Validation of NHSN Data: Reports from State Health Departments

Suparna Bagchi, DrPH

HAI Validation Lead

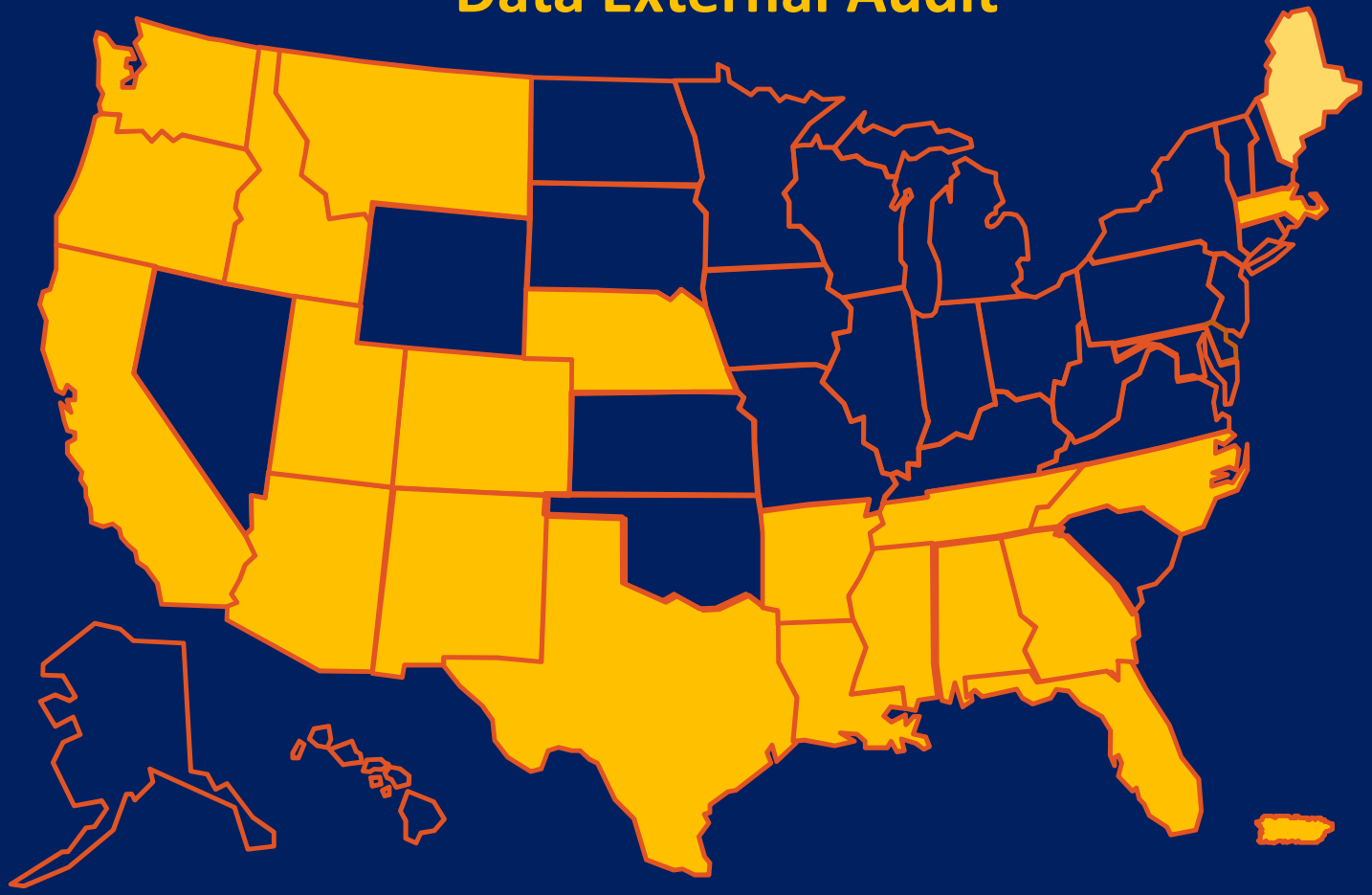
Protocol and Validation Team

March 20, 2018

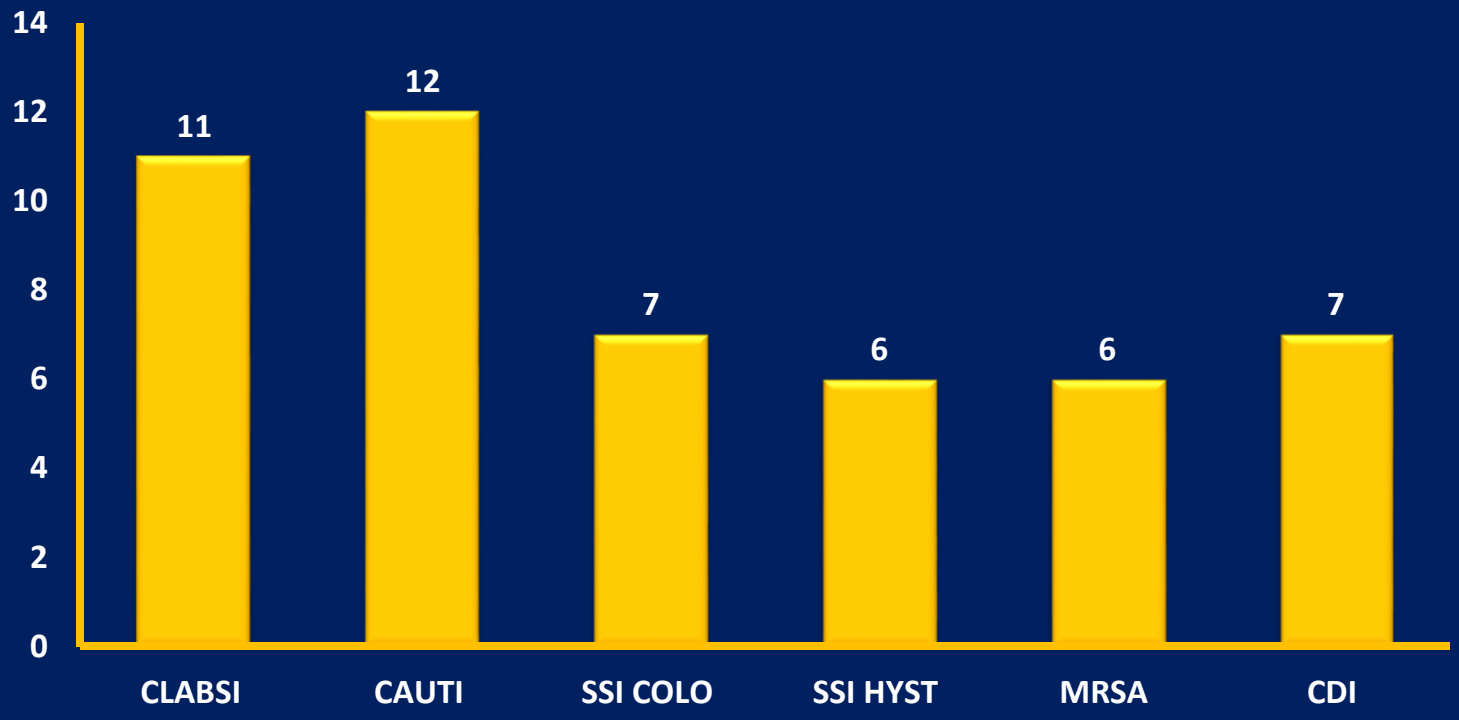
Objectives

- Results from State Department of Health validation studies
- Validation challenges: States and NHSN
- Modifications in 2018 NHSN external validation guidance
- State validation experiences:
  - North Carolina and Massachusetts DPH

