ABSTRACT BOOK

Uganda Public Health Fellowship Program

9th Uganda National Field Epidemiology Conference

Theme: *The Role of Field Epidemiology in Strengthening Public Health Emergency Response in Uganda*

Hotel Africana

21 November 2023

THE REPUBLIC OF UGANDA
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MAKERERE UNIVERSIT
SCHOOL OF PUBLIC HEAL

9th National Field Epidemiology Conference
Hotel Africana, Kampala
21 November 2023

Theme: *The Role of Field Epidemiology in Strengthening Public Health Emergency Response in Uganda*

Time	Event Title	Person
8:00-8:20	Arrival and Registration	**Julie Namagulu**
8:20-8:25	Welcome Remarks	Dr. Alex Ario (UNIPH)
8:25-8:30	Remarks	AFENET
8:30-8:35	Remarks	Dr. Julie Harris (RA CDC)
8:35-8:40	Remarks	MOH
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8:50-9:00	Understanding the delay in identifying Ebola Virus Disease: gaps in integrated disease surveillance and response and community-based surveillance to detect viral haemorrhagic fever outbreaks in Uganda, September 2022	Jane Frances Zalwango
9:00-9:10	Stigma among Ebola Virus Disease survivors in Mubende and Kassanda districts, Uganda, 2022	Marie Gorreti Zalwango
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9:30-9:40	Time to care-seeking and factors influencing appropriate EVD care among Ebola case-patients in Uganda, September to November, 2022	Rebecca Akunzirwe
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10:00-10:10	Prevalence of and factors associated with anxiety, depression and post-traumatic stress disorder among Sudan Virus Disease survivors and family members in Uganda, January 2023: a cross-sectional study	Brian Agaba
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11:50-12:00	Cholera outbreak associated with drinking untreated lake water, Sigulu Island, and Bukana mainland lakeshore communities, Namayingo District, Uganda July 2023	Rek John
12:00-12:10	Cholera outbreak associated with using contaminated river water in Kayunga District, Uganda, 2023	Adams Kamukama
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Time	Title	Presenter
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Epidemiology of cases of Sudan Virus Disease in Uganda, August-November 2022

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Background

On September 20, 2022, the Uganda Ministry of Health (MoH) declared a Sudan virus disease (SVD) outbreak in MubendeDistrict, Central Uganda. We describe epidemiological characteristics and transmission dynamics.

Methods

Cases were classified as suspected, probable, or confirmed using MoH case definitions. We collected data on case-patient demographics, exposures, and signs and symptoms, and identified transmission chains. Basic reproduction number (R_o) estimates were calculated using the EpiEstim package in R.

Findings

Among 164 cases (142 confirmed, 22 probable) in nine districts, median age was 29 years (IQR 20-38), 95 (58%) were male, and 77 (47%) died. Symptom onsets ranged from August 8 to November 27, 2022. Case-fatality rate was highest in children <10 years (74%) and adults aged ≥40 years (60%). Fever (135, 84%), vomiting (93, 60%), weakness (89, 56%), and diarrhoea (81, 51%) were the commonest symptoms; bleeding was uncommon at presentation (13, 8%). Before outbreak identification, most (60%) case-patients sought care at private health facilities. Median incubation was 6 days (IQR 5-8), and median time from onset to death was 10 days (IQR 7-23). Most early cases represented healthcare-associated transmission; most later cases represented household transmission. Overall R_o was 1·25.

Interpretations

Despite delayed detection, the 2022 SVD outbreak was rapidly controlled, possibly potentiated by a low R_o. Children were at highest risk of death. Initial care-seeking occurred at facilities outside the government system. Healthcare-associated transmission in private health facilities drove the early outbreak, suggesting gaps in infection prevention and control.

Understanding the delay in identifying Ebola Virus Disease: gaps in integrated disease surveillance and response and community-based surveillance to detect viral haemorrhagic fever outbreaks in Uganda, September 2022

Jane Frances Zalwango[1*], Helen Nelly Naiga[1], Edirisa Junior Nsubuga[1], Rebecca Akunzirwe[1], Benon Kwesiga[1], Daniel Kadobera[1], Richard Migisha[1], Alex Riolexus Ario[1,2], Julie R. Harris[3]

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Background: Early detection of outbreaks requires robust surveillance and reporting at both community and health facility levels. Uganda implements Integrated Disease Surveillance and Response (IDSR) for priority diseases and uses the national District Health Information System (DHIS2) for reporting. However, investigations after the first case in the 2022 Uganda Sudan virus outbreak was confirmed on September 20, 2022 revealed many community deaths among persons with Ebola-like symptoms as far back as July. Most had sought care at private facilities. We explored possible gaps in surveillance that may have resulted in late detection of the Sudan virus disease (SVD) outbreak in Uganda.

Methods: Using a standardized tool, we evaluated core surveillance capacities at public and private health facilities at the hospital level and below in three sub-counties reporting the earliest SVD cases in the outbreak. Key informant interviews (KIIs) were conducted with 12 purposively-selected participants from the district local government. Focus group discussions (FGDs) were conducted with community members from six villages where early probable SVD cases were identified. KIIs and FGDs focused on experiences with SVD and Viral Haemorrhagic Fever (VHF) surveillance in the district. Thematic data analysis was used for qualitative data.

Results: Forty-six (85%) of 54 health facilities surveyed were privately-owned, among which 42 (91%) did not report to DHIS2 and 39 (85%) had no health worker trained on IDSR; both metrics were 100% in the eight public facilities. Weak community-based surveillance, poor private facility engagement, low suspicion index for VHF among health workers, inability of facilities to analyze and utilize surveillance data, lack of knowledge about to whom to report, funding constraints for surveillance activities, lack of IDSR training, and lack of all-cause mortality surveillance were identified as gaps potentially contributing to delayed outbreak detection.

Conclusion: Both systemic and knowledge-related gaps in IDSR surveillance in SVD-affected districts contributed to the delayed detection of the 2022 Uganda SVD outbreak. Targeted interventions to address these gaps in both public and private facilities across Uganda could help avert similar situations in the future.

Keywords: Surveillance, Ebola, viral haemorrhagic fever, Sudan Virus Disease, Uganda

Stigma among Sudan Ebola Virus Disease survivors in Mubende and Kassanda Districts, Uganda, 2022

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Background: Ebola disease survivors often experience stigma in multiple forms, including felt (perceived) stigma, enacted (action-based) stigma, and structural (institutional) stigma. On September 20, 2022, Uganda declared a Sudan Virus Disease (SVD, caused by *Sudan ebolavirus*) outbreak after a patient with confirmed Sudan virus (SUDV) infection was identified in Mubende District. The outbreak led to 142 confirmed and 22 probable cases over the next two months. We examined types of stigma experienced by survivors and their household members and its effect on their well-being.

Methods: We conducted a qualitative study during January 2023 in Mubende and Kassanda Districts. We conducted in-depth and key informant interviews with ten SVD survivors, ten household members of SVD survivors, and ten key informants (district officials and health workers in the affected communities). Interviews were recorded, translated, transcribed, and analyzed thematically.

Results: Survivors reported experiencing isolation and rejection by community members and loss of work. They reported being denied purchases at shops or having their money collected in a basket and disinfected (enacted stigma), which led to self-isolation (felt stigma). Educational institutions denied admission to some students from affected homes, while parents of children in some affected families stopped sending children to school due to verbal abuse from students and teachers (structural stigma). Prolonged SVD symptoms and additional attention to survivors from responders (including home visits by health workers, public distribution of support items, and conspicuous transport from home to the survivor's clinic) were perceived as aggravating both felt and enacted stigma. Even after the outbreak had been declared over, survivors felt that they were still considered a threat to the community.

Conclusion: Survivors experienced felt stigma, enacted stigma, and structural stigma. Strengthening community engagement to counteract stigma, rethinking response activities that aggravate stigma, management of long-term SVD symptoms for survivors, integrated response interventions by partners, private distribution of support items, and increasing awareness and sensitization through video messages could reduce stigma among persons affected in future similar outbreaks.

Key words: Sudan Ebola Virus Disease, Disease outbreaks, Stigma, Survivors, Uganda

Determinants of workplace resilience among healthcare workers at the epicenter of the Sudan virus disease outbreak response in Uganda, 2022

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Background: Healthcare workers' (HCWs) mental resilience can be challenged during times of adversity, such as during outbreaks. On September 20, 2022, the Uganda Ministry of Health declared a Sudan virus disease (SVD) outbreak. We assessed the level and determinants of resilience at the workplace among HCWs working during the SVD outbreak in Uganda.

Methods: During March 2023, we conducted a cross-sectional survey among all HCWs (clinical and non-clinical) working from September 20, 2022─January 23, 2023 (the outbreak period) in the 3 health facilities with Ebola Treatment Units (ETUs) in Mubende and Kassanda districts, the epicenters of the outbreak. Data were collected using a structured questionnaire. Risk perception was assessed using 11 statements with a 4-point Likert-type scale. We assessed resilience using the Connor-Davidson Resilience Scale (CD-RISC-10). Resilience was dichotomized into 'not resilient' (score 1-29) and 'resilient' (score 30-40). Logistic regression was used to identify factors associated with resilience.

Results: Among 400 HCWs interviewed, mean age was 35 (range: 20-58) years; 222 (56%) were male and median work experience was 8 years (range:1-38). One hundred and ten (28%) HCWs were support staff and 72 (18%) were nurses; 344 (86%) worked >40 hours per week. Ninety-three (23%) HCWs were resilient. Three hundred and fifty-six (89%) expressed fear of contracting SVD and 356 (89%) expressed concern about stigma at their workplace if they had contracted SVD. Resilience was associated with age >40 years (adjusted odds ratio (AOR)=2.1; CI=1.3-3.5), work experience >10 years (AOR=2.2; CI=1.1-4.7), working >40 hours per week (AOR=6.8; CI=2.1-23) and receiving Ebola-specific counselling (AOR=3.3; CI=1.7-6.5).

Conclusion: Most HCWs at the SVD outbreak epicentre in Uganda faced resiliency challenges shortly after the outbreak end related to their infection risk and treatment from others if they became infected. Adopting workplace policies aimed at addressing these concerns in future similar outbreaks may support resilience.

Keywords: Sudan virus disease, Ebola, resilience, stress, healthcare worker, Uganda

Performance of contact tracing in the Sudan Ebola Virus Disease Outbreak in Uganda, September 2022–January 2023

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Background: Contact tracing (CT) is critical for ebolavirus outbreak response. Ideally, all new cases after the index case should be previously known contacts (PKC) before their onset and spend minimal time ill in the community. We assessed the impact of CT during the 2022 Sudan Virus Disease (SVD) outbreak in Uganda.

Methods: We collated anonymized data from the SVD case and contacts database to obtain and analyse data on CT performance indicators, comparing confirmed cases that were PKC and were not PKC (NPKC) before onset. We assessed the effect of PKC on the number of people infected using Poisson regression.

