

# Meeting Report

## Regional Workshop on Surveillance For New Vaccine-Preventable Diseases



30 November–2 December 2011  
Manila, Philippines

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**REPORT**

**REGIONAL WORKSHOP ON SURVEILLANCE  
FOR NEW VACCINE-PREVENTABLE DISEASES**

Convened by:

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## NOTE

The views expressed in this report are those of the participants in the Regional Workshop on Surveillance for New Vaccine-Preventable Diseases and do not necessarily reflect the policies of the World Health Organization.

This report has been prepared by the World Health Organization Regional Office for the Western Pacific for governments of Member States in the Region and for those who participated in the Regional Workshop on Surveillance for New Vaccine-Preventable Diseases, which was held from 30 November to 2 December 2011 in Manila, Philippines.

## SUMMARY

A Regional Workshop on Surveillance for New Vaccine-Preventable Diseases was held at the WHO Regional Office for the Western Pacific in Manila, Philippines, from 30 November to 2 December 2011. The workshop was attended by participants from the eight countries that are part of the WHO-coordinated rotavirus and invasive bacterial vaccine-preventable disease (IB-VPD) surveillance networks, directors of the designated regional reference laboratories (RRLs) for rotavirus and IB-VPD, and WHO staff.

The objectives of the workshop were:

- (1) to provide technical updates on new vaccine-preventable disease (VPD) surveillance and review findings from the global and regional rotavirus and IB-VPD surveillance networks; and
- (2) to share country experiences, challenges and lessons learnt in implementing rotavirus and IB-VPD surveillance, and to develop recommendations and short- and medium-term action plans to improve the quality of rotavirus and IB-VPD surveillance.

The workshop consisted of country presentations, technical presentations by WHO staff and work group discussions. Participants agreed on regional action plans for the rotavirus and IB-VPD surveillance networks in 2012 and then developed individual country action plans. The regional action plans included:

- (1) implementing the revised case definition for rotavirus;
- (2) aiming to achieve the rotavirus enrolment target of 80% of eligible cases;
- (3) optimizing stool specimen storage and testing timelines, and ensuring adequate CSF specimen collection;
- (4) monitoring and reducing the time required to transport CSF to the laboratory;
- (5) supplementing CSF testing with additional rapid (e.g. Binax) or highly sensitive polymerase chain reaction (PCR) tests;
- (6) further standardizing quality control procedures and proficiency testing;
- (7) implementing the revised rotavirus database and accompanying case report form, and developing a revised IB-VPD database and case report form;
- (10) further standardizing data entry and reporting;
- (11) conducting surveillance site assessments using a standardized global tool; and
- (12) carefully planning surveillance management transitions in several countries.

Country action plans addressed the regional issues relevant to that country and the necessary actions within the country context to improve the quality of rotavirus and IB-VPD surveillance.

## LIST OF ACRONYMS

CDC	Centers for Disease Control and Prevention
CSF	cerebrospinal fluid
ELISA	enzyme-linked immunosorbent assay
EPI	Expanded Programme on Immunization
Hib	<i>Haemophilus influenzae</i> type b
IB-VPD	invasive bacterial vaccine-preventable disease
LP	lumbar puncture
RRL	regional reference laboratory
PCR	polymerase chain reaction
RT-PCR	reverse transcription polymerase chain reaction
VPD	vaccine-preventable diseases
WBC/hpf	white blood cells per high-power field

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OBSERVERS/REPRESENTATIVES, SECRETARIAT

Keywords

Vaccines / immunization programs / Sentinel surveillance / Rotavirus / Regional health planning



## 1. INTRODUCTION

A rapidly increasing number of effective and safe vaccines are available to countries and have the potential to greatly reduce morbidity and mortality among their populations. To support informed decision-making for the introduction of these new vaccines and to establish systems for monitoring vaccine impact, WHO supports countries to establish and strengthen surveillance for diseases targeted by these vaccines. WHO has developed surveillance networks as an effective mechanism to coordinate surveillance among countries, to exchange information, and to maintain quality by promoting standard procedures and sharing best practices. Surveillance networks for rotavirus and invasive bacterial vaccine-preventable diseases (IB-VPD) were established in 2009 and include eight Member States in the Western Pacific Region.

In August 2011, the 20th Technical Advisory Group on Immunization and Vaccine Preventable Diseases in the Western Pacific Region recommended that rotavirus and IB-VPD surveillance should be further standardized and strengthened to ensure the availability of high-quality data for decision-making and vaccine impact assessment. To that end, a Regional Workshop on Surveillance for New Vaccine-Preventable Diseases was held at the WHO Regional Office for the Western Pacific in Manila, Philippines, from 30 November to 2 December 2011.

### 1.1 Objectives

- (1) To provide technical updates on new vaccine-preventable disease (VPD) surveillance and review findings from the global and regional rotavirus and IB-VPD surveillance networks.
- (2) To share country experiences, challenges and lessons learnt in implementing rotavirus and IB-VPD surveillance, and to develop recommendations and short- and medium-term action plans to improve the quality of rotavirus and IB-VPD surveillance.

### 1.2 Organization

The agenda and timetable of the meeting are provided in Annex 1 and Annex 2, respectively. The list of participants is given in Annex 3.

### 1.3 Opening remarks

Dr Teodora Wi, Acting Director, Division of Combating Communicable Diseases, WHO Regional Office for the Western Pacific, presented opening remarks. Dr Wi noted the importance of vaccination programmes in protecting millions of children from disease and death. Despite increases in the number of safe and effective vaccines, further success depends on informed decision-making and effective planning for immunization programmes. A key stepping stone that signalled worldwide commitment to increased coverage and access was the adoption in 2005 by WHO Member States of the Global Immunization Vision and Strategy, which includes as a key component surveillance to inform decision-making and to monitor vaccine impact. This workshop is aimed at supporting Member States in implementing surveillance and impact monitoring strategies.

