



**10<sup>th</sup>**

**KEMRI Annual  
Scientific & Health  
(KASH) Conference**

**BOOK OF  
ABSTRACTS**

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Safari Park Hotel, Nairobi

**11<sup>th</sup> -13<sup>th</sup>  
February  
2020**





*In Search of Better Health*

# The 10<sup>th</sup> KEMRI Annual Scientific & Health (KASH) Conference

11<sup>th</sup> to 13<sup>th</sup> February, 2020  
At Safaripark Hotel, Nairobi, Kenya

Theme:

*Towards Sustainable UHC in Kenya: Utilization of Research Evidence  
Through Multi-sectorial Collaboration*

**Organized by:**

**Kenya Medical Research Institute (KEMRI)**

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**P. O. Box 54840-00200**  
**Nairobi, Kenya**  
*www.kemri.org*



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## Message from Director General, KEMRI,

Prof. Yeri Kombe

The 10<sup>th</sup> KASH conference is taking place at a very historic moment for the Institute: a period when we also take stock for the milestones covered over the last 40 years since the establishment of the Institute. More than 40 years ago, the Institute had only a handful of scientists and neither did they have any meaningful infrastructure to write home. But today, KEMRI has grown tremendously to a world re-known Institution with research activities not just spreading across Kenya, but influencing regional and global direction with a staff strength of close to 4,000.

The initiation of the KASH conference 10 years ago, is itself

one very important milestone for the Institute. I am delighted that the conference has remained true to the founding values and objectives. KASH is indeed an opportunity to assess where we are, evaluate recent scientific developments and lessons learnt, and collectively chart a course forward.

Research can only be impactful when the results are disseminated successfully to the key stakeholders for policy formulation and implementation. To this end, KEMRI formed the KEMRI Annual Scientific Conferences (KASH) as a dissemination forum. This is perhaps a sure commitment that KEMRI is equal to the task

of effectively and efficiently implement the UHC programme through research in this country. With the critical mass of research data and evidence available at KEMRI, it is only prudent that we use such avenues such as KASH, and the Knowledge Management platforms to share such findings and experiences not just with fellow scientist but also with policy makers and general public for policy formulation and practice.

I am delighted that this conference has managed to attract eminent speakers and delegates including our very own, and others from our distinguished partners and collaborators whom I warmly welcome to the KASH 10 conference.

We are indeed honored that a total of 500 participants from various institutions not just in the country, but other countries that have made our conference truly international. Our commitment towards hosting and investing in this conference has remained steadfast. It is my pleasure and joy to note that the 10th KASH conference whose theme is theme ***“Towards Sustainable Universal Health Coverage (UHC) in Kenya: utilization of research evidence through multi-sectorial***

***collaboration”*** will also have oral, poster, symposia and a pre-conference panel discussion.

This year’s theme is a demonstration of KEMRI’s commitment that it is equal to the task of effectively and efficiently implementation of the UHC program through research in Kenya. Of interest will be the keynote addresses by our very homegrown eminent scientist Dr. Zipporah Bukania’s titled, “The Cost of hunger in Africa-Kenya Study: Consequences of Undernutrition on Attainment of Universal Health Coverage” and our Board Member Prof. Peter Ngunjiri’s “Steps towards Achievement of Universal Health Coverage in Kenya: Implications of Devolved Health Functions.”

I therefore celebrate all of you here for making time to attend this conference and for sharing our gains and pains throughout our historical journey thus far. Thank you and Karibuni sana.

**Prof. Yeri Kombe, MBChB, MPH, PhD, MBS.**

**Director General  
Kenya Medical Research Institute  
(KEMRI)**



## Conference Overview by Chair, KASH Conference Organizing Committee,

Prof. Charles Mbogo

It is with great pleasure that I extend a warm welcome to all participants of the 10th KEMRI Annual Scientific and Health (KASH) conference and the KEMRI's 40th Anniversary celebration. The conference brings together scientists, health research experts and health care personnel and common people while providing a platform to disseminate research findings, networking, collaboration and partnerships among others. It also provides a great opportunity for sharing good practice, cross-learning and mentoring of upcoming young scientists as well as providing a platform for

the discussions of the current health challenges, exchange of new knowledge and the way forward.

True to its tradition, the 10th KASH Conference is living to its expectation. As Chairman of this great dissemination platform, and as we celebrate 40th anniversary of research and innovations, KASH has a very special significance to the KEMRI professional fraternity and the nation at large. The KASH Conference is a perfect platform especially for young researchers to disseminate their research findings, to network and build or strengthen new and or existing collaboration and partnerships.

To demonstrate this, we are bringing in a forum of young investigators to showcase their research findings and innovation that will be competitively awarded. Professionally, the 10th KASH platform is a wonderful melting pot of talent from both elderly experienced senior scientists and the youthful budding researchers to intellectually engage in stimulating scientific and innovative challenges facing humanity and offer sustainable solutions. In addition, the conference also provides an open forum for panel discussions on two major areas of research on Cancer, and Gender and Science.

The 10th KASH Conference theme is, “**Towards Sustainable Universal Health Care in Kenya: Utilization of Research Evidence through Multi-Sectoral Collaboration**”, which is in line with the government of Kenya’s Universal Health Coverage, a critical component of the governments big 4 agenda and SDGs. It also fully captures what KEMRI is currently doing in the face of evolving diseases countrywide and to overcome the challenges facing counties in the prevention and control of diseases. Universal

Health Coverage (UHC) with full access to high quality service for health promotion, prevention, treatment, and financial risk protection cannot be achieved without evidence from research. The KASH conference clearly highlights the importance of technological innovation and multi-sectoral collaborations in ensuring KEMRI’s continued growth and research development in the coming years.

This year’s conference is a special event in two ways: First, this is the year KASH celebrates 10 years since its inception in 2011. Secondly, it is held at a time when KEMRI is turning 40 years since its establishment in 1979. KEMRI at 40 is a period of great renewal and focus. It is hence gratifying that the over 200 abstracts presented in diverse titles including symposia covering current issues in emerging and re-emerging diseases, Genomics, Diagnostics and Innovations, Health systems, Sexual, Reproductive, Adolescent and Child Health, Alternative medicine, One Health, Maternal and Child Health, Non- Communicable Diseases, Neglected Tropical Diseases, meet the new direction

that the Institute is taking.

We have Keynote and plenary speakers who are world class scientists with deep understanding and a wealth of knowledge on disease burden and with practical knowledge of appropriate interventions. These include first Dr Zipporah Bukania who will give a key note address on ***“Cost of Hunger in Africa-Kenya Study: Consequences of Undernutrition on Attainment of Universal Health Coverage”*** and plenary speakers include Prof. Peter Ngunjiri, Prof. Adana A M Llanos, Dr. Fidelis Toloyi Ndombera, Prof Rosemary Sang, Dr Bernhards Ogutu, Dr. Fredros Okumu, Dr. Thumbi Mwangi, Prof. Graham Devereux, and Prof Lesley Drake. We have also included two special panel discussions by eminent experts. I therefore encourage you to freely participate to expand these discussions beyond the meeting halls and the wonderful Poster presentations, into coffee and lunch breaks and on your respective social media groups and interactions.

I thank you all individually and collectively for taking your time to support this conference either by submitting your abstracts

and posters, by mounting a symposium, your presence, exhibiting or sponsorship. I want to thank the KEMRI leadership right from the KEMRI Board of Management, the Director General, Prof. Yeri Kombe, all our collaborators and partners, members of the fourth estate and all other officers who have contributed one way or another towards making this conference successful. I remain indebted to members of my organizing committee for their dedication and resilience.

I hope you enjoy every minute of it! We are confident that the event will truly be fruitful and memorable for everyone, and we now look forward to welcoming you all!

Karibuni Sana.

# 40<sup>TH</sup> ANNIVERSARY PROGRAM AT A GLANCE

<b>MONDAY FEBRUARY 10, 2020</b> <b>KEMRI @ 40 CELEBRATIONS AND 10TH KASH OPENING CEREMONY</b>	
0730-0900hrs	Arrival and Registration of Delegates
0900-1230hrs	KEMRI @ 40 CELEBRATIONS AND KASH OPENING CEREMONY VENUE: JAMBO ROOM
1230-1400hrs	Lunch Break
<b>1400-1700Hrs</b>	<b>PANEL DISCUSSIONS</b> <b>VENUE: JAMBO ROOM</b>
1400-1420hrs	Blood Transfusion in Kenya: Future Perspectives
1420-1520hrs	Cancer, A battle to be won!
1520-1620hrs	Gender and Science: Harnessing the potential of women in addressing Health
1620-1700hrs	Afternoon Tea

# KASH PROGRAM AT A GLANCE

TUESDAY FEBRUARY 11, 2020	
0730-08.30hrs	Arrival and Registration of Delegates
SESSION 1	OFFICIAL OPENING SESSION & KEYNOTE ADDRESS
0830 – 0840hrs	VENUE: JAMBO ROOM Conference overview: Chair of KASH Organizing Committee, Prof. Charles Mbogo
0840 – 0850hrs	Welcome remarks: Director General KEMRI, Prof. Yeri Kombe
0850 – 0900hrs	Remarks Chair, KEMRI Board of Management, Dr. Naphtali N. Agata
0900 – 0930hrs	Opening Keynote Address: Dr. Zipporah Bukania: Cost of Hunger in Africa-Kenya Study: Consequences of Undernutrition on Attainment of Universal Health Coverage
Session Chair	Prof. Sam Kariuki
Rapporteur	Dr. Damaris Matoke-Muhia
PLENARY SESSION 1 -3 JAMBO ROOM	
Plenary Chair:	Dr. Benjamin Tsofa
Co-Chair:	Dr. Veronica Manduku
Rapporteurs	Dr. Josyline C. Kaburi

<b>0930- 0950hrs</b>	<b>Plenary 1: Prof. Peter Ngunjiri:</b> "Steps towards Achievement of Universal Health Coverage in Kenya: Implications of Devolved Health Functions"			
<b>0950- 1010hrs</b>	<b>Plenary 2: Prof. Adana AM Llanos:</b> "Epidemiologic Exploration of Personal Care Products as Important Environmental Risk Factors for Breast Cancer"			
<b>1010-1030hrs</b>	<b>Plenary 3: Dr. Fidelis Toloyi Ndombura:</b> "NanoString Chemistry and Technology, An emerging tool in Cancer Drug Discovery and Treatment"			
<b>1030-1050hrs</b>	<b>Health break and Poster Session 1</b>			
<b>SCIENTIFIC SESSION 1 -4 AND SYMPOSIUM 1 PARALLEL SESSIONS</b>				
<b>Room: Tsavo</b>	<b>Room: Amboseli</b>	<b>Room: Samburu</b>	<b>Room: Bogoria</b>	<b>Room: Ivory</b>
<b>1050-1300hrs</b>	<b>1050-1300hrs</b>	<b>1050-1300hrs</b>	<b>1050-1300hrs</b>	<b>1050-1300hrs</b>
<b>Scientific Session 1: Health Systems</b>	<b>Scientific Session 2: Genomics, Diagnostics and Innovations(1)</b>	<b>Scientific Session 3: Infectious Diseases (1)</b>	<b>Scientific Session 4: TB/ HIV (1)</b>	<b>Symposium 1: Strengthening of exploitation of Science, Technology and Innovations as a key enabler of realization of UHC</b>
<b>Chair: Dr. Kui Muraya</b>	<b>Chair: Dr. John Waitumbi</b>	<b>Chair: Dr. Margaret Mbuchi</b>	<b>Chair: Dr. Hellen Meme</b>	<b>Chair: Dr. James Kimotho</b>
<b>Co-Chair: Dr. Lydia Kaduka</b>	<b>Co-Chair: Dr. Muuo Nzou</b>	<b>Co-Chair: Dr. Patrick Munywoki</b>	<b>Co-Chair: Asiko Ongaya</b>	<b>Co-Chair: Dr. Cecilia Wanjala</b>