Results: There were 3,844 contacts of 142 confirmed cases (mean: 22 contacts/case). Forty-seven (33%) confirmed cases were PKC. PKCs had fewer median days from onset to isolation (4 versus 6; $p<0.007$) and laboratory confirmation (4 versus 7; $p<0.001$) than NPKC. Being a PKC versus NPKC reduced risk of transmitting infection by 84% (IRR=0.16, 95%CI 0.08-0.32).

Conclusion: Contact identification was sub-optimal during the outbreak**.** However, CT reduced the time SVD cases spent in the community before isolation and the number of persons infected in Uganda. Approaches to improve contact tracing, especially contact listing, may improve control in future outbreaks.

Key words: Contact Tracing, Sudan Ebola Virus Disease, Uganda

Time to care-seeking and factors influencing appropriate EVD care among Ebola case patients in Uganda, September to November 2022

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Background
Early isolation of and appropriate care for Ebola Disease patients at Ebola Treatment Units (ETU) curbs outbreak spread and reduces case fatality. We evaluated time-to-patient entry into the ETU and associated factors during the 2022 Sudan virus disease (SVD) outbreak in Uganda.

Methods
We included persons with RT-PCR-confirmed Sudan virus infection during September–November 2022 with onset after the outbreak was declared. We categorized days from patient symptom onset to ETU entry ('delays') as short (≤ 2), moderate (3-5), and long (≥ 6); the latter two were considered 'delayed care'. We assessed demographics, onset (earlier vs later in the outbreak, using October 15 as a cutoff), and knowledge of one's status as a contact as predictors for delayed care using modified Poisson regression. We conducted key informant interviews with 17 SVD case-patients with short (n=8) and long (n=9) delays to explore reasons for late care.

Results
Among 118 case-patients, 25 (21%) case-patients had short, 43 (36%) moderate, and 50 (43%) long delays. Seventy-five (64%) had symptom onset later in the outbreak. Having onset earlier in the outbreak increased risk of delayed care [cRR=1.8, 95%CI (1.2-2.8)]. Patients with short delays reported knowing that they were a case contact, knowing SVD symptoms, encouragement from a trusted person, and belief that early treatment-seeking was lifesaving as facilitators to early care. Patients with long delays reported fear of ETUs and lack of transport as contributing to later care.

Conclusion: Delayed care was common early in the outbreak. Strong contact tracing and community education and outreaches could facilitate more rapid presentation during similar outbreaks.

Keywords: Ebola, Healthcare seeking behaviour, Outbreak, Uganda

Prevalence of and factors associated with anxiety, depression and post-traumatic stress disorder among Sudan ebolavirus disease survivors and family members, Uganda, January 2023: a cross-sectional study

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Background: Communities affected by Ebola disease (EBOD) may face resulting increases in mental health disorders. We evaluated the prevalence of and factors associated with mental health disorders among persons affected by the 2022 Sudan virus disease (SVD) outbreak in Uganda.

Methods: We conducted a cross-sectional study among SVD survivors and family members of survivors and fatal cases from 15–31 January 2023 (six weeks after the last case was discharged). We included only laboratory-confirmed, consenting SVD survivors and family members who lived with or cared for confirmed SVD patients during their illness and who were home at the time of our visits. The Hospital Anxiety and Depression Scale was used to evaluate anxiety and depression. The post-traumatic stress disorder (PTSD) checklist for the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition was used to evaluate PTSD. We used modified Poisson regression (adjusted for clustering by household) to determine factors associated with each mental health disorder.

Results: We enrolled 54 survivors and 82 family members from 96 households; median participant age was 30 years (range, 15-73), and 54% were female. The prevalence of anxiety (55%) and depression (50%) was higher than PTSD (17%); 64% had ≥1 mental health disorder. The prevalence of anxiety among persons from households with 2-4 members (aPR=0.54, 95%CI:0.31-0.92) was lower than among persons who lived alone. The prevalence of PTSD was lower in persons from households with 2-4 members (aPR=0.24, 95%CI:0.08-0.66) and >4 members (aPR=0.32, 95%CI:0.13-0.78) compared to persons who lived alone. Persons from households with ≥1 SVD death had a higher prevalence of depression (aPR=1.8, 95%CI:1.1-3.3) and anxiety (aPR=1.9, 95%CI:1.1-3.5) compared to households with no EBOD deaths. The prevalence of all mental health disorders was similar between survivors and family members.

Conclusion: Approximately two-thirds of SVD survivors and family members of patients in the 2022 outbreak in Uganda had ≥1 mental health disorder shortly after the outbreak ended. Strengthening mental health services during and after Ebola virus outbreaks for survivors and family members of patients may enhance the quality of outbreak response.

Keywords: Anxiety, depression, post-traumatic stress disorder, Ebola virus disease

Knowledge, attitudes, and practices of traditional healers regarding management of Ebola virus disease (EBOD) in Kassanda and Mubende districts, Uganda, September 2022

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Background: Traditional healers (TH) often serve as initial healthcare providers in Uganda. During September to November 2022, 164 Sudan virus disease cases were registered in Uganda. We assessed knowledge, attitudes, and practices (KAP) of TH regarding Ebola Virus Disease (EBOD) among affected communities in Mubende and Kassanda Districts.

Methods: We surveyed TH in Mubende and Kassanda Districts during April–May 2023. We randomly sampled 62 TH registered with an official association and used snowballing to identify 103 additional unregistered TH. We assessed sociodemographics; knowledge of EBOD symptoms and transmission; attitudes towards using recommended IPC measures and referral of suspected EBOD patients; and IPC practices during management of suspected EBOD patients. We scored participants' responses as "1" (correct) or "0" (incorrect); adequate knowledge was ≥8/16, positive attitude was ≥4/8, and good practices was ≥11/21. Logistic regression was used to identify factors associated with KAP.

Results: Among 165 respondents, 57% were male; the mean age was 53 years. In total, 62% had adequate knowledge, 40% had a positive attitude, and 4% had good practices. Having formal education (aOR=7.6, 95%CI: 3.6–11.8) and being registered with a TH association (aOR=3.4, 95%CI: 1.5–9.5) were associated with adequate knowledge. Being aged <40 years (aOR=3.8, 95%CI: 1.2–16.3) and female (aOR=4.3, 95%CI: 1.3–12.7) were associated with good practices. Having formal education (aOR=3.0, 95%CI:2.7-8.8) and being aged <40 years (aOR=4.5, 95%CI: 1.3–15.6) were associated with a positive attitude.

Conclusion: Practices of TH interviewed in Kassanda and Mubende put them at risk for EBOD during an outbreak. Younger, female TH were more likely to have good practices and those with formal education were more likely to have good knowledge and a positive attitude. Structured training programs by the Ministry of Health to address specific knowledge and practice gaps among TH could facilitate EBOD control.

Key words: ebolavirus, traditional healers, KAP, Uganda

Healthcare-associated infections during the 2022 Sudan Virus Disease Outbreak in Uganda

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Introduction: Healthcare-associated infections (HAIs) represent gaps in infection prevention and control (IPC) that can facilitate the spread of diseases. Ebola disease (EBOD) outbreaks are often characterized by healthcare spread as patients seek health care at treatment sites. We described the characteristics of HAIs during the Sudan virus disease (SVD) outbreak in Uganda during August–November 2022 to help identify IPC gaps and improve future response.

Methods: An HAI was defined as confirmed or probable SVD in a person with any exposure to a health facility (HF) (admission, visit, or work) where a confirmed or probable symptomatic case was located during the 2–21 days preceding their symptom onset, and with no documented exposure to an SVD case-person in the community. Data were collected retrospectively from case investigation forms and through in-depth interviews with SVD survivors or family members of fatal cases. We conducted a descriptive analysis by socio-demographic and clinical characteristics and ownership of the health facility attended.

Results: Among 164 SVD cases, 43 (26%) were HAI. Among these, 15 (35%) were aged 20-29 years, and 27 (63%) were male. Twenty (47%) were among healthcare workers (HCW) and 23 (53%) were among patients, caregivers, and visitors in healthcare facilities, with many becoming infected during their treatment for endemic diseases such as malaria. Among HCWs, 8 (40%) were nurses and 6 (30%) were trainees. Mubende District, with 84 (51%) of the total cases, experienced 70% of the HAIs. Eleven health facilities had at least one HAI, with privately-owned facilities accounting for 51% of the total cases

Conclusion: Healthcare facilities were key in propagating the 2022 SVD outbreak in Uganda. Efforts to strengthen IPC measures targeting HCWs, patients, caregivers, and visitors, including those in private health facilities, could help avert a similar situation in the future.

Keywords: Healthcare-associated infections, Ebola Virus Disease, Sudan Ebola Virus disease, Health facility, Health Care Worker, Uganda

Outbreak of Rift Valley Fever among herdsmen linked to contact with body fluids of infected animals in Nakaseke District, Central Uganda, July 2023

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Background: Rift Valley fever (RVF) is a viral zoonosis which occurs sporadically in Uganda**.** On July 24, 2023, a 24-year-old male para-veterinarian from Kimotozi village, Nakaseke District presented to Mengo Hospital with a 5-day history of intermittent nosebleeds, fever, abdominal and joint pain; Polymerase Chain Reaction (PCR) from a blood sample was positive for RVF. We set out to identify the source, determine the magnitude and drivers of the outbreak, and make recommendations.

Methods: We defined a suspected case as a sudden onset of fever (≥38°C), and ≥2 of: headache, skin rash, muscle/joint pain, intense fatigue, dizziness, coughing, abdominal pain, or bleeding in a resident of Nakaseke District from June 1−July 30, 2023. A confirmed case was a suspect case with positive PCR results. We actively searched for case-patients and interviewed them about demographics, symptoms, and animal-related activities. Blood samples from seven case-patients were tested by PCR at Uganda Virus Research Institute (UVRI). We conducted environmental assessments and interviewed farmers and herdsmen to identify risk factors.

Results: Eight case-patients (2 confirmed), all males, were identified in Kimotozi Village; one (12.5%) died. Median age was 25 years (range 19-28). Symptoms included fever (100%), headache (100%), and bleeding (25%). All case-patients (one para-veterinarian and seven herdsmen) worked on three affected farms with reports of multiple recent animal abortions and young animal deaths. All had frequent contact with the livestock, including placentas, and drank raw cow milk. Before presenting to Mengo Hospital, the index case visited three health facilities without any suspicion or clinical testing for viral haemorrhagic fevers.

Conclusion: This RVF outbreak likely resulted from contact with infected animals' fluids. We educated farmers and herdsmen and restricted animal movement from affected farms. Training clinicians to increase their suspicion index for RVF could reduce delays to diagnosis in the future.

Key words: Rift Valley Fever, Outbreak, Uganda

Trends and Spatial Distribution of Organophosphate Poisoning in Uganda:2017–2022

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Introduction: Uganda has an agricultural-based economy with widespread use of organophosphate-based pesticides. This elevates the risk for organophosphate (OP) poisoning in the population. We assessed the distribution, temporal, and spatial trends of OP poisoning admissions in Uganda during 2017─2022 to guide control and prevention interventions.

