

## ABSTRACTS

### Sandfly virus association in East Africa

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Viruses transmitted by blood feeding arthropods (arboviruses) constitute a growing public health menace, globally. They cause diseases ranging from mild febrile illnesses to haemorrhagic and/or encephalitis, as well as death in humans. However, their ecology and potential public health impact is undetermined due to paucity of active surveillance, lack of appropriate diagnosis and poor disease reporting systems. My talk will highlight efforts to characterise circulating viruses of potential public impact in sandflies trapped from selected leishmaniasis endemic areas of Kenya. The work will inform predictive risk assessment in support of diagnosis and disease control operations.

### The preference of women living with HIV for the HPV self-sampling of urine and the nurse-led sampling at a rural HIV clinic in Uganda.

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**Background:** Women living with HIV (WLWH) have a double risk of acquiring cervical cancer (CC) due to repeated HPV infections resulting from reduced immunity with CC screening being low at 46.7%.

**Objective:** To determine the factors associated with the preference for HPV self-sampling using urine as well as establish its feasibility among WLHIV attending a rural HIV clinic in Uganda.

**Methods:** A cross-sectional study design using quantitative data collection methods was used at the HIV clinic, Luweero district hospital among 426 women aged between 30 to 65 years. Data were analyzed using descriptive statistics and modified Poisson regression. Urine samples were analyzed using a Liferiver High-risk Human Papillomavirus (HPV) genotyping real-time Polymerase Chain Reaction (PCR) kit to determine the prevalence of the 15 HPV subtypes. Cervical Intraepithelial Neoplasia (CIN2) was determined by visual inspection under acetic acid (VIA) using the nurse-led approach.

**Results:** Most women 296/426 (70%) preferred nurse-led screening. Preference for HPV self-sampling using urine was associated with; older age (46 to 65 years) (adjusted prevalence risk ratios [aPRR] 1.59; 95% confidence interval [CI]: 1.13–2.24), history of STI (aPRR 0.74: 95% CI: 0.55-0.98), and acquisition of CC information from the television (aPRR 1.48: 95% CI: 1.09-2.02). Approximately, 97% (68/70) of WLWH tested HPV positive with one or more subtypes. The most prevalent subtype of HPV was HPV 58 (87.1%). Only one woman tested positive for VIA.

**Conclusion:** Nurse-led CC screening is preferred among WLWH and HPV self-sampling using urine is feasible at the HIV clinic. Therefore, educational programs to reassure the masses about urine HPV self-sampling need to be designed.

### Training of Village Health Teams (VHTS) in rural Uganda to use a Smart Phone Guided Intervention to link Older Ugandans with Hypertension and Diabetes to Care

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**Objectives:** To establish if VHTs could be effectively trained to measure blood pressure and blood glucose, identify older persons with hypertension and diabetes and their willingness to use a smartphone app to link the older people to care.

**Methods:** Between October 2017 and December 2018, we conducted in-depth interviews and trained 20 VHTs selected randomly from Bukulula Sub County in Kalungu district in South West Uganda. VHTs were trained on symptoms of diabetes and Hypertension. Practical sessions were conducted on measuring blood pressure and testing for blood glucose. In addition, VHTs were trained on referral systems. Qualitative data were analysed by thematic content analysis. We used competency tests to evaluate the practical sessions.

**Results:** All VHT members said the practical exercises were very exciting and expressed their wish that it would be good if they could have these frequently during their routine work. Most of them were competent with finger pricks, probably because they do finger pricks frequently when testing children for malaria. Three participants out of 20 (15%) failed the competence test for the practical exercises.

**Conclusion:** With proper training, VHTs can be able to reach a population of older people with Diabetes and Hypertension who cannot be reached by the traditional health care systems.

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Tuberculosis (TB) is the 13th leading cause of death worldwide. The emergence of multidrug-resistant TB (MDR-TB) poses a major health security threat. Plants have traditionally been used as a source of medicine since olden days. In many parts of Uganda, some plants have shown ethno-pharmacological prospects for the treatment of TB, and yet they have not been fully researched. This study aimed to document plant species used traditionally by the herbalists and non-herbalist communities of Kitgum and Pader districts for managing symptoms of TB. An ethnobotanical study was carried out in 42 randomly selected villages between August 2020 and January 2021. Information was obtained by administering semi-structured questionnaires to 176 respondents identified by snowball and random sampling methods. Data were analyzed using SPSS and presented using descriptive statistics and Informant Consensus Factor (ICF). Overall, only 27% of the respondents were knowledgeable about plants used for managing symptoms of TB. Nine plant species belonging to six families (Mimosaceae, Apiaceae, Lamiaceae, Rutaceae, Loganiaceae and Rubiaceae) were used to manage symptoms of TB. The most representative family was Rutaceae with three species, followed by Rubiaceae (two species) and the rest of the families were represented by one species each. The most frequently recorded species were *Steganotaenia araliacea* Hochst. (8.5%), *Gardenia ternifolia* Schumach. & Thonn (6.8%) and *Albizia adianthifolia* (Schum.) W.Wight (6.8%). Most of the medicinal plants were trees, and roots (69%) were the most frequently plant part used, followed by the bark (16%) and leaves (15%). The most common method of preparation was by pounding and mixing concoction with water. The administration of the concoctions was mostly done orally. The results established the existence of few medicinal plants for managing symptoms of TB among the Acholi communities which could be used in developing new, effective plant-based antimycobacterial drugs. The few plants mentioned might face conservation threats due to exploitations of the roots. Phytochemical and toxicological studies are recommended to identify active compounds responsible for antimycobacterial activity.

