Guidelines for Meningitis Surveillance, Preparedness, and Response in South Sudan

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1.0 Meningococcal Meningitis

1.1 Background

Epidemics of *N. meningitidis* commonly occur in the African meningitis belt. The belt extends from Senegal to Ethiopia with an estimated population of 500 million in 26 countries. South Sudan is among the countries in the African meningitis belt and has reported several outbreaks in the past.

Meningococcal meningitis epidemics in the African meningitis belt typically occur during the dry season between December to June and are precipitated by dust, hot dry winds, cold nights, and upper respiratory tract infections that combine to damage the nasopharyngeal mucosa thus increasing the risk of invasive colonisation of nasopharyngeal mucosa by *N. meningitidis*. At the same time, transmission of *N. meningitidis* may be accelerated by overcrowded housing and by large population displacements. This explains the large epidemics that occur during the dry season in the meningitis belt.

To mitigate the risk of meningitis outbreaks, the World Health Organisation (WHO) is supporting countries in the African meningitis belt to implement the strategy for enhanced surveillance of meningitis to reduce excess morbidity, mortality, and disability associated with the disease. Up to until 2010, most meningitis epidemics in the belt were due to *Neisseria meningitidis* serogroup A (NmA). Preventive mass vaccination campaigns using serogroup A meningococcal conjugate vaccine (MenAfriVac®) were implemented by countries from 2010 to reduce the burden of NmA epidemics in the belt. Thus, the burden of NmA declined in the belt from 2010 but a proportionate increase in meningitis due to other serogroups – NmW135; NmX; NmC; and *Streptococcus pneumoniae* has been reported. These trends highlight the need for countries to strengthen meningitis surveillance for timely cases detection, investigation, confirmation and response within the framework of Integrated Disease Surveillance and Response (IDSР). To effectively monitor and detect changing meningitis epidemiological patterns in the aftermath of introducing MenAfriVac®, it is recommended that:
1) Countries continue to implement enhanced surveillance that entails prompt detection, reporting, investigation and analysis of cases for timely outbreak response.

2) Implement case-based and laboratory backed surveillance for suspect meningitis cases in select health facilities to complement the countrywide enhanced surveillance and to monitor the impact of MenAfriVac.

1.2 History of Meningitis outbreaks in South Sudan

The threat of meningitis outbreaks in South Sudan is premised on its location in the African meningitis belt in addition to the historical, climatic, and the complex public health situation in the entire country. The dry spell in South Sudan lasts for 5-6 months (from September to March), with outside temperatures reaching as high as 40°C.

These factors coupled with the complex security and humanitarian situation with nearly 2 million people living in refugee and IDP camps, poor infrastructure and limited access to health care delivery; altogether increase the risk of meningitis outbreaks in South Sudan. A total of six outbreaks of meningococcal meningitis outbreaks have been reported in South Sudan since 2006 with the most recent outbreak being reported in Malakal in 2013 (Table 1).

Figure 1: Counties in South Sudan affected by meningitis in 2008

The 2006 meningitis outbreak affected 5 out of 10 states, namely Northern Bahr-El-Ghazel, Western Bahr-El-Ghazel, Warrap, Central Equatoria and Upper Nile. In the 2006 outbreak, Nm W135 was detected in 5 out of 25 samples tested from 4 counties by Latex agglutination. In 2007, Nm W135 was detected in only one CSF sample but it was not confirmed by culture. During the
2007 season, South Sudan with over 12,000 cases and 600 deaths was only second to Burkina Faso among the countries in the African meningitis belt that reported outbreaks that year. *Neisseria Meningitis* serogroup A was identified as the prevalent strain during the 2009 and 2010 outbreaks.

<p>| Table 1: Suspected meningococcal meningitis cases and deaths recorded in 2006-2013 |
|---------------------------------|--------|-------|</p>
<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>4353</td>
<td>426</td>
</tr>
<tr>
<td>2007</td>
<td>12000</td>
<td>600</td>
</tr>
<tr>
<td>2008</td>
<td>128</td>
<td>27</td>
</tr>
<tr>
<td>2009</td>
<td>363</td>
<td>28</td>
</tr>
<tr>
<td>2010</td>
<td>229</td>
<td>14</td>
</tr>
<tr>
<td>2013</td>
<td>196</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>17,269</td>
<td>1,108</td>
</tr>
</tbody>
</table>

In 2008, the reported number of cases and deaths reduced markedly. Only 128 sporadic cases and 27 deaths were recorded in all states but no outbreak was confirmed that year. Nonetheless, a meningitis outbreak which affected the greater Kapoeta in Eastern Equatoria state, Rubkona, and Pariang counties in Unity State, occurred in 2009. A total of 363 cases and 28 deaths (CFR 7.7%) were recorded in 2009 outbreaks, mostly from greater Kapoeta and Pariang counties. In 2010, a total of 229 sporadic meningitis cases and 14 deaths (CFR 6.1%) were recorded across South Sudan but none of the counties reached meningococcal meningitis alert or epidemic threshold. Nonetheless, South Kordofan and Darfur states in northern Sudan bordering South Sudan experienced meningitis outbreak caused by NM W135 serogroup but never spread to the South states.

In 2013, an outbreak of *Neisseria meningitidis* serogroup A (Nm A) was confirmed in Malakal county, in Upper Nile state. The outbreak was declared by the Ministry of Health on 30 April 2013. The ICG released 198 770 doses of *Meningococcal A* conjugate vaccine to implement a reactive vaccination campaign from 15-24 May 2013, which was led by the Ministry of Health of South Sudan with the support of WHO and partners. An estimated 123,520 people, covering 80 per cent of the target population of people between two and 30 years of age, were vaccinated by 24 May as part of a mass-immunization campaign in Upper Nile State. At least 196 meningitis cases including 13 deaths (CFR 6.6%) were reported in Malakal county during the 2013 outbreak.

In March 2016, the Ministry of Health with support from partners launched the first round of preventive meningitis vaccine campaigns using the *Meningococcal A* conjugate vaccine targeting individuals one to 29 years of age in Central Equatoria, Eastern Equatoria, Warrap, Western Bahr

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el Ghazal, Northern Bahr el Ghazal, and Lakes states. The second round of the preventive campaign targeting Upper Nile, Unity, Western Equatoria, and Jonglei states had to be postponed to May 2017 following the outbreak of violence in July 2016.

1.3 The disease

Meningococcal meningitis is a bacterial form of meningitis, an infection of the thin lining (the meninges) that surrounds the brain and spinal cord. The disease therefore affects the brain membrane and can cause severe brain damage resulting in case fatality rates of up to 50% if not treated. Even when the disease is diagnosed early and adequate treatment is started, 5 - 10% of patients die, typically within 24 to 48 hours after the onset of symptoms.

Although several bacteria can cause meningitis, large epidemics are commonly caused by *Neisseria meningitidis*. The bacteria has twelve serogroups of which five (A, B, C, W135, X, and Y) have been known to cause epidemics.

1.4 Transmission

*Neisseria meningitidis* only infects humans and has no animal reservoir. *Neisseria meningitidis* is transmitted through direct contact with respiratory secretions of infected people. The disease can also be transmitted to a susceptible individual though exposure to droplets generated through coughing, sneezing, or talking. Most of the transmission occurs following exposure to asymptomatic carriers as opposed to symptomatic cases of invasive meningococcal disease. The incubation period ranges between 2-14 days with the average of 4 days. It is believed that 10% to 20% of the population carries *Neisseria meningitidis* at any given time. However, the carriage rate may increase up to 30% during epidemics.

1.5 The risk factors for transmission

The risk of invasive disease outbreaks is higher in children, adolescents, and young adults. The risk disease is also higher in persons with complement disorders. Environmental conditions like dry and dusty conditions with low absolute humidity and in settings that promote crowding and travel or population movement for trade, religion, migration, nomadism, or population displacements due to disasters or civil strife, all enhance the risk of disease transmission. The risk of transmission and disease transmission is often associated with emergence of new clones of *N. meningitidis*.

1.6 Case definitions for bacterial meningitis

1.6.1 Suspected meningitis case

Any person with sudden onset of fever (>38.5 °C rectal or 38.0 °C axillary), and neck stiffness or other meningeal signs, including bulging fontanelle in infants.
1.6.2. Probable meningitis case

Any suspected case with turbid, cloudy or purulent cerebrospinal fluid (CSF); or with a CSF leukocyte count >10 cells/mm3 or with bacteria identified by Gram stain in CSF.

In infants: CSF leucocyte count >100 cells/mm3; or CSF leucocyte count 10–100 cells/mm3 and either an elevated protein (>100 mg/dl) or decreased glucose (<40 mg/dl) level.

1.6.3. Confirmed meningitis case

Any suspected or probable case that is laboratory confirmed by culturing or identifying (i.e. polymerase chain reaction, immunochromatographic dipstick or latex agglutination) a bacterial pathogen (Neisseria meningitidis*, Streptococcus pneumoniae, Haemophilus influenzae type b) in the CSF or blood.

*If N. meningitidis is confirmed, the serogroup should be identified to guide vaccine decisions.

1.7 Epidemiological thresholds

1.7.1 Alert threshold

For populations between 30 000 and 100 000 inhabitants: an attack rate of 3 suspected cases per 100 000 inhabitants per week (minimum of 2 cases in one week). For populations, less than 30 000 inhabitants: an incidence of 2 suspected cases in one week or an increase in the number of cases compared to the previous non-epidemic years (see Annex 1).³

1.7.2 Epidemic threshold

For populations between 30 000 and 100 000 inhabitants: an attack rate of 10 suspected cases per 100 000 inhabitants per week. For populations, less than 30 000 inhabitants: an incidence of 5 suspected cases in one week, or the doubling of the number of cases over a three-week period (see Annex 1).¹

Note: For county populations with more than 100 000 inhabitants, it is recommended to calculate attack rates by payams containing 30 000 to 100 000 inhabitants.

1.8 Diagnosis

Initial clinical diagnosis of meningococcal meningitis can be made by clinical examination followed by a lumbar puncture showing a purulent spinal fluid. The bacteria can sometimes be seen in microscopic examination of the spinal fluid. The diagnosis is supported or confirmed by growing the bacteria from specimens of spinal fluid or blood, by agglutination tests or by polymerase chain reaction (PCR). The identification of the groups and susceptibility testing to antibiotics are important to define control measures.

1.9 Treatment
Meningococcal disease is potentially fatal and should always be treated as a medical emergency. Appropriate antibiotic treatment must be started as soon as possible, ideally after the lumbar puncture has been carried out if the puncture can be performed immediately. If treatment is started prior to the lumbar puncture it may be difficult to grow the bacteria from the spinal fluid and confirm the diagnosis.