Methods: We analyzed secondary data from the District Health Information System version 2 (DHIS2). OP poisoning admissions were defined as a hospital stay due to suspected OP poisoning while OP poisoning deaths were defined as inpatient deaths with OP poisoning listed as the cause of death. We calculated annual incidence of OP poisoning admissions and case-fatality rates per patient admitted with OP at national, regional, and district health facility levels. The Mann-Kendall (MK) test was used to assess the trend.

Results: A total of 37,883 (average: 6,314 per year) OP admissions and 1,599 (average: 267 per year) deaths were reported. The case-fatality rate was 4.2%. The average national incidence of OP admission was 15/100,000 admissions. Males (incidence=18/100,000), children <5 years (incidence=20/100,000), and residents of Ankole Region (incidence=26/100,000) were the most affected. The incidence of OP admissions declined from 25/100,000 in 2017 to 9/100,000 in 2022 (MK=-13, p=0.02). Kiruhura District in western Uganda and Bukwo District in eastern Uganda had high incidences of >10/100,000 admissions throughout the study period.

Conclusion: From 2017-2022, there was a significant reduction in incidence of OP poisonings. Males, children <5 years, and residents in Ankole Region were the most affected. Strengthening sensitization among agricultural and livestock farming communities about the risks of OP poisoning could reduce the OP related burden and mortality in Uganda.

Keywords: Organophosphate poisoning, pesticides, Uganda

Food Poisoning Outbreak caused by *Bacillus Cereus* at Nakanyonyi Senior Secondary School, Mukono District, Uganda, July 2023

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Introduction: *Bacillus cereus* is a foodborne bacterial pathogen. Infection causes abdominal pain and diarrhoea; incubation is typically 4-16 hours. On July 20, 2023, Uganda Ministry of Health was notified of a suspected food poisoning outbreak at Nakanyonyi Secondary School in Mukono District. We investigated the incident and recommended control measures.

Methods: We defined a case as sudden onset of abdominal pain, diarrhoea or vomiting from July 19–20, 2023 in a student or staff member at Nakanyonyi Senior Secondary School. We found cases by reviewing school and health facility records and created a line list. We subjected cases to a questionnaire and conducted descriptive epidemiology and environmental assessments. We tested our hypothesis in a cohort of all boarding students.

Findings: Among 267 cases (all students), 13% were commuters and 87% were boarders. The most common symptoms included abdominal pain (100%), diarrhoea (92%), and vomiting (16%). The epidemic curve indicated a point-source outbreak with onsets occurring 6-36 hours after eating school lunch or dinner. Posho and beans from the same bags were consumed on preceding days with no illness reported, suggesting that the food was contaminated during preparation on that day. Nearly all 299 cohort members ate the food for lunch and/or dinner on July 19; 229 (78%) of 295 students who ate the school lunch and/or dinner and 0 (0%) of 4 students who ate neither meal became ill (RR=7.8; 95%CI 0.56-108). Attack rates were similar for those who ate only lunch (80%), only dinner (77%), or both (78%). *Bacillus cereus* was isolated from leftover samples of the cooked food.

Conclusion: This was a point-source outbreak likely caused by *Bacillus cereus* in food cooked at school; the mechanism of contamination was unknown. Proper food handling, preparation, and storage were emphasized to prevent repeat occurrences.

Key words: food poisoning, outbreak, point source, *Bacillus cereus*

Cholera outbreak associated with drinking untreated lake water, Sigulu island, and Bukana mainland lakeshore communities, Namayingo District, Uganda, July 2023

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Background: On July 24, 2023 Uganda's Ministry of Health confirmed a cholera outbreak on Sigulu Island, Namayingo District. We investigated to determine its magnitude, identify possible exposures, and recommend evidence-based control interventions.

Methods: We defined a suspected case as acute onset of watery diarrhea in a resident of Sigulu and Bukana Sub-county in Namayingo District from July 1–August 15, 2023, and a confirmed case as a suspected case with positive *Vibrio cholerae* stool culture. Cases were identified by active case search and record review. We collected water samples from water collection points to test for *Vibrio cholerae*. We conducted descriptive epidemiology and 2 case-control studies (individual and household level). A control person resided in the same village as a case-patient but had no cholera symptoms, while a control household was in the same village as a case-household (a household with a case) but had no members with symptoms. We analyzed using logistic regression.

Results: Among 24 cases (4 confirmed), 15 (62%) were female, 18 (75%) were residents of Secho Village, and median age was 27 years (range: 2-68 years); none died. Nine (37%) had received the Oral Cholera Vaccine (OCV) in 2020 or 2021. The primary case had travelled to a cholera outbreak-affected area of Kenya from July 1-4, 2023, returned to Uganda and had onset of profuse diarrhea on July 5, and washed her soiled clothes at a lakeshore water collection point A (serving Secho Village) on July 8. Subsequent case-patients fell ill during July 11-28, 2023. All case-patients consumed lake water, but no lake water samples tested positive for *Vibrio cholerae.* Treatment of drinking water (aOR=0.085, 95% CI: 0.097–0.74) and having received OCV (aOR=0.16, 95% CI: 0.051–0.56) were protective. Compared to all other water points, drinking from water point A increased odds of cholera (aOR=4.3, 95% CI: 1.3–15). We observed residents drawing lakeshore water for laundry, bathing, and drinking.

Conclusion: This cholera outbreak in an island community was associated with introduction of *Vibrio cholerae* from a traveler, followed by community consumption of untreated lakeshore water. We recommended mass distribution of water treatment tablets, repeated OCV, and sensitization about risks associated with drinking untreated lake water.

Key words: Cholera, outbreak, water, Uganda

Cholera outbreak associated with drinking contaminated river water in Kayunga District, Uganda, July–August 2023

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Background: In July 2023, a cholera outbreak was reported in Kayonjo Village, Kayunga District, and spread to other villages in Kayunga District. We investigated the outbreak to identify the scope, risk factors, and recommend control measures.

Methods: We defined a suspected case as onset of acute watery diarrhea during 24 June to 24 August 2023 in a resident of Kayunga District aged ≥2 years; a probable case as a suspected case with positive stool rapid diagnostic test; and a confirmed case as a suspected case with *Vibrio cholerae* cultured from stool. We described cases and conducted a case-control study stratified by the two most affected villages of Kayonjo (inland) and Lusenke (on the river), using village-matched controls. We analyzed using logistic regression and common reference group analysis.

Results: We identified 78 case-persons (22 suspected, 19 probable, and 37 confirmed); 10 (13%) died. Males were more affected than females (attack rate (AR)=2.4 vs 1.6/1,000). Lusenke was more affected than Kayonjo (AR=41 vs 6.2/1,000). The outbreak began after the primary case's funeral in Kayonjo Village on 2 July; eating posho at the funeral was associated with illness (OR=∞, p=0.005). It subsequently spread to nearby Lusenke, where both drinking and using river water domestically (compared with no river water use) were associated with illness (OR=17, CI=3.8-78). We observed villagers using the river to defecate, bathe, wash clothes, and collect drinking water.

Conclusion: This outbreak was likely initiated by food served at a funeral of a suspected case whose source was unknown and amplified through contamination of river water used and drank by villagers. We sensitized villagers to stop using untreated river water and stop open defecation, washing clothes, bathing, and swimming in the river, and to seek care urgently if symptomatic. The outbreak ended on 24 August, shortly after distributing water chlorination tablets and prophylactic antibiotics and setting up the cholera treatment unit.

Key word: Cholera, Outbreak, Kayunga, River, Uganda

Cure rates among wasted patients receiving ready-to-use therapeutic feeds in Kabale Region, July 2022–June 2023

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Background: Wasting is the most lethal form of undernutrition. It remains a major public health problem in developing countries. The outpatient therapeutic care (OTC) program provides ready-to-use therapeutic feeds (RUTF) for treatment of wasting among patients without medical complications. In 2010, OTC was introduced in some health facilities in Kabale Region. However, little is known about the OTC cure rates in the region. We described cure rates among wasted patients receiving RUTF in Kabale region, July 2022–June 2023.

Methods: We conducted a descriptive analysis of cure rates among patients enrolled into the OTC program in Kabale region, July 2022–June 2023. We abstracted data from the District Health Information System version 2 on district, age, sex, facility level, facility ownership, and number of patients given RUTF who were cured, defaulted, did not respond to treatment, or died. According to the Global Sphere Standards, a cure rate >75% is considered "acceptable". We compared the cure rates against the Sphere Standards.

Results: Among 733 patients who exited the OTC program in Kabale Region, 69% were cured, 16% defaulted, 13% did not respond to treatment, and 2% died. Cure rate was higher among children <5 years than their older counterparts (76% vs 39%, p=0.038), but similar between males and females (74% vs 66%, p=0.75). Health Center IIIs had higher cure rates than regional referral hospitals (79% vs 22%, p=0.036). Private facilities had a similar cure rate to public facilities (84% vs 64%, p=0.88). Only Kisoro District (79%) achieved the target cure rate of >75% during the study period. The regional cure rate was above the target only during the last quarter of 2022.

Conclusion: The regional cure for wasting in Kabale did not meet the target. We recommend Ministry of Health to scale up OTCs to lower-level health facilities to improve cure rates in the region and conduct further studies to understand barriers to achieving the standard cure rates across facility types.

Keywords: Outpatient Therapeutic Care, cure rates, wasted, therapeutic feeds, Kabale

Development of a district-based competency assessment system in Mubende Region Uganda, February to July 2023

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Background: Competency assessments (CA) are critical in identifying performance gaps among laboratory workers that can hinder high-quality patient care. Until April 2023, there was no comprehensive system for assessing laboratory personnel's technical competence in Mubende Region. We established a district-based technical CA system for laboratory workers.

Methods: We organized a cascaded training for CAs in 8 districts in Mubende Region, Central Uganda. First, we developed standard operating procedures (SOPs) and an observational form to conduct CAs and trained three district-based laboratory staff (trainers) from each district on how to conduct them. Seven laboratory tests were included in the CAs: HIV Rapid Diagnostic Testing (HIV-RDT), HIV-Rapid Testing for Recent Infection (RTRI), stool analysis, TB *Ziehl-Neelsen (TB*-ZN) staining, serum Cryptococcus Antigen (CrAg), CD4 Visitect testing, and blood examination for malaria parasites (BMPs). Trainers were assessed pre- and post-training using written examinations and observations and scored in areas of patient preparation, sample accession, collection, testing, storage, results interpretation, biosafety, work area management, and results documentation. Trainers then trained facility staff at 40 district facilities on the same testing techniques. CAs were performed and facility staff were assessed in the same way. An average competence score of 80% was considered a passing mark.

