



UNIPH Epidemiological Bulletin

Volume 1 | Issue 1 | Dec 2015



Quarterly Epidemiological Bulletin of the Uganda National Institute of Public Health, Ministry of Health

FOREWORD

The Uganda National Institute of Public Health (UNIPH) is a science based government organization within the Ministry of Health (MoH) that serves as a focal point for the country's leadership, expertise and coordination to address public health concerns in line with global health security requirements. The Uganda Ministry of Health established the UNIPH in collaboration with key partners notably US CDC, WHO, Makerere University School of Public Health amongst others, to create expertise, information, and tools that people and communities need to protect their health by focusing on 1) developing surveillance networks for the detection, control and prevention of disease, 2) developing the required national reference laboratory capacity, 3) leading and coordinating response efforts, 4) developing and implementing evidence-based public health guidelines and programs, and 5) strengthening public health systems through focusing investments into critical public health institutions and their associated functions. As the center of gravity for public health leadership and excellence, the NIPH focuses on protecting people's health by conducting infectious and non-infectious disease surveillance, responding to disease outbreaks and public health emergencies, and strengthening prevention activities and health promotion. The cornerstones in the NIPH are: To fulfill the function as a centre of excellence concerning evidence-based methods for population health interventions and to render support to local, regional and national authorities, so as to facilitate their actions from a multi-sectoral perspective on public health; To monitor and evaluate the attainment of the national public health goals and report to the Top Management of MoH and To generate precise and current reference knowledge for the formulation, implementation and evaluation of health research policy on national and regional levels. To enable it achieve the above, the institute is structured into 6 departments namely: Disease Epidemiology and Surveillance (DES); Emergency Operations Centre (EOC); Health Information Services (HIS); National Health Laboratory (NHL); Public Health Fellowship Programme (PHFP); and Research and Development (R&D). The UNIPH Quarterly Epidemiological Bulletin will showcase the precise functional achievements of the institute by demonstrating outbreak investigations findings and public health actions taken, studies conducted to provide evidence for policy and decision making and epidemiological data of importance nationally and globally. This is the 1st edition of the bulletin with very enriching reading. Enjoy the reading.

Dr. Jane Ruth Aceng

Director General Health Services

Inside this issue:

04 MEASLES OUTBREAK IN
KAMWENGE DISTRICT

06 MALARIA OUTBREAK
IN NORTHERN UGANDA

09 CHOLERA IN KASESE
DISTRICT

11 TYPHOID IN
KAMPALA

Dear Reader,

Welcome to our very first issue of the Uganda National Institute Public Health (UNIPH) Quarterly Epidemiological Bulletin.

This bulletin aims to inform the district, national, and global stakeholders on the public health interventions and investigations undertaken in disease prevention and control.

In this issue, we present updates on cholera and measles outbreak investigations; malaria epidemic in northern Uganda; decline in malaria cases in Tororo district after introduction of IRS; effect of IDSR training on epidemic disease notification; and an overview of the laboratory response to the typhoid outbreak in Kampala.

In case you would like to access original references used in this issue, feel free to contact us at: inabukenya@yahoo.com OR ckihembo@musph.ac.ug.

We will appreciate any feedback regarding the content and general outlook of this issue and look forward to hearing from you. We hope this will be both an informative and enjoyable reading for you.

Thank you.



Dr. Monica Musenero |
ACHS, Epidemiology & Surveillance
Division

Dr. Nabukenya Immaculate |
Epidemiologist, Epidemiology & Sur-
veillance Division

Dr. Alex Ario Riolexus |
Ag. Director, Uganda National Institute
of Public Health, MoH

Dr. Kihembo Christine |
PHFP-FET, Fellow Epidemiology & Sur-
veillance Division

Lilian Bulage |
PHFP-FET, Fellow, Central Public
Health Laboratories

Dr. Ben Masiira |
PHFP-FET, Fellow Epidemiology & Sur-
veillance Division

Allen E. Okullo |
PHFP-FET, Fellow Malaria Control Pro-
gramme

Overview of the Public Health Fellowship Program-Field Epidemiology Track (PHFP-FET)

By Dr. Alex Riolexus Ario, PHFP Secretariat

Uganda Ministry of Health in partnership with Makerere University School of Public Health (MakSPH) and the U.S. Centers for Disease Control and Prevention (CDC) is implementing the Public Health Fellowship Program (PHFP), an initiative to develop the next generation of public health leadership for Uganda. The goal of this program is to develop a competent workforce by learning-through-service and responding to real public health problems of Uganda.. The PHFP has four objectives:

Training: Develop a workforce competent in applied epidemiology and other cross-cutting aspects of public health practice

Service: Fill gaps and perform essential functions in public health practice within priority technical units and programs at national and sub-national levels.

Advocacy: Establish/reinforce substantive public health specialist cadres at national, regional/district levels and ensure dedicated funding to sustain the capacity building efforts.

Networking: Strengthen collaborations across various tiers of the health sector, other national and regional stakeholders

Continues on page 3



Fellows, cohort 2015

The PHFP is a two year, non-degree full-time program offered on a competitive basis to Ugandan nationals who seek to become leaders in public health practice. The PHFP will be offered in five tracks, namely: Field Epidemiology, Laboratory Systems, Health Informatics, Prevention Effectiveness, and Monitoring and Evaluation.

The Field Epidemiology Track (PHFP-FET) commenced in January 2015 with a cohort of 10 Fellows. The learning scheme consists of didactic learning (20%) and field project-based training (80%). Competency domains include field epidemiology, communications, public health programming, and management and leadership. Fellows show development of these competencies by completing a portfolio of projects in each of these domains. After the introductory course, 8 Fellows were placed in MoH programs and departments namely: CPHL, ACP, NMCP, UNE-PI, Mental Health & Substance Abuse, Epidemiology & Surveillance Division (ESD), Resource Centre, and two were placed in Rakai & Tororo Districts. In future, fellows will be placed in priority technical units of the MoH, regional level or districts to complete this portfolio under the supervision and mentorship of national and international subject-area experts.

.....The PHFP aims at training transformative leaders in health who are analytical in thinking, who can work effectively in teams and who can integrate inter-disciplinarity in their work

The PHFP aims at training transformative leaders in health who are analytical in thinking, who can work effectively in teams and who can integrate inter-disciplinarity in their work. The training methodology takes on a hands-on approach that is guided by four main competency domains mentioned above.

For each domain, fellows must demonstrate multiple competencies by executing projects to address public health priorities in Uganda. Attachment at field sites accounts for 80% of the experience. The remaining 20% is reserved for Fellows to attend modular trainings, seminars, debates, etc. that are supportive of competency development and linked to the fieldwork.

