The Uganda Public Health Fellowship Program Cohort 2018 Summary Book

THE REPUBLIC OF UGANDA
MINISTRY OF HEALTH

CENTERS FOR DISEASE CONTROL AND PREVENTION

Makerere University
School of Public Health

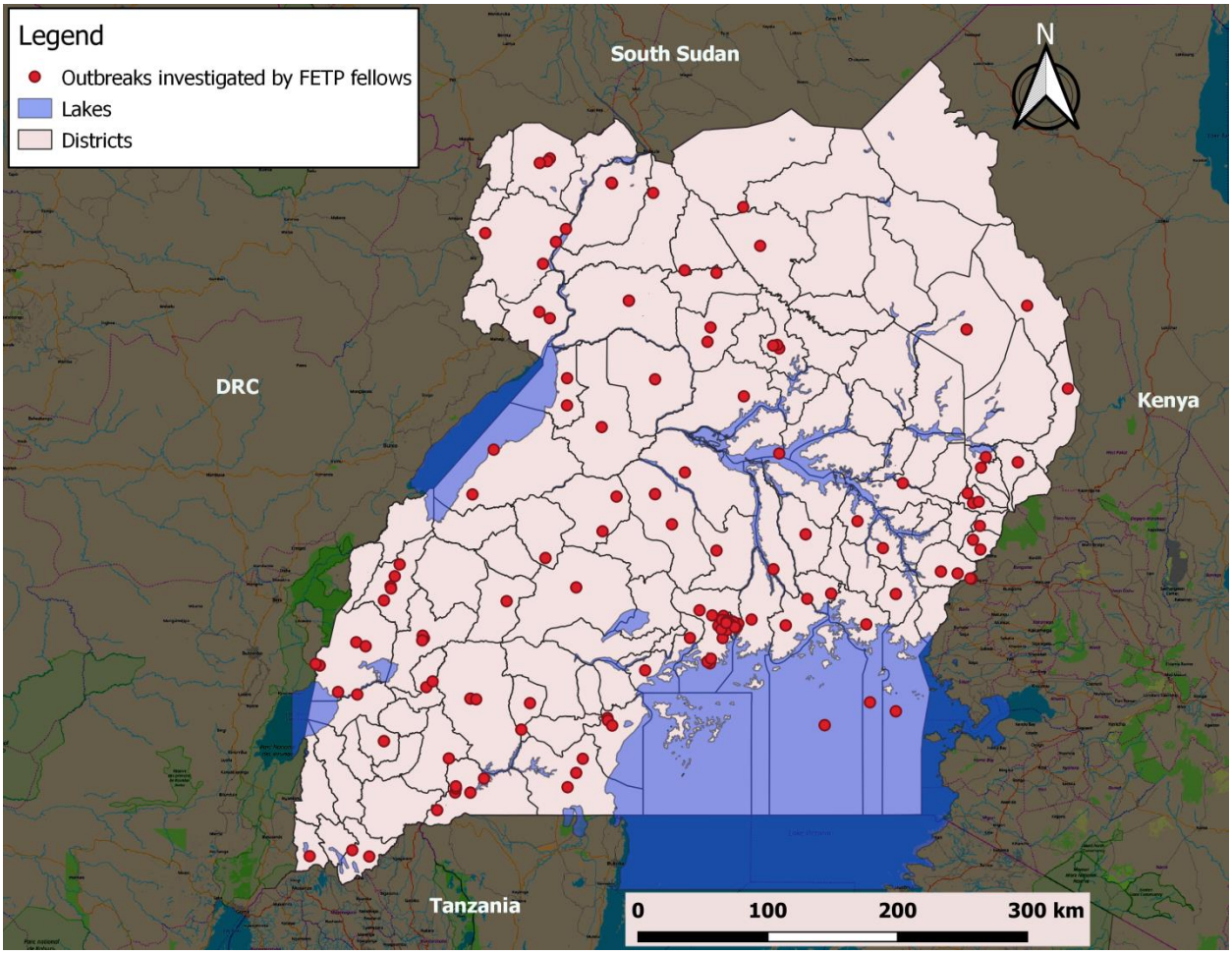
PHFP Overview

The Uganda Public Health Fellowship Program (PHFP) is a skill and competence based training program designed for post-Masters technical officers in health-related disciplines. The program is implemented by Ministry of Health (MoH) and Makerere University School of Public Health (MakSPH) in partnership with the US Centers for Disease Control & Prevention (CDC).

The Fellowship program aims at providing additional skill training and work-related competences in applied epidemiology, effective communication, leadership and public health programing with emphasis on solving issues of public health concern by linking them to timely action.

The program is designed to plug critical technical human resource gaps while providing hands-on-training, mentorship in the field to Fellows who can lead investigations and respond to epidemic threats, improve interface with laboratory services, develop competency in public health informatics and management, and undertake opportunities for public health studies and dissemination of findings to community, national and international audiences. These experiences will also increase the pool of expertise that will be at the disposal of stakeholders for use in the different positions at national and subnational levels. The graduates of PHFP provide essential epidemiologic services to national and sub-national levels to effectively address public health priorities.

The overall purpose of the program is to reinforce implementation of priority public health programs in Uganda to reduce morbidity and mortality, and cultivate core capacities for compliance with the International Health Regulations.



Map showing outbreak investigations carried out by Fellows over the Fellowship period, 2018 - 2019

DISCLAIMER

This Program is funded by the US Centers for Disease Control and Prevention (US CDC) through the Public Health Workforce Cooperative Agreement number NU2GGH001353-04. The contents of this report are solely the responsibility of the authors and do not necessarily represent the official views of the US Centers for Disease Control and Prevention, Ministry of Health or Makerere University School of Public Health.

PREFACE

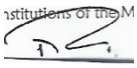
The Uganda Public Health Fellowship Program (PHFP) has enrolled 66 Fellows in Advanced Field Epidemiology since its inception in 2015; with the highest ever enrollment of 13 in 2020. Over the past 5 years, Fellows have conducted 108 outbreak investigations most of them on high priority diseases of public health importance; thereby contributing to their effective management and control. They have also analyzed public health surveillance data and conducted evaluation of public health surveillance systems with the aim of improving detection of disease epidemic alerts and prompting early response. Within this short span, Fellows have implemented a total of 313 projects, which is no mean achievement.

In addition, Fellows have made 237 presentations at national and international conferences, winning six awards including the prestigious CDC Director's Award for Excellence in Public Health and Response at the 2017 EIS conference. Fellows have made significant appearances in the local media, contributing feature articles on key topics of public health importance.

The publication of the Uganda National Institute of Public Health Quarterly Epidemiological Bulletins where Fellows have participated very effectively as editors and article contributors is another tremendous achievement. Sixteen volumes have so far been produced since commencement of the program five years ago. In addition, PHFP has continued to contribute to production of the Quarterly Malaria Bulletin as well as initiating three completely novel bulletins i.e. Neglected Tropical Diseases Bulletin, National TB and Leprosy Program Bulletin and Non Communicable Diseases Bulletin, where the fellows and other MoH epidemiologists and officers publish valuable public health information for consumption by the public and scientific world. In 2020, the HIV/AIDS Program Bulletin is planned to hit the scientific and program platform waves.

The program has produced a total of eighty manuscripts, submitted to reputable peer-reviewed journals; 35 of which have so far been published and the other remaining 45 have either been accepted or undergoing peer reviews at various levels.

In this report, we present to you the profiles of Cohort 2018 Fellows and their achievements over the two-year period of training in service while placed within priority programs or institutions of the Ministry of Health.



Dr. Patrick Tusiime
Commissioner Health Services, National Disease Control, Ministry of Health and Program Co-Director, Uganda Public Health Fellowship Program

DEAN'S MESSAGE TO GRADUATING FELLOWS

To Our Esteemed Cohort 2018 Fellows,

On my own behalf and on behalf of Makerere University School of Public Health, I would like to congratulate you individually and generally on your great accomplishment! We're very proud of all that you have managed to do during your fellowship in the Public Health Fellowship Program, and we wish you the best as you begin this next phase in your careers as Field Epidemiologists.

It's my personal conviction that you have been prepared to face the world at another level. As you begin your careers however, be focused and prepared to lead wherever you will be whether in the Ministry of Health, International Agencies or even in academia. Continue to excel and be an inspiration to others to steer through the challenges of the contemporary world of today.

Your contributions at the host sites, your dedication to achieving your deliverables, and your enthusiasm to continuously learn, innovate and contribute to addressing the public health needs in the country have been invaluable to the Ministry of Health, Makerere University School of Public Health and the country at large. We are grateful for all that.

Although you're graduating, you will always be part of the family of epidemiologists. I urge you to remain active alumni and keep within the network so that you grow even further in your dreams. We encourage you to build on the efforts of your predecessors to ensure a vibrant Alumni Association and support the program by mentoring those you are leaving behind or those who will come after you to sustain the image and legacy which you should surpass all of you.

We do hope that you enjoyed your time with us at the School and we are always glad to see you again. Congratulations once more!

Prof. Rhoda Wanyenze

Dean, Makerere University School of Public Health and Program Director, Uganda Public Health Fellowship Program

Dativa Maria Aliddeki
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Host Site: Uganda National Expanded Program on Immunization (UNEPI)

Host Mentors:

1. Dr. Immaculate Ampaire
2. Dr. Alfred Driwale
3. Dr. Bernard Opar

Fellow's Profile

Dativa Maria Aliddeki is an Epidemiologist with special interest in the area of emergency response management and coordination. She holds a BSc in Adult and Community Education from Kyambogo University and a Master of Public Health from the Sam Higginbottom University of Agriculture, Science and Technology - India. She has 8 years of experience working in the Uganda health sector in the field of public health management and emergency response.

Prior to joining the fellowship program, she worked as an Administrator at the Public Health Emergency Operations Center (PHEOC), Ministry of Heath, where she coordinated national level response to public health emergencies in Uganda. With a passion for public health emergency response, the fellowship offered her a unique opportunity to acquire all round knowledge on emergency response, both at national and district level. She joined the Uganda Public Health Fellowship Program in January 2018.

During her time on the fellowship program, she was placed at Uganda National Expanded Program on Immunization. Working with this team, she contributed to national efforts towards the control of vaccine preventable diseases in the country.

Key achievements at UNEPI

1. Conducted weekly analysis of measles outbreak data in multiple districts. This weekly analysis informed UNEPI and the National Task Force for public health emergencies of the scope and magnitude of the outbreak, thereby informing response efforts.
2. National level supervisor and trainer during the introduction into routine immunization of the rotavirus vaccine in Kayunga District and the first time use of the Oral Cholera Vaccine (OCV) during a cholera outbreak in Hoima District. Under her supervision, the rotavirus vaccine was rolled out in all health facilities in Kayunga District and an 83% coverage of 2 doses of the OCV in 5 sub-counties of Hoima District was achieved.
3. Coordinated and participated in the assessment of Missed Opportunities for Vaccination in 20 districts of Uganda. In Buikwe District where she was a Team Leader, 104 caregiver exit interviews and 40 health worker Key Informant Interviews were conducted. Findings of

this assessment informed implementation of her Quality Improvement Project.

4. A member of the National Stop Transmission of Polio (NSTOP) team and conducted NSTOP surveillance activities in Nebbi and Mubende Districts. She followed up on reported suspected AFP cases and provided immunization support supervision for all vaccinating health facilities in the districts.
5. Compiled a national report of the first time use of the OCV in the country. This report provided the findings of the initial roll out of the OCV and informed subsequent phases of the OCV use in other cholera endemic districts in Uganda.

Key deliverables on the fellowship program

Emergency response and outbreak investigation

Lead Investigator:

- A Food-borne Cholera Outbreak in a School Associated with Eating of Contaminated Fried Fish, Hoima District. Our investigation discovered that the sporadic cases of cholera in Hoima were linked to a secondary school where a student had travelled and brought fried fish from a fishing village with an ongoing cholera outbreak.
- An Outbreak of Anthrax in Pawor Sub-county, Arua District. Our investigation findings linked this outbreak to slaughtering and consumption of cows that had died of unknown causes. We recommended proper disposal of all animals that die of unknown causes and liaising with the district veterinary office to provide an anthrax vaccine to all at risk cattle.
- A Suspected Measles Outbreak in Oyam District, affecting both children and adults. Our investigation found that this outbreak was propagated by congregating in trading centres. In response, we worked with the District to conduct Periodic Intensified Routine Immunization (PIRI) in the affected sub-county for all children under 5 years and intensify routine surveillance and reporting of suspected measles cases.
- Contact Tracing during the Ebola Virus Disease (EVD) Outbreak in Kisinga Sub-county, Kasese District. We identified 45 contacts that were linked to 2 confirmed EVD cases, both in Uganda and DRC. The contacts were subsequently vaccinated and followed for 21 days. None of these contacts developed symptoms of EVD.

Co-Investigator:

- Cholera Outbreak in Kyangwali Refugee Settlement, Hoima District. We identified 2,122 case-patients, including 44 deaths (CFR: 2.1%). Our investigation found that this outbreak was associated with drinking contaminated stream water and thus recommended provision of safe and adequate water to the refugee population.
- Malaria Outbreak in Butambala District. This outbreak was propagated by the presence of static water collection containers in households which acted as breeding sites for anopheles mosquitoes.
- EVD Preparedness Assessment and Risk Mapping in Bundibugyo and Ntoroko Districts. During this assessment we conducted focus group discussions and key informant interviews to map out population movements between Uganda and the DRC. This information

was used to prioritise EVD preparedness and response interventions, for example, locating of screening points for cross-border movement.

Scientific communication

- A Foodborne Cholera Outbreak in a School Caused by Eating Contaminated Fried Fish: Hoima Municipality, Uganda, February 2018. This was presented at the 14th Joint Annual Scientific Conference, 2018, the 4th National Field Epidemiology Conference, 2018 and 2nd International Conference for Emerging and Re-emerging Diseases, Addis-Ababa, Ethiopia 2018
- Risk Factors for Unfavourable Treatment Outcomes among Tuberculosis and TB/HIV co-infected Patients in Rhino Camp Refugee Settlement, Arua District - Uganda, 2015-2017, presented at the 5th Uganda National Field Epidemiology Conference, 2019

Written communication

Bulletin articles

- Editor of the Uganda National Institute of Public Health (UNIPH) Bulletin, Issue 1, Volume 4, January - March 2019.
- Policy Brief: Carrying of Home-Based Vaccination Records to Health Facilities for all Children under 5 years to Reduce Missed Opportunities for Vaccination; published in the UNIPH Epi bulletin, Issue 1, Volume 4, January - March 2019
- Lessons Learned from the First Oral Cholera Vaccination in Uganda, May – July 2018: published in the UNIPH Epi bulletin, Issue 3, Volume 3 July - September 2018.

Newspaper articles

- Cholera outbreak in Hoima District; what Uganda should do: Newspaper article published online by the New Vision on 11 April 2018.

Manuscripts

- A Food-borne Cholera Outbreak in a School Associated with Eating of Contaminated Fried Fish, Hoima District: Uganda, February-March 2018: Manuscript submitted to a peer reviewed journal.
- Risk Factors for Unfavourable Treatment Outcomes among Tuberculosis and TB/HIV co-infected Patients in Rhino Camp Refugee Settlement, Arua District - Uganda, 2015-2017: Manuscript submitted for review and publication.
- Achievements and Lessons Learned from the First Oral Cholera Vaccination in Uganda, May-July 2018: Manuscript submitted for review and publication.

Quality Improvement Project

- Conducted a 7 month quality improvement project on reducing of Missed Opportunities for Vaccination at Mayuge Health Center III, Mayuge District. This project involved working with VHTs and health workers to screen all children below 5 years and ensure that those missing any vaccines are vaccinated before leaving the health facility.

