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Bottlenecks and enablers for measles outbreak detection, notification, and response using the 7-1-7 matrix in Bunyoro Mubende and Toro regions, Uganda, January–May 2024

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Summary

Background: Early action during outbreaks is important in limiting spread of infections, deaths, and socio-economic impact. Uganda has had numerous measles outbreaks and most of them have been attributed to refugee settlements. Suboptimal detection and response to recent measles outbreaks in Uganda have shown insufficiency in preparedness by the country for such emergencies. We utilized the 7-1-7 matrix to measure the timeliness of detection, notification, response, identify bottlenecks and enablers of system performance for measles outbreaks, Bunyoro, Mubende, and Toro regions, January–May 2024.
Methods: Seven measles outbreaks were recorded between January and May, 2024. For each, early action review meetings using the standard 7-1-7 assessment tool were conducted with the respective District Rapid Response Team (DRRT) officials to document the milestone dates of detection, notification, response as well as bottlenecks and enablers. The median time and range in days were computed for each milestone. Timeliness was considered as detection of ≤7 days, notification of ≤1 day, and response ≤7 days. Bottlenecks and enablers, were summarized into predetermined categories and analyzed thematically
Results: None of the outbreaks met all the three 7-1-7 targets of timeliness in full. The median time to detection was 4 days (range: 1-34), notification 0 days (0-27), response 16 days (9-35). Most of outbreaks 4/7 (57%) met the target for detection, 5/7 (71%) met the target for notification while none (0%) met the response target. Most of the bottlenecks to detection, 10/18 (56%) were due to insufficient community linkages to the health facilities, low knowledge on how to notify (80%) for notification, vaccination related gaps (36%), and delays in the laboratory system for response. Enablers for detection were active trained Village Health Team (VHT) members (43%) and a high suspicion index among health workers (43%). Active trained VHTs (60%), for notification and having a sufficient workforce, well established coordination and partner support for response
Conclusion: The measles outbreaks in Bunyoro, Mubende, and Toro regions had suboptimal timeliness as per the 7-1-7 matrix. We recommend refresher training of health workers on measles surveillance and improvement of vaccination campaigns in outbreak areas.

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Introduction

Early action during outbreaks is important in limiting spread of infections, deaths, and socio-economic impact Uganda has had numerous measles outbreaks and most of them have been attributed to refugee settlement(1,2).
Suboptimal detection and response to recent measles outbreaks in Uganda have shown insufficiency in preparedness by the country for such emergencies(3).
It is important to routinely assess institutional ability to quickly detect and contain any outbreak at its source. Monitoring the timeliness of outbreak detection, verification, notification, and response can provide insight on surveillance capabilities and indicate where performance might be improved (4).

The 7-1-7 matrix has been proposed as a tool for outbreak detection, notification, and early response, whereby every suspected outbreak is detected within 7 days of emergence and reported to public health authorities within 1 day of detection, and seven early response actions are completed within 7 days from reporting to public health authorities, indicating timely initiation of response(5).

We utilized the 7-1-7 matrix to measure the timeliness of detection, notification, response, identify bottlenecks and enablers of system performance for measles outbreaks, Bunyoro, Mubende, and Toro regions, January–May 2024.

Methods

We conducted the study in districts in Bunyoro, Mubende, and Toro regions that experienced measles outbreaks in 2024. We used the 7-1-7 assessment tool for rapid performance improvement for outbreak detection and response to measure timelines for the 7-1-7 milestones, and identify bottlenecks and enablers in the measles outbreaks (6). Early action review meetings were conducted with the respective District Rapid Response Team (DRRT) officials to document the milestone dates (date of emergence, date of detection, date of notification, and dates of each of seven early response actions), as well as bottlenecks and enablers.

We calculated median timelines to get the overall performance at each of the milestones of; detection, notification, and completion of early response actions.
We computed proportions of milestones that met the set 7-1-7 timelines as follows; timely detection (≤7 days), notification (≤1 day), start date for the last early response action (≤7 days). The full 7-1-7 target will be achieved if the milestones for outbreak do not exceed the 7-1-7 targets. The full 7-1-7 target was met when an event did not exceed any of the three targets. Bottlenecks and enablers, as qualitative data, were summarized into predetermined categories and analyzed by thematic analysis.

The study used routine surveillance data reported by the District Health Office during outbreaks. There are no individual patient identifiers in the data.
Permission to utilize the data was from Ministry of Health through the National Public Health Emergency Operations Center. This activity was reviewed by the US CDC and was conducted consistent with applicable federal law and the US CDC policy. §§See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq. The protocol was approved as non-research by the Centers for Disease Control and Prevention.

Results

Measles outbreaks that met the detection, notification, and response timelines, Bunyoro, Mubende, and Rwenzori regions, Uganda, January-April, 2024

The regions of Bunyoro, Mubende, and Rwenzori experienced seven measles outbreaks between January and April, 2024, with the majority, 4/7 (57%) in Rwenzori and 2/7 (29%) in Bunyoro regions. None of the outbreaks met all the three 7-1-7 targets of timeliness in full.