During the field attachment, the Fellow is placed under the guidance of a host mentor, and also receives mentorship from the PHFP Secretariat,

and from senior technical experts at MakSPH, MOH and CDC. The PHFP builds upon the rich tradition of capacity building at MakSPH. Since 1994, MakSPH has been conducting Master's level training in Public Health and Health Services Research; training over 300 public health officers

who occupy positions of responsibility at different levels of the public health system in Uganda. In 2002, MakSPH initiated the MakPH-CDC Fellowship Program aimed at enhancing leadership and management capacity of health program managers and leaders in Uganda. This capacity building program has trained over 85 Fellows in leadership and management of health programs, with over 90% of the graduates occupying senior leadership positions in Uganda and elsewhere. PHFP-FET will subsequently build a critical mass of field epidemiologists to address the public health needs of the country.

Exposure at crowded health centers, vaccine failure and failure to vaccinate as risk factors for measles transmission in Kamwenge district, Western Uganda, April to August 2015

By Fred Nsubuga, Lillian Bulage, Alex Riolexus Ario - PHFP Field Epidemiology Track

On 27 April 2015, a measles outbreak was confirmed in Kamwenge District, Western Uganda. We conducted an investigation to identify risk factors for measles transmission, estimate vaccination coverage, determine vaccine effectiveness. We defined a probable case as onset of fever and generalized rash with ≥ 1 of the following: Coryza, conjunctivitis, or cough; a confirmed case was a probable case with serum positivity of measles-specific IgM. We found cases by reviewing patient records and examining patients in patients' homes. We conducted a case-control study involving 50 cases and 200 controls, matched by village and age. We estimated the vaccination coverage based on the proportion of the controls vaccinated. By 30th August 2015, 213 probable cases had been line-listed. Of three affected sub-counties, Biguli had highest attack rate (38/10000); children ≤ 5 years had highest attack rate (9.2/10000). The epidemic curve showed sustained community transmission. 42% (21/50) of cases and 12% (23/200) of controls visited health centers during the case-patients' likely exposure period (adjusted $OR_{M-H}=6.1$; 95% CI=2.7-14). The estimated vaccination coverage ≤ 2 years in control persons was 58% (95% CI: 47-68) and the vaccine effectiveness was 80% (95% CI 35-94%). All health centers were very crowded; no patient triage system was in place. Exposure to measles patients at health centers, low vaccination coverage and suboptimal vaccine effectiveness facilitated the spread of measles. We recommended emergency immunization campaign targeting children ≤ 5 years in the district, triaging and isolating febrile or rash patients at health centers and introduction of 2nd dose of measles vaccine in immunization schedule.

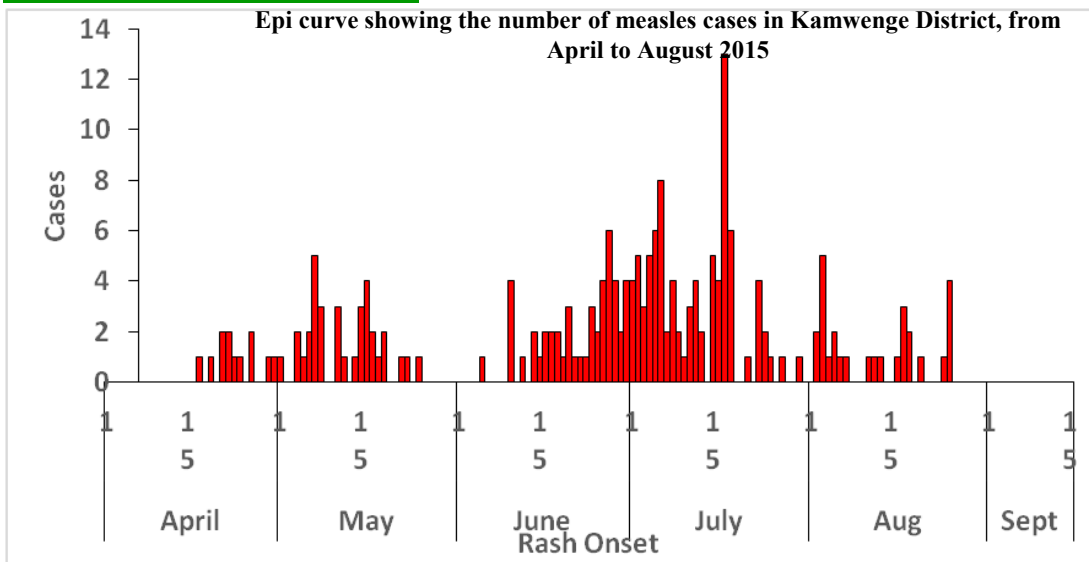
Methods: We defined a probable case as onset of fever and generalized rash with at least any of the following: Coryza, red eyes or cough. Confirmed case as a probable case with IgM positive. We visited health facilities (Rwamwanja HCIII and Biguli HCIII) within the affected county (Kibale) in order to update the line list. We reviewed patient records from 1st March 2015 to identify suspected cases based on the standard case definition (SCD). Other health facilities and Village Health Team members were also sensitized about case finding using the Standard Case Definition. During hypotheses generation the team interviewed 24 suspected cases found at the health facilities and surrounding communities. The key variables explored were; visit to health facilities, church, trip to any place, going to school and attending any vaccination campaign/vaccination within the last 21 days before onset of rash. By the end of the first day of case finding, the team identified 3 major factors that could be driving the outbreak namely; going to school, health facilities and attending church. A case control study was conducted to test the hypothesis. It involved 50 cases and 200 controls (Ratio; 1:4) matched by village and age. Only probable and laboratory confirmed cases were used in this study. Cases were identified with the help of a Village Health Team member, LC 1 chairperson or a village guide. After locating and interviewing a case, 4 controls from the same village with the same age as the case were conveniently selected and interviewed. We estimated measles vaccine coverage (VC) for children aged ≤ 1 year using control-persons. We estimated vaccine effectiveness (VE) using:

$$VE = 1 - RR \\ \approx 1 - OR$$

Where: VE = Vaccine effectiveness, RR= Relative risk of vaccinated vs. unvaccinated
OR= Odds ratio (In rare disease $OR \approx RR$)

Results: By August 2015, 213 probable cases had been line-listed in 10 parishes of the 3 affected sub-counties. Measles-specific IgM was positive in 61 % (14/23) of the blood samples collected. Of the 3 affected sub-counties, Biguli sub-county had the highest attack rate (3.1/1000); children aged ≤ 5 years had the highest attack rate of all age groups (9.2/10,000). The median age of the cases was 5.0, range 0.5-44 years. The epidemic curve showed sustained community transmission. 42% (21/50) of cases and 12% (23/177) of controls visited the health centers during the case-patients likely exposure period ($OR_{M-H}=6.1$; 95% CI=2.7-14). The estimated vaccination coverage ≤ 2 year was 58% (95% CI=47-68%), the vaccine effectiveness was 81% (95% CI=35-94%).