Epidemiological Study

- Conducted a study on Risk Factors for Unfavourable Treatment Outcomes among Tuberculosis and TB/HIV co-infected Patients in Rhino Camp Refugee Settlement, Arua

District - Uganda, 2015-2017. Our findings found that refugee populations had a slightly higher risk of unfavourable TB treatment outcomes in comparison to the host population.

- Conducted a study on Timeliness to Responding to Alerts of Suspected Viral Haemorrhagic Fever (VHF) case-patients to establish the proportion of suspected VHF case-patients that met the case definition and the factors associated with delays in time to responding to alerts of suspected VHF cases. Our study found that most suspected VHF cases did meet the case definition and that districts that delay in responding to suspected VHF cases were minimal in districts with a history of VHF outbreaks.

a) Leadership and management

- Wrote and won a 50,000 USD grant from Ending Pandemics to implement the Outbreak Timeliness Metrics in Uganda. This project arose from an identified gap of lack of data on the previous outbreaks that have occurred in Uganda. This information, if available, would help to evaluate our previous outbreak responses and highlight areas of improvement as well as act as a basis for predicting future outbreaks in Uganda.
- Since October 2018, I have led a team of experts working on developing a disease outbreak surveillance system, so as to inform the country's outbreak detection and response efforts.

Summary of HIV Project

Condom Use among Adolescent Girls and Young Women Engaged in High-Risk Sexual Behavior: Kampala District, Uganda, 2013-2018

Authors: Dativa Maria Aliddeki[1], Donna Kabatesi[2], Agnes Ssali[3], Rachel King[4], Janet Seeley[3], Yunia Mayanja[3], Onesmus Kamacooko[3], Godfrey Nsereko[1], Martha Akulume[5], Daniel Eurien[1], Daniel Kadobera[1], Lillian Bulage[1], Alex Riolexus Ario[1], Julie R. Harris[2,6]

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[2]US Centers for Disease Control and Prevention, Kampala, Uganda
[3]London School of Hygiene and Tropical Medicine and MRC/UVRI Uganda Research Unit
[4]UCF and MRC/UVRI and LSHTM Uganda Research Unit
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Background: Despite a steady decline in HIV prevalence in Uganda, Adolescent Girls and Young Women (AGYW) remain at a higher risk of HIV infection, compared to their male counterparts. One of the key strategies for HIV prevention among AGYW is correct and consistent condom use. We determined the prevalence of and factors associated with condom use among AGYW engaged in high-risk sexual behaviour in Kampala City, Uganda to inform condom programming by MoH.

Methods: In a cross-sectional study, data were collected among AGYW attending the Good Health for Women Project clinic, a site

opened in Kampala specifically for women at high-risk of HIV infection. We collected socio-demographic, clinical, and behavioural characteristics data for AGYW. We defined condom use as having used a condom during the last sexual encounter. Modified Poisson regression was used to identify factors associated with condom use.

Results: Of the 1,697 AGYW, 373 (22%) were HIV-positive. The overall prevalence of condom use was 70%. Persons aged 20-24 years were more likely to use condoms compared to those 15-19 years [Prevalence Risk Ratio (PRR) = 1.17, 95% CI: 1.02-1.33]. AGYW engaged in sex work (PRR=1.42, 95%CI: 1.06-1.90) and those working in beauty parlours (PRR=1.85, 95%CI: 1.36-2.53) were more likely to use condoms compared to those who were unemployed. AGYW who had multiple sexual partners in the last month were more likely to use condoms compared to those who had one partner (PRR=1.95, 95%CI: 1.21-3.14).

Conclusions: Approximately one in three AGYW at high risk of HIV infection do not use condoms. We recommend health education on condom use and strategic provision of youth-friendly free condom access points in these communities.

Key skills/competencies acquired during the fellowship

1. Outbreak investigation and response
2. Public health surveillance and emergency response, at district and national level
3. Project design, implementation and monitoring and evaluation
4. Scientific writing and communication: policy briefs, newspaper articles, bulletin articles and PowerPoint presentations
5. Leadership and management

Next steps

This fellowship has been offered Dativa an opportunity to build all round skills in public health management. She looks forward to using her experience to work towards improving emergency response, at district, national and international level.

Pictorial

Dativa conducting a key informant interview during the assessment of missed opportunities for vaccination at Lugazi Mehta Hospital, Buikwe District, December 2018

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Host Site: Uganda Prisons Service
Host Mentor: Dr. James Kisambu

About the fellow

Kenneth Bainomugisha holds a Master of Public Health and a Bachelor of Environmental Health Science from Makerere University Kampala, Uganda. Kenneth has received training in Disaster Risk Leadership and Public Health in Complex Emergencies from Makerere University School of Public Health. He has worked at the Epidemiology and Surveillance Division of the Ministry of Health and developed passion for International Health Regulations (2005) and subsequently conducted a study, "Surveillance for Public Health Emergencies of International Concern at Points of Entry for Uganda, a case of Entebbe International Airport" for his master's thesis. His attachment to the Uganda Prisons Service exposed him to unique health needs of prisoners as a key population. He developed skills in Applied Epidemiology, effective communication and emergency public response and has interest in using epidemiologic methods in solving cross-border public health problems.

Achievements

- **Host site achievements**
- Engaged in support supervision and mentorship activities in different prison health facilities around the country. This contributed to improved HIV/TB care in prison health facilities.
- Participated in workshops and conferences at the host site such as the Electronic Medical Records (EMR). These engagements led to harmonization of the National EMR and the Prison EMR and strengthened reporting on indicators such as care transferred prisoners and linkage of released prisoners.
- Reviewed and disseminated updated HIV/AIDS guidelines among Prison Health Workers such as Assisted Partner Notification (APN) and Differentiated Service Delivery Model (DSDM) among others.
- Studied key indicators of prisoners' health such as HIV/TB/Mental Illness prevalence and determinants and recommended evidence-based practices to improve on prisoners' health.

Fellowship specific achievements

- **Descriptive analysis**
  Analysis of Surveillance Data to determine mental and neurological disorders among prisoners who sought care at Murchison Bay prison Hospital in Uganda, 2015 – 2017. The results from this study generated evidence of the need to strengthen care of prisoners with these disorders with special

recommendation to increase metal health workers in prison health facilities.

Outbreak Investigations

Lead Investigator:

- Anthrax Outbreak investigation, Makutano Village, Kween District, May 2018
- Suspected Food Poisoning Outbreak Caused by Drinking Porridge Prepared with Fermented Maize Flour, Katuulo Village, Lwengo District, Oct 2018

Co- Investigator:

- Anthrax Outbreak Caused by Handling and or Consumption of Meat from a Dead Cow in Kaplobotwo Village, Kween District, Uganda April, 2018
- Prolonged Cholera Outbreak in Kyangwali Refugee Settlement caused by drinking contaminated water from the stream, Hoima, Uganda, 2018
- Uganda Ebola Virus Disease Preparedness Assessment and Risk Mapping, Aug - Sept, 2018

Bulletin Articles

- Mental and neurological disorders among prisoners who sought care at Murchison Bay Prison Hospital in Uganda, 2015 - 2017
- Risk factors for active TB among HIV-Positive prisoners on ART at Murchison Bay Hospital in Luzira Maximum Security Prison in Uganda; 2013-2017

Quality Improvement project

- Improving Quality of HIV/TB and Related Data at Murchison Bay Hospital in Luzira Maximum Prison in Uganda, 2019. The QI project was able to make an impact on the knowledge levels of health workers on data quality and percentage of patients with missing records in the ART clinic in Luzira Prisons Health facilities reduced.

Conference Presentations

- Mental and Neurological Disorders Among Prisoners Who Sought Care at Murchison Bay Prison Hospital in Uganda, 2015 – 2017 (USHS 19th Annual Scientific Conference 23 -24 May 2019)
- Risk factors for active Tuberculosis among HIV-Positive prisoners on Antiretroviral Therapy at a Maximum-Security Prison in Uganda; 2013-2017 (USHS 19th Annual Scientific Conference 23 -24 May 2019 & The 5th Uganda National Field Epidemiology Conference 2019)
- Anthrax Outbreak Associated with Handling Anthrax Infected Dead Cows, Makutano Village, Kween District, Uganda, May 2018 (USHS 19th Annual Scientific Conference 23 -24 May 2019)

Policy Brief

- Democratic Republic of Congo Ebola Outbreak Should Constitute a Public Health Emergency of International Concern, 2017
- Improve Screening of Prisoners for Mental Illnesses in Prison Health Facilities in Uganda

HIV project

- Risk factors for active Tuberculosis among HIV-Positive prisoners on Antiretroviral Therapy (ART) at a Maximum-Security Prison in Uganda; 2013-2017. Our study found that the incidence of active TB among HIV

prisoners on ART was >20 times higher than that in the general population. Prisoners who had stayed in prison for >5 years and those who had a WHO stage of IV at enrolment on ART had a higher risk of developing active TB while in prison.

TB Operations Research

- Risk factors for active Tuberculosis among HIV-Positive prisoners on Antiretroviral Therapy at a Maximum-Security Prison in Uganda; 2013-2017. Staying longer in prisons and having WHO Stage IV on ART enrolment were key risk factors for developing of TB.

Newspaper Articles

- Can Current HIV/AIDS Interventions by Uganda Prisons Service curb the worrying Prevalence? (Published in *The New Vision Jul 17, 2018*)
- Entebbe Airport and Ebola Viral Disease preparedness (*Aviation Bulletin, 2019*)

Manuscripts

- Short Communication Manuscript - Cutaneous Anthrax Outbreak Caused by Handling Meat from Infected Carcass, Makutano Village, Kween District, Uganda, May 2018 *(under review)*
- Risk factors for active Tuberculosis among HIV-Positive prisoners on Antiretroviral Therapy at a Maximum-Security Prison in Uganda; 2013-2017 *(under review)*

Summary of Epidemiologic Study

Title: Risk factors for Active Tuberculosis among HIV-Positive Male Prisoners on Antiretroviral Therapy, at Luzira Maximum Security Prison, Uganda, 2013-2017

Introduction: Tuberculosis (TB) prevalence in Uganda Prisons Service (UPS) is estimated at 654/100,000, more than double that in the general population (253/100,000). We documented the incidence of and risk factors for active TB among HIV positive male prisoners on Antiretroviral Therapy (ART) in Luzira Maximum Security Prison (LMSP) in Uganda, 2013-2017.

Methods: We conducted a retrospective cross-sectional analysis of data for HIV-infected male prisoners on ART diagnosed with TB from January 2013-December 2017 at LMSP. Routinely collected program data were obtained from medical registers at LMSP. We considered prisoners who had been detained for ≥1 year before data collection. We computed the proportion of prisoners on ART who developed TB and used logistic regression to identify risk factors for active TB among male HIV^+ prisoners.

Results: Of the 108 HIV^+ male prisoners on ART, 69 (63%) were aged 18-34 years, 61 (57%) had stayed in prison for a period of 1 to 3 years, 81 (75%) were at HIV WHO clinical stage 1 or 2, and 61 (57%) had a normal body mass index 18.5-24.9. 24 (22%) prisoners on ART developed active TB. HIV^+ prisoners enrolled on ART with HIV WHO clinical stage 3 had increased odds to acquire TB from prison compared to those in stage 1 (AOR=141; 95% CI=2.1-9795). Among HIV^+ prisoners, unemployment before prison, was associated with an increased odds of acquiring TB in prison (AOR=0.015; 95% CI=0.000-0.73), and 62 (57%) of HIV+ prisoners enrolled with BMI of 18.5-24.9 had lower odds of acquiring TB from prison compared to 10 (44%) who had

a BMI of <18.5 at enrolment (AOR=0.032; 95% CI=0.0021-0.51).

Conclusion: Persons presenting late for ART initiation, and those with low BMI had increased odds of developing TB. We recommended on entry screening of all new prisoners and early ART initiation for all HIV^+ prisoners.

Key Skills and Competencies

- Practical skills in disease outbreak investigation, response and control.
- Scientific writing and presentation skills to various audiences.
- Analysis, interpretation and evaluation of surveillance data to improve health.
- Leadership and management skills attained from the different assignments at the host site and the Quality Improvement project conducted in Uganda Prisons Service.

Next Steps

- With the knowledge and skills I have acquired in field epidemiology, I desire to build a career in infectious disease epidemiology and International Health Regulations.
- I also intend to transfer the knowledge and skills I have gained to persons with interest in field epidemiology.

Kenneth (centre) conducting an interview during Anthrax outbreak in Kween District

Kenneth conducting interviews during a Cholera Outbreak Investigation in Kyangwali Refugee Settlement Camp, Hoima District

Mirembe Bernadette Basuta,
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Host Site: Viral Hemorrhagic Fever Surveillance Program – Uganda Virus Research Institute (UVRI)

Host Mentors:

- Dr. Julius J. Lutwama
- Dr. Luke Nyakarahuka
- Mr. Stephen Balinandi

Fellow's Profile

Mirembe Bernadette Basuta is an Epidemiologist with special interest in the One Health initiative. She has a Bachelor of Environmental Health Science and Master of Veterinary Preventive Medicine from Makerere University. She was attached to UVRI where she has supported the institution through leading multiple outbreak investigations associated with her host site among other projects. She played a crucial role in establishing an alert desk during the Ebola outbreak response in 2019 in Kasese District. She led 13 Crimean-Congo Hemorrhagic Fever (CCHF) outbreak investigations that span over 7 months in 2018-2019 gathering vast expertise in the topic. She has vast knowledge on Viral Hemorrhagic Fevers (VHF) and has been at the frontline of such outbreaks multiple times. She has successfully estimated the cost of treating Rift Valley Fever (RVF) patients, which can improve planning for future outbreaks. She has disseminated her work and knowledge in various forums and hopes to further her expertise in the area.

Achievements at the Host Site

- Participated in Ebola outbreak response where she was in charge of setting up the alert lines and protocols to be followed in case of an alert.
- Led investigations of sporadic CCHF outbreaks in over 14 districts for seven months. Tick contact was the exposure determined to be associated with transmission as in previous studies. Visiting patients both in hospital and community further led to understanding challenges to individuals, community and health facilities during these outbreaks.
- Led investigations of imported Dengue outbreak of Indian origin where she had to trace movements of a religious missionary who had been in the country for over 29 days. He arrived in Entebbe and travelled preaching in several districts. He was intercepted in Yumbe District and luckily none of his companions acquired the disease.
- Led investigations of suspected O'nyong nyong fever in Kampala District. Two suspected case-patients were line-listed of which one was confirmed with O'nyong nyong fever at UVRI. Case-patient had travel history to Kitgum District during the effective exposure period.

- Updated the VHF surveillance system on a daily basis for four months after attachment. This involved making calls to health workers to clarify information on suspect VHF samples sent and also following up if necessary.
- Described the VHF surveillance system hosted at UVRI. The findings showed that increase in samples received through sentinel sites led to increase in number of outbreaks detected. This showed importance of improving suspicion index of health workers so as to sustain transfer of samples to the VHF lab.
- Entered, analysed and developed a report for the customer review survey assessing acceptability and functionality of the VHF surveillance system as perceived by health workers. About 60% of health workers were satisfied with the VHF surveillance system.
- Submitted an article to the UVRI newsletter about the Viral Haemorrhagic Fever surveillance program where successes of the program was described.
- Formulated and implemented an archiving system of surveillance case investigation forms since 2010 for easy retrieval. The system was adopted and has greatly simplified the retrieval process of forms.
- Participated in opening of five new sentinel surveillance sites for the surveillance program and trained hospital staff on completion of the VHF case investigation forms.
- Participated in an ecological study in the caves in Kween District where presence of rossettus bats was established using smell and sound. Rossetus bats are known reservoirs for Marburg virus and it was reported that the index case during the 2017 Marburg outbreak had visited these caves.
- Collated and analysed data on Crimean-Congo Haemorrhagic Fever since 2013 in the VHF surveillance system. The aim was to create a case-control dataset within the surveillance system to see whether exposures differed. Analysis was however not fruitful because of incompleteness of previous entries due to missing information in case investigation forms.
- Developed two concepts for longitudinal studies on immune response of VHF survivors and frontline healthcare workers vaccinated during the Ebola preparedness and response.