2.0 Prevention and Control of Epidemic Meningitis

2.1 Five-Pillar Strategy for Control of Epidemic Meningitis

Due to the devastating nature of outbreaks in the African meningitis belt, prevention and control of outbreaks is a public health priority in the region. The WHO has therefore developed a five-pillar strategy for the prevention and control of meningococcal meningitis outbreaks in the African meningitis belt. The core interventions in the strategy include:

1) Coordination of preparedness and response activities;
2) Enhanced surveillance, laboratory confirmation, preparedness, and response;
3) Case and contact management;
4) Using vaccines to prevent and respond to outbreaks and;
5) Risk communication

2.1.1 Planning and coordination of epidemic preparedness and response.

Overall planning and coordination of meningitis outbreak preparedness and response should take place at the national, state and county levels. This mandate lies with the Ministry of Health at national and state levels supported by health cluster partners. The National Epidemic Preparedness and Response (EPR) Committee and the state health and nutrition partners’ fora that are chaired by the Ministry of Health are responsible for planning, coordinating, and supervising activities to ensure outbreaks are detected early and an appropriate response is launched promptly. The membership of these committees also includes staff from the laboratories, key hospitals, and partners involved in surveillance and response activities. The members of the EPR committee further constitute themselves into technical sub-committees, namely Coordination/Logistics; Surveillance, Laboratory, and Case Management; Risk Communication/ Social Mobilization; vaccination working groups to implement meningitis preparedness and response activities. The EPR Committee should meet regularly - before and throughout the epidemic season.

The role of the EPR Committee is to:

1) Ensure the national surveillance system (IDSR and EWARS) are functioning optimally with optimal timeliness and completeness of weekly reporting; and that health workers receive training in the collection, reporting, analysis and monitoring of data as they become available;
2) Ensure that information, training and medical supplies are made available to provide the best possible treatment for patients in the most remote health centres;
3) Ensure the distribution of appropriate vaccines as needed, and coordinate vaccination campaigns;
4) Disseminate information to the public on the risks of meningitis, where and how to seek treatment and any plans for vaccination campaigns.
2.1.2 Enhanced meningitis surveillance, preparedness, and response

Early detection of meningitis outbreaks and prompt laboratory confirmation of circulating pathogens depend on effective implementation of surveillance activities at all levels. The level of preparedness and the public health measures for epidemic meningitis control vary throughout the year and should be intensified as the epidemic season approaches. In South Sudan, the meningitis epidemic coincides with the dry season that starts from September to March.

During the epidemic season, different procedures should be established for counties that have crossed the alert and epidemic thresholds and those that have not. Therefore, for the purposes of meningitis surveillance, preparedness and response, four different epidemiological phases are presented: pre-epidemic, epidemic, post-epidemic and inter-epidemic. Specific procedures for data collection and specimen collection for laboratory confirmation will be indicated for each of these phases.

2.1.2.1 Pre-epidemic phase

This phase is sub-divided into two phases: pre-alert and alert. A county is in pre-alert phase when the weekly attack rate is below the alert threshold. All suspected cases should be investigated and laboratory confirmed. For any suspected case where a lumbar puncture is performed, a case-based form should be completed (Annex 1.1) and the CSF sent to the nearest reference laboratory for bacteriological tests. Every meningitis case should be treated with recommended antibiotics per the national treatment protocols. Presumptive antibiotic treatment should be started without delay as soon as the CSF is collected, and before the laboratory returns the results.

For each county in alert phase, detailed data on the suspected cases should be recorded on a line list. CSF sample should be collected from suspect cases and the IDSR case-based form filled out and along to the National Public Health Laboratory with support from the WHO state hub offices (see Box 1). It is recommended to get at least 10 samples that are positive for a bacterial pathogen, including serogroup if a meningococcus is identified. This will help in making a rapid decision as to the need for vaccination and the type of vaccine to be used in case the county reaches the epidemic threshold, as well as orienting the clinicians so they can provide effective case management. Hence, it is important to strengthen laboratory capacity and the use of rapid diagnostic tests and culturing specimens. For every county in alert phase, follow the steps in box 1 below.

**Box 1: Checklist of what should be done during the alert phase:**

1. Immediately alert the health officers in the next higher level.
2. Record cases on a line listing form with: residence, age, sex, vaccination status, outcome, laboratory results, etc.
3. Make use of rapid diagnostic tests to give an early indication of the pathogen(s) and serogroup responsible.
4. Collect and send specimens immediately to the nearest reference laboratory for bacteriological analysis and determination of causal pathogen. Be sure that samples are labelled with patient ID and have an IDSR case-based form completed.
5. Test as many samples as possible for bacterial pathogens. At least 10 positive samples are recommended per surveillance unit (county or sub-county) for decision-making about the appropriate vaccine to be used.
6. Samples should be sent using adequate media: TI bottles (for culture) and cryotubes for PCR.
7. Continue data analysis, graphing and mapping.
8. Treat all suspected cases with antibiotics as recommended by the national treatment protocol.
9. Prepare to initiate request for vaccines.
2.1.2.2 Epidemic phase

A county or payam is in epidemic phase when the attack rate reaches the epidemic threshold. For counties with large populations (above 100,000 inhabitants), it is recommended to calculate the weekly attack rates by payam of 30,000 to 100,000 inhabitants to detect localized epidemics.

As soon as the epidemic threshold is reached in a county or payam, and if the epidemic is due to NmA, NmC, NmW or NmY, a mass immunization campaign should be conducted in the population of that county or payam using multivalent polysaccharide vaccine (or in NmA epidemics with MenAfriVac®) (see Annex 4.1). Depending on the age groups affected, the campaign may be targeted for example at those aged 2–29 years old. It is also recommended to include any contiguous county or payam that is at risk (i.e. in the absence of a relevant vaccination programme, if cases occur early in the dry season, in crowded populations).

The speed of response is critical. For mass vaccination to be effective in preventing a substantial number of cases before the epidemic is over, vaccination should commence as soon as possible and within four weeks of crossing the threshold.

A micro-plan and budget for each area targeted for mass vaccination should be quickly finalized. Sufficient vaccine must be immediately requested from the ministry of health. The Ministry of Health will then request the vaccines from the International Coordinating Group (ICG) on Meningitis Vaccine provision which manages the international emergency stockpile. Once vaccine supplies have been confirmed, a public information campaign must be launched to inform all the communities in the target areas of the coming campaign.

At least 4-5 CSF samples should continue to be collected and sent to the reference laboratory to monitor the characteristics of the causal pathogens (serogroups, antibiotic sensitivity).

Box 2 summarizes the specific actions recommended during the epidemic phase.

**Box 2. What should be done during the epidemic phase:**

1. If the epidemic is due to NmA, NmC, NmW or NmY, make immediate preparations for mass vaccination in the epidemic county, as well as any contiguous county if the population is at risk.
2. Vaccinate using vaccines from national contingency stocks. If not available, prepare a request to the ICG for meningococcal vaccine supplies as soon as new counties or sub-counties cross the epidemic threshold. For the ICG to evaluate a country’s request, attack rates by county and sub-county, by week and by age group, and identification of causal pathogens are needed (See Annex 5).
3. Continue data collection, transmission and analysis.
4. Maintain regular collection of CSF specimens throughout the epidemic season in the epidemic counties to detect any shifts in the serogroup.
5. Treat all cases with the appropriate antibiotic as recommended by the national protocols.

For longitudinal surveillance purposes, regular collection of CSF samples should be maintained in all epidemic counties for monitoring the circulating serogroups, antibiotic susceptibility testing, as well as any shifts in the serogroup during the epidemic period. Note that before sending a specimen to the National Public Health Laboratory, it should be adequately labelled and accompanied by a filled IDSR case-based form (Annex 1.1).
A rapid response team (RRT) from central or state/provincial level should be sent to the affected areas to support surveillance and laboratory activities. In the event of an NmA outbreak in a population vaccinated with MenAfriVac® the RRT should conduct a thorough investigation (See Annex 6). The team should evaluate vaccine coverage, the collection, analysis and transmission of data, as well as lumbar puncture practices, the use of trans-isolate medium and all laboratory results and procedures (e.g. Gram stain, cytology, latex agglutination tests, etc.). It is particularly important to verify laboratory results and procedures to ensure the identification of the Nm serogroup is reliable. Vaccination status of the cases should also be verified and a copy of the vaccination card, if available, should be collected.

### 2.1.2.3 Post-epidemic phase

The post-epidemic phase corresponds to the first four weeks after the end of an epidemic. The end of a meningitis epidemic is declared when the attack rate in the epidemic county descends below the alert threshold for two consecutive weeks. During this phase, it is recommended to:

1) Evaluate the detection and response/management of the epidemic to outline the gaps, lessons learned and make recommendations for their improvement
2) Conduct a vaccine coverage survey if a vaccination campaign was implemented
3) mobilize adequate resources to conduct the evaluation, which is essential for improve control and response measures during future epidemics.

To enable these evaluations, good documentation is essential. At the end of the response, the state Ministry of Health and county health department should:

1) Collect all the documents including minutes of the meeting, activity, process, epidemic report, evaluation report and other relevant documents.
2) Prepare a coversheet listing of all the above documents.

This will become an essential source of data for evaluating the response.

### 2.1.2.4 Inter-epidemic phase

The inter-epidemic phase extends from the end of an epidemic season to the beginning of the next season. In this phase the epidemiological profile of the causal pathogens may be different from the epidemic phase. Therefore, the identification of prevailing germs is important to better understand and guide future control of meningitis epidemics in Africa. During this phase, it is recommended to:

Facilitate strong collaboration among the surveillance officers, clinicians and the national reference laboratory officers to ensure a comprehensive sample collection and confirmation mechanism under the IDSR framework;

1) Continue surveillance and laboratory confirmation of suspected meningitis cases in all national, state and county hospitals.
2) Ensure new staff are trained in relevant meningitis surveillance protocols and procedures such as lumbar puncture
2.1.2.5 Community surveillance

To enhance early case detection in the community and quick referral for treatment, the community should be actively involved. A community based health worker should be designated and trained to identify suspected cases in community. He/she will work collaboratively with the response team from the affected area. His/her major duties should be to identify and report to the health center suspected cases in the village, referral of cases to health centers, and identification of those that are reluctant to seek health care.

2.1.2.6 Data management

Data collection and transmission

Some basic patient information is required for all suspected meningitis case; use the IDSR line list form in Annex 2 to record this information. Suspected cases and deaths should be recorded and transmitted weekly to the county surveillance officer. Data should be immediately compiled and transmitted by the quickest means available (e.g. radio, telephone/SMS, or email) to state and national levels. Weekly notification should be done throughout the season/year. Counties should report weekly, even when no cases are recorded (i.e. 'zero reporting'). Moreover, in case of epidemics, the reporting of cases and deaths should be done daily.

The line list should be completed at the health facility level, compiled at county level and a copy sent to the state and national levels, on a weekly basis. For each suspected meningitis case with CSF specimen, fill an IDSR case-based form (Annex 1.1). Provide a unique identifier [Epid Number: Country code (3 letters)-state code (3 letters)-County code (3 letters)-Year code (2 digits)-Case Number (4 digits): CCC-PPP or RRR-DDD-YY- NNNN] to link the laboratory results with the patient clinical/epidemiological records. Keep a copy of the IDSR case-based form at the county level, and send the other copy together with the CSF specimen to the national public health laboratory. This Epid Number is assigned at county level.

Data entry

At county level

County surveillance officers will enter the data into a computer programme (e.g. Excel, Epi Info) the case forms received from peripheral health facilities. They will also enter the laboratory data and tests results in the same software, completing the database. The data will be sent to the state/national level on a weekly basis. The county surveillance officers should be able to use the data locally by calculating and monitoring weekly attack rates and case fatality rates. The county surveillance officer should be able to analyse and use the data locally by calculating the weekly attack rates and case fatality rates. In the same way, the meningitis trends should be monitored at the treatment facilities where the same indicators should be calculated and monitored.

\[
\text{Weekly Attack rate (AR) } = \frac{\text{No of new cases of Cerebrospinal meningitis (CSM) in an area in a given week}}{\text{Average total population at risk in the same week}} \times 100,000
\]
Each clinician or health unit in-charge of a designated meningitis treatment center should calculate weekly attack rates (AR) and case fatality ratio (CFR) for meningitis throughout the meningitis season.