Discussion: Since the beginning of 2015, there has been an increase in the number of measles cases in Uganda especially in the West and central region (DHIS2, 2015). It is therefore important to identify the risk factors, vaccine effectiveness and vaccination coverage so that effective control strategies can be implemented(1). Our findings suggested that visiting health centers was the most important risk factor for measles transmission in Kamwenge District. Inspection of health centers revealed extremely crowded conditions, making it very easy for measles probably the most infectious of all infectious diseases (2) to transmit among patients in the waiting area. This is in line with another study done in DeKalb County, Georgia Atlanta, where an outbreak occurred in a pediatric office setting and three of the children infected were never in contact with the source patient, suggesting airborne transmission (3). It's also in line with the study done in Sanliurfa Province, Turkey, which demonstrated Hospital exposure as risk factor for measles transmission (4). Health care settings have been known to be critical in the transmission of measles and generation of cases (5). This happens because large numbers of patients congregate in proximity with susceptible individuals and often for long period of time. The vaccination coverage estimated in this study was not consistent with the administrative coverage of the District. The proportion of population vaccinated was low to confer population protection (6). However even in countries which have attained good immunization coverage, measles outbreaks are not uncommon (7). This finding is consistent with a study done in the Republic of the Marshall Islands (RMI) is a South Pacific nation, where the measles outbreak lasted 6 months (8). WHO region where Uganda is; set its measles elimination goal in 2020. However elimination can only be achieved if measles coverage in every district is 95% (6). Measles vaccine effectiveness was low; a single dose of measles vaccine given at 9 months reduced the risk of measles disease by 81%. This is lower than the estimated measles vaccine effectiveness in the Africa region when the vaccine is administered at 9 months of age (9). Vaccine effectiveness can be increased if a second dose of measles is administered at 12 months of more (10). In Uganda this is achieved during supplemental immunization activities (SIAs). If this is well done, and we improve routine immunization coverage, we can eliminate indigenous measles transmission



Recommendation: We recommend an emergency immunization campaign targeting children aged <5 years in the affected sub-counties, triaging and isolating all febrile or rash patients at outpatient departments, and exclusion of all persons with a febrile or rash illness from social gatherings.

Effect of Integrated Diseases Surveillance and Response training on notification of epidemic-prone communicable diseases in Uganda

By Ben Masiira and Immaculate Nabukenya - ESD, Ministry of Health

Integrated Disease Surveillance and Response (IDSR) is a comprehensive strategy adopted in African region to improve surveillance. IDSR training is among core functions for strengthening disease surveillance and response. We assessed reporting rates of notifiable diseases before and after districts were trained in IDSR. There was a significant improvement in average weekly reporting rate after IDSR training but only 32% of district achieved the target. However, monthly reporting rates were above the target in ≥97% of districts before and after the training. This might point to lack of prioritization of weekly reporting by districts. Therefore, strengthening IDSR through trainings might yield limited results if these trainings are not supplemented by other interventions.

Introduction: Communicable diseases remain a significant threat to developing countries and contribute 54% of the disease burden in Uganda (1). Since the beginning of 2015, the country has experienced several disease outbreaks such as typhoid fever, cholera, measles, rubella and malaria. IDSR is a comprehensive strategy proposed by World Health Organization (WHO) to improve public health disease surveillance and response in the African region (2). With support from WHO, the Uganda Ministry of Health has been conducting IDSR trainings in various districts. We assessed the impact of IDSR training, in districts which were trained in 2015, by comparing reporting rates of priority diseases before and after the training.

Methods: We assessed 2015 weekly and monthly reporting rates in the four cohorts of districts that were trained in IDSR for five days. We computed average reporting rates before and after conducting the IDSR training in each of the districts and compared them with a district target of ≥80%. We compared overall weekly average reporting rates before and after the training by using a t-test for comparison of means. We also computed average monthly reporting rates before and after IDSR training.

Results: Over all, the reporting rate improved significantly in 73% (29/40) of districts after IDSR training ($P < 0.001$) but only 32% of district achieved the target. The average weekly reporting rate improved in 86% districts trained in cohort 1 but only 14% ($n=1$) achieved the target (Figure 1). All districts in cohort 1 were above the monthly reporting target before and after the training. In cohort 2, 60% ($n=6$) recorded improvement in average weekly reporting rate but 40% ($n=4$) achieved the target of which only one (Kyegegwa) had reporting rate <80% before the training (Figure 1). All districts in cohort 2 were above the monthly reporting target before and after the training. In cohort 3, 100% ($n=12$) of districts recorded an improvement in average weekly reporting rate after the training of which 50% ($n=6$) achieved the target and out of six districts that achieved the target, four had reporting rates below the target before training (Figure 1). Monthly reporting rates before the training were above the target in 92% ($n=11$) of districts in cohort 3 and 100% ($n=12$) had reporting rates above the target after IDSR training. There was improvement in average reporting rates in 45% ($n=5$) of districts trained in cohort 4 but none of these districts achieved the target (Figure 1). Of the districts trained in cohort 4, only 9% ($n=1$) achieved the. All districts in cohort 4 had monthly reporting rates above the target before and after the training.

Discussion and recommendations: IDSR has been adopted as a national strategy in Uganda since 2000 and much has been achieved regarding its implementation at both national and regional levels in Uganda. IDSR trainings have led to improved reporting in majority of districts but reporting rates are still below the target in 67% of districts. Despite of low weekly reporting rates, monthly reporting rates were above the performance target before and after IDSR training. Findings of this analysis are similar to an assessment in Tanzania which documented a few districts exceeding performance targets of above 80% after the training on IDSR (3). It is unclear why districts are unable to achieve weekly reporting targets yet majority can easily achieve monthly targets

The Malaria Outbreak in Northern Uganda.

By Allen Eva Okullo, Myers Lugenwa
Malaria Control Program, Ministry of Health

On July 9 2015, the Director General, Ministry of Health, Dr. Aceng Ruth gave a press release confirming a malaria outbreak in Northern Uganda [1]. The ten districts affected were: Nwoya, Amuru, Gulu, Kitgum, Lamwo, Pader, Agago, Apac, Oyam and Kole. Important to note is the fact that these are the same districts that had undergone Indoor Residual Spraying (IRS) over the last five years, IRS having been stopped in November 2014. This epidemic has claimed about 306 lives between April and September 2015, affected close to one million people with tens of thousands health facility admissions in the same period as shown in the table 1 below. The suspected outbreak was initially reported to the Malaria Control Program, Ministry of Health, by some of the affected districts in early June 2015. MOH responded by sending a rapid response team (RRT) to confirm and respond to the outbreak in the affected districts. The RRT followed the Epidemic Preparedness and Response guidelines in re-activating the respective District Task Forces in collaboration with implementing Partners to provide support. The preparedness of the districts and health facilities to provide case management was assessed and used to fill the gaps.

The Public Health Emergency Operation Center (PHEOC) was activated and a National Task Force (NTF) activated place to mobilize resources, give technical guidance and oversight, monitor and coordinate response activities by various implementing partners. This would be led by the Incident Management Team, and chaired by the Incident Commander and Program Manager, Malaria Control Program, Dr. Albert Peter Okui (RIP). Stakeholders from various implementing partners such as WHO, PMI-USAID, MSF, UNICEF, Malaria Consortium, USAID-ASSIST, USAID-CHC, Nakasero Blood Bank, along with the Ministry of Health teams formed the NTF.

