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Fellow, Cohort 2015
Measles surveillance

- Effective surveillance key in measles control, elimination and evaluation of control efforts
- Weak surveillance system is a risk for spread and resurgence of diseases
- Integrated Disease Surveillance and Response system used for measles surveillance
  - Passive surveillance (eHMIS)
  - Active surveillance (case-based surveillance)
Case-based surveillance started in Uganda; 2003

- Strategy establishment towards accelerated measles control
- Enhances the completeness passive surveillance
- Laboratory confirmation is a critical component;
  - excludes other rash illnesses
  - document decline and progress towards elimination
  - Traces importations versus indigenous viruses
Surveillance indicator targets for elimination of measles

- Proportion of suspected cases with blood sample collected: Target ≥ 80%
- Proportion of lab confirmed measles cases: Target < 10% of investigated cases confirmed by serology
Objectives

- Determine the sensitivity of measles surveillance system
- Estimate the positive predictive value of the system
Definitions

- Sensitivity: Ability to detect outbreaks and monitor changes in the number of cases over time.
- Positive predictive value: Proportion of true measles IgM (+) alerts detected by the system.
Definition of an alert

- **IDSR alert**: ≥1 suspected measles cases reported by a district in a week
- **Case Based Surveillance alert**: ≥1 suspected cases with a sample collected in the corresponding week
- **Positive alert**: Any alert with one of the sample measles IgM (+)
Data sources

- Reviewed weekly measles surveillance data 2012-2015
  - Electronic Health Management Information System
  - Case-based laboratory backed surveillance
Estimation of sensitivity and PPV

- **Sensitivity** = \( \frac{\text{Alerts with blood samples collected}}{\text{Alerts from eHMIS}} \)

- **PPV** = \( \frac{\text{Alerts measles IgM (+)}}{\text{Alerts with blood samples collected}} \)
Sensitivity of measles surveillance system: Sub-optimal

<table>
<thead>
<tr>
<th>Year</th>
<th>IDSR alerts</th>
<th>Alerts sample taken</th>
<th>% of alerts sample taken off</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>190</td>
<td>850</td>
<td>NA*</td>
</tr>
<tr>
<td>2013</td>
<td>1140</td>
<td>713</td>
<td>63</td>
</tr>
<tr>
<td>2014</td>
<td>1086</td>
<td>916</td>
<td>84</td>
</tr>
<tr>
<td>2015</td>
<td>1553</td>
<td>1083</td>
<td>70</td>
</tr>
<tr>
<td>2013-15</td>
<td>3779</td>
<td>2712</td>
<td>72</td>
</tr>
</tbody>
</table>
Decreasing positive predictive value; good sign towards elimination

<table>
<thead>
<tr>
<th>Year</th>
<th>Alerts sample taken</th>
<th>IgM (+) alerts</th>
<th>PPV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>850</td>
<td>310</td>
<td>36</td>
</tr>
<tr>
<td>2013</td>
<td>713</td>
<td>79</td>
<td>11</td>
</tr>
<tr>
<td>2014</td>
<td>916</td>
<td>92</td>
<td>10</td>
</tr>
<tr>
<td>2015</td>
<td>1083</td>
<td>68</td>
<td>6.3</td>
</tr>
<tr>
<td>2013-15</td>
<td>2712</td>
<td>239</td>
<td>9.1</td>
</tr>
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</table>
Strength and limitations

- Compared two national databases
  - eHMIS
  - Case-based surveillance with laboratory confirmation
- Unable to assess other surveillance attributes because of limited data
- Lacked information external to the system to determine the true frequency of measles outbreaks
Conclusion

- Sensitivity of measles surveillance system was sub-optimal while the PPV showed that true measles cases occur rarely in Uganda.
Public health implication

- Measles surveillance system does not detect all outbreaks in the community
- Measles cases reported in the eHMIS do not reflect true numbers
- Case-based surveillance needed for all suspected measles cases
Recommendation

- MOH/UNEPI should strengthen CBS to ensure all alerts reported have blood samples collected for lab confirmation
Acknowledgements

- UNEPI/MOH
- US CDC
- EPI Laboratory
- PHFP
- WHO
- Districts
2 types of measles surveillance in Uganda

- Passive surveillance
  - measles data in registers reported periodically using monthly, quarterly and annual reports to MOH
  - Yields limited data because many patients don’t come to health facilities
  - Cases may not be correctly classified or reported

- Active surveillance
  - Surveillance officers regularly visit the most utilized health centers and other service delivery points
  - Ensures all cases are reported rather than waiting report
  - Improves reliability of data about disease burden
2020, target for measles elimination in WHO-AFRO

- Goal was adopted by the WHO African region in 2011
- Strategic Advisory Group of Experts affirmed that measles could be eradicated (Nov 2010)
Age distribution of cases: 2012-2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Median age (yrs)</th>
<th>IQR</th>
<th>Male n (%)</th>
<th>Female n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>3.0</td>
<td>1.3-6.0</td>
<td>261 (49)</td>
<td>227 (51)</td>
<td>538</td>
</tr>
<tr>
<td>2013</td>
<td>2.3</td>
<td>1.0-9.8</td>
<td>49 (49)</td>
<td>50 (51)</td>
<td>99</td>
</tr>
<tr>
<td>2014</td>
<td>1.7</td>
<td>0.8-5.2</td>
<td>74 (51)</td>
<td>70 (49)</td>
<td>144</td>
</tr>
<tr>
<td>2015</td>
<td>2.5</td>
<td>1.3-6.5</td>
<td>105 (54)</td>
<td>90 (46)</td>
<td>195</td>
</tr>
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