Dr Wi highlighted key aspects of WHO surveillance networks, which were developed to coordinate surveillance among countries and maintain quality standards. Networks were established for rotavirus and IB-VPD in 2009. Eight Member States in the Western Pacific Region participate in one or both of these networks by collecting data on children with severe

diarrhoea, meningitis, pneumonia and sepsis. A recent Technical Advisory Group on Immunization and Vaccine Preventable Diseases in the Western Pacific Region recommended further standardization and strengthening of rotavirus and IB-VPD surveillance to ensure the availability of high-quality data for decision-making and vaccine impact assessment. In closing, Dr Wi outlined how participants would develop recommendations and country action plans to improve surveillance quality over the coming year.

## 2. PROCEEDINGS

### 2.1 New vaccines surveillance in the global context

#### 2.1.1 Global and regional updates on new vaccines and new vaccines surveillance

Dr Kimberley Fox, Technical Officer, Expanded Programme on Immunization (EPI), WHO Regional Office for the Western Pacific, discussed global and regional progress in the introduction of new vaccines and in the rotavirus and IB-VPD surveillance networks. One of the four objectives of the Global Immunization Vision and Strategy is introduction of new vaccines. Pneumonia, meningitis and diarrhoea account for 24% of mortality among children under five years old in the Western Pacific Region, making the role of *Haemophilus influenzae* type b (Hib), pneumococcal conjugate and rotavirus vaccines important in reaching Millennium Development Goal 4. Surveillance is critical to provide the disease burden evidence for decision-making on introduction of these vaccines. WHO has therefore established global networks for rotavirus and IB-VPD surveillance. Core variables and standard procedures for these networks were established in 2008 and revised in subsequent annual network meetings based on lessons learnt.

Across 61 countries participating in the global rotavirus surveillance network in 2010, 40% of cases (median) were rotavirus-positive. Among participating countries in the Western Pacific Region (i.e. Cambodia, China, Fiji, the Lao People's Democratic Republic, Mongolia, Papua New Guinea and Viet Nam), more than 6000 cases were enrolled in 2010 and 47% were rotavirus-positive. Peak ages for overall diarrhoea and rotavirus cases were 6–11 months and 12–23 months. Among countries reporting clinical data (i.e. the Lao People's Democratic Republic, Mongolia and Viet Nam), 62% of enrolled cases were male and most cases experienced some (58%) or severe (7%) dehydration. Performance indicators were used to monitor the quality of surveillance implementation. Overall, the percentage of eligible children enrolled was 75% in 2009 and 74% in 2010, both below the 80% target. All other indicators (percentage of enrolled cases tested, percentage of stool specimens collected within two days of admission, percentage of positive enzyme-linked immunosorbent assay (ELISA) results confirmed positive by the regional reference laboratory (RRL), and percentage of genotyped samples with results available within six months) exceeded their targets. Use of rotavirus surveillance network data to model the protection afforded by rotavirus vaccine in various epidemiologic and programme contexts was demonstrated. The relative timing of vaccination and risk of infection is the key factor in determining the potential for protection through vaccination.

Globally and within the Western Pacific Region, the rotavirus surveillance network is relatively robust, with strong performance and consistent results. Remaining challenges in some sites include inconsistencies in enrolment due to staffing limitations and holidays, incomplete core data elements, timeliness of data reporting, late collection of stool specimens, and enrolment gaps while navigating management transitions. Resolving these issues and implementing formal site assessments by joint WHO–Ministry of Health teams in selected countries will be priorities in 2012.

IB-VPD surveillance monitors the role of Hib, *Streptococcus pneumoniae* (pneumococcus), and *Neisseria meningitidis* (meningococcus) in causing pneumonia, meningitis and sepsis in children under five years old. Four Western Pacific Region countries (i.e. Cambodia, Papua New Guinea, the Philippines, and Viet Nam) participate in the surveillance network and conduct Tier 1 IB-VPD surveillance, for meningitis only; one country, Mongolia, conducts Tiers 2 and 3 IB-VPD surveillance, measuring the incidence rates of meningitis, pneumonia and sepsis through population-based sites. Of the 2837 suspected meningitis cases enrolled in the five countries, 5% in 2009 and 12% in 2010 had vaccine-preventable bacterial etiologies. Notably, Hib was not found in Mongolia, where Hib vaccine has been used nationally since 2008. Japanese encephalitis accounted for 12%–22% of cases across countries. Overall, the Region met or nearly met performance indicator targets for the percentage of suspected meningitis cases with lumbar puncture (LP) performed and the percentage of these with a culture result recorded. Only one country was able to report data for the percentage of cerebrospinal fluid (CSF) samples logged into the laboratory within one hour of collection.

Progress has been made in strengthening IB-VPD surveillance in the Western Pacific Region, through expanded use of standardized data collection tools and databases, integration of surveillance into routine national systems to improve sustainability, and increased data reporting to immunization programme officials. Pneumococcal data have been used to support decision-making in five countries, with three countries opting to apply for pneumococcal conjugate vaccines through the GAVI Alliance in 2011. However, substantial challenges remain in optimization of laboratory testing. Quality issues in testing and pre-hospital antibiotic use, which was reported in 30%–55% of enrolled cases, may contribute to the relatively low yield of pathogens found in most countries. Adding more sensitive non-culture tests such as Binax, a new rapid test for pneumococcus, and polymerase chain reaction (PCR) is expected to increase the yield. Expanding the use of these non-culture tests and implementing formal site assessments by joint WHO–Ministry of Health teams in selected countries will be priorities in 2012.

#### 2.1.2 Global and regional updates on laboratory activities for new vaccines surveillance

Dr Fem Paladin, Technical Officer, EPI, WHO Regional Office for the Western Pacific, reviewed the current status of the WHO rotavirus and IB-VPD laboratory networks and summarized challenges and ways forward. The rotavirus and IB-VPD laboratory networks were established in 2010 to support surveillance through standardized testing, quality assurance, training, structured laboratory data management and international collaboration. The networks include laboratories at four levels: sentinel site laboratories, national laboratories, RRLs and global reference laboratories.