Overtime, the malaria cases in the epidemic districts started to decline as shown in the malaria normal channel graph(figure1). This decline could be attributed to the interventions put in place by MOH and various implementing partners. There is also a possibility that the gradual drop in the number of malaria

cases could have been due to the change in malaria seasonality, as is usually the case.

Interventions implemented included:

1. Onsite technical assistance at the districts by the MOH rapid response teams supported by WHO, Malaria Consortium, Makerere University School of Public Health -/Public Health Fellowship Program supported by CDC.
2. Activation of district epidemic management task force with the Surveillance, Logistics and Behavioural Change and Communication (BCC) sub-committees by the MOH rapid response teams.
3. Intensified surveillance in the 10 epidemic districts by the MOH Emergency Operation Centre.
4. Training of VHTs in the most affected sub counties in Mass Fever Treatment by PMI-USAID
5. The provision of Anti-malarials from Joint Medical Stores to 72 most affected sub counties in the 10 districts for mass fever treatment by PMI-USAID.
6. Intensified Behavioural Change Communication (BCC) in all 10 districts through various media channels and local leaders within the community by CHC-USAID.
7. Emergency stock up of supply of anti-malarials within facilities for rapid treatment to reduce disease burden and reduce mortality by NMS.
8. Provision of 34,000 Long Lasting Insecticide treated Nets (LLINs) to the most affected sub-counties by PMI-USAID.
9. Comprehensive malaria outbreak support to Kole district by MSF.
10. Reactivation of the community VHTs stocked with anti-malarials and rapid diagnostic tests
11. Scaling up blood supply to meet the need in the affected districts by the Uganda blood bank.
12. Direct support to the affected districts in monetary terms by UNICEF and MOH
13. Training of health facility staff on integrated management of severe malaria by USAID-ASSIST team.

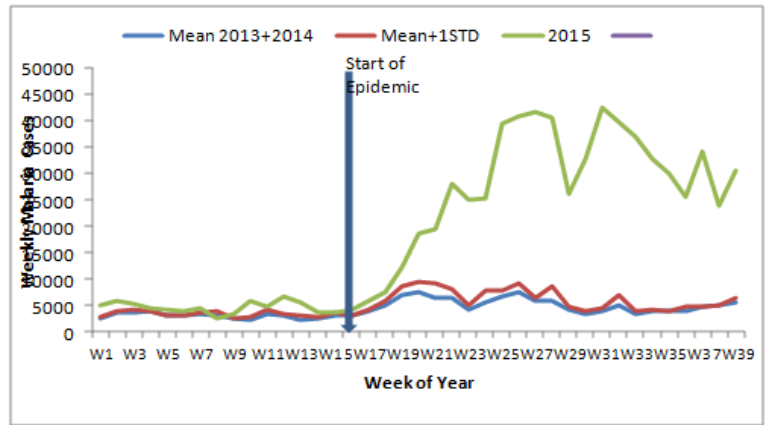
| District | April-September Under 5's | April-September Pregnant mothers | April-September Female OPD | April-September Female IPD | April-September Male OPD | April-September Male IPD | April-September OPD cases | April-September IPD cases | April-September Total deaths |
|--------------|---------------------------|----------------------------------|----------------------------|----------------------------|--------------------------|--------------------------|---------------------------|---------------------------|------------------------------|
| Agago | 29672 | 1941 | 55365 | 3201 | 38130 | 2851 | 93495 | 6052 | 29 |
| Amuru | 31136 | 1137 | 52025 | 3551 | 35980 | 3160 | 88005 | 6711 | 14 |
| Apac | 31237 | 1795 | 53996 | 2941 | 34802 | 2148 | 88798 | 5089 | 27 |
| Gulu | 61739 | 3124 | 112711 | 4077 | 80621 | 3727 | 193332 | 7804 | 51 |
| Kitgum | 37800 | 1838 | 60037 | 8963 | 41357 | 8033 | 101394 | 16996 | 71 |
| Kole | 18462 | 1807 | 31114 | 709 | 19338 | 557 | 50452 | 1266 | 1 |
| Lamwo | 25883 | 1379 | 59269 | 2344 | 43899 | 1911 | 103168 | 4255 | 20 |
| Nwoya | 15581 | 584 | 23788 | 1307 | 16750 | 1239 | 40538 | 2546 | 30 |
| Oyam | 28730 | 2536 | 48682 | 3037 | 32358 | 2716 | 81040 | 5753 | 33 |
| Pader | 12945 | 556 | 29721 | 1603 | 19940 | 1296 | 49661 | 2899 | 30 |
| Total | 293185 | 16697 | 526708 | 31733 | 363175 | 27638 | 889883 | 59371 | 306 |

Continues on page 7

Table 1: Malaria burden across different groups and health facility departments from April - September 2015

Though the malaria burden seems to be coming down, it is imperative that action is taken to prevent the recurrence of an upsurge especially given the El Nino rains alert. El Nino has been shown to have several health implications among which are an increase in malaria cases to epidemic levels. To sustain these achievements thus far, it is important that surveillance is intensified in every district to quickly pick up any upsurges and mount targeted interventions. This should be, hand in hand with case management of all malaria cases at health facilities and within communities and BCC in the communities.

Figure 1: Malaria Normal Channel for the 10 epidemic districts, Jan- Sep 2015



Decline in Malaria Incidence in Tororo District, Uganda following implementation of Vector Control Interventions, 2013-2015.

By David Were Oguttu¹, David Cyrus Okumu², Patrick Omita², Alex Ario Riolexus¹

¹PHFP-FET, ²Tororo District Health Office

This article presents achievements in the ongoing malaria control in Tororo District following universal distribution of Long Lasting Insecticide treated Nets (LLINs) and introduction of Indoor Residual Spraying (IRS). We used routine District Health Management Information Systems (HMIS) surveillance data 2013-2015 to assess the extent to which malaria incidence changed after implementing vector control interventions. The peak of malaria incidence reduced from 90/1000 in July 2013 to 73/1000 in 2014 after Universal distribution of LLINs. Following introduction of IRS in December 2014, the peak of malaria incidence significantly reduced from 73/1000 in 2013 to 31/1000 in July 2015. Slide and Rapid Diagnostic Test (RDT) positivity rates have also reduced. OPD attendance due to malaria also declined during the same period.