States And Territories That Completed 2016 NHSN Data External Audit



2016 Validation Projects: HAI Type



CDC Funded HAI Data Validation Activities

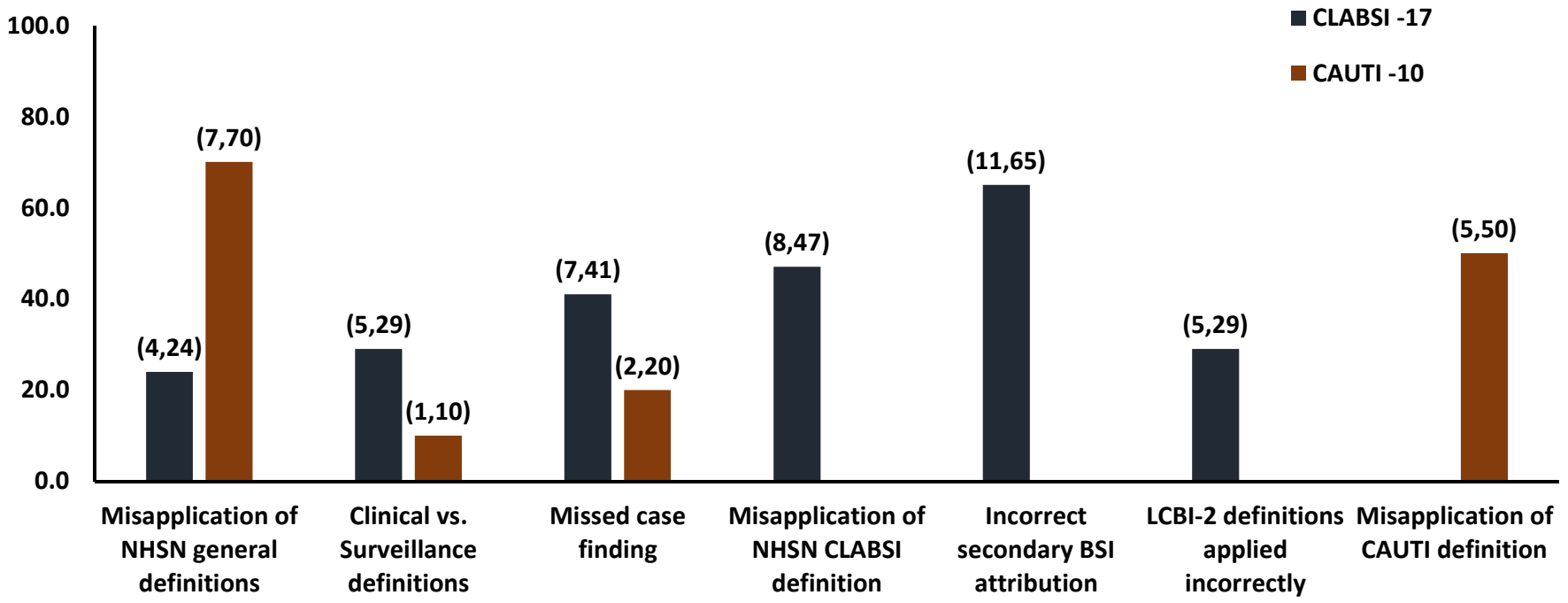
- **Prevention and Public Health Fund (PPHF) Epidemiology and Laboratory Capacity for Infectious Diseases (ELC)**
- **Total Funds: $500,000**
- **Approximate average per award: $50,000-$500,000**
- **FY 2016 – 17: 6 SHDs receiving award (TN,CO,MA,NM,GA,WI)**
- **FY 2017 – 18: 7 SHDs received award (TN, CO, MA, NM, NH, GA, AL)**

Results from State Validations (2009 – Current)