Fellowship program specific achievements

Emergency response and outbreak investigation

Lead Investigator:

- Cholera outbreak at Sebagoro Landing site in Hoima District that was epidemiologically linked to the massive outbreak in Kyangwali Refugee Settlement, February – May 2018
- Imported case of Dengue Fever from India identified after spending one month in Uganda and travelling to Yumbe District, October 2018
- Sporadic Crimean-Congo Hemorrhagic Fever outbreaks in Central and Western Uganda, June 2018 – January 2019
- O'nyong nyong fever outbreak detected at a hospital in Kampala District suspected to originate from Kitgum District, February 2019
- CCHF outbreak investigation in Lyantonde District, August 2019

Co-Investigator:

- Cholera outbreak in Kyangwali Refugee

Settlement in Hoima District, February – May 2018
- Anthrax outbreak in Kiruhura District, May 2018
- Black Water Fever in Manafwa District, May – June 2018
- Rift Valley Fever (RVF) in Western Uganda, June – October 2018
- Plague outbreak in Zombo District, March 2019

Scientific communication and writing

Conference Presentations

- International Federation of Environmental Health (IFEH) that took place from 9 – 11 April 2019. '*Cholera Outbreak propagated by Heavy Rainfall at Sebagoro Landing site, Hoima District, Uganda, Feb-May 2018*' and '*Epidemiology of Typhoid fever in Kasese District, Uganda*'
- MakCHS 15th JASH Conference that took place on 6th - 8th November 2019 at Hotel Africana. '*Predictors for Mortality among Multidrug–Resistant Tuberculosis and HIV Co-Infected Patients in Uganda, 2013-2016*'.
- 5th National Field Epidemiology Conference (NFEC) that took place on 24 October 2019. '*Sporadic Crimean-Congo Haemorrhagic Fever outbreaks associated with Tick Exposures: Western and Central Uganda, 2018 – 2019*' and '*Predictors for Mortality among Multidrug–Resistant Tuberculosis and HIV Co-Infected Patients in Uganda, 2013-2016*'.

Written communication

Bulletin articles

- Investigation of an imported case of Dengue fever, Uganda, November 2018 – UNIPH Volume 3 Issue 2 October - December 2018
- Multiple sporadic Crimean-Congo Haemorrhagic Fever Outbreaks, Uganda, July 2018-January 2019 – UNIPH Volume 4 Issue 1 January - March 2019
- Investigation of suspected O'nyong nyong fever Outbreak in Kampala District, Uganda, February 2019 – UNIPH Volume 4 Issue 2 April – June 2019

Newspaper articles

- '*Beware of animal diseases this season*' published in New Vision as letter of the day on 28 December 2018. The intention was to inform the public about zoonotic diseases that had been rampant in 2018 and linked to handling raw meat.

Manuscripts

- Multiple sporadic Crimean-Congo Haemorrhagic Fever Outbreaks, Uganda, July 2018-January 2019
- Predictors of Mortality among MDR-TB/HIV co-infected patients in Uganda, 2013 – 2016

Cost Analysis Project

- Conducted a cost analysis study for management of patients at Mbarara Regional Referral Hospital during the 2018 RVF outbreak in Western Uganda. The estimated cost of managing a critical RVF patient was UGX 55,520/$15 and UGX 2,406/$0.66 daily in recovery phase for patients that survive. Average time spent in critical condition was 7 days and in recovery was 11 days. Patients that died cost on average UGX 127,154/$35 and spent approximately two days in isolation unit. Estimated welfare costs for RVF patient with one attendant was UGX

27,000/$7.4.

Epidemiological Study

- Predictors of mortality among MDR-TB/HIV co-infected patients in Uganda, 2013 – 2016. MDR-TB/HIV co-infected persons that had been treated before for TB had higher risk of death compared to new cases as well as those in whom sputum conversion had failed during treatment.
- Waste management practices in selected laboratories around Uganda. About 54% of them were found to uphold good waste management practices.

Summary of Epidemiological study

Background: Crimean-Congo Haemorrhagic Fever (CCHF) is a severe tick-borne, zoonotic viral disease. Despite having ten confirmed outbreaks between 2013 and 2017, all within or along the 'cattle corridor', no national tick control program exists in Uganda. During a seven-month-period from July 2018-January 2019, the Ministry of Health confirmed multiple isolated CCHF outbreaks. We investigated to identify risk factors to prevent future outbreaks.

Methods: We defined a confirmed case as sudden onset of fever with ≥4 of the following: anorexia, vomiting, diarrhoea, headache, abdominal pain, joint pain, sudden onset of unexplained bleeding and tested positive for CCHF by RT-PCR assay or IgM serology between 1 July 2018 and 30 January 2019 in a resident of the 11 affected districts. We identified cases by record review at Uganda Virus Research Institute and active community case-finding. In a case-control study, we compared the exposures of cases with neighbourhood-matched controls (1:4). We assessed risk factors using Mantel-Haenszel odds ratios derived by stratification analysis of case-control sets.

Results: We identified 14 confirmed case-patients, with 5 deaths (case-fatality rate=36%) from July 2018–January 2019. Case-patients came from 11 districts in Western and Central region; 78% of case-patients resided within the cattle corridor of Uganda. Males (AR 4.4/1,000,000) were more affected than females (AR2.4/1000000). Case-patients ranged in age from 6-36 years, with persons aged 20-44 years more affected (AR: 7.2/1,000,000) than persons ≤19 years (2.02/1,000,000). Most (93%) case-patients had contact with livestock ≤2 weeks before symptom onset. Ten (71%) of 14 case-patients found ticks attached to their bodies ≤2 weeks before symptom onset, compared to 15 (27%) of 56 control-persons (OR_{M-H}=9.3, 95%CI=1.9-46).

Conclusions: Isolated CCHF outbreaks occurred sporadically during 2018-2019 within and outside 'cattle corridor' districts of Uganda. Most outbreaks were associated with tick exposure. The Ministry of Health partnering with Ministry of Agriculture, Animal Industry and Fisheries should consider a One Health approach towards tick control by developing joint nationwide tick-control programs and strategies.

Key lessons learnt during the fellowship

- I understood and appreciated epidemiology theories and concepts through fieldwork and its challenges. I appreciated terms such as confounding, effect modification and bias as well as the art of understanding epidemic curves and their role in epidemiology. I appreciated outbreak investigations and its challenges.

- I learned how the Uganda Health System works. I had the opportunity to join the National Stop Transmission of Polio (NSTOP) team and I gained vast experience in vaccine management.
- I have acquired new skills such as using software for example QGIS, ODK and GoData. I learned how to draw maps, malaria channels and conduct contact tracing among others. I also benefited from various trainings for example TB Operations Research, Evidence-based Public Health Interventions and Preparedness and Response on Ebola Virus Disease.
- I learned the art of disseminating results through presentations, reports and manuscript writing at a more vigorous and effective level.
- Most of all, I expanded my professional network through working with different key stakeholders and institutions in the health system of Uganda as well as health personnel at districts and communities at large. This was the biggest achievement of all as it grounds me in my career path.

Next Steps

Further my career in Public Health as an Epidemiologist with passion in the One Health Initiative. Serve and support Ministry of Health towards improving lives of Ugandans.

Pictorial and narrative

Bernadette picking coordinates from a household during the response to an outbreak of CCHF in Rakai District

Daniel Eurien
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Host Site: AIDS Control Program (ACP)
Host Mentors:

- Dr. Joshua Musinguzi
- Dr. Shaban Mugerwa

Fellow's Profile

Daniel Eurien holds a Bachelor of Environmental Health Science from Makerere University; a Masters in Public Health from The Peoples-Uni, United Kingdom and a Post graduate Diploma in Health Services Management from the Indian Institute of Public Health, India. Daniel is also an alumnus of the Frontline Field Epidemiology Training Program and a Fellowship in Governance, Leadership and Management of Health Services from Makerere University. Before joining the Fellowship Program, he served as a Health Educator in Amuria District Local Government. He also served as HIV Focal Person and acted as Assistant District Health Officer. While at the District Local Government, he oversaw the coordination of implementation of all HIV programs and also provided technical assistance in disease surveillance and immunization activities. He has undertaken a number of short courses, including data analysis using statistical and spatial packages like STATA, SPSS, EPI Info and QGIS; TB Operations Research and Monitoring and Evaluation.

Achievements at the Host site

1. Participated in the review of Health Management Information System data capture tools used in HIV/AIDS care and treatment. This ensured that the data captured at service point levels are robust enough and aligned to measure the core indicators outlined in the Health Sector HIV/AIDS Strategic Plan 2018-2022.
2. Participated in development of the Health Sector HIV/AIDS Strategic Plan 2018/2022 as Team Lead for the Strategic Information working group. The new strategic plan seeks to provide a strategic direction to accelerate achievement of 2030 goal of zero new infections through incorporating new strategies like pre exposure prophylaxis among others.
3. Was principal investigator in the investigation of IPT completion rates among People Living with HIV in North Eastern Uganda, 2015 to 2017. This study provided evidence of the challenges of roll-out of IPT including IPT stock outs to the National TB and Leprosy Control Program.
4. Participated in the Training of Trainers on New HIV Prevention Guidelines that was followed by training of district level trainers. This led to capacity building of frontline health workers on new strategies like pre exposure prophylaxis with the aim of implementing combination HIV prevention in order to

contain the epidemic.

Fellowship program specific achievements

Emergency response and outbreak investigation

Lead Investigator:

- Cholera outbreak investigation in Kampala, January 2019. This investigation revealed that drinking water from an unprotected well caused the outbreak, the unprotected well was closed; consequently, the cholera outbreak was contained.
- IPT completion rates among People Living with HIV in North Eastern Uganda, 2015 to 2017. This study provided evidence to the National TB and Leprosy Control Program about the challenges of roll-out of IPT including IPT stock outs.
- Suspected Typhoid fever outbreak in Kabarole District in May 2018. It was found that the reported outbreak was as a result of over-diagnosis of Typhoid fever cases as result of not confirming cases by culture. A quality improvement project was implemented at Fort Portal Regional Referral hospital in which clinical diagnosis of Typhoid fever cases reduced by 80%.
- HIV Care Cascades among Key Populations in Uganda, 2015 to 2019. HIV cascade among key populations in Uganda showed very poor rates of retention in treatment and very low viral load test coverage; suggesting an urgent need to develop and implement effective interventions to support patients in care and increase viral load coverage among all people with HIV.
- Investigation of a Mysterious Illness in Mubende District, 2018. In this investigation, the cause of death was not established because all the reported cases had been buried by the time of investigation. However, capacity of the District Health Teams and the community on early reporting of unusual health events for speedy response was developed.

Co-Investigator:

- A cholera outbreak in Hoima District associated with drinking unsafe water from the lake
- Investigation of Anthrax among domestic ruminants in the affected districts of Arua, Kween and Kiruhura
- Investigation of Black Water Fever in Mbale Region in 2018
- Investigation of anthrax among humans in Arua District
- Investigation of food borne outbreak as a result of consumption of relief food in Karamoja Region

Scientific communication and writing
Conference Presentations

- Presented a paper on IPT completion among People living with HIV in North Eastern Uganda, 2015 to 2017 at both the Uganda Society for Health Scientists 19th Annual Conference and at the 5th Uganda National Field Epidemiology Conference.
- Presented a paper on Cholera outbreak associated with drinking contaminated unprotected well water in Kampala, 2019 at both the Uganda Society for Health Scientists 19th Annual Conference and at the 5th Uganda National Field

Epidemiology Conference. This paper was voted as the oral presentation at the Uganda Society for Health Scientists 19th annual conference.

Written communication

Bulletin articles

He published three bulletin articles in the Quarterly Epidemiological Bulletin of the Uganda National Institute of Public Health, Ministry of Health including:

- Need for increase of coverage of portable water in slum dwellings in Kampala slums to reduce frequent cholera outbreaks, 2019
- IPT completion among People living with HIV in North Eastern Uganda, 2015 to 2017.
- Cholera outbreak associated with drinking contaminated unprotected well water in Kampala, 201

Policy Brief

- The need to increase access to portable water in slum dwellings in Kampala to prevent cholera outbreaks. This policy brief highlighted the role played by flooding of storm water drainages in cholera outbreaks; consequently, Kampala Capital City Authority used this evidence to prioritize construction of storm water drainages to prevent future flooding.

Manuscripts

- IPT completion among People living with HIV in North Eastern Uganda, 2015 to 2017.
- Cholera outbreak associated with drinking contaminated unprotected well water in Kampala, 2019.

Summary of an Epidemiological Study

Title: IPT completion among People living with HIV in North Eastern Uganda, 2015 - 2017

Background: Isoniazid preventive therapy (IPT) is highly effective at preventing tuberculosis among Persons Living with HIV (PLHIV). However, IPT completion rates in Uganda have not been studied. We examined completion rates for the 6-month course of IPT and factors associated with non-completion among PLHIV in northeastern Uganda

Methods: We conducted a retrospective cohort study using routinely-collected program data in nine Antiretroviral Treatment (ART) sites in northeastern Uganda. The study period covered January 2015-December 2017. Non-completion was defined as failure to pick up any of the six IPT refills over a 6-month period. We abstracted data on IPT treatment site, IPT completion, and demographic and clinical characteristics from the IPT register and patient HIV care card. We used logistic regression to identify factors associated with non-completion

Results: Among 543 patients who started IPT, 175 (32%) completed the full 6-month course. Among those who did not complete, 163 (44%) did not have a documented reason for stopping; 193 (52%) had to stop due to drug stock outs at their treatment site, and 12 (3.3%) were lost to follow-up. Being at World Health Organization (WHO) HIV clinical stages three and four at initiation were associated with a higher risk of IPT non-completion compared to those who were at WHO clinical staging one and

two (aRR 1.35, 95%CI 1.23-1.48).

Conclusions: IPT completion rate among PLHIV in northeastern Uganda were suboptimal, largely due to IPT drug stock outs. The National TB and Leprosy Program should streamline the IPT supply chain to address drug stock outs and improve completion rates.

Key lessons learnt during the fellowship

During the fellowship, I learnt and developed the following skill sets:

- Data analysis skills
- Designing an epidemiological study
- Evaluating a surveillance system
- Presentation skills
- Outbreak investigation
- Writing skills
- Networking skills

Next Steps

I hope to apply the skills of field of Epidemiology to build capacity of my fellow health workers in the district in the medium term. I am also open to taking up a more challenging role of an Epidemiologist at the national level where I will fully apply the knowledge and skills I have learned in past last two years.

Pictorial and narrative

Certificate for best Oral presentation awarded to Daniel Eurien for his work on cholera outbreak associated with drinking contaminated unprotected well water in Sembule village, Kampala city, Uganda 2019 at the Uganda Society for Health Scientists 19th Scientific Conference, 2019 at Hotel Africana, Kampala, Uganda.

Daniel Eurien interviewing a mother during an investigation of a large outbreak of malaria in Zombo District.