The rotavirus laboratory network in the Western Pacific Region has 28 participating laboratories in nine countries, including three RRLs in Australia, China and the Republic of Korea. All network laboratories conduct rotavirus ELISA testing, the RRLs and Viet Nam's national laboratories conduct genotyping by reverse transcription PCR (RT-PCR), and the RRLs use nucleotide sequencing to resolve genotypes as needed. Globally, for 2010, rotavirus genotypes were reported for 4987 specimens, with G1P[8] (31%) and G2P[4] (19%) the most common types. Of 1721 rotavirus-positive specimens from the Western Pacific Region, G1P[8] (47%) and G3P[8] (25%) were the most common genotypes. Prevalent genotypes varied substantially across countries and between years. RRLs provided re-testing for quality control; overall, 96% (range, 94%–100%) of reported positive specimens were confirmed positive and 89% (range, 76%–93%) of reported negative specimens were confirmed negative (target 80% for both). Major progress in 2011 included the development of quality control testing procedures, development of an on-site laboratory assessment tool, and database revision to incorporate performance indicators and other laboratory data. Regional hands-on training on rotavirus detection and strain characterization was held at the Korea Centers for

Disease Control and Prevention (CDC). Challenges remain in the proper selection, labelling, and shipment of specimens to the RRL; correct interpretation of ELISA results; matching of genotype data and other case data; and avoiding reagent stock-outs due to late orders and delays in release from customs. Proposed steps to address these issues include following standardized referral procedures, developing local standard operating procedures, using supplies inventories, increasing participation in proficiency testing, introducing the updated database, and conducting on-site assessments.

The IB-VPD laboratory network in the Western Pacific Region has 18 participating laboratories in six countries, including RRLs in Australia and the Republic of Korea. Tests used to detect or characterize Hib, pneumococcus and meningococcus include latex agglutination, culture and molecular methods. Overall, the yield of IB-VPD testing has been relatively low. Several steps were taken in 2011 to strengthen this testing: initiation of quality control through re-testing of CSF specimens and blood culture broths at the RRLs, inclusion of network laboratories in proficiency testing, publication of a WHO laboratory manual for IB-VPD testing, regional training on detection of IB-VPD pathogens, and expansion of PCR and Binax use for pathogen detection. Additional challenges have been inadequate CSF specimen volume, operational issues in the proficiency testing system and needed revisions in the database. Steps proposed to address these issues include increased coordination of the proficiency testing system, on-site assessment reviews to monitor performance and introduction of an updated database. It was noted that Ministry of Health commitment is invaluable in formalizing the role of network laboratories and promoting sustainability.

## 2.2 Achievements and challenges in IB-VPD surveillance implementation

### 2.2.1 Mongolia

Dr Gungaa Surenkhand, Deputy Director, National Center for Communicable Diseases, presented the experiences of Mongolia. IB-VPD surveillance in Mongolia is managed by the National Center for Communicable Diseases. Children aged two months to five years old with pneumonia, meningitis or sepsis are enrolled at all six hospitals in Ulaanbaatar that admit children with these serious syndromes. Blood cultures are taken from all enrolled cases, and CSF is taken from those with meningitis. The proportion of suspected meningitis cases with LP performed has increased from 72% in 2009, to 86% in 2010 and 85% in 2011 (through three quarters). All cases with LP performed had culture results recorded. The large majority of IB-VPD cases were pneumonia; blood culture detected pneumococcus in 0.5% of cases in 2010 and 1.0% in the first three quarters of 2011. Most meningitis cases were pneumococcal, but in 2011, two of nine cases were due to Hib. The case fatality rate of meningitis cases ranged from 0% to 10%. Steps taken since 2010 to improve the quality of surveillance included: providing posters on surveillance procedures to hospitals; conducting refresher training for doctors, nurses and laboratory technicians from all hospitals; establishing hospital policies on specimen management; providing vaccine carriers and a portable incubator to maintain a "warm chain" for blood culture transport; negotiating monthly reporting with hospital statisticians; and training national laboratory staff to do PCR on blood culture broth.

### 2.2.2 Papua New Guinea

Dr William Lagani, Manager, Family Health Services, presented the experiences of Papua New Guinea. Meningitis surveillance among children under five years old was established at eight provincial hospitals in 2008 as part of the Paediatric Surveillance System. Children with clinical meningitis undergo LP and routine CSF testing; if the CSF contains more than five white blood cells per high-power field (WBC/hpf), latex agglutination testing is performed. Pneumococcus was identified in 7% of cases in 2009, 8% in 2010, and 14% in the first half of 2011; Hib was identified in 10% in 2009, 9% in 2010, and 10% in the first half of 2011. Meningococcal cases were rare. The proportion of cases with culture results

recorded increased from 58% in 2009 to 100% in 2011. Significant challenges remain in human resources restructuring, staff turnover, timeliness of reporting, and reliance on partners for test kits. Surveillance will be strengthened through additional training of staff, integration of kit procurement into routine systems, and engagement of provincial disease control officers. This will be particularly important as pneumococcal conjugate vaccine is introduced into the National EPI in 2013.

### 2.2.3 Philippines

Dr Maria Rosario Capeding, Research Institute for Tropical Medicine (RITM), presented the experiences of the Philippines. Combined meningitis–encephalitis surveillance among children up to 18 years old has been implemented in five hospitals across two of the three major regions in the Philippines. PCR testing of CSF for bacterial pathogens and IgM antibody testing for Japanese encephalitis have been conducted at RITM. Of 215 cases enrolled so far, 99 had aetiologies identified: 41 with Japanese encephalitis, 13 each with Hib and pneumococcus, 2 with meningococcus, and 30 with dengue. All suspected meningitis cases enrolled had LP performed, and the proportion of cases with a culture result recorded was 100% in 2010 and 81% in the first half of 2011. Challenges have included limited enrolment due to informed consent difficulties, inadequate specimen volume for testing, staffing turnover, insufficient laboratory supplies in hospitals, lack of quality assurance for private laboratory testing, incomplete data collection, and the need for a sustainable structure. This surveillance is now transitioning to new management under the National Epidemiology Center and will be integrated into routine national surveillance systems. The data resulting from this ongoing surveillance are important to document the impact of Hib vaccine introduction in 2011 and pneumococcal conjugate vaccine introduction in 2012.