**Weekly Attack Rate (AR):** This rate refers to the incidence of new cases during an epidemic. The denominator is the total number of exposed contacts during the same period.

The clinician or health unit in-charge should send the weekly reporting form summarizing the cases, deaths, weekly AR and CFR to the County/State/National by the fastest available means

**At state level**

A database like that used at county level will be made available to the national public health laboratory. The data received from the counties will be merged by the state surveillance officer into a single database (e.g. using Excel or Epi Info), and sent to national level on a weekly basis.

**At central/national level**

The data received from the regions or counties will be merged into a single national database (e.g. using Excel or Epi Info), before they are sent to WHO and partners on a weekly basis.

**At the national reference laboratory**

The data from the national reference laboratories will be computerized using Excel or Epi Info, then sent to the national surveillance/epidemiology unit, where they will be linked to the clinical data using the Epid Number. The results will then be sent to the regions and counties where the specimen originated. The data manager at the national surveillance unit should check for data entry flaws and resolve any anomalies in the database on a weekly basis. S/He should make sure that clinical and laboratory data of each patient are linked, before any detailed data analysis.

**Data analysis**

The disease surveillance officers at county, state, and national level should analyse their data. The supervisors at state and national levels should ensure that all counties keep an up-to-date weekly epidemic trend (curve) of meningitis cases with the alert and epidemic thresholds shown. Every week, the data manager of the national surveillance unit should make a standard map showing the alert and epidemic counties, as well as the laboratory results by county, and for the country.

**2.1.2.7 Specimen collection, storage, transportation and processing**

Before the beginning of the epidemic season, each country should:

<table>
<thead>
<tr>
<th>Weekly Case Fatality Ratio (CFR)</th>
<th>Number of deaths from Cerebrospinal meningitis (CSM) in a given week x 100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of CSM cases diagnosed in the same week</td>
</tr>
</tbody>
</table>
1) Procure an adequate stock of lumbar puncture kits, colour gram kits, rapid diagnostic tests, anti-sera (monovalent), trans-isolate (TI) media, cryotubes and triple packaging box for specimen transport;
2) Pre-position these materials at state and county levels under the responsibility of the provincial and county disease surveillance and laboratory officers.
3) Note that TI media should be stored and used per the manufacturer’s guidelines (see Annex 6 for instructions on using TI media).

Depending on the epidemic situation and resources available, WHO will supply the affected and at risk areas with TI media and other laboratory consumables on a case-by-case basis.

**Sample collection**

Health personnel or rapid response teams in the field should systematically collect CSF specimens for laboratory confirmation before the start of antibiotic therapy. At least 10 positive samples per county (or payam) are needed to determine the circulating causal pathogens and decide on the need for vaccination and the appropriate vaccine (see Annex 4). It is estimated that the collection of 20 to 30 CSF samples per county (or payam) are sufficient, but in some cases the collection of more than 30 samples per county may be necessary. If possible, perform antibiotic susceptibility testing (the best methods are the E-test or Minimal Inhibitory Concentration) to guide the use of appropriate antibiotic treatments for case management. The quicker these samples are tested at the reference laboratory the better. Once an epidemic has been declared in a county/payam, regular collection of a few CSF specimens should be maintained in that county throughout the epidemic season, to monitor circulating pathogens. However, for the purposes of enhanced surveillance, the systematic collection of CSF from every single suspected case is not necessary while the epidemic lasts. Health personnel at health facilities should be trained on the lumbar puncture technique, specimen collection, TI utilization and handling, and specimen transportation to the reference laboratory. Additionally, laboratory technicians should be trained on how to perform Gram stains and rapid latex agglutination (Pastorex kits), or dipsticks.

Where the CSF volume is <3 ml, the CSF should be collected in one dry tube (Tube 1); 0.5 ml should be inoculated from this tube into the TI medium and priority tests should be done per laboratory level (Annex 7). Where CSF volume is >3 ml, CSF should also be collected into a cryotube (Tube 2).

**Utilization of TI bottles**

The TI bottles are stored between 4 °C and 8 °C in the refrigerator. Before using a TI bottle, keep it at room temperature and away from direct sunlight and protected from dust for 30 minutes before adding the CSF. From each suspected meningitis case, 0.5 ml of CSF should be injected aseptically into TI media. After the CSF has been injected, the TI medium should be vented with a sterile needle and kept at room temperature away from direct sunlight or dust until it is sent to the national public health laboratory. The inoculated TI medium should not be refrigerated (see Annex 3 for instructions on using TI media).
Transportation of CSF specimen

For culture:

The inoculated TI media should be sent from the health facility to the state Ministry of Health within 24 hours. The state Ministry of Health with support from WHO should send the inoculated TI media to the national public health laboratory at least twice a week. Inoculated TI media are sent (triple packaging) without venting needle and without ice packs. Once inoculated, TI media should be kept at room temperature.

For other bacteriological tests:

Any remaining CSF in the Tube should be kept at room temperature and transported rapidly (within two hours) to higher-level laboratories for additional bacteriological tests.

For polymerase chain reaction (PCR):

If Tube 2 (cryotube) is available, this should be sent to a national public health laboratory, along with TI media for PCR testing. Unlike inoculated TI media, cryotubes should be refrigerated or frozen during storage and transported to the reference laboratory under reverse cold-chain system.

Specimen processing

The identification of causal pathogen is essential to confirm the nature of the meningitis epidemic and implement control measures. Therefore, laboratory confirmation of suspected meningitis cases should be a standard practice during the meningitis epidemic season. The following laboratory tests should be conducted, depending on the organizational levels (national, state, county) and the technical capacity of the laboratory at that level:

1) Gram stain and cell counts at county laboratory or health facility with appropriate equipment.
2) Rapid diagnostic tests (RDTs) at health facility, state and county hospital level. Note that the use of a RDT to identify NmW and NmC is highly recommended during the initial phase of an outbreak. RDTs can be used at field level and substantially reduce the delay in bacteriological confirmation and decision-making. Latex tests (e.g. Pastorex®, Directigen®) and dipsticks (CERMES) are suitable tests. It is important to confirm serogroup results at the national public health laboratory before decisions are taken on vaccination.
3) Culture and identification of serogroup at national public health laboratory.
4) Antibiotic susceptibility pattern should be conducted for all specimens received at national public health laboratory.
5) DNA detection by polymerase chain reaction (PCR) at WHO collaborating laboratories to confirm the causal agent by biomolecular (DNA) test. PCR can be used to confirm the germ on negative TI (no growth by culture).

For PCR testing, CSF specimens should be stored in cryotubes preferably in a freezer (-20°C) or in sterile dry tubes in the refrigerator (+4°C) and shipped in a cool box to the national public health laboratory.
Turn-around time of laboratory results

The laboratory results should be sent to the surveillance units (county, state and national) and to the facility that sent the sample(s) as per the below timelines:
1) County laboratories: within 48 hours upon reception of the sample(s)
2) National level laboratories: within 7 days upon reception of the sample(s).

Quality control and sequence-type

For quality control and sequence-type, 10 to 20% of isolates obtained at national level should be regularly sent to the Regional Office for Africa’s Inter-Country Support Team for West Africa (AFRO-IST) for quality control and to WHO collaborating centres for genotypic characterization. This will allow for monitoring of epidemiological trends of serogroups and genotypes and a better understanding of the spreading patterns of Nm epidemic complexes in the African region.

2.1.3 CASE AND CONTACT MANAGEMENT

2.1.3.1 Case management

Treat all cases of meningitis as quickly as possible, using adequate antibiotics per national treatment protocols. If a lumbar puncture is to be performed, do so before the antibiotic treatment. Treat the patient with presumptive antibiotics without waiting for laboratory results. Recommended treatment of suspected cases of bacterial meningitis during epidemics of meningococcal meningitis
1) In children aged 0–2 months, ceftriaxone 100mg/kg per day IM or IV once a day for 7 days.
2) In children aged over 2 months, ceftriaxone 100mg/kg per day once a day (maximum 2g) IM or IV for 5 days.
3) In children aged >14 years and adults ceftriaxone 2g/day once a day IM or IV for 5 days.

Patients in health centres should be transferred to hospital if there is no improvement within 48 hours, or if exhibiting convulsions or comatose.

In challenging situations of confirmed meningococcal meningitis such as large-scale epidemics, very remote areas or weak infrastructure, single-dose ceftriaxone treatment protocols may be implemented. However, it is essential to ensure community follow-up of cases after 24 hours and refer to hospital care when needed.

Outside epidemics, the recommended length of treatment for children of all ages and adults is 7 to 10 days.

2.1.3.2 Contact management

Prophylaxis for household contacts of a case is not advised during epidemics for logistical reasons and because of the uncertainty of additional benefit. Outside epidemics, household contacts of cases of probable or confirmed meningococcal meningitis are advised to receive chemoprophylaxis with a single dose of either ciprofloxacin (500 mg single dose orally in
teenagers and adults; 15 mg/kg orally in children <12 years) or ceftriaxone (250 mg single dose IM in adults; 125 mg IM in children <12 years). Rifampicin is not advised in the meningitis belt because of the risks of antibiotic resistance. Prophylaxis should be given as soon as possible (ideally within 1–2 days) after diagnosis to reduce the risk of further cases in the household. Note: Ciprofloxacin is available as tablets (250 mg) or as syrup 50 mg/ml (WHO children formulary 2010).

2.1.4 VACCINATION AND VACCINE SELECTION

The best way of limiting the spread of meningococcal disease outbreaks is by vaccination. Effective polysaccharide vaccines exist for two of the major meningococcal serogroups, A and C. Polysaccharide vaccines are also available for serogroups Y and W-135. Trivalent vaccine (A, C, W135) and tetravalent vaccine (A, C, Y, W135) are also available but are more expensive. The other N. meningitidis strains that cause epidemics like X do not have vaccines against them. A new Meningitis A conjugate vaccine (MenAfriVac®), specific for sero group A has been developed. This vaccine confers protection for a longer duration of at least 10 years, eradicated nasopharyngeal carriage of the bacteria, can also be used in children below 2 years; and is cheap to administer since it can be kept outside the cold chain at 4°C without loss in potency, efficacy, or safety.

A mass vaccination campaign, if appropriately carried out, attaining high coverage, can halt an epidemic of meningococcal disease within 2 weeks. Vaccine efficacy is 90% from 2 years and above.

Laboratory diagnosis and confirmation of epidemic sero-groups will guide the type of vaccine needed; either meningococcal polysaccharide bivalent A/C (if serogroup A or C is confirmed as the causative agent) or meningococcal polysaccharide tri-valent vaccine A/C/W135 if serogroup A and W135 are confirmed, or tetravalent A/C/Y/ W135 if sero group W135 and/or Y is confirmed. A vaccination campaign concentrating in the affected districts and sub-counties is recommended. There is no vaccine against N. meningitidis type X.