## **Population dynamics of *Anopheles* mosquitoes and their level of insecticide resistance to pyrethroids in northern Uganda**

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Northern Uganda registers the highest number of malaria cases in the Uganda with prevalence of over 63%. There is long history of indoor residual spraying (IRS), long-lasting insecticide nets (LLINs) usage in northern Uganda for management of malaria vectors. The use of these preventive interventions measures are known to induce insecticide resistance, impact major malaria vectors resting and feeding behavior and can result in shift in mosquito species compositions. We undertook a longitudinal study to assess the *Anopheles* population dynamic, insecticide resistance in the region and household predictors of malaria episode. Standard WHO insecticide susceptibility test assays were used to test for susceptibility to 0.5% malathion, 0.1% bendiocarb, 0.05% deltamethrin, pirimiphos-methyl (0.25%) and 0.75% permethrin on 3-5 day old generation one progeny. In Karamoja region, the predominant species, *An. arabiensis* population exhibited resistance to deltamethrin (11.9%) and permethrin (47%), but susceptibility (100% mortality) to organophosphate pirimiphos-methyl. In Acholi and Lango regions, the predominant species, *An. gambiae* s.s. was susceptible to malathion and bendiocarb with the observed mortality rate of 100% and 98-100% observed respectively while very high resistance was observed with deltamethrin and permethrin. On household predictors of malaria episode, on average, there were two bed nets per household and 86% spent the night prior to interview under a bed net. In conclusion, in Acholi and Lango regions, *An. gambiae* s.s. are susceptible to malathion and bendiocarb while high intensity of resistance was observed with deltamethrin and permethrin. In Karamoja region, *An. arabiensis* are susceptible to pirimiphos-methyl and can also be significantly controlled by deltamethrin and permethrin, especially when integrated with PBO using existing methods such as impregnated mosquito nets and/or indoor residual spraying. Overall, malaria episodes were strongly related to lack of bed nets or lack of use thereof, and directly linked to the number of individuals in a household. Household predictors of incidence of malaria in northern Uganda includes bed nets, use of treated bed nets, and indoor residual spraying with households not practicing any of these bearing the heaviest burden of malaria.

## **Human genetic determinants in Mycobacterium tuberculosis complex lineage infections**

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Tuberculosis (TB) remains a disease of global public health concern, especially in sub-Saharan Africa. Both human and human adapted Mycobacterium tuberculosis complex lineages (MTBC) genomic differences impact TB outcomes, but few studies have evaluated how the two genomes interact to affect disease occurrence. We hypothesized that long-term coexistence between human genomes and MTBC lineages regulate disease manifestation. Specifically, we examined the diversity of MTBC lineages circulating in peri-urban Kampala. Also, elucidated on the interaction of human genes and M. tuberculosis MTBC lineages. We examined the hypothesis using our previous data in Uganda, we identified 3 MTBC

lineages (64 % MTBC Uganda lineage, 24% MTBC lineage 4 and 12% MTBC lineage 3). We observed an interaction between MTBC Uganda lineage and polymorphisms in IL12 B, SLC11A1 PP1AP2 genes. These findings suggest a host-pathogen interaction that can be defined as measure of coevolution that is likely to explain patterns of disease manifestations.

## **Burden and Correlates of Significant Liver Fibrosis among HIV-infected and uninfected Adults in Urban Uganda**

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**Background:** Following chronic inflammation and other disease specific factors, the risk of liver disease is believed to be higher among HIV-infected patients than in the general population despite shared risk factors. Understanding this differentiated burden and its drivers will inform policy and priority populations for intervention.

**Methods:** This was a cross sectional study among 516 adults attending care clinics in Kampala Uganda. Significant liver fibrosis (SLF) was defined as liver stiffness measurement  $\geq 7.2$ KPa identified by Fibroscan®. Data analyses were stratified by HIV status and we performed logistic regression to identify correlates.

**Results:** The prevalence of SLF was higher among HIV un-infected patients ((24% Vs 14%;  $p=0.004$ ). Overall HIV-uninfected patients were more likely to be overweight and or obese, with elevated serum cholesterol levels. Elevated measurement of fatty change in the liver (CAP scores  $>248$ dB/m) was associated with SLF among HIV un-infected patients (OR 2.3 CI (1.0-5.2);  $p=0.046$ ). Low nadir CD4 counts (200cell/mm<sup>3</sup>) was predictive of SLF among HIV-infected patients (OR 3.3 CI (1.0-10.7);  $p=0.05$ ).

**Conclusions:** The prevalence of SLF was unexpectedly higher among HIV un-infected than HIV affected patients attending care clinics in urban Uganda. This observed burden is most likely driven by non-alcoholic fatty liver disease (NAFLD) resulting from metabolic syndrome.

## **Bioinformatics career in resource limited settings: An experience from student to mentor**

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The ever-reducing costs of genome sequencing and increasing computational power have brought bioinformatics to the forefront in biomedical research. Consequently, there have been many approaches to developing bioinformatics skills globally due to its wide applications. This highly interdisciplinary area that's barely 20 years has a steep learning curve and prerequisites for a successful career that may not clearly fit the traditional career paths. Bioinformatics is apparently not a degree option at undergraduate level, but recently some undergraduate programmes offer a course unit in this field to enable students to have some basic understanding of its applications. As someone who has marched this journey first with THRIVE-2 support while starting as a bioinformatics student to a mentor, I share my evaluation of opportunities, challenges and lessons learnt. Bioinformatics jobs exist in biomedical research, molecular medicine, public health, energy sector, biotechnology, environmental restoration, forensic investigations, agricultural, and animal science fields. Importantly, one has to undertake training that includes programming in one of the common languages such as Bash/Linux, R, Perl, or Python, define the exact area of your bioinformatics application, continuous professional development, train existing students/researchers to analyze data, create or join bioinformatics research group, grant writing skills, establish collaborative research, identify funding resources, where possible set up a formal bioinformatics MSc/PhD degree program, establish computational infrastructure, develop or leverage partnerships, and embrace local challenges to develop innovative solutions.