Results: Trainers achieved an average post-training score of 94%, up from 84% pre-training (p<0.0001). Pass rates for facility staff during the CA were 67% (TB-ZN), 65% (RTRI), 53% (HIV-RDT), 58% (BMPs), 35% (stool analysis), and 33% (CD4 Visitect). The overall average performance score increased from 65% to 79% after training (p<0.0001). The best-performed testing areas were documentation (82%), sample collection (80%), biosafety and work area management (80%), sample accession (79%) and patient preparation (78%), while the poorest-performed areas were sample testing and results interpretation (72%), sample storage (75%), and written evaluations (76%).

Conclusions: A new district-based laboratory CA system in Mubende Region demonstrated suboptimal competency in conducting laboratory tests even after training. Regular supervision is needed to improve performance for specific tests and competency areas.

Evaluation of the HIV Early Infant Diagnosis and Viral Load Laboratory Hub Logistics Management in Uganda

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Background: HIV early infant diagnosis (EID) and viral load (VL) laboratory logistics include sample collection, transportation, and point-of-care testing materials for HIV diagnosis and VL monitoring. Central Public Health Laboratories (CPHL) in Uganda distributes laboratory logistics to requesting health facilities nationwide via a hub system. To hasten processing, CPHL recommended transition from manual to electronic ordering of laboratory logistics via the electronic inventory management system (eIMS). We evaluated eIMS utilization and lead time (time from ordering to receiving logistics, targeted at <1 week) for HIV EID/VL laboratory logistics in Uganda.

Methods: We sent an online questionnaire to all 100 hub coordinators to collect quantitative data on utilization of eIMS; HIV EID/VL laboratory logistics lead time, and challenges with laboratory logistics management. We conducted key informant interviews (KIIs) with four CPHL logistics officers to identify challenges experienced with laboratory logistics management. Data were analysed in Excel and thematically.

Results: Fifty-three (53%) hub coordinators completed questionnaires. Of these, 42 (79%) reported using eIMS for ordering, while 11 (21%) used other platforms. Forty-four (83%) reported a lead time of <1 week, five (9%) a lead time of ≥1 but <2 weeks, and four (8%) a lead time of ≥2 weeks. During June-December 2022, 34 (64%) experienced HIV EID/VL logistics stockouts, 22 (42%) experienced delays in responding to online orders by CPHL, and 10 (19%) received near-expired supplies. KIIs revealed stockouts of HIV EID/VL logistics at CPHL stores, understaffing leading to delays in processing orders, and delayed delivery by manufacturers as the major factors contributing to stockouts at hubs.

Conclusion: Of the hubs that participated, the majority order through eIMS and receive supplies in time. However, some challenges still exist in the use of eIMS, response time by CPHL, and delay in approval of orders from vendors. Addressing these gaps may reduce stockouts and improve timely logistics delivery to hubs.

Key words: HIV EID/VL, laboratory logistics management, Hub System, Uganda

Strengthening HIV Test Kit Inventory Management at an HIV Testing Laboratory, Kampala, 2023

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Background: Effective management of HIV test kit inventory is crucial for successful HIV testing programs. A laboratory in Kampala, Uganda conducts approximately 160,000 HIV tests annually using nine different platforms i.e. 3 HIV rapid test kits, Abbott RealTime HIV-1 viral load kits, COBAS® TaqMan® HIV-1 viral load and DNA Test kits, Elecsys HIV Combi test kits and the Geenius HIV 1/2 test kits but is challenged by frequent kit stockouts. A May 2021 survey of clinicians ordering HIV tests at the laboratory showed that 61% were dissatisfied with the turnaround time. We conducted a quality improvement project to strengthen HIV test kit inventory management in the laboratory.

Methods: We reviewed laboratory stock card records, HIV test kit orders, and kit supply forms from January 2022 to February 2023, interviewed inventory management staff to identify inventory-related challenges, and analyzed data thematically. We engaged laboratory leadership and staff to design quality improvement strategies and compared HIV test kit inventory data in February and May 2023. We developed and documented a standardized re-order system, implemented a real-time inventory tracking tool, and assigned staff to monitor stock in May 2023.

Results: From assessment of the system, the laboratory used a manual inventory management system without a defined algorithm for monitoring resupply needs and re-ordering. Data accuracy of stock cards improved from 78% to 90% from February to May 2023. In February 2023, only six of nine HIV test kits were available, each with only one month's stock, compared to all nine kits available with three months' supply in May 2023. The laboratory adopted a performance indicator to monitor HIV test stockouts.

Conclusion: A quality improvement approach engaging laboratory leadership improved inventory management in the short term. Continuous monitoring would facilitate sustainable inventory management.

Key words: HIV-test kits, Inventory Management, stock

Evaluation of time from sample collection at health facilities in Kigezi Region to receipt at Central Public Health Laboratory, Uganda from February to May 2023

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Background: In 2011, Uganda established a national laboratory sample transport, referral, and results network. Using a hub-and-spoke model, HIV viral load (VL) samples collected at 'spoke' facilities and transported through a 'hub' are expected to be received by Central Public Health Laboratory (CPHL) within ≤7 days (≤2 days from collection to pick-up, ≤4 days to delivery, ≤1 day to receipt). However, in Kigezi Region, during October–December 2022, the mean total time was 11 days. We evaluated the VL sample transport process in the Kigezi Region from collection to receipt at CPHL.

Methods: We abstracted data from the CPHL sample tracking database (April–May 2023) on the date of VL sample collection, pick-up, delivery, and receipt at CPHL for the four hubs serving all six districts in Kigezi Region. We calculated mean days between respective time points. We brainstormed and held key informant interviews with CPHL management and Kigezi regional stakeholders to identify factors leading to delays in sample receipt. Thereafter we carried out a root cause analysis.

Findings: Data were available for 6593 samples received during April–May 2023. The mean total turnaround time was 12 days, including 7 days from sample collection to pick-up by transporters, 2 days from pick-up to delivery at CPHL, and 3 days from sample delivery to sample receipt by CPHL. Factors identified as possible causes of delays included non-adherence to route schedules and delays in sample packaging for shipment.

Conclusion: Total turnaround was almost double the 7-day benchmark, and sample collection to pick up represented the longest delays in VL sample receipt at a central lab in Uganda. Future studies could evaluate the impact of efforts to improve adherence to route schedules and rapid sample packaging to address this issue.

Keywords: Turnaround time, Viral Load, Uganda

Evaluation of turnaround time for yellow fever testing in Uganda from Jan 2022 to Mar 2023

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Background: Control of yellow fever (YF) outbreaks relies on early detection and response, which requires short laboratory turnaround time (TAT). YF is endemic in Uganda; surveillance is conducted at sentinel health facilities in high-risk areas. TAT targets are defined for three phases: pre-analytic (target ≤7 days), analytic and post-analytic (target ≤5 days). We evaluated the TAT for YF testing and factors affecting TAT in Uganda.

Methods: Median and range TAT was calculated from the national FY database, January 2022-March 2023. We conducted key informant interviews (KII) with staff involved in YF surveillance in March 2023 to assess factors affecting TAT and strategies to improve TAT.

Results: Among 1,274 entries evaluated, 25 (2.0%) were positive, and 1,249 (98%) were negative. In the pre-analytic phase, all samples had TAT >7 days (median=30 days, range 10-64). In the analytic and post-analytic phases, 15 (60%) positive samples had TAT >21 days (median=29 days, range 13-50), while 10 (40%) were within the target TAT. All negative samples had TAT ≤7 days (median=7 days, range 3-7) in the analytic and post-analytic phases. Among 20 KII, 18 persons reported delayed sample delivery from sentinel sites to UVRI due to inconsistent sample pick-ups.

Conclusion: The highest TAT was observed in the pre-analytic phase and affected all samples; due to delayed sample transport. We recommend alternative means of sample transportation aimed at ≤7 days TAT and improvement of TAT in the analytical phase by optimizing the YF confirmatory assay.

Keywords: Yellow fever, Turnaround time, Uganda, Laboratory

Breakout Session 2: Malaria, Nile Hall

Burden of malaria, pneumonia, and diarrhea among children under five years in iCCM implementing and non-implementing districts in Uganda, 2017-2022

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Introduction: Malaria, pneumonia, and diarrhea are leading causes of child morbidity and mortality globally. In 2004, Uganda adopted the integrated Community Case Management (iCCM) strategy for childhood illness to improve access to treatment for the 3 diseases in areas with few health facilities. Evaluation of this strategy in Uganda is still limited. We compared the incidence and case-fatality rates (CFR) for malaria, pneumonia, and diarrhea among children under five years in iCCM-implementing and non-implementing districts in Uganda during 2017–2022.

Methods: We conducted a descriptive analysis of monthly national surveillance data on malaria, pneumonia, and diarrhea among children under 5 years from 2017–2022. Data for cases and deaths were abstracted from the monthly outpatient and inpatient reports respectively from the District Health Information System (DHIS2). We abstracted data on age, sex, health facility level, and district. We compared incidence and CFR among iCCM-implementing and non-implementing districts using the t-test.

Results: Overall, there were no significant differences in the incidence and CFR of malaria, pneumonia and diarrhoea between ICCM-implementing and non-implementing districts. However, there were significant decreases in diarrhoea incidence and pneumonia CFR in both iCCM and non iCCM implementing districts during 2017–2022 (p=0.024). Districts that had implemented iCCM for <2 years had a lower malaria incidence compared to those that had implemented iCCM for a longer period (p=0.039).

Conclusion: Generally, iCCM implementation neither influenced incidence nor CFR of malaria, pneumonia, and diarrhoea among children <5 years during 2017–2022. We recommend further studies to identify factors contributing to the sustained burden of malaria, pneumonia, and diarrhoea in iCCM-implementing districts despite the intervention.

Keywords: iCCM, Malaria, pneumonia, diarrhoea, under-fives, Uganda

Increasing stockouts of critical malaria commodities in public health facilities in Uganda, 2017-2022

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Background: Consistent access to malaria treatment commodities at health facilities is necessary to address malaria morbidity and mortality. In Uganda, there needs to be documentation of the trends of stockouts of these commodities. We described the trends and spatial distribution of stockouts of malaria diagnostic and treatment commodities in Uganda, 2017-2022.

Methods: We analyzed monthly artemisinin combination therapy (ACT) and rapid diagnostic test (RDT) stock data from the District Health Information System (DHIS2) for public facilities at the general hospital level and below during 2017-2022. A facility was considered stocked out in a month if it reported ≥1 day of stockout of a commodity during that month. We calculated the proportion of facilities stocked out of ACT and RDTs per month and evaluated ACT stockouts by health facility type. We used the seasonal Mann-Kendall test and Sen's slope estimator to evaluate trends. Districts were considered stocked out for a commodity in a year if the average monthly health facility stockout proportions were >10% in that year.

