

# Underreporting of Necrotizing Fasciitis and Streptococcal Toxic Shock Syndrome in Invasive Group A *Streptococcus* Cases in New York State, 2007 - 2016

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## Background

- While the majority of group A *streptococcus* infections result in relatively mild infections such as strep throat, less frequently these bacteria can result in invasive group A *streptococcus* (iGAS) infections<sup>1,2</sup>.
- In New York State (NYS) all culture confirmed cases of iGAS are required to be reported to the New York State Department of Health.
- Necrotizing fasciitis (NF) and streptococcal toxic shock syndrome (STSS) are severe presentations of iGAS, associated with significant morbidity and mortality<sup>2</sup>.
- Despite their severity, these syndromes are not effectively captured through passive laboratory-reliant surveillance systems, making it difficult to obtain accurate burden estimates of morbidity and mortality due to these syndromes<sup>1,2</sup>.

## Methods

- Through the Emerging Infections Program, a collaboration among CDC and ten state health departments and academic partners, the NYS Active Bacterial Core surveillance (ABCs) conducts active population-based surveillance for iGAS in 15 counties (pop 2.1 million).
- iGAS is defined as isolation of GAS from a normally sterile site, or from a wound specimen of a patient with NF or STSS.
- Cases were classified as NF or STSS if a physician based diagnosis of NF and/or STSS was documented in the hospital medical record.
- For all iGAS reported in the ABCs counties, extensive medical chart reviews are conducted, utilizing ABCs protocols and standardized case definitions. Information collected includes demographic characteristics, clinical signs and symptoms, laboratory results, and patient outcomes.
- To compare completeness of reporting of iGAS cases, we evaluated incidence between 2007 and 2016 in ABCs counties and counties in the rest of the state (ROS; pop. 9.1 million) excluding NYC. Additionally, we compared the proportion of iGAS cases with NF and/or STSS between ABCs and ROS.
- In order to estimate the number of cases of NF and STSS in iGAS patients in the ROS, we applied rates of iGAS NF and STSS seen in ABCs counties to the number of reported iGAS cases in ROS.

## Results

**Table 1. Number of invasive group A *Streptococcus* cases with necrotizing fasciitis and/or streptococcal toxic shock syndrome in ABCs and ROS counties, 2007 - 2016**

	Total iGAS Cases N	iGAS with NF N (%)	iGAS with STSS N (%)	iGAS with NF and STSS N (%)
ABCs Counties	883	51 (6)	56 (6)	30 (3)
ROS Counties	2874	54 (2)	28 (1)	8 (.3)

**Table 2. Characteristics of invasive group A *Streptococcus* cases with necrotizing fasciitis and/or streptococcal toxic shock syndrome in ABCs counties, 2007 - 2016**