Kisaakye Esther
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Host Site: Reproductive Health Division, Ministry of Health

Host Mentors:

- Dr. Dinah Nakiganda
- Dr. Livingstone Makanga

About the Fellow

Esther Kisaakye holds a Master of Public Health and a Bachelor of Science in Nursing, both from Makerere University Kampala, Uganda. Esther has had training in health systems research at Makerere University and has worked in several projects in areas of research, programs and clinical work. Before joining the fellowship program, Esther worked as Project Coordinator, Safe Motherhood and Childhood Disability project at Mildmay Uganda, Lweza, Entebbe. While on the fellowship program, Esther has been hosted at the Reproductive Health Division, Ministry of Health where she has gained skills/experience in implementing reproductive health, maternal, new born and adolescent care programs/services at all levels. The fellowship program has enabled Esther to gain expertise in outbreak detection, investigations and response, development and evaluation of public health surveillance systems, proposal/concept/project development and implementation, leadership, management, support supervision/mentoring, effective communication, scientific writing and results dissemination skills.

Achievements at the Host site

While at the host site, Esther was involved in several activities that included:

1. Development, implementation, supervision, monitoring and evaluation of different reproductive health, maternal, new born and adolescent care programs/ activities at national level.
2. Extraction and analysis of DHIS2 data on key reproductive health, maternal, new born and adolescent care indicators and recommended ways to ensure improved service delivery, data reporting and data usage.
3. Assessment of the current data reporting and surveillance tools for reproductive health, maternal, newborn and adolescent health services offered at health facility levels, district and national levels and recommendations to improve on the tools.
4. Provision of technical support to the Maternal and perinatal mortality surveillance and response (MPDSR) section of the Reproductive Health Division by engaging in support supervisions, compilation of the quarterly and annual MPDSR reports.
5. MPDSR training Bududa District.
6. Conducting AFP/Polio surveillance

and integrated support supervision for vaccine preventable diseases in high risk districts of Zombo, Jinja, Mayuge, Kyenjojo, Hoima, Wakiso, Lwengo and Iganga.

7. Participating in quarterly data quality validation exercises organized by the department and identified gaps for data quality improvement at both facility and district levels.

Fellowship program specific achievements

Descriptive analysis

Analysis of Surveillance data to determine the spatial and temporal distribution of maternal sepsis admissions in Uganda, 2013 -2017. Results demonstrated a gradual increase in admissions due to maternal sepsis in all four regions of Uganda over the study years. However, the cumulative incidence in maternal sepsis admissions over the five years was highest in the northern region (199/10000 live births) and lowest in the central region (146/10000 live births). The aggregated data from DHIS 2 system does not give a leeway to study modifiable risk factors for the high maternal sepsis admissions in northern Uganda, yet this would provide valuable information to inform planning of obstetric care aimed at reducing maternal morbidity and mortality due to post-partum sepsis in Uganda. This led to the epi-study that I conducted to assess for the risk factors of post-partum sepsis among women in Lango sub region, Northern Uganda, August, 2019.

Outbreak investigations

Lead investigator:

- Outbreak of Cutaneous and Gastrointestinal Anthrax Associated with Handling and Eating Meat from a Cow that Died of Anthrax: Kween District, Uganda, April 2018
- Suspected black water fever among children in Manafwa District, May to June 2018

Co-Investigator:

- Investigation of Cholera outbreak in Hoima, District, April, 2018
- Investigation of human anthrax in Makutano village, Kween District, May 2019
- Investigation of anthrax outbreak among animals in Kiruhura District, Uganda, 23rd to 28th October 2018
- Investigation of anthrax among animals in Kween District, Uganda, 5th to 15th December 2018
- Investigation of anthrax in animals in Arua District, Uganda, July 2018
- Investigation of Cholera outbreak in Kampala, January 2019
- Risk factors of CCHF outbreaks in western Uganda, January 2019
- Investigation of CCHF outbreak in Isingiro District, Uganda, July-August, 2018
- Investigation of RVF outbreaks in Western Uganda, August, 2018
- Investigation of suspected Food Poisoning at Katuulo Village, Lwengo District, September 2018
- Investigation of Ebola outbreak in Kasese District, June-July 2019

Bulletin articles

1. Analysis of Surveillance data to determine the spatial and temporal distribution of maternal sepsis admissions in Uganda, 2013 -2017
2. Outbreak of Cutaneous and Gastrointestinal Anthrax Associated with Handling and Eating Meat from a Cow that Died of Anthrax: Kween District,

Uganda, April 2018
3. Suspected black water fever among children in Manafwa District, May to June 2018

Quality improvement project

"Improving prevention, early diagnosis and management of postpartum hemorrhage through risk screening and active Management of third stage of labour at Mityana Hospital, Mityana District, Uganda".

This was a successfully implemented QI project. The percentage of midwives/nurses who; take and documents a full history of mother on admission for labour increased from 16% to 92%, assesses the mother for risk of obstetric hemorrhage using a risk checklist tool on admission for labour increased from 0% to 75%, categorize mothers by their risk of post-partum haemorrhage (PPH) before preparation for labour increased from 25% to 83% and those continues to monitor the uterus for 2 h after birth increased from 0% to 67%. The overall ratio of PPH cases with in the hospital per 1000 live births reduced from 7/1000 live births before project implementation to (5.8/1000 live births) after the implementation of the Quality Improvement (QI) project. Oxytocin injection use increased after the implementation of the QI project. We recommended that the quality improvement project should be scaled up in other health units with high numbers of PPH cases with in the facility to reduce on the burden of PPH in Uganda.

Conference Presentations

1. Outbreak of Cutaneous and Gastrointestinal Anthrax Associated with Handling and Eating Meat from a Cow that Died of Anthrax: Kween District, Uganda, April 2018, *EIS Conference International Night, 2019 and 4th Uganda National Field Epidemiology Conference*
2. Spatial and temporal distribution of maternal sepsis admissions in Uganda in Uganda, 2013 -2017, *JASH Conference 2019*
3. Presumptive Tuberculosis among Newly-diagnosed HIV Patients at Naguru Regional Referral Hospital in Kampala, Uganda, January 2016 – June 2018, *JASH Conference 2019*
4. Anthrax in Makutano Village, Kween District, May 2018, *The Uganda Society of Health Sciences,19th annual scientific conference 23-24 May 2019*
5. Mental Illnesses Among Prisoners Who Sought Care At Murchison Bay Prison Hospital, Uganda: 2015 – 2017, *The Uganda Society of Health Sciences,19th annual scientific conference 23-24 May 2019*
6. Suspected black water fever among children in Manafwa, May 2018, *the World Malaria Day Scientific Conference held in Uganda April 2019*

Policy brief

"Improve availability and provision of quality postpartum care services at both facility and community levels to reduce occurrence of post-partum maternal and neonatal infections in Uganda"

HIV project

"Validation of a computer based HIV risk scoring tool for predicting HIV positivity among key populations in Uganda". Of the 13,787 clients enrolled, 71% (9801/13787) were males, 92% (12628/13787) were aged from 18 to 49 years and 58% (8029/13787) were doing manual work. 27% (3658/13787)

of respondents were clients of sexual workers. The prevalence of HIV was highest 27% (209/781) among the female sexual workers. 95% (13071/13787) of enrolled clients reported that it was easy for them to do the ACASI interview. 42% (5823/13796) preferred the ACASI interview with a computer. The rate of HIV positivity was highest (10%, 13/124) among clients who were categorized as high risk by the computer based HIV risk scoring tool compared to other risk categories. The computer based HIV risk scoring tool has a high specificity of 99%. The tool could be useful in low resource settings in discriminating people with almost no risk of HIV infection, and thus excluding them to be HIV tested. It could also improve early detection of new HIV infections among key populations.

TB Operations Research

"*Presumptive Tuberculosis among Newly-diagnosed HIV Patients at Naguru Regional Referral Hospital in Kampala, Uganda, January 2016 – June 2018*".

Of the 3314 patients enrolled into HIV care, 91 (2.7%) were already on TB treatment, 64 (1.9%) were not screened, and 3159 (95%) were screened for presumptive TB. Of 3159 patients screened, 172 (5.4%) had presumptive TB. Of the 172 HIV patients enrolled into HIV care with presumptive TB, 44 (26%) were confirmed to have TB. Factors associated with presumptive TB included: being male (AOR 2.3, 95%CI=1.7-3.2), having a WHO clinical stage 2 (AOR=2.9; 95% CI=1.8-4.6), having an advanced WHO clinical stage 3 or 4 at enrollment into HIV care (AOR=4.5; 95% CI=2.9-7.1), and not having viral load records at baseline (AOR=1.8; 95% CI=1.3-2.6). We recommended intensified TB case-finding and treatment among PLHIV, strengthening administration of Isoniazid preventive therapy (IPT) to newly-diagnosed HIV patients without TB, and timely treatment of active TB cases among newly-diagnosed HIV patients.

Newspaper articles

1. Why you should and how to protect yourself and your newborn baby from Infections after giving birth *(Published in New Vision paper)*
2. Back to school time: Is your child vaccinated against measles?
3. Who should get the HPV vaccine in Uganda and why?
4. What it means to have a child with black water fever: lessons learnt from Manafwa district

Manuscripts

- Outbreak of Cutaneous and Gastrointestinal Anthrax Associated with Handling and Eating Meat from a Cow that Died of Anthrax: Kween District, Uganda, April 2018 (*Submitted to the Emerging Infectious Diseases Journal*)
- Factors associated with Presumptive Tuberculosis among Newly-diagnosed HIV Patients at Naguru Regional Referral Hospital in Kampala, Uganda, January 2016 – June 2018 *(under peer review)*
- An increasing trend of admissions for maternal sepsis in Uganda, 2013 - 2017*(under peer review)*
- Risk factors of post-partum sepsis among women in Lango sub region, Northern Uganda, August, 2019 *(under peer review)*
- Validation of a computer based HIV risk scoring tool for predicting HIV positivity among key populations in Uganda *(under peer review)*

Summary of Epidemiological Study

Title: Risk factors of post-partum sepsis among women in Lango sub region, Northern Uganda, August, 2019

Introduction: Maternal sepsis is the third most common direct cause of maternal mortality in Uganda. The greatest attention in obstetric care in Uganda has been put on postpartum hemorrhage and hypertensive disorders, the two leading direct causes of maternal mortality however, maternal sepsis, has received less attention and programming. We assessed for the Risk factors of post-partum sepsis among women in Northern Uganda to provide valuable information to inform planning of obstetric care aimed at reducing maternal morbidity and mortality due to post-partum sepsis in Uganda

Methods: We conducted an unmatched case control study during august 2019 at Lira Regional Referral Hospital (LRRH) that serves the lango sub region of northern Uganda. Sample size was calculated using Fleiss JL formula using a 1:4 case to control ratio. In total we recruited 38 cases and 152 controls. We used a semi structured interviewer administered questionnaire to collect data. Data was analysed using Stata software version 12.0. A logistic regression model was used for multivariate data analysis.

Results: The age of respondents ranged from 16 to 43 years with a mean age of 29(SD=5.8) years. The largest proportion 43% (81/190) of the respondents were within age group of >30 years. Factors independently associated with post-partum sepsis included: having a first pregnancy (prim gravid) (aOR =14, 95%CI=2.0-99), having more than six vaginal examinations during delivery (AOR=4.6; 95% CI=1.0-35), having a cesarean section delivery (AOR=11; 95% CI=3.1-38) and having a vaginal tear during delivery (AOR=10; 95% CI=2.7-38).

Conclusions and Recommendations: Having the first pregnancy, having more than six vaginal examinations during delivery, having a cesarean section delivery and having a vaginal tear during delivery were identified as risk factors for post-partum sepsis. We recommended strengthening of health education programs for post-natal mothers about how to prevent post-partum sepsis with more focus to first time mothers, women who have had a cesarean section and those who have had vaginal tear. We also recommended sensitization of health workers to observe sterility while carrying out vaginal examinations, minimize vaginal examinations and also ensure that they conduct health education about infection prevention talks to mothers attending ANC.

Key lessons learnt during the fellowship

1. Outbreaks detection, investigation, response and control.
2. Scientific writing (manuscripts, newspaper articles, policy briefs, bulletin articles etc.) and presentation skills at both national and international audiences.
3. Analysis, interpretation and evaluation of surveillance data to improve health
4. Development of surveillance systems
5. Leadership and management skills attained from the different assignments at the host site
6. Development and implementation of Quality Improvement projects
7. National level programing and coordination of reproductive health, maternal, new born and adolescent care programs

Next Steps

- Using the expertise that I have acquired in field epidemiology, I desire to build a career in infectious disease epidemiology.
- Using the expertise I have acquired in national level leadership, programing and coordination, I intend to contribute towards the movement aiming at improving reproductive, maternal, new born and adolescent health in Uganda.
- I also intend to transfer the knowledge and skills I have gained to upcoming epidemiologists and public health officials.

Pictorial and narrative

Esther conducting active search for anthrax case patients at Kaplobotwo village, Kween District, Uganda

Esther with the surveillance focal person investigating an anthrax case patient at Makutano village, Kween District, Uganda

Dr. Fred Monje:
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Host Site: National Animal Disease Diagnostic Epidemiology Centre (NADDEC) and Arua attached to Infectious Disease Institute

Host Mentors:

- Dr. Deo Birungi Ndumu, Assistant Commissioner Diagnostics and Epidemiology
- Dr. Joseph Sserugga, Data Manager
- Mr. Martin Esau, Laboratory Technician

Fellow's Profile

Dr. Fred Monje holds a Master of Veterinary Preventive Medicine and a Bachelor of Veterinary Medicine from Makerere University, Kampala, Uganda. Fred is a former FETP-V awardee of a 2-year AFENET Scholarship that led to his Master's degree in Veterinary Preventive Medicine of Makerere University. Prior to joining the fellowship program, Fred was a Senior Veterinary Inspector and One Health Focal Person for the Ministry of Agriculture, Animal Industry and Fisheries where he played a key role in the establishment of the National One Health Platform in Uganda. Fred joined the Uganda Public Health Fellowship Program in January, 2018 and was hosted at the National Animal Disease Diagnostics and Epidemiology Centre (NADDEC), Entebbe, Uganda and Arua District (attached to Infectious Diseases Institute) for the 2-year period. While at the host site, Fred was part of the National Rapid Response Team that strives to build capacity, prevent, and control infectious diseases especially of animal origin (zoonoses) in Uganda. With his passion for a safer and healthier world for all, Fred proactively participated and gained skills in epidemiology including: investigation and mitigation of disease outbreaks, preparedness, response to public health emergencies, description and evaluation of disease surveillance systems, implementation of quality improvement projects, designing and implementation of operational research, scientific writing, communication and leadership.

Achievements at the Host Site

- Studied the trends and spatial distribution of animal bites and vaccination status among victims and the animal population, Uganda: 2013-2017. We found out that there was low reporting of animal bites in the veterinary surveillance system and low vaccination of the pets against rabies. So, we designed and implemented a quality improvement project in one of the non-reporting districts in Uganda (i.e. Sironko District) from April 2019 to September, 2019 to improve reporting of animal bites. The animal bites reporting improved from 0% in April 2019 to 100% in September, 2019. In addition, we came up with a policy brief advocating for compulsory vaccination of pets against rabies in the country.

