

# Evaluation of Varicella Surveillance in Arkansas

<sup>1</sup>Arkansas Department of Health (ADH), <sup>2</sup>CSTE Applied Epidemiology Fellowship

## Background

### Varicella

- Commonly known as chickenpox
- Very contagious disease caused by the varicella-zoster virus (VZV)
- Symptoms include multi-stage itchy rash ranging from red spots to blisters, with tiredness and fever
- Can be serious, especially in babies, adults, and people with weakened immune systems
- Highly contagious and can spread by touching or breathing in viral particles
- Two doses of the varicella vaccine are ~90% effective in preventing disease<sup>1</sup>

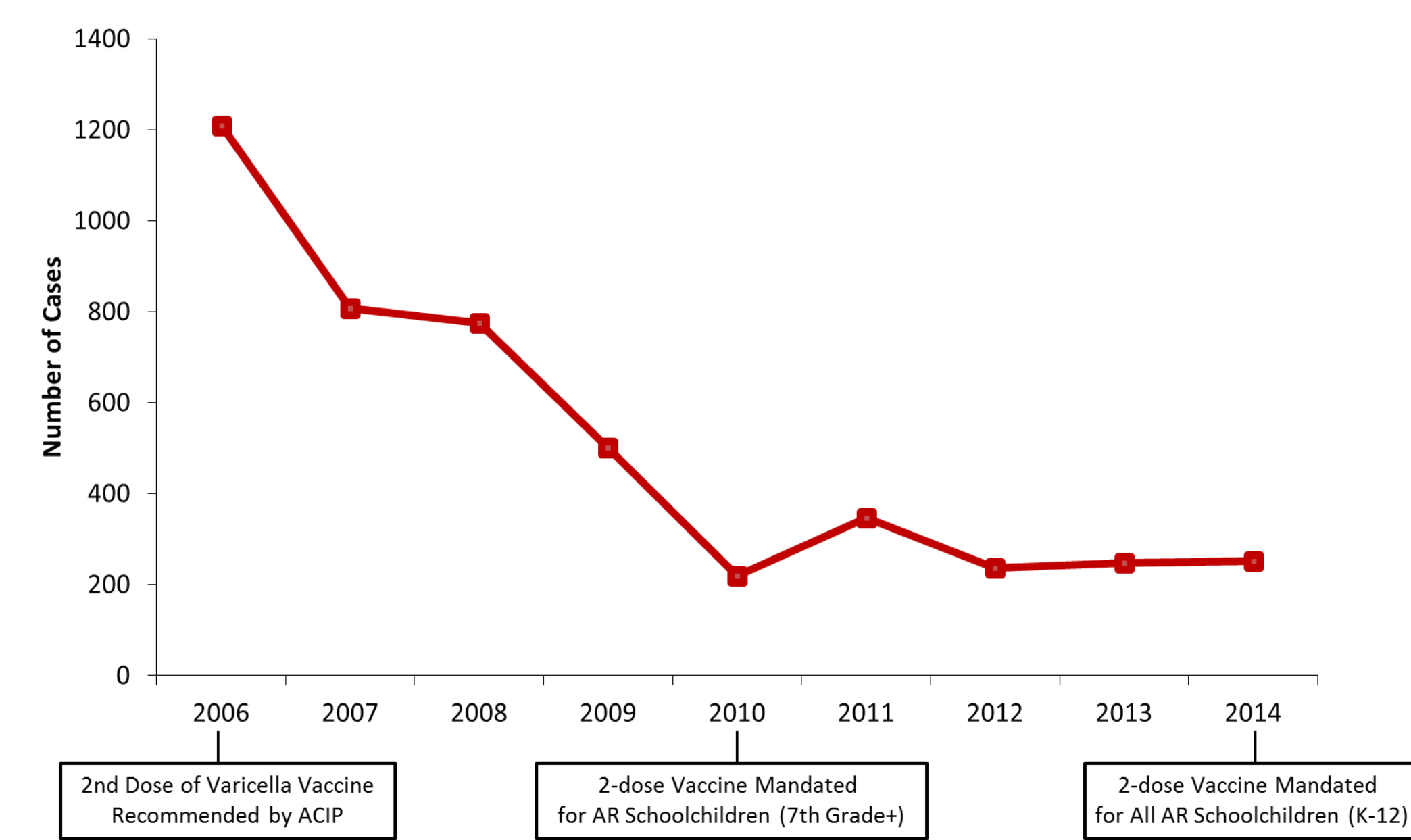


Figure 1. Confirmed and probable cases of varicella (chickenpox) in Arkansas, 2006-2014.