Based on these facts, the recommended age group for vaccination against group A meningococcal disease is usually 2–29 years for the poly saccharide vaccines and 1-29 years for the Meningitis A conjugate vaccine. This age group can be broadened to the local epidemiology of the outbreak.

Vaccine selection

The decision on the type of vaccine to be used (see decision tree in Annex 4.1) should be based on the results from at least 10 positive specimens. To obtain that number of positive specimens, it is estimated that 20 to 30 CSF specimens should be collected from the affected area. Efforts should be made to collect and test CSF specimens in the field as early as possible. In the absence of laboratory evidence that a specific Nm serogroup is causing the epidemic, the use of meningococcal vaccines should be strongly discouraged.

In all situations, and especially where the number of available positive specimens is lower, the decision tree should be used flexibly to guide the decision, considering all epidemiological and laboratory information available in the country. The following should be considered:

1) Analysis of geographic distribution can orientate more targeted actions.
2) Analysis of affected age groups is important and could lead to different age groups being targeted for vaccination or the use of different vaccines for different age groups.

Status of the MenAfriVac® introduction roll-out is key:
1) If a MenAfriVac® campaign is planned, preference might be given to MenAfriVac® vaccine;
2) If a MenAfriVac® campaign has already been conducted and MenAfriVac® is identified, an investigation should be launched including sending CSF samples for reference laboratory confirmation.
3) In special situations (e.g. displaced persons, refugee camps, closed institutions), different decision criteria can be applied.

2.1.5 RISK COMMUNICATION

Risk is the element that has the strongest influence on people's behaviour and decision-making. Disease risks are best communicated through communication. Consequently, communication is considered as an essential tool that allows people and organizations, including Governments, to manage risks effectively.

A strategic approach to risk communication, i.e., taking the risk into account before it leads to a crisis, could help reduce the costs of communication if the latter is integrated to the whole process and planned.

Considering risk communication helps to reach at least three goals if policies are well implemented. These are:
1) Preventing and reducing risks;
2) Promoting ways of life that are conducive to health;
3) Integrating prevention, health promotion and protection in any public health approach.

During meningitis outbreaks, communication is designed to bridge the gap between the definition of risk by experts on the one hand, and its perception by the public on the other hand. As a rule, it is established that the perception of risk may however vary between experts and those who "face a risk". For technical experts, a risk is directly related to the nature and extent of the HAZARD. For the public (or other persons concerned) a risk is perceived in relation to many other factors and their ability to generate a feeling of indignation (fear, concern, intense emotional investment). This is illustrated in this formula RISK = HAZARD + INDIGNATION.

To implement risk communication that is relevant to the context of preparedness and response of meningitis outbreaks, it is essential to work upstream to come up with communication responses based on the 4 strategies of risk communication.

The above elements must be put in place before moving on to the stage of implementation of the following risk communication strategies in a sequential manner, depending on the level of the meningitis outbreak and the perception obtained from the population:

**Strategy no. 1 –** health education (and relations with stakeholders and partners): applicable when the hazard (meningitis outbreak) is relatively low and the emotional investment is reduced, or in case of indifference.
**Strategy no. 2** – preventive awareness-raising (or advocacy for prevention): applicable when the hazard (meningitis outbreak) is serious but does not give rise to great concern or outrage among people, who can be indifferent to the problem.

**Strategy no. 3** – outrage management: applicable when the hazard (meningitis outbreak) is low (or non-existent) but there is widespread outrage or concern, or disproportionate response compared to the actual risk.

**Strategy no. 4** – Communication in case of crisis: applicable when the hazard (meningitis outbreak) is serious or imminent, giving rise to a high level of fear.

The generic messages for health education on meningitis prevention and control usually include:

a) Avoid massive gatherings or areas of concentration as this enhances transmission of the disease  

b) Report any sudden death in the community/village to the nearest health workers  

c) Report any person with fever and neck stiffness to the nearest health unit for early/timely treatment  

d) Avoid taking antibiotics for prophylaxis as it leads to:  
   → Resistance  
   → Effectiveness doubtable  
   → False confidence  
   → Leads to unnecessary delays in seeking treatment and care for possible cases  

e) Mobilize people in your village in the target age group to go for vaccination at the designated vaccination posts.

**3.0 MONITORING AND SUPERVISION**

**3.1 County level**  
The county surveillance officers supported by the state surveillance officer should ensure during supervisory activities that the personnel of health facilities have been fully briefed on the meningitis preparedness and response plan. For health facilities in meningitis epidemic prone areas, personnel there should be trained on lumbar puncture techniques as well as how to handle and transport CSF specimens. In addition, health personnel should be trained in proper case management, alert and epidemic thresholds, as well as data analysis and reporting using appropriate IDSR forms.

During the epidemic season, the National EPR Committee and the taskforce should continue meeting to review trends and coordinate response interventions. The same coordination meetings should be undertaken on a regular basis at the state levels.

**3.2 State level**  
Surveillance officers at state level should help to conduct and supervise enhanced epidemic meningitis surveillance at county levels. During an outbreak, other health workers from polio, measles and yellow fever should be engaged to support for enhanced meningitis surveillance and response in line with the IDSR strategy.
The surveillance officer at state level working with the state rapid response team should review, monitor, and update data from counties in alert or epidemic phases. Working with the state rapid response team, the state surveillance officer should ensure that CSF is collected for laboratory confirmation, and determine whether samples from counties in alert or epidemic phase have been sent to the national public health laboratory, as well as the return of laboratory results.

During the epidemic season, the taskforce at the state level should be to enhance decision-making and management and coordination of response to potential meningitis outbreaks and to provide support to counties. Regular weekly meetings should be conducted to review surveillance data and rollout interventions in affected and at-risk areas. Continuous supportive supervision from the national level is vital for supporting the state level response activities.

3.3 National surveillance unit
Each week during the epidemic season, the national EPR department in the Ministry of Health should monitor if any counties have reached the alert threshold. For those that have, the national EPR team should then check with the laboratory to determine if TI media or cryotubes (CSF samples) have started arriving from that county. If samples have not arrived, a means of supporting the county to achieve laboratory confirmation by sending the state and/or national rapid response teams to the country.

Other important activities to be conducted at this level include:
1) Monitoring vaccine supply;
2) Monitoring drug supply;
3) Provision of data management tools;

The national EPR/taskforce should review the data on a weekly basis with recommendations for proper control measures and enhanced management of potential meningitis outbreaks. Regular weekly EPR meetings should be conducted at national level to analyse the epidemiological and laboratory data, upon which, supervision and monitoring actions are decided to support both the affected and at-risk counties. The national EPR should also advocate for resource mobilization (funds, drugs, laboratory reagents, vaccines and logistics) from government and partners.

A rapid response team (RRT) should be designated at national level including partners for field investigation and rapid implementation of control measures in affected areas.

3.4 National Public Health Laboratory
The National Public Health Laboratory (NPHL) should ensure the high-quality testing of CSF specimens in the laboratory and the prompt reporting of results back to affected counties. The NPHL should provide regular feedback on samples collected and processed, to minimize contamination and handling/transportation problems. In addition, NPHL should organize regular training and supervision of state laboratory focal points, and ensure that rapid diagnostic tests and trans-isolate media are available. The NPHL should also ensure that 10–20% of positive isolates are transported to WHO collaborating centres for quality assurance and control (in accordance with international standards) for genotyping and sequence typing.

3.5 National Epidemic Preparedness and Response (EPR) committee
As part of the IDSR implementation framework in South Sudan, the national EPR committee is the national coordinating body comprising the EPR directorate in the Ministry of Health, the
NPHL, Disease control programs in the Ministry of Health, WHO, and health cluster partners (Figure 2). Five technical sub-committees, namely Coordination/Logistics, Surveillance, Laboratory, Case Management, and Risk Communication/ Social Mobilization are in place to provide technical guidance in the corresponding thematic areas of interventions (Figure 3). Through weekly meetings, the EPR committee monitors and manages the implementation of activities related to enhancing meningitis surveillance and response in affected and at-risk areas. The EPR committee ensures that partners’ contributions are considered and that all activities are well coordinated. This committee is also responsible for feedback and reporting of surveillance performance to all involved actors as well as the final evaluation report on the country’s response to meningitis epidemics.

Figure 2: The Structure of the EPR Coordination Committee at National Level

Chair: Directorate of Preventive health services
Secretariat: WHO

Government sectors: Health, Agriculture, Wildlife, Environment, Drug and Food Control; Security, Internal and Foreign Affairs
State Ministries of Health
Other Ministry of Health Directorates
Media: Radio; TV; print
Medical Corps; Police, Prisons

Health and WASH cluster partners
UN agencies

Figure 3: The Strategic Approach to EPR for meningococcal disease
3.6 Feedback
The weekly epidemiological bulletin will be used to disseminate regular updates on suspect cases of meningitis during the interepidemic period. In the event of a confirmed outbreak, regular situation reports will be compiled to inform that response.

4.0 OPERATIONAL RESEARCH AND DOCUMENTATION OF THE RESPONSE
To pursue meningitis eradication strategies, priority research areas pursued. The potential areas of research include surveillance, diagnostic tests, and resistance to antibiotics. The information from research may serve as a basis for updating guidelines and improving interventions for meningitis response.

At the end of the response, the county health management team should collect all the documents relevant to the documentation and evaluation of the epidemic response. This should include minutes of the meetings, activity, process, epidemic report, evaluation report and other relevant documents. Further, prepare a coversheet listing of all the above documents. This will become an essential source of data for evaluating the response.

5.0: Meningococcal Meningitis Vaccination Campaign

5.1 Objectives
1. To vaccinate 95% of health workers below 30 years of age with a polysaccharide meningococcal vaccine, regardless of previous immunization history.
2. To vaccinate 80% of all persons aged 2-30 years in epidemic affected counties.
   - To ensure safe injection practices and proper waste disposal in every payam during the meningitis vaccination campaign.

   The aim of conducting a meningitis vaccination campaign is to ensure that all persons aged 2-30 years of age are vaccinated against meningitis, so that a population immunity barrier is built to interrupt transmission of meningitis

5.2 Meningitis Campaign Target Age Group
The target age group for the meningococcal meningitis vaccination campaign is all persons aged 2 to 29 years of age for the meningitis polysaccharide vaccines and 1-29 years for the Meningitis A conjugate vaccine (MenAfriVac®). All persons in this age group are eligible to getting the meningococcal vaccine because it includes most persons who are at risk of getting meningitis in an outbreak setting.

   Persons above 30 years are commonly immune to meningitis disease because they were either immunized by previous meningitis vaccination campaigns or have been naturally exposed to the meningococcal bacteria.

5.3 Special Considerations
To maximize safety and benefit of the campaign, certain situations should receive special consideration:
→ Persons who are sick should receive the meningococcal vaccination and thereafter be referred for treatment.
Persons suffering from meningitis or having recently recovered from the infection or having complications related to previous infection with meningitis should be vaccinated and referred for appropriate treatment.

All persons within the target age group sick or not should be immunized

5.4 Vaccinating children
Children below 2 years of age are known to be at increased risk from the disease during an epidemic. However, immunization of these children by using polysaccharide vaccine is not recommended because the vaccine has poor immunogenicity, thus very low efficacy, in children of this age group. Group A polysaccharide vaccines are poorly immunogenic in children under one year of age, and Group C vaccines have a poor response in children under two years of age. The new meningococcal A conjugate vaccine can induce a higher and more sustainable immune response against group A meningococcus among children aged one year and above, therefore type A conjugate vaccine is effective in protecting children aged one year above.