Introduction: Tororo is one of the districts in Eastern Uganda whose geographical features and economic activities favor breeding of malaria vectors. Wetland rice growing is a major agricultural activity in all the 17 rural sub counties. Swamps along rivers and streams such as R. Malaba, Kanyinima, Aturukuku and Nyamatunga are the major areas of rice paddies. During high malaria transmission rainy months of the year (April-July), rice gardens become flooded and hold water for long periods providing potential breeding sites for *Anopheles* mosquitoes. Cattle kept in homes make hoof prints on wet grounds creating more *Anopheles* breeding sites closer to homes. In rural villages where mosquito breeding is high, most people live in grass thatched houses suitable for indoor resting and feeding of the vectors leading to high *Plasmodium* transmission. Entomological surveys of malaria vectors conducted before 2012 described Tororo to be second to Apac with a high population of *Anopheles* mosquitoes feeding and resting inside inhabited grass thatched houses with a biting density of 160 bites per person per night and a high annual entomological inoculation rate of 591/person/year (Okello, *et al* 2006).

In December 2013, the Ministry of Health (MOH) conducted universal distribution of Long lasting insecticide treated nets in the district giving one net per two people in every household. Tororo is among the 14 districts where the National Malaria Control Programme started implementing IRS in December 2014. In this study we describe the magnitude of malaria in Tororo 2012-2015 and assess if there was a change in the disease incidence following universal distribution of LLINs to communities and introduction of IRS. Our findings inform the district, National Malaria Control Program (NMCP) and partners on temporal change in clinical malaria burden following vector control interventions. We also demonstrate use of routine surveillance data in assessing malaria control interventions.

Methods: We analyzed aggregated district malaria surveillance data 2012 to 2015 from District Health Information System (HMIS) form 105. The data came from five hospitals, 3 health centre IV facilities, 18 health centre IIIs and 35 health centre II units. The number of malaria cases reported included both the laboratory and clinically diagnosed. rates and incidence by month

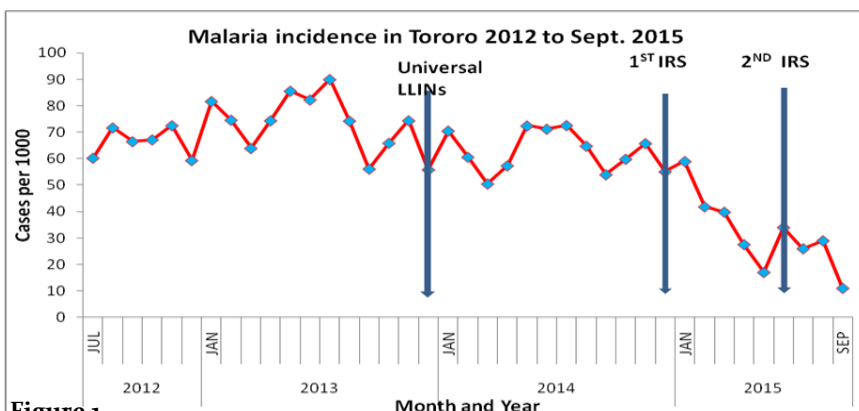
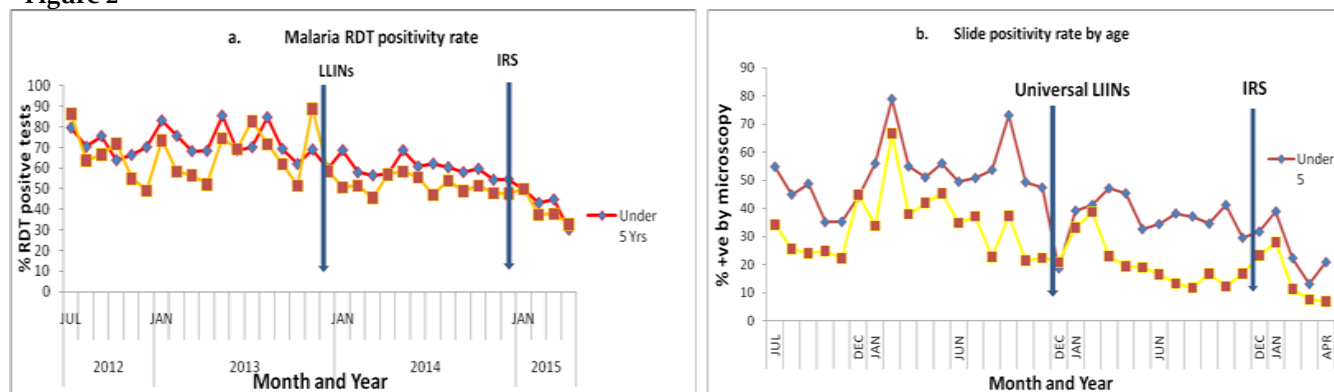


Figure 1

We computed the percentage of malaria cases in Out Patient Department per year, malaria laboratory test positivity rates and incidence by month. We used Chi square for trends to analyze the annual change in malaria incidence.

Results: The peak of malaria incidence reduced from 90/1000 in July 2013 to 73/1000 (P<0.05) in 2014 after universal distribution of LLINs. Following introduction of IRS in December 2014, the peak of malaria incidence fell to 31/1000 (P<0.05) in July 2015. After the second round of IRS the malaria incidence decline to below 20 cases per 1000 by September 2015

Figure 2



Laboratory test positivity rates have declined among the below 5 year old children and the above five individuals. RDT positivity fell from 68% in April 2015 to 30% among the under fives and 52 to 33 among the 5 & above (Figure 2.a). Microscopy malaria slide positivity rate declined from 56% to 21% among the under fives and 45 to 7% among older individuals in the same period (Figure 2.b)

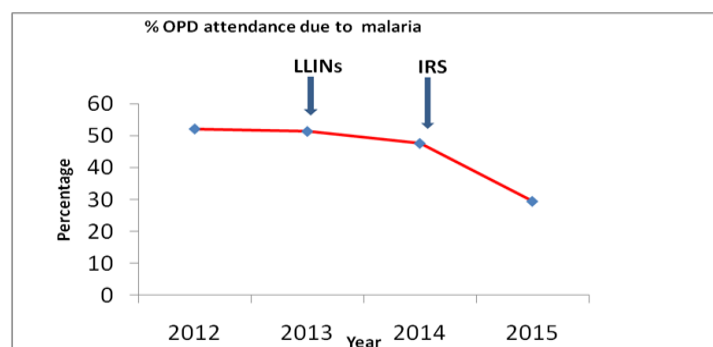
Discussion and recommendations: The study findings indicate that malaria incidence, test positivity rates and OPD attendance due to malaria are declining following implementation of vector control interventions (Figure 1). A small decrease in incidence after universal distribution of LLINs implies that the vector population could have remained high or net use to protect individuals from infective bites was poor. Following implementation of IRS the rapid decrease in malaria incidence could have been as a result of huge reduction in the vector density. There was sharper decline in incidence when IRS was introduced than when LLINs were used alone. This is similar to the effect of IRS reported by Steinhardt *et al* (2006) in Northern Uganda.

With reducing malaria transmission, the human population in the district will gradually lose immunity and become very susceptible. It is therefore important to consider implementation of strategies to sustain the gains made against malaria to prevent the disease resurgence and resultant epidemics after halting IRS in the district.