## **Sexually Transmitted Infections and sexual behaviour among young adults attending Higher Learning Institutions in Mbeya region, Tanzania.**

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**Background:** Sexually transmitted infections (STIs) are common among young people in low-and-middle-income countries and are associated with negative reproductive outcomes. Since most of the studies among young people assessed HIV, this study assessed STIs awareness, sexual behavior, and access to Sexual and Reproductive Health (SRH) information and care; and prevalence of STIs among students attending Higher Learning Institutions (HLIs) in Tanzania.

**Methodology:** We conducted a cross-sectional study among randomly selected HLIs students aged 18-24years in Mbeya-Tanzania. We used a self-administered questionnaire to collect information on STIs awareness, sexual behavior, access to SRH information and care. Participants were tested for HSV-2, Syphilis, HIV, chlamydia and gonorrhoea infections.

**Results:** We enrolled 504students with mean age of 21.5years (SD 1.7). At first sex, mean-age was 18.4years and only 48% reported using a condom. About 1 in 10 students reported forced sex by their sexual partner. Sex under influence of alcohol was reported by 24% of participants. About 78.7% of participants had heard of STIs, but only 16% were aware STIs can be asymptomatic. 17% of the students had at least one STI; prevalence was higher among females (21.1%) than males (14.1%). Chlamydia (11%) and HSV-2(6.1%) were the common STIs. Predictors for STIs were sex, inconsistent



condom use, report of oral sex, sexual orientation (bisexual/homosexual) and having a sexual partner with an age-difference of at least 5 years (older or younger).

**Conclusions:** Information, Education and Communication (IEC) campaigns targeting young adults, especially at HLIs, need to focus on STIs exposure-risk minimization, counseling and support for those experiencing sexual violence. STIs such as chlamydia and HSV-2, commonly asymptomatic, are of concern among young adults attending HLIs. Programs that have invested heavily on HIV prevention campaigns should consider giving similar recognition to other STIs for a streamlined outcome.

## Aspergillus Sensitisation And Asthma Un Uganda

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**Background:** Allergic fungal diseases have been reported to complicate asthma progression and treatment outcomes. *Aspergillus fumigatus* is the most common causative agent. However, data on prevalence of *Aspergillus* sensitisation in asthma and whether this is associated with severe asthma phenotypes remain limited in Uganda.

**Aim:** The main objective of the study was to investigate the burden of fungal asthma caused by *A. fumigatus* in Uganda.

**Methods:** In this thesis, we first estimated the burden of fungal asthma among adults and children in Africa using a systematic review. In addition, we estimated the baseline prevalence of *A. fumigatus* skin positivity among a healthy non-atopic population in Uganda. We then estimated the prevalence and factors associated to fungal asthma among adult Ugandan asthmatics. We then evaluated the diagnostic performance of a POCT for the detection of fungal asthma.

**Results and Conclusions:** From the systematic review, we concluded that fungal asthma is a significant problem in Africa but there remains a paucity of data on the epidemiology and associated complications. We found a high prevalence of *A. fumigatus* skin positivity in adults without an apparent/known atopic disease in Uganda. From the cross-sectional study, we similarly observed that fungal asthma is a significant problem among Ugandans with asthma. The *Aspergillus* LFD demonstrated a poor diagnostic performance for the diagnosis of both ABPA and SAFS.

## Strengthening implementation of maternal death surveillance and response (MDSR) policy at a busy tertiary Hospital in Kampala Uganda: Achievements, challenges and lessons learnt.

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**Background:** Timely maternal deaths (MDs) identification, notification, review and response to bridge gaps in care within the entire health system remains an effective part of the cohesive strategies to prevent future deaths. However, its application remains a tall order in many low- and middle-income countries (LMICs).

**Objective:** To evaluate the effect of MDSR training linked to leadership and stakeholder engagement on implementation of timely MDSR over a 19 months period (March 2020-Sept,2021) compared to the baseline 3-year period (2016-2018)

**Methods:** We conducted a comparative study with a before and after component. We used quantitative and qualitative data collection strands. For the quantitative part, data was collected by a trained-multidisciplinary team (Senior obstetricians and midwives) from de-identified MDs records including audit forms. In order to explore perspectives of stakeholders on the changes and challenges, we conducted a sequential qualitative study using in-depth interviews and key-informant-interviews that involved 33 health workers purposively selected from Kawempe National Referral, Ministry of Health, implementing partners and two major referring sites.

**Results:** Significant increase in proportion of timely notification (11.1% to 85.3%, p-value < 0.001) and review of maternal deaths (from 7% to 67%, p-value < 0.001) in pre-intervention compared to post-intervention period respectively. Mean interval from death to reviews reduced: from 112 days ( $\pm 87.3$ ) to 12.3 days ( $\pm 21.4$ ), p-value < 0.001. Regarding the qualitative strand, most stakeholders reported improvement in MDSR implementation; reduced blame during reviews, enhanced leadership and stronger commitment to implement recommendations as per health system building blocks with emphasis to

capacity building of health workers, accountability and increased funding. Major challenges were impact of COVID-19, persistence of big number of patients and low functionality of HCIVs.

**Conclusions:** Implementation of MDSR increased significantly. However, further commitment, accountability, functional HCIVs, funding is required to sustain implementation of recommendations to reduce maternal deaths.

**Key words:** Strengthening MDSR implementation, achievements, challenges and lessons

## Task sharing in second trimester post abortion care

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**Objective:** To compare the safety, effectiveness and acceptability of treatment for incomplete second trimester abortion using misoprostol by midwives versus physicians in Uganda.