5.5 Activities for meningococcal meningitis mass immunization planning and coordination
Being an outbreak, the State and the County Epidemic Response Committee in collaboration with the existing agencies/NGOs at the state and lower levels are expected to actively participate in the planning, coordination and implementation of this activity at the respective levels.

In addition, the State Education Officers and heads of educational institutions should be brought on board. This is to ensure that they can participate in planning and implementation especially social mobilization, (disseminating messages on the planned mass immunization).

Other influential personalities/opinion leaders to work with include: heads of other departments within the State, the army and police, religious and cultural leaders, as well as traditional birth attendants.

5.6 Micro planning
There will be no time for elaborate micro planning at State and County levels. However, the State is expected to use the experience of the previous campaigns and knowledge and skills of epidemic response and control to conduct training and micro planning at the State and County level.

1. Resource requirement for the implementation of mass immunization activities for meningococcal meningitis include health workers, logistical requirements - vaccines, immunization equipment (disposable syringes and needles for reconstituting the vaccine and safety boxes), conditions of fridges and the available storage capacity, gas cylinders, vaccine carriers, cold boxes frozen icepacks, funds, transport, and existing structures and capacities for social mobilization.

2. Working figures, such as target populations, number of Counties, educational institutions, and immunization posts and any other information deemed necessary in those counties for the planning and implementation of mass vaccination for meningitis.
5.7 Training

Training will be carried out at the central, state and county levels in a cascade manner. That is the central trainers will train the state trainers who will in turn train the county supervisors and post workers.

The Target groups to be trained at all levels include:

**State level** - State trainers (mainly RRTs including representatives of Counties, sector heads, police, army and health inspectors.

**County level** - County surveillance officers, EPI Officers, County supervisors, health workers, inspectors of schools, heads of educational institutions, heads of PHCCs and PHCUs.

The purpose of training is to ensure that the health workers and the mobilizers are equipped with adequate knowledge/ information on the causes, signs and symptoms, case management, prevention of meningococcal meningitis, and the justification for the mass immunization. In addition, the training will put more emphasis on provision of quality service during the implementation of mass immunization activities.

The duration of training at all levels will be 2 days, and the training content will include:

- Overview of meningococcal meningitis in South Sudan
- Justification for meningococcal meningitis mass immunization activities,
- Epidemiology of meningococcal meningitis
- Meningococcal meningitis outbreak control activities
- Micro planning and training for the mass immunization,
- Social mobilization activities,
- Estimation of vaccines and logistics for mass immunization activities,
- Meningococcal meningitis vaccine including its packaging and administration,
- Organization of the immunization posts,
- Roles of posts workers, monitoring and supervision during mass vaccination,
- Surveillance for meningococcal meningitis
- Adverse events following immunization (AEFI) and their management,
- Data collection tools during the mass vaccination

5.8 Social Mobilization for the Meningitis Vaccination Campaign

Involvement of local civic, traditional and religious leaders, youth groups, women leaders, teachers and NGOs in mobilizing the population for the meningitis vaccination campaign is critical. Any rumor or misconception about the vaccine should be clarified with facts. Therefore, regardless of the limited time available for social mobilization, key people and groups should participate in specific promotional activities. Remember that the meningitis campaign involves an injection.

The aim is to ensure that all those involved are well informed of the need for the vaccination, and know when and where the vaccination is taking place. This is extremely important for the success of the exercise. To achieve the above, social mobilization activities should be planned and started early using the following structures:
→ Multi-sectoral social mobilization committees
→ Involve traditional and religious leaders, political leaders, youth groups, women leaders, Ministry of Education, Army, Police, State Education Officers, inspectors of schools, head teachers and teachers as well as NGOs
→ Use local radio stations

5.9 Implementation of social mobilization activities
Social mobilization activities should be continuous and intensified. The activities should include:
→ Making house to house visits and making proper arrangements with schools
→ Announcing meningococcal meningitis mass vaccination days during community meetings like political rallies, announcements in church/places of worship, schools and any other opportunity
→ Mobilizing leaders to convince parents and youth to respond to the mass vaccination for meningococcal meningitis.
→ Hanging posters and banners in the community if any
→ Passing circulars in offices indicating the days for the mass vaccination, target age group and location of immunization posts.
→ Distributing brochures/leaflets
→ Using Radio stations and newspapers available locally to mobilize the communities.

NB: All social mobilization activities at all levels should use uniform messages about the meningococcal meningitis mass vaccination. Try to identify the local word for meningococcal meningitis so that people will understand it very easily.

Social mobilization messages could include messages such as the following:

1. Why the meningitis vaccination campaign?
The number of cases reported in the state as seen in the health facilities in the county indicates that there is a meningitis outbreak. Although effective treatment is now available in all health facilities in the county, this campaign is important to interrupt the transmission of the disease from one person to the other.

2. When will the meningitis vaccination campaign be conducted?
The mobilizer should know the dates when the immunization is going to take place and pass on this information to the communities.

3. Where will the meningitis vaccine be given from?
Meningitis vaccine will be in all designated vaccination posts or carefully planned mobile teams may be used for special population.

4. Who should receive the meningitis vaccine? - Messages to mobilizers
→ Target group - all persons aged 2 to 30 years will receive meningitis vaccine.
→ There is no contraindication for meningitis vaccine
→ Persons in the target age group that are admitted in health facilities should receive meningitis vaccination.
All persons aged 2 to 30 years, even if previously vaccinated should be brought for meningitis vaccination during the campaign. Persons above 30 years or below 2 years are not included in the target age group; however, if they come to the vaccination post, they can receive the vaccine on special consideration and should be recorded separately.

5. Who will give the injection?
Trained health workers will be giving the meningitis vaccine injection.

5.10 Ensuring safe injection in meningitis vaccination campaign

→ Each injection is administered safely with a single sterile Auto-disabling syringe and needle.
→ The Auto-disabling syringe and needle presents the lowest risk of person to person transmission of blood borne disease-causing organisms because it cannot be reused.
→ Use the right or matching diluents for the meningitis vaccine
→ Dispose the used syringes and needles in safety boxes
→ Supervisors during the campaign will inspect injection safety practices of all vaccinators
→ Adverse events following meningitis immunization (AEFI) will be monitored.
→ Use guidelines on how to monitor AEFI provided during the measles vaccination campaign.

All social mobilization activities at all levels should use uniform messages about the meningitis vaccination campaign. Most people in outbreak-affected sub-counties will have knowledge of meningitis and its consequences. Therefore, all social mobilizers should try to identify and use the local knowledge of meningitis for people to understand it very easily.

The key messages for the meningitis vaccination campaign

- Meningitis is a very contagious disease that frequently kills infected persons if untreated early at the health facilities
- To control meningitis in epidemic affected areas, meningitis vaccine will be given in specified campaign days
- Each injection is administered safely by a trained health worker with a single sterile syringe and needle.
- Auto-disabling syringes and needles plus safety boxes will be used for administering the vaccine.
- There is no risk of infections because auto-disabling syringes cannot be reused
- Report any case of suspected meningitis to your nearest Health facility for early treatment.

6.0: Estimation of meningitis vaccine and other logistics requirements

6.1 Size of Target Population

The number of persons 2 to 29 years of age should be worked out by the State or County supervisor using the population census figures. The size of the target population for meningitis vaccination campaigns will be approximately 70% of the total State or County population.
Calculating the target population for meningitis vaccination Campaigns is:
Population 2-29 years = Total State/County Population x 0.7 (Target population for meningitis campaigns)

6.2 Vaccine requirements
The vaccine requirements for a meningitis vaccination campaign will be equal to the size of the population plus an additional 20% for wastage and reserve.

6.3 Estimation of vaccine:
Target population for the campaign x 1.20 = Vaccine doses required.

For example, if the target population for meningitis vaccination campaigns in County ‘Y’ is 128,235. The amount of meningitis vaccine required (in doses) for the county will be: 128,235 x 1.20 = 153,882 doses

6.4 Estimating the Auto-disabling syringes and needles (AIDS)
Target population for the campaign x 1.20 = Number of expected Auto-disabling syringes and needles.

Mixing syringes
Number of mixing syringes and needles = Number of vaccine vials (one needle, one syringe, and one vial)

Safety boxes
Number of safety boxes = \frac{Auto\ disabling + Mixing\ syringes\ needles}{100}

NB. These calculations are based on building concept of vaccines and injection material.

6.5 Immunization posts
Two vaccination strategies will be used.

a) Fixed posts - The same number of immunization posts used for previous polio and measles campaigns should be used for meningitis vaccination campaign. In areas where new immunization posts are going to be created or shifted to a more convenient place, the community leaders should participate in the decision-making about the changes and location of extra immunization posts.

b) Mobile teams/ teams for identified special groups.

7.0: Vaccine packaging, storage, and administration

7.1 Packaging of the vaccine
The vaccines are packaged as a lyophilized powder with dilute in single and multi-dose vials. The vaccine that will be used during this mass immunization is packed in 50-dose vial and/or 10-dose vial.

7.2 Storage of the vaccine
Meningococcal vaccine is stored between 2° - 8° C, at all levels.
7.3 Administration of meningococcal vaccine
The vaccine is administered by subcutaneous or intra muscular injection in the upper arm, (Look at manufacturer’s specifications for different batches to ascertain recommended route).

7.4 Required Materials for meningitis vaccine administration at every immunization post (checklist)
→ 1-2 tables
→ Chair, benches, mats etc. for sitting
→ 1-2 vaccine carriers with frozen ice packs and sponge
→ Meningitis vaccine and diluent, packed in polythene bags
→ Gullipots, dressing jar (if available otherwise can use clean plastic bowls)
→ A thermometer in the vaccine carrier
→ Auto-disabling hypodermic syringes 0.5 ml with fixed 23G x 1” needles per person.
→ 5 ml disposable syringes and needles for reconstituting the meningitis vaccine one per vial
→ Safety box for disposing syringes/ needles (1 box is required for ever 100 Auto-disabling syringes)
→ File for opening glass vials (if available)
→ Cotton wool (1 roll per post)
→ Tally sheets and a pen
→ A container with boiled cool water for cleaning injection site (3-5 liter)
→ A jerry can of water, basin and soap for hand washing
→ A poster or any other alternative to mark the post
→ Containers (2)- 1 for empty vials, 1 for wet swabs
→ PHN bag or polythene bag
→ Plastic sheeting -1 meter per post
→ Paraffin 2 liters and a box of matches per post
## 7.5 Steps in reconstituting the meningococcal vaccine

