occurring among older adults with co-morbidities.
- However, previous studies were limited in that the GAS surveillance was limited to iGAS disease and did not include pharyngitis or superficial skin infections that are known to occur more frequently.

## Objectives

The main goal of this study is to determine PTEs and community secondary attack rates using comprehensive GAS surveillance (invasive, pharyngitis, and superficial infections) in the Texas Medical Center (TMC).

## Methods

- Retrospective study using a comprehensive GAS passive surveillance system.
- GAS isolates and associated metadata were obtained from 2 hospital systems TMC from 2017-2019.
- Molecular *emm* typing of GAS isolates was performed using the CDC protocol.
- PTEs were defined based on GAS disease isolates originating from the same zip code, occurring within 30 days of each other, and of the same *emm* type.



**Figure 1** : Heat map showing PTEs including an invasive GAS isolate (index or transmission) with labels indicating events resulting in invasive disease. Left upper corner color code for each *emm* type

| PTE No. | Index Disease | PTE Disease | PTE Diagnosis                   | <i>emm</i> | Total PTE Isolates |
|---------|---------------|-------------|---------------------------------|------------|--------------------|
| 1       | Invasive      | Invasive    | Bacteremia W/O focus            | 1          | 2                  |
| 9       | SSTI          | Invasive    | Pneumonia                       | 1          | 2                  |
| 17      | Invasive      | Invasive    | Necrotizing fasciitis           | 1          | 2                  |
| 23      | Pharyngitis   | Invasive    | Bacteremia W/O focus            | 1          | 2                  |
| 25      | Pharyngitis   | Invasive    | Peritonsillar abscess           | 6          | 2                  |
| 29      | Invasive      | Invasive    | Bacteremia / pharyngitis        | 1          | 2                  |
| 32      | Pharyngitis   | Invasive    | Pneumonia                       | 1          | 2                  |
| 36      | Pharyngitis   | Invasive    | Otitis media                    | 1          | 3                  |
| 53      | Pharyngitis   | Invasive    | Surgical site infection/ sepsis | 28         | 3                  |

**Table 1:** Description of each PTE resulting in and invasive isolate as marked on the heat map

## Results

- A total of 1291 isolates were included in the study – 94 PTEs were identified representing 168 individual GAS isolates (150/168 89.2% are pediatric isolates) of which 74 were defined as index cases.
- The 4 most common GAS *emm* types identified among PTEs were *emm1* (43/94, 45.7%), *emm12*(30/94, 31.9%), *emm4* (6/94, 6.4%), and *emm6* (5/94, 5.3%).
- Index cases most frequently resulted in a single PTE (n=74) with an average number of PTEs per index case of 1.3 (range 1 to 3 PTEs).
- From index cases, 10 GAS isolates were derived from invasive disease (10/74, 13.5%) and 6 from skin and soft tissue infections (SSTI; 6/74, 8.1%), with the remainder (58/74, 78.3%) being derived from pharyngeal infections.
- A substantial proportion of PTEs resulted in iGAS (9/94, 9.5%) and SSTI (10/94, 10.6%).
- GAS PTE isolates were derived from patients with a mean age of 12.50 (range 0.22-71.1 years).

## Conclusion

- Using comprehensive local surveillance, we were able to identify several potential GAS transmission events.
- Further analysis – including whole genome sequencing on index and PTE isolates – is needed to better define transmission events.

## References

- Carapetis JR, Steer AC, Mulholland EK, Weber M. The global burden of group A streptococcal diseases. *Lancet Infect Dis* **2005**; 5:685-94.
- Nelson GE, Pondo T, Toews KA, et al. Epidemiology of invasive group A streptococcal infections in the United States, 2005-2012. *Clin Infect Dis* **2016**; 63:478-86.
- O'Loughlin RE, Roberson A, Cieslak PR, et al. The epidemiology of invasive group A streptococcal infection and potential vaccine implications: United States, 2000-2004. *Clin Infect Dis* **2007**; 45:853-62
- Risk of severe Group A Streptococcal Disease among patients' Household contacts,1997-1999 , Robinson K.A, Rothrock G et.al
- Evaluating Household Transmission of Invasive Group A Streptococcal Disease in the United States Using Population-Based Surveillance Data, 2013-2016 Adebajo T, Apostol M et. al