**Methods:** We conducted a multicentre randomized controlled equivalence trial at 14 health facilities in Uganda. Women with incomplete abortion of uterine size 13-18 weeks were randomly assigned to undergo a clinical assessment and treatment by either a midwife (intervention arm) or physician (control arm). Participants received misoprostol 400mcg sublingually three-hourly up to five doses. Primary outcome was complete abortion within 24 hours that did not require surgical evacuation. Analysis was intention to treat and per-protocol.

**Results:** We recruited 1191 women; 593 women were treated by midwives and 598 by physicians from 14<sup>th</sup> August 2018 to 16<sup>th</sup> November 2021. Of the 1164 women in the outcome analysis, 530 women (91.9%) in the midwife's arm and 553 (94.2%) in the physician's arm had a complete abortion within 24 hours. The model-based risk difference for midwife versus physician group was -2.3% (95% CI -4.4 to -0.3), and within our predefined equivalence range of -5% to +5%.

**Conclusion:** Misoprostol treatment of uncomplicated second trimester incomplete abortion is equally effective, safe, and acceptable when care is provided by midwives compared with physicians.

## Deletions of the *Plasmodium falciparum* histidine-rich protein 3 gene are common in field isolates from north-eastern Tanzania

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**Introduction:** *Plasmodium falciparum* parasites lacking *histidine-rich protein 2* and *3* (*pfhrp2/3*) genes have been reported in several parts of the world. These deletions are known to compromise the effectiveness of HRP2-based malaria rapid diagnostic tests (HRP2-RDT). The National Malaria Control Programme (NMCP) in Tanzania adopted HRP2-RDTs as a routine tool for malaria diagnosis in 2009 replacing microscopy in many Health facilities.

**Objective:** We investigated *pfhrp2/3* deletions in 122 samples from two areas with diverse malaria transmission intensities in Northeastern Tanzania.

**Methods:** This cross-sectional study enrolled 998 participants in Handeni and Moshi from April to June 2018. HRP2/Pan-RDTs and microscopy were used for on-site screening. *Pfhrp2/3* gene deletion was screened by PCR targeting the exon 2 region.

**Results:** *Pfhrp2* deletion was confirmed in 1.6% of samples while *pfhrp3* deletion was confirmed in 50% of samples. We did not find parasites with both *pfhrp2* and *pfhrp3* deletions among our samples.

**Conclusion:** Results from this study highlight the need for systematic surveillance of *pfhrp2/3* deletions in Tanzania to understand their prevalence and determine their impact on the performance of mRDT.

## Detection of *Mycobacterium tuberculosis* in CD34+ peripheral blood mononuclear cells during latent tuberculosis infection

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**Background:** Tuberculin Skin Test and Interferon Gamma Release Assay (IGRA) have limitations in diagnosing latent tuberculosis (TB) and monitoring TB preventive therapy (TPT). We explored detection *Mycobacterium tuberculosis* (*M.tb*) DNA in CD34+ PBMCs in diagnosing latent TB and monitoring TPT.

**Methodology:** Cross-sectional, and before-after studies were carried out. HIV-positives received 300 mg of isoniazid for six months. Participants donated 100 ml for *M.tb* DNA detection using IS6110 and *rpoB* and 4 ml for IGRA.

**Study results:** IS6110 or *rpoB* was detected in CD34+/CD34- PBMCs of 106/119 (89%) participants, more in CD34+ than CD34- PBMCs: (103/119 [87%] vs 59/119 [50%];  $p=0.007$ ). IS6110 was detected more at follow-up than baseline: CD34- PBMCs; 25/53 vs 27/53, and CD34+ PBMCs; 43/53 vs 46/53 respectively. *rpoB* was detected more at follow up than baseline in CD34+ PBMCs: 13/53 vs 25/53 ( $P=0.0015$ ) but not in CD34- PBMCs. IGRA positivity was 51% (138/272), associated factors included; manual job/no job (aOD): 2.18 [1.01-4.72],  $P=0.047$ , 13% higher BMI (aOD: 1.09 [1.00-1.18],  $P=0.049$ ) and current smoking (aOD: 2.94 [1.00-8.60],  $P=0.050$ ), among others.

**Conclusion:** CD34+ PBMCs can form a basis for a molecular test for latent TB diagnosis but not for monitoring TPT response. Current smoking and BMI were among the IGRA positivity determinants.

## Double burden of malnutrition: prevalence and correlates of over-and underweight among primary school children in Kilimanjaro, Tanzania

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**Background:** A double burden of malnutrition (DBM) is affecting many low- and middle-income countries, where overweight / obesity co-exist with under nutrition.

**Objectives:** We determined the validity of available tools for assessment of physical activity and dietary intake in children and adapt them to understand the prevalence and correlates of over and underweight among children from northern Tanzania.

**Methods:** A school-based cross-sectional study was conducted between May 2018 – November 2019. We recruited 1170 children aged 9 – 11 years from 20 primary schools using a multistage sampling technique.

**Results:** The positive and moderate correlation was found between self-reports and accelerometry. The prevalence of overweight and obesity was 15%, and of thinness 10%. Living in urban areas (aRRR 3.76; 95% CI 2.49, 5.68) and attending private schools (aRRR 4.08; 95% CI 2.66, 6.25) were associated with a higher risk of overweight and obesity. The availability of playgrounds in schools (aRRR 0.68; 95% CI 0.47, 0.97) was associated with a lower risk of overweight and obesity. The availability of sugary drinks at home (aRRR 1.52; 95% CI 1.01, 2.28) was associated with a higher risk of overweight and obesity. Two dietary patterns were identified; mixed pattern which consisted of some healthy food options such as poultry, fish, milk and unhealthy options such as fatty and sugary snacks and healthy option included frequent consumption of fruits and vegetables.