Rapporteur: <b>Sharon Mokuu</b>	Rapporteur: <b>Kimita Gathii</b>	Rapporteur: <b>Josephat Nyataya</b>	Rapporteur: <b>Fred Orina</b>	Rapporteur: <b>Misiani Ochwoto</b>
<b>1300-1400hrs Lunch Break, Poster Viewing Session 1</b>				
<b>SCIENTIFIC SESSION 5-8 &amp; SYMPOSIUM 2 PARALLEL SESSIONS</b>				
1400-1630hrs	1400-1630hrs	1400-1630hrs	1400-1630hrs	1400-1630hrs
<b>Scientific Session 5: Public Health(1)</b>	<b>Scientific Session 6: Non-Communicable Diseases (NCDS)</b>	<b>Scientific Session 7: TB/HIV 2</b>	<b>Scientific Session 8: Malaria</b>	<b>SYMPOSIUM 2: NAPREDA: Herbal and Traditional Medicine in Universal Health Coverage: The Potential and Need for Evidence Based Products</b>
Chair: <b>Sophie Matu</b>	Chair: <b>Dr. Linet Ongeri</b>	Chair: <b>Dr. Patrick Munywoki</b>	Chair: <b>Dr. Carolyne Kifunde</b>	Chair/Organizer: <b>Dr. Festus Tolo</b>
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Rapporteur: <b>Mike Muraya</b>	Rapporteur: <b>Joyce Ondicho</b>	Rapporteur: <b>Josephat Nyataya</b>	Rapporteur: <b>Clement Masakwe</b>	Rapporteur: <b>Dr. Beatrice Irungu</b>
<b>WEDNESDAY FEBRUARY 12, 2020</b>				
0730-0830hrs	Registration of Delegates			

<b>PLENARY SESSION 4-6</b>	
<b>Plenary Chair</b>	<b>Dr. Doris Njomo</b>
<b>Co-chair</b>	<b>Dr. Joel Lutomiah</b>
<b>Rapporteur</b>	<b>Ms. Milkah Mwangi</b>
<b>0830-0900hrs</b>	<b>Plenary 4: Dr. Fredros Okumu</b> "Multiplicity of Malaria Transmission in East Africa"
<b>0900-0930hrs</b>	<b>Plenary 5: Prof. Rosemary Sang</b> "The emergence and re-emergence of arbovirus threats in East Africa; why we should be concerned about our early warning systems and preparedness for combat"
<b>0930-1000hrs</b>	<b>Plenary 6: Dr. Bernards Ogutu</b> "Malaria management in the UHC framework for maximum impact"
<b>1000-1020hrs</b>	<b>Health Break and Poster Viewing Session 2</b>

<b>SCIENTIFIC SESSION 9-11 &amp; SYMPOSIUM 3,4, young investigators awards PARALLEL SESSIONS</b>					
<b>Room: Tsavo</b>	<b>Room: Amboseli</b>	<b>Room: Samburu</b>	<b>Room: Bogoria</b>	<b>Room: Ivory</b>	<b>Room: Cub</b>
1020 – 1300hrs Scientific Session 9: NTDS	1020 – 1300hrs Scientific Session 10: SRACH (Sexual, Reproductive, Adolescence and Child Health) (1)	1020 – 1300hrs Scientific Session 11: Antimicrobial Resistance (AMR) (1)	1020 – 1300hrs Symposium 3: PAMCA: It Is Not Just Malaria: Arboviral Transmission, Disease, Surveillance, And Prevention In Kenya	1020 – 1300hrs Symposium 4: Respect for Persons, by Whom? and for Whom? (SERU)	1020 – 1300hrs Scientific Session 9: Young Investigators Awards
Chair: <b>Dr. David Odongo</b> Co-Chair: <b>Erastus Mulinge</b>	Chair: <b>Dr. Simon Njenga</b> Co-Chair: <b>Dr. Joan Olale</b>	Chair: <b>Dr. Willie Sang</b> Co-Chair: <b>Tom Ouko</b>	Chair: <b>Prof. Charles Mbogo</b> Co-Chair: <b>Dr. Simon Muriu</b>	Chair/ Organizer: <b>Mr. Enock Kebenei</b> Co-Chair: <b>Caroline Kithinji</b>	Chair: <b>Dr. Doris Njomo</b> Co-Chairs: <b>Dr. Simon Njenga and Dr. Lillian Musila</b>
Rapporteur: <b>Beth Mutai</b>	Rapporteur: <b>Beatrice Olack</b>	Rapporteur: <b>Eric Odoyo</b>	Rapporteur: <b>Dr. David Mburu</b>	Rapporteur: <b>Cyprian Kisiyena</b>	Rapporteur: <b>Dr. Joseph Mwangangi</b>
<b>1300-1400hrs LUNCH BREAK/ POSTER VIEWING SESSION 2</b>					

<b>SCIENTIFIC SESSIONS 12,13,14 &amp; SYMPOSIUM 5, 6, 7</b>					
<b>PARALLEL SESSIONS</b>					
<b>Room: Tsavo</b>	<b>Room: Amboseli</b>	<b>Room: Samburu</b>	<b>Room: Bogoria</b>	<b>Room: Ivory</b>	<b>Room: Cub</b>
1400 – 1630hrs	1400 – 1630hrs	1400 – 1630hrs	1400-1630hrs	1400-1630hrs	1400-1630hrs
<b>Scientific Session : 12</b>	<b>Scientific Session : 13</b>	<b>Symposium 7:</b>	<b>Symposium 5:</b>	<b>Symposium 6:</b>	<b>Scientific Session : 14</b>
<b>Genomics, Diagnostics and Innovations (2)</b>	<b>Antimicrobial Resistance (AMR) (2)</b>	<b>Knowledge Management</b>	<b>New Approaches for Disease Surveillance and Discovery</b>	<b>International Multidisciplinary Programme to Address Lung Health and TB in Africa (IMPALA)</b>	<b>Public Health (2)</b>
Chair: <b>DrJackline Kosgei</b>	Chair: <b>Dr. Konogoi Limbaso</b>	Chair: <b>Prof. Jennifer Orwa</b>	Chair: <b>Dr. John Waitumbi</b>	Chair: <b>Dr. Hellen Meme</b>	Chair: <b>Dr. Jacinta Nzinga</b>
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<b>DAY 3: THURSDAY FEBRUARY 13, 2020</b> <b>PLENARY SESSION 7-9</b>	
0730-0830hrs	Registration of Delegates
<b>Plenary Chair:</b>	<b>Dr. Evans Amukoye</b>
<b>Co-Chair:</b>	<b>Dr. Hellen Meme</b>
<b>Rapporteurs</b>	<b>Dr. Joseph Mwangangi</b>
<b>0830-0900hrs</b>	<b>Plenary 7: Dr. Thumbi Mwangi-</b> “People, their animals and development: Together in sickness and in health”
<b>0900-0930hrs</b>	<b>Plenary 8: Prof. Graham Devereux</b> – “Early life influences on the life course of non-communicable lung disease”
<b>0930-1000hrs</b>	<b>Plenary 9: Prof. Drake-</b> School Health and Nutrition: An Investment in Human Capital
<b>1000-1020hrs</b>	<b>Health Break</b>

<b>SCIENTIFIC SESSIONS 15-16,17 &amp; SYMPOSIUM 8, 9</b>				
<b>PARARELL SESSIONS</b>				
<b>Room: Tsavo</b>	<b>Room: Amboseli</b>	<b>Room: Samburu</b>	<b>Room: Bogoria</b>	<b>Room: Ivory</b>
1020 – 1300hrs	1020 – 1300hrs	1020 – 1300hrs	1020 - 1300hrs	1020 - 1300hrs
<b>Scientific Session 15: SRACH (Sexual, Reproductive, and Child Health) (2)</b>	<b>Scientific Session 16: Public Health and Health Systems</b>	<b>Scientific Session 17: Infectious Diseases (2)</b>	<b>SYMPOSIUM 9: Hatua</b>	<b>Symposium 8: The Japan-Africa Collaborative Research on Helicobacter Pylori Project.</b>
<b>Chair: Dr. Betty Njoroge</b>	<b>Chair: Dr. Lydia Kibe</b>	<b>Chair: Dr. Peninah Munyua</b>	<b>Chair: Dr. Langat</b>	<b>Chair: Prof. Yashio Yamaoka</b>
<b>Co-Chair: Dr. Benson Singa</b>	<b>Co-Chair: Bridget Kimani</b>	<b>Co-Chair: Abdi Mohammed</b>	<b>Co-Chair: Prof. Bukusi</b>	<b>Co-Chair: Prof. Elijah Songok</b>
<b>Rapporteur: Dr. Joan Olale</b>	<b>Rapporteur: Titus Mutwiri</b>	<b>Rapporteur: Stephen Anyona</b>	<b>Rapporteur: Rose Kamuyu</b>	<b>Rapporteur: Dr. Elizabeth Matey/ Prof. Matsumoto</b>
<b>1300-1400hrs</b>	<b>Lunch Break</b>			

<b>1400-1530hrs</b>	<p style="text-align: center;"><b>CLOSING SESSION</b></p> <p>Conference outcomes &amp; resolutions Chief Rapporteur: <b>Dr. Steve Wandiga</b></p> <p>Awards Ceremony: <b>Dr. Veronica Manduku</b> Vote of thanks: <b>Dr. Damaris Matoke-Muhia</b> Official Closing remarks – • <b>KASH Chair</b> <b>Director General, KEMRI</b></p>
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## Key Note Speaker

### Zipporah Bukania, PhD

Dr. Zipporah Bukania is Deputy Director -KEMRI heading the Centre for Public Health Research. She has strong academic and professional training in applied human nutrition with over 20 years' work experience in both clinical application and research. Her doctoral studies training is in applied human nutrition. She has been involved in a wide range of nutrition research activities focusing majorly on generating evidence to support policy formulation and development of government guidelines for the implementation of nutrition programmes. She is currently leading two national level studies, on Universal Health Coverage and assessment of food consumption in Kenya as part of response to the 'Big 4 Agenda'. Zipporah serves on various technical committee as well as mentors nutrition graduate students from various national and international institutions.

## **ABSTRACT**

### **TITLE: Cost of Hunger in Africa-Kenya Study: Consequences of Undernutrition on Attainment of Universal Health Coverage**

**Authors: Zipporah. Bukania, PhD<sup>1</sup>, Lucy Kinyua<sup>2</sup>, Florence Mugo<sup>2</sup>, Veronica Kirogo<sup>2</sup> Janet Ntwiga,<sup>3</sup>**

<sup>1</sup>Centre for Public Health Research, Kenya Medical Research Institute, <sup>2</sup> Division of Nutrition, Ministry of Health, <sup>3</sup>United National Children's Fund,

**Background:** Nutrition is a basic human right (Article 25 - Universal Declaration of Human Right). In Kenya, health and nutrition agenda is entrenched within the Constitution of Kenya 2010 under Bill of rights, Article 43(1)(a) and Vision 2030. The World Health Organization in its **Call to Action 2020**, has called for '*Coherent multisectoral action in-order to make meaningful progress towards achieving the nutrition- and health-related Sustainable Development Goals, especially to make Universal Health Coverage (UHC) a reality*'. Evidently, UHC cannot be achieved without access to quality nutrition service and its documented that poor nutrition in children has severe economic and health consequences some, whose negative effects manifest in later years.

**Objective:** To generate evidence about the cost to Kenya for not addressing child undernutrition and estimating its social and economic effects on health, education and labor sector.

**Methods:** Adopted from Cost of Hunger in Africa (COHA) study model. COHA is a continental initiative implemented within the framework of the revised African Regional Nutrition Strategy (2015-2025) to estimate additional cases of morbidity, mortality, school repetition, school dropout and reduced physical capacity that can be directly associated with children under-five years. The study estimated economic and social impact of child undernutrition showing possible economic returns with appropriate investments in nutrition and estimated associated impacts experienced by the population in 2014, the year of study.

**Findings:** Stunting has social and economic effects on health, education and productivity. Undernourished children were more susceptible to recurring illness (increased risk of diarrhea, fever and malaria) where high economic impact of treating undernutrition in health-related aspects in 2014 was equivalent to KES 18.6B(US\$ 211.8M) [0.34%GDP]. The effect on education showed grade repetition (17.5%), poor performance and high school dropout attributed to low cognitive ability. Only 16.9% of stunted working age people completed primary school compared to non-stunted (62.2%). 94,708 cases of grade repetition cost the education system and families Ksh 3.2B (US\$36.8M) [0.06%GDP]. Effects on productivity were attributed to mortality due to child undernutrition where Kenya lost an equivalent of [Ksh 96.7B(US\$ 1,099.5M)1.8%GDP] from manual labor and [Ksh66.6B(US\$ 757.9M)(1.23%GDP)] from non-manual labor while child mortality cost losses of 3.8% (1.2M) of working age persons from the workforce. Overall, the total effect of undernutrition on health, education and productivity showed that in 2014, Kenya lost KES 373.9B (US\$ 4.2B) equivalent 6.9%GDP.