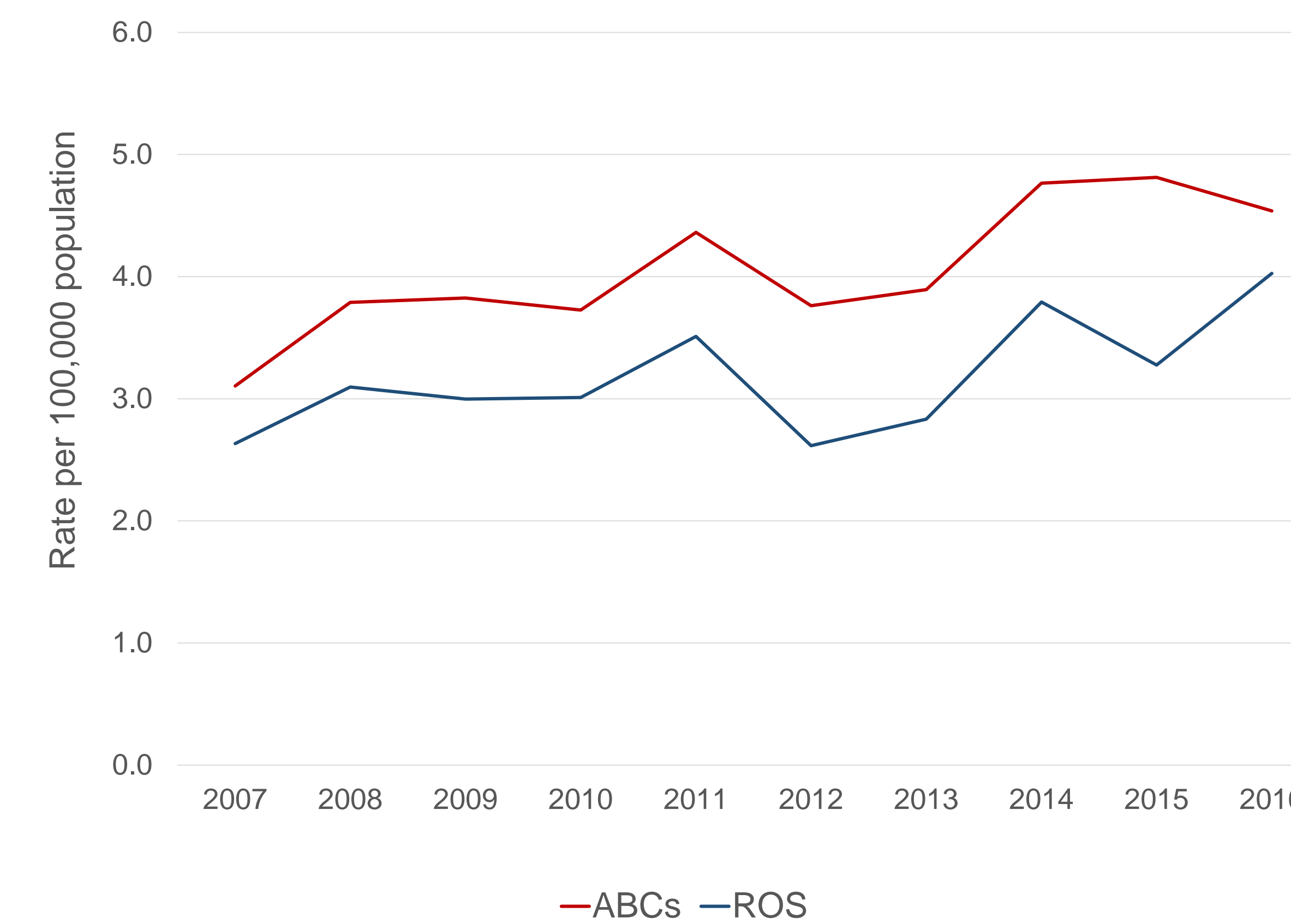
	iGAS without NF or STSS n (%) (N= 746)	iGAS with NF n (%) (N=51)	iGAS with STSS n (%) (N=56)	iGAS with NF and STSS n (%) (N=30)	p value
Mean Age	55.1	48.3	57.7	54.3	0.1852 <sup>1</sup>
<i>Missing</i>	0	0	0	0	
Female	358 (48)	23 (45)	30 (54)	13 (43)	0.9595 <sup>2</sup>
Male	386 (52)	28 (55)	26 (46)	17 (57)	
<i>Missing</i>	2	0	0	0	
Black	92 (12)	5 (10)	5 (9)	3 (10)	0.8497 <sup>2</sup>
White	621 (83)	41 (80)	50 (89)	27 (90)	
Other	33 (4)	5 (10)	1 (2)	0 (0)	
<i>Missing</i>	0	0	0	0	
Alive	653 (88)	45 (88)	37 (66)	20 (67)	<.0001 <sup>2</sup>
Deceased	81 (11)	6 (12)	19 (34)	10 (33)	
<i>Missing</i>	12	0	0	0	
Mean Days Hospitalized	11.5	20.5	18.3	22.7	<.0001 <sup>1</sup>
ICU Admission	186 (25)	24 (47)	37 (66)	20 (67)	<.0001 <sup>2</sup>
No ICU Admission	338 (45)	11 (22)	3 (5)	1 (3)	
<i>Missing</i>	222 (30)	16 (31)	16 (29)	9 (30)	