- Analyzed NADDEC data for the Trends and spatio-temporal distribution of brucellosis in animals in Uganda, 2014-2018. Brucellosis being one of the 7 priority zoonoses in Uganda, targeted for control, we established the hotspot districts with bovine brucellosis in Uganda. Information on hotspots districts generated will guide NADDEC and National One Health Platform on trade (for NADDEC) and targeted interventions (for the country). The findings may also be used as a support tool for test and slaughter policy of infected animals in the affected districts.
- Studied the Trends and spatio-temporal distribution of bovine tuberculosis in animals in Uganda, 2014-2018. We established the hotspot districts of bovine tuberculosis in Uganda. Findings informed NADDEC and the National Tuberculosis and Leprosy Programme in the Ministry of Health on the hotspots of bovine TB in Uganda. Information on hot spot districts of bovine TB in Uganda will guide prioritized interventions in the affected districts, using a One Health approach as Uganda strives to END TB deaths by 2030, including bovine TB.
- Evaluated the Animal Disease Surveillance System in Arua District, 2019. We found that the animal disease surveillance system was useful. To improve upon the functionality of animal disease surveillance system, we recommended improvement in data quality through use of standard case definitions for livestock diseases, standard reporting format, improving completeness of forms and reporting rates. There is an urgent need for an increment in dedicated quarterly allocations to surveillance activities to improve stability and hence functionality of animal disease surveillance system. We shared the findings with District Veterinary officer and Infectious disease institute, Arua office for action.
- Sensitisation of communities in Kyotera District about rabies prevention and control, September 2018. Participated in awareness creation of rabies during the World Rabies Day commemoration in Kiryadongo District in September 2019. These were follow-up activities that arose from our descriptive for rabies/animal bites at NADDEC where one of our recommendations was to sensitize the public about the consequences of animal bites and need for urgent health care.
- Following animal anthrax outbreak investigation in the country, I organised an anthrax symposium that led to the formation of an anthrax prevention and control technical working group for the country to spearhead control of anthrax
- To support animal disease surveillance activities at NADDEC (Country) and the region, we engaged in the following activities:
  - Trained data entrants on usage of Epiinfo at NADDEC to improve data quality at NADDEC
  - Facilitated One Health Training in Ntoroko District, 23rd to 27th, April, 2018 as part of support to animal disease surveillance activities in Uganda
  - Facilitated a stakeholders meeting to operationalize National Rabies Control Strategy in Uganda, 2019-2023
  - Trained District Surveillance Veterinary focal persons on early disease reporting, disease detection, and outbreak response using One Health approach in Buyende District and Mid-Western

Uganda. This was support to animal disease surveillance activities

- Trained District Surveillance focal persons on early reporting, and outbreak investigation and response from selected disease hot spot districts in August 2019
- Participated in Joint Risk Assessment (JRA) training for assessing health risks at the interphase between animals and humans, Jinja, 2019
- Trained Rubirizi, Kamwenge and Kabarole district top leadership (RDC, CAO, DHO, DVO's, Game wardens etc.) on Hazard analysis and Disaster risk management
- Represented Uganda in development of a manual guiding countries globally in establishment of Animal Health Emergence Operation centre (AH-EOC) in Rome, Italy, in December, 2018; March 2019 and October, 2019
- Facilitated One Health Trainings in surveillance and infectious Disease Management at Micelle, Jimma and Addis Ababa Universities, Ethiopia, 2018. This was support to disease surveillance activities in the region
- Trained IOWA state university students on how One Health Approach has been applied in Disease detection and Outbreak responses of Zoonotic Diseases at NADDEC, 2019. This was part of sharing the success stories of One health in Uganda
- National trainer for Joint Risk Assessment tool (A tool used to prioritise risks at the interphase between animals and humans)

Fellowship program specific achievements

Outbreak investigations

Lead investigator:

- Cholera outbreak investigation in Hoima District, 2018. We found that drinking water from the stream was associated with the outbreak. We recommended boiling drinking water to the communities, increasing latrine coverage and safe water access by the District and UNHCR. The outbreak was contained.
- Animal anthrax outbreak investigation in districts of Arua, Kiruhura and Kween, 2018. In these outbreak investigations, we found that in districts where human outbreaks occurred, animal outbreaks occurred, which were associated with butchering suspected anthrax-infected livestock and improper carcass disposal. We recommended vaccination of domestic ruminants for anthrax, proper carcass disposal, and sensitization of communities, game reserve wardens, animal and medical health workers about anthrax control.
- Ebola Virus Disease Preparedness in the districts of Bundibugyo and Ntoroko, 2018. We found that readiness and preparedness for EVD response in the Bundibugyo and Ntoroko Districts was wanting. We recommended immediate actions on the identified gaps in the EVD preparedness core capacities in the high-risk districts of Bundibugyo and Ntoroko.
- Ebola Virus Disease Preparedness in Kagadi and Rubirizi Districts, 2018. We found that readiness and preparedness for EVD response in the Kagadi and Rubirizi Districts was very low. We recommended immediate actions on the identified gaps in the EVD preparedness in all the core capacities in the high-risk districts of Kagadi and Rubirizi.

Co-investigator:

- Investigation of anthrax outbreak investigation in Kiruhura District in humans, 2018. We found that cutaneous Anthrax outbreak in humans was caused by skinning and cleaning of waste from dead animals. The team implemented the following immediate control measures in the infected villages, Engari Sub-county: provision of Post Exposure Prophylaxis to community members, sensitized the community on the dangers of consuming meat from dead animals, and participated in safe disposal of dead animals in Engari Sub-county. We recommended vaccination of all animals in affected sub county and safe disposal of dead animals.
- Investigation of malaria outbreak investigation in Gomba District, 2019. We found that two sub-counties were affected by malaria. Transmission of malaria was exacerbated by presence of water logging around households. We recommended drainage of the water-logged areas around households.
- Investigation of malaria outbreak investigation in Mbale District, 2019. We found that presence of erosion control pits was significantly associated with the occurrence of malaria outbreak. Lack of awareness on malaria transmission and control highlighted by the belief that mosquito nets brought bedbugs also created laxity on preventive measures. We recommended removal of potential mosquito breeding sites and draining of erosion pits regularly. Community awareness on malaria prevention and control mechanisms should be done.

Epi-bulletin Articles

- Cholera outbreak in Kyangwali Refugee Settlement in Hoima, Uganda, 2018. We found that stream water was associated with cholera outbreak. We recommended increased access to safe water in all affected communities.
- Prolonged Animal Anthrax outbreak amplified by slaughtering infected carcasses on the pastureland in Arua District, Uganda, 2016 – 2018. Animal anthrax infection in Arua District was associated with butchering of anthrax infected animals on the pastureland, and grazing animals near the river bank. We recommended vaccination of domestic ruminants at risk against Anthrax and enhanced sensitization of all the key stakeholders about anthrax control.
- Animal Anthrax outbreak caused by slaughtering infected carcasses on and or near the pastureland, Kiruhura District, Uganda, May-October 2018. Butchering anthrax infected carcasses on and or near the pastureland and improper disposal of infected carcasses were associated with anthrax infection in animals. We recommended vaccination of domestic ruminants at risk against anthrax and enhanced sensitization of the key stakeholders about anthrax control.
- Animal Anthrax outbreak triggered by butchering infected carcasses on and or near the pastureland, Kween District, Uganda: January - December 2018. Animal anthrax infection in Kween District was associated with improper disposal of infected carcasses and butchering anthrax infected carcasses on or near the pastureland were the main exposures. We recommended vaccination of domestic ruminants at risk against anthrax and improved

sensitization of the communities; animal health workers and medical health workers about anthrax control.

- Trends and Treatment Outcomes of Pediatric Tuberculosis, Mbale Regional Referral Hospital, Uganda, 2013-2017. We found out that TB treatment completion rate was below the WHO recommendation of 85%. Better TB completion rate was associated with TB patients residing ≤ 20km from the Hospital. To improve completion of TB treatment, MRRH should consider designing a means of follow up of TB patients who transfer out due to long distance to ensure they complete TB treatment in the scheduled period. Ministry of Health should consider educating communities on the importance of completing TB treatment.
- Animal bite patterns and delays in initiating Post Exposure Prophylaxis (PEP) caused by Vaccine stock- outs at Arua Regional Referral Hospital, Arua District, Uganda: 2014-2018. We found that there was low timely initiation of PEP among animal bite victims in Arua District associated with stock-outs of rabies vaccine at ARRH. We recommended increasing availability of rabies vaccine at ARRH guided by animal bites data from the veterinary department; and sensitization of the public about PEP usage to minimize the dangers of animal bites/rabies in humans.

Policy Brief

- "*Adopt compulsory vaccination of pets against rabies to prevent human rabies*". In this policy brief, we emphasized that rabies can be controlled in pets and prevent spillage to human population. The government of Uganda through the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), Ministry of Health (MoH), Uganda Wildlife Authority (UWA) needs to design and strengthen collaborative strategies that enable compulsory vaccination of pets against rabies to ensure elimination of dog mediated human rabies by 2030.

Newspaper Articles

- Embrace Animal Anthrax Vaccination to save lives- Daily Monitor, 26th April, 2019
- Beware of animal-to-human diseases- Daily Monitor, 9th Aug, 2019: Featured as letter of the day
- Rabies vaccination- Uganda's New Vision, 25th September 2019
- Embrace compulsory vaccination of pets against rabies to prevent human rabies, New Vision, 28th September, 2019
- Rabies vaccine stock-outs in health care facilities delays uptake among animal bite victims, New Vision, 28th September, 2019

Conference Presentations

- Prolonged cholera outbreak in Kyangwali refugee settlement caused by drinking contaminated water from the stream, Hoima, Uganda, 2018, Time: 15:00-15:15 hours, 26th September, 2018 *(AFENET Conference, Maputo, Mozambique, 12-16, November, 2018 & JASH Conference, 26-28 September, 2018 & 4th National Field Epidemiology Conference, 30th September, 2018)*
- Anthrax Outbreaks among Domestic Ruminants Associated with Butchering Infected Livestock and Improper Carcass Disposal: Three Districts, Uganda, 2016-2018, Time:9:10am-9:20am *(10th TEPHINET Global Scientific Conference,*

Atlanta, USA, 28th October-01st November, 2019 &5th National Field Epidemiology Conference, 24th October, 2019)

- Trends and spatial distribution of animal bites and vaccination status among victims and the pet population, Uganda: A veterinary surveillance system analysis, 2013 – 2017, Time: 4:10pm-4:20pm *(5th National Field Epidemiology Conference, 24th October, 2019)*
- Rabies Vaccine stock-outs delays uptake among animal bite victims at Arua Regional Referral Hospital, Uganda: 2014-2018. Time: 9:50am-10:00am on 7th November, 2019 *(JASH-GDC-AMR Conference, 6-8, November, 2019)*
- Trends and Treatment Outcomes of Pediatric Tuberculosis at Mbale, 6th November, 2019 *(JASH-GDC-AMR Conference, 6-8, November, 2019)*
- One Health Champion, 12:10pm-12:20pm 24th, July 2019 (*3rd OHCEA International Conference, 24-26, July 2019*)
- Correlates of Early Retention among newly initiated persons on HIV treatment in Kampala and Wakiso Districts, Uganda: 2018 *(PEPFAR Science Summit, 13-14, Jan, 2020)*

HIV project

- Correlates of Early (3-6 months) Retention among newly initiated persons on HIV treatment in Kampala and Wakiso Districts, Uganda: 2018. We found out that the sub group of young adults (aged 20-30) in cohort January-March 2018 had a lower early retention. Early retention was associated with increasing residential distance from the Urban Health facility and decreasing distance from rural health facility. May be due to Urban stigma and rural transportation costs. We recommended that the District Health Office and Ministry of Health should conduct regular refresher training of health workers and community sensitization against stigma of ART patients.

QI project

- Improving the reporting rates of animal bites through quality improvement approaches in Sironko District, Uganda, 2019. This led to 100% improvement in animal bites reporting. Improved animal bites reporting was associated with teamwork, adoption of appropriate data collection tools and sensitization.

TB Operations Research

- Trends and Treatment Outcomes of Pediatric Tuberculosis at Mbale Regional Referral Hospital, Uganda, 2013-2017. We established that TB treatment completion rate was below the WHO recommendation of 85%. Better TB completion rate was associated with TB patients being HIV- negative. To improve completion of TB treatment, MRRH should strengthen HIV treatment services among childhood TB patients who are HIV-positive through involving community linkage facilitators.

Epidemiologic Study

- Animal bite patterns and delays in initiating Post Exposure Prophylaxis for rabies prevention among animal bite victims at Arua Regional Referral Hospital, Arua District, Uganda: 2014-2018. We established that delayed rPEP initiation was associated with stock-outs of rabies vaccine at ARRH. We recommended increasing availability of

rabies vaccine at ARRH guided by animal bites data from veterinary department; and sensitization of the public about rPEP to minimize the consequences of animal bites.

- **Manuscripts**
- Trends and spatial distribution of animal bites and vaccination status among victims and the animal population, Uganda: A veterinary surveillance system analysis, 2013 – 2017- Submitted to PLOS one Journal
- Prolonged Cholera Outbreak Caused by Drinking Contaminated Water from a Stream, Kyangwali Refugee Settlement, Hoima District, Western Uganda: February-May 2018- Submitted to BMC Infectious Diseases journal
- Anthrax Outbreaks among Domestic Ruminants Associated with Butchering Infected Livestock and Improper Carcass Disposal in Three Districts of Uganda, 2016-2018- Submitted to BMC One Health Outlook journal
- Trends and Treatment Outcomes of Pediatric Tuberculosis at Mbale Regional Referral Hospital, Uganda, 2013-2017- Under peer review
- Animal bite patterns and delays in initiating Post Exposure Prophylaxis for rabies prevention among animal bite victims at Arua Regional Referral Hospital, Arua District, Uganda: 2014-2018- Under peer review
- Evaluation of Animal Disease Surveillance System: Arua District, 2019 - Under peer review
- Improving the reporting rates of animal bites through quality improvement approaches in Sironko District, Uganda, 2019 - Under peer review
- Correlates of Early (3-6 months) Retention among newly initiated persons on HIV treatment in Kampala and Wakiso Districts, Uganda: 2018 – Under peer review
- Trends and spatio-temporal distribution of brucellosis in animals in Uganda, 2014-2018 **-** Under peer review
- Trends and spatio-temporal distribution of bovine tuberculosis in animals in Uganda, 2014-2018 – Under peer review

Editorial work

- Editor for the UNIPH bulletin Volume 3, Issue 3, July-Sept 2018

Special presentations during high level visits in 2018 and 2019

- Anthrax presentation during US CDC Director's visit to Uganda, 2018
- Anthrax presentation during US Secretary of Health and Human Services visit in Uganda, 2019

Mini Grants

- Awarded a mini grant from Infectious disease institute to evaluate animal disease surveillance system in Arua District, 2019.
- Awarded a mini grant from Food and Agriculture Organization to organize a national anthrax symposium that led to the formation of National Anthrax Prevention and Control Technical Working Group (NAPCTWG) for Uganda, 2019.

Summary of Epidemiological Study

Title: Anthrax Outbreaks among Domestic Ruminants Associated with Butchering Livestock and Improper Carcass Disposal: Three Districts, Uganda, 2016-2018

Introduction: In 2017 and 2018, human anthrax outbreaks occurred in Arua, Kween and Kiruhura districts, Uganda. Investigations indicated eating and handling meat from domestic ruminants that died suddenly caused these outbreaks. We investigated to determine the existence and extent of anthrax in domestic ruminants, identify exposures, and recommend control measures.

Methods: We defined a suspected case-animal as sudden death with unclotted blood oozing from body orifices in a domestic ruminant during 2016–2018 in the above-mentioned districts. A probable case-animal was a suspected case-animal with a positive rapid diagnostic test (RDT) for *Bacillus anthracis* and/or identification of Gram-positive rods from a specimen. A case-kraal was one with a suspected case-animal. A kraal meant "an enclosure for cattle or sheep" in this study. We reviewed district veterinary records and conducted active case-finding for case-animals. We conducted case-control studies in the three affected districts separately to compare exposures among case-kraals and control-kraals (with no suspected case-animals during the same time period), frequency-matched by village, with ratios of 1:1 in Arua, 1:4 in Kiruhura and 1:2 in Kween. We estimated the overall associations using pooled analysis.