**Conclusion & Recommendation:** Economic impacts of undernutrition (underweight and stunting) have significant implications on health, education, and economic productivity. For Kenya to achieve UHC, investing in essential nutrition actions, and good nutrition for all cannot be over emphasized. Actions to inform and support human capital gains will help catalyze implementation of Kenya's "Big Four" Agenda, Vision 2030 and related sectoral policies. Therefore, there is need to eradicate undernutrition through enhanced implementation of multi-sectoral programmes and coordination, resource mobilization and effective monitoring of nutrition initiatives.

# PLENARY SPEAKERS' BIOGRAPHIES



## Prof. Peter Ngure, PhD

Prof. Peter Ngure is the Deputy Vice Chancellor, Academic Affairs at St. Paul's University, Limuru, Kenya. He served as Programme Manager, Consortium for Advanced Research Training in Africa (CARTA) at African Population and Health Research Center (APHRC) from 2015 to 2018. Peter holds a PhD in Parasitology and Entomology from the Jomo Kenyatta University of Agriculture and Technology. He has over 25 years experience of university level teaching, research, research capacity building and administration in 4 chartered private universities and one public university in Kenya and publications in over 45 peer-reviewed journals. His research

interests are in leishmaniasis, malaria vector control and treatment, higher education and poverty alleviation. Peter has won and managed grants from the Bill and Melinda Gates Foundation, Hickey Family Foundation, the Wellcome Trust, Carnegie Corporation of New York among others. He has facilitated over 15 grant writing workshops in Kenya, Nigeria, Uganda, and South Africa with participants drawn from over 10 African countries. He has also successfully supervised 72 Masters students and 5 PhD students. Peter is a founder member of the Global Young Academy and the Private Universities Research Consortium of Kenya, a member of the Kenya Palliative Care Association, and

the Kenya National Academy of Sciences. He is a board member at the Kenya Medical Research Institute and World Vision Kenya where he is involved in resource mobilization, oversight of staff and financial management and compliance.

## **ABSTRACT**

### **Title: Steps towards Achievement of Universal Health Coverage in Kenya: Implications of Devolved Health Functions**

The Constitution of Kenya 2010 provides that every person has the right to the highest attainable standard of health, which includes the right to healthcare services, including reproductive healthcare. In line with this, the Kenyan government has made a commitment to achieve Universal Health Coverage (UHC) by 2022 ahead of the United Nation's target of 2030. According to the World Health Organization report on monitoring report on healthcare, by mid-2019 the UHC index for Kenya was only 55%. This means that about half of Kenyans lack access to healthcare services putting in doubt the attainment of the ambitious goal of UHC in the next three years.

Following devolution of health services, the 47 counties are responsible for provision of county health facilities, ambulance services and promotion of primary healthcare, leaving the national government with the function of policy, research and regulation of the sector. This creates very high expectation for counties to deliver high quality health services. Decentralization of health services aimed at focussing attention on community and increasing community participation so that needs are better met, speeding up development programmes and health coverage, and increasing accountability and promoting local autonomy. A recent pilot of UHC undertaken in four counties – Machakos, Nyeri, Kisumu and Marsabit provided important lessons for the anticipated roll-out in the rest of the counties in 2020. It pointed at gaps in the implementation of the initiative namely, the need to re-orient the approach to primary healthcare approach, building capacity of healthcare professionals, and enhancing community ownership of the UHC

initiatives. Further, it emphasized the need to strengthen the primary role of the National Hospital Insurance Fund (NHIF) and the Kenya Medical Supplies Agency (KEMSA) to increase access of medical insurance and medicines respectively. The Ministry of Health is aware of the need to harness technology to improve access to services and to work with the private sector in improving health financing and access. The downside of the pilot was that it focussed on treatment and services at the health facilities rather than the broader aspects of affordable healthcare.

The model Kenya will adopt to achieve UHC is crucial, especially at the county level. Counties are ill-prepared to roll-out UHC. They face innumerable challenges related to finance and human resources for healthcare provision. Counties grapple with insufficient funds for healthcare provision, embezzlement of funds, low capacity for resource mobilization for health, lack of capacity to absorb the funds provided, alignment of budgets with health priorities at the county level, procurement of drugs, and conditions for disbursement of funds e.g. co-pay by patients. Human resource challenges include a low healthcare professional to population ratio, inadequate experts to operate and maintain sophisticated equipment, and ability to attract, retain and develop high-performing healthcare professionals – poor remuneration, working conditions, and lack of tools of trade and alternative sources of income.

For Kenya to make significant progress towards attaining UHC, there is need for better coordination between the national and county governments in planning, financing, and roll-out of UHC. Adequate funding for UHC is a priority that will be achieved through partnerships with private healthcare providers and development partners. Rethinking devolution of health functions such as human resource and governance arrangements, curbing corruption in health insurance such as unnecessary diagnostic procedures, unnecessary medical procurement, surgery, prescriptions, and hospital stay; better human resource management, use of integrated healthcare technology coupled with the establishment of regional disease surveillance centres will enhance UHC.



## Adana A.M. Llanos, PhD, MPH

Dr. Llanos received a PhD in Genetics from Howard University (2009) and MPH in Epidemiology from the Ohio State University (2013). Prior to joining the faculty at Rutgers, she completed a postdoctoral fellowship in the Department of Oncology at the Lombardi Comprehensive Cancer Center at Georgetown University and an NCI-funded postdoctoral fellowship in the Center for Population Health and Health Disparities at the Ohio State University Comprehensive Cancer Center.

Dr. Llanos is a molecular epidemiologist, with training and expertise in community-based participatory research and cancer health disparities. Her primary area of research focuses

on understanding the molecular underpinnings (epigenetic, genetic/genomic, proteomic) and sociobiologic mechanisms (integration of social determinants of health, biomarkers, and biological pathways) that contribute to cancer disparities. Her research program seeks to address cancer outcomes disparities, through collaborative studies that center on cancers that disproportionately affect minority and medically underserved populations. As recognition of cancer disparities has grown, efforts to move beyond simply documenting the inequities and moving towards understanding causes and developing impactful interventions have also grown. Research in cancer health

inequities allows Dr. Llanos to leverage her training and expertise in genetics, molecular epidemiology, population sciences, and public health for the greatest impact.

## **ABSTRACT**

### **Title: Epidemiologic Exploration of Personal Care Products as Important Environmental Risk Factors for Breast Cancer**

Over the last several decades, the concern of environmental exposures to certain endocrine-disrupting chemicals (EDCs), carcinogens, and mutagens found in hair products and other personal care products have been explored for evidence of an association with breast cancer risk. Much of the data have been equivocal to date. Emerging data suggests that products used predominately by Black/African American women may contain more hormonally-active compounds. Additionally, recent studies have demonstrated significant associations between PCPs, namely hair products, and increased breast cancer risk. We examined hair product use (hair dyes, chemical relaxers and cholesterol or placenta-containing conditioners) among Black and White women, and explored associations with breast cancer. Multivariable-adjusted models were used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) to describe the associations of interest among 2280 cases (1508 Black and 772 White) and 2005 controls (1290 Black and 715 White). Among controls, hair dye use was more common among Whites than Blacks (58 versus 30%), while relaxer (88 versus 5%) and deep conditioner use (59 versus 6%) was more common among Blacks. Among Blacks, use of dark hair dye shades was associated with increased breast cancer risk (OR = 1.51, 95% CI: 1.20–1.90) and use of dark shades (OR = 1.72, 95% CI: 1.30–2.26) and higher frequency of use (OR = 1.36, 95% CI: 1.01–1.84) were associated with ER+ disease. Among Whites, relaxer use (OR = 1.74, 95% CI: 1.11–2.74) and dual use of relaxers and hair dyes (OR = 2.40, 95% CI: 1.35–4.27) was associated with breast cancer; use of dark hair dyes was associated with increased ER+ disease (OR = 1.54, 95% CI: 1.01–2.33), and relaxer use was associated with increased ER– disease (OR = 2.56, 95% CI: 1.06–6.16). These findings provide support a relationship between the use of some hair products and breast cancer.

Additional examinations of hair products and other PCPs as important exposures contributing to breast cancer risk and risk of other health effects are necessary. As use of various PCPs continue among women in the US as well as in other countries, improved awareness of the potential effects of exposures to their chemical ingredients are needed.



## Fidelis Toloyi Ndombera, PhD.

Dr. Ndombera is a research scientist at Covance Laboratories Inc. USA; a global drug development company. He obtained his PhD (Chemistry) from Wayne State University, Detroit in USA, the title of his thesis was *Carbohydrate-based inducers of cellular stress that target cancer cell metabolism*. Dr. Ndombera leverages his experience in Organic and Bioanalytical chemistry in biochemical cancer research and bioassay method development using tools that include illumina sequencing, Nanostring technology, qPCR, and Biodistribution studies. Dr. Ndombera independently analyzes samples and validates methodologies for various

compounds and components in compliance with appropriate SOPs and drug approval regulatory agency guidelines such as the FDA. His role involves designing and implementing clinical studies on new drugs seeking FDA and global approval. He supports the implementation of startup priorities, systems and SOPs and serves as a primary scientist on projects with an oversight role on technical personnel. Dr. Ndombera has published work in refereed journals that include *Bioorganic and Medicinal Chemistry Letters* (Carbohydrate-based inducers of cellular stress for targeting cancer cells. *Biorg. Med. Chem. Lett.* 26, 1452 (2016)). Dr. Ndombera's recent collaborative work with Kenyan researchers was published

in *Journal of Pharmacy and Pharmacology* (Pharmacokinetic, physicochemical and medicinal properties of N-glycoside anti-cancer agent more potent than 2-deoxy-D-glucose in lung cancer cells 7 (2019)). Dr. Ndombera is a member of American Chemical Society, National Organization of Black Chemists and Chemical Engineers, among others. He also volunteers giving public lectures in schools and universities in Kenya and abroad.

## **ABSTRACT**

### **Title: NanoString Chemistry and Technology: An emerging tool in Cancer Drug Discovery and Treatment**

In recent times, global collaborative efforts such as the Human Genome Project, The Cancer Genome Atlas, The Human Cell Atlas, The Human Protein Atlas, and the Precision Medicine Initiative (PMI) have fast-tracked cancer research by capitalizing on advances in genomics and biotechnology. These biotechnological advances have enabled the understanding of cancer on a cellular and molecular level with promising therapeutic solutions to various forms of cancer. These collaborative work among researchers include studies on gene expression and cancer therapeutics. For example, researchers at the National Cancer Institute (NCI) under PMI and at Covance Laboratories in the USA, hope to use an increased knowledge of the genetics and biology of cancer to find new, more effective treatments for various forms of this disease.

These researchers are conducting studies using tools that measure gene expression to gain insight into the signaling pathways implicated in cancer activity and therapeutic response. The intricacies of these cancer signaling pathways are a bottleneck to the effective study of cancer therapeutic solutions. More precise research tools are required to enable discoveries that advance understanding of how cancer cells develop, metastasize and progress. Narrowing the genes, including driver genes, that are responsible for controlling these various pathways and learning how to exploit them will allow for the development of novel

treatments. One promising tool for measuring gene expression in multiplexed fashion is NanoString technology.

NanoString technology can measure gene expression of up to 800 genes in a multiplex fashion from various matrices that include cell lysate, body fluids and formalin-fixed, paraffin-embedded tissues. NanoString platform captures the activity of 13 canonical cancer pathways and associated driver genes. This powerful ability is largely because the gene expression state of a cell or tissue contains information about the biological processes occurring within a sample. NanoString technologies utilize digital color-coded barcode technology based on direct multiplexed measurement of gene expression and offer high levels of precision and sensitivity. Each color-coded barcode is covalently attached to a single target-specific probe corresponding to a single gene which can be individually counted without amplification. NanoString's chemistry utilizes these target-specific Reporter and Capture Probes, collectively referred to as a CodeSet, that directly hybridize to a gene of interest. The gene of interest or target molecule could be in form of single-stranded RNA, DNA or protein in solution. Additionally, NanoString's 3D Biology™ Technology, enables simultaneous profiling of any combination of DNA, RNA, protein, and phospho-protein targets.

In this presentation, we demonstrate the emerging role of NanoString Technology in Cancer diagnosis, prognosis and drug discovery. We highlight select NanoString gene expression data and information that provides a framework for understanding the discrete changes between the biology of different cancers and cancer subtypes. This allows for understanding of cancer-drug targets and related changes that occur in multiple pathways. Additionally, we introduce the Prosigna Breast Cancer Prognostic Gene Signature Assay (formerly called the PAM50 test), made by NanoString. Prosigna is a genomic test that analyzes the activity of certain genes in early-stage, hormone-receptor-positive breast cancer. The Prosigna test was approved by the U.S. Food and Drug Administration (FDA) in 2013. Importantly, ongoing research suggests the test may eventually be widely used to help make breast cancer treatment decisions based on the risk of distant recurrence for women within 10 years of diagnosis of early-stage, hormone-receptor positive disease. In conclusion, the Prosigna case will be used to highlight the FDA drug approval process with a goal of encouraging drug development efforts in developing countries, such as Kenya.