### 2.2.4 Viet Nam

Dr Nguyen Van Cuong, Deputy Director, National EPI, presented the experiences of Viet Nam. Combined meningitis–encephalitis surveillance among children up to 15 years old is conducted at two national paediatric hospitals, one in Ha Noi and one in Ho Chi Minh City. Surveillance management is undergoing transition to the National EPI, integrated into routine systems for VPD surveillance. Due to the high volume of cases admitted to these two hospitals, the new system will enrol only cases meeting probable bacterial meningitis criteria and confirmed Japanese encephalitis cases. The proportion of probable bacterial meningitis cases found to have Hib was 10% in 2010 and 9% in the first half of 2011; the proportion with pneumococcus was 9% in 2010 and 33% in the first half of 2011. Of all suspected cases, 4% in 2010 and 8% in 2011 were found to have Japanese encephalitis. LPs were performed in 98% of suspected cases, and 41% of those had a culture result recorded. Challenges include inadequate specimen volume, lack of quality control for Japanese encephalitis testing in hospitals, delays in laboratory supplies procurement, a need for database updating, and the need for increased data analysis and sharing. Additional training and closer collaboration among stakeholders will be used to address these challenges.

## 2.3 Achievements and challenges in rotavirus surveillance implementation

### 2.3.1 Cambodia

Mr En Rin, National Paediatric Hospital, Phnom Penh presented the experiences of Cambodia. Following the generic WHO protocol, children admitted to the sentinel hospital with acute gastroenteritis are enrolled and a stool specimen is collected within 48 hours. Specimens are stored frozen until testing, and data are reported quarterly. From January to October 2011, 663 cases were enrolled, with most in the age groups of 6–11 months or 12–23 months. From 2009 through the first six months of 2011, 61% of cases were males. Dehydration was present in 75% of cases, including 5% with severe dehydration. Overall,

54% of enrolled cases tested positive for rotavirus, with the peak seasons for both rotavirus and overall diarrhoea cases in July and December–January. In 2009, 75% of eligible cases were enrolled, below the target of 80%. Eligible cases were not counted in subsequent years. Of the enrolled cases, 99% were tested in 2009, 100% in 2010, and 86% in the first half of 2011, slightly below the target of 90%. Genotype data are available for cases from May to December 2009. During this period, 90% of cases were G1P[8], and the remaining cases were G4P[6], G1P[6], G12P[6] and G12P[8]. Challenges include the absence of standard operating procedures or manuals to guide the surveillance activities, limitation of sample collection to daytime, difficulty in using the database and changes in ELISA cut-off value calibration.

### 2.3.2 China

Dr Duan Zhao-jun, Professor and Director, Department of Viral Diarrhea, Institute for Viral Disease Control and Prevention, China CDC, presented the experiences of China. A network of 17 provincial hospital sites conducts rotavirus surveillance according to the generic WHO protocol. Data and stool specimens are sent monthly to the provincial CDCs where the specimens are tested for rotavirus by ELISA and rotavirus-positive specimens are genotyped. Data are managed in Epi Data and sent to China CDC every three months, with reporting to the Ministry of Health and WHO every six months. From 2009 to 2011, the quality of surveillance reporting has improved and the number of sites reporting to WHO has increased from five to nine. Overall, from 2009 through the first half of 2011, 39% of hospitalized diarrhoea cases tested were rotavirus-positive. The majority of rotavirus cases occurred in children aged 6–11 months and 12–23 months. The peak season for rotavirus cases was from November to March each year. Since 2006, G3P[8] has been the dominant genotype; however, the proportion of cases that are G3P[8] has decreased from 60% in 2009 to 44% in 2011 (January–June). In performance indicators for 2011 (January–June), 74% of enrolled cases were tested and 85% of stool specimens were collected within two days of admission, both below the targets of 90%. Challenges have included difficulty obtaining data on eligible case numbers, infrastructure limitations to specimen shipping and storage, and the need to improve provincial rotavirus characterization methods, data management, and reporting. In the past year, steps taken to strengthen the network have included hands-on laboratory training for provincial CDC laboratories, re-testing of 30% of specimens at China CDC, and proficiency testing for all 17 participating provincial CDC laboratories.

### 2.3.3 Fiji

Dr Adam Jenney, Centre for International Child Health, University of Melbourne, discussed the experiences of Fiji. The Colonial War Memorial Hospital in Suva, which serves approximately one-third of the Fiji population, has been conducting surveillance since 2006 among children under five years of age admitted with acute watery diarrhoea. From December 2005 to September 2011, 1932 cases were enrolled, 1550 were tested, and 619 (32%) tested rotavirus-positive. Most rotavirus cases occurred in the cooler months, from June to November each year, except for a February peak in 2008. Most cases occurred among children aged 6–11 months and 12–23 months. Ninety per cent of eligible cases were enrolled in 2009 and 2010, increasing to 97% so far in 2011. The proportion of enrolled cases that were tested was 97% in 2009 and 100% in 2010. Genotype distribution varies widely in Fiji, with G12P[8] dominant in 2008 and G1P[8], which was finally identified in Fiji, dominant in 2011; meanwhile, G2P[4] and G3P[8] have increased and decreased dramatically year to year. Jenney credited the successes of rotavirus surveillance in Fiji to the quality of the small research team and cooperation among nurses, doctors and laboratories. Key challenges now include transitioning the responsibility for surveillance to the Ministry of Health, with testing at a site apart from the hospital, and introduction of a new database.