Results: We identified 1971 case-animals during 2016–2018 (attack rate[AR]=1.4/1000); 229 of 31500 kraals (7.3/1000) were affected. Cattle (AR=2.3/1000), goats (AR/1000=0.39/1000) and sheep (AR=0.094/1000) were all affected. Arua (AR=14/1000) was the most affected district, followed by Kween (AR=2.5/1000) and Kiruhura (AR=0.095/1000). The epidemic curve indicated continuous outbreaks in Arua and Kween districts. Human outbreaks were reported during or after the onset of livestock outbreaks in all three districts. Butchering suspected anthrax-infected livestock (OR=8.0; 95%CI=5.2-12) and improper carcass disposal on/near pastureland (OR=1.7, 95%CI=1.1-2.4) were significant exposures. Of 21 animal carcasses tested, 14 (67%) were positive for *B. anthracis* by both RDT and gram stain.

Conclusion and recommendations: Ugandan districts with human anthrax outbreaks had concurrent livestock anthrax outbreaks associated with nearby butchering and improper carcass disposal of livestock with suspected anthrax. We recommended anthrax vaccination for domestic ruminants, proper carcass disposal, increased surveillance for sudden livestock deaths, increased capacity for laboratory confirmation, and sensitization to livestock-keepers about anthrax control.

Key words: Anthrax, animal; Disease outbreaks; pooled-analysis; Global Health Security; Uganda, *Bacillus anthracis,* Rapid diagnostic test

Key lessons learnt during the fellowship

- Outbreak investigation and response skills
- Scientific Writing and communication skills: abstract and manuscript writing in peer reviewed journals, presentations, policy briefs, newspaper articles, bulletin articles, trainings, dissemination meetings.
- Leadership skills: Anthrax symposium, Class president, implementation of QI and Operational research
- Evaluation of disease surveillance systems
- Epidemiological data presentation

using QGIS and EPI info
- Team work through outbreak investigations

Next Steps

With the epidemiological skills and competencies gained coupled with hard work, commitment, discipline and teamwork, Fred hopes to have a great career in epidemiology especially in building capacity and systems for preparedness, early detection, and response to public health threats. As a public health leader, Fred hopes to write and win grants to create a difference in the society through epidemiological work for a safer and healthier world for all.

Pictorial and narrative

Dr. Fred Monje, interviewing a Kraal head in Pawor Sub-county, Arua District during animal anthrax investigation, July, 2018

Dr. Fred Monje (Centre) interviewing a Kraal head in Pawor Sub-county, Arua District during animal anthrax investigation, July, 2018

Angella Musewa:
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Host Site: National Animal Disease Diagnostics and Epidemiology Centre, Entebbe Uganda

Host Mentors:

- Dr. Deo Ndumu Birungi
- Dr. Joseph Serugga
- Mr. Martin Esau

Fellow's Profile

Angella Musewa holds a Bachelor of Biomedical Laboratory Technology (BLT) and Master of Science in Clinical Epidemiology and Biostatistics from Makerere University. During her two years of the fellowship, she has gained skills in writing, leadership, communication, reporting of public health events, coordination, management and analysis of public health surveillance data. In addition, I gained competencies in preparing policy briefs, using epi-info & STATA. I prepared several articles for publication in the Ministry of Health quarterly epidemiological bulletin, technical reports and manuscripts. I have gained experience, organizing meetings/ trainings, conducting epidemiological investigations and quality improvement projects. I have gathered skills and expertise in extracting, cleaning and analyzing secondary.

Prior to joining the fellowship, Angella completed a fifteen weeks graduate fellowship in infectious Disease Management supported by USAID and Minnesota University – implemented by Makerere University School of Public Health and College of Veterinary Medicine, Animal Resources and Biosecurity. Angella led outbreak investigations under the One Health Student's clubs supported by One Health Central and Eastern Uganda. Angella worked with the International Livestock Research Institute (ILRI) as a research associate on Safe Food Fair projects and the Small Holder Pig Value Project. Angella has been involved in investigations of various disease outbreaks including Marburg, Rift Valley Fever, Crimean Congo Viral Hemorrhagic Fever, Cholera, and Anthrax. Angella was involved in the development a National Trainers manual for one health district frontiers and is currently a national trainer for one health district frontiers and Integrated Disease Surveillance and Response.

Achievements at the Host site: National Animal Disease Diagnostics and Epidemiology Centre (NADDEC)

- Analyzed surveillance data on Trends and Distribution of Anthrax cases in Uganda 2003- 2017. Given our findings, a policy brief entitled reclassify anthrax from a private good disease to a public good disease was developed and published in the quarterly epidemiological bulletin as well as the host site.
- Analyzed data on a sero-survey study conducted across the country on RVF in

cattle, sheep and goats in 2016. A manuscript was developed and currently under peer review.

- Presented Foot and Mouth Disease data on maps showing the affected districts in Uganda over a certain period of time (2017-2018). These maps have been put on display at NADDEC and are used to monitor the trends of Foot and Mouth Disease in Uganda as well as progress towards its control in cattle.
- Participated in the young scientists' symposium on One health with a focus on infectious Diseases in Africa- held in Durban May 2019. During this symposium, the One health working group for Africa formulated a one health communique on which I am representing Uganda. I am in-charge of writing and reporting one health events from Uganda on a quarterly basis which are later published.
- Participated in a three weeks course in advanced field epidemiology in Gothenburg Sweden, September 2018. Given this training, on return, I was able to analyze data and applied all the knowledge gained into data management. I was able to design a data base for RVF serological data collected given the knowledge obtained.
- Represented NADDEC during a stakeholder's meeting on outbreak response and prevention at Uganda Virus Research Institute, February 2019. The challenges NADDEC is facing regarding timely response were voiced and subsequent meeting were held to discuss the way forward.
- Participated in a FAO meeting on Institutional networks and policy framework for One Health in Uganda, May 2018. A training manual was drafted which is currently used for training one health district front liners in Uganda.
- Trained frontline extension staff in Ntoroko district on Animal Disease Surveillance and Reporting for One Health 25th – 27th April, 2018.
- Participated in a dissemination meeting for In-Service Veterinarians supported FAO while they were sharing their findings from their field placements to their facilitators ahead of certificate awarding in May 2019.
- Designed a data base for the sero-survey of RVF in cattle, sheep and goat for data entry in epi-info. This database is currently used to retrieve data on RVF sero-prevalence.

Fellowship program specific achievements

- Made a presentation on Fatal Rift Valley Fever Outbreak Caused by Exposure to Sick Animals: Western and Central Uganda, July 2018 during the high level visit of the US Secretary of Health, Minister for Health- Uganda among other delegates from the US and Uganda.
- Participated in a simulation exercise on Crimean Congo Viral Hemorrhagic Fever at Kiswa Health Centre III, during a visit of the CDC director in Uganda, July 2018.
- **Lead Investigator**:
    - Fatal Rift Valley Fever Outbreak Caused by Exposure to Sick Animals: Western and Central Uganda, July 2018.
    - Outbreak of Cutaneous Anthrax Associated with Handling Meat of Dead Cows: Engari Sub-County, Kiruhura District,

Southwestern Uganda, May 2018.
    - Cluster of Sudden Deaths due to Carbon Monoxide Poisoning in Malaba Township, Tororo District, Uganda, August 2018.
- **Co-Investigor**:
    - Cholera outbreak in Kampala along Nalukolongo channel, February 2019.
    - Crimean Congo Viral Hemorrhagic Fever in multiple districts in Central and Western Uganda, June 2018- January 2019.
    - Cholera outbreak in Kyangwali Refugee settlement in Hoima district, February 2018.
    - Ebola Risk mapping and assessment in Kagadi and Rubirizi districts, May 2019.
- Wrote a policy Brief on reclassification of anthrax from a private good disease to a public good disease in the Uganda National Institute of Public Health, Volume 4 Issue 1 April 2019
- Conducted TB Operations Research on: Turnaround Time (TAT) for Microbiological Testing of Tuberculosis in Routine Clinical Practice and Time to Patient Initiation on Treatment, Iganga Hospital, 2012-2017. Findings from this project highlighted significant delays in TAT from sample collection to reporting Xpert MTB/RIF results and treatment initiation. We designed a quality improvement project aiming at improving Turnaround Time for Microbiological Testing of Tuberculosis in Routine Clinical Practice and Time to Patient Initiation on Treatment, Iganga Hospital, 2012-2017. This was successful implemented to completion, and the causes of delays were identified and recommendations to overcome them were instituted.
- Conducted an HIV study on Prevalence and predictors for virological Non-suppression among HIV-Positive patients in Uganda Jan 2016- March 2017
- Analyzed surveillance data on Trends and Distribution of Anthrax among Humans and Animals in Uganda, 2003-2018.
- Conducted an epidemiological investigation on Risk factors for mortality among Human African Trypanosomiasis Patients admitted at Lwala Hospital, Kaberamaido District, 2004 – 2014.

Conference Presentations

- Fatal Rift Valley Fever Outbreak Caused by Exposure to Sick Animals: Western and Central Uganda, July 2018 at the *10th TEPHINET Conference in Atlanta Georgia, October 2019*.
- Turnaround Time for Microbiological Testing of Tuberculosis in Routine Clinical Practice and Time to Patient Initiation on Treatment, Iganga Hospital, 2012-2017 at the *4th National Field Epidemiology Conference in Kampala, October 2019*.
- Outbreak of Cutaneous Anthrax Associated with Handling Meat of Dead Cows: Engari Sub-County, Kiruhura District, Southwestern Uganda, May 2018 at the *3rd National Field Epidemiology Conference held in Kampala, November 2019*.

Manuscripts

- Outbreak of Cutaneous Anthrax Associated with Handling Meat of

Dead Cows: Engari Sub-County, Kiruhura District, Southwestern Uganda, May 2018.

- Fatal Rift Valley Fever Outbreak Caused by Exposure to Sick Animals: Western and Central Uganda, July 2018
- Cluster of Sudden Deaths due to Carbon Monoxide Poisoning in Malaba Township, Tororo District, Uganda, August 2018

Epi-bulletin articles

- Cluster of Sudden Deaths due to Carbon Monoxide Poisoning in Malaba Township, Tororo District, Uganda, August 2018
- Fatal Rift Valley Fever Outbreak Caused by Exposure to Sick Animals: Western and Central Uganda, July 2018 at the 10th TEPHINET conference in Atlanta Georgia, October 2019.
- Outbreak of Cutaneous Anthrax Associated with Handling Meat of Dead Cows: Engari Sub-County, Kiruhura District, Southwestern Uganda, May 2018.
- Reclassify Anthrax from Private Good Disease to Public Good Disease.

Newspaper Articles

- Published a Newspaper article in new vision on 12 August 2018, on "Beware of Rift Valley Fever in Uganda."

Summary of Epidemiological Study

Title: Fatal Rift Valley Fever Outbreak Caused by Exposure to Sick Animals: Western and Central Uganda, July 2018.

Background: Rift Valley Fever (RVF) is a viral hemorrhagic fever that can be fatal to humans and livestock. During June–October 2018, an upsurge of RVF cases occurred in western and central Uganda. We investigated to estimate the scope of the outbreak, identify exposure factors, and recommend evidence-based control measures.

Methods: We defined a probable case as acute onset of unexplained fever with thrombocytopenia or leukopenia, plus ≥1 of: unexplained bleeding, blurred vision, or unexplained death during June–October 2018 in a resident of eleven affected districts. A confirmed case was a probable case with a positive serum test for RVF by RT-PCR. We reviewed medical records, searched communities for cases and sampled animals in affected districts. In a case-control study, we compared exposures of cases and age-, sex-, and neighborhood-matched controls.

Results: We identified 19 cases (17 confirmed, 2 probable); 13 (68%) died. The attack rate (AR) was 19 times as high in males (8.7/1,000,000) as in females (0.46/1,000,000). Of the 18 case-patients included in the case-control study and 90 controls, 10 case-patients (56%) and (8.0%) had a history of butchering/cutting/carrying sick/dead livestock (OR_{MH}=22, 95%CI=4.6-110). Exposure to raw meat from healthy livestock was protective against RVF (OR_{MH}=2.1, 95%CI=0.36-31). Of 100 livestock serum samples, 72 (72%) were IgM-positive for RVF.

Conclusions: This outbreak was caused by exposure to raw meat from sick/dead livestock. RVF infection in area livestock appeared to be widespread. We recommended banning the processing of meat from sick/dead livestock.

Key lessons learnt during the fellowship

- Improved communication skills; Train district veterinary officers openly and with confidence

- Presentation skills; presented my investigations at both local and international conferences
- Improved scientific writing skills (proposal/protocol writing, manuscript writing)
- Project Management (Gained experience in conducting projects to completion)
- Improved data analysis skills especially advanced analysis
- Expanded professional Network (Got to know a number of persons instrumental in my profession)
- Ability to Multitask
- Improved analytical skills (Deeper understanding of elements)
- Public speaking (with a lot of opportunity to present to different fora and researchers)

Next Steps

The Africa One Health University Network (AFROHUN), formerly OHCEA Regional Secretariat appointed me as the AFROHUN-Uganda Country Manager. My tasks shall be to:

- Coordinate AFROHUN- Uganda's agenda and provide strategic guidance to the country.
- Coordinate with university leadership, including Deans and University top management, within and across member institutions.
- Strengthen national level coordination with government and other stakeholders. Strategic partnership engagement including but not limited to government, private sector, civil society, and community.
- Broaden the scope of operation (One Health) and reporting beyond, disciplines, institutions, and countries
- Support the process of bringing on board new institutions and actors.
- Provide leadership and support to programme management and capacity development.
- Identify programming gaps and develop strategies to address them.
- Manage timely dissemination of programme reports to the Regional Secretariat and stakeholders.
- Identify scientific publication ideas and support teams to write publications.

Pictorial and Narrative

Angella interviewing one of the residents on possible alternative water sources around the landing site and the use of water collected from the Lake Albert in Hoima District, February 2019

Angella interviewing a Veterinary Officer in Engari sub-county, Kiruhura District on farming practices prior to the Anthrax outbreak in May 2018

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Host Site: National Tuberculosis and Leprosy Program (NTLP), Ministry of Health

Host Mentors:

- Dr. Stavia Turyahabwe
- Dr. Robert Majwala

Fellow's Profile

Carol has a Bachelor of Medicine and Bachelor of Surgery, and a Master of Public Health from Makerere University. Before joining the fellowship, Carol worked in the field of HIV and TB for a good time. She has extensive knowledge in HIV/AIDS and Tuberculosis patient care including prevention care and treatment, capacity building and health systems strengthening. She successfully built capacity of both public and private health care workers in TB and HIV patient centered care through on site mentorships programs to improve quality of patient care and retention. These included practical trainings in clinical care, quality improvement projects, recording and reporting. Through this experience, she developed planning, budgeting, mentorship, report writing and leadership skills. During the fellowship, she gained competences in investigating disease outbreaks including Ebola Virus disease preparedness, proposal writing, data management and analysis, report, abstract, manuscript writing, presentation and publishing skills for articles in the local newspapers, national bulletins and international journals. She has a successful track record of employing evidence base findings, resilience and determination to achieve required outputs.

Achievements at the Host site

- Developed the 2018/19 community TB Annual Operational Plan which enabled advocacy for financing and implementation on of national community based activities.
- Drafted the Community TB Guidelines in 2018 which was approved in 2019 and is used to enhance implementation of TB activities at community level by all Implementing Partners and Civil Society Organizations.
- Developed community section of the MoH participants' manual for the in-service course on integrated and comprehensive TB and Leprosy management and control in 2018. This has been used in district level trainings to improve implementation of community TB activities such as TB case finding through contact tracing.
- Investigated and reported on the suspected TB outbreak in Butabika Hospital in 2018 that led to routine TB screening and early treatment of TB among psychiatric patients in Butabika Hospital.
- Conducted a descriptive analysis and presented a report on TB in Karamoja Region to NTLP. This contributed to advocacy for support to TB patient

follow up and treatment activities in Karamoja Region by donor agencies such as Doctors with Africa under Italian non-Government organization for University Colleagues, Aspirants and Medical Missionaries CUAMM).