Figure 2. Key surveillance system attributes.<sup>2</sup>

## Methods

- Obtained all reports of varicella in the state from the National Electronic Disease Surveillance System (NEDSS) Base System (NBS) for years 2009-2014
- Obtained hospital discharge records of all patients hospitalized with an ICD-9 code indicative of varicella (052) from the Health Statistics Branch for years 2009-2014, excluding patients with an additional ICD-9 code for zoster (053)
- Determined the percentage of hospitalized cases detected by the surveillance system to calculate the sensitivity
- Determined the number and percentage of case investigations with variables marked as 'unknown' or missing
- Determined the timeliness of reporting a case, completing an investigation, and sending notification to the Centers for Disease Control and Prevention (CDC)
- Discussed surveillance system attributes with the Outbreak Response Section and the NBS Manager

## Results

### Simplicity

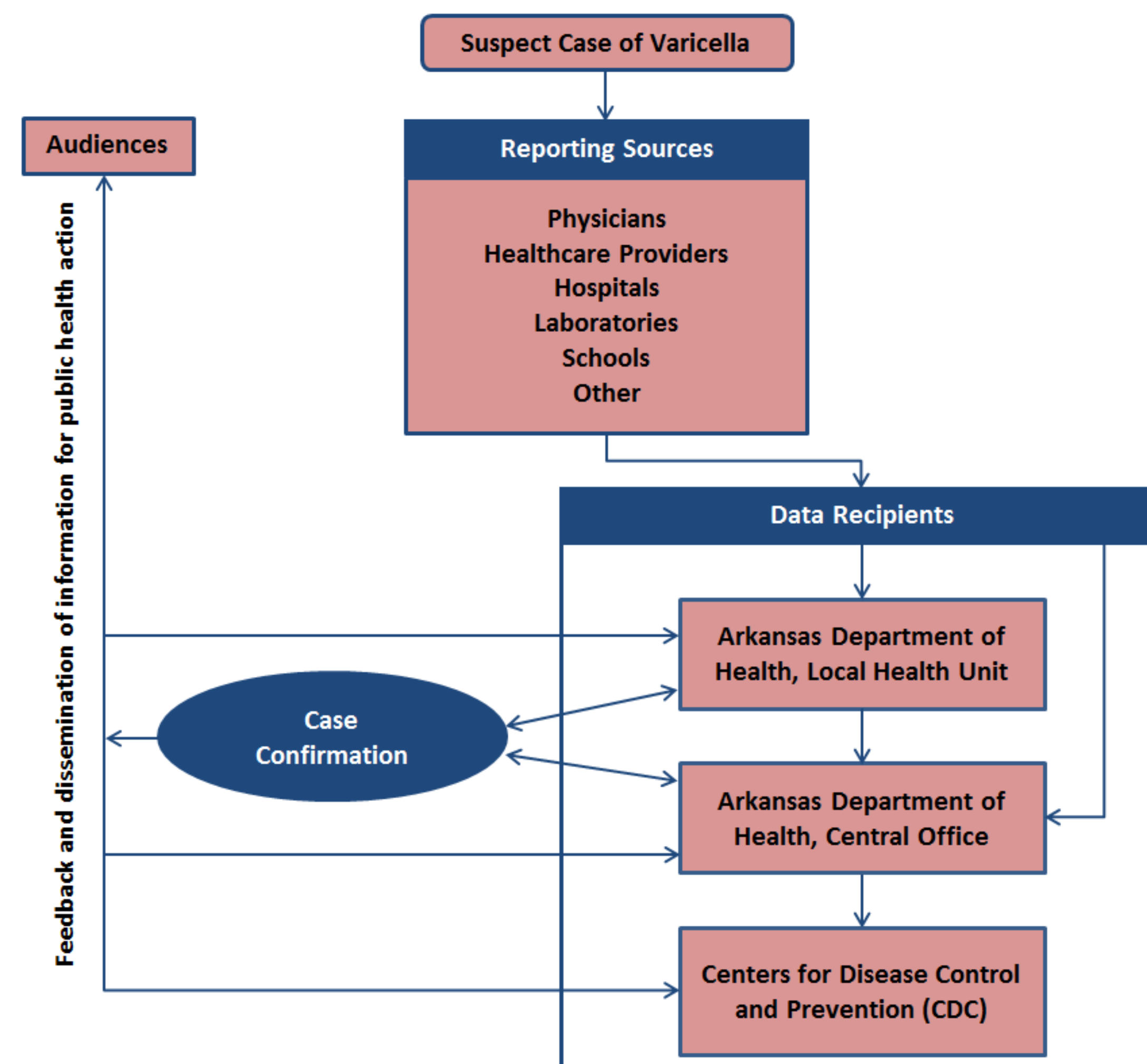


Figure 3. Process of investigating suspect varicella cases in Arkansas.

### Data Quality

Table 1. Percentage of varicella investigations that had missing key variables in 2009 and 2014.

Variable	% Missing or Unknown	
	2009 (n=501)	2014 (n=253)
First Name	0.0%	0.0%
Last Name	0.0%	0.0%
City	0.0%	0.0%
Zip	5.2%	3.2%
Date of Birth	1.0%	0.0%
Gender	0.4%	2.0%
Race	11.2%	4.3%
Reporting Source Name	33.1%	1.2%
Event Date	0.0%	0.0%
Fever (Y/N)	15.6%	2.4%
Total Lesions	15.8%	1.6%
Hospitalized (Y/N)	11.2%	1.6%
Lab Testing (Y/N)	12.2%	4.0%
Vaccine (Y/N)	11.4%	2.4%
# Vaccine Doses	29.5%	16.6%
Previous Diagnosis (Y/N)	34.1%	8.3%
Epi Linked (Y/N)	38.1%	19.0%
Outbreak (Y/N)	21.4%	24.1%

### Acceptability

Table 2. Delay in reporting a case to ADH by year.

