The WHO coordinated Invasive Bacterial Vaccine Preventable Disease (IB-VPD) sentinel hospital surveillance network was formed in 2008; this bulletin presents a summary of case-based surveillance data as reported by WHO Regions of Africa (AFR), Eastern Mediterranean (EMR), Europe (EUR) and Western Pacific (WPR), and aggregate surveillance data from the WHO Regions of the Americas (AMR) and South-East Asia (SEAR) for the period from January to December 2013. Fifty-seven WHO Member States reported data to the WHO (Figure 1, Table 1.)

Table 1: Number of countries and sites that reported data and number of children <5 years of age hospitalized for suspected meningitis, pneumonia and sepsis in the WHO Global Invasive Bacterial Vaccine Preventable Disease Surveillance Network, January—December 2013

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Member States reported data to WHO (% Gavi-eligible)</th>
<th>Number of sites reported data to WHO (% Gavi-eligible)</th>
<th>Number of children &lt;5 years of age enrolled with meningitis* (% of total global cases)</th>
<th>Number (%) of enrolled suspect meningitis cases with cerebrospinal fluid collected</th>
<th>Number of children &lt;5 years of age enrolled with pneumonia or sepsis (% of total global cases)</th>
<th>Number (%) of enrolled pneumonia or sepsis cases with blood collected for culture</th>
<th>Total number of meningitis, pneumonia or sepsis cases enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR</td>
<td>29 (90)</td>
<td>46 (91)</td>
<td>11,114 (42)</td>
<td>10,826 (97)</td>
<td>25 (&lt;1)*</td>
<td>N/A</td>
<td>11,139</td>
</tr>
<tr>
<td>AMR</td>
<td>11 (27)</td>
<td>40 (30)</td>
<td>6,391 (24)</td>
<td>5,675 (89)</td>
<td>24,996 (75)</td>
<td>9,270 (37)</td>
<td>31,387</td>
</tr>
<tr>
<td>EMR</td>
<td>5 (80)</td>
<td>22 (86)</td>
<td>4,424 (17)</td>
<td>4,267 (96)</td>
<td>755 (2)</td>
<td>206 (27)</td>
<td>5,179</td>
</tr>
<tr>
<td>EUR</td>
<td>6 (83)</td>
<td>14 (79)</td>
<td>685 (3)</td>
<td>678 (99)</td>
<td>N/A</td>
<td>N/A</td>
<td>685</td>
</tr>
<tr>
<td>SEAR</td>
<td>3 (100)</td>
<td>5 (100)</td>
<td>3,261 (12)</td>
<td>1,475 (45)</td>
<td>5,587 (17)</td>
<td>2,865 (51)</td>
<td>8,848</td>
</tr>
<tr>
<td>WPR</td>
<td>3 (100)</td>
<td>14 (100)</td>
<td>780 (3)</td>
<td>349 (45)</td>
<td>1,929 (6)</td>
<td>1,927 (100)</td>
<td>2,709</td>
</tr>
<tr>
<td>Total</td>
<td>57 (77)</td>
<td>141 (73)</td>
<td>26,655 (100)</td>
<td>23,270 (87)</td>
<td>33,292 (100)</td>
<td>14,268 (43)</td>
<td>59,947</td>
</tr>
</tbody>
</table>

Notes: Brazil conducts laboratory based surveillance and accounts for 5,427 of the suspected meningitis cases enrolled in AMR.

*Any child aged 0-59 months admitted to a sentinel hospital conducting surveillance with sudden onset of fever (> 38.5 °C rectal or 38.0 °C axillary) and one of the following signs: neck stiffness, altered consciousness with no other alternative diagnosis, or other meningo-encephalitis signs: 1. every patient aged under 5 years of age hospitalized with a clinical diagnosis of meningitis.

**Any child aged 0-59 months admitted to a sentinel hospital conducting surveillance, demonstrating a cough or difficulty breathing and displaying fast breathing when calm (defined by age): 1. Age 0 to <2 months: 60 breaths/minute or more; 2. Age 2 to <12 months: 50 breaths/minute or more; 3. Age 12 to <59 months: 40 breaths/minute or more

*a Cases classified as suspect meningitis or pneumonia based on 1) admission diagnosis; 2) clinical characteristics; or 3) specimen collected.
b AFR Member States do not conduct Tier 2 surveillance but a limited number of cases were entered with an admission diagnosis of Pneumonia or Sepsis.

**Data from the WHO-coordinated Global IB-VPD Surveillance Network as at October 2014. Map production: Immunization Vaccines and Biologicals, (IVB), World Health Organization, Updated on 29 January 2015.
Among Member States that reported data to WHO, 29 (51%) were located in the African Region. Seventy-seven percent of the sentinel sites that reported data were located in a Member State eligible for Gavi, the Vaccine Alliance, funding for surveillance. A total of 59,947 children <5 years of age were hospitalized for treatment of suspected meningitis, pneumonia or sepsis and enrolled in surveillance (Table 1.). Forty-one percent of the enrolled suspect meningitis cases were from the AFR. Among the enrolled children with suspect pneumonia and sepsis, 75% were from the WHO Region of the Americas.