Lack of reliable HMIS data for years earlier than 2012, limited our analysis to recent years. The study could not build a model to estimate the actual contribution of vector control interventions to the reduction in malaria incidence due to lack of data on other factors which also affect transmission. The estimated malaria incidence may not be very accurate because we used both reported confirmed and clinically diagnosed cases, but gives a true temporal situation of malaria to inform the program.

Malaria incidence, test positivity rates and the contribution of the disease to OPD attendance have declined significantly since introduction of vector control interventions. There is need to sustain the achieved success to avoid malaria resurgence and epidemics

Figure 3:



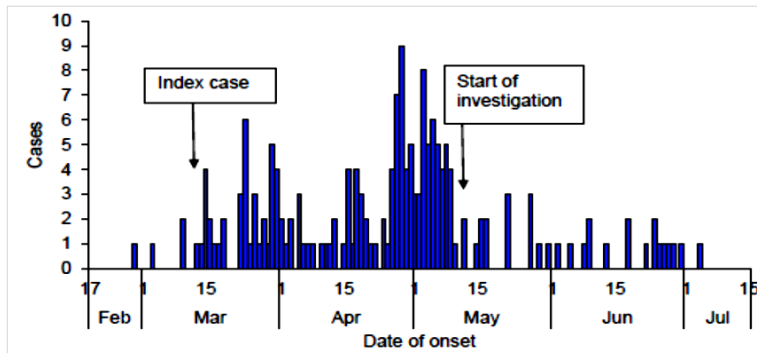
Cholera outbreak caused by contaminated water spreads across 80 villages in endemic Kasese District, February to July 2015

By Benon Kwesiga, Pande Gerald, Ario Alex Riolexus - PHFP Field Epidemiology Track

On 14th May 2015, the Ugandan Ministry of Health (MOH) sent out a central team to support the local cholera response team in the Western District of Kasese. The cholera outbreak had lasted two months since confirmation of the index cholera case on 14th March 2015. The team set out to epidemiologically characterize the outbreak, identify the mode of transmission and institute control measures. This cholera outbreak originated from Bwera Sub-County, a cholera prone area near the border with the Democratic Republic of Congo (DRC) where another cholera outbreak was ongoing. It gradually spread to over 80 villages across the district, affecting 183 people over a 6 months period (February to July 2015). A case control study revealed that drinking contaminated water was highly linked to developing the disease. Sources of drinking water in the affected areas including piped and stream/river water were heavily contaminated with fecal coliforms. Piped water was inadequately chlorinated and had increasing levels of fecal contamination along the pipeline and in households. The team recommended proper disposal of patients' faeces, adequate chlorination of the piped water system and health education of the population which helped control the outbreak.

Background: On March 14th 2015, the District Health Officer (DHO) Kasese District notified MOH headquarters about a confirmed cholera outbreak in the district. The initial cases registered were from two villages in Mpondwe/Lhubiriha Town council located near the Ugandan border with Democratic Republic of Congo (DRC). The first reported case, was a 12 year old boy from Nyabugando village, in Bwera Sub County whose symptoms had started on March 14, 2015. He tested positive by the cholera Rapid Diagnostic Test (RDT) on March 15th, 2015. We also learnt that the first cases had crossed the border to DRC where another cholera outbreak had been reported around the same time.

Figure 1: Epi-curve showing the number of cholera cases in, Kasese District, February to July 2015



The first reported case, was a 12 year old boy from Nyabugando village, in Bwera Sub County whose symptoms had started on March 14, 2015. He tested positive by the cholera Rapid Diagnostic Test (RDT) on March 15th, 2015. We also learnt that the first cases had crossed the border to DRC where another cholera outbreak had been reported around the same time. However due to challenges in cross-border collaboration, it was difficult to fully investigate events on the DRC side. Despite efforts by the Kasese District team, the outbreak continued to spread across several villages in the district. On May 14th 2015 therefore, MoH assembled a team to support the local efforts in investigating and controlling the outbreak. The investigation team set out to epi-

demologically characterize the outbreak, identify the mode of transmission and guide targeted control measures.

Methods: We conducted the study in Bwera and Kitwamba Sub Counties, in Kasese, a district in western Uganda. Bwera town is located 5 km from the Ugandan border with DRC where a big food market is located. There is a lot of cross border trading making it easy for contagious diseases to be transferred between the two countries. The district is composed of 20 rural sub-counties and 4 town councils. We defined a suspected cholera case as onset of acute watery diarrhoea in a Kasese District Resident from February 2015 onwards [1]. A Confirmed cholera case was defined as a suspected case with laboratory-confirmed *vibrio cholerae*. To find cases systematically, we reviewed patient records. We conducted Laboratory testing on stool samples from Bwera hospital. Cases were tested with cholera Rapid Diagnostic Tests (RDTs) before confirmatory culture testing of a stool sample. To test the hypotheses generated from the descriptive analysis, we conducted a case – control study in the most affected areas of Bwera and Kitwamba Sub Counties.

Results: By June 30, 2015, 183 suspected cases had been documented in the district, with cases distributed in more than 80 villages throughout the district. Two sub counties: Bwera and Kitwamba were the most affected. Three cholera treatment centers were set up in these areas where all suspected cases were managed with intravenous fluid rehydration and antibiotics. The age range of the case-patients was 1-90 years; the sex ratio was approximately 1:1. The commonest symptoms were diarrhea (100%) and vomiting (46%). As illustrated by the epi-curve in figure 1, the outbreak lasted five months from February to July 2015. On stratifying the epi curve, it depicted small point source epidemics occurring in the different villages as the outbreak spread. The main hotspot of the outbreak was Bwera where the sporadic cases were reported throughout the outbreak period. In Kitwamba the outbreak started approximately one and a half months after the index case in Bwera and lasted only one month. The outbreak started from Bwera Sub County in villages nearest to the DRC border, spread to Kasese municipality where it affected a few people before attacking Kitwamba Sub County. Figure 2 below shows the distribution of the affected villages across Kasese district. The highest attack rates were found in parishes within Bwera and Kitwamba.

Tests were conducted from Bwera Hospital laboratory and 61 samples tested culture positive for *Vibrio cholerae*. We conducted an environmental assessment of the area to assess for possible drivers of the outbreak. The most affected sub county, Bwera is located just near the border with DRC where a lot of cross border trading takes place. The main water supply for this area is a gravity flow scheme of water from River Rubiriha that marks the border between Uganda and DRC. The scheme provides two types of water. Treated water is paid for while untreated water is free. Tests done on the water found that both treated and untreated water were heavily contaminated with *E. coli*. We also observed people washing cooking utensils in the water, children playing in the water and evidence of open defecation along the river banks. Our findings therefore suggested that water was the most likely mode of transmission. From the case control study, we found a significant association between drinking unsafe water (not boiled, treated or filtered) and getting sick. 94% (46/49) of case-patients and 76% (152/209) of controls drank water that was not treated, boiled, or filtered ($OR_{M-H} = 5.9$, 95% CI: 1.6-21.5). Eating fish or buying it from various markets were not associated with illness.