- Participated in the revision of the Tuberculosis Health Information Management Systems (TB- HIMS) tools which led to the incorporation of TB community activities in the national surveillance and reporting system.
- Carried out data quality assessment in Amudat District in 2019 which led to improved accuracy of reporting in Karamoja Region.
- Conducted support supervision in Kamwenge District in 2019 to enhance TB case finding and better TB treatment outcomes.
- Conducted a Quality Improvement project on improving TB screening among HIV patients in Kotido Health Center IV. This led to increased proportion of HIV patients screened for TB at Kotido Health Center IV from a mere 38% to 85% and the number of presumptive TB patients also increased by 50%.
- Published two NTLP quarterly bulletins of October-December 2018 (Vol 2 Issue 4) and January-March 2019 (Vol 3 Issue 1) in which the following articles were published: TB Outbreak in Butabika Hospital, the 2019 World TB day celebrations and dissemination of TB operations research by UPHFP fellows.
- Published a newspaper article on the role of the public in ending TB in Uganda and compiled the Ministerial press statement for World TB Day celebrations, 24th /Mar/2019.
- Represented NTLP in Quarterly TB performance review meetings in Mbale District.

Fellowship program specific achievements

Disease outbreak investigations

Lead investigator:

- A suspected intussusception outbreak in Kampala which led to the development of a concept and budget for the intussusception national baseline survey submitted for funding to WHO Country Office in March 2018.
- Crimean Congo Haemorrhagic Fever outbreak investigation in Kakumiro and Mubende Districts in May 2018. Our findings revealed that the outbreak was caused by CCHFV-infected tick bite with an epidemiological link to tick infested livestock from Kyankwanzi District. We recommended spraying of livestock with acaricides, disinfection of livestock owners' homes and quarantine on livestock movement from CCHF affected districts to stop the transmission of CCHFV in Kakumiro District. This investigation contributed to advocacy for Government interventions to support use of acaricides by farmers to spray their animals.
- TB outbreak in Butabika National psychiatric Hospital, Kampala District, Uganda, December, 2018. We concluded that the outbreak may have been caused by ward congestion and inadequate infection control measures in place. We recommended reduction of ward congestion by implementing the recommended inter-bed spacing of at least 2.5 meters, routine in patient TB screening for early identification, isolation of TB patients and initiation of TB treatment.

- Ebola Virus Disease preparedness assessment and risk mapping in Kabarole and Bunyangabu Districts in August 2018. These findings were used to develop the district and national contingency plans that enabled facilitation and resource mobilisation for preparedness and prevention of importation of Ebola into the districts and country.

Co-Investigator:

- A prolonged Cholera outbreak in Kyangwali Refugee Settlement in Hoima District conducted in March 2018. This was a propagated outbreak caused by drinking contaminated stream water in the settlement.
- A suspected Typhoid intestinal perforation outbreak in Kabarole District conducted in July 2018. This was a case of misdiagnosis because of lack of confirmation by blood culture.
- An anthrax outbreak in Kiruhura District conducted in September 2018. Handling and butchering infected dead animals led to the disease outbreak.
- A malaria outbreak in Kyotera District conducted in July 2019. The findings revealed that the sustained stagnant water due to a prolonged rainy season increased mosquito breeding sites in addition to lack of functional mosquito nets which led to the outbreak.

Analysis of Surveillance data

- Conducted a descriptive analysis of surveillance data of TB in Karamoja Region. It was the most affected region with TB and the major finding was that TB mostly affected the elderly above 60 years of age. This led to additional support for TB care and treatment in the region from international agencies like CUAMM.
- Studied the characteristics and treatment outcomes of Multi-Drug Resistant Tuberculosis (MDR-TB) and Rifampicin Mono-Resistant Tuberculosis (RMR TB) patients in Uganda 2012-2017. The major finding was that MDR-TB and RMR-TB patients had similar demographic and clinical characteristics but poor treatment outcomes were associated with HIV positive MDR-TB compared to HIV positive RMR-TB patients
- Characterized Non-Occupational Post Exposure Prophylaxis for HIV in 5 Urban Health Centres of Kampala, Uganda: January 2016 - June 2019. We found that attendance at follow-up visits for HIV testing was poor and recommended exploration of the causes to improve service completeness, and integration of PEP with other HIV prevention services.

HIV study

- Using secondary data analysis from Ministry of Health Post Exposure Prophylaxis registers, we characterized Non-Occupational Post Exposure Prophylaxis for HIV (NPEP) in 5 Urban Health Centers of Kampala, Uganda: January 2016 - June 2019.The major finding was that sexual exposure is the main indication for NPEP in Kampala. Attendance at follow-up visits for HIV testing was poor and was associated with PEP receipt 24-72 hours after exposure and knowing the HIV status of the exposure source. We recommended exploration of causes of poor follow-up after PEP to improve adherence and explore opportunities for linkage to additional services.

Epidemiological study on TB/HIV

- Using secondary data from the 2017 Ministry of Health TB/HIV policy evaluation study, I studied the Predictors of Mortality among TB/HIV co-infected patients before and after implementation of the TB/HIV Collaborative Policy in Uganda, 2012 and 2016. The major finding was that mortality of TB/HIV co-infected patients slightly increased after implementation of the revised TB/HIV policy. Clinically-diagnosed and extra pulmonary TB predicted mortality, while ART was modestly protective. We recommend further studies to establish the cause of increased mortality after policy initiation.

Conference Presentations

- "Ebola preparedness assessment in Uganda August –September 2018" at the *10th TEPHINET Global Scientific Conference in Atlanta Georgia USA, October 2019 and 4th National Field Epidemiology Conference in November 2018*
- "Predictors of Mortality among TB/HIV co-infected patients before and after implementation of the TB/HIV Collaborative Policy in Uganda, 2012 and 2016" at the *5th National Field Epidemiology Conference in October 2019 and 15th MAKCHS Joint Annual Scientific and Health Conference(JASH) & 4th Grande Doctors' Conference in November 2019*.

Manuscripts

- Ebola Virus Disease Preparedness and Risk Mapping: Uganda, August-September 2018" submitted to the Health Security Journal.
- Uganda's experience in the Ebola Virus Disease Outbreak preparedness, 2019 under peer review.
- Predictors of Mortality among TB/HIV co-infected patients before and after implementation of the TB/HIV Collaborative Policy in Uganda, 2012 and 2016, under peer review.
- Characteristics and treatment outcomes of MDR and RMR TB patients in Uganda 2012-2017, under peer review.
- Characterizing Non-Occupational Post Exposure Prophylaxis for HIV in Five Urban Health Centers of Kampala, Uganda: January 2016 - June 2019, under peer review.

Epidemiological Bulletin Articles

- The MoH-UNIPH Quarterly Epidemiological Bulletin, Volume 3, Issue 3 (July - September 2018) in which I published the technical highlights on the Ministry of Health-Uganda Public Health Fellowship Program (MOH/PHFP) scientific work at the 14th Joint Annual Scientific Health (JASH 2018) conference in Kampala, and the Ebola Virus Disease (EVD) Preparedness in Western Uganda, 2018.
- Epidemiological articles in the MoH-UNIPH Quarterly Epidemiological Bulletin, Volume 3, Issue 2 (April – June 2018); One on the suspected intussusception outbreak in Kampala District and the other on the Crimean Congo Hemorrhagic fever outbreak in Kakumiro District.

Newspaper Articles

- Newspaper article on the dangers of Crimean Congo Hemorrhagic Fever, April 2018.
- Newspaper article on the role of the public in ending TB in Uganda, March

2019.

Epidemiological Study

Title: Predictors of Mortality among TB/HIV co-infected patients before and after implementation of the TB/HIV Collaborative Policy in Uganda, 2012 and 2016

Background: Tuberculosis (TB) remains the leading cause of mortality among HIV patients in Uganda. In 2013, Uganda implemented the revised TB/HIV Collaborative Policy to include co-located TB/HIV services and early initiation of antiretroviral therapy (ART) to reduce mortality among TB/HIV co-infected patients. We examined predictors of mortality among TB/HIV co-infected patients before and after policy implementation.

Methods: We abstracted data from TB Unit registers for co-infected patients who were treated for TB before (July 2012-June 2013) and after (July 2015-June 2016) policy implementation. Patients were categorized into "pre-policy" and "post-policy" cohorts. We used logistic regression to identify predictors of mortality**.**

Results: We examined 15,971 records of co-infected patients. Of these, 8,641 (56%) were in the pre-policy and 7,330 (44%) in the post-policy cohort. Mean age was 34 years in both cohorts. In pre-policy cohort, 956 (11%) patients died compared to 1,018 (13%) in post-policy cohort (OR=1.11; 95% CI, 1.16-1.40, p=0.04) with mean time to death in both of 4.2 months. The mortality rate was higher in post-policy vs pre-policy cohort (5.9 vs. 5.4/100,000, p=0.03). Compared to bacteriologically-confirmed TB, clinically-diagnosed TB had significantly increased odds of mortality in both pre-policy cohort (aOR=1.41; 95% CI, 1.22-1.67) and post-policy cohort (aOR=1.85; 95% CI, 1.59-2.16). Extra-pulmonary TB increased the odds of mortality, compared to bacteriologically-confirmed TB, in pre-policy (aOR=1.57; 95% CI, 1.30-1.90) and post-policy cohorts (aOR=2.42; 95% CI, 2.00-2.93). ART was protective against mortality in post-policy (aOR=0.84; 95% CI, 0.74-0.96) but not pre-policy cohort (aOR = 0.96; 95% CI, 0.87-1.06).

Conclusion: Mortality of TB/HIV co-infected patients increased slightly after implementation of the revised TB/HIV policy. Clinically-diagnosed and extra pulmonary TB predicted mortality, while ART was modestly protective. We recommend further studies to establish the cause of increased mortality after policy initiation. Strategies to ensure early initiation and adherence to ART should be investigated and implemented.

Key lessons learnt during the fellowship

The PHFP has been a wonderful opportunity for hands on learning experience in field epidemiology and public health leadership. The skills and competencies acquired from this practical experience and mentorship with supervision from technical experts in the Ministry of Health and the fellowship program are invaluable.

These include;

- Evaluation and analysis of MoH surveillance systems to generate information for action to improve program implementation strategies and policy formulation for better patient care and disease control interventions across MOH programs.
- National disease outbreak investigations and response as part of the MoH National rapid Response Team (NRRT) and the National Task Force (NTF) to

establish causes of outbreaks and inform early prevention and control interventions to prevent further spread and save lives.

- Operational research through proposal development, secondary data analysis, to generate information to evaluate progress, outputs and impact of MoH program interventions
- Writing and publishing of scientific papers (Manuscripts), reports, policy briefs, and newspaper and Epi-Bulletins articles to inform the public, National and Global health actions for control and elimination of disease epidemics.
- Leadership skills in rapid response and control of disease outbreaks, analysis and evaluation of national surveillance systems, quality improvement and program implementation.

Next Steps

As I leave PHFP, I look forward to working as an epidemiologist with the Ministry of Health, National and international agencies to contribute towards prevention and control of disease epidemics in Uganda and elsewhere in the world.

Pictorial and narrative

Dr. Carol. N (Seated) reviewing TB/HIV records with the Clinic Nurse during a Quality Improvement mentorship at Kotido Health Center IV

Dr. Carol. N discussing TB documentation with the Records Officer at during a data quality assessment exercise in Amudat District

Dr. Carol. N (Standing) conducting a training on TB screening for the clinicians at Kotido Health Center IV for the Quality Improvement project

Godfrey Nsereko: BPharm (MUK), MPH (UMU), PgD-PPM (UMI), Field Epidemiology Fellow (UPHFP)
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Host Site: National Malaria Control Program (NMCP), Ministry of Health

Host Mentors:

- Dr. Jimmy Opigo, Program Manager, NMCP
- Dr. Daniel Kyabayinze, Deputy Program Manager, NMCP
- Dr. Damian Rutazaana, Malaria Epidemiologist, NMCP

Fellow's Profile

Godfrey Nsereko is a Pharmacist and Public Health and Management specialist. He holds a Bachelor of Pharmacy from Makerere University, a Master of Public Health from Uganda Martyrs University and a Post-graduate Diploma in Project Planning and Management from Uganda Management Institute. Godfrey has 10 years demonstrable experience in public health management and leadership. He has interest in both infectious disease and non-communicable disease epidemiology. Prior to joining the fellowship program in January 2018, Godfrey worked with a USAID funded social and commercial marketing organization, Uganda Health Marketing Group, as the Chief Pharmacist and Technical Support Manager. He also worked as a national coordinator for a UHMG-PATH Sayana Press Pilot Introduction and Evaluation Project under the same organization, and also as a Regional Pharmacy Manager in West Nile region.

During the fellowship program, Godfrey was assigned to the National Malaria Control Program, Ministry of Health, under the Departments of Surveillance, Monitoring and Evaluation, and Operational research (SME-OR) and Epidemic Preparedness and Response (EPR)

Achievements at the Host Site

While at NMCP, Godfrey achieved the following:

- Contributed to Policy development through dissemination of a policy brief on cost-effective ways to prevent malaria transmission in endemic Uganda
- Led investigation and response to malaria outbreaks in 2018-2019. As a result of the investigations, some affected local communities were mobilized to use simple cost-effective methods (such as repurposing old mosquito nets as curtains, closing doors early and wearing long sleeve clothing to minimize vector contact) to fight malaria in the communities
- Part of the core team that established a novel Technical Working Group, for Epidemic Preparedness and Response, to steer early detection and prompt response to malaria outbreaks and epidemics in Uganda. As part of this team, I championed review of malaria epidemic preparedness and response

guidelines

- Participated in Malaria Program Review (MPR) and subsequent strategic planning in preparation for new strategic direction towards malaria elimination in Uganda.
- Participated in drafting and review of the M&E operations plan for the LLIN Universal Coverage Campaign 2020
- Conducted weekly malaria morbidity and mortality surveillance. Using centrally aggregated data in the DHIS2, we conducted routine analysis and disseminated key highlights to national and sub-national levels to inform further decision making and action
- Developed and updated malaria program specific systems for collection, analysis, detection and response to malaria upsurges and epidemics. This was under direct stewardship of the malaria epidemiologist of NMCP
- Conducted descriptive analysis of hospitalizations due to malaria in pregnancy in Uganda between 2012 and 2017. We conducted this study to examine the burden of malaria hospitalizations among pregnant women. We anticipate that results of this study will lead to enhancing core interventions for malaria in pregnancy.
- Lead editor of 3 quarterly malaria bulletins that are widely disseminated to malaria stakeholders. The bulletin highlight: key morbidity, mortality and interventional indicators at national and district level; recent advances in prevention, control and treatment of malaria; programmatic intervention updates; and plans for the future
- Participated in capacity building plans for regional and district based systems strengthening for malaria control. This was especially in the area of malaria surveillance and coordination
- Participated in launch of Parliamentary Forum on Malaria and Mass Action against Malaria in April 2018 by H.E The President of Uganda
- Participated in delivering 2 World Malaria day celebrations in Mpigi (2018) and Alebtong (2019) Districts
- Made international presentation on Malaria outbreak investigations and response in the 68th EIS conference, Atlanta, GA
- Presented the Malaria Epidemic Situation to High Level Visit delegation to Uganda in September 2019
- Conducted a quality improvement study on improving adherence to Malaria Test, Treat and Track policy among health workers in Kassanda HCIV, Kassanda District
- Conducted a planned study on Predictors of Malaria in Pregnancy deaths in 3 West Nile Districts in 2018

Achievement of Program-specific Deliverables

Emergency Response

Lead Investigator:

- Malaria Outbreak Facilitated by Heavy Rains and Inappropriate Preventative Measures in Nwoya District, Northern Uganda March – May 2018
- Malaria Outbreak Facilitated by increased breeding sites in Gomba District, Central Uganda March – February
- Participated in an Ebola Virus Disease outbreak in Kasese District, June 2019
- Conducted an HIV rapid assessment titled "*Investigation of increased Intimate Partner Violence (IPV) following Assisted Partner Notification (APN) at HIV clinics*

in Uganda, 2018"

Co-investigator:

- Cholera in Kyangwali Refugee Settlement, Hoima District, February 2018
- Cholera in a School in Hoima Municipality, Hoima District, February 2018
- Intussusception among children under 5 in Kampala and Wakiso Districts, March 2018
- Extra Pulmonary TB in Karamoja region, June 2018
- Malaria Deaths in Kabarole Region, July 2018
- Ebola Virus Disease Preparedness in 5 high risk districts in western Uganda, August 2018

Scientific communication

- Published 1 Abstract Published online (World Academy of Science, Engineering and Technology International Journal of Medical and Health SciencesVol:13, No:2, 2019)
- Published in the local newspaper an article titled "*Oral Cholera vaccine needed for most vulnerable populations in Uganda"*: Published in Uganda's New Vision in April 2018
- Published Letter of the Day: "*Need for cholera vaccination of most at risk populations: Published in Uganda's Daily monitor newspaper*".
- Published two articles in the Uganda National Epidemiological Bulletin
- Made 3 oral presentations at National conferences
- Made 2 poster presentations at international conferences (68th EIS FETP Intl Nights 2019, Atlanta, GA, USA and ICREID 2019, Addis Ababa, Ethiopia)

Policy Brief

- Developed and disseminated a policy brief titled "*Develop Mass Behavioral Change Communication Messages on Cost-Effective Malaria Prevention Methods*". The implementation of this policy will mean that even the least privileged of communities in Uganda can utilize available resources and knowledge to control malaria transmission at household level.

