

# Evaluation of Varicella Surveillance in Arkansas

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## 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>

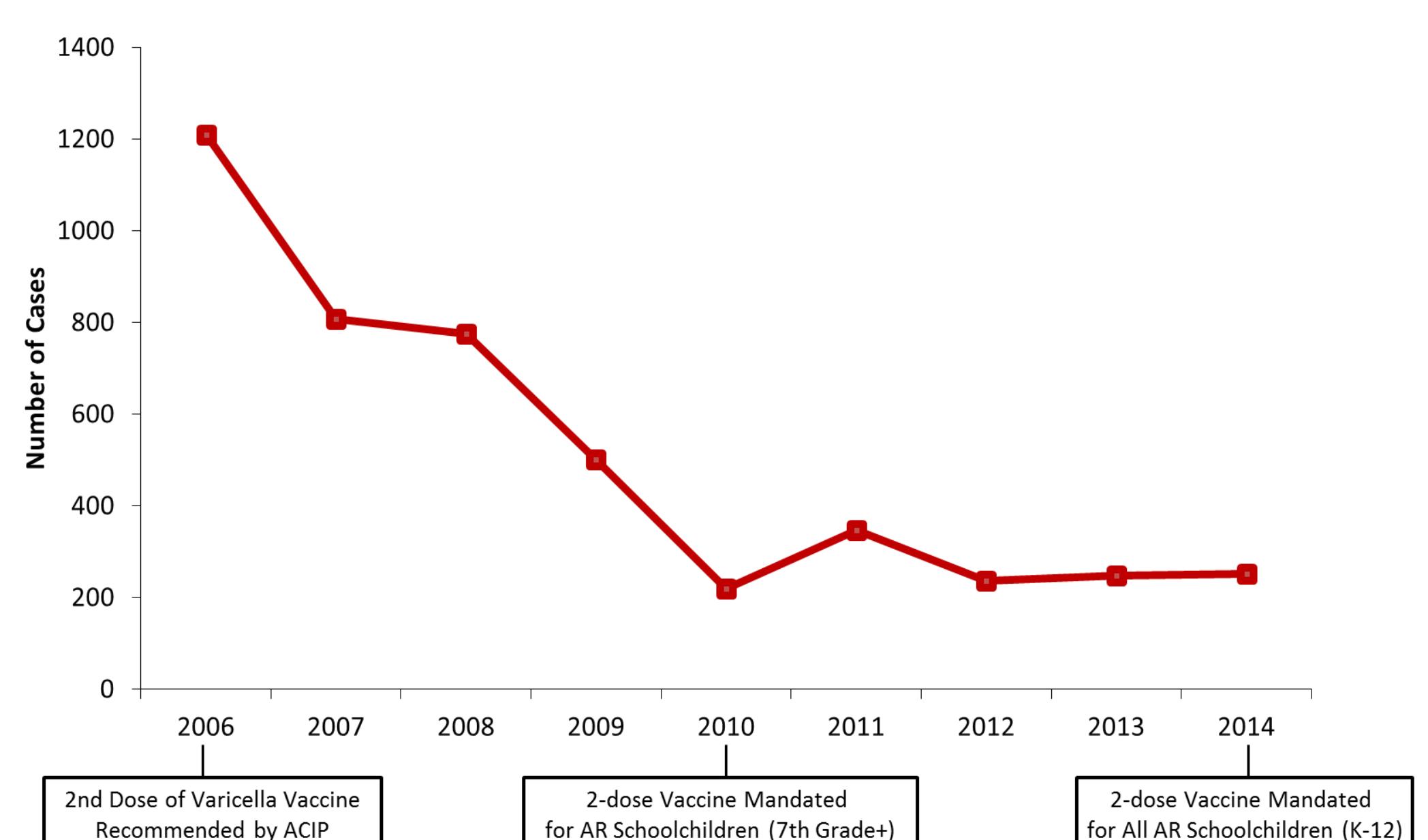


Figure 1. Confirmed and probable cases of varicella (chickenpox) in Arkansas, 2006-2014.