	2009	2010	2011	2012	2013	2014
Total Cases	484	219	345	237	248	249
Mean	4.9	5.3	4.8	6.7	6.8	6.3
Median	3	3	3	4	3.5	3
Range	-185 – 367	-50 – 43	-57 – 61	-1 – 224	-4 – 64	0 – 127
St. Dev	24.5	7.8	8.4	6.7	9.8	12.2
Missing	3.5%	<1%	<1%	<1%	<1%	1.6%

Reporting sources include schools, daycares, healthcare providers, hospitals, and laboratories.

### Sensitivity

What percentage of hospitalized cases were detected by the surveillance system? Out of 98 persons hospitalized with an ICD-9 code indicative of varicella at any time during 2009-2014, only 13 (13%) were reported to ADH's surveillance system.

### Timeliness

Table 3. Timeliness of closing out a varicella investigation by year.

Year	2009	2010	2011	2012	2013	2014
Total Cases	501	220	347	237	249	253
Mean	58.9	41.9	34.8	14.0	23.3	15.5
Median	28	16.5	15	7	6	7
Range	0 – 483	0 – 449	0 – 439	0 – 161	0 – 306	0 – 202
St. Dev	94.0	66.7	59.0	19.8	45.1	27.6

Table 4. Timeliness of sending notification of a case to CDC by year.

Year	2009	2010	2011	2012	2013	2014
Total Cases	501	220	347	237	249	253
Mean	195.5	279.2	64.6	48.2	54.8	30.5
Median	146	322	27	17	18	12
Range	2 – 966	25 – 1429	0 – 903	0 – 1022	0 – 817	0 – 382
St. Dev	166.0	142.8	90.9	134.5	100.6	55.6

## Limitations

- Hospital discharge data likely includes zoster cases despite efforts to exclude them, so sensitivity may be higher than presented.
- Negative and extreme values for timeliness ranges are likely due to data entry errors.

## Conclusions

- Data quality and timeliness of reporting and closing out investigations have improved over the years.
  - Assigned data entry task to nurse responsible for investigation instead of Central Office clerk
  - Daily NBS checks and weekly unassigned investigation checks
  - Quality checks before closing investigations
  - Section Chief / Nurse Coordinator does monthly overdue reports with Patient Care Managers, Local Public Health Nursing Director, and Communicable Disease Nurses
- Reporting from patients and providers remains a challenge, though efforts are being made to encourage more individuals to report.

System Attribute	Grade
Simplicity	Good
Data Quality	Fair
Acceptability	Fair
Sensitivity	Poor
Timeliness	Good
Flexibility	Excellent
Representativeness	Fair
Usefulness	Good

## Recommendations

System Attribute	Problem(s)	Recommendations
Simplicity	Case definition is easily applied and interview questions are straightforward, but lab confirmation is hardly utilized	• Recommend lab confirmation of cases, especially in outbreak settings
Data Quality	Some key variables are missing from investigations and accuracy of data entry is not assured	• Educate system users about collecting data to complete key fields and review process of quality assurance
Acceptability	Reporting of suspect cases from some sources to ADH is not done in a timely manner or not done at all	• Identify sources reporting more than 24 hours after diagnosis to encourage timely reporting • Develop strategies to educate all providers about reporting
Sensitivity	Less than 15% of hospitalized cases are detected by the surveillance system	• Identify hospitals/healthcare providers/infection control staff who do not report and strongly encourage reporting
Timeliness	Long investigations could allow transmission of disease by not identifying susceptible contacts in a timely manner	• Continue to improve communication between LHUs, CDNS, and ADH to close investigations within 30 days
Flexibility	If there are new reporting requirements or changes to the case definition, the system needs to easily and effectively adapt	• Continue to keep surveillance system and its users updated as changes occur
Representativeness	There may be missing cases from providers who do not report, for a number of different reasons	• Develop strategies to educate and encourage reporting by all providers • Develop a fillable electronic reporting form
Usefulness	The ability to detect outbreaks or identify trends or risk factors may be limited by missing information for key variables and delaying or not reporting cases by sources	• Focus on improving data quality, sensitivity, acceptability, and representativeness

## References

- Centers for Disease Control and Prevention. "Chickenpox | About | Varicella | CDC". *Cdc.gov*. N.p., 2017. Web. 5 May 2017.
- German RR, Lee LM, Horan JM, Milstein RL, Pertowski CA, Waller MN. Guidelines Working Group Centers for Disease Control & Prevention. 2001. Updated guidelines for evaluating public health surveillance systems: recommendations from the Guidelines Working Group. *MMWR Recomm. Rep.* 50, 1–35; quiz CE31–37.

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