## Prof. Rosemary Sang

As an arbovirologist with background in Medical Entomology and Medical Virology to PhD level and with over > 25 years of experience in field and laboratory studies in arbovirus disease ecology and epidemiology, I have worked for the Kenya Medical Research Institute here in Kenya for over 3 decades. During this time I had opportunity to support arbovirus programs in collaborative projects with a number of institutions and agencies including the US Army medical research unit (USAMRU-K), the International Livestock Research Institute (ILRI), the International Center of Insect Physiology and Ecology (ICIPE) among others. I have had rare opportunities to lead and mentor

strong arbovirus teams and students in conducting extensive surveillance, ecological research studies that have improved our knowledge and understanding of the distribution and ecology of arboviruses of public health importance, key among them being Rift Valley Fever. My collaborative research effort has resulted in > 98 publications in peer reviewed journals covering areas of arbovirus surveillance, epidemiology, ecology, outbreak investigations, response and control.

Along with my research, I have had administrative duties including serving as head of the Arbovirus and Hemorrhagic Fevers laboratory at the Center for Virus Research in KEMRI since 2003 and

as Director of the Center for Virus Research of the Kenya Medical Research Institute up to 2018. I also support capacity building activities through teaching in the Institute of Tropical Medicine and Infectious Disease (ITROMID), a programs hosted in the College of Health Sciences, Jomo Kenyatta University of Agriculture and Technology (JKUAT) where I am adjunct professor, teaching

Medical virology in addition to supervising and mentoring MSc, PhD and Post-Doctoral fellows. I have served in various WHO and National expert committees to provide expert opinion advice on research trends on viral diseases and response to public health challenges and emergencies caused by arboviruses/hemorrhagic fevers and other viral diseases in general.

## **ABSTRACT**

**Title: The emergence and re-emergence of arbovirus threats in East Africa; why we should be concerned about our early warning systems and preparedness for combat**

The worldwide emergence and spread of arthropod-borne viruses (arboviruses) in recent times is now a major public health concern as reports of disease outbreaks like dengue, yellow fever, Rift Valley Fever, Chikungunya fever, Zika and Crimean Congo Haemorrhagic fever (to name a few) increase in frequency. Many of these emerging and re-emerging arboviruses are said to be of African origin yet as a continent we have not done enough to improve our state of preparedness to contain the scourge.

Over time, we have compiled data to shade more light on the complex ecology and epidemiology of some of the key virus diseases and some little-known ones. Even as we battle the increasing frequency of outbreaks and spread of dengue, chikungunya and Yellow Fever in East Africa, there is no knowing what and where the next emerging big thing is or will come from due to inadequate surveillance. As

we gather evidence through research it is important to move towards enhancing our early warning systems and state of preparedness so that arbovirus outbreaks do not reverse the gains being made by universal health coverage through disease prevention.



## Dr. Bernhards Ogutu

Dr Bernhards Ogutu is currently the Assistant Clinical Research Scientist, the Kenya Medical Research Institute (KEMRI). Dr. Ogutu has led several large research clinical trials across the region such as with the INDEPTH-Network as Senior Clinical Trialist with the Malaria Clinical for the phase III RTS,S malaria vaccine. He was also a cofounder of the KEMRI Malaria Diagnostic Centre in Kisumu. Dr. Ogutu is also a Director a virtual cross institution open platform for capacity development, Centre for Research in Therapeutic Sciences (CREATES) at Strathmore University in Nairobi. Dr. Ogutu is a visiting professor and examiner to a number of Universities.

He has authored more than 150 peer reviewed publications. His areas of research expertise includes clinical trials, disease pathogenesis, and clinical therapeutics with a bias in malaria and clinical trials capacity development.

Dr Ogutu received his MBChB, MMed and PhD from the University of Nairobi. Dr Ogutu is a board certified Medical Practitioner, Paediatrician and Clinical Pharmacologist.

**ABSTRACT****TITLE: Malaria management in the UHC framework for maximum impact**

Malaria remains the most important parasitic disease globally with 228 million cases recorded in 2018 of which sub-Saharan accounted for 93% of the burden. There were an estimated 405 000 deaths from malaria globally in 2018, compared with 416 000 estimated deaths in 2017, and 585 000 in 2010. As would be expected 94% of deaths in 2018 occurred in sub-Saharan Africa.

The impact of the disease on children and pregnant remains high and with epidemiological shift in a number of regions the disease pathogenesis has also changed necessitating changes in treatment approaches. The adoption of UHC is a good framework for embedding malaria elimination agenda. This is because malaria is a public health problem disease and will require a community based approach.

Recent global efforts have focused on prevention, diagnosis, treatment, elimination and surveillance looking at both investments and achievements over time. For the first time the global community has engaged the approach of “High Burden to High Impact” in malaria management and this requires rethinking the tool kit which will vary from region to region and even country but with one focus on elimination. There is need to rethink the approach of malaria management in the UHC framework in a country such as Kenya.



## Dr. Fredros Okumu

**Dr. Fredros Okumu** is the Director of Science at Ifakara Health Institute, in Tanzania, an Adjunct Professor at the Nelson Mandela Africa Institute of Science & Technology, also in Tanzania, and an Associate Professor at University of the Witwatersrand in South Africa. He is a public health specialist focusing on biology and control of mosquito-borne diseases. His research covers a wide range of subjects, including basic biology of disease transmission, quantitative ecology of disease vectors, low-cost approaches for disease control and surveillance, mathematical evaluation of interventions, innovative malaria diagnostics for low-income communities, and

improved approaches to public engagement & policy. Fredros originally trained as a Public Health Officer at Moi University College of Health Sciences in Kenya between 2001 and 2005. He holds a Master degree in Applied Parasitology from University of Nairobi, Kenya (2008), and another Master degree in Geo-information Science, Earth Observation & Environmental Modeling from Lund University, Centre for Geographical Information Systems, in Sweden (2011). He earned a PhD in Infectious Tropical Diseases from London School of Hygiene & Tropical Medicine in 2012, and an MBA-International Health Management from University of Basel and Swiss

Tropical & Public Health Institute, Switzerland in 2019. Fredros was awarded the American Society of Tropical Medicine & Hygiene (ASTMH) Young Investigator Award in 2009, a Wellcome Trust Intermediate Fellowship in Public Health & Tropical Medicine (2014-2019), a Howard Hughes-Gates International Scholarship (2017-2022), and an ASPEN New Voices Fellowship (2019-2020). He was named among Top 100 Global Thinkers by US-Based Foreign Policy Magazine in 2016, and Top 30 African Innovators by Quartz Africa in 2018.

He was a co-chair of the Malaria Eradication Research Agenda consultative group on Tools for Elimination (2016-2018) and co-Chaired the WHO Vector Control Working Group on New Tools for Malaria Vector Control between 2016 and 2019. Between 2017 and 2018, he provided research support for the Africa Union High-Level Panel on Emerging Technologies, and was a member of the working group that defined the pathway for testing of gene-drives for malaria control in Africa. Fredros is Associate Editor of the Journal, Parasites & Vectors, and a member of Editorial Board of Malaria Journal. He was inducted in June 2016 as a Young Affiliate of the African Academy of Sciences.

In 2018, Fredros was appointed to the 12-member Malaria Advisory Panel of the Bill & Melinda Gates Foundation for a three-year term. He also works as an assessor for the WHO prequalification program for vector control products since 2017. He is currently a Honorary Research Fellow at University of Glasgow and was until 2019 a Visiting Professor at the Federal University of Minas Gerais in Brazil. Fredros has more than 80 publications in peer-reviewed journals, and maintains an active research group with several post-graduate students, scientists, staff and collaborators in more than ten countries. Over the years, his team has produced various high-impact innovations including highly effective mosquito attractants, scalable new technologies for malaria prevention, a reagent-free malaria diagnostic developed by integrating math, biology and chemistry, and a series of evidence-based advisories on optimal implementation of public health interventions.

## **ABSTRACT**

### **Title: Multiplicity of Malaria Transmission in East Africa**

Malaria transmission is a simple process typically occasioned by an infectious *Anopheles* bite. The associated events are theoretically well-understood, and could be disrupted by simply preventing human-mosquito interactions. Yet, in practice, malaria transmission remains extraordinarily complicated and heterogenous. Across Africa, it is a complex web of different vector species, pathogen species, human behaviors, environmental determinants, intervention choices and political pressures, among other factors. Though most progress accrued against malaria in the last two decades was due to scale-up of insecticide-treated nets and house spraying with residual insecticides, these interventions cause differential impact on the malaria transmission complex. This talk will discuss the multiplicity of factors in malaria transmission and the dominance of certain *Anopheles* species. Special attention will be put on pyrethroid resistant *Anopheles funestus*, which now dominates malaria transmission across east and southern Africa, despite occurring in lower densities than other vectors such as *An. arabiensis*. The talk will also provide an analysis of how different vector species respond to current interventions, and what opportunities exist to sustain or expand the gains so far accrued. Specific examples will be provided from east and southern Africa. In conclusion, there will be an outline of possible pathways for accelerating current efforts towards malaria elimination in Africa. In summary, all malaria control efforts must recognize the multiplicity of the disease, and deploy targeted interventions that target the most dominant vector species.



## Dr. Thumbi Mwangi<sup>1,2,3</sup>

<sup>1</sup>Center for Global Health Research,  
Kenya Medical Research Institute

<sup>2</sup> University of Nairobi Institute of  
Tropical and Infectious Diseases

<sup>3</sup>Paul G Allen School for Global Animal  
Health, Washington State University

Thumbi Mwangi is an infectious disease epidemiologist leading a research group that investigates the zoonotic, socio-economic and nutritional pathways that link animal health to human health and development. He qualified as a veterinarian from the University of Nairobi and holds a Master of Science degree in Genetics and Animal Breeding from the same

University, and a PhD in Infectious Disease Epidemiology from the University of Edinburgh. He is a Clinical Assistant Professor at the Paul G Allen School for Global Animal Health, Washington State University, Senior Research fellow at the University of Nairobi and at the Kenya Medical Research Institute.

## **Abstract**

### **Title: People, their animals and development: together in sickness and in health**

Human health and development are intricately related to the health and production of animals. These relationships are strongest among rural communities closely interacting with animals and whose livelihoods are dependent on livestock. Using data from ten years of field epidemiological research studies in East Africa, this talk examines the three main pathways (zoonotic, nutritional and socio-economic) that link human and animal health. The talk focuses on use of epidemiological skills in country prioritization of livestock diseases and infectious zoonotic diseases in the face of multiple endemic and epidemic disease threats, quantification of risk and impact of animal diseases and production on human health, and animal based interventions to reduce human disease burden, reduce risk of child malnutrition, and improve household economics and socio-determinants of health.



## Prof. Graham Devereux

**Graham Devereux** is Professor of Respiratory Medicine, Liverpool School of Tropical Medicine, Consultant Physician Aintree University Hospital, Liverpool, UK. Graham is a chest physician looking after adults with lung disease. In addition he has a research interest in the early life origins of airways disease. He has conducted translational

research in a wide age range of populations, spanning from 10 weeks gestation to 65 years, he is particularly interested in the role of maternal nutrition during pregnancy and the development of lung disease in children. Graham is currently helping KEMRI with a study investigating the lung health of children living in two areas of Nairobi.



## **Abstract**

### **Title: Early life influences on the life course of non-communicable lung disease**

Non-communicable respiratory airways disease (asthma, COPD) are of major public health importance with considerable adverse effects on quality of life, disability and/or mortality. Globally 210 million people have COPD and 300 million people have asthma, with low and middle income countries (LMIC)s shouldering the greatest burdens (90% of deaths), both conditions are increasing in prevalence in LMICS. Recent studies in Africa have revealed a high burden of airways disease and small lung capacity that cannot be explained by smoking habits.

Recent studies in high income countries indicates that both asthma and COPD have their origins very early in life, most probably 'in utero' and extrapolation to Africa suggests that the patterns of lung disease observed in adults is a consequence of adverse early life exposures. The nature of these adverse early life exposures is under active investigation but is likely to include, maternal nutrition, maternal exposure to air pollution and early life respiratory infections. Whether intervention during early life can reduce the risk of children and adults developing airways disease remains to be established.