**Conclusion and recommendations:** A double burden of malnutrition is found among school-aged children in northern Tanzania. Parents and school authorities should ensure that children are offered both a balanced diet and sufficient physical activity.

**Key words:** Double burden, overweight / obesity, thinness, correlates, physical activity, diet

## Understanding Trends and Trajectories of Repeat Adolescent Birth in Uganda

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We studied the magnitude and explanation for repeat adolescent birth (=a second or higher order live birth before age 20 years, following a first birth before age 18 years) and its later life consequences in Uganda. Results among women age 20-24 years, in the available six rounds of UDHS data (1988/89-2016), indicated high repeat adolescent births (over 1 in 2) with slight decline in the 30 years of observation. Over the years, more women wanted to have this repeat birth later although birth intervals between first and second order birth did not change. In addition, results among women age 40-49 years at the 2016 survey suggest life-long negative socio-economic and reproductive health outcomes among women with repeat adolescent births compared to those without. A qualitative inquiry among women in Eastern Uganda age 20-25 years with first birth before 18 years (with or without repeat birth), revealed that escalation of the socio-economic distress following first birth, domestic violence, and partner coercion, predisposed adolescent girls to sexual exploitation and unwanted marriages. Interventions should focus on preventing repeat adolescent pregnancy and increasing opportunities for adolescent mothers, with a primary focus on: improving school retention/continuation, strengthening family planning services, and preventing early marriage.



## Effects Of HIV Infection Aand Art Use on Fertility Amongst Women of Reproductive Age in Magu District, Northwestern Tanzania: 1994 – 2018

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**Introduction:** HIV infection and antiretroviral therapy (ART) have been shown to affect fertility outcomes in women of reproductive ages (15 to 49 years). The aim of the study was to update the effect of HIV on fertility in different periods of ART availability, ascertain trends in the desire for fertility and estimate unmet need for FP amongst women of reproductive age in Magu district, Tanzania from 1994 to 2018.

**Methods:** This was the secondary data analysis of demographic and HIV serological surveillance data collected from 1994 to 2018 within the Kisesa Open Cohort study in North-western Tanzania.

**Results:** We reported overall and HIV-specific trends in age-specific fertility rates (ASFR) and Total Fertility Rates (TFR) from 1994 to 2018. We identified factors associated with fertility changes in the cohort. We also reported desire for fertility in men and women and unmet need for Family Planning in women of reproductive age from 2012 to 2018.

**Conclusion:** Updated information on the overall and HIV specific trends on fertility rates, desire for fertility and unmet need for Family Planning are crucial for planning and delivery of contraception and PMTCT services in this setting.

## A better understanding of acute rheumatic fever in Uganda

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**Background:** Rheumatic heart disease (RHD) currently affects over 40 million people worldwide, resulting in 345,000 deaths annually. RHD is as a long-term complication of acute rheumatic fever (ARF). Despite the high burden of RHD, the incidence of ARF remains low. A combination of factors including different disease presentation and poor health seeking behaviour are thought to explain the disparity in incidence of ARF.

**Aims:** To determine the incidence and clinical and laboratory profile of children diagnosed with ARF in Uganda.

**Methods:** A prospective observational study of children aged 3-17 years presenting with fever and joint pain at health centres in Lira and Mbarara districts was conducted.

**Results:** Of 1075 children referred for evaluation, 90 (22%) had definite acute rheumatic fever, 82 (20.0%) had possible acute rheumatic fever. The incidence of definite acute rheumatic fever among children aged 5-14 years as 25 cases (95% CI 13.7-30.3) per 100 000 person-years in Lira district (north) and 13 cases (7.1-21.0) per 100 000 person-years in Mbarara district (west).

**Conclusion:** These data dispel the long-held hypothesis that the condition does not exist in sub-Saharan Africa and compel investment in improving prevention, recognition, and diagnosis of acute rheumatic fever.

## Bioactivities of Parthenin Isolated from the Invasive Weed *Parthenium Hysterophorus* and its Derivatives on Malaria Vector and Parasites

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Malaria is a vector-borne infectious disease of global importance. Whilst current approaches to malaria control have proven useful in the fight against malaria, emerging evidence shows a surge in cases in some malaria endemic countries. Additional tools are therefore needed to sustain malaria control achievements and to attain elimination. Here we investigated the potential of *Parthenium hysterophorus* (African malaria vector preferred host plant for sugar feeding) as a source of phytochemicals that can be explored in vector control. Parthenin (a key metabolite from the plant) was found to influence mosquito oviposition behavior and to reduce egg hatch rate by 10%. Parthenin also influenced the length of progeny survival with larvae surviving exposure recording a longer lifespan as adults (12 days) than the non-exposed (7 days). Furthermore, structural modification of parthenin i) improved larvicidal potency by 2-to-4 fold ii) increased antimalarial activity and iii) reduced cytotoxic effect by 7-to-20 fold. An immediate application of these findings is the use of chemical synthesis to improve the activity of other secondary metabolites of natural origin. Overall, the study findings suggest that mosquito host plants can be exploited as an additional source of compounds with activity against the malaria parasite and vector.

## The Student and the Scientist: Experiences in Public Engagement on Zika Virus Research with Mugezi Secondary School students, Ziika zone, Kisubi.

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Community and Public engagement (CPE) activities facilitate scientists to exchange ideas with members of the public about the conduct, direction, benefits, and ethics of scientific research. The importance of CPE activities are well known regarding their ability to shape the future of responsible research by influencing policy, research funding allocation, and career paths for the next generation of professionals. Nonetheless, CPE training is often lacking in the medical curriculum of many developing countries, partly due to limited human resources, time constraints and the intensity of the scientific training process.