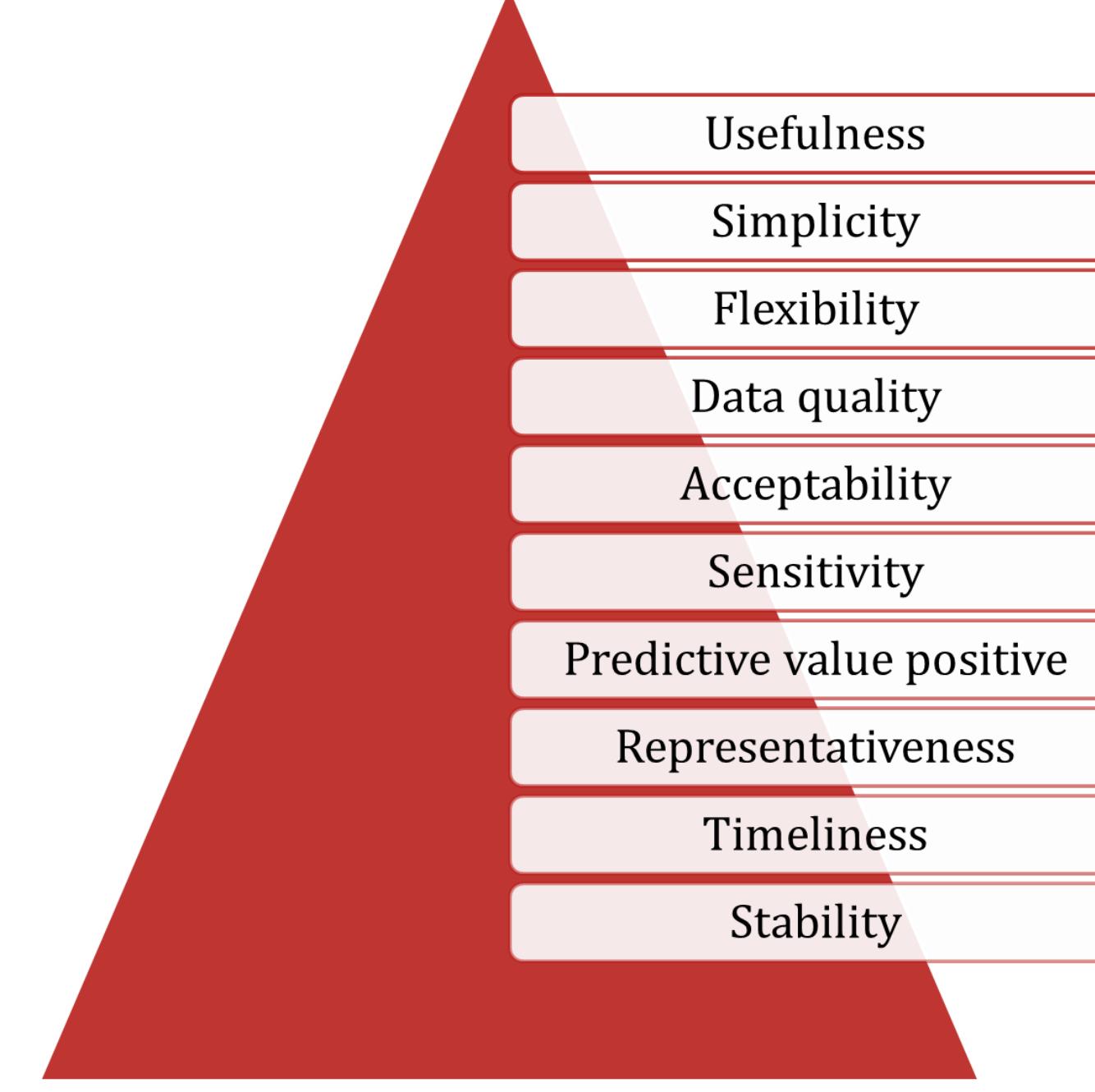


Figure 2. Key surveillance system attributes.<sup>2</sup>

## 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

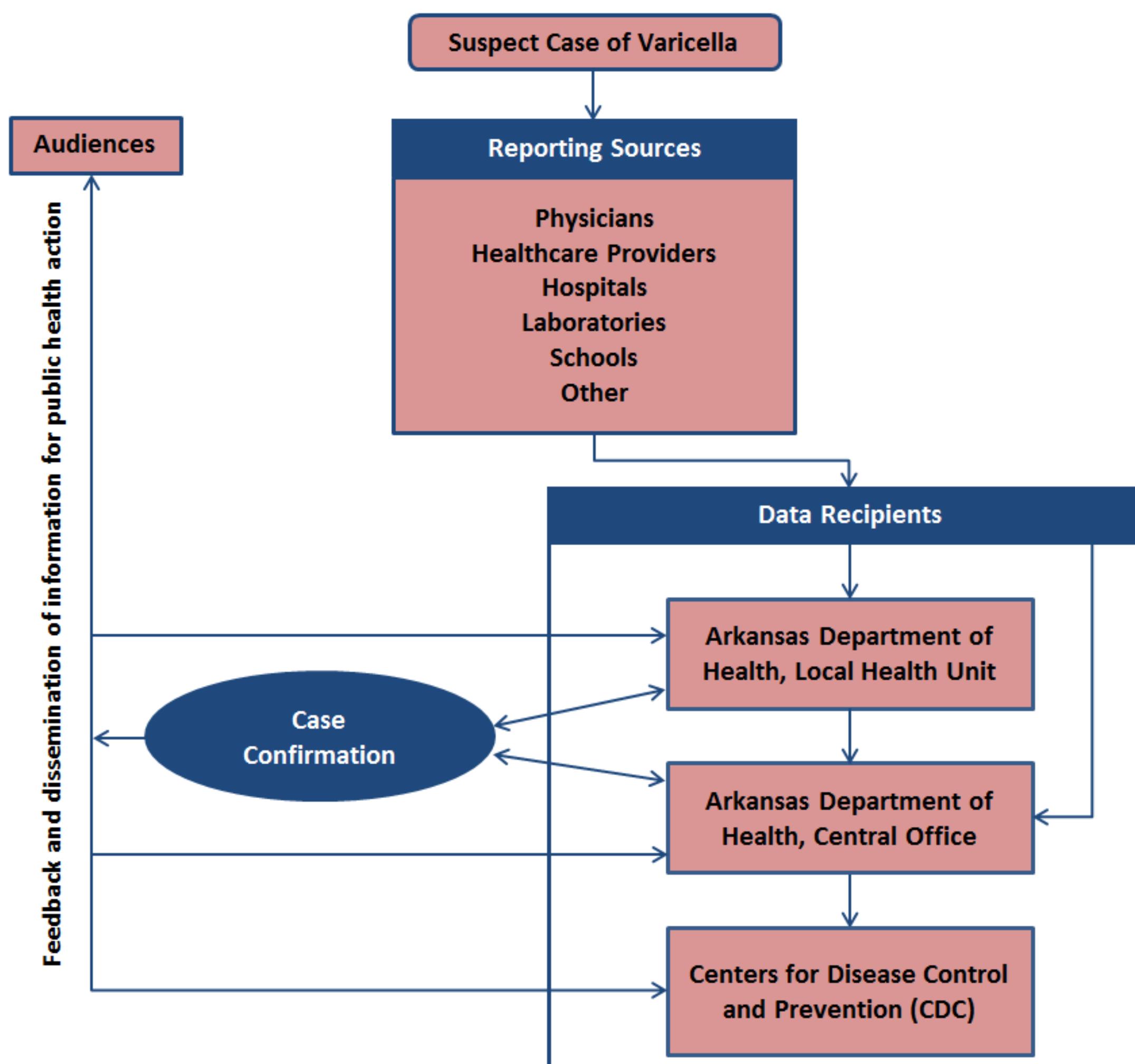


Figure 3. Process of investigating suspect varicella cases in Arkansas.

## Data Quality

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

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

## Acceptability

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

	2009	2010	2011	2012	2013	2014
<b>Total Cases</b>	484	219	345	237	248	249
<b>Mean</b>	4.9	5.3	4.8	6.7	6.8	6.3
<b>Median</b>	3	3	3	4	3.5	3
<b>Range</b>	-185 – 367	-50 – 43	-57 – 61	-1 – 224	-4 – 64	0 – 127
<b>St. Dev</b>	24.5	7.8	8.4	6.7	9.8	12.2
<b>Missing</b>	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
<b>Total Cases</b>	501	220	347	237	249	253
<b>Mean</b>	58.9	41.9	34.8	14.0	23.3	15.5
<b>Median</b>	28	16.5	15	7	6	7
<b>Range</b>	0 – 483	0 – 449	0 – 439	0 – 161	0 – 306	0 – 202
<b>St. Dev</b>	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
<b>Total Cases</b>	501	220	347	237	249	253
<b>Mean</b>	195.5	279.2	64.6	48.2	54.8	30.5
<b>Median</b>	146	322	27	17	18	12
<b>Range</b>	2 – 966	25 – 1429	0 – 903	0 – 1022	0 – 817	0 – 382
<b>St. Dev</b>	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.

## Recommendations

System Attribute	Problem(s)	Recommendations
<b>Simplicity</b>	Case definition is easily applied and interview questions are straightforward, but lab confirmation is hardly utilized	<ul style="list-style-type: none"> <li>Recommend lab confirmation of cases, especially in outbreak settings</li> </ul>
<b>Data Quality</b>	Some key variables are missing from investigations and accuracy of data entry is not assured	<ul style="list-style-type: none"> <li>Educate system users about collecting data to complete key fields and review process of quality assurance</li> </ul>