## Prof. Lesley Drake

Lesley Drake has a PhD in Epidemiology/Parasitology from Imperial College London. She is the Executive Director for the Partnership for Child Development (PCD), Imperial College London. PCD is a global leader in School Health and Nutrition (SHN) and has been instrumental in developing evidence-based frameworks, policies, and tools that have been adopted by over 60 countries globally. Prof. Drake was a key member of the UN joint taskforce to develop an action framework that laid out the principles of good practice for effective policy and programming: Focusing Resources on Effective School Health (FRESH). She

has contributed to over a hundred publications including contemporary seminal analyses on school feeding and the school as a platform for health service delivery. A recent key highlight was leading a senior international team on a chapter documenting the impact of school feeding for *Disease Control Priorities, Third Edition (DCP3)*. Prof. Drake is also an assistant professor, Department of Global Health, University of Washington.

## ABSTRACT

### **Title: School Health and Nutrition: An Investment in Human Capital**

School feeding is commonly implemented across low-, middle-, and high-income countries; however, there is significant variation driven by context to a large degree. The research most strongly indicates that school feeding has social protection and educational benefits; more recent studies have explored its nutritional benefits. School feeding can serve to protect earlier investments in child welfare, buffering the effects of early shocks and contributing to the continuum of interventions from childhood through adolescence and into adulthood. Furthermore, school feeding also has the potential to address emerging issues such as the nutrition transition and could be integrated with other school health interventions, such as deworming, for greater impact. Home grown school feeding can not only change eating preferences of households, improve community incomes, and smallholder production and market access, but can also benefit investments in rural economies and contribute to national food security. Much still needs to be learned about the barriers to these potential benefits. The costs of school feeding vary significantly across countries. An economic modelling exercise indicates that the returns to greater *quantity and quality of education* are a *primary contributor to benefits*. *Future research is needed on the quantification of benefits to ensure more valid comparisons with other interventions.*

# FULL PROGRAM

TUESDAY FEBRUARY 11 <sup>TH</sup> FEBRUARY 2020	
VENUE	SAFARI PARK HOTEL
0700-0830hrs	Registration of Delegates
<b>SESSION 1</b>	<b>Official Opening Session – Jambo Room</b>
0830– 0840hrs	Conference overview: Chair of KASH Organizing Committee, <b>Prof. Charles Mbogo</b>
0840– 0850hrs	Welcome remarks: DIRECTOR GENERAL, KEMRI, <b>Prof. Yeri Kombe</b>
0850– 0900hrs	Remarks from Chair, KEMRI Board of Management, <b>Dr. Naphtali N. Agata</b>
0900– 0930hrs	<b>Opening Keynote Address: Dr. Zipporah Bukania</b> -Cost of Hunger in Africa-Kenya Study: Consequences of Undernutrition on Attainment of Universal Health Coverage
Session Chair	<b>Prof. Sam Kariuki</b>
Rapporteur	<b>Dr. Damaris Matoke- Muhia</b>
PLENARY 1 -3- Jambo Room	
Plenary Chair: Co-Chair:	<b>Dr. Benjamin Tsofa</b> <b>Dr. Vera Manduku</b>
Rapporteurs:	<b>Dr. Josyline C. Kaburi</b>
0930 -0950hrs	<b>Plenary Session 1: Prof. Peter Ngunjiri:</b> “Steps towards Achievement of Universal Health Coverage in Kenya: Implications of Devolved Health Functions”
0950- 1010hrs	<b>Plenary Session 2: Prof. Adana AM Llanos:</b> “Epidemiologic Exploration of Personal Care Products as Important Environmental Risk Factors for Breast Cancer”
1010-1030hrs	<b>Plenary Session 3: Fidelis Toloyi Ndombera:</b> “NanoString Chemistry and Technology, An emerging tool in Cancer Drug Discovery and Treatment

<b>1030-1100hrs</b>	<b>Health Break, Poster Viewing Session 1</b>	
	<b>SCIENTIFIC SESSION 1-4 &amp; Symposium 1- Parallel Sessions</b>	
<b>1100- 1300hrs</b>	<b>Abstract No</b>	<b>SCIENTIFIC SESSION 1: Health Systems</b> <b>Venue:Tsavo</b> <b>Chair: Dr. Kui Muraya</b> <b>Co-Chair: Dr. Lydia Kaduka</b> <b>Rapporteurs: Sharon Mokuu</b>
1100- 1115hrs	001	Institutionalizing Knowledge Management: A Pilot sensitization Activity at The Kenya Medical Research Institute, <b>Lilian Mayieka</b>
1115- 1130hrs	002	Resource tracking for public health facilities in Kenya: experiences in a devolved health system, <b>Angela Kairu</b>
1130-1145hrs	003	Systems thinking with stakeholders to strengthen primary health care in Kenya: concept mapping in the HEKIMA Study, Vihiga, Kenya, <b>Lydia Kaduka</b>
1145-1200hrs	004	Immunization Coverage in Siaya County, Kenya, Before and After Healthcare Worker Strikes, <b>Benard Opiyo</b>
1200- 1215hrs	005	Laboratory Safety Audits A Game Changer In Infection Prevention And Control, <b>Duncan Ongayi</b>
1215-1230hrs	006	Implementation of an Electronic Quality Management System using Q-Pulse: The KEMRI-Wellcome Trust Research Laboratories Experience, <b>Susan Njuguna</b>
1230-1245hrs	007	Operationalization and sustainability of a quality accredited tuberculosis reference laboratory in resource limited setting, met and unmet goals from 2012 At KEMRI, <b>Joshua Ongalo</b>
<b>1245-1300hrs</b>	<b>Panel Discussion</b>	

1100- 1300hrs	Abstract No	<b>SCIENTIFIC SESSION 2: Genomics, Diagnostics and Innovations</b> <b>Venue: Amboseli</b> <b>Chair: Dr. John Waitumbi</b> <b>Co-Chair: Dr. Muuo Nzou</b> <b>Rappoeurters: Kimita Gathii</b>
1100- 1115hrs	008	Biomarkers associated with inpatient mortality among acutely ill undernourished children, <b>James Njunge</b>
1115- 1130hrs	009	No Evidence of <i>P. falciparum</i> K13 Artemisinin Conferring Mutations Over a 24-year Analysis in Coastal Kenya, but a Near Complete Reversion to Chloroquine Wild Type Parasites, <b>Kevin Wamae</b>
1130-1145hrs	010	Update and broader direction of an Indo-African pathogen genomics initiative, <b>Pratik Lakhani</b>
1145-1200hrs	011	Phylogenetic analysis and sequence-typing of multi-drug resistant <i>Neisseria gonorrhoeae</i> clinical isolates from Kenya using Nanopore sequencing, <b>Meenakshi Iyer</b>
1200-1215hrs	012	Molecular Analysis of Antimalarial Resistance Markers in Parasite Samples Obtained from Children Recruited into a Drug Efficacy Trial in Kwale, Kenya, 2013, <b>Leonard Ndwiga</b>
1215- 1230hrs	013	Identification of approved drugs with unknown antiplasmodial activity using chemogenomics and in vitro approaches, <b>Douglas Ochora</b>
1230-1245hrs	014	Genetic Diversity of respiratory human adenoviruses isolated in Kenya, <b>Rachel Achilla</b>
<b>1245-1300hrs</b>	<b>Panel Discussion</b>	

1100- 1300hrs	Abstract No	<b>SCIENTIFIC SESSION 3: INFECTIOUS DISEASES 1</b> <b>Venue: Samburu</b> <b>Chair: Dr. Margaret Mbuchi</b> <b>Co-Chair: Dr.Patrick Munywoki</b> <b>Rapporteur: Josephat Nyataya</b>
1100- 1115hrs	015	Gestational Age at Attendance for Antenatal Care as a Potential Factor for the Success of a Maternal Respiratory Syncytial Virus (RSV) Vaccine Program in Coastal Kenya, <b>Joyce Nyiro</b>
1115- 1130hrs	016	Measles Outbreak in Remote Area in Unvaccinated Population, Tana River County, Kenya, January 2019, <b>Abbas Godana</b>
1130-1145hrs	017	Measles outbreak investigation in Wajir County, Kenya 2019, <b>Muma Shariff</b>
1145-1200hrs	018	Long-term impact of 10-valent pneumococcal conjugate vaccine in Kenya: nasopharyngeal Streptococcus pneumoniae carriage among children and adults six to seven years after vaccine introduction, <b>Patrick Munywoki</b>
1200-1215hrs	019	Seasonality and prevalence of respiratory syncytial virus, parainfluenza, and adenoviruses in Kenya: USAMRD-K supported Influenza-like illness surveillance program (2007-2018), <b>Therese Umuhoza</b>
1215- 1230hrs	020	Using the synthetic control method to assess 10-valent pneumococcal conjugate vaccine impact on pneumonia among children aged <5 years in rural and urban Kenya, <b>Allan Audi</b>

1230-1245 hrs	021	Surveillance of Neuraminidase inhibition susceptibility of Influenza A virus (IAV) isolates obtained from Kenya, 2008 to 2017, <b>Meshack Wadegu</b>
1245-1300 hrs	022	Understanding The Cellular Immunology To Pneumonia, <b>Elijah Gicheru</b>
<b>1300-1310hrs</b>	<b>Panel discussion</b>	
<b>1100- 1300hrs</b>	<b>Abstract No</b>	<b>SCIENTIFIC SESSION 4: TB/ HIV (1)</b> <b>Venue: Bogoria</b> <b>Session Chair: Dr. Hellen Meme</b> <b>Co-Chair: Asiko Ongaya</b> <b>Rapporteur: Fred Orina</b>
1100- 1115hrs	023	Continous Quality Improvement Approach To Scale Up TB Active Case Finding In Suna West Sub County, <b>Peter Omware</b>
1115- 1130hrs	024	HIV Epidemiology among the Fisherfolk in the Islands of Lake Victoria in Western Kenya; 2017-2018, <b>Anne Adega</b>
1130-1145hrs	025	Factors associated with bacteriologically confirmed pulmonary Tuberculosis cases in Kwale County, 2016–2019, <b>Samuel Kimaru</b>
1145-1200hrs	026	Tuberculosis Case Finding among HIV Positive clients attending HIV Care Clinic at Kathiani Hospital Machakos County, Kenya, January 2018 to June 2019, <b>Eunice Kiilu</b>
1200-1215hrs	027	Experiences in successful implementation of a tuberculosis (TB) vaccine trial in a TB endemic setting western Kenya, <b>Joshua Ongalo</b>
1215-1230hrs	028	Retention of New adult Clients on Anti-Retroviral Therapy at Kisumu County Referral Hospital Comprehensive Care Centre in 2018, <b>Larry Mwallo</b>

1230-1245 hrs	029	HIV-specific antibody neutralization function in HIV infected children, <b>Yiakon Sein</b>
<b>1245-1300hrs</b>	<b>Panel Discussion</b>	
<b>1100-1300 hrs</b>		<p><b>Symposium 1: Strengthening of exploitation of Science, Technology and Innovations as a key enabler of realization of UHC</b></p> <p><b>Venue: Ivory</b></p> <p><b>Organizer/Chair: Dr. James H. Kimotho</b></p> <p><b>Co-Chair: Dr. Cecilia Wanjala,</b></p> <p><b>Rapporteur: Dr. Missiani Ochwoto, Ruth Nyangacha</b></p>
<b>1300-1400hrs</b>	<b>Lunch Break/ Poster Viewing Session 1</b>	
<b>SCIENTIFIC SESSION 5-8 &amp; Symposium 2</b>		
<b>1400-1630hrs</b>	<b>Abstract No</b>	<p><b>SCIENTIFIC SESSION 5: Public Health(1)</b></p> <p><b>Venue: Tsavo</b></p> <p><b>Session Chair: Sophie Matu</b></p> <p><b>Co-Chair: Dr. Lilian Mayieka</b></p> <p><b>Rapporteur: Mike Muraya</b></p>
1400-1415hrs	030	Evaluation Of Hepatitis B Vaccination Uptake And Awareness Among Health Care Workers At Chulaimbo County Hospital, <b>Dancan Ongayi</b>
1415-1430hrs	031	Assessment of HIV Exposed Infants on Follow Up at Mentor Mothers Program Sites, Kwale County, Kenya, 2016- 2018, <b>Juma Mwavita</b>
1430-1445hrs	032	Mortality rates and causes of death in an urban informal settlement, Kibera, Kenya, 2017, <b>Clifford Oduor</b>