I was a recipient of a THRIVE-2, Research Enrichment-Community and Public Engagement (RECPE) award to empower secondary school students to be champions regarding their own health by helping them come up with an appropriate engagement project of applicable communication strategies to tackle the knowledge deficit regarding the Zika virus and its potential dangers in their communities. Through meaningful CPE approaches, effective two-way scientist-student dialogue was established to create a win-win situation. The experiences of this exercise and the lessons learned will be presented and discussed. These experiences illustrate how CPE enables students to explore and develop their interests in science communication, teaching, public speaking, with potential benefits to their future careers.

## Dirty syringe in Kenya's north: *Hippobosca camelina* and transmission of camel diseases

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**Background:** There are no tsetse flies (only known biological vectors of African trypanosomiasis) in the northern Kenya region under study, but trypanosomiasis is prevalent in camels, cattle, sheep, goats, and donkeys. Biting flies such as Tabanidae and *Stomoxys* spp. are known to mechanically transmit trypanosomes. However, little is known about the role of camel keds, *Hippobosca camelina*, in transmission of trypanosomiasis and other hemopathogens. Keds infest all livestock species, domestic and wild animals. Keds also feed on humans and in the process they could transmit zoonotic pathogens.

**Objectives:** This study aimed to (i) determine the prevalence of haemopathogens (such as trypanosomes, *Anaplasma* spp., piroplasms) in camels and their keds, (ii) characterize biting keds associated with livestock, and (iii) determine the ability livestock keds to transmit haemopathogens.

**Methodology:** Camels (n = 976) and > 10,000 keds were sampled from Laisamis, northern Kenya over a three-year study period. We screened samples for trypanosomal and camelpox DNA by conventional PCR, and for *Anaplasma*, *Ehrlichia*, *Brucella*, *Coxiella*, *Theileria*, and *Babesia* spp. by PCR coupled with high-resolution melting analysis.

**Outcomes:** We detected *Trypanosoma vivax* 41%, *Trypanosoma evansi* 1.2%, and "*Candidatus Anaplasma camelii*" 68.5% in camel blood. In camel keds, we also detected *T. vivax* 45.3%, *T. evansi* 2.56%, *Trypanosoma melophagium* 0.4%, and "*Candidatus Anaplasma camelii*" 16.24%. Piroplasms (*Theileria* spp. and *Babesia* spp.), *Coxiella burnetii*, *Brucella* spp., *Ehrlichia* spp., and camel pox were not detected in camels or keds collected from them.

We also identified three species of livestock keds in northern Kenya, and they harboured pathogens, namely trypanosomes, *Ehrlichia*, *Anaplasma*, *Bartonella schoenbuchensis* (zoonotic), *Clostridium perfringens* (zoonotic), *Brucella* (zoonotic), and *Theileria* species. Further studies will aim to determine the contribution of each species of keds in pathogen transmission.

We determined whether freshly collected camel keds harbouring hemopathogens acquired from the infected camels could transmit to the small laboratory animals via blood-feeding bites. We show evidence of ked competence in pathogen transmission and subsequent infection, post-ked bites, in mice and rabbits using Field's staining of blood smears to detect *Anaplasma* followed by the molecular identification of these pathogens. Identical "*Ca. Anaplasma camelii*" was present in camels and their keds, as well as in the test mice (17.89 - 47.4%) and rabbits (25%) after ked bites. Hence, we demonstrate, for the first time, the potential of *H. camelina* as a vector of anaplasmosis. Camel keds harboured at least three species of trypanosomes, but they do not transmit them to mice and rabbits.

This key finding provides the basis for establishing ked control programmes for improvement of livestock and human health.



## Heat Shock Proteins over-expressed in Triple Negative Breast Cancer (TNBC) in a Group of Ugandan Women; a comparative descriptive study.

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**Introduction:** African women with TNBC are more likely to present with late stage, aggressive and less hormone-responsive breast tumors. Our hypothesis was that TNBC in women of African ancestry express higher levels of heat shock proteins (HSP) 10, 27, 40, 60, 70 and 90 as compared to women with HER2+ tumors. HSP confers on TNBC its highly aggressive nature including resistance to chemoradiation.

**Methods:** We recruited consecutively 112 consenting patients from the Breast Clinic Mulago /Uganda Cancer Institute. We surgically obtained tumor biopsies and paraffin imbedded those using standard protocols and subsequently mounted on microscope slides. Initially H&E and IHC analyses were done, followed by Mass spectrometry (MS), a high-throughput tool for studying proteins. Five of 36 TNBC and 5 of 24 HER2 were purposively selected. Others were 42 luminal A and 5 luminal B. The MS-based proteins were digested into peptides. The peptides were then run on a Synapt G2-Si high-definition MS (Waters Corporation, Milford, MA), for proteomic profiling. We used Progenesis-QIP software to obtain label-free protein quantitation statistics. Dendrograms and Ingenuity Pathway Analyses were performed to provide more detailed information.

**Results:** The 5 TNBC-bearing tumors expressed higher levels of various HSP family members; Hsp10, Hsp27, Hsp40 Hsp60 Hsp70 increased by 10, 4.5, 18, 6 and 70-fold increased respectively compared to HER2 tumors.

Similarly, 4 out of 5 Hsp90 sub-family members were significantly increased (2.87, 3.88, 8.42 to 18.53-fold increase) while fifth significantly decreased (-2.20-fold decreased), as compared to HER2+ tumor biopsies.

**Conclusion:** HSP are overexpressed in TNBC tumors. We make a case for HSP testing and neoadjuvant anti-HSP therapy trials for African women with TNBC.