<sup>1</sup> Test type: GLM

<sup>2</sup> Test type: Chi Squared

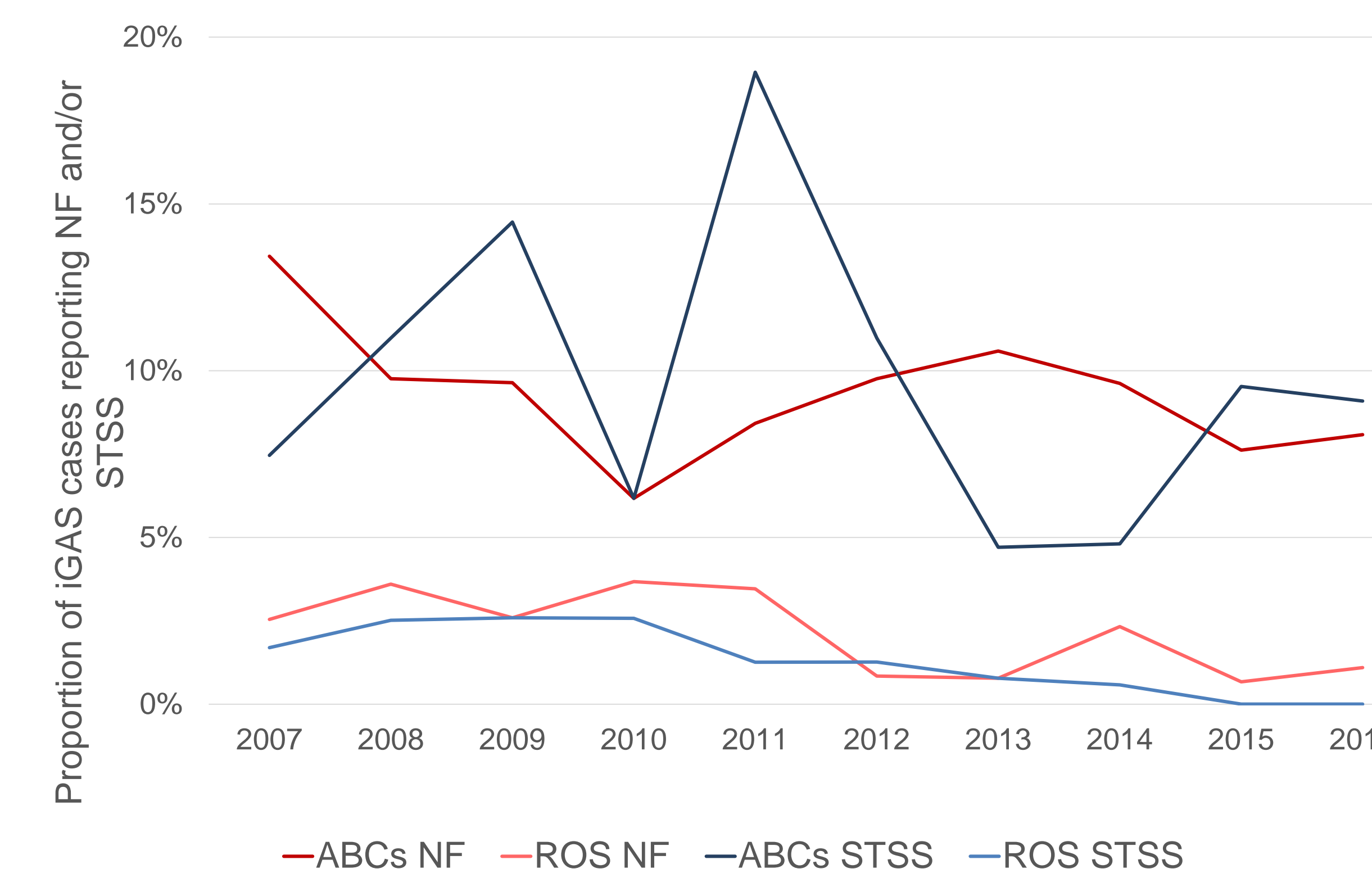
- iGAS patients with NF and/or STSS did not differ significantly from those without NF or STSS in terms of age at onset, gender, or race (Table 2).
- However, iGAS patients with STSS, whether with NF or without, had significantly higher rates of death when compared to patients without STSS.
- iGAS patients without NF or STSS also spent significantly fewer days in hospital.
- Similarly, admission to intensive care units (ICUs) was significantly higher in patients with STSS, with two-thirds admitted to an ICU during their illness, compared with one quarter of iGAS patients without STSS or NF, and just under one half of patients with NF but not STSS.