State Validation Results: Overview

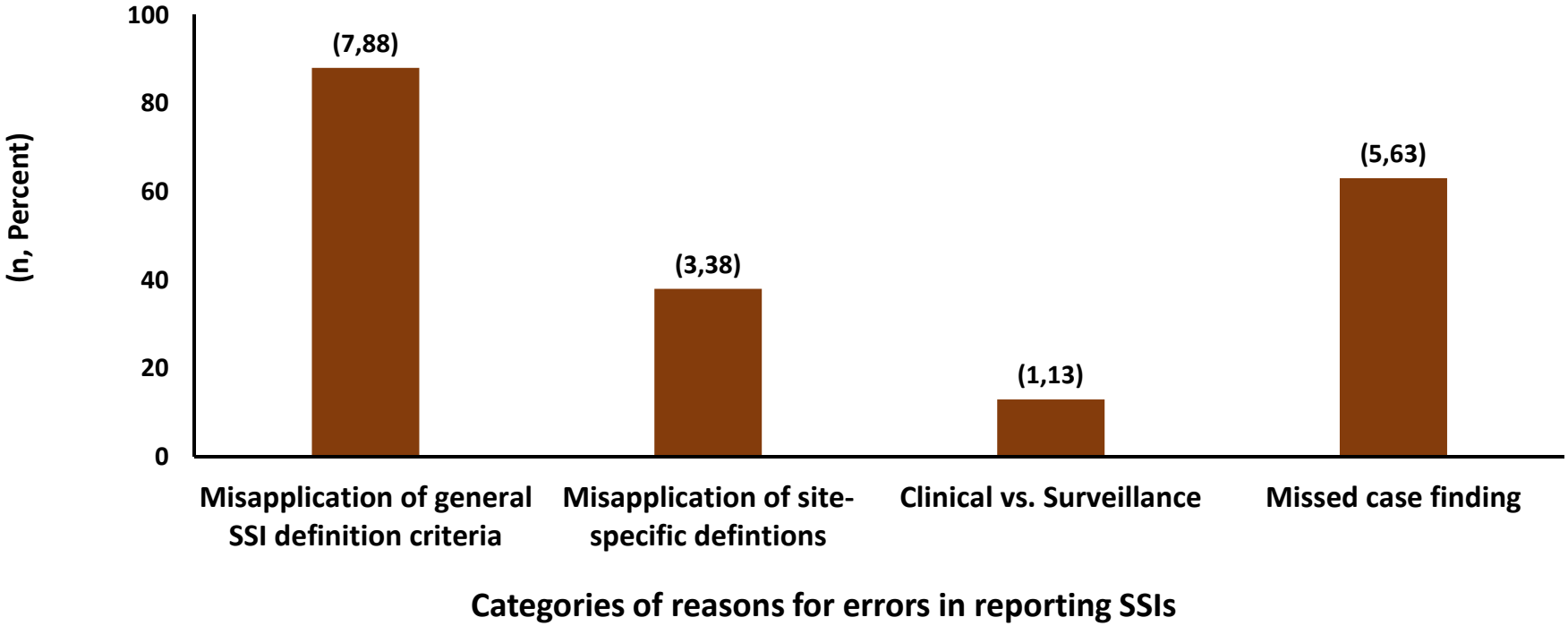
	States	Sensitivity %	Specificity %	Positive Predictive Value %	Negative Predictive Value %	Error Rate % (Range %)
CLABSI	23	82.5	99	95.4	96.9	4.4 (0–22.3)
CAUTI	12	86.8	98.6	93.8	96.8	3.5 (1.0–10.4)
SSI COLO	7	74.9	99.1	95.8	93.4	6.6 (3.4–12.3)
SSI HYST	3	87.9	98.1	91.1	97.3	3.9 (3.6–4.2)
MRSA	3	84.9	92.6	97.4	64.9	9.4 (0.6–18.2)
CDI	6	94.9	93.7	99.4	58.7	5.9 (2.3–2.4)