#### 2.3.4 Lao People's Democratic Republic

Dr Bounthanom Sengkeopraseuth, Deputy Chief, Epidemiology Division, National Center for Laboratory and Epidemiology (NCLE), summarized the experiences of the Lao People's Democratic Republic. Acute watery diarrhoea is one of 17 syndromes and diseases covered by the National Surveillance of Notifiable Selected Diseases. NCLE has recently established sentinel surveillance for the etiology of acute diarrhoea at five hospitals in Vientiane and investigates outbreaks of foodborne illness. In terms of sentinel surveillance, 128 cases were enrolled in January 2011 and 29 tested positive for rotavirus. Mahosot Hospital conducts rotavirus surveillance as part of the WHO network; cases are enrolled according to the WHO generic protocol and tested monthly in the hospital laboratory. From 2009 through June 2011, 60% of rotavirus cases were males and most were aged 6–11 months or 12–23 months. Ninety-five per cent of cases had dehydration, with three per cent having severe dehydration. Most rotavirus cases occurred during January to April each year. G2P[4] was the most common genotype, with approximately equal proportions of G1P[4] and G3P[8] as the next most common genotypes. The proportion of eligible cases enrolled was 74% in 2010 and 91% for the first half of 2011, surpassing the target of 80%. All enrolled cases in 2010 and 2011 to date were tested. The proportion of stool specimens collected within two days of admission has increased from 94% in 2010 to 99% in the first six months of 2011. Challenges to rotavirus surveillance have included limited resources, limited capacity at provincial laboratories, and the technical requirements of testing. Strong teamwork and linkages between epidemiology and laboratory are important to success. National surveillance and laboratory policies are being drafted and plans are being developed to strengthen provincial- and district-level surveillance.

#### 2.3.5 Mongolia

Dr Murdorj Altankhuu, Director, Laboratory Department, National Center for Communicable Diseases, discussed the experiences of Mongolia. Ulaanbaatar has two sentinel hospitals conducting surveillance of children aged two months to five years admitted with acute watery diarrhoea. Stool samples are transported to the national laboratory twice per month for rotavirus ELISA testing. From 2009 through September 2011, 59% of hospitalized rotavirus cases were males and 83% of all cases were dehydrated, with 3% experiencing severe dehydration. Most rotavirus diarrhoea cases occurred in children aged 6–11 months and 12–23 months. Overall, 44% of hospitalized diarrhoea cases were due to rotavirus. The months with the highest numbers of rotavirus cases were September and October each year. For performance indicators, the proportion of eligible cases enrolled was 85% in 2009, 74% in 2010, and 76% in the first half of 2011, below the 80% target. The proportion of enrolled cases that were tested was 99%–100% in all three years. The proportion of stool specimens collected within two days of admission increased from 86% in 2009 to 88% in 2010 and 89% in the first half of 2011, nearly reaching the 90% target. The range of genotypes was broad, with G2P[4] responsible for the highest proportion at 30%. Compared to other countries in the Western Pacific Region, Mongolia has a high diversity of genotypes, with substantial shifts from year to year. Progress in improving surveillance in 2011 includes enrolment during the night and weekends, monthly site visits and feedback by the national coordinator, establishment of PCR for genotyping, and participation in external quality control and proficiency testing. In 2012, plans include improving enrolment to meet the indicator target and ensuring a sense of ownership by sentinel hospitals.

#### 2.3.6 Papua New Guinea

Dr James Amini, Chief Paediatrician, Port Moresby General Hospital, reported on the accomplishments and challenges in Papua New Guinea's rotavirus surveillance system. Surveillance at two sentinel sites began in mid-2008 and now includes two sites, Goroka General Hospital with testing by the Institute for Medical Research, and a newly established

site at Port Moresby General Hospital with testing to be done at the Central Public Health Laboratory. Children under five years of age admitted for diarrhoea are enrolled and tested for rotavirus. From 2009 through June 2011, the most common age group for rotavirus cases was 6–11 months and the highest numbers of cases occurred in May and June. The most common genotype was G1P[8], accounting for 42%–71% of tested cases. In performance indicators, the proportion of stool specimens collected within two days of admission has increased from 57% in 2009 to 83% in 2010 and 81% in 2011, below the target of 90%. Restructuring in the Central Public Health Laboratory and multiple assignments of staff have delayed testing at the Port Moresby site, and enrolment at the Goroka site decreased in 2011. Full implementation of the Port Moresby site and better coordination between the sentinel sites and the National Department of Health are key steps to improving the rotavirus surveillance system.

### 2.3.7 Viet Nam

Dr Nguyen Dang Hien, Director, Center for Research and Production of Vaccines and Biologicals (POLYVAC), presented the experiences of Viet Nam. Rotavirus surveillance in Viet Nam enrolls children under five years old admitted for acute water diarrhoea at three sentinel hospitals, located in the northern, central and southern areas of the country. Stools are tested with the WHO-recommended rotavirus ELISA, and positive samples are further characterized by genotype using RT-PCR. A large number of cases have been enrolled each year: 2744 in 2009, 2259 in 2010, and 1087 in the first half of 2011. The proportion testing positive for rotavirus was 65% in 2009, 65% in 2010, and 55% so far in 2011. Most rotavirus cases were aged 6–12 months or 13–23 months, and males accounted for 63% of these cases. Peak seasons for rotavirus cases were in July and December–January, with stronger seasonality in the north as compared to the central and southern sites. In 2009 and 2010, G1P[8] was the most common genotype, followed by G3P[8], with variation from year to year and from north to south. In performance indicators, 73% of eligible cases were enrolled in 2009, 90% in 2010, and 86% in the first half of 2011, exceeding the 80% target. In all three years, 100% of enrolled cases were tested. The proportion of stool specimens collected within two days of admission was 99% in 2009, 95% in 2010, and 97% in the first half of 2011, all exceeding the 90% target.