Surveillance sites are assessed for consistency of surveillance performance based on the twelve month reporting period covered in the data analysis (Table 2). The criteria for a site to be considered a consistently performing site are:

1. Enrolled cases all 12 months of the year
2. Enrolled >=100 cases (Tier 1) or >=500 cases (Tier 2/3); OR
1. Enrolled cases all 12 months of the year
2. Enrolled >=50 cases (Tier 1) or >=250 cases (Tier 2/3)
3. Collected specimens (blood or CSF) on >90% of enrolled cases.

Table 2—Number of reporting countries and sites that met criteria for consistent surveillance performance and number of children <5 years of age hospitalized for the treatment of suspected meningitis, pneumonia or sepsis in consistently performing and targeted sites, WHO Invasive Bacterial Vaccine Preventable Disease Network, January—December 2013

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Member States with at least one site meeting criteria</th>
<th>Number of sites meeting criteria</th>
<th>Number of sites receiving targeted support from WHO meeting criteria for consistent performance</th>
<th>Of sites receiving WHO targeted support and meeting criteria for consistent performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of children &lt;5 years of age enrolled with suspect meningitis (% of total global cases)</td>
<td>Number of children &lt;5 years of age enrolled with suspect pneumonia or sepsis (% of total global cases)</td>
<td>Total number of meningitis, pneumonia or sepsis cases enrolled</td>
<td></td>
</tr>
<tr>
<td>AFR</td>
<td>20</td>
<td>27</td>
<td>24</td>
<td>7,149 (66)</td>
</tr>
<tr>
<td>AMR</td>
<td>10</td>
<td>18</td>
<td>3</td>
<td>210 (2)</td>
</tr>
<tr>
<td>EMR</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>3,092 (28)</td>
</tr>
<tr>
<td>EUR</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>222 (2)</td>
</tr>
<tr>
<td>SEAR**</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>WPR</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>196 (2)</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>56</td>
<td>37</td>
<td>10,869 (100)</td>
</tr>
</tbody>
</table>

Data from the WHO-coordinated Global Invasive Bacterial Vaccine Preventable Surveillance Network as of October 2014.

*Targeted sites are sites from Gavi-eligible countries that receive continued financial support from WHO based on recommendations from the 2013 Strategic Review.

**SEAR did not report month of admission therefore consistency criteria could not be calculated.

Criteria for sites for consistent surveillance performance: 1. Enrolled cases all 12 months of the year AND 2. Enrolled >=100 cases (Tier 1) or >=500 cases (Tier 2/3); OR 1. Enrolled cases all 12 months of the year AND 2. Enrolled >=50 cases (Tier 1) or >=250 cases (Tier 2/3) AND 3. Collected specimens (blood or CSF) on >90% of enrolled cases.

Global Invasive Bacterial Vaccine Preventable Disease Laboratory Data

The Global IB-VPD laboratory network supports the laboratory confirmation of disease caused by Streptococcus pneumoniae, (Spn) Haemophilus influenzae (HI) and Neisseria meningitidis (Nm) and identifying the circulating serotypes. In the post-vaccine introduction period, the laboratories must continue to generate high quality data to monitor disease trends over time. In 2013, the laboratory network included 121 Sentinel Hospital Laboratories, 21 National Laboratories, nine Regional Reference Laboratories (RRL), and one Global Reference Laboratory (GRL) (Figure 3). Laboratory performance is monitored through quality assurance/quality control programmes and on-site assessment of the laboratories using a standardized questionnaire.
and direct observation. An external quality assessment (EQA) programme helps assess laboratory performance in diagnosis and serotyping/serogrouping of the identified pathogens. In 2013, the EQA showed a high level of laboratory proficiency with 87% of labs passing the EQA exercise. WHO and the GRL at the Centers for Disease Control and Prevention (CDC), Atlanta have contributed to reinforcing laboratory capacities at the RRLs for molecular detection and typing using PCR methods.

Initial testing at the sentinel site includes culture, Gram stain and rapid diagnostic testing. Within the network, national and sentinel site laboratories refer clinical specimens from suspected, probable and confirmed meningitis cases to the RRL for additional laboratory investigation and confirmatory testing. The sample referral system has challenges due to political, logistical and resource issues.

Figure 4 shows the distribution of Spn, HI and Nm by region for 2013 from the RRL database. RRL data is currently not fully linked to the sentinel site data so there are discrepancies in the number of cases reported from the Member States. Serotype/serogroup could be assigned to 83% of the positive cases while 17% could not be assigned a serotype/serogroup because of technical limitations such as low DNA load in the clinical samples or insufficient amount of extracted DNA to complete all the PCR runs for serotyping.