Discussion and public health actions undertaken: This was the third cholera outbreak in Kasese since 2000 [2]. Like previous outbreaks, this one also began in Bwera Sub County. It was caused by consumption of contaminated drinking water. Although we could not elicit concrete evidence, it seems that the water was most likely contaminated by faeces from the first cases through open defecation followed by drinking

the water without rendering it safe first by boiling, treating or filtering it. These could have led to the spread of the disease to household level [3, 4].

Having confirmed that water was the source of the outbreak and that the available water sources were contaminated, we sought for practical and immediate ways to provide safe drinking water to the affected communities.

Water treatment helps prevent up to 90% of water borne diseases including cholera [5]. At the time of this outbreak, the only safe water source was borehole water collected in a clean container. The river water in the affected areas was highly contaminated with faecal matter and thus unsafe to drink. Proper treatment of the piped water and proper disposal of faeces could have prevented this outbreak or at least greatly reduced its impact. Primary prevention through improvement of sanitation and waste disposal as well as provision of safe water are the most effective and sustainable interventions for control of cholera in such a community. Prior experience in cholera outbreaks enabled the health workers to detect this outbreak in a timely manner. However there was a delay of more than a month between confirmation of the first case and launching of a detailed outbreak investigation. If investigation and control measures had been initiated upon confirmation of the first cases, this could have possibly reduced the extent of the outbreak significantly.

References:

1. Cummings, M.J., et al., *A cholera outbreak among semi-nomadic pastoralists in northeastern Uganda: epidemiology and interventions*. *Epidemiol Infect*, 2012. 140(8): p. 1376-85.
2. Bwire, G., et al., *Cholera Surveillance in Uganda: An Analysis of Notifications for the Years 2007–2011*. *Journal of Infectious Diseases*, 2013. 208(suppl 1): p. S78-S85.
3. DAS, A., et al., *Two sequential outbreaks in two villages illustrate the various modes of transmission of cholera*. *Epidemiology & Infection*, 2009. 137(06): p. 906-912.
4. Nguyen, V.D., et al., *Cholera Epidemic Associated with Consumption of Unsafe Drinking Water and Street-Vended Water—Eastern Freetown, Sierra Leone, 2012*. *The American Journal of Tropical Medicine and Hygiene*, 2014. 90(3): p. 518-523.
5. WHO, *World Health Organisation cholera fact sheet*. 2015.

During this outbreak, there was a concurrent outbreak on the other side in DRC. The District Health Team reported that the first cases came from DRC although this proved difficult to confirm. This brought out a challenge of inadequate cross-border collaboration. This was later on addressed by linking the cholera response teams on the Uganda and DRC borders so as to work together and learn from each other. Eventually, through proper disposal of patients' faeces, adequate chlorination of the piped water system, distribution of water treatment tablets and health education, we were able control this outbreak.

Acknowledgements

We would like to acknowledge all the efforts by the WHO team, the District Health Team, the health workers especially those in the CTCs, the Village Health Team members and Local Council chairmen in responding to this outbreak.

Continued from page 4

Although several reasons may explain why weekly reporting rates in many districts are low, it is possible that health facilities are not prioritizing weekly reporting. This is due to the fact that most districts were able to achieve monthly targets. Strengthening IDSR through trainings might yield limited results if these trainings are not supplemented by other interventions. These interventions should target all stakeholders so that they offer full support and commitment to objectives of IDSR. The government investment in recruitment of health workers and HMIS focal persons at health facilities is a useful resource for districts to fulfill their IDSR responsibilities. Districts need to ensure that all personnel involved in IDSR appreciate the importance of disease surveillance in detection and solving public health threats. Supervision or mentorships to health facilities by districts with support from Ministry of Health is crucial in addressing individual factors such as staff motivation and attitude. There is need to conduct studies to explore reasons why weekly reporting rates remain low.

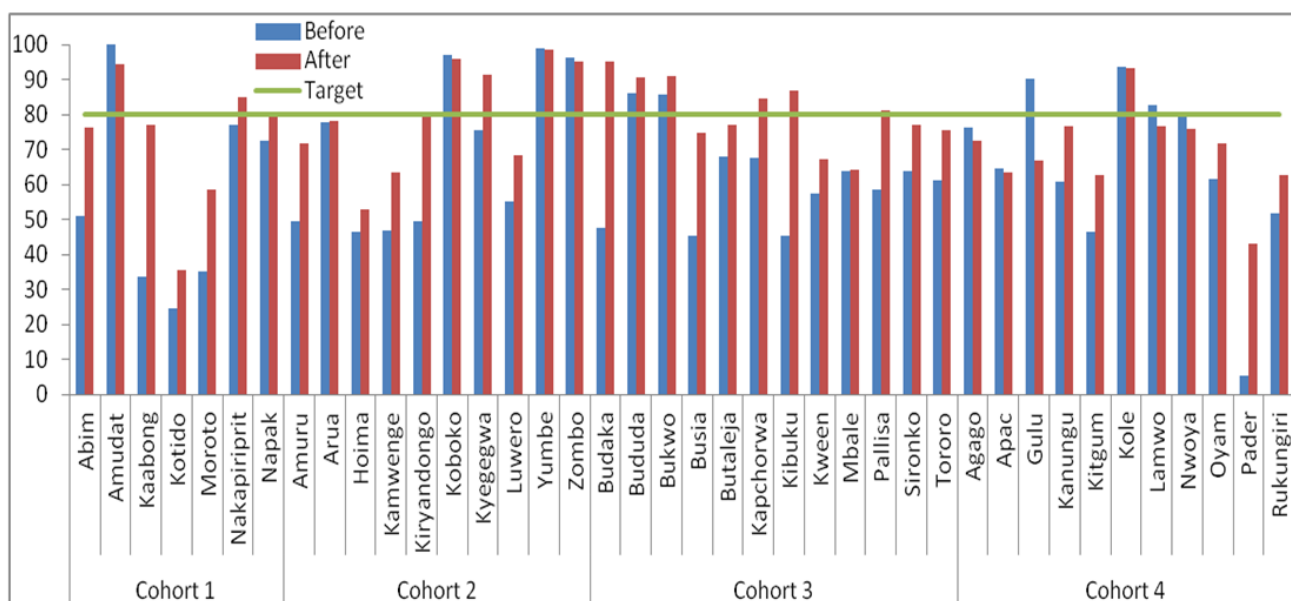


Figure1: District Average weekly reporting rates: before and after IDSR training

An overview of the laboratory response to the 2015 typhoid outbreak in Kampala, Uganda

By Lilian Bulage, Atek Kagirita, Henry Kajumbula, Guma Gaspard, Isaac Ssewanyana, Charles Kiyaga, Aisu Stephen
Central Public Health Laboratories, Ministry of Health Uganda