Results: Among an average of 2,210 facilities reporting per month (range, 1,341-2,791), most (56%) were Health Centre IIs. There were seasonal peaks in stockouts of ACTs and RDTs, with small peaks in December through February and sharp peaks in June through September. At the national level, we observed a significant increase in the monthly ACT (S=474, p<0.001; Sen's slope=+0.59) and RDT (S=444, p<0.001; Sen's slope=+0.616) stockouts over the study period. Monthly ACT stockouts increased significantly across all facility levels, with Health Centre IIs having the largest increase (S=472, p<0.001; Sen's slope=+0.697) while general hospitals reported the smallest increase (S=198, p=0.026; Sen's slope=+0.201). Among 136 districts, the number of districts experiencing ACT stockouts increased steadily, from 5 in 2017 to 85 in 2022.

Conclusion: Malaria diagnosis and treatment commodity stockouts increased from 2017-2022 across Uganda. Reasons for this increasing trend should be explored and addressed to improve access to essential malaria treatment commodities.

Keywords: Malaria, stockout, District Health Information System, Uganda

Trends and Distribution of Severe Malaria Cases, Uganda, 2017-2021: A Descriptive Analysis of the Health Management Information System Data

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Background
Malaria remains the largest contributor to morbidity and mortality among children <5 years in Uganda. We evaluated the trends and distribution of severe malaria from 2017 through 2021 to inform progress on current interventions to reduce malaria morbidity and mortality in the country.

Methods
We used secondary data from monthly malaria surveillance reports from the District Health Information System (DHIS2) for 2017-2021. Severe malaria was defined as any admission with confirmed malaria (by microscopy or rapid diagnostic test). We calculated the proportions of malaria cases that progressed to severe malaria for each year using severe malaria cases as the numerator and total outpatient malaria cases as the denominator. We used Mann Kendall test for trend analysis to determine the trends and significance was considered at $p<0.05$).

Results
Overall, 2,957,672 severe malaria cases were reported; severe malaria cases as a proportion of all malaria cases decreased by 10% annually from 7.0% in 2017 to 5.0% in 2021 (ktau=-0.89; p-value=0.07). The proportion among children <5 years reduced from 13% in 2017 to 10% in 2021 while that for >5 years reduced from 4.4% to 3.5% (ktau=-0.08; p-value=0.09). The proportion for females reduced from 6.1% in 2017 to 4.6% in 2021 while males reduced from 7.2% in 2017 to 6.0% in 2021 (ktau=-0.08; p-value=0.09). Among the 15 regions, Karamoja and Tooro regions had a significant reducing trend in severe malaria cases over the years (ktau=-0.95; p-value=0.04). North central and Bukedi regions registered no trend (ktau=0.0; p=1), all other regions registered non-significant reductions just like the national picture. At health facility level, regional referral hospitals (ktau=0.06; p-value = 0.22) and private clinics (ktau=0.2; p-value = 0.81) had a non-significant increase while all other health facility levels had non-significant reductions. Both private and public health facilities (ktau=0.4; p-value = 0.46) had non-significant increases.

Conclusion
The proportion of severe malaria cases nationally declined slightly over the review period suggesting slight progress in the control and management of uncomplicated malaria. However, Karamoja and Tooro regions experienced significant decreases. Strengthening efforts to improve management of uncomplicated malaria in the whole country could reduce the incidence of severe malaria in Uganda.

Keywords: Severe malaria, proportions, Uganda

Factors associated with Black Water Fever among children with severe malaria in Kakumiro District, Western Uganda, February- August 2022

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Background: Blackwater fever (BWF) is an unusual complication of malaria causing fever, hemolysis, anemia, and tea-colored urine; untreated, it can be fatal. Previous studies have suggested possible associations with quinine or other antimalarial treatments in some children, but the etiology is unproven. On August 12, 2022, the Uganda Ministry of Health received an alert of a "strange disease" in Kakumiro District, Western Uganda. The "strange disease" reportedly manifested as tea-colored urine, severe anemia, fever, and death in children with malaria. We investigated to identify the strange disease and associated factors.

Methods: BWF case-patients were defined as children with severe malaria who passed tea-colored urine (graded by Hillmen urine color chart >5) during February-August 2022. We generated a line list and conducted an unmatched case-control study in the subcounty with the highest attack rates (Nkooko Subcounty). Controls were conveniently selected neighbor children with severe malaria (1:1 ratio) who had never passed tea-colored urine. A standardized questionnaire about malaria treatment was used to interview primary caretakers of case-patients and controls. We conducted regression with a common reference group to identify factors associated with BWF.

Results: We enrolled 102 case-patients (mean age=10 years; 44% female) and 139 controls (mean age=6 years; 50% female). Risk factors had an additive effect. Compared with 'low-risk' children [children who always completed malaria treatment, did not have quinine treatment stored at home, and who did not take combinations of ≥ 2 antimalarials], the odds of BWF were elevated among children who never completed treatment and took combinations of antimalarials (OR=2.7, 95%CI 1.1-6.5), who had oral quinine at home and took combinations of antimalarials (OR=4.8, 95%CI 1.1-21), who never completed malaria treatment and had oral quinine at home (OR=13, 95%CI 1.3-131), and who had all three risk factors (never completed treatment, had oral quinine at home, and took combinations of antimalarials) (OR=19, 95%CI 2.1-183).

Conclusion: Inappropriate treatment of malaria was associated with BWF in Kakumiro district. Investigations into drug-resistant malaria may be warranted. Educating parents about the risks of self-medication (especially quinine) and encouraging them to support their children's full treatment course may reduce BWF in Kakumiro District.

Keywords: Blackwater fever, severe malaria, children

Descriptive Analysis of Antenatal Care Attendance and Intermittent Preventive Treatment Utilization among Pregnant Women in Uganda, 2017-2022

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Background: In Uganda, despite significant progress in antenatal care (ANC) attendance, the extent of intermittent preventive ttreatment of malaria in pregnancy with sulfadoxine-pyrimethamine (IPTp-SP) utilization remains unknown. The Ministry of Health (MoH) Uganda recommends ≥4 ANC visits for every pregnant woman (ANC1, 2, 3, and 4) and three IPTp-SP doses, including one during each pregnancy trimester (IPTp-SP1, 2 and 3). IPTp-SP3 utilization is used to estimate completion of the full dose during ANC, with a national target of 85%. We determined the trends in IPTp-SP3 utilization among ANC attendees and its relationship with malaria cases among pregnant women (malaria in pregnancy [MIP]) during 2017–2022.

Methods: We analyzed data on IPTp-SP3 utilization, antenatal care (ANC) attendance, and MIP from the District Health Information System 2 (DHIS2) from 2017–2022. We extracted data on IPTp-SP3, ANC attendance (ANC1 and 4) and MIP. We calculated the national, regional, and district IPTp-SP3 utilization as the proportion of pregnant women (number who had attended ANC1) who received IPTp-SP3 during 2017–2022. MIP percentage was calculated as proportion of pregnant women with malaria. The Mann-Kendall test was used to evaluate significance of linear trends.

Results: During 2022, IPTp-SP3 utilization by ANC attendees was 52%, an increase from 2.5% in 2017. The regions with a decreasing trend in IPTp-SP3 utilization during the period 2017–2022 were Acholi (-35%), South Buganda (-33%), Karamoja (-19%) and Bukedi region (-13%). Ankole region (+27%) had an increasing trend in IPTp-SP3 utilization during the period 2017–2022. MIP prevalence was highest in 2017 (16%) and 2018 (14%), a period when IPT-SP3 utilization was lowest (2.5% in 2017 and 19% in 2018).

Conclusions: There was suboptimal IPT-SP3 utilization in Uganda from 2017–2022, with the target >85% utilization not achieved. Additionally, declining trends in IPTp-SP3 utilization in the regions of Acholi, South Buganda, Karamoja and Bukedi may result to increase in malaria in pregnancy situation in the regions. Further investigation into reasons for low uptake of IPTp-SP3 among pregnant mothers in Uganda, particularly in regions with declining IPTp-SP3 utilization could provide insights to help improve uptake.

Keywords: Intermittent Preventive Treatment of malaria in in pregnancy using Sulfadoxine Pyrimethamine (IPTp-SP), Antenatal care

HIV yield from assisted partner notification (APN) in Uganda: 2020-2022

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Background: HIV testing services (HTS) are crucial to achieving the 2025 UNAIDS global 95-95-95 targets. In Uganda in 2020, only 81% of persons living with HIV (PLHIV) knew their status, falling short of the first 95%. Assisted partner notification (APN), a targeted HIV testing method introduced in 2017, aims to identify PLHIV with unknown status using minimal resources by interviewing known HIV-infected persons about sexual partners and confidentially offering HTS to partners. The expected HIV yield is 15-25%. We examined trends and distribution of HIV testing yield among partners aged ≥15 years in Uganda during 2020-2022.

Methods: We analyzed facility-based HTS data in the District Health Information System 2. We downloaded 6-month data for APN partners elicited, notified, tested for HIV, and linked to HIV care during January 2020-December 2022. The HIV-positive yield was calculated as the proportion of all partners tested (denominator) that tested HIV-positive (numerator). Mann-Kendall test to evaluate the presence of HIV yield trend across all 15 health regions in Uganda.

Results: Among 461,274 partners identified, 411,294 (89%) were notified; 331,622 (81%) of these were tested for HIV, and 71,518 (22%) tested positive. The overall yield was higher among females (23%) than male partners (20%) (p<0.001). The overall yield was similar across the study period (p=0.45). More than 75% of the regions had a yield above 15% across the study period. The West Nile region consistently had the lowest yield of <14%.

Conclusion: APN identified PLHIV more efficiently than routine HTS [>1 in 5 persons tested vs <1 in 30 persons tested]. However, 10% of the partners who were elicited were not notified and >25% of the partners notified were not tested. Intensifying APN across the country by enhancing proportion of partners notified and tested could facilitate identification of PLHIV. Further, there need to investigate individual factors that influence the uptake of APN.

Keywords: Uganda, assisted partner notification, HIV

Adherence to the early infant diagnosis algorithm and associated factors among HIV-exposed infants in Uganda, 2017–2019

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Background: Early infant diagnosis (EID) facilitates early initiation into HIV care and treatment for identified HIV-positive infants. According to the Uganda Ministry of Health (MOH) EID testing algorithm, HIV-exposed infant (HEI) testing should occur at <6 weeks, 9 and 18 months of age, and 6 weeks after stopping breastfeeding. Uganda has faced challenges with loss to follow-up (LTFU) for EID. We assessed adherence to the EID algorithm for HEI and associated factors.

Methods: We analysed data from the 'Impact of the National Program for Prevention of Mother-to-Child Transmission of HIV in Uganda (2017−2019)' study. HIV-positive mothers and their infants enrolled in a prospective cohort (2017−2018) were followed until the HEI tested positive, died, was LTFU, or reached 18 months of age. We calculated the mean number of HIV tests per child and adherence to the EID algorithm (having HIV tests at all four appropriate time points, using 15 months of age as a proxy for 6 weeks after cessation of breastfeeding). We evaluated factors associated with adherence using modified Poisson regression.