**Figure 1. Incidence rate of invasive group A *Streptococcus* in ABCs and ROS counties, 2007 - 2016**



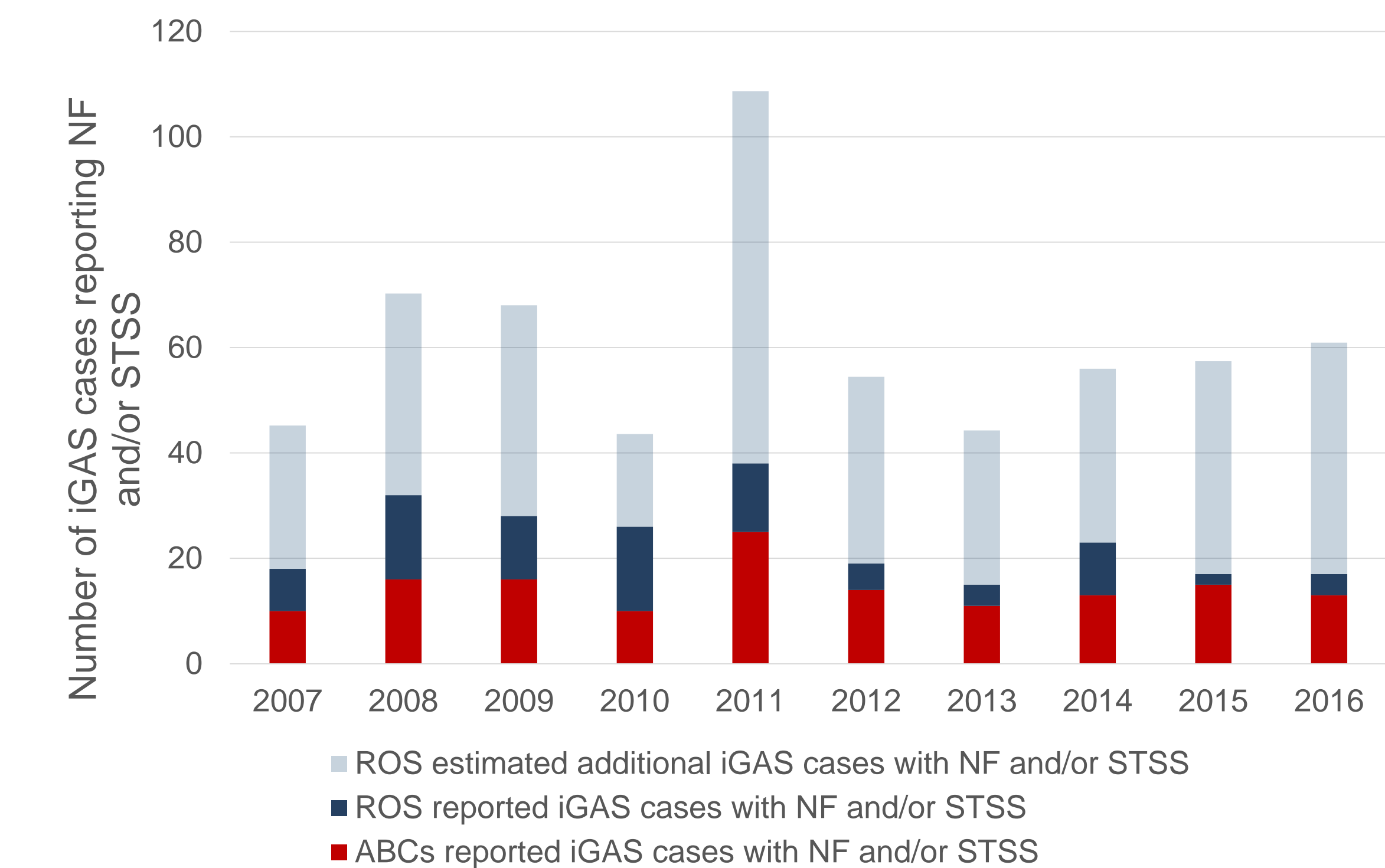
- Between 2007 to 2016, iGAS incidence rates increased by 46% and 53% in ABCs and ROS counties respectively, with consistently higher incidence in the ABCs catchment area (Figure 1).

**Figure 2. Proportion of invasive group A *Streptococcus* cases reporting necrotizing fasciitis and streptococcal toxic shock syndrome, 2007 - 2016**



- There are substantially lower proportions of iGAS cases with NF and STSS in ROS compared to ABCs counties (Figure 2).
- Among all iGAS cases, NF and STSS rates in ABCs compared to ROS counties are over four (9.2% and 2.2%) and eight times higher (10.6% and 1.3%) respectively.

**Figure 3. Estimated additional iGAS cases reporting necrotizing fasciitis and/or streptococcal toxic shock syndrome, 2007 - 2016**



- An estimated additional 376 cases of NF and/or STSS among iGAS cases (418% of reported) would be expected in ROS if rates of NF and/or STSS reported in ABCs counties are applied (Figure 3).

## Conclusions

- While differences in case definitions may have led to higher incidence rates of iGAS in ABCs counties than ROS, it is still likely that an active population-based laboratory surveillance system led to higher identification of iGAS cases. Despite this higher incidence, the ABCs inclusion criteria of a NF or STSS physician-based diagnosis makes it likely that, even in ABCs counties, these syndromes are still underreported.
- Based on ABCs data, NF and STSS among iGAS cases represent a significant disease burden in contrast to substantially lower reported rates in the ROS. These data demonstrate the limitations of using passive surveillance systems, particularly when clinical information is essential for case classification in addition to lab data.
- This analysis shows the critical importance of an active surveillance system, such as the ABCs, which can be used to provide more accurate national estimates.

## References

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