Background: On 6th Feb 2015 Kampala Capital City Authority (KCCA) notified Ministry of Health (MoH) of a strange illness in the Central Business District. The disease had reportedly affected more than 30 persons causing 5 deaths in a month. The report indicated that majority of cases started having symptoms in early Jan 2015 and was mainly affecting adult males and females working in Nakasero market, Disabled market and Qualicel Bus terminal. The symptoms of the Index case included high-grade fever, severe abdominal pain, and jaundice. Further investigations pointed to and confirmed typhoid. Epidemiological and laboratory investigations revealed that the outbreak was caused by people drinking water from underground wells and locally processed juices contaminated with sewage. Treatment centers were set up at various KCCA health centres in the city. UNICEF provided aqua tablets for household water treatment, made safe water temporarily available to the affected communities and supported house to house health education and mass media sensitization on typhoid. Referral of suspected typhoid patients was carried out. KCCA sealed off all the underground wells. By 12th June 2015, a total of 14,304 suspected typhoid cases: 1,038 tubex positive and 52 cases confirmed on blood culture cases had been documented. MoH declared Kampala free of typhoid outbreak on the 17th/June/2015.

A number of laboratory related activities were conducted during this outbreak, and afterwards. These included confirmation of cases, verification of the outbreak in other districts aside Kampala, identification of the source of the outbreak, monitoring the effectiveness of control measures among others. Following the confirmation of the typhoid outbreak in Kampala, all districts enhanced their surveillance and reporting and the number of suspected typhoid cases in the Health Management Information System (HMIS) increased in over 30 districts. These districts had reported cases beyond the IDSR national set threshold of 5 cases / 50,000 population to levels of 20 cases / 50,000 population. This therefore required verification and investigation to ascertain the possibility of a national typhoid outbreak. In this article we provide an overview of the challenges, lessons learnt and recommendations of the 2015 typhoid outbreak in Uganda.

No Issue

Surveillance

- | 1. | Recommendations/Responsible institution/persons |
|--|--|
| Difficulties in identifying outbreaks in mobile and urban settings: This typhoid outbreak occurred in the underprivileged populations – those working in the disabled's' market, taxi parks, farmers' market in downtown Kampala. These are low income earning people who could hardly afford to spend long times off their work stations due to fear of missing out on their clientele. Due to long waiting times in public health centers, many opted to go to nearby private clinics once they fell ill. Most of the clinics do not routinely feed into the HMIS. Worse still these clinics the widal test in the diagnosis of typhoid. It is therefore very hard to detect outbreaks in such populations using traditional methods. In fact, this typhoid outbreak was never detected by the public health surveillance system. | MoH-ESD/KCCA: Work with the administrative persons in such populations to report any outbreaks/ unusual clusters of cases. For example, in the Disabled's Market there was a main "chairperson" and several "area chairpersons," who were very knowledgeable on what's going on in their communities. MoH/CPHL/Resource centre: Public private partnerships/supervision should be strengthened making sure that private clinics conduct the right tests and also ultimately feed into the HMIS. MoH/CPHL/KCCA: A program for regular monitoring of water sources, open air foods, etc. would be one of the long term solutions. |
| 2. A lot of data is generated in the laboratories but very limited analyses are done to inform decision making | MoH-ESD/CPHL: Laboratory staff should be oriented on the basics of surveillance and if possible should be part of the surveillance teams at all levels |
| 3. Lack of basic laboratory materials: Early in the investigation exercise, the team was ready to collect blood specimens for culture. However, it was noted that basic sample collection bottles were not available the national laboratory-CPHL. | CPHL: Modern microbiological methods like the Bactec be introduced at CPHL. A SOP should be set up to ensure timely testing of specimens collected during outbreaks. MoH-ESD/CPHL: There is need for more staff in the unit to help fasten the processes. |
| 4. Delay in release of results: The investigation team collected about 20 blood specimens and sent half of them to CPHL. The rest were sent to the Makerere University Microbiology laboratory which produced results within a week CPHL was still preparing samples in the same period. It was noted that CPHL was still using conventional microbiological methods which could affect the timeliness in release of results. Important to note was the glaring human resource gap to handle the work at the institute specifically microbiologists. Most of the "staff" were volunteers. | CPHL: Modern microbiological methods like the Bactec be introduced at CPHL. A SOP should be set up to ensure timely testing of specimens collected during outbreaks. MoH-ESD/CPHL: There is need for more staff in the unit to help fasten the processes. |

| No | Issue | Recommendations/Responsible institution/persons |
|----|---|---|
| 5. | Use of widal for typhoid testing: Ministry of Health stopped supply of widal test reagents in public health facilities due to its limitations. However, it was discovered that many private clinics and a few government facilities are still using the test. | CPHL/District Laboratory Focal Persons (DLFPs): Mentorship/supervisions should be strengthened at private facilities to ensure that widal is correctly used or not used at all. The DLFPs/CPHL should ensure presence and use of the Guidelines for sample collection, transportation and referral for facilities to know the steps to follow when there is need of a test they cannot perform. Blood culture bottles should be provided at health facilities. All the regional laboratories should be equipped to handle some microbiological procedures. |
| 6. | Communication problems: The procedure for accessing results was not clear to all need to know parties. | MoH-ESD/CPHL: CPHL should consider establishing an SOP (or revise any existing SOPs) to ensure smooth and timely communication with all need-to-know parties. Alternatively, all the parties should be informed about the |
| 7. | Coordination issues with referral and shipment of services: There was no means of transport dedicated for referral and shipment of samples to the testing centers (MRC/Medical Microbiology Laboratory Makerere University) within Uganda. This affected the turnaround times for results. | MoH-ESD/CPHL: During outbreak times funds/means of transport should be allocated for sample referral and transit to avoid any delays in releasing results. Guides/information should always be established on how the sample referral is to be done if deemed necessary. A standard Operating Procedure (SOP) on sample referral and shipment during outbreak situations should be established. Use of the National HUB Sample Transportation Network during outbreak situations should be strengthened |
| 8. | Testing environmental samples: Water/juice samples were collected and submitted to CPHL for analysis. However, there was no protocol for testing environmental samples. It took a good number of days for the environmental samples to be worked upon. Currently, there is no environmental microbiology section at CPHL. This is key in identifying the source of outbreaks. | MoH-ESD/CPHL: Testing environmental samples are essential for identifying the source of outbreaks. An environmental microbiological testing section should be established and the respective SOPs put in place. |

Conclusion: The laboratory played a critical role in the detection and monitoring of typhoid cases in this outbreak and beyond. There were however, glaring gaps in medical commodities and essential supplies, human resource (both in number and specialized staff like the microbiologists) and overall coordination of the response. Well-equipped labs, and well-maintained supply chains, ensure that laboratory staff do not find themselves limited by their materials. Unexpected rapidly increasing caseloads associated with outbreaks require organizational leadership from laboratory management. Preparedness and flexibility, in both training and work time are necessary for facing an outbreak. The lessons learnt in this response should enable us to prepare and respond better in future similar outbreaks.