<b>Acceptability</b>	Reporting of suspect cases from some sources to ADH is not done in a timely manner or not done at all	<ul style="list-style-type: none"> <li>Identify sources reporting more than 24 hours after diagnosis to encourage timely reporting</li> <li>Develop strategies to educate all providers about reporting</li> </ul>
<b>Sensitivity</b>	Less than 15% of hospitalized cases are detected by the surveillance system	<ul style="list-style-type: none"> <li>Identify hospitals/healthcare providers/infection control staff who do not report and strongly encourage reporting</li> </ul>
<b>Timeliness</b>	Long investigations could allow transmission of disease by not identifying susceptible contacts in a timely manner	<ul style="list-style-type: none"> <li>Continue to improve communication between LHSUs, CDNS, and ADH to close investigations within 30 days</li> </ul>
<b>Flexibility</b>	If there are new reporting requirements or changes to the case definition, the system needs to easily and effectively adapt	<ul style="list-style-type: none"> <li>Continue to keep surveillance system and its users updated as changes occur</li> </ul>
<b>Representativeness</b>	There may be missing cases from providers who do not report, for a number of different reasons	<ul style="list-style-type: none"> <li>Develop strategies to educate and encourage reporting by all providers</li> <li>Develop a fillable electronic reporting form</li> </ul>
<b>Usefulness</b>	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	<ul style="list-style-type: none"> <li>Focus on improving data quality, sensitivity, acceptability, and representativeness</li> </ul>

## 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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