1445-1500hrs	033	Increasing Screening In All Hospital Departments To Improve Active Case Finding The Case Of Awendo Sub County, <b>Peter Omware</b>
1500-1515 hrs	034	Human Papillomavirus (HPV) Infection: Molecular/Genotype Epidemiology, Acceptability of Screening and Vaccination and Risk-factors among women in lower Mt. Kenya region, <b>James Njue</b>
1515-1530 hrs	035	Process evaluation of the implementation of Linda Mama Free Maternity Programme in Kenya, <b>Stacey Orangi</b>
1530-1545 hrs	036	Assessment of Community Knowledge on Tuberculosis in Meru County, Kenya February 2019, <b>Martin Njiru</b>
1545-1600 hrs	037	Factors associated with outcome of Gender Based Violence Survivors attending care at Makadara Health Center, Nairobi County, January-December,2018, <b>Nellie Motanya</b>
<b>1600-1630hrs</b>	<b>Panel Discussion</b>	
<b>1400-1630hrs</b>	<b>Abstract No.</b>	<b>SCIENTIFIC SESSION 6: Non-Communicable Diseases (NCDs)</b> <b>Venue: Amboseli</b> <b>Chair: Dr. Linet Onger</b> <b>Co-Chair: Ann Korir</b> <b>Rapporteur: Joyce Ondicho</b>
1400-1415hrs	038	Integration of chronic oncology services in noncommunicable disease clinic in rural Rwanda, <b>Robert Rutayisire</b>
1415-1430hrs	039	The epidemiology of sickle cell disease in children recruited in infancy in Kilifi, Kenya: a prospective cohort study, <b>Brian Tawa</b>

1430-1445hrs	040	Genotypes and Prevalence of High-Risk Human Papillomavirus among patients diagnosed with Head and Neck Cancer at Alexandria Cancer Centre, <b>Eva Ombiro</b>
1445-1500hrs	041	Evaluation of Road Traffic Accident Fatal Injury Surveillance System - Machakos County, Kenya, 2015–2019, <b>Ian Chessa</b>
1500-1515hrs	042	Evaluation of Palliative Care Surveillance System in Kenya, 2016–2018 <b>Elizabeth Nzioka</b>
1515-1530hrs	043	Case presentation where mri shows superiority as a modality for breast cancer screening, <b>Mazaher Jaffer</b>
1530-1545hrs	044	Myocardial and haemodynamic responses to two fluid regimens in African children with severe malnutrition and hypovolaemic shock (AFRIM study), <b>Nchafatso Obonyo</b>
1545-1600hrs	045	Factors associated with high prevalence of diabetes among adults in Nyeri County, Kenya, 2019, <b>Gatwiri Murithi</b>
1600-1615hrs	046	Histopathological Patterns of Breast Cancer Diagnosed at Alexandria Cancer Center and Palliative Care Hospital, <b>Tabitha Kamau</b>
1615-1630hrs	047	Antiproliferative effects of Fagaropsis angolensis (Engl.) Dale (Rutaceae) leaf and root extracts on breast cancer cells in culture, <b>Jared Onyancha</b>
1630-1645hrs	<b>Panel discussion</b>	
1400-1630hrs	<b>Abstract No</b>	<b>SCIENTIFIC SESSION 7: TB/HIV 2</b> <b>Venue: Samburu</b> <b>Chair: Dr. Patrick Munywoki</b> <b>Co-Chair: Barbra Miheso</b> <b>Rapporteur: Josephat Nyataya</b>

1400-1415hrs	048	Preliminary Findings of Scaling up Evidence-based Multiple Focus Integrated Intensified Tuberculosis Screening to End TB in Siaya County, Kenya, <b>Douglas Okello</b>
1415-1430hrs	049	Characterization of Drug Sensitive Tuberculosis cases in the Coastal region of Kenya, 2015-2017, <b>Emily Kurera</b>
1430-1445hrs	050	Comparative testing for MDRTB cases among presumptive multidrug resistant tuberculosis patients, in western- Kenya, <b>Albert Okumu</b>
1445-1500hrs	051	Recovery Of Mycobacterium Tuberculosis From Negative Mgit Cultures With Growth Units Above 1 After Protocol Incubation Period Of 42 Days, <b>Joshua Ongalo</b>
1500-1515hrs	052	Predictors of unfavorable treatment outcomes among drug sensitive TB patients at the County Referral Hospital, Taita Taveta, Kenya, 2014–2017, <b>Williamson Mwanyika</b>
1515-1530hrs	053	The distribution and trends of drug resistant Mycobacterium tuberculosis among patient's sputum samples referred to KEMRI-TB laboratory for drug resistance surveillance in Western Kenya, <b>Joshua Ongalo</b>
1530-1600hrs	<b>Panel discussion</b>	
1400-1630hrs	<b>Abstract No</b>	<b>SCIENTIFIC SESSION 8: MALARIA</b> <b>Venue: Bogoria</b> <b>Chair: Dr. Caroline Kifunde</b> <b>Co-Chair: Dr. Joseph Mwangangi</b> <b>Rapporteur: Clement Masakwe</b>

1400-1415hrs	054	Gametocyte clearance in children, from western Kenya, with uncomplicated Plasmodium falciparum malaria after artemether-lumefantrine or dihydroartemisinin-piperazine treatment, <b>Protus Omondi</b>
1415-1430hrs	055	Monthly malaria chemoprevention for the post-discharge management of severe anaemia in children in sub-Saharan Africa, <b>Titus Kwambai</b>
1430-1445hrs	056	The Efficacy of Artemisinin Combination Therapy in Kenya; the status at four malaria endemic regions' sentinel sites, <b>Francis Kimani</b>
1445-1500hrs	057	An effective method for enrichment of Plasmodium falciparum DNA from cryopreserved infected red blood cells, <b>Brian Bartilol</b>
1500-1515hrs	058	Diagnostic performance of ultra-sensitive rapid diagnostic tests (uRDTs) for malaria in pregnant women attending antenatal care clinics in western Kenya, <b>Aaron Samwels</b>
1515-1530hrs	059	Assessment of Community Case Management of Malaria in Muhoroni Sub County from January to September 2019, <b>John Seda</b>
1530-1545hrs	060	Antiplasmodial Activities Of Securidaca Longipedunculata Fresen (Polygalaceae), <b>Douglas Ochora</b>
1545-1615hrs	<b>Panel discussion</b>	

1400-1630hrs	<b>SYMPOSIUM 2: NAPREDA: Herbal and Traditional Medicine in Universal Health Coverage: The Potential and Need for Evidence Based Products</b> <b>Venue: Ivory</b> <b>Organizer/Chair: Dr. Festus Tolo</b> <b>Co-Chair: Dr. Peter Mwitari</b> <b>Rapporteur: Dr. Beatrice Irungu</b>	
<b>DAY 2: WEDNESDAY FEBRUARY 12 2020</b> <b>Venue: Jambo Room</b> <b>PLENARY 4-6</b>		
0730-0830 hrs	Registration of Delegates	
	Session Chair:	<b>Dr. Doris Njomo</b>
	Co-chair:	<b>Dr. Joel Lutomiah</b>
	Rapporteur:	Ms. Milkah Mwangi
0830–0900hrs	<b>Plenary Session 4: Dr. Fredros Okumu</b> “Multiplicity of Malaria Transmission in East Africa”	
0900–0930hrs	<b>Plenary Session 5: Dr. Rosemary Sang</b> “The emergence and re-emergence of arbovirus threats in East Africa; why we should be concerned about our early warning systems and preparedness for combat”	
0930-1000 hrs	<b>Plenary Session 6: Dr. Bernards Ogutu</b> “Malaria management in the UHC framework for maximum impact”	
1000-1030hrs	<b>Health Break And Poster Viewing Session 2</b>	
1030-1300hrs	<b>SCIENTIFIC SESSION 9-11 &amp; SYMPOSIUM 3,4, Young investigators Awards</b>	

<b>1030-1300hrs</b>	<b>Abstract No</b>	<b>SCIENTIFIC SESSION 9: NTDS</b> <b>Venue: Tsavo</b> <b>Chair: Dr. David Odongo</b> <b>Co-Chair: Erastus Mulinge</b> <b>Rapporteur: Beth Mutai</b>
1030-1050hrs	061	Ujplus:A Novel Approach to National School Based Deworming Programs, <b>Elijah Songok</b>
1050-1110hrs	062	Prevalence and genotyping of Taenia species in dogs from five counties in Kenya, <b>Erastus Mulinge</b>
1110-1130hrs	063	Occurrence of Cryptosporidium infection among children aged under 24 months in Kibera, Kenya, <b>Daisy Mutai</b>
1130-1150hrs	064	Magnitude and Epidemiological Characteristics of Visceral Leishmaniasis Outbreak in Arid Northern Kenya - April 2019, <b>Qabale Duba</b>
1150-1210hrs	065	High incidence of human brucellosis in a rural Pastoralist community in Kenya, 2016, <b>Peninah Munyua</b>
1210-1230hrs	066	An evaluation of Trichuris trichiura prevalence in Kwale County, <b>Stella Kepha</b>
<b>1230-1300hrs</b>	<b>Panel Discussion</b>	
<b>1030-1300hrs</b>	<b>Abstract No</b>	<b>Scientific Session 10: SRACH (Sexual, Reproductive, Adolescence and Child Health) (1)</b> <b>Venue: Amboseli</b> <b>Chair: Dr. Simon Njoroge</b> <b>Co-Chair: Dr. Joan Olale</b> <b>Rapporteur: Beatrice Olack</b>

1030-1045hrs	067	Uptake of antenatal care services among women of reproductive age in Mandera County, Kenya, <b>Ismail Ahmed</b>
1045-1100hrs	068	Classification Of Semen Parameter Results For Patients Visiting The University Of Nairobi Obstetrics And Gynecology Andrology Laboratory, <b>Dennis Chalo</b>
1100-1115hrs	069	Safety and Pharmacokinetic profile of Fosfomycin in hospitalized neonates in rural Kenya, <b>Christina Obiero</b>
1115-1130hrs	070	Coverage and timeliness of antenatal services in an urban informal settlement in Nairobi, Kenya, <b>JaneAlice Ouma</b>
1130-1145hrs	071	Multi-sectorial approach; a road map for joint implementation of Adolescent and Youth Sexual Reproductive Health interventions, <b>Lillian Nyaga</b>
1145-1200hrs	072	Causes of Low Birth Weight and Preterm Neonatal Mortality in Migori, Kenya: Evidence from Verbal Autopsy, <b>Beatrice Olack</b>
1200-1215hrs	073	Early detection of neurodevelopmental impairment: Comparing the use of caregiver report with direct assessment of pre-term and low birth weight babies in Migori County, Kenya, <b>Olieng'o Geoffrey</b>
1215-1230hrs	074	Factors associated with stillbirths and neonatal deaths in Lamu County, January – December 2017, <b>Khadija Athmani</b>
<b>1230-1300hrs</b>	<b>Panel Discussion</b>	

<b>1030-1300hrs</b>		<b>Scientific Session 11: Antimicrobial Resistance (AMR) 1</b> <b>Venue: Samburu</b> <b>Chair: Dr. Willie Sang</b> <b>Co-Chair: Tom Ouko</b> <b>Rapporteur: Eric Odoyo</b>
1030-1050hrs	075	Gentamicin susceptibility profiles among <i>Neisseria gonorrhoeae</i> isolates from different regions in Kenya, <b>Valerie Oundo</b>
1050-1110hrs	076	Prevalence of <i>Shigella</i> serogroups and their antimicrobial resistance among patients with diarrhea in urban and rural Kenya: 2010-2018, <b>Richard Onyando</b>
1110-1130hrs	077	Human <i>Campylobacter</i> spp., susceptibility patterns and capsular types, <b>Elizabeth Odundo</b>
1130-1150hrs	078	Assessment of antibiotic stewardship among patients admitted in Migori County Referral Hospital (MCRH) - June 2018-June 2019, <b>Tabitha Oketch</b>
1150-1210hrs	079	Direct evidence of the role of environmental contamination in transmission of hospital acquired infections, <b>Lillian Musila</b>
1210-1230hrs	080	Regional Distribution and Antimicrobial Resistance Patterns of Methicillin resistant <i>Staphylococcus aureus</i> isolated from humans in Africa <b>Brian Ogoti</b>
<b>1230-1300hrs</b>	<b>Panel Discussion</b>	