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wash your hands</td>
<td>Wash your hands with clean water and soap and drip-dry</td>
</tr>
<tr>
<td>2</td>
<td>Inspect the vaccine vial or ampoule</td>
<td>Check the expiry date on the vaccine and status of vial monitor (if there is any), to ensure that the vaccine has not passed the discard point. Discard any vaccine without a label.</td>
</tr>
<tr>
<td>3</td>
<td>Flick the vial or ampoule</td>
<td>Make sure that all of the vaccine powder is at the bottom of the vial. Flick or tap the vial with your finger.</td>
</tr>
<tr>
<td>4</td>
<td>Open the vaccine vial or ampoule</td>
<td>The center of the metal cap is pre-cut so that it can easily be removed. Lift the center of the metal cap and bend it back, using a metal file.</td>
</tr>
<tr>
<td>5</td>
<td>Inspect the diluent ampoule or vial</td>
<td>Make sure the ampoule is not cracked.</td>
</tr>
<tr>
<td>6</td>
<td>Read the label on the diluent ampoule or vial</td>
<td>Make sure that you are using the diluent the manufacturer sent with the vaccine and the expiry date has not passed. Use only the ampoule or vial sent by the manufacturer for the specific powder vaccine. Each vaccine has its own diluent and must not be reconstituted with anything else.</td>
</tr>
<tr>
<td>7</td>
<td>Open the glass ampoule</td>
<td>Hold the ampoule between your thumb and middle finger. Use your index finger to support the top. Take the metal file that is packed with the ampoules and scratch hard around the neck of the ampoule you wish to open. Hold the top of the ampoule in a clean swab and gently break off the top. It breaks where you made the scratch. In case of injury while breaking the ampoule, discard the ampoule as the content may have been contaminated. Cover the wound/cut before opening new ampoule. “Scratching and breaking” the neck of the vial.</td>
</tr>
<tr>
<td>8</td>
<td>Draw diluent into a mixing syringe</td>
<td>Use a new disposable mixing syringe (5 mls) and a mixing needle (76 mm, 18 gauge) to reconstitute each supply. Put the needle in the open top of the ampoule. Pull back the plunger to draw all the diluent from the ampoule into the syringe: Taking fluid from an ampoule.</td>
</tr>
<tr>
<td>9</td>
<td>Reconstitute the vaccine</td>
<td>Insert the mixing syringe that is filled with diluent into the vaccine vial or ampoule. Hold the plunger end the mixing...</td>
</tr>
</tbody>
</table>
### 7.5 How to administer the Meningococcal vaccine

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use a sterile packed syringe and needles for each injection. Therefore, check the AD package to ensure that it is intact (sealed)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Load a sterile AD syringe with a 0.5 ml of reconstituted meningococcal Vaccine.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Remember to put back the vial in the sponge after drawing the vaccine.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>For a child, ask the parent/ caretaker to expose the upper arm, and Instruct him or her to hold the child well to restrict movement. For an adult, explain to him/ her the procedure, injection site and the need to support the arm.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Clean the injection site with a cotton swab moistened with cool boiled water.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>With the fingers of the left hand, gently pinch up the skin on the left outer upper arm.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Hold the syringe at an acute angle to the client’s arm.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>DO NOT TOUCH THE NEEDLE. With the right hand, push the needle into the pinched-up skin, push the plunger slowly and inject the 0.5 of the vaccine subcutaneously. <strong>Caution:</strong> Avoid injecting in the vein or muscle</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Withdraw the needle and discard the needle and the syringe immediately into the safety box provided. Do not attempt to recap the needle</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Apply gently pressure on the injection site using dry swab to prevent any bleeding. <strong>DO NOT MASSAGE OR RUB THE INJECTION SITE.</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Discard the needle and syringe in a safety box.**

Put the reconstituted vaccine in the sponge of the vaccine carrier. Reconstituted vaccine should be used for 12 hours only and discarded. Open vial policy does not apply.
Step | Procedure
---|---
11 | Give the client/parent/caretaker health advice like: Do not rub or put anything on the injection site; In case of any side effect seek medical advice immediately from a qualified health work from a health facility.
12 | Wash hands before administering vaccine to every client whenever necessary.

### 7.6 Potential side effects of meningococcal vaccine

**Mild reactions include:**
- **Soreness:** Some people experience redness or pain at the injection site. These symptoms usually last 1-2 days.
- **Fever:** A small percentage of people who receive the vaccine develop a fever.

**Severe adverse reactions:** These include allergic reactions (anaphylaxis, urticaria, wheeze, angioedema), somnolence and neurological reactions (e.g., seizures, paraesthesia and anaesthesia). However, these have been reported very rarely.

### 7.7 Administration summary: Meningococcal vaccine

<table>
<thead>
<tr>
<th>Type of vaccine</th>
<th>Purified bacterial capsule polysaccharide (AC, AC/ W135, Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of doses required</td>
<td>One</td>
</tr>
<tr>
<td>Schedule</td>
<td>2 years and above</td>
</tr>
<tr>
<td>Target age group during this mass immunization</td>
<td>2-29 years</td>
</tr>
<tr>
<td>Booster</td>
<td>Every three to five years</td>
</tr>
<tr>
<td>Contraindication</td>
<td>Severe adverse reaction to previous dose</td>
</tr>
<tr>
<td>Adverse reactions</td>
<td>Occasional mild local reaction, mild fever</td>
</tr>
<tr>
<td>Special precautions</td>
<td>Children aged under two years of age are not protected by the vaccine</td>
</tr>
<tr>
<td>Dosage</td>
<td>0.5 ml</td>
</tr>
<tr>
<td>Injection site</td>
<td>Upper arm</td>
</tr>
<tr>
<td>Injection type (mode of administration)</td>
<td>Subcutaneous (SC) or intramuscularly (IM)</td>
</tr>
<tr>
<td>Storage</td>
<td>Store between 2° - 8°C</td>
</tr>
</tbody>
</table>

### 7.8 Management of the side effects

Side effects are transient, therefore:
- → Reassure or comfort the client
- → Give mild analgesics
- → In case of severe reactions refer the patient to the nearest health facility with a qualified health worker for proper management. Preferably at County or State level (hospital)
- → Remember to fill in the Adverse Events following immunization (AEFI) form

### 7.9 Recording / issuing of meningitis vaccines, and its logistics

All items received for meningitis vaccination campaigns should be recorded in the same manner that medical supplies are recorded/ issued using the stock card. Receipts and distribution lists should be made prior to the campaign dates.
Meningitis campaigns vaccination posts: Types of immunization posts
Vaccination posts to be employed during the meningitis vaccination campaign may be Fixed (Permanent) or temporary.

Permanent - Fixed Immunization posts
These posts are located at permanent health facilities. Immunization will be provided at the health facilities the whole day for five days during the campaign. These sites will also serve as depots for storage and distribution of vaccine to temporary fixed sites and mobile teams.

Temporary Immunization posts
These posts are located at schools, churches, market areas or any other central or site used for previous campaigns. Immunization will be provided at these sites for either the duration of the campaign or partially depending on the population density.

Mobile – Immunization posts
These posts move from community to community reaching populations that are living in hard-to-reach areas who may not have access to a fixed site, too small in size to justify an all-day fixed post or unlikely to visit the fixed sites.

Immunization posts location
The post needs to be well organized to create conducive environment for efficient delivery of immunization services. The following areas are essential:
- Waiting area
- Registration / screening
- Immunization table
- Check point/ recording area (Tallying area)

Flow chart for clients during mass meningitis campaign

![Flow chart for clients during mass meningitis campaign]

Elements of an immunization post
- Should have adequate shade
- Should have good client flow
- Should have two health workers for meningitis vaccine administration, a mobilizer for giving messages/ crowd control and a recorder for tallying
- Should have a sign that stands out clearly to signify a vaccination post

Where to place an immunization post

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33
→ Should be situated in an area easily accessible to the community and should have adequate space for crowds of people
→ Preferably in a building, veranda or under a good shade.
→ The site should be located in a clean environment with a place of convenience (latrine).

**Staffing at the immunization post**
→ 2 Health workers
→ 1 mobilizer
→ 1 volunteer

**Roles of the Mobilizer**
→ Assist in the setting up of the vaccination point each day
→ Welcomes the parent/ caretaker for coming
→ Controls the crowd
→ Ensures a one-way-flow through the post
→ Gives health advice
→ Inform the crowd of any delays etc.
→ Makes house-to-house education on meningitis

Look for all eligible clients from the community in order to reach the entire target population

**Roles of Vaccinator (Health Worker) at immunization table**
→ Ensure adequate vaccine and diluent are packed in the vaccine carrier with frozen icepacks.
→ Ensure adequate availability of auto-disabled syringes and needles plus the mixing syringe and needle.
→ Dilute the meningitis vaccine and records used vials
→ Prepare the AD syringes for vaccine administration
→ Ensure that the vaccination area remains safe and clean
→ Ensure correct storage of vaccine
→ Vaccinates the persons in the targeted age group
→ Ensure procedure safety
→ Ensures that one disposable syringe and needle re-constitutes one vial of meningitis vaccine.
→ Ensures safety procedure by using appropriate techniques and use of ADS per person to administer 0.5 ml dose of meningitis vaccine subcutaneously or intramuscularly.
→ Gives health advice on meningitis vaccine and possible side effects.
→ Monitor and respond to community reactions

**As a supervisor at the post, the health worker**
→ Supervises all activities at the vaccination post.
→ Makes sure the tally sheets are completed appropriately
Ensures that all the equipment/logistics, tally sheets, balances of vaccines are returned to the storage center.

Ensures that all used syringes and needles are disposed of by burning (using the recommended procedure)

In addition, each PHCC will have 2 supervisors. Preferably, they must be qualified health workers. One of them will have a roving supervisory role while the other will be static at the vaccines store. The sample of tally sheets to use during the mass immunization.

Roles of the static supervisor
- Supervises the distribution of vaccine, icepack and tally sheets at the distribution center.
- Receives tally sheets from the posts, returned vaccines and other logistics
- Liaises with the roving supervisor to crosscheck and compile returns from the immunization posts for onward submission to the County/State
- Disseminates prime messages on meningitis
- Enlists reactions of community on vaccination
- Build alliance with opinion and community leaders
- Detect rumors from the community and report the immediately

Roles of the roving supervisor
- Co-ordinates all meningitis vaccination campaign activities at PHCC level, monitors and supervises all activities at immunization posts during the campaign period and advises operational staff accordingly.
- During meningitis campaign implementation, carries extra vaccines, logistics/supplies for distribution to immunization posts with shortages.
- After each round, collects tally sheets and compiles PHCC summary report for onward submission to the County/State within two days of completion of the campaigns.

During the actual implementation of meningitis vaccination campaigns, supervisors at all levels should be actively visiting posts and vaccinating teams to monitor, assist and help solve any problems as they arise. The payam supervisors may change roles from time to time.

7.10 Contingency plans
a) If few clients come to be vaccinated
If by end of day one vaccination post has achieved 40% or less of the target population, do not wait until it is very late.
- Send mobilizers around into the community to look for eligible clients from house-to-house.
- Ask clients leaving the post for assistance to remind/call others who have not been vaccinated. Consider the benefits of using mobile teams.

b) If too many clients come to be vaccinated
- Do not panic
- Seek assistance from the clients, ask them for patience.
- Organize the queue and explain to them that every client will be vaccinated
→ Reassure clients frequently to prevent them from leaving before they are vaccinated.
→ Try to seek assistance from your supervisor or other volunteers, if possible.

c) If there is shortage of vaccine
→ Do not wait until vaccine is completely finished. If you foresee a shortage, try to find more vaccines from the nearest post/health unit.
→ Send “somebody” by the quickest means to obtain more vaccine.
→ Explain to the clients that more vaccines are coming
→ Try to seek assistance from your supervisor or other volunteers
→ Try to contact the mobile team

d) If there is a shortage of tally sheets
→ Do not lose information
→ Use the back of the tally sheets or any other kind of paper
→ Try to obtain more tally sheets from your supervisor.