## Innovative approaches towards control of soil-transmitted helminthiasis and schistosomiasis in Kenya

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Current World Health Organization (WHO) guidelines for Soil-transmitted helminths (STH) and schistosomiasis (SCH) call for controlling morbidity through mass drug administration (MDA) of the benzimidazole-class anthelmintics (for STH) and praziquantel (for SCH) mainly by targeting school-age children (SAC). The frequency of treatment is determined by the disease endemicity within a subset of surveyed schools, which are classified using parasitological prevalence and intensity of infections. Understanding where STH & SCH at-risk populations live in order to effectively plan and target available resources and to achieve maximum impact on disease burden is critical to achieving elimination goals. Additionally, there is need for innovative approaches supported by sensitive diagnostic methods that adequately quantify the population requiring MDA. The current recommended diagnostic method is Kato-Katz, a microscopy based method that is able to detect and quantify STH and SCH (*S. mansoni*) eggs in stool, although this method that has the disadvantage of having low sensitivity especially in low transmission settings and poor reproducibility. In the recent past we have explored i) granular mapping for STH and SCH at sub-unit level ii) safety and efficacy of albendazole-ivermectin for treatment of *T. trichiura* and iii) role of artificial intelligence algorithms based on deep-learning to automatically *T. trichiura*. Findings from this work will be presented will be written up into three manuscripts.

## Air pollution in Uganda: Preliminary findings from households within Kampala

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**Background:** Air pollution is a leading risk factor for morbidity and mortality in Uganda; however, most air pollution assessments among Ugandan residents rely on self-reports from surveys. We objectively assessed air pollution levels among low-income residents in Kampala.

**Methods:** We conducted a cross-sectional study in two urban slums of Kampala in 2020 and 2021. Using wearable ultrasonic personal aerosol sampling devices, 24-hour average exposure to PM-2.5 was measured among consenting adults, and questionnaires administered about the household environment.

**Preliminary results:** Among 226 adults who completed all procedures, median age was 29 years (IQR: 24 - 36 years), 19.1% completed secondary school and 16.4% were unemployed. Over 94% reported using charcoal as primary cooking fuel; commonly cited reasons for using this fuel were: economical (32.4%), convenient (36.4%), and easily available (28.9%). Most participants reported cooking inside their dwelling, or in the same room where they slept (68.0%). Tobacco smoking prevalence was low (3.7%). Among 133 participants with total sampling time >20 hours, over 50% had average PM-2.5 exposure exceeding 300 µg/m<sup>3</sup>, over 20 times the most recent WHO 24-hour limit of 15 µg/m<sup>3</sup>.

**Conclusions:** Our preliminary findings indicate high exposure to PM-2.5 in households of low-income Kampala residents. Additional analyses will focus on evaluating factors associated with levels of air pollution exposure, and health outcomes in the same population.

## Disclosure of HIV positive sero-status to sexual partners in Mwanza Tanzania

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**Background:** Rates of HIV status disclosure to sexual partners are low in Tanzania, despite the benefits that it confers to both partners. This qualitative study aimed to explore the factors underlying the decision made by people to disclose or not disclose their HIV status to their partner.

**Methods:** Six focus group discussions and thirty in-depth interviews were conducted in Mwanza, Tanzania in 2019 with PLHIV. Topics covered decision-making around disclosure and experiences of disclosure. Thematic content analysis was conducted, aided by Nvivo12.

**Results:** Most respondents reported having already disclosed their status to their partners, with the remainder still considering disclosure. Decisions made by PLHIV about whether to disclose their HIV status were made after carefully weighing up the perceived benefits and risks. The sense of liberty from a guilty conscious, and not “living a lie” were perceived as benefits of disclosure, while fears of stigma, family break-up or abandonment were perceived as risks. Many participants found disclosure was beneficial in promoting their adherence to treatment and clinic appointments.

**Conclusion:** Given these experienced benefits, interventions to support PLHIV through the disclosure process should include enhanced counselling, strengthening HIV support groups, enhanced assisted partner notification services and stigma reduction in the community.

## Trypanosome Infection Prevalence in the Tsetse Fly *Glossina fuscipes fuscipes* and Livestock Reservoirs in a Vector Genetic Transition Zone in Northern Uganda

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**Background:** *Glossina fuscipes fuscipes* (*Gff*) is the main vector for both human African trypanosomiasis, HAT) and animal African trypanosomiasis, AAT) in Uganda. This study was done to identify the trypanosome species circulating in vectors and cattle in a *Gff* genetic Transition Zone (TZ) in northern Uganda to provide information for planning interventions.

**Methods:** Tsetse flies were captured in two districts (Oyam and Kole) using biconical traps and animal surveys done using snowball sampling. Tsetse tissues and cattle blood (applied on Whatmann FTA cards) were screened for trypanosome infections using nested PCR.

**Results:** The overall trypanosome infection rate in tsetse and animals were 7.13% (34/477) and 6.62% (48/725) respectively. Four species of bovine trypanosomes were detected, namely; *T. vivax*, *T. congolense*, *T. brucei brucei* and *T. simiae*, with a few cases of mixed infections. Risk factors for infection included age, place of origin, and sex of animals.

**Conclusions:** The relatively high tsetse density and trypanosome infection rates in both vectors and animals indicate that the transition zone is a high-risk area for AAT and appropriate mitigation measures should be instituted. No human infective trypanosomes species were detected but more extensive sampling of the whole TZ should be done to make more definitive conclusions.

## Mass drug administration of ivermectin significantly reduces onchocerciasis in hyperendemic communities in Pader district, northern Uganda

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**Background:** Onchocerciasis caused by a filarial parasitic nematode, *Onchocerca volvulus* is a notable neglected tropical disease of public health concern in much of Africa and South America. In Pader district, northern Uganda, onchocerciasis still remains a major health concern. A rapid epidemiological mapping of Onchocerciasis conducted in 2008, indicated that the most affected villages were Angagura and Lamac South in Atanga and Awere sub counties.