Substantial progress has been made in establishing and sustaining the first global IB-VPD laboratory network, developing standardized laboratory procedures and guidelines for data collection, and implementing quality assurance/quality control systems. Efforts are underway to optimize critical laboratory procedures used at the global and regional reference laboratories to facilitate inter-laboratory data comparability and improve serotype/serogroup data quality and linkage to epidemiological data.

Analysis of Linking Laboratory & Clinical Data

Data from PCR testing at the RRLs in the WHO IB-VPD surveillance network are being linked into the sentinel site clinical database. To use the PCR results for in-depth epidemiological analyses, such as future PCV impact studies, the RRL PCR data must be linked to individual cases at each sentinel site.

Case-based data from RRLs was received at WHO for the surveillance year 2013. An effort was made to link the existing case-based clinical data in the separate surveillance database and the RRL database using unique patient IDs.

Figure 2 shows the results of analysis of the cases where the PCR data could be linked to the individual cases. Only countries that had case-based data available from the sentinel site and RRL for 2013 were included. There were 27 countries from AFR, EMR, EUR and WPR that contributed data to this analysis. Globally, one-third (34%) of cases could be linked. This percentage varied substantially between regions, ranging from 0% to 98%.

The percentage of linked cases was calculated as the number of cases that could be linked between the sentinel site and RRL divided by the total number of samples tested at the RRL. Activities will focus on increasing the percentage of data that can be linked in 2014 and beyond. This will include site visits to attempt the historical linking of data to maximize the available PCR data for analysis.
Conclusions, Limitations and Next Steps

Conclusions
Fifty-seven Member States, with 141 sentinel hospital sites, reported 2013 data to WHO as at October 2014. Among the sites, 70 (50%), received targeted financial and technical support from WHO. Globally, 36 (63%) Member States had at least one sentinel site that met criteria for consistency of surveillance practices. Linkage of laboratory and clinical data has begun and 34% of the 2013 cases could be linked. As of January 2015, in total 47 (82%) of the Member States have introduced PCV10 or PCV13.

Limitations
The reported surveillance data still has limitations and should be cautiously interpreted. The most recent 2013 data available still do not reflect the outcomes of the changes implemented following the strategic review conducted in 2013. “Zero reporting” was not yet initiated in 2013 and thus the data analysis cannot differentiate between the absence of a case from the lack of surveillance activity.

2014 Activities
During 2013, a global strategic review of the sentinel surveillance network was conducted, and 50 recommendations were made to improve the quality of data generated. During 2014, significant progress was made to implement recommendations. Network management was strengthened with the use of a Performance Management Framework to track implementation status of each recommendation. A major achievement was the transition to standardized, case-based reporting with quarterly data sharing plus feedback of standard process and performance indicators to sites. Data management processes continue to be improved toward having a more systematic approach in reporting, cleaning, analysing and interpreting data. The reference laboratories are appropriately supporting sites and network laboratory performance has been successfully monitored by the global EQA program as well as other quality measures being implemented. Sentinel site and laboratory assessments have been prioritized but have not yet been able to include all priority sites. Beginning in 2014, RRLs only processed specimens with a unique identification number and it is thus anticipated that a larger percent of cases will have laboratory testing data from the RRL linked to individual cases.

Thus far, the surveillance network data has contributed to vaccine introduction decisions and the surveillance networks have been used as platforms to conduct vaccine impact evaluations. Moving forward, the rapid introduction of PCV by Member States now requires the network to focus on improving baseline data for sites in non-vaccine using Member States and to ensure consistent surveillance practices in vaccine using Member States. The web-based data management tool that is being developed (refer to previous bulletin) has great potential to improve data quality and accessibility at all levels and may be expanded to other vaccine preventable diseases in due course.

Key Recommendations for Implementation in 2015
- Strengthen involvement of Ministry of Health;
- By end-April 2015, IB-VPD specimen sharing agreements should be established between all 71 IB-VPD target hospitals and RRLs;
- All IB-VPD cerebrospinal fluid specimens should be tested by PCR at an RRL;
- Further focus efforts and define a subset of sites where PCV impact evaluations may be feasible;
- Link clinical and laboratory data by use of unique identification numbers;
- Zero reporting should be implemented at all sites;
- Finalize the web-based data management tool.

Acknowledgements
WHO gratefully acknowledges the dedicated efforts of the numerous individuals and organizations involved with compiling this surveillance information, including Ministries of Health, sentinel hospitals, as well as the network of global, regional and national reference laboratories. WHO also gratefully acknowledges the financial support from Gavi, the Vaccine Alliance, that is provided eligible countries.