Results: Among 1,804 HEI, 912 (51%) were male. A mean of 4 (SD ±1.4) HIV tests was done per HEI. At baseline, 1,605 (89%) were HIV-negative, 37 (2%) were HIV-positive, and 162 (9%) had indeterminate or missing results. Among baseline-negative HEI, 1,212 (76%) remained negative at 9 months, 1 (0.06%) tested positive, 18 (1%) died, and 374 (23%) did not test. Of those negative at 9 months, 1,066 (88%) remained negative at 15 months, 2 (0.2%) tested positive, 4 (0.3%) died, and 140 (12%) did not test. Of those negative at 15 months, 793 (74%) were negative at 18 months, 5 (0.5%) died, and 268 (25%) did not test. Overall, 255 (14%) were tested only at baseline. Overall adherence to the complete EID algorithm timeframe was 46% (833/1,804). Lack of perceived stigma (RR=1.25, 95%CI: 1.03-1.50), each additional pregnancy (RR=1.04, 95%CI:1.01-1.06), and reporting ever experiencing sexual violence (RR=1.31, 95%CI: 1.14-1.49) were associated with adherence.

Conclusion: Most HEI received the recommended four HIV tests; however, many were outside the recommended time points. Interventions to address stigma may improve adherence to the EID algorithm. Investigations are needed to explore associations between sexual violence, parity, and adherence to the EID algorithm.

Keywords: Early infant diagnosis, HIV-exposed infants, PMTCT, Uganda

Trends and spatial distribution of Tuberculosis Preventive Therapy uptake and completion among HIV patients on Antiretroviral Therapy in Uganda, 2020 - 2023

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Background: Since 2015, Uganda adopted the WHO recommendations and guidelines for Tuberculosis (TB) prevention among PLHIV and has implemented several initiatives to scale up TB preventive therapy including the integration of TB Preventive Therapy (TPT) into HIV care services. WHO targets a 90% initiation rate and a 90% completion rate for TPT among people on ART. However, data on trends and distribution of TPT uptake and completion among People on Antiretroviral Therapy (ART) in Uganda remains suboptimal to inform program implementation. We conducted a study to describe the trends and spatial distribution of TPT uptake and completion among PLHIV in Uganda from 2020 to 2023.

Methods: We analyzed national and subnational aggregated data on TPT among people on ART as reported through DHIS2 from 2020 to 2023 was extracted and analysed. We calculated rates of TPT eligibility, initiation, and completion. Reasons for failure to complete TPT were categorized as a loss to follow-up, TB diagnosis, and death while on TPT. We analyzed trends using Mann Kendall and described spatial distribution by region.

Results: By June 2023, a cumulative total of 1,330,693 ART clients had been eligible for TPT of which, 1,157,703 (87%) had been initiated on TPT. Both uptake and completion rates between 2020 and 2023 with p = 0.004 and p=0.02, respectively. Of the 79,106 ART clients who did not complete their TPT regimen, 29,435 (37%) were lost to follow-up, 2,356 (3%) died and 1,589 (2%) were diagnosed with TB while on TPT. Overall, the loss to follow-up decreased at an average of 23% per semi-annual period from 43% in 2020 to 33% in 2023, remaining highest in the Mid-Eastern region, however, the decrease was not statistically significant at p=0.2296.

Conclusion: Uganda has achieved high levels of TPT uptake and high completion rates among PLHIV considering the WHO targets. The Ministry of Health should however explore factors associated with TPT loss to follow-up in this subpopulation for better program performance.

Keywords: TPT, ART patients, loss to follow-up, Uganda

PrEP Uptake among Adolescent Girls and Young Women in Uganda, 2017 – 2022

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Background: Adolescent Girls and Young Women (AGYW) are disproportionately affected by HIV. Pre-Exposure Prophylaxis (PrEP) is an evidence-based HIV prevention intervention for persons at high risk of acquiring HIV, including AGYW. Among 146 districts implementing PrEP in Uganda, 23 (16%) are also implementing the Determined, Resilient, Empowered, AIDS-free, Mentored and Safe (DREAMS) programs. The goal of DREAMS is to reduce HIV incidence in AGYW through youth-friendly sexual services, socio-economic strengthening, and addressing harmful gender norms. Oral PrEP uptake by AGYW has not been evaluated. In this study we describe oral PrEP uptake by AGYW in Uganda from 2017−2022.

Methods: We conducted a retrospective analysis of nationwide PrEP data among AGYW reported through the PrEP tracker, an electronic Ministry of Health (MoH) data collection tool. We abstracted data on HIV testing and the PrEP cascade (screening, eligibility, and uptake). We summarized the data as frequencies and proportions and stratified by year of initiation, health sub-region, 'DREAMS' and 'non-DREAMS' implementing districts.

Results: Overall, 37,896 observations of AGYW were obtained; 22,860 (60.3%) were from the 23 DREAMS districts. All AGYW were tested for HIV and 37,840 (99.9%) were HIV-negative, of whom 37,080 (97.9%) were screened for PrEP eligibility; 36,970 (99.7%) of those screened were eligible for PrEP. Of those eligible, 36,893 (97.4%) were initiated on PrEP and the initiation was highest in south central sub-region 9445 (26%). Of those initiated, 21,919 (59.4%) were aged 20-24 years. PrEP Uptake among AGYW in DREAMS-implementing (98%) and non-DREAMS-implementing districts (97%) was similar. Uptake was highest in 2022.

Conclusion: Overall, PrEP uptake among AGYW was high among AGYW screened and found to be eligible. Despite DREAMS-implementing districts comprising only 16% of all districts, most AGYW screened were from DREAMS-implementing districts. Scaling up interventions to improve screening in the non-DREAMS districts could help optimize PrEP screening and uptake.

Key words: PrEP, Adolescent Girls and Young Women, Uganda

Description of tuberculosis contact follow-up across the care cascade in four selected regional referral hospitals, Uganda, 2022

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Introduction: In 2022, Uganda's tuberculosis (TB) incidence was 200/100,000 population; higher than World Health Organization END-TB target to10/100,000 population by 2035. Contact tracing facilitates early diagnosis and treatment, reducing severity of disease and breaks the transmission cycle thereby reducing incidence. We evaluated the TB contact follow-up cascade in selected regional referral hospitals during 2022.

Methods: We reviewed and abstracted data from unit and contact tracing registers to identify pulmonary bacteriologically confirmed (PBC) TB cases and their contacts at four regional referral hospitals. We calculated proportions of PBC-TB cases whose contacts were listed, contacts screened for TB, presumptive cases among contacts, presumptive contacts tested for TB using genexpert and their result, TB positive contacts initiated on treatment, TB contacts below 5 years initiated on TB preventive therapy (TPT), contacts with HIV who were initiated on TPT and treatment outcome.

Results: We identified 491 index TB cases of whom 231(47%) had their contacts (1,215) listed for follow-up. Median age of the contacts was 18 years (range: 0-98), 14% of whom were <5 years. Fifty-four percent were female. The majority (97%) of the contacts were household members to index cases. Of the contacts, 1,067 (88%) were screened of whom 222 (21%) were presumed for TB. Of those presumed, 98% were tested for TB; 10% tested positive. Of those who tested positive, 91% were initiated on treatment with 37% declared cured while 63% were still on treatment at the time of data collection. Only 1% of the contacts were HIV positive. None of the TB contacts below five years or HIV positive were initiated on TPT.

Conclusion: The TB care cascade was successful overall. Missing data on contacts could have resulted in an under-estimation of contact follow-up rate. While the majority of the national targets were achieved, contact listing and initiation of eligible clients on TPT was unmet.

Key words: TB, contact tracing, follow up

Breakout Session 3: Vaccine Preventable Diseases, Katonga Hall

Factors associated with severe pneumonia among children <5 years in Kasese District, Uganda, 2023: a hospital-based case-control study

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Background: Analysis of 2013-2022 data for children <5 years from the District Health Information System (DHIS-2) indicated a high incidence of severe pneumonia in Kasese District. We investigated risk factors associated with severe pneumonia among children <5 years in Kasese District to inform prevention and control strategies.

Methods: We conducted a 1:1 case-control study among children aged 2-59 months presenting with pneumonia at five high-volume facilities in Kasese District from January to April 2023. A case-person was defined as pneumonia with ≥1 of the following danger signs: low oxygen saturation, central cyanosis, severe respiratory distress, feeding difficulties, altered consciousness, and convulsions. Controls were outpatient children aged 2-59 months with a diagnosis of non-severe pneumonia. Controls were selected from those registered after a case at the same facility. We reviewed medical records at facilities and used an interviewer-administered questionnaire with caregivers in their homes to obtain information on clinical and non-clinical characteristics. Logistic regression was used to identify risk factors for severe pneumonia.

Results: The 199 cases and 174 controls enrolled were similar by age and sex. The odds of severe pneumonia were higher among children with diarrhea only (adjusted odds ratio [aOR]=2.9, 95%CI: 1.7-4.9), or malaria and diarrhea (aOR=3.4, 95%CI: 2.0-5.9), than those without a co-existing illness at the time of pneumonia diagnosis. Not being exclusively breastfed for ≥6 months (aOR=2.0, 95%CI: 1.1-3.3) and exposure to indoor air pollution from cooking combustion sources (aOR=2.9, 95%CI: 1.8-4.7) increased odds of severe pneumonia.

Conclusion: The findings highlight the significance of multimorbidity, absence of exclusive breastfeeding, and exposure to indoor air pollution in the development of severe pneumonia. Promoting exclusive breastfeeding for ≥6 months and advocating for the use of clean energy sources, such as clean energy stoves, could mitigate morbidity and mortality attributable to severe pneumonia in the region.

Keywords: Severe Pneumonia, children <5 years, Uganda.

Trends of routine immunization and incidence of vaccine-preventable diseases among infants, Uganda, 1980–2020

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Introduction Uganda has implemented several interventions to improve vaccination coverage, including community outreach programs and mobile vaccination clinics. We described the coverage of routine immunization and the corresponding incidence of vaccine-preventable diseases (VPDs) among infants in Uganda, 1980─2020.

Method: We analysed data on five antigens for immunization and VPDs among children aged $\leq$1 year from 1980─2020 in Uganda. Antigens considered were those being given by 1980. We extracted data from paper forms (pre-2012) and electronic District Health Information Software for women aged 15–49 years who received at least two doses of tetanus-toxoid (TT2) and infants aged 0-12 months who received routine immunizations and had new VPDs. We calculated the annual vaccine coverage (proportion of the target population that has received the last recommended dose for each vaccine) and the annual incidence of VPDs among infants. We used the seasonal Mann-Kendall (MK) test and Sen's slope estimator to evaluate the trends.

Result: Immunization coverage for any of the five antigens increased annually from 1980-2020. Coverage of Bacille-Calmette-Guerin (BCG) vaccine increased from 18% to 91% (p<0.001); diphtheria-tetanus (DPT)1 from 29% to 94% (p<0.001), DPT3 from 9% to 89% (p<0.001), measles from 18% to 91% (p<0.001), polio vaccine from 18% to 91% (p<0.001), and TT2 among pregnant women from 20% to 65% (p<0.001). From 1980 to 2020, diphtheria cases decreased from 40/100,000 to no cases (p=0.071); pertussis reduced from 2,398/100,000 to no cases (p=0.057); measles cases reduced from 18,241/10,000 to 323/100,000 (p=0.002); polio cases reduced from 56/100,000 to no cases (p<0.001). Among neonates, tetanus cases increased from 56/100,000 in1986 to 140/100,000 in 2020 (p<0.001).