## 2.4 Data management and reporting

Dr Jorge Mendoza-Aldana, Technical Officer, EPI, WHO Regional Office for the Western Pacific, presented an update on reporting, data management and the regional rotavirus and meningitis-encephalitis databases. For rotavirus, data are reported quarterly in electronic format from seven countries. The reporting deadline is the end of the month following the end of each quarter. To date, reporting has been mostly complete, but timeliness needs to be improved; on average, only 10% of reporting occurred on time during the first three quarters of 2011. Most countries are reporting line-listed data using the feed forward file from the rotavirus database provided by the WHO Regional Office for the Western Pacific. Others report aggregate data using a standardized spreadsheet format. Data on eligible cases and genotypes have been reported by countries in ad hoc documents or spreadsheets. RRLs report genotype data in a standardized spreadsheet format. Discrepant or missing patient identification numbers have led to difficulties in matching genotype data with cases in the surveillance database. The newly revised Western Pacific Region rotavirus database integrates national and regional laboratory data, includes a screen for eligible case data, adds utilities for easy searching or browsing of data, and provides automatic generation of basic reports. This database is being distributed on the flash drives provided at the end of this workshop. For IB-VPD surveillance, data are reported quarterly in electronic format from four countries, with the same deadlines as for rotavirus data. IB-VPD data are reported in line listings either using the feed forward file from the IB-VPD database provided by the WHO Regional Office or in spreadsheet format.

Rotavirus and IB-VPD surveillance data are analysed following each quarterly reporting cycle, and on an ad hoc basis when requested by countries or when needed by the WHO Regional Office. Data are reported back to countries in the form of country data reports and to WHO Headquarters in aggregate format every six months. Data are used at the country level to improve decision-making for the immunization programme and measure impact for following vaccine introduction, and at the global level to produce estimates of disease burden.

## 2.5 Work groups on surveillance improvement

### 2.5.1 Surveillance networks in 2012: Issues and plans for improvement

Dr Fox presented an overview of current plans for improvement in the surveillance networks in 2012, and current issues that need to be addressed in the work groups. For rotavirus surveillance, the case definition will be changed to include patients with up to 14 days of watery diarrhoea, effective 1 January 2012. According to the performance indicator, at least 90% of eligible cases should be enrolled, including those that present on holidays, nights and weekends. Testing should be performed at least monthly, with specimens refrigerated if tested within one to two weeks and frozen for testing later. Eligible cases and national data on diarrhoea hospitalizations can be reported in the new Western Pacific Region database.

For Tier 1 IB-VPD (meningitis) surveillance, a new enrolment criterion for funding will be implemented starting in 2012; at least 100 cases should be enrolled each year in each country. CSF specimens should be collected with adequate volume and transferred to the laboratory within one hour of collection, according to a new performance indicator. PCR testing will be phased in for all CSF specimens collected, either at the national or regional reference laboratory. Binax pilots will continue, and may be expanded to additional countries. The Western Pacific Region IB-VPD database will be revised next year, simplifying the data collected while adding laboratory data that are currently managed separately. Ensuring appropriate and effective management and site transitions in Fiji, the Philippines, Papua New Guinea and Viet Nam will be critical. Surveillance site assessments using a structured global tool will begin for both rotavirus and IB-VPD surveillance in 2012.

### 2.5.2 Laboratory issues in the surveillance networks

Dr Paladin presented an overview of laboratory issues in the surveillance networks that need to be addressed by the work groups and country plans. For rotavirus, the main issues of concern are proper selection, labelling and shipment of specimens to the RRL; correct interpretation of ELISA results; matching between genotype data and other case data; and preventing reagent stock-outs. For IB-VPD laboratory work, the main issues of concern are the low rate of pathogen detection, operational issues in the quality assurance programme, and the need for more laboratory data elements in the Western Pacific Region database.

Laboratories are suggested to maintain a supplies inventory, procure locally when feasible and advantageous, identify approaches to facilitate early release of supplies from customs, and ensure that local maintenance and calibration are arranged for equipment. Locally adapted standard operating procedures are critical to establish a guide for laboratory staff. Training needs and biosafety issues should be addressed. Procedures for specimen referral to the reference laboratory and proficiency testing should be carefully followed. For rotavirus, the WHO-recommended ELISA kit and PCR primers should be used, and testing should be frequent enough to make results available within one month of specimen collection. For IB-VPD, it is necessary to ensure the collection of adequate CSF volume and the quality of hospital-based testing.

Following the above reviews of issues, work groups were asked to review all aspects of rotavirus and IB-VPD surveillance, and to identify areas that continue to be challenges, solutions that have been found, and additional solutions that could be proposed. Work groups were asked to recommend specific steps that countries and WHO could take over the subsequent 12 months to improve the quality of surveillance.

#### 2.5.3 Rotavirus surveillance work group

Areas that continue to be challenges in at least some countries are the number of data elements on the case form, the need for a refrigerator or freezer to store specimens on the hospital ward, difficulties in getting internationally procured supplies released from customs, uncertainty about how to select specimens to send to the RRL, managing the workload of data entry, and concerns about sustainability surveillance if WHO discontinues support. The new case definition and database revision will not be difficult to adopt. The group recommended that countries should strive to meet the 80% target for enrolment, should ensure full compliance with quality assurance systems, and should consider how the surveillance would be financed in the absence of WHO support. The importance of continued awareness and involvement by the Ministry of Health in rotavirus surveillance, though not necessarily in a supervisory role, was noted. The group also recommended that in-country database training should be provided where requested.