Reasons for Errors in Reporting: Device Associated HAIs

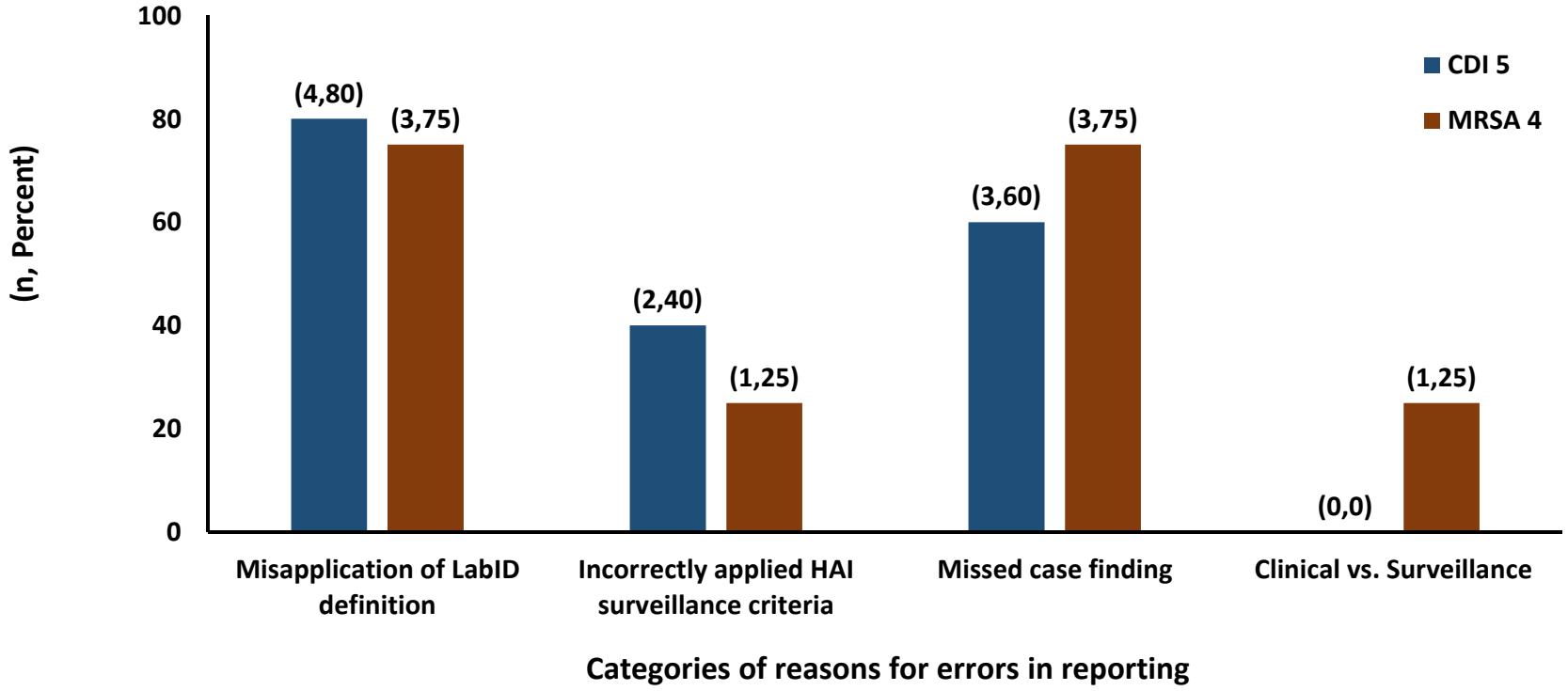


Categories of reasons for errors in reporting CLABSI and CAUTIs

Reasons for Errors in Reporting: Procedure Associated HAIs



Reasons for Errors in Reporting: LabID Events



Successes of SHD validation

- **Opportunity: relationship building between SHD and healthcare facilities within their jurisdiction**

- **Onsite chart reviews: opportunity for education and training to correct errors in reporting**

Challenges Reported by SHD

- Lack of resources to fund travel and personnel
- Unable to follow NHSN guidance of validation – resource intensive
- Unless funded by CDC or state mandate, validation is conducted on ad hoc basis

Challenges for NHSN

- **Deviation from a uniform validation methodology – limited assessment of accuracy measures**
- **Lack of uniformity of reporting accuracy measures – tendency to measure "overall agreement" which looks better**
- **Lack of documentation of reasons for errors in reporting – required for ELC funded states**