Conclusion: Uganda made significant progress in immunization coverage and VPD reduction between 1980 to 2020. However, an increase in incidence of tetanus among neonates underscores the need for targeted interventions in this age group. Ongoing surveillance and interventions are vital for sustaining progress and preventing VPD outbreaks.

Keywords: Routine Immunization, Vaccine Preventable Diseases, Infants, Coverage

Rotavirus outbreak linked to poor hygiene practices at a babies' home in Mpigi District, Uganda, August 2023

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Background: In Uganda, the rotavirus vaccine for children under ≤5 years was introduced in 2018. By 2022, rotavirus as a cause of acute diarrhea among children had decreased from 40% to 14%. On August 10, 2023, the Uganda Ministry of Health was notified of a suspected rotavirus disease outbreak at a babies' home in Mpigi District. We investigated to determine the magnitude and identify possible exposures associated with the outbreak.

Methods: We defined a suspected case as acute onset of watery diarrhea plus ≥1 of the following: vomiting, fever, lethargy, and loss of appetite in a child or adult at the babies' home from July 27─August 20, 2023. A probable case was a positive rotavirus Rapid Diagnostic Test (RDT) result. A confirmed case was a suspected or probable case with a positive ELISA test for rotavirus A. We identified cases by reviewing health records and conducting mass RDT testing. We conducted descriptive epidemiology, staff interviews, and an environmental assessment to determine possible sources of exposure.

Results: Among the 44 children and 59 adults at the home, we line-listed 23 case-patients (21 children and 2 adults). Of these, 6 were confirmed, 13 were probable (1 death), and 4 were suspect. Symptom onsets ranged from August 3─17, 2023. Twenty (87%) case-patients were fully vaccinated against rotavirus. Attack rates were highest in children aged 7-12 months (83%). The environmental assessment indicated poor hand hygiene practices among the caregivers. Among 23 staff interviewed, four (17%) reported washing their hands-on arrival at the facility; one (4%) reported washing hands after washing potties, and 17 (74%) reported washing hands after changing diapers.

Conclusion: The outbreak was caused by rotavirus, with spread likely facilitated by poor hygiene practices. We instituted infection prevention and control measures and decontaminated the babies' home. We recommended further investigation into the effectiveness of the rotavirus vaccine.

Key words: Rotavirus, Outbreak, Babies' Home, Uganda

Measles outbreak investigation in Bundibugyo District, Western Uganda, February–June 2023

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Background: Measles is the most common cause of outbreaks in Uganda. On April 28, 2023, the Ministry of Health was notified of a measles outbreak in Bundibugyo District, Western Uganda. We investigated to determine the scope of the outbreak, assess risk factors for transmission, evaluate vaccine effectiveness (VE), and recommend control measures.

Methods: A suspected measles case was onset of fever and maculopapular rash, plus ≥1 of: cough, runny nose, or conjunctivitis in a Bundibugyo District resident from February 1 to June 8, 2023. We defined a confirmed case as a suspected case with positive measles-specific IgM. We reviewed medical records and conducted active case-finding in communities to identify case-patients. We conducted a case-control study at a ratio of 1:2 cases to controls, matched by age and village of residence. We estimated vaccine coverage using the percentage of vaccinated persons among eligible controls. We identified risk factors using conditional logistic regression, and calculated VE as VE= 1-OR$_{MH}$, where OR$_{MH}$ is the Mantel-Haenszel odds ratios associated with having received ≥1 dose of measles vaccine.

Results: We identified 234 case-patients; 14 (6%) were confirmed and 4 (2%) died. Children aged 7-11 months were the most affected (attack rate [AR]=134/10,000), followed by 0-6 months (AR=44/10,000). Tokwe (AR=18/10,000) and Bundibugyo (AR=19/10,000) were the most affected sub-counties. Being unvaccinated for measles (aOR=6.1, 95%CI: 2.5–15) and visiting a health facility with symptomatic case-patients 7-21 days before rash onset (aOR=3.7, 95%CI: 1.0–13) increased odds of infection. Overall, measles vaccination coverage was 86% (95%CI 79-92); VE was 87% (95%CI: 69–94%).

Conclusions: The measles outbreak was facilitated by suboptimal vaccine coverage and effectiveness. A mass measles vaccination campaign targeting children <5 years in affected sub-counties, and proper triaging and isolation of patients with signs and symptoms of measles could help prevent future outbreaks in this area.

Keywords: Measles, Vaccine effectiveness, Vaccine coverage, Disease outbreak, Uganda

Measles outbreak associated with illegal entry and exit of refugees in the settlement of Kiryandongo District, Uganda, October 2023

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Background: Measles is a highly infectious viral disease that mostly affects children. On August 28, 2023, Ministry of Health (MoH) was notified of an outbreak of measles in Kiryandongo District, Western Uganda. Kiryandongo District is a refugee-hosting district with approximately 60,000 refugees. We investigated to determine the scope of the outbreak, factors associated, vaccine effectiveness and coverage, and recommend evidence-based interventions.

Method: We defined a probable case as onset of fever (lasting ≥3 days) and maculopapular rash with ≥1 of: cough, coryza or conjunctivitis in a resident of Kiryandongo District from July 1–October 25, 2023. A confirmed case was a probable case with positive measles-specific IgM (+) not explained by vaccination in the past 8 weeks. Cases were identified through medical records review and active case search. We conducted a descriptive analysis and an unmatched case-control study (1:2) to evaluate risk factors for transmission during the case-person's exposure period (7–21 days prior to rash onset). We estimated vaccine effectiveness (VE) as VE≈100 (1-OR$_{protective}$), using the odds ratio associated with having received ≥1 dose of measles vaccine. We calculated vaccination coverage using the percent of eligible controls vaccinated. We also carried out in-depth key informant interviews (KII) with camp staff.

Results: We identified 50 cases (14 confirmed) with an overall attack rate (AR) of 11/100,000 population. The AR was higher among the refugees than among nationals (42 vs 6/100,000). Children <12 months (AR=58/100,000) were the most affected age group. Being vaccinated (AOR=0.13, 95%CI: 0.06-0.31) and playing around a water collection point (AOR=3.2, 95%CI: 1.4-6.9) were associated with infection. Vaccination coverage was 87% among refugees and 85% among nationals; VE was 87% (95% CI=69-94) for both groups. KIIs revealed unrestricted movement of unregistered refugees visiting their relatives in and out of the camp.

Conclusion: The measles outbreak was associated with suboptimal vaccination coverage and unrestricted movement of persons into and out of the settlement camp. Increased screening of persons entering the camp and strengthened immunization programs could avert a similar situation in the future.

Keywords: Measles, outbreak, vaccine effectiveness, refugee.

Effect of ambient air pollution during pregnancy on preterm births in Kampala City, Uganda, October 2021–September 2022.

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Introduction: Fine particulate matter ($PM_{2.5}$) is a health-damaging air pollutant. $PM_{2.5}$ levels >15 µg/m^3 are associated with adverse health effects. Gestational exposure to $PM_{2.5}$ has been reported to be associated with preterm birth (PTB). We investigated the effect of gestational $PM_{2.5}$ exposure on PTB in Kampala City from October 2021–September 2022.

Methods: We conducted a retrospective cohort study among mothers with singleton pregnancies ≥28 weeks of gestation who resided in Kampala City throughout their pregnancy and delivered at Kawempe National Referral Hospital during October 2021–September 2022. PTB was defined as live births occurring <37 weeks after the first day of a pregnant woman's last menstruation. For each mother, we calculated average daily gestational $PM_{2.5}$ exposure (ADGPE) by summing the daily $PM_{2.5}$ concentration from the estimated last normal menstrual period to the date of delivery and dividing by the number of days. We obtained these data from the Clarity© Node Solar-Powered $PM_{2.5}$ monitor located nearest to each mother's primary residence. We used the Mann-Whitney U test to compare ADGPE between pregnant mothers who experienced PTB and full-term birth (FTB). We used Modified Poisson regression model with ADGPE as the principal predictor of PTB, adjusted for demographics, HIV status, antenatal attendance, smoking and alcohol use history, premature rupture of membranes, hypertensive disorder, prenatal haemorrhage, oligohydramnios, and chorioamnionitis. We assessed interaction by prenatal complications using chi-square.

Results: Among 1,519 births, 214 (14%) were PTB. ADGPE was 66µg/m^3 (range: 45–75µg/m^3). A significant difference in ADGPE was observed between pregnant mothers who had PTB and FTB (p=0.002). For each unit increase in ADGPE, risk of preterm birth increased by 4% (adjusted PR=1.04, 95%CI: 1.01–1.07). Pregnant mothers who developed hypertensive disorders during pregnancy had a 59% higher risk of PTB than their counterparts (adjusted PR=1.59, 95%CI: 1.06–2.48). There was no difference in stratum-specific prevalence ratios between gestational $PM_{2.5}$ exposure and PTB by prenatal complications.

Conclusion: Increasing $PM_{2.5}$ concentration during pregnancy was associated with an increased incidence of PTB in Kampala City. Implementing strategies aimed at mitigating air pollution exposure could help reduce the incidence of preterm births attributable to air pollution.

Keywords: Air pollution, Fine Particulate Matter ($PM_{2.5}$), Preterm birth, Premature birth

Trends and distribution of maternal sepsis in Uganda, 2018–2022

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Background: Maternal sepsis (MS) is a pregnancy-related life-threatening condition that occurs after infection during pregnancy, childbirth, after delivery, or after an abortion or miscarriage. In low-income countries, MS causes 10% of preventable maternal deaths. In 2016, MS caused 13% of maternal deaths in Uganda. In 2019, Ministry of Health set a target of reducing the proportion of sepsis-attributable maternal deaths to 8% by 2024. We assessed the trends and distribution of incidence of MS, case-fatality rate, and proportion of maternal deaths due to sepsis in Uganda from 2018–2022.

Methods: We calculated MS cases per 10,000 live births per year from 2018–2022 at district, regional, and national levels, using District Health Information System version 2 (DHIS2) data for 2018–2022. We calculated the case-fatality rate and proportion of maternal deaths attributed to MS. The Mann-Kendall test was used to evaluate significance of linear trends.

Results: In total, 24,285 new MS admissions were reported from 2018–2022; case-fatality was 1.8%. Maternal deaths attributable to sepsis declined from 22% in 2018 to 8.6% in 2022 (p=0.005). The national MS incidence was 43/10,000 live births, with Acholi Region being the most affected (71/10,000). High rates in Acholi Region were driven by the high rates in Nwoya and Kitgum districts (both consistently ≥112/10,000). MS rates declined from 48/10,000 live births in 2018 to 37/10,000 in 2022 (p=0.02). Significant regional declines occurred in 6 of 15 regions; increases occurred in Teso (p=0.049).