1030-1300hrs	<p><b>SYMPOSIUM 3- : Pan-Africa Mosquito Control Association (PAMCA): It Is Not Just Malaria: Arboviral Transmission, Disease, Surveillance, And Prevention In Kenya</b></p> <p><b>Venue: Bogoria</b></p> <p><b>Chair: Prof. Charles Mbogo</b></p> <p><b>Co-Chair: Dr. Simon Muriu</b></p> <p><b>Rapporteur: Dr David Mburu</b></p>
1030-1300hrs	<p><b>SYMPOSIUM 4: Respect for Persons, by Whom? and for Whom? (SERU)</b></p> <p><b>Venue: Ivory</b></p> <p><b>Organizer/Chair: Mr. Enock Kebenei</b></p> <p><b>Co-Chair: Caroline Kithinji</b></p> <p><b>Rapporteur: Cyprian Kisiyenya</b></p>
1030-1300hrs	<p><b>UNIQUE SESSION: YOUNG INVESTIGATORS AWARD</b></p> <p><b>Venue: Cub Room</b></p> <p><b>Organizer/Chair: Dr. Doris Njomo</b></p> <p><b>Co-Chair: Dr. Simon Njenga and Dr. Lillian Musila</b></p> <p><b>Rapporteur: Dr. Joseph Mwangangi</b></p>
1300-1400hrs	Lunch Break/Poster Viewing Session 2
<b>SCIENTIFIC SESSION 12,13,14 &amp; SYMPOSIUM and 5,6,7</b>	

1400-1630hrs	Abstract No.	<b>SCIENTIFIC SESSION : 12</b> <b>GENOMICS, DIAGNOSTICS AND INNOVATIONS 2</b> <b>Venue: Tsavo</b> <b>Chair: Dr. Jackline Kosgei</b> <b>Co-Chair: Beatrice Ongandi</b> <b>Rapporteur:Cecilia Kyanya</b>
1400-1415hrs	081	Genetic Diversity of Plasmodium falciparum Parasites in Pregnant and Non-pregnant Women and Potential Resistance to Antimalarial Drugs in Western Kenya, <b>Brenda Makena</b>
1415-1430hrs	082	Evaluation of Plasmodium falciparum Histidine-Rich Protein 2 and 3 (PfHRP2 and PfHRP3) gene polymorphisms in Kenya, <b>Martha Kivecu</b>
1430-1445hrs	083	The differences in haemoglobins A, A2, F and S in the context of the haemoglobinopathies HbS and $\alpha$ +thalassaemia in Kenyan infants, <b>Johnstone Makale</b>
1445-1500hrs	084	Investigation of Plasmodium falciparum piperaquine resistance in Kenya using molecular marker analysis and growth inhibition assays, <b>Duncan Wakoli</b>
1500-1515hrs	085	Four separate low frequency $\beta$ -thalassemia pathogenic variants are found within a cohort of children on the East African Coast: results from a sequencing project in Kilifi, Kenya, <b>Alexander Macharia</b>
1515-1530rs	086	Comparing Diagnostic Performance of Pronto Dry Rapid Urease® and Culture to Histopathology among Endoscopy Patients at the Aga Khan University Hospital, Nairobi-Kenya <b>Stephen Njoroge</b>

1530-1545hrs	087	PfHRP2-PfHRP3 diversity among Kenyan isolates and comparative evaluation of PfHRP2/pLDH malaria RDT with microscopy and nested PCR methodologies, <b>Maureen Otinga</b>
<b>1545-1615hrs</b>	<b>Panel Discussions</b>	
<b>1400-1630hrs</b>	<b>Abstract No.</b>	<b>Scientific Session 13: Antimicrobial Resistance (AMR) 2</b> <b>Venue: Tsavo</b> <b>Chair: Dr. Sam Konongoi Limbaso</b> <b>Co-Chair: Enock Kebenei</b> <b>Rapporteur: Susan Kawai</b>
1400-1420hrs	088	Socio-economic factors related to antimicrobial resistance in middle and low Income countries, a literature review, <b>Beatrice Oduor</b>
1420-1440hrs	089	Water, sanitation and hygiene (WASH) and AMR (Antimicrobial Resistance) in an urban slum in Nairobi, Kenya, <b>Joyce Odwar</b>
1440-1500hrs	090	Carriage of Antimicrobial Resistance (AMR) among children with Acute Childhood Illness in Kenya, <b>Caroline Tigoi</b>
1500-1520hrs	091	Status Of Antimicrobial Resistance In Kisumu County In Context To Surveillance Systems, <b>Duncan Ongayi</b>
1520-1540hrs	092	Molecular mechanisms of low level azithromycin resistance in Neisseria gonorrhoeae isolates from Kenyan, <b>Mary Kivata</b>
1540-1600hrs	093	Phenotypic and genotypic characteristics of uropathogenic Escherichia Coli isolates from Kenya, <b>Catherine Muriuki</b>
<b>1600-1630hrs</b>	<b>Panel Discussion</b>	

1400-1630hrs	Abstract No.	<b>Scientific Session 14: Public Health 2</b> <b>Venue: Cub Room</b> <b>Chair: Dr. Jacinta Nzinga</b> <b>Co-Chair: Nicholas Mwikwabe</b> <b>Rapporteur: Judy Mwai</b>
1400-1415hrs	094	Evaluation of Community Led Total Sanitation in Lungalunga Sub County October 2017 to September 2019, <b>Mohammed Mwachakure</b>
1415-1430hrs	095	Improving Water Sanitation and Hygiene in Public Hospitals, <b>Michuki Maina</b>
1430-1445hrs	096	Vitamin D insufficiency is highly prevalent among children living in Africa, <b>Reagan Moseti</b>
1445-1500hrs	097	Improving Pre-Analytical Processes Of HIV Viral Load And Early Infant Diagnosis Services Through Laboratory-Clinical Interface, <b>Tobias Oloo</b>
1500-1515hrs	098	Assessment of Utilization of Blood Transfusion Services among Medical Patients admitted in Migori County Referral Hospital in 2018, <b>Catherine Menganyi</b>
1515-1530hrs	99	Assessment Of Makueni County Healthcare Workers Capacity to Acquire, Summarize and Adopt Research Evidence for Decision Making Processes, Kenya, <b>Kariuki James</b>
1530-1545hrs	100	Factors associated with exit of HIV stable patients on Fast track ART refill at Homabay County Teaching and Referral Hospital, November 2014 – December 2018, <b>Corneleous Okal</b>
1545-1600hrs	101	Feasibility, implementation and experiences of TB integrated laboratory information management system in a referral lab in western Kenya, <b>Ben Odhiambo</b>

<b>1600-1630hrs</b>	<b>Panel Discussion</b>	
1400-1700hrs	<b>Symposium 5: New approaches for disease surveillance and discovery</b> <b>Venue: Samburu</b> <b>Organizer/Chair: Dr. John Waitumbi</b> <b>Co-Chair:</b> <b>Rapporteur: Dr. Caroline Kifunde</b>	
1400-1700hrs	<b>Symposium 6: International Multidisciplinary Programme to address Lung Health and TB in Africa (IMPALA Symposium)</b> <b>Venue: Ivory</b> <b>Organizer/Chair: Dr. Hellen Meme</b> <b>Co-Chair: Ms. Barbra Miheso</b> <b>Rapporteur: Ms. Barbra Miheso/ Kendi</b>	
	<b>Symposium 7: Knowledge Management</b> <b>Venue: Amboseli</b> <b>Organizer/Chair: Prof. Jennifer Orwa</b> <b>Co-Chair: Ms. Lilian Mayieka</b> <b>Rapporteur: Donfelix Ochieng/Daniel Gitau</b>	
<b>DAY 3: THURSDAY FEBRUARY 13 2020</b> <b>Venue: Jambo Room</b> <b>PLENARY 7-9</b>		
<b>0730-0830hrs</b>	<b>Registration of Delegates</b>	
	Session Chair:	<b>Dr. Evans Amukoye</b>
	Co-Chair:	<b>Dr. Hellen Meme</b>
	Rapporteur:	<b>Dr. Joseph Mwangangi</b>

0830–0900hrs	<b>Plenary 7: Dr. Thumbi Mwangi</b> “People, their animals and development: Together in sickness and in health”	
0900–0930hrs	<b>Plenary 8: Prof. Graham Devereux</b> – “Early life influences on the life course of non-communicable lung disease”	
0930-1000hrs	<b>Plenary 9: Prof Drake-</b> “School Health and Nutrition: An Investment in Human Capital”	
1000-1030hrs	<b>HEALTH BREAK</b>	
<b>SCIENTIFIC SESSION 15,16,17 &amp; SYMPOSIUM 8&amp;9 Parallel Sessions</b>		
1030-1300hrs	<b>Symposium 8: The Japan-Africa Collaborative Research on Helicobacter Pylori Project.</b> <b>Venue: Ivory</b> <b>Chair: Prof. Yoshio Yamaoka</b> <b>Co-Chair: Prof. Elijah Songok</b> <b>Rapporteur: Ass. Prof. Matsumoto/Dr. Elizabeth Matey</b>	
1030-1300hrs	<b>SYMPOSIUM 9: Hatua</b> <b>Venue: Bogoria</b> <b>Chair: Dr. Langat</b> <b>Co-Chair: Prof. Elizabeth Bukusi</b> <b>Rapporteur: Rosemary Kamuyu</b>	
1030-1300hrs	<b>Abstract No.</b>	<b>Scientific Session 15: SRACH (Sexual, Reproductive, Adolescence and Child Health) (2)</b> <b>Venue: Tsavo</b> <b>Chair: Dr. Betty Njoroge</b> <b>Co-Chair: Dr. Benson Singa</b> <b>Rapporteur: Dr. Joan Olale</b>

1030-1045hrs	102	Healthcare-related stigma experiences among MSM in sub-Saharan Africa: Findings from the HPTN 075 study, <b>Calvin Mbeda</b>
1045-1100hrs	103	Morbidity and Mortality of Neonates: Preliminary Findings from Neonatal Register (MOH 373) Within Selected Health Facilities in Kenya, <b>Enock Sigilai</b>
1100-1115hrs	104	Community Perceptions on Preterm Births, Practices and Care for Preterm Newborns in Migori County Kenya: Preliminary Analysis of a Qualitative Study, <b>Beatrice Olack</b>
1115-1130hrs	105	Prevalence of Self-Reported Sexually Transmitted Infections (STIs) and Associated Factors among Fisherfolk Community in the Islands of Lake Victoria, Kenya, <b>Diana Aluko</b>
1130-1145hrs	106	Maternal VL monitoring in PMTCT: coverage and clinical action at 4 Kenyan hospitals, <b>Matthew Sandbulte</b>
1145-1200hrs	107	Piloting at-birth HIV DNA PCR testing at four government hospitals in Kenya, <b>Sarah Finocchario-Kessler</b>
1200-1215hrs	108	Perception on alternative medicine for children under five years among community members in western Kenya: A qualitative study, <b>Sarah Ngere</b>
1215-1245hrs	<b>Panel Discussion</b>	
1030-1300hrs	<b>Abstract No.</b>	<b>SCIENTIFIC SESSION 16: Public health and Health Systems</b> <b>Venue: Amboseli</b> <b>Session Chair: Dr. Lydia Kibe</b> <b>Co-Chair: Bridget Kimani</b> <b>Rapporteur: Titus Mutwiri</b>

1030-1045hrs	109	Rapid point-of-care testing for genital tract inflammatory cytokine biomarkers to diagnose asymptomatic sexually transmitted infections and bacterial vaginosis in women: cost estimation and budget impact analysis, <b>Angela Kairu</b>
1045-1100hrs	110	Use of regression calibration to correct for measurement error in assessment of gestational age in a low-resource setting, <b>George O. Agogo</b>
1100-1115hrs	111	Preparedness of primary care and community markets to develop a system interface to drive health equity: The HEKIMA study in Vihiga, Kenya, <b>Lydia Kaduka</b>
1115-1130hrs	112	Cost-effectiveness of Kenya's former early infant diagnosis (EID) of HIV guidelines, <b>Segars James</b>
1130-1145hrs	113	Avoiding a band-aid solution: Addressing key health determinants as a responsive approach in the implementation of UHC, <b>Sharon Mokuu</b>
1145-1200hrs	114	Completeness, accuracy and legibility of Tuberculosis culture test requisition forms with reference to the Laboratory Information System (LIMS) implementation in MOH facilities in Western Kenya, <b>Ronald Odero</b>
1200-1215hrs	115	Provider Experience with Implementing Birth Point of Care Infant HIV Testing: An Implementation Study at 4 Rural Hospitals in Kenya, <b>Yvonne Kamau</b>
<b>1215-1230hrs</b>	<b>Panel discussion</b>	