Public Health Surveillance

- Conducted a descriptive analysis of public health surveillance data titled "*Malaria in Pregnancy Hospitalization in Uganda 2012-2017*". We analyzed trends of admissions of pregnant women with malaria. We observed an increasing trend in malaria in pregnancy hospitalizations despite malaria decreasing in the rest of the population. We recommended strengthening interventions in most affected parts of the country.
- Conducted a quality improvement project titled "*Improving Adherence to Malaria Test and Treat Policy in Kassanda HCIV, Kassanda District, April-November 2019*". Following an observed decline in adherence to malaria test, treat and track policy in the health facility, we initiated a proposal to implement this quality improvement project with the staff of the facility. We registered marked improvement in testing before treating patients and cessation of treating RDT and microscopy negative patients with antimalarial drugs.

Public Health Leadership Achievements

As part of public health leadership development domain of the fellowship program, Godfrey achieved the following:

- National Trainer on Ebola Preparedness and Response, Contact Tracing and Surveillance
- Regional supervisor of malaria surveillance and coordination activities in the NMCP
- Provided technical assistance in data collection tool development using ODK and Kobo Collect platforms
- Co-led grant writing and project planning for 2 currently awarded grants under PHFP (The Malaria Test, Treat and Track of the Global Fund and Ending Pandemics projects)
- Showcased PHFP role to US/CDC/MoH delegation during EVD preparedness efforts in Bundibugyo district Sept 2018
- National Stop Transmission of Polio (NSTOP) Officer
- Awarded an opportunity to participate in AFENET Grant writing workshop in Abuja, Nigeria September 2018
- National trainer of the 3rd edition of Integrated Disease Surveillance and Response

Summary of Epidemiological Study

Title: Malaria Outbreak Facilitated by Appearance of Vector-Breeding Sites after Heavy Rainfall and Inadequate Preventive Measures: Nwoya District, Northern Uganda, February–May 2018

Background: Malaria is a leading cause of morbidity and mortality in Uganda. In April 2018, malaria cases surged in Nwoya District, Northern Uganda, exceeding the action thresholds. We investigated this outbreak to estimate the magnitude, identify exposure factors for transmission, and recommend evidence-based control measures.

Methods: We defined a malaria case as onset of fever in a resident of Anaka and Koch Goma sub-counties, and Nwoya Town Council, Nwoya District with a positive Rapid Diagnostic Test or microscopy for malaria from 1 February to 25 May 2018. We reviewed medical records in all health facilities of affected sub-counties to find cases. In a case-control study, we compared exposure factors between case-persons and asymptomatic controls matched by age and village. We conducted entomological assessments on vector-density and behavior.

Results: We identified 3,879 case-persons (attack rate [AR] =6.5%) and two deaths (case-fatality rate=5.2/10,000). Females (AR=8.1%) were more affected than males (AR=4.7%) ($p < 0.0001$). Of all age-groups, the 5-18 year age-group (AR=8.4%) was most affected. Heavy rain started in early March 2018 and a propagated outbreak followed in the first week of April 2018. In the case-control study, 55% (59/107) of case-persons and 18% (19/107) of controls had stagnant water around households for several days following rainfall (ORM-H=5.6, 95%CI=3.0-11); 25% (27/107) of case-persons and 51% (55/107) of controls wore full extremity covering clothes during evening hours (ORM-H=0.30, 95%CI=0.20-0.60); 71% (76/107) of case-persons and 85% (91/107) of controls slept under a long-lasting insecticide-treated net (LLIN) 14 days before symptom onset (ORM-H=0.43, 95%CI=0.22-0.85); 37% (40/107) of case-persons and 52% (56/107) of controls used at least one LLIN per 2 household members (ORM-H=0.54, 95%CI=0.30-0.97). Entomological assessment indicated active breeding sites; Anopheles gambiae sensu

lato species were the predominant vector.
Conclusion: Increased vector breeding sites after heavy rainfall, and inadequate malaria preventive measures caused this outbreak. We recommended increasing coverage for LLINs and larviciding breeding sites in the area.

Key competencies acquired during the fellowship

- Integrated Disease Surveillance and Response
- International Health Regulations 2005
- Data analysis and use for decision making
- Public Health Alert verification and making spot reports
- Making epidemiological reports and technical presentations
- Mentoring and training health workers
- Disease outbreak investigations and response
- Contingency planning for public health emergencies
- Publication and dissemination of work among peers and stakeholders
- Ability to write grants for funding
- Identification and highlighting of funding gaps to attract funding
- Stakeholder/Partner engagement for resource mobilization purposes
- Better understanding of donor/funder requirements prior and during project funding
- Project monitoring, evaluation and reporting

Pictorial

Godfrey presents malaria situation in Uganda during the high level visit by US Secretary for Health, Alex Azar

Godfrey interviews a respondent during an outbreak of extra-pulmonary TB in Napak District

Godfrey (standing) conducts capacity building during the Ebola Virus Disease Preparedness and Response Activities in Isingiro District

Godfrey presents findings of a malaria outbreak investigation during the 68th EIS Conference in Atlanta, Georgia

Vivian Ntono: BScN (MUK), MPH (MUK), Field Epidemiology Fellow -PHFP
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Host Site: Mental Health, Substance Abuse and Neurological Disorders, Ministry of Health & Butabika National Referral Hospital (Alcohol & Drug Unit)

Host Mentors:

- Dr. Hafsa Lukwata
- Dr. Brian Mutamba

About the fellow

Vivian Ntono holds a Master of Public Health and a Bachelor of Science in Nursing from Makerere University Kampala, Uganda. Vivian has worked in a number of research projects, the most recent being the Makerere University John Hopkins University (MUJHU) as a Study Nurse. Vivian was hosted at Mental Health, Substance Abuse and Neurological Disorders, Ministry of Health & Butabika National Referral Hospital (Alcohol & Drug Unit). Vivian has developed skills in applied Epidemiology, effective communication and emergency public response and has interest in using epidemiologic methods in solving global health challenges.

Achievements

Host site achievements

- Analyzed Surveillance Data to determine Distribution of Attempted Suicide: Uganda, January 2016 – December 2017. This led to drafting of policy brief which was presented at the NCD technical working group and published in the NCD quarterly bulletin. It recommended Integration of Suicide prevention strategy into the Mental Health Policy in Uganda.
- Participated in writing a concept on psychosocial support during Ebola response and participated in planning meetings for psychosocial support during the Ebola outbreak in Kasese.
- Lead editor in the NCD quarterly bulletin which is a platform to showcase research and current news on NCDs. The NCD bulletin also fosters interaction among the various stakeholders and reflects upon progress made by key players and policy makers.
- Conducted Quality Improvement project on Improving screening, assessment and reporting of Depression among People Living with HIV at the HIV Clinic in Naguru Hospital, Kampala District, Uganda-2019. This provided the first steps of integration of mental health care in HIV care and promotion of key indicators like adherence to ART and improved Viral load suppression.
- Conducted an epidemiological study on Distribution of Childhood Mental Health Disorders among children receiving care in Butabika National Referral Hospital, Kampala, Uganda, 2018 following a dissemination workshop on Childhood Mental Health Policy guidelines that indicated gaps as far as burden and drivers of childhood mental health

disorders.

Fellowship specific achievements

Descriptive analysis

Analysis of Surveillance Data to Determine Distribution of attempted Suicide: Uganda, January 2016 – December 2017. This led to drafting of policy brief which was presented at the NCD technical working group and published in the NCD quarterly bulletin. It recommended Integration of Suicide prevention strategy into the Mental Health Policy in Uganda.

Field investigations

Lead investigator:

- Cutaneous Anthrax outbreak associated with handling meat of dead animals in Rhino Camp, Arua District, Uganda-2018
- Verification of Anthrax outbreak in Nebbi, Zombo and Arua Districts
- Ebola preparedness and risk mapping activity in Kasese District from 14th August- 19th August, 2018.

Co-Investigator:

- Cholera outbreak investigation in Hoima District, 2018
- Animal Anthrax outbreak investigation Arua District Rhino-camp, Rigbo and Pawor sub-county
- TB outbreak investigation in Butabika National Referral Hospital from 14th to 25th of January.
- Malaria Outbreak investigation in Gomba District 24th February to 21st March
- Malaria outbreak in Kole District from 1st July, 2019 to 19th July, 2019

Bulletin Articles

- Integration of Suicide prevention strategy into the Mental Health Policy in Uganda
- Distribution of Attempted Suicide in Uganda, 2016-2017
- 7th AFENET Conference, Maputo, Mozambique, 11th – 16th November 2018

Quality Improvement project

- Improving screening, assessment and reporting of Depression among People Living with HIV using a Quality Improvement Approach in Naguru China Friendship Hospital, Kampala District, Uganda-2019. Overall, by October, that is 6 months of implementing the Quality Improvement Project, 99% of the HIV patients had been screened for depression in the ISS clinic. Out of HIV patients that had been screened, a total of 91 (96%) of HIV patients were assessed for depression on the ISS clinic over the QI Project Period. Among those that had been assessed 38 (7%) were referred to the Psychiatrist for further review. There was an increasing trend of the proportion of screening and assessment for depression in HIV on the ISS clinic and had exceeded the target by the third month of the project. Overall this was a successful QI project and we recommended HIV service providers to step up assessment and screening of depression to improve on adherence to ART regimens and promote Viral load suppression.

Conference Presentations

- Cutaneous Anthrax Outbreak associated with contact with dead animals in Rhino-camp Sub-county, Arua District, Uganda*(TEPHINET Conference 2019)*
- Assessment And Characterization Of Extra-Pulmonary TB In Uganda, 2014

to 2017 *(National Field Epidemiology Conference 2019)*

Policy Brief

- Integration of Suicide prevention strategy into the Mental Health Policy in Uganda, 2018

HIV project

- Prevalence and distribution of HIV among people that have experienced childhood abuse in Uganda

TB Operational Research

- Assessment And Characterization of Extra-Pulmonary TB in Uganda, 2014 to 2017 Prevalence of EPTB was 1.5/100,000 in 2013, 1.9/100,000 in 2014, 1.3/100,000 in 2015, 2.6/100,000 in 2016, and 1.9/100,000 in 2017. There was annual average increase of 8% in EPTB in Uganda over the study period ($p<0.0001$). EPTB was 7-fold higher among HIV-positive patients compared with HIV-negative patients (AOR: 7.3, CI: 3.6-17). EPTB is increasing in Uganda. HIV infection was associated with EPTB. We recommend intensified screening for EPTB, especially among HIV-positive individuals, early diagnosis, and prompt treatment of EPTB.

Newspaper Articles

- What can we do to prevent Suicide in Uganda was submitted to the New Vision on 8th April, 2019

Manuscripts

- Cutaneous Anthrax Outbreak associated with contact with dead animals in Rhino-camp Sub-county, Arua District, Uganda, 2018 (*under peer review*)
- Assessment And Characterization Of Extra-Pulmonary TB In Uganda, 2014 to 2017 *(under peer review)*

Summary of epidemiologic study

Title: Assessment and Characterization of Extra-Pulmonary Tuberculosis among Patients Receiving Care in Public Health Facilities in Kampala, Uganda, 2013 – 2017

Introduction: Despite recent advances in diagnosis, treatment, and management, tuberculosis (TB) remains a major public health problem. Uganda is one of the high-burden TB countries, and extra-pulmonary (EPTB) is a common presentation. We assessed and characterized EPTB among patients receiving care in public health facilities in Kampala to inform treatment strategies at the point of care.

Methods: We conducted a retrospective cross-sectional data analysis of all TB cases in the Track-TB database from 2013-2017. We abstracted data on presumptive, bacteriologically-confirmed and clinically-diagnosed TB patients enrolled during the period. We conducted descriptive epidemiology and used chi-square test for trends to test association. Multivariable logistic regression was used to determine predictors of EPTB.

Results: Data for a total of 4,025 EPTB patients were obtained. Of these, 58% (2,348/4,025) were female. The mean age was 33 years (SD=13) and 32% (1,285/4,025) were aged 30-39 yrs. Thirty-seven percent (1,502/4,025) were new TB patients and66% (2,666/4,025) were HIV-positive. Forty-eight percent (1,922/4,025) completed TB treatment. Prevalence of EPTB was 1.5/100,000 in 2013, 1.9/100,000 in 2014, 1.3/100,000 in 2015, 2.6/100,000 in 2016, and 1.9/100,000 in 2017. There was annual average increase of 8% in EPTB in Uganda

over the study period (p<0.0001). EPTB was 7-fold higher among HIV-positive patients compared with HIV-negative patients (AOR: 7.3, CI: 3.6-17).

Conclusions and recommendations: EPTB is increasing in Uganda. HIV infection was associated with EPTB. We recommend intensified screening for EPTB, especially among HIV-positive individuals, early diagnosis, and prompt treatment of EPTB.

Key Skills and Competencies

- Practical skills in disease outbreak investigation, response and control.
- Scientific writing and presentation skills to various audiences.
- Analysis, interpretation and evaluation of surveillance data to improve health.
- Leadership and management skills attained from the different assignments at the host site and the Quality Improvement project conducted in Naguru China Friendship Hospital.

Next Steps

- With the knowledge and skills I have acquired in field epidemiology, I intend to build a career in epidemiology and mainly Non-Communicable Diseases.
- I also intend to pass on the knowledge and skills I have acquired to field epidemiology professionals and stakeholders.

Pictorial

Vivian (3rd from left) with CDC Director Dr. Robert Redfield in the wake of the Ebola outbreak in the DRC.

Vivian (in blue shirt) interviewing health workers during the assessment of Ebola preparedness in Kasese District.