#### 2.5.4 IB-VPD surveillance work group

Areas that continue to be challenges in at least some countries are informed consent for LP, collecting an adequate volume of CSF, transporting CSF specimens to the laboratory within one hour, ensuring quality in culture procedures and collecting the large number of data elements on the case form. The group also noted a need for training on the database and for proficiency testing at the sentinel sites in addition to the national laboratory. The group recommended that the WHO Regional Office should continue to provide support for supplies procurement, ensure that funds are made available promptly, provide timely feedback of proficiency testing results, and consider providing CSF analysis reagents to sentinel sites. The group identified the primary problem with specimen volume as communication, and said that clinicians need to understand that obtaining an adequate volume is safe. A statement from WHO would be useful to define safe volumes of CSF to be taken from infants and neonates. The group also discussed the potential for using Trans-Isolate medium to inoculate CSF when it cannot reach the laboratory in one hour; however, this would require additional training and supplies management. Finally, the group noted the importance of data feedback, both at individual level (even when results are not in time for patient management) and summary level, in motivating clinicians who enrol patients.

### 3. CONCLUSIONS

#### 3.1 Regional action plans for rotavirus and IB-VPD surveillance networks

Based on technical updates provided during the workshop and lessons learnt from country implementation of rotavirus and IB-VPD surveillance, regional action plans for the two networks in 2012 were developed. Each regional action plan is for the network as a whole or for the WHO Regional Office as the network coordinating focus. The final agreed action plans are outlined below.

### 3.1.1 Regional action plan for the rotavirus surveillance network in 2012

#### (1) Enrolment

- (a) A new case definition, including cases with acute diarrhoea for up to 14 days instead of up to 7 days, will be implemented on 1 January 2012.
- (b) Sites will work to reach the enrolment target – at least 80% of eligible cases in sentinel hospitals in each country.

#### (2) Specimen collection and management

- (a) An optimal approach will be identified in each country for stool specimen storage before testing. The following factors will be considered:
  - (i) frozen specimens – allows for testing in flexible time frame;
  - (ii) refrigerated specimens – can be stored for shorter time but can be divided into aliquots for on-site testing and RRL referral without an additional freeze–thaw cycle.
- (b) ELISA testing will be performed on a monthly basis (or more often).

#### (3) RRL referral for genotyping and quality control

The following timelines for specimen referral from sites to RRLs have been clarified and will be followed in 2012:

- (a) every January – for specimens collected from June to December and any unsent specimens from January to June of preceding year;
- (b) every July – for specimens collected from January to June (same year) and unsent specimens from July to December of preceding year;
- (c) RRL to report genotyping and/or sequencing results to referring laboratory and WHO within three months after receipt of samples.

#### (4) Quality assurance programme

- (a) All laboratories that perform ELISA testing for rotavirus surveillance will participate in proficiency testing provided by WHO.
- (b) All laboratories that perform testing for rotavirus surveillance will refer a subset of ELISA-positive and -negative stools for quality control (re-testing).
- (c) Laboratories conducting genotyping will refer a subset of genotyped specimens for quality control.

#### (5) Data management and reporting

- (a) Eligible cases
  - (i) Eligible cases will be reported in the database, for countries using the Western Pacific Region database.

- (ii) Consistent classification of eligible and enrolled cases by month and year will be ensured by using the date of admission (not discharge) for classification.
  - (b) National data on diarrhoea hospitalizations
    - (i) Countries will work to obtain national data on diarrhoea hospitalizations and report them through the Western Pacific Region database, on the data screen for monthly data.
    - (ii) An appropriate timeline for this will be discussed, as hospitalization data at the national level are often subject to substantial delays.
  - (c) New Western Pacific Region rotavirus database
    - (i) Countries will start using the new database for cases enrolled as of 1 January 2012.
    - (ii) Countries not currently using the Western Pacific Region database will adopt it within six months (except China).
    - (iii) The WHO Regional Office will provide a revised generic case report form to match the revised database (minor changes will include the revised case definition – from 7 to 14 days).
  - (d) Reporting timeline
    - (i) The first quarter (January–March) will be reported on 30 April; second quarter (April–June) on 31 July; third quarter (July–September) on 31 October; and fourth quarter (October–December) on 31 January of the following year.
    - (ii) The current timeline allows for one month after the end-of-data period to prepare data; this timeline will continue to be used.
    - (iii) Genotyping data are not included in this schedule; they will be reported later.
  - (e) The WHO Regional Office will continue to provide feedback to countries through semi-annual country data reports and global bulletins.
- (6) Management and supervision
- (a) Joint Ministry of Health–WHO surveillance site assessments will be conducted in selected countries in 2012; discussions will be held with proposed countries.
  - (b) Careful planning is needed to ensure the successful transition of surveillance management in Fiji and Viet Nam and for starting a new site in Papua New Guinea.
- 3.1.2 Regional action plan for the IB-VPD surveillance network in 2012
- (1) Enrolment
    - (a) The network will implement the global network case definition for suspected meningitis, which is a clinical diagnosis of meningitis; the WHO surveillance

definition for suspected bacterial meningitis may be used as a guide for clinical diagnosis.

- (b) Case definitions for pneumonia and sepsis will be clarified (Mongolia only).
  - (c) Countries will implement Tier 1 surveillance to ensure that they meet the new criteria for funding, requiring at least 100 cases of suspected meningitis enrolled per country per year.
- (2) Specimen collection and management
- (a) Countries will take steps to ensure collection of adequate CSF volume for increased number of tests.
  - (b) CSF specimens will be stored (frozen) for PCR testing; if storage is not currently feasible at the site, countries will identify necessary steps to make it feasible.
  - (c) The day and time of CSF specimen collection and arrival in the laboratory will be recorded, to monitor the proportion of CSF specimens received within one hour of collection, and to take steps to increase this proportion.
  - (d) The WHO Regional Office will identify and share quality standards for routine CSF testing reagents, and explore the possibility of funding these reagents.
  - (e) The WHO Regional Office will explore the possibility of supporting the use of Trans-Isolate medium for CSF specimens that must wait to be transported.
- (3) Specimen testing
- (a) PCR testing of all CSF specimens will be initiated at national laboratories or RRL.
  - (b) Binax testing will be expanded according to recommended global protocols.
  - (c) The WHO Regional Office will share the global prioritization algorithm for CSF testing.
- (4) RRL referral for strain characterization and quality control
- The following timelines for specimen referral from sites to RRLs have been clarified and will be followed in 2012:
- (a) every January and July, or as necessary, depending on the number of samples;
  - (b) RRL to report results to referring laboratory and WHO within three months after receipt of samples.
- (5) Quality assurance programme
- (a) Laboratories that perform testing for IB-VPD surveillance will participate in the proficiency testing provided by WHO.
  - (b) All laboratories will refer a subset of negative and positive CSF specimens tested by culture, latex agglutination, Binax or PCR for quality control (re-testing).