NHSN External Validation Guidance Toolkit

- **Step 1: Facility selection using a targeted sampling methodology**
  - **States with < 20 facilities: validate them all**
  - **States with 21 to 149 facilities: select at least 18 targeted facilities + 5% random sample**
  - **States with ≥ 150 facilities: select at least 21 targeted facilities + 5% random sample**
- **Step 2: Selection of medical charts to be reviewed**
  - **Typically 60 charts: 20 events reported to NHSN & 40 candidate events**
- **Step 3: Onsite chart reviews**
  - **Using Medical Record Abstraction Tools (MRATS)**
  - **Survey of the facility coordinator (assess knowledge and practices of NHSN)**

Current Validation Method Approach

- Targeted sampling: facility specific expected events and SIR
- Facilities are sorted based on predicted/expected number of events
- Top tertile:
  - Targeting and prioritization
  - Facility specific SIR relative to median SIR for the top tertile of the facilities
- A facility with relatively low exposure volume that may not report a large number of observed events could still yield a high SIR

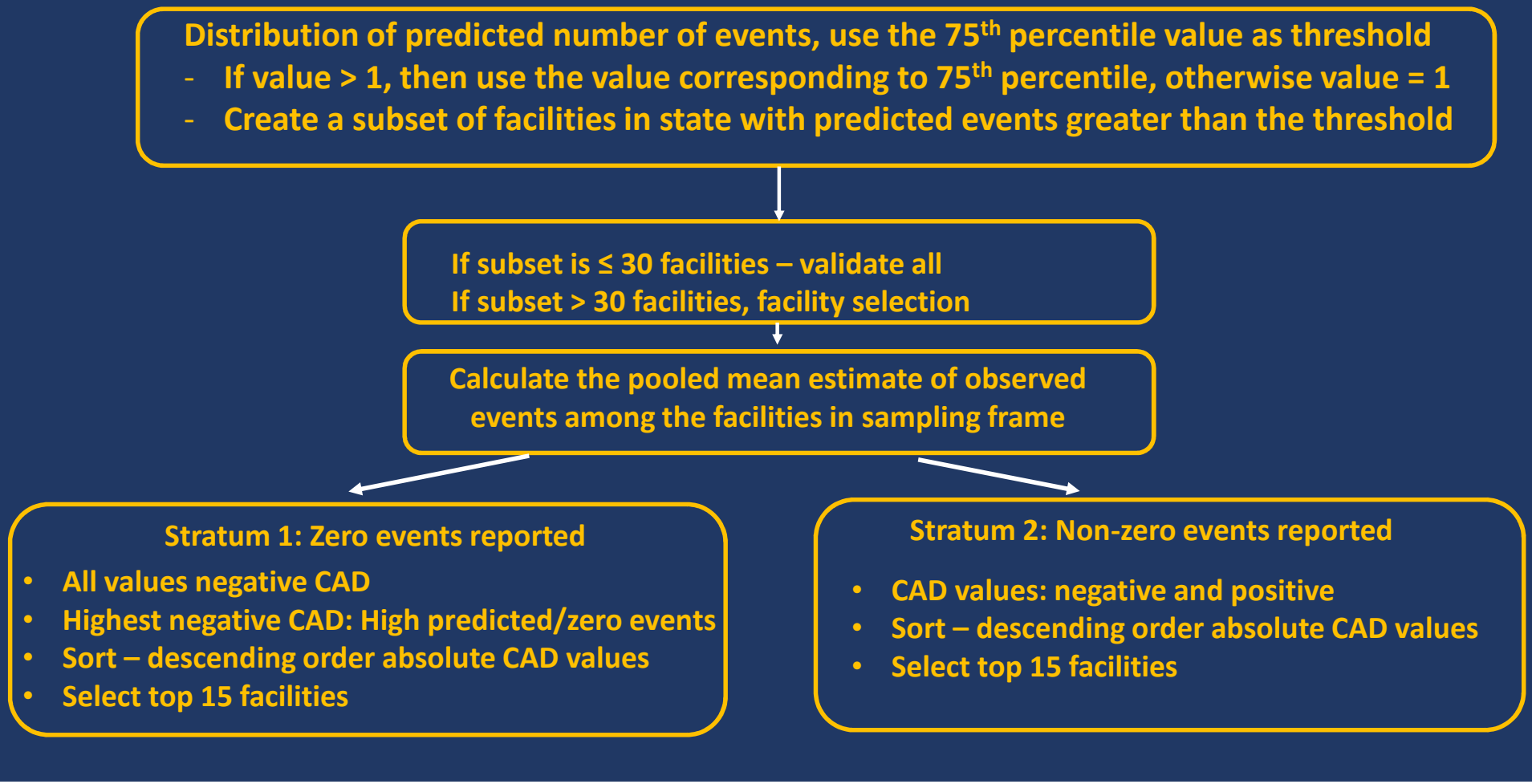
Alternative Approach

- Underreporting of HAI remains primary concern
- Cumulative Attributable Difference (CAD) approach

  CAD = Observed events - Predicted/expected events

- Facilities reporting zero or very few events: negative CAD value
- Prioritization based on highest negative CAD values can help assess the data accuracy among facilities with high predicted/expected and very few or no reported events during a time frame

Facility Sampling Using CAD Approach



Recommended Data Summary

	Auditor Determination		
Facility	**Events**	**Not Events**	
Events reported	**True Positive (a)**	**False Positive (b)** **Over reports**	**(a+b)**
Events not reported	**False Negative (c)** **Missed events**	**True Negative (d)**	**(a+d)**
	(a+c)	**(b+d)**	**Total**

- **True positive (a): facility identified and reported the events and auditor agreed**
- **True negative (d): facility did not identify/report event and auditor agreed**
- **False negative (c): facility did not identify/report event and auditor disagreed (MISSED)**
- **False positive (b): facility identified and reported the events and auditor disagreed (OVER REPORT)**