Conclusion: There was a significant decline in maternal deaths attributable to sepsis from 2018–2022, with the target nearly achieved in 2022. This was due to a reduction of MS incidence, but not case-fatality rates. A study to understand the high MS admission rates in Acholi region may support interventions to continue to reduce MS in Uganda.

Keywords: Maternal sepsis, Uganda

Mechanisms of injury among patients at Naguru Regional Referral Hospital, July 2022- June 2023

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Introduction: Hospital-based trauma registries provide data on causes, severity and outcomes of injuries, which can be used to improve patient care. Naguru Regional Referral Hospital (NRRH) is scheduled to be elevated to a trauma center next year. We described the leading mechanisms of injury among patients at NRRH to identify opportunities for quality improvement and policy development.

Methods: An injury case was any patient presenting at the emergency department at NRRH with trauma-related injuries during July 2022–June 2023. Data on age, sex, date of hospital visit, location when injury occurred, hospital arrival time, injury characteristics and cause, and patient outcome were abstracted from emergency department registers. We analyzed data descriptively.

Results: Of 1,812 injury-related cases recorded, most (80%) were among males; median age was 28 years (range: 5 months–90 years). Most (80%) were treated in the casualty department and discharged the same day; 18% were admitted and 2% were referred. Road traffic injuries (RTIs) (56%), falls (17%), assaults (16%), and burns (4%) caused most injuries for all age groups; among persons <10 years of age, falls (48%) were the most common cause. Among RTIs, injuries were primarily among motorcycle drivers (49%), motorcycle passengers (18%), vehicle passengers (7.6%), and drivers (3.4%). Lower extremity injuries were most the frequent RTI (43%). The peak arrival times for RTIs were 09:00 and 20:00.

Conclusion: One in five injury cases presenting to NRRH required admission. Most injuries were due to RTIs, with lower extremity injuries being the most common. Peak hours for RTIs corresponded with daily "rush hours". We recommend NRRH to institute special strategies to manage high volumes of lower extremity injuries, especially during peak hours.

Keywords: Trauma, road traffic injuries, injury patterns, Kampala, Uganda

Prevalence of hypertension and associated factors in patients attending selected health facilities in Kampala, Uganda, 2023

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Background: Hypertension is a risk factor for cardiovascular and cerebrovascular diseases. It affects approximately 22% of the global adult population. In 2014, a national survey found that the regional prevalence of hypertension was highest (29%) in the Central Region of Uganda, which includes the capital city of Kampala. However, in 2017, a survey at a large-volume health facility in Kampala revealed that only 42% of adult outpatients are screened for hypertension. We determined the prevalence of hypertension and its associated factors among adults in selected public health facilities in Kampala, Uganda.

Methods: This cross-sectional study was conducted during August to October 2023 in outpatient departments in the high-volume Kisugu, Kawaala, and Kisenyi Health Center IVs in Kampala District. We selected consecutive consenting participants from the facility triage who were not pregnant and did not require admission. We interviewed participants aged ≥18 years on their socio-demographic and clinical characteristics using a modified stepwise approach to noncommunicable risk factor surveillance (STEPS) questionnaire. Pre-hypertension was defined as systolic blood pressure 120-139 mmHg or diastolic blood pressure ≥80-89 mmHg. Grade 1 hypertension was systolic blood pressure 140-159 mmHg or diastolic blood pressure 90-99mmHg, and grade 2 hypertension was systolic blood pressure ≥ 160 mmHg or diastolic blood pressure ≥100 mmHg. Factors associated with hypertension were assessed using logistic regression.

Results: Of 786 participants, 490 (62%) were female; the mean age was 45 years, and 102 (18%) were pre-hypertensive. The overall prevalence of hypertension was 65% (95% CI: 62-68). Of the hypertensive patients, 37% were newly diagnosed, 37% grade 1, and 45% grade 2. Having hypertension was associated with each 10-year increase in age group (aOR=3.8, 95% CI 2.9–5.0), being female (aOR=2.0, 95% CI: 1.2-3.4), overweight (aOR=1.9, 95% CI: 1.1–3.3), obese (aOR=2.8, 95% CI: 1.3–5.5), and having a history of heart disease (aOR=4.9, 95% CI: 2.6–9.3).

Conclusion: Two-thirds of adults attending selected public health facilities in Kampala, Uganda were hypertensive, associated with increasing age, overweight/obesity, being female, and having a history of heart disease. There is a need to raise awareness about hypertension and promote preventive measures, focusing on modifiable risk factors like maintaining a healthy diet and an active lifestyle.

Keywords: Prevalence, Hypertension, Uganda

Gastrointestinal anthrax outbreak investigation in Ibanda District, Southwestern Uganda, August 2022

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Background: Anthrax outbreaks associated with exposures to meat from cows that die suddenly are increasingly common in Uganda, with three outbreaks reported during January-July 2022. In Uganda, animals that die suddenly are supposed be notified to authorities and disposed of safely. On August 23, 2022, the MoH was alerted about a community death due to suspected anthrax in Ibanda District. We investigated to determine the scope of the outbreak and possible exposures and recommend suitable measures to control the outbreak.

Methods: We defined suspected gastrointestinal anthrax as acute-onset diarrhea or vomiting in a resident of Ibanda District during August 12–30, 2022. Confirmed cases were suspected cases with a clinical sample positive for *Bacillus anthracis* by culture or PCR. We reviewed health facility records to collect data on cases. We conducted a retrospective cohort study including all persons >9 years of age in all households potentially exposed to an anthrax-infected animal during this period and used log-binomial regression to identify risk factors.

Results: There were 45 suspected cases (1fatal) and 1 confirmed case. Twenty-seven (60%) were males; median age was 27 (IQR 12-45) years. Case-patients presented with abdominal pain (96%), vomiting (60%), and non-bloody diarrhoea (57%). Compared to unexposed cohort members, persons who ate (RR=4.7, 95%CI: 1.8-12.6) or ate and prepared the meat (RR=4.9, 95%CI: 1.3-13.5) were at increased risk. Compared to those eating only boiled meat, those who ate only roasted meat (RR=2.7, 95%CI: 1.1-6.2) or fried and roasted meat (RR=2.8, 95%CI:1.2-6.7) were at increased risk. Twenty-five (89%) case-patients who provided information on the source of meat purchased meat from Butcher A. Interviews revealed that Butcher A obtained meat of a cow that died suddenly from the neighbouring district of Kazo and sold it in the community below the normal price.

Conclusion: Despite guidelines preventing butchering or eating animals that die suddenly, communities continue this practice, leading to anthrax outbreaks. Continued sensitization of the community on the health risks of eating meat of animals that have died of unknown causes, regular meat inspection, and annual vaccination of animals against anthrax in Ibanda and neighbouring districts could reduce the anthrax burden in Uganda.

Keywords: Gastrointestinal anthrax, Anthrax, Outbreak, Uganda

Anthrax Outbreaks in Western Uganda: The Role of illegal meat dealers in spreading the infection

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Background: Uganda experiences recurrent human anthrax outbreaks, always associated with eating meat from cows found dead. Dealers in meat from such animals ('dealers') may facilitate the spread of anthrax outbreaks. We determined the existence of such dealers, examined their impact on the spread of anthrax, and identified drivers of the trade in meat from animals found dead.

Methods: During an anthrax outbreak in Ibanda District in April 2023, we conducted 11 key informant interviews (KIIs) and one focus group discussion (FGD) to learn about the trade in meat from animals found dead. We used snowballing to identify dealers. KII participants included the Ibanda District Surveillance Focal Person, security officers, farmers, and dealers. FGD participants included 6 dealers who had operated in Ibanda District during a recent anthrax outbreak (March-April 2023). We used open coding and generated themes using thematic analysis.

Results: We found a well-organized network of dealers in Kagongo Division, Ibanda District. They are well known to farm workers in and around the district. Dealers buy animals found dead from farms and sell the meat at a reduced price to consumers in Ibanda and fellow dealers in neighboring Kitagwenda District. During two recent outbreaks in Ibanda, dealers had butchered animals found dead and sold the meat in affected areas; five of the six dealers who slaughtered the animals also developed anthrax in the most recent outbreak. Key drivers of the dead animal meat trade were weak beef market regulations, public willingness to buy cheap meat, delayed or non-reporting of animal deaths, and complacency of farm owners towards the legally-mandated appropriate disposal of dead animals.

Conclusion: Operations of dealers in meat from animals found dead likely facilitated anthrax outbreaks in Ibanda District. Deliberate measures should be taken to prohibit this trade to mitigate risks for future anthrax outbreaks.

Keywords: Anthrax, Outbreak, Uganda

Anthrax outbreak associated with handling and/or consuming meat from animals that died suddenly - Ibanda District, Uganda, May 2023

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Background: Despite an available, effective livestock anthrax vaccine, few farmers vaccinate cattle against anthrax in Uganda. On March 24, 2023, the Ministry of Health was notified of a patient who died with suspected gastrointestinal anthrax in Ibanda District. We investigated the outbreak to determine its magnitude, identify possible exposures, and recommend evidence-based control interventions.

Methods: We defined suspected cutaneous anthrax as acute onset of skin papules or vesicles plus ≥2 of: skin itching, reddening, swelling, or regional lymphadenopathy during February–April 2023 in an Ibanda District resident. A suspected case of gastrointestinal anthrax was acute onset of ≥2 of: abdominal pain, vomiting, diarrhea, sore throat, mouth lesions, and neck swelling. A confirmed case was a suspected case with a positive PCR test. We reviewed health facility records and conducted house-to-house visits in the affected community to identify cases. We tested soil samples from an affected farm for *Bacillus anthracis* and conducted an unmatched case-control to evaluate exposures.

Results: Among 18 suspected and 6 confirmed cases, 13 (54%) were cutaneous and 11 (46%) were gastrointestinal; one (4.2%) died. Males were more affected than females [attack rates of 22 vs 8.6/1,000, p=0.029]. The outbreak lasted from March 3–April 3, 2023. Six cows died suddenly on 'Farm D' during March 3–21, 2023; the first three were sold to Meat Trader X, who sold the meat to the community and the rest were buried on Farm D. Slaughtering (aOR=51; 95% CI: 4.2–609) and eating meat (aOR=22.3; 95% CI: 3.5–139) from these animals were associated with illness. *Bacillus anthracis* was identified in soil samples from Farm D's grazing area.

Conclusions: Another anthrax outbreak was recorded in Uganda associated with handling and consuming meat from cattle that died suddenly. We disinfected the slaughter area and sensitized the community about dangers of eating meat from such animals. We recommended increased surveillance and reporting of sudden livestock deaths, vaccination of livestock against anthrax, and continued sensitization of the community.

Keywords: Anthrax, Cutaneous, Gastrointestinal, Outbreak, Uganda

Uganda Public Health Fellowship Program

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Theme:

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