(6) Data management and reporting

- (a) Countries will review the generic meningitis–encephalitis case report form and provide feedback by December 2011 on proposed fields to drop (or to add, if necessary).
- (b) The WHO Regional Office will complete the revision of the IB-VPD database for each participating country and provide a revised case report form to match the database.
- (c) Countries not using the Western Pacific Region database will adopt it (the Philippines' database plan, however, is still undetermined).
- (d) The reporting timeline, which allows for one month after the end-of-data period to prepare data, will continue to be used: first quarter (January–March) reported on 30 April, second quarter (April–June) reported on 31 July, third quarter (July–September) reported on 31 October, and fourth quarter (October–December) reported on 31 January of the following year.
- (e) The WHO Regional Office will continue to provide feedback to countries through semi-annual country data reports and global bulletins.

(7) Management and supervision

- (a) Joint Ministry of Health–WHO surveillance site assessments will be conducted in selected countries in 2012; discussions will be held with proposed countries.
- (b) Careful planning is needed to ensure the successful transition of surveillance management in the Philippines and Viet Nam.

3.2 Country action plans to improve the quality of rotavirus and IB-VPD surveillance in 2012

Following agreement on the regional action plans, each country developed a country action plan to improve the quality of rotavirus and IB-VPD surveillance. Country action plans are summarized in Tables 1 and 2.

Table 1. Country action plans to improve rotavirus surveillance in 2012

Country	Country action plan summary
Cambodia	Implement standardized surveillance site assessment, conduct refresher training for clinicians, obtain freezers for hospital ward and laboratory to improve specimen storage, and adopt new database with training as needed.
China	Hold national rotavirus surveillance workshop and emphasize performance indicators, propose baseline survey for rotavirus vaccination coverage in selected sites, conduct hands-on training for provincial laboratories and on-site supervision for surveillance sites, standardize quality control processes in laboratory network, and focus on data feedback to local units and sharing with Ministry of Health and WHO.
Fiji	Transition rotavirus <u>surveillance</u> management to the Ministry of Health, establish rotavirus testing at the national laboratory (Mataika House), and adopt new Western Pacific Region database with training as needed.

<b>Country</b>	<b>Country action plan summary</b>
Lao People's Democratic Republic	Train clinicians on new case definition, refer specimens to RRL according to new schedule, participate in proficiency testing, sentinel site and Ministry of Health to discuss use of data for action, and request training on new database as needed.
Mongolia	Implement standardized surveillance site assessments, provide refresher training for clinicians at all sites, monitor and improve performance indicators, fully implement PCR for rotavirus genotyping in national laboratory, and request training on new database as needed.
Papua New Guinea	Train staff on new case definition, support new sentinel site at Port Moresby General Hospital and existing site at Goroka Base Hospital (managed by Institute for Medical Research), participate in proficiency testing, and request database training as needed.
Philippines	Assess sites and plan surveillance using WHO case definition, obtain policy issuance to initiate surveillance, review and revise rotavirus case report form, and participate in proficiency testing.
Viet Nam	Transition rotavirus surveillance management to National EPI under the Ministry of Health, train newly designated rotavirus surveillance laboratories as needed, and transfer data and data management to National and Regional EPI.

EPI, Expanded Programme on Immunization; PCR, polymerase chain reaction; RRL, Regional Reference Laboratory; WHO, World Health Organization

Table 2. Country action plans to improve IB-VPD surveillance in 2012

<b>Country</b>	<b>Country action plan summary</b>
Cambodia	Re-establish sentinel sites under coordination of the National Immunization Programme, send CSF specimens to reference laboratory for PCR testing, and consider use of latex agglutination or Binax testing at sentinel sites.
Mongolia	Implement standardized surveillance site assessments, provide refresher training for clinicians, expand the use of designated blood culture rooms, use newly received portable incubator and continue to monitor specimen transport procedures, increase assigned staff during peak pneumonia season, improve performance indicators including the timeliness of specimens reaching the laboratory, implement PCR for serotyping in the national laboratory, and conduct data management training.
Papua New Guinea	Adopt WHO-recommended procedures for IB-VPD surveillance, review procedures at Paediatric Society meeting, conduct needs assessments of sentinel sites, train laboratory and clinical staff from sentinel sites, participate in proficiency testing, discuss potential for PCR testing at the national laboratory in the future, and review the Western Pacific Region database.
Philippines	Harmonize meningitis–encephalitis surveillance with national infectious disease surveillance system, review sentinel sites for capacity to implement surveillance, obtain policy issuance and support of sentinel site hospital chiefs, simplify case report form, and train surveillance staff.
Viet Nam	Closely follow up and monitor the implementation of IB-VPD surveillance through Regional EPI and sentinel hospitals, monitor the new system for case enrolment based on probable bacterial meningitis criteria, clarify the adequate and reasonable volume of CSF specimens, participate in proficiency testing, and adopt new database with training as needed.

CSF, cerebrospinal fluid; EPI, Expanded Programme on Immunization; IB-VPD, invasive bacterial vaccine-preventable disease; PCR, polymerase chain reaction; WHO, World Health Organization