7.11 How to maintain injection safety during immunization session
→ Always wash your hands with soap before the session and ensure having a clean working environment and use of clean hands all the time.
→ Use polythene sheeting on the table where the immunization items will be laid.
→ Lay the immunization table in an orderly manner (dressing jar/ clean plastic bowl for cotton swabs, gullipots for cool boiled water for cleaning the site of injection, scissors for cutting vitamin A capsules, kidney dishes/ clean plastic bowl for holding the pair of scissors)
→ Observe the non-touch technique
→ Reconstituted meningitis vaccine should be used within 12 hours.
→ Discard all the reconstituted vials at the end of the session.
→ Discard any vial without a label
→ Ensure proper reconstitution and administration of the vaccine.

7.12 Safe Disposal of used syringes and Needles
→ Needles should not be recapped after use.
→ Every used syringe and needle should be put in the safety boxes provided.
→ Each vaccination team should have sufficient safety boxes to dispose of all used syringes and needles. Each team should have safety boxes for every 100 syringes.
→ The safety boxes should not be overfilled or made wet.
→ Do not put the used swabs and empty vaccine vials in the safety box.
→ Burn all the filled safety boxes at the end of each session
→ Every immunization post should ensure that all the used items (burnt safety boxes and cotton wool swabs) are buried.
NB: “Health workers (supervisors) at Post must be responsible for safe disposal of all immunization waste generation during the campaigns”

7.13 Monitoring and supervision

During the planning and implementation of meningitis vaccination campaigns, supervision at all levels play a very big role in the effective coverage of the target populations and the quality of service provided during the campaign. High risk and hard to reach populations should receive more intensive supervision.

Therefore, the supervisors selected at all levels should be technically knowledgeable and have adequate supervision skills. There is need to know:

- Proportion of target population immunized
- Quality of services provided/ injection safety
- Major lessons learnt and proposed adjustments to strategy implementation
- Projected impact on the meningitis outbreak (morbidity and mortality)

a) Proportion of target population immunized

Procedure for recording information on the Tally Sheet during the meningitis vaccination campaign:

- The recorder/ Health worker at the post fills the tally sheet.
- Use one tally sheet per day of the vaccination campaign period.
ANNEXES

Annex 1: Alert and Epidemic thresholds for detection and control of epidemic meningitis

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 000–100 000</td>
</tr>
<tr>
<td><strong>Alert threshold</strong></td>
<td></td>
</tr>
<tr>
<td>- Inform authorities</td>
<td></td>
</tr>
<tr>
<td>- Strengthen surveillance</td>
<td></td>
</tr>
<tr>
<td>- Investigate</td>
<td></td>
</tr>
<tr>
<td>- Confirm (including laboratory)</td>
<td></td>
</tr>
<tr>
<td>- Prepare for eventual response</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 suspected cases / 100 000 inhabitants / week</td>
</tr>
<tr>
<td>(Minimum of 2 cases in one week)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 suspected cases in one week</td>
</tr>
<tr>
<td></td>
<td>Or</td>
</tr>
<tr>
<td></td>
<td>An increased incidence compared to previous non-epidemic years</td>
</tr>
<tr>
<td><strong>Epidemic threshold</strong></td>
<td></td>
</tr>
<tr>
<td>- Mass vaccination within 4 weeks of crossing the epidemic threshold</td>
<td></td>
</tr>
<tr>
<td>- Distribute treatment to health centres</td>
<td></td>
</tr>
<tr>
<td>- Treat according to epidemic protocol</td>
<td></td>
</tr>
<tr>
<td>- Inform the public</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 suspected cases / 100 000 inhabitants / week</td>
</tr>
<tr>
<td></td>
<td>5 suspected cases in one week</td>
</tr>
<tr>
<td></td>
<td>Or</td>
</tr>
<tr>
<td></td>
<td>Doubling of the number of cases in a three-week period(^2)</td>
</tr>
</tbody>
</table>

If a neighbouring area to a population targeted for vaccination is considered to be at risk\(^3\), it should be included in a vaccination programme.

In special situations such as mass gathering refugees displaced persons or closed institutions, two confirmed cases in a week should prompt mass vaccination.

---

2. For example, week 1: 1 case, week 2: 2 cases, week 3: 4 cases
3. Epidemic risk factors: cases early in the dry season; no recent relevant vaccination campaign; high population density.
**Annex 1.1: Epidemiology Surveillance Division: Case Based Investigation Form**

**Ministry of Health, Republic of South Sudan**

**Case Based Investigation**

**Health facility:** ___________________  **State** ___________________  **County** ___________________

**Payam** ___________________  **Date:** ____________

**Generic Reporting Form – from Health Facility/Health Worker to County Health Team**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFP</td>
<td></td>
</tr>
<tr>
<td>Cholera</td>
<td></td>
</tr>
<tr>
<td>Diarrhea with Blood</td>
<td></td>
</tr>
<tr>
<td>Shigelloses</td>
<td></td>
</tr>
<tr>
<td>Dracunculiasis</td>
<td></td>
</tr>
<tr>
<td>Neonatal Hemorrhagic</td>
<td></td>
</tr>
<tr>
<td>Tetanus</td>
<td></td>
</tr>
<tr>
<td>Measles</td>
<td></td>
</tr>
<tr>
<td>Meningitis</td>
<td></td>
</tr>
<tr>
<td>Plague</td>
<td></td>
</tr>
<tr>
<td>Viral Yellow Fever</td>
<td></td>
</tr>
<tr>
<td>Viral Hemorrhagic Fever</td>
<td></td>
</tr>
<tr>
<td>Viral Tetanus</td>
<td></td>
</tr>
<tr>
<td>Viral Other</td>
<td></td>
</tr>
</tbody>
</table>

**Date Received form at national level:** ____________

<table>
<thead>
<tr>
<th>Name(s) of Patient</th>
<th>Date of Birth</th>
<th>Age</th>
<th>Sex</th>
<th>County of Residence</th>
<th>U=Urban</th>
<th>R=Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient:</td>
<td>Birth:</td>
<td></td>
<td></td>
<td>County:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Patient’s Residence: Village/Neighbourhood**

<table>
<thead>
<tr>
<th>Locating Information</th>
<th>For cases of Measles, NT (TT in mother), Yellow Fever, and Meningitis:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Seen at Health Facility:</td>
<td>Date of last vaccination:</td>
</tr>
<tr>
<td>Presenting symptoms:</td>
<td>Year</td>
</tr>
</tbody>
</table>

**Date Health Facility Notified County:** ____________

**Dates of Onset:** ____________

**Other treatment given**

<table>
<thead>
<tr>
<th>Blank variable #1</th>
<th>In/Out patient</th>
<th>1=In-patient</th>
<th>2=Out-patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank variable #2</td>
<td>Outcome</td>
<td>1=Alive</td>
<td>2=Dead</td>
</tr>
</tbody>
</table>

**Final Classification:**

<table>
<thead>
<tr>
<th>Final Classification</th>
<th>1=Confirmed</th>
<th>2=Probable/Compatible</th>
<th>3=Discarded</th>
<th>4=Suspected</th>
<th>9=unknown</th>
</tr>
</thead>
</table>

**Person Completing Form:** ___________________

**Signature:** ___________________

**Date Sent Form to County:** ____________

---

For Health Facility: If lab specimen is collected, complete the following information. And send a copy of this form to the lab with the specimen.

**Date of specimen collection:** ____________

**Specimen source:** Stool  Blood  CSF

**Date Specimen sent to lab:** ____________

**Specify Laboratory where sample sent to:** ___________________
For the Lab: Complete this section and return the form to county team and clinician

Date lab specimen: ______/_______/______ Specimen Condition: Adequate Not adequate

<table>
<thead>
<tr>
<th>Disease / Condition</th>
<th>Type of Test</th>
<th>Results (P=pending)</th>
<th>Disease / Condition</th>
<th>Type of Test</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholera</td>
<td>Culture</td>
<td>+ - P</td>
<td>Yellow Fever</td>
<td>IgM</td>
<td>+ - P</td>
</tr>
<tr>
<td></td>
<td>Direct Exam</td>
<td>+ - P</td>
<td>Measles</td>
<td>IgM</td>
<td>+ - P</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rubella</td>
<td>IgM</td>
<td>+ - P</td>
</tr>
<tr>
<td>Meningitis</td>
<td></td>
<td>for Direct Exam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. meningitidis</td>
<td>Culture</td>
<td>+ - P</td>
<td>RVF</td>
<td>IgM</td>
<td>+ - P</td>
</tr>
<tr>
<td>S. pneumonia</td>
<td>Culture</td>
<td>+ - P</td>
<td>Ebola</td>
<td>IgM</td>
<td>+ - P</td>
</tr>
<tr>
<td>H. influenza</td>
<td>Culture</td>
<td>+ - P</td>
<td>CCHF</td>
<td>IgM</td>
<td>+ - P</td>
</tr>
<tr>
<td>N. meningitidis</td>
<td>Latex</td>
<td>+ - P</td>
<td>Lassa</td>
<td>IgM</td>
<td>+ - P</td>
</tr>
<tr>
<td>S. pneumonia</td>
<td>Latex</td>
<td>+ - P</td>
<td>Marburg</td>
<td>IgM</td>
<td>+ - P</td>
</tr>
<tr>
<td>H. influenza</td>
<td>Latex</td>
<td>+ - P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shigella Dysenteriae</td>
<td>Culture</td>
<td>SD type 1 Other shig</td>
<td>No shig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plague</td>
<td>Culture</td>
<td>+ - P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IFA&gt;1: 64</td>
<td>+ - P</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other lab results:

<table>
<thead>
<tr>
<th>Virus Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholera</td>
</tr>
<tr>
<td>Yellow Fever</td>
</tr>
<tr>
<td>Measles</td>
</tr>
<tr>
<td>Rubella</td>
</tr>
<tr>
<td>N. meningitidis</td>
</tr>
<tr>
<td>S. pneumonia</td>
</tr>
<tr>
<td>H. influenza</td>
</tr>
<tr>
<td>N. meningitidis</td>
</tr>
<tr>
<td>S. pneumonia</td>
</tr>
<tr>
<td>H. influenza</td>
</tr>
<tr>
<td>Shigella Dysenteriae</td>
</tr>
<tr>
<td>Plague</td>
</tr>
</tbody>
</table>

Nome of lab sending results: _______________________

Other pending tests: __________________________

Date lab results sent to county: ______/_______/______

Date lab results sent to clinician by county: ______/_______/______

NOTE: County is responsible for ensuring lab results get to clinicians. Failure to do so will undermine cooperation with clinicians on reporting of cases in the future.
## Annex 2: Epidemiology Surveillance Division: Meningitis Line Listing Form

### Ministry of health, Republic of South Sudan

**Line listing of suspected cases of Meningitis**

Health facility: ___________________ State ___________________ County______________ Payam ___________ Date: __________

<table>
<thead>
<tr>
<th>S/No</th>
<th>Name</th>
<th>Age</th>
<th>Sex</th>
<th>Location</th>
<th>Date of Visit</th>
<th>Date of Onset</th>
<th>Symptoms and Signs</th>
<th>CSF Specimen Taken</th>
<th>Laboratory result</th>
<th>Vaccine status</th>
<th>Outcome (I; L; D)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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**Legend:**
- **S/No**: Serial number
- **Age**: specify exact Months “M” or Years “Y” example “8 M” or “17 Y”
- **Sex**: “M” for male and “F” for female
- **Location**: village or area of residence
- **Date of visit**: date of visit to health facility
- **Date of onset of symptoms**: date when illness started
- **Presenting Symptoms**: “Y” for Yes and “N” for No
- **CSF sample**: “Y” if taken, “N” if not taken
- **Lab result**: Enter exact name of organism isolated if results available, “P” for pending;
- **Vaccine Status**: “N” of not vaccinated. Enter exact year if vaccinated for example, 2006
- **Outcome**: “I” for Improved, “L” for Lost to follow up, “D” for died

Counties
Annex 3: Epidemiology Surveillance Division: Specimen Collection and Transportation

CEREBROSPINAL FLUID (CSF) SAMPLE FOR DETECTION OF MENINGITIS
Transportation of cerebrospinal fluid (CSF) samples for culture is a difficult task because during shipping the bottles (vials) must be kept at body temperature, i.e. 37°C. Specimens for isolation of Neisseria meningitidis, Haemophilus influenzae or Streptococcus pneumoniae must never be refrigerated because these pathogens are killed at low temperatures.