The median time for detection of the measles outbreaks was 4 days (range 1-34; IQR 2-7). Bunyoro region had the slowest detection time of 34 days for one of the two outbreaks responded to in the region.

The median time to notification of the measles outbreaks to a public health authority responsible for action was 0 days (range 0-27; IQR 0-2.5). Mubende region had the slowest notification time of 27 days for the single outbreak responded to in the region.

The median time for completion of all applicable early response actions were completed was 16 days (range 9-35; IQR 10.5-24). Early response action five had the slowest response time, with a median of 16 days (range 9-35; IQR 12-25.5), while action one had the fastest response time with a median of one day (range 0-23; IQR 0-5)

The majority, 4 (57%) of the outbreaks met the target for detection, 5 (71%) met the target for notification while none met the target for completion of early response actions (Table 1).

Table 1: Measles outbreaks that met the detection, notification, and response timelines, Bunyoro, Mubende, and Rwenzori regions, Uganda, January-April, 2024

Metric	Median (Range)	Target met
Date of detection (Target: 7 days)	**4.0 (1-34)**	**4/7 (57%)**
Date of notification (Target: 1 day)	**0.0 (0-27)**	**5/7 (71%)**
Early response action 1	1.0 (0-23)	
Early response action 2	15.0 (6-33)	
Early response action 3	8.0 (2-20)	
Early response action 4	10.0 (0-33)	
Early response action 5	16.0 (9-35)	
Early response action 6	15.0 (3-34)	
Early response action 7	15.0 (6-35)	
Date of early response initiation	2.0 (0-16)	
Date of early response completion (Target: 7 days)	**16.0 (9-35)**	**0/7 (0%)**

We identified 18 bottlenecks to detection, 5 for notification, and 11 for completion of early response activities. There were 7 enablers to detection, 5 for notification and 3 for completion of early response activities. The majority of the bottlenecks to detection, 10/18 (56%) were due to insufficient community linkages to the health facilities, followed by distant health centers and low measles suspicion index for

among health workers (17%). Knowledge on how to notify (80%) and low use of the electronic integrated disease surveillance and response system (eIDSR) were the reported bottlenecks to notification. The bottlenecks to completion of early response actions were; vaccination related gaps (36%), delays in the laboratory system (18%) and hard to reach outbreak areas (18%). Enablers for detection were active trained Village Health Team (VHT) members (43%) and a high suspicion index among health workers (43%). Active trained VHTs (60%), Use of passive surveillance (20%) and knowledge of reporting hierarchy (20%) were the enablers for notification. The enablers for completion of early response actions were; having a sufficient workforce, well established coordination and partner support.

Discussion

In this review of measles outbreaks, we applied the 7-1-7 matrix district to measure capacity for detection, notification, and early response initiation. We found that the median time for detection (4 days), notification (0 days) were good performances, but completion of early response actions (16 days), with none of the outbreaks meeting all of the three targets. Most of the bottlenecks identified were for detection, with insufficient community linkages to the health facilities accounting for largest proportion. Detection still had the highest proportion of enablers, with most citing a high suspicion index among health workers.

Detection of measles outbreaks was suboptimal, with just over half of the outbreaks detected in a timely manner. This was mainly due to inadequate community surveillance linkage to health facilities, with Village Health Team (VHT) members having inadequate knowledge on measles signs and symptoms. (2,7,8). Late detection leads to further quick spread of the disease in the community as it limits the progress of the subsequent steps in the response.

Notification of the measles outbreaks was the best done of the three 7-1-7 matrix actions. This finding was consistent with other studies that show notification as one the meets the targets the most(3,9). Timely notification was attributed to VHTs and health facility workers who had knowledge of the hierarchy of reporting to Public Health authorities.

Study limitations

Conclusion

The measles outbreaks in Bunyoro, Mubende and Toro regions had suboptimal timeliness as per the 7-1-7 matrix, with none of them meeting all the three targets of timeliness in full. Linkages between communities, health facilities, low health worker suspicion index, and delays in initiating appropriate public health countermeasure of vaccination were the main bottlenecks. On the other hand, VHTs and health facility workers who had knowledge of the hierarchy of reporting to Public Health authorities were major enablers. We recommend refresher training of health workers on measles surveillance and improvement of vaccination campaigns in outbreak areas.

Conflict of interest
The authors declare no conflict of interest

Author contribution
BK, EA, DI, PJE, conceived and designed the study. BK, EA contributed to data abstraction, cleaning and analysis. BK, DNG took lead in developing the bulletin. BK, DK, AAR, PJE supervised the entire writeup process. All authors contributed to the final draft of the bulletin. All authors read and approved the final bulletin.

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