Surveillance Tools for Meningitis Sentinel Hospital Surveillance: Field Guide to Rapidly Estimate the Hospital Catchment Population (Denominator) and the Annual Rate of Hospitalisations

DEPARTMENT OF IMMUNIZATION, VACCINES AND BIOLOGICALS

Family, Women's and Children's Health (FWC)



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Why estimate a denominator for a meningitis (Tier 1) sentinel hospital site?

The WHO coordinated invasive bacterial vaccine preventable diseases (IB-VPD) sentinel surveillance network monitors the characteristics and disease etiologies of children <5 years of age admitted to sentinel hospitals with suspect meningitis. Using variable laboratory diagnostic practices, sentinel hospitals determine if these children have probable bacterial meningitis and seek to identify the causative organism. When considering a rate, the IB-VPD sentinel surveillance system thus collects 'numerator' information. There is no corresponding data available to determine the 'at risk' population of children (e.g. denominator) that gave rise to the numerator. Determining both the numerator and denominator is needed to calculate an estimated annual rate of hospitalizations for suspect meningitis in a given population of children. The estimated annual rate of hospitalizations among children <5 years of age at the sentinel hospital is a useful tool nationally and globally, as follows:

- Nationally: Tracking the rate over time can help assess changes in disease patterns following vaccine introduction, and help monitor potential changes in clinical practices that can impact surveillance quality and thus should be further investigated.
- Regionally/Globally: Once an estimated rate is known for several sentinel hospitals, it may be possible to determine a target rate, such as the target rate for non-polio acute flaccid paralysis (AFP) of 2 per 100,000 children aged <15 years.

2. What are the objectives of this exercise and how long will it take?

- To estimate the denominator population of children <5 years of age (the 'at risk' population) for a sentinel hospital participating in the WHO IB-VPD Tier 1 (meningitis) surveillance network.
- For the sentinel hospital, the combination of available numerator data with the denominator of children <5 years of age will be used to estimate the annual rate with 95% confidence interval of admissions to the sentinel hospital for suspect meningitis in children <5 years of age residing in the geographical catchment area of the sentinel hospital
- If records are well-kept and easily accessible at the sentinel hospital, and no other hospitals are involved, then the exercise can be completed within a day. However, if other hospitals are involved and need to be visited, allow one additional day per hospital.

3. Guiding principles

- Many approaches can be taken to determine a denominator, with different levels of complexity. This approach attempts to balance the amount of effort, time and resources required to obtain a reasonably accurate denominator and subsequently an estimated annual rate of hospitalizations for suspected meningitis in children <5 years of age at the sentinel hospital.
- Whenever there is a choice of approaches for this methodology, the option taken has been to underestimate, rather than overestimate, the rate. Thus, the generated rate would represent the 'tip of the iceberg.'
- The catchment population estimation will, in general, be a one-time estimation completed during sentinel site evaluation visits. However, a 'stock take' is recommended every two years to determine whether any major changes to the denominator have occurred, such as the influx of a large number of refugees, opening of new hospitals, or other demographic shifts in population patterns. If so, this exercise should be repeated.
- To have confidence in the estimate's stability, ≥100 suspect meningitis cases in children <5 years of age must have been admitted to the sentinel hospital within the years being assessed. It is encouraged to include at least the 2 most recent years (any 24 consecutive months) -- preferably 3 years -- of meningitis data. These data years do not need to be consecutive years but ideally should be.
- Overall, the methodology consists of:
 - Estimating the geographical sentinel hospital catchment area (i.e. subnational levels comprising the catchment area for children <5 years of age with suspected meningitis)
 - Within that geographical hospital catchment area, estimating the population of children <5 years of age who would be taken to the sentinel hospital

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