Empiric antibiotic therapy may be initiated after CSF specimens for culture have been collected.

LABORATORY REQUEST FORMS:
Print the case based investigation form with the following information:
- Patients’ names, age, sex, location, registration/specimen number
- Type of specimen and test required
- Clinical notes: Major features of the illness, suspected diagnosis and any antimicrobial treatment that has been started
- Date and time of specimen collection
- Name and signature of requesting officer

LABORATORY MATERIALS NEEDED:
- Lumbar puncture needles (22G 3½)
- Sterile gloves
- Alcohol swabs
- Glass slides
- Laboratory request forms
- Adhesive labels.
- Trans-Isolete medium
- Sterile needle (21G)
- Sterile syringe (2ml)
- Sterile test tubes (75x10mm) OR Sterile bijou bottle
- Carton box or cool box without coolants (ice packs)

METHOD OF COLLECTION FOR CSF SPECIMEN:

**Procedure for performing a lumbar puncture**

A lumbar puncture is performed to collect samples of cerebrospinal fluid (CSF), the clear fluid surrounding the brain and spinal cord, in patients with suspected meningitis. Lumbar puncture should not be performed if there is a possibility of raised intracranial pressure, e.g. a brain tumour, due to the danger of sudden death from “coning” of the medulla of the brain through the foramen magnum. Lumbar puncture should also not be performed in coagulation disorders, or if there is local infection near the puncture site. CSF is most conveniently collected by passing a needle into the spinal canal (subarachnoid space) surrounding the lower part of the spinal cord.

1. The space between the 3rd and 4th lumbar vertebrae is the preferred site for entry into the spinal sac in both adults and children. The space between the 4th and 5th lumbar vertebrae can also be used. Children must be held securely in position.
2. Sterile supplies should be prepared in advance, including sterile gloves, sterile drapes, a sterile spinal needle (for adults or children), two sterile bottles, and 70% alcohol and sterile swabs for cleaning the skin. If appropriate, the laboratory staff should be pre-warned that a lumbar puncture is about to take place.
3. Position the patient lying on the left side, with neck, back, hips and knees fully flexed. The patient should lie as tightly curled up as possible to open up the inter-vertebral spaces. Identify the 3rd lumbar vertebral spine by drawing a finger vertically down from the posterior superior iliac crest to the midline. Palpate the space between the 3rd and 4th vertebral spine.

4. Using a sterile technique, clean the area of skin over the selected area using 70% alcohol then apply povidine-iodine. Let it dry. Place one drape under the patient, and one over the patient's back.

5. Infiltrate the skin and subcutaneous tissue with local anaesthetic (1% lignocaine), and allow a few minutes to take effect. Do not use local anaesthetic in neonates.

6. Introduce the spinal needle (22G 3½ in adults; 21G needle in children) through the skin in the midline between the vertebrae, carefully keeping the needle at right angles to the skin and pointing slightly towards the head. As the needle enters the spinal canal, a slight easing of resistance can be felt.

7. Remove the stylet of the needle, and CSF should be seen dripping freely out of the needle. Collect about 2 ml of fluid (about 0.5ml in children) into each of the two sterile test tubes (75x10mm). Withdraw the needle and apply pressure for a few minutes over the puncture wound. The patient should remain lying down for 1 hour after the procedure.

Note: Examine the colour of the fluid. Normal CSF is clear and colourless. Turbid fluid indicates the presence of many cells.

See below: Transportation of the specimen and inoculation into Trans Isolate medium.

**TRANS ISOLATE MEDIUM (T-I) AND HOW TO USE IT**

Trans Isolate Medium is broth medium for isolation and transportation of meningococci and other agents causing bacterial meningitis from CSF.

Procedure:
1. Remove a vial of T-I medium from the refrigerator at least 30 minutes before inoculating it with the specimen. Allow the vial to warm at room temperature which is more favourable for growth of the organism.
2. Before inoculating the vial, check to see if there is any visible growth or turbidity. If there is any turbidity discard the bottle.
3. Lift the small lid in the middle of the metal cap on top of the T-I vial.
4. Disinfect the top of the T-I vial with 70% alcohol or iodine. Allow to dry (usually 30-60 seconds).
5. Use a sterile syringe and needle preferably 21G to aspirate 0.5ml of CSF from the sterile bottle containing CSF.
6. Inject CSF into the T-I vial through the disinfected dry stopper on the top of the T-I vial.

**Description of Trans-Isolate medium (T-I)**
- Trans-Isolate media is normally stored in the refrigerator and can be used for at least one year after the date of production.
- T-I medium is destroyed by freezing.
- Contamination is the single most problematic point with T-I vials. Aseptic measures and understanding the risks are necessary to achieve good recovery of the isolates.

**TRIPLE PACKAGING OF INFECTIOUS MATERIALS**

Currently, triple packing is an essential safety feature for the transport of infectious materials, and is an international requirement.

**MATERIALS**
- Gauze or cotton wool
- Plastic containers of variable sizes, e.g. used drug containers
- Rubber bands
- Adhesive labels
- Marker pen (waterproof marker)

**METHOD OF PACKING**

1. Place the sample into appropriate specimen container (glass or plastic) and tighten the cap
2. Wrap the specimen container in absorbent material, e.g. gauze or cotton wool, to cushion it and absorb any leakage.
3. Place the primary container into a secondary container and tighten the cap.
4. Place the secondary container into a tertiary container and tighten the cap. Label appropriately.
5. Attach the request form to the outside container.

**MATERIALS TRANSPORTED FOR INVESTIGATION TO A REFERENCE LABORATORY**

1. CSF specimen in plain sterile test tube
2. Part of the CSF inoculated into T-I medium
3. In case the specimen has been examined by a Health Centre Laboratory; Place fixed, unstained slides in a slide plastic carrier for transportation. Include the results of the preliminary testing carried out in the field laboratory.

**PACKING AND TRANSPORTATION OF SAMPLES:**

1. Transport the triple packed container at room temperature in a box.
2. Transport the box in an upright position. Mark the box: “HANDLE WITH CARE”
3. Deliver to the laboratory as soon as possible or within 24 hours from the time of specimen collection.
4. Attach request forms outside the box

**COMMUNICATION OF RESULTS:**

Please indicate the name of the organization, address including telephone number, e-mail, fax number and contact person to whom the report should be sent.

**TIME TO TEST COMPLETION:**

Results will be returned to the organisation within 2 – 4 days from the time the samples are received at the AMREF Laboratory, Nairobi
Annex 4: Epidemiology Surveillance Division: Vaccination Card

<table>
<thead>
<tr>
<th>Counties</th>
<th>1st dose</th>
<th>2nd dose</th>
<th>3rd dose</th>
<th>Booster</th>
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<tbody>
<tr>
<td>Vaccine: (enter tick)</td>
<td>Date <strong>/</strong>_/_____</td>
<td>Date <strong>/</strong>_/_____</td>
<td>Date <strong>/</strong>_/_____</td>
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<td>Meningitis</td>
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<td>Hepatitis B</td>
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<td>Other vaccines</td>
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Remarks:
Annex 4.1: Indicative decision tree for meningitis vaccine choice in a reactive campaign

Confirmation includes a positive result from culture, polymerase chain reaction or rapid diagnostic test.

* Confirmation includes a positive result from culture, polymerase chain reaction or rapid diagnostic test.
Annex 5: Preparing for the ICG vaccine request

To access the ICG emergency vaccine stockpile, countries must:

- Provide evidence of a meningococcal disease outbreak
- Provide laboratory confirmation of the Nm serogroup responsible
- Develop and provide plan(s) of action for the vaccination campaign(s)
- Provide proof of necessary storage and transportation resources to ensure the safe and effective delivery and maintenance of the vaccines to the area affected.

A micro-plan must be prepared for every district targeted for a vaccination campaign. It is the responsibility of the district health authorities to complete and submit the plan in order to prepare thoroughly for the campaign and to secure the necessary vaccines.

The micro-plan should include:

- the names of sub-districts targeted for vaccination;
- the total population currently present in the target areas;
- the population targeted for vaccination;
- the type and quantity of vaccine needed;
- the quantity of additional supplies needed—AD syringes, safety boxes, dilution syringes (10 ml), cotton wool, gloves;
- the number of teams conducting the campaign (each team requires vaccinators, recorders, crowd controllers and a supervisor);
- the number of supervisors—team, district, provincial and central levels;
- the mechanism for training the vaccination teams;
- logistic needs—cold chain equipment, vehicles;
- the mechanism for managing waste resulting from the campaign;
- the plans for vaccination campaign coverage surveys.

The budget should include:

- allowances for members of the vaccination team;
- social mobilization costs (including allowances for staff);
- costs of logistic equipment;
- costs of waste management;
- costs of coverage survey.

The email address of the ICG is ICGsecretariat@who.int

The form is available at: http://www.who.int/csr/disease/meningococcal/icg/en/
Annex 6: Template report on investigation of meningitis epidemics

Adapted from IDSR technical guidelines

- Title/Description (include the disease or condition being investigated)
- Period
- Location (Villages, Neighbourhood, District, Province)
- Executive summary

INTRODUCTION
- Background:
  - Reason for investigation (public-health significance, threshold exceeded, etc.)
  - Specific objectives of the investigation and preparation for epidemic response:

METHOD
- Dates of investigation:
- Site(s) of investigation (health facilities, villages, other):
- Case detection (indicate what has been done to detect cases, e.g. examination of medical records, on-site investigation, alerting other health facilities, etc.)
- Laboratory specimens collected:
- Describe response and intervention (give dates)
- Describe method of data analysis.

RESULTS
- Date and localization of index case:
- Date and health facility where index case entered the health system.
- Results of supplementary case investigation:
- Laboratory results and data analysis:
- Describe parameters in terms of time, place and persons
- Display detailed results graphically by parameters of time (epidemic curve), place (map), and persons (table).
- Outcome of response and proof that response interventions have had an impact

DISCUSSION
- Discuss key outcomes
- Compare with the literature
- Discuss whether or not the starting objectives or hypotheses have been met
- Discuss any new hypothesis arising in the course of the investigation or while interpreting the results

CONCLUSION
- Draw a conclusion as to whether or not the objectives have been met or the results achieved
- Learn any lessons