Recommended Data Analysis

	Auditor Determination		
Facility	Events	Not Events	
Events reported	True Positive (a)	False Positive (b)	(a+b)
Events not reported	False Negative (c)	True Negative (d)	(a+d)
	(a+c)	(b+d)	Total

- **Sensitivity:** Ability of a test to correctly identify those with the disease (true positive rate) = a/(a+c)
- **Specificity:** Ability of the test to correctly identify those without the disease (true negative rate) = d/(b+d)
- **Positive Predictive Value:** Proportion of individuals who test positively (a+b) AND truly have the disease (a) = a/(a+b)
- **Negative Predictive Value:** Proportion of individuals who test negatively (c+d) AND truly do not have the disease (d) = d/ (a+d)

Reasons for Misclassification

- For each misclassified case, list the reasons for errors in reports
- Compute proportion of each error type – identify gaps, training opportunities

Reasons for under-reported CDI events

- Incorrect understanding of protocol definition (n1)
- Laboratory records missed (n2)
- Reason ….

Total Under-reported events

Reasons for over-reported CDI events

- Incorrect specimen (n1)
- Duplicate record (n2)
- Reason ….

Total Over-reported events

MRAT Modified

- Length reduced – validator notes removed
- HAI specific validator abstraction manual
  - Provided detailed notes for each question in the MRAT
- Reasons for error/ misclassification
  - No misclassification
  - Over-reported HAI – reason for error
  - Underreported HAI – reason for error

Moving Forward….

- State Health Departments funded by ELC grants
  - Required: Template of reporting reasons for errors in reporting of each HAI validated - will allow translating the validation findings to actionable items via NHSN training
  - Potentially reduce the HAI validation requirement – 1 HAI per year
  - Potentially increase number of states funded
  - Priority will be given to states not previously funded and have demonstrated HAI validation completion
- States not receiving CDC funding
  - Electronically fillable MRATS
  - Sharing platform: validation resources, success stories, barriers

Questions !

Suparna Bagchi – iyj9@cdc.gov
Jennifer Watkins – nub7@cdc.gov
Bonnie Norrick – ojd8@cdc.gov