**Objective:** The aim of this study was to explore the impacts of 10 years (2008-2018) of mass drug administration (MDA) of ivermectin on prevalence of onchocerciasis in affected sub-counties in Pader district, Uganda.

**Results:** Microfilaria prevalence reduced from the baseline value of 76.2% (80/105) to 17.4% (67/384), indicating a 58.8% reduction, nodule prevalence from 51% (51/100) to 9.4% (36/384), indicating 41.6% reduction, and onchodermatitis prevalence from 28.0% (28/100) to 8.1% (31/384) indicating 19.9% reduction. Findings suggest that mass drug

administration of Ivermectin significantly reduced the prevalence of onchocerciasis in the study area. To reduce the microfilarial load to the level the disease would no longer be a public health problem in Pader district, we recommend continuous monitoring and improvements in the therapeutic treatment coverage.

## The association of sickle-cell trait with $\beta$ -cell dysfunction and physical activity in adults living with and without HIV in Tanzania

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**Aim:** This study aimed to investigate sickle cell trait (SCT) associations with physical activity, markers of insulin secretion and resistance, and glucose among people living with HIV infection (PLWH), both antiretroviral therapy (ART) naïve and experienced, and HIV-uninfected adults.

**Methods:** This was a cross-sectional study conducted in Mwanza, north-western Tanzania. We used data of 668 participants attained from two sub-studies of CICADA study.

**Results:** Mean age was 40 (SD 11.5) years, 402 (61.7 %) were females and 157 (24.1 %) had SCT. PLWH were 422 (64.7 %), of these, 80 (18.9 %) were on ART. People with SCT had higher risk of having an isolated  $\beta$ -cell dysfunction compared to those without SCT (RRR=1.82, CI: 1.10, 3.01,  $P=0.02$ ). People with SCT but without HIV infection had lower average acceleration on the trunk longitudinal axis (ACCx) and higher level of self-reported physical activity. 30 min oral glucose tolerance test among PLWH on ART was higher in those with SCT compared to those without SCT.

**Conclusion:** People with SCT are at higher risk of having  $\beta$ -cell dysfunction and those with SCT on ART are at more risk of developing diabetes. Future studies to investigate the interaction between SCT and HIV/ART on risk of diabetes should be considered.

## Prevalence and risk factor associated with *Taenia solium* cysticercosis among pig farmers in two districts (Amuru and Gulu) in Northern Uganda

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**Introduction:** *Taenia solium* cysticercosis is a serious public health issue affecting humans in developing countries. The disease affects the rural economies due to the loss in productivity associated with human ill-health and condemnations of infected pork carcasses by the veterinarians.

**Aim:** The aim of the study was to investigate the prevalence and risk factors for porcine cysticercosis in the districts of Amuru and Gulu in Northern Uganda.

**Methods:** A cross sectional study was conducted among households rearing pigs in Amuru and Gulu districts in Northern Uganda from March to June, 2019. A total of 569 pigs and 300 households were studied. Data on prevalence and risk factors for *T. solium* cysticercosis was collected using lingual examinations and questionnaires, respectively. Data was analyzed using Pearson's Chi square. Bivariate and multivariate analyses were used to detect the independent factors associated with dependent variables. Variables with  $P < 0.05$  were considered as statistically significant.

**Results:** The prevalence of *Cysticercus cellulosae* was at 13.6% (95% CI: 8.6-18.6). The risk factors associated with porcine cysticercosis transmission in Gulu and Amuru were sex ( $P=0.044$ , OR=5.41 (95%CI:1.04-15.24), pig keeping, ( $P=0.00$ , OR=0.56 (95%CI: 0.012-0.25), routine deworming ( $P=0.04$ , OR=1.13 (95%CI:0.032-0.35)) and pig free range ( $P=0.03$ , OR=3.843 (95%CI: 1.13-12.71) and open defecation ( $P=0.003$ , OR=0.322(95%CI: 0.003-3.058).

**Conclusion:** The findings from the current study indicate that the prevalence of porcine *T. solium* cysticercosis is endemic in Gulu district. The porcine cysticercosis is being influenced by pig farmers, lack of deworming, free range pigs, and allowing pigs to feed on human faeces. There is need for the local authorities to strengthen public health education on pig husbandry practices and routine meat inspection at these facilities by the health authorities in the region.



## Diabetes mellitus effects on anti-tuberculosis drugs exposure: research from Kilimanjaro Region

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**Introduction:** Diabetes mellitus is a well-known risk factor for tuberculosis and is associated with poor TB treatment outcome and an increased risk of TB relapse. With the current global increase in cases of type 2 DM, attention needs to be increased on optimum treatment of TB in patients with diabetes.

**Objectives:** To assess the effect of diabetic mellitus on the pharmacokinetic of first line tuberculosis drugs and treatment outcome of the participants.

**Methods:** Blood samples from 15 tuberculosis/diabetic patients and 20 non-diabetic TB patients was taken during the intensive phase of TB treatment. A full pharmacokinetic profile will be determined for isoniazid, rifampicin, pyrazinamide and ethambutol. Plasma concentrations will be measured using validated HPLC methods. PK parameters will be calculated using non-compartmental methods and will be compared using the independent samples T-test on log-transformed data. Multiple linear regression analysis will be performed to assess the effect of other exploratory variables on the PK of TB drugs. In-depth interview and focus group discussion was used to explore the well-being of the participants and patient file to assess the outcome after six months.

**Results:** For TB alone, all participants was cured, however on TB/DM arm we had one death and one relapse.