1030-1300hrs	Abstract No.	<b>SCIENTIFIC SESSION 17: Infectious Diseases (2)</b> <b>Venue: Samburu</b> <b>Chair: Dr. Peninah Munyua</b> <b>Co-Chair: Nicholas Mmwikwabe</b> <b>Rapporteur: Stephen Anyona</b>
1030-1045hrs	116	ESBL-producing Enterobacteriaceae among children with and without severe malnutrition at three public hospitals in Kenya <b>Caroline Ogwang</b>
1045-1100hrs	117	Cholera Outbreak in Narok County- Kenya, January 2019: A Case Control Study, <b>Judith W Gachau</b>
1100-1115hrs	118	Characterization of Shigella species causing disease in children admitted to Kilifi County Hospital, Kenya, <b>Anne Amulele</b>
1115-1130hrs	119	Burden of bacterial and parasitic infections in children aged below 16 years in Mukuru informal settlements, <b>Susan Kavai</b>
1130-1145hrs	120	Enhanced surveillance for early detection of MERS-CoV in Kenya: findings from returning pilgrims in 2016, <b>Janet Majanja</b>
1145-1200hrs	121	Investigation of Unknown Febrile illness in Semi-Arid Region in Kenya, September 2019, <b>Josephine Ihahi</b>
1200-1215hrs	122	Infectious Diseases and Poly-Drug Use among Medically Assisted Therapy clients enrolled at Kisauni Clinic, Kenya, January 2017 – December 2018, <b>Nassoro Mwanyalu</b>
1215-1230hrs	123	Towards Managing and Controlling Aflatoxin Producers Within Aspergillus Species in Infested Rice Grains Collected from Local Markets in Kenya, <b>Douksouna Youmma</b>
1230-1245hrs	124	The Use of Zinc and ORS for Treatment of Childhood Diarrhea in Rural Western Kenya, 2010-2017, <b>George Otieno</b>
<b>1245-1300hrs</b>	<b>Panel discussion</b>	

**VIEWING OF POSTERS ON 11<sup>th</sup> TO 12<sup>th</sup> FEBRUARY 2020 DURING COFFEE AND LUNCH BREAK – Dr. Linet Onger, Dr. Lydia Kibe and Nicholas Mwikwabe**

SUB THEME	Abstract No	VIEWING OF POSTERS ON 11 <sup>th</sup> AND 12 <sup>th</sup> FEBRUARY 2019 DURING COFFEE AND LUNCH BREAK
<b>POSTER SESSION 1 Tuesday 11<sup>th</sup> February</b>		
<b>Genomics, Diagnostic &amp; Innovative Technologies</b>	125	Investigation of Plasmodium falciparum Cytoadherence Proteins Interaction with Sulfated Polysaccharides Containing Anti-malarial Properties, <b>Jennifer Mutisya</b>
<b>Genomics, Diagnostic &amp; Innovative Technologies</b>	126	Genomic characterization of invasive Salmonella enterica serovar Typhi isolates from Population-Based Infectious Disease Surveillance in Kibera, Kenya, 2007 – 2018, <b>MikePowel Osita</b>
<b>Genomics, Diagnostic &amp; Innovative Technologies</b>	127	The utility of Taqman Array Card technology for determination of the cause of death in children under 5 years of age in Western Kenya, <b>Fredrick Ade</b>
<b>Genomics, Diagnostic &amp; Innovative Technologies</b>	128	Prevalence of mutations in Plasmodium falciparum genes associated with resistance to different antimalarial drugs in Nyando, Kisumu County in Kenya, <b>Bryan Musyoka</b>
<b>Non-Communicable Diseases (NCD): Diagnosis, Prevention &amp; Control</b>	129	The effects of Zinc supplementation in children with sickle cell disease in Western Kenya: a pilot study, <b>Lucas Tina</b>
<b>Non-Communicable Diseases (NCD): Diagnosis, Prevention &amp; Control</b>	130	Description of drug users enrolled in MEWA( Muslim education and welfare association) Drop in center from October 2017 to September 2019, <b>Kassam Yusuf</b>

<b>Non-Communicable Diseases (NCD): Diagnosis, Prevention &amp; Control</b>	131	Baseline Assessment of Occupational Health Exposure Incidents among Laboratory Personnel who attended Biosafety and Biosecurity Trainings in Kenya, 2015 – 2018, <b>Kennedy Yatich</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	132	Profiling of malaria infection in asymptomatic population in Kisumu County, Western Kenya, <b>Benjamin Opot</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	133	Therapeutic response of non-falciparum versus pure falciparum species to ASMQ and AL treatment in Kisumu County, Western Kenya, <b>Gladys Chemwor</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	134	Plasmodium falciparum gametocyte sex ratio in an asymptomatic population: impact on malaria transmission, <b>Raphael Okoth</b>
<b>One Health, Infectious &amp; Parasitic Diseases One Health, Infectious &amp; Parasitic Diseases</b>	135	Evaluating microscopy performance among trainees trained in Malaria Diagnostics Center in Kisumu, <b>Everlyne E Omondi</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	136	Prevalence of Malaria Infection among ABO Blood Groups within Kenyan Isolates, <b>Redemptah Yeda</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	137	Molecular characterization of P. falciparum multidrug resistance protein 1 (Pfmrp1) SNPs in correlation with in vitro P. falciparum drug sensitivity patterns pre and post-ACTs in Kenya, <b>Winnie Okore</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	138	Comparison of Plasmodium infections between adults and children in Kombewa village, <b>Cornel Arima</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	139	The Role of malaria rapid diagnostic tests in screening of asymptomatic individuals to be enrolled in Clinical Trials, <b>Catherine Sumbi</b>

<b>One Health, Infectious &amp; Parasitic Diseases</b>	140	Evaluating the prevalence of Plasmodium parasites among asymptomatic individuals using Microscopy and malaria rapid diagnostic test in kombewa HDSS area, western Kenya, <b>Agneta Ogolo</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	141	A systematic review of Malaria Diagnostics Centre's comprehensive malaria microscopy training coverage in Kenya and beyond, <b>Rose Adeny</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	142	Comparing co-infection of Plasmodium ovale and Plasmodium malariae in symptomatic and asymptomatic individuals in Kombewa HDSS area, Western Kenya. <b>Cephas Aguko</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	143	Co-infection of Plasmodium ovale and Plasmodium falciparum species associated with symptomatic malaria in the endemic region of western Kenya, <b>Jackline Juma</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	144	A trend of in vitro antimalarial performance in a span of ten years during artemisinin combination therapy in Kenya, <b>Agnes Cheruiyot</b>
<b>POSTER SESSION 2 Wednesday 12<sup>th</sup> February</b>		
<b>One Health, Infectious &amp; Parasitic Diseases</b>	145	Prescription of Antimalarials among Malaria-negative Febrile Patients in an Urban Informal Settlement in Nairobi, Kenya, <b>Terry Komo</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	146	Hepatitis C Virus Infection in People Who Inject Drugs in Mombasa and Kilifi Counties, <b>Rajiv Shah</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	147	Human Rhinovirus associated with hospitalizations in Western Kenya 2014–2015, <b>Clayton Onyango</b>

<b>One Health, Infectious &amp; Parasitic Diseases</b>	148	Rising prevalence of HIV-1 drug resistance among adults in Busia Boarder, Kenya, <b>Olipher Makwaga</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	149	Implementing a 4-tier Quality Control System in an Evidence Based Multiple Focus Integrated Intensified Tuberculosis Screening Study to End TB in Siaya County, <b>Josephine Awino</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	150	Updated CNS-TAC detects Cryptococcus and malaria in previously undiagnosed patients in Kenya, <b>Shirley Lidechi</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	151	Comparing co-infection of Plasmodium ovale and Plasmodium malariae in asymptomatic individuals in Kombewa HDSS area, Western Kenya, <b>Cephas Oyieke</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	152	Discriminating malaria recrudescence and reinfection in a two-arm randomized trial, <b>Brenda Onyango</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	153	Prevalence and associated risk factors of Soil Transmitted Helminths among pregnant women living in Vihiga County Kenya: a cross-sectional study, <b>Sylvie Araka</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	154	Blood-meal preferences of malaria vector populations within a holoendemic setting in Kisumu County, Western Kenya, <b>Risper Maisiba</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	155	Increasing prevalence of Plasmodium ovale during implementation of artemisinin combination therapy, <b>Hoseah Akala</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	156	Carriage of Comamonas kerstersii from asymptomatic participants enrolled in a case-control diarrheal study in Kenya, <b>Janet Ndonge</b>

<b>One Health, Infectious &amp; Parasitic Diseases</b>	157	Invasive pneumococcal disease and serotype distribution in children aged less than five years before and after the introduction of 10-valent pneumococcal conjugate vaccine in urban and rural areas of Kenya, <b>Arthur Odoyo</b>
<b>One Health, Infectious &amp; Parasitic Diseases</b>	158	Genetic Determinants of Extended-Spectrum Beta-Lactamase and Quinolone Resistance in Shigella spp. in Kenya, <b>Ronald Kirera</b>
<b>Sexual, Reproductive, Adolescent &amp; Child Health</b>	159	The feasibility of using peer mothers to deliver a community-based package of interventions to low birth weight infants post discharge from hospital care in Homa Bay County, Kenya, <b>Helen Nabwera</b>
<b>Sexual, Reproductive, Adolescent &amp; Child Health</b>	160	Maternal Mental Health and CHAIN, <b>Molline Timbwa</b>
<b>Sexual, Reproductive, Adolescent &amp; Child Health</b>	161	Intended and actual reasons for exclusive breastfeeding cessation in Naivasha, Kenya, <b>Joyceline Kinyua</b>
<b>Natural Products &amp; Alternative Medicines</b>	162	Discovery and exploration of dual stage-active antimalarial compounds for development of Plasmodium, <b>Jackson Muema</b>
<b>Health Systems Strengthening (Access; Equity; Governance; Financial Protection; e-Health)</b>	163	Determinants associated with adherence to mass drug administration guidelines among community health volunteers in three counties in western Kenya, <b>Charity Hungu</b>
<b>Health Systems Strengthening (Access; Equity; Governance; Financial Protection; e-Health)</b>	164	Accessibility and Affordability to Healthcare for Children with Severe Acute Malnutrition: Mapping Patients' Costs, <b>Rebecca Njuguna</b>

# SCIENTIFIC SESSIONS

# SCIENTIFIC SESSION 1:

## Health Systems

**Abstract 001****Title: Institutionalizing Knowledge Management: A Pilot sensitization Activity at The Kenya Medical Research Institute**

**Mayieka Lilian<sup>1</sup>\* Wambui Njonge<sup>1</sup>, Donfelix Ochieng<sup>1</sup>, Kariuki James<sup>1</sup>, Orwa Jennifer<sup>1</sup>**

<sup>1</sup>Kenya Medical Research Institute, Department of Resource Development & Knowledge Management (RD&KM)

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**Background:** Research organizations handle vast research findings and human intellectual capital which can be translated to knowledge. Knowledge, both tacit and explicit is a key resource power tool in any organization as it is the driver of all ongoing activities and therefore needs specialized handling. For knowledge management (KM) activities to thrive with sustainable results, it is vital that they are embedded in the organization's milieu. Hence the need for Knowledge Management Systems (KMS). Knowledge loss has been singled out as one of the major challenges within the organization due to employee turnover or retirement. There is need to tap into the tacit knowledge of its experienced personnel, those exiting the service or those taking up new jobs for retention and reuse throughout the organization. The aim of the pilot project was to sensitize and gather feedback on current knowledge of the basic concepts of Knowledge Management in the institute.

**Methodology:** The KEMRI senior management was sensitized thereafter a team of staff was identified and appointed as KM Champions. An external consultant was hired to train Champions as Knowledge Management trainers of trainees (TOT). The team formulated a policy guideline to be embedded in the KEMRI research policy which was in line with The Strategic plan (2018-2023). A pilot Sensitization program was conducted to selected scientists. A pre and post training test of KM knowledge was also done.

**Results:** We were able to get the institutional buy-in through the senior management sensitization and embedding the program to the KEMRI strategic plan. The TOT training offered a competent team to conduct the sensitization which was a

success. The pilot program pre-training analysis showed that only 5% of staff understood KM and the rest ranged from very little to none. Only 10% could relate KM to their work and 5% confirmed to have skills in applying KM to their research work. Despite the fact that over 55% admitted to have stored their data individually 83% of staff were willing to share their knowledge. The post training analysis sought to rate the acceptance of the program and quality of training content. >85 % of the trainees agreed that their objectives were met and that the content quality was relevant and trainers were well prepared and engaging. >60% showed interest in registering for a KM course.

**Conclusion:** The preliminary activities have provided observational information on areas of improvement needed in creating and sharing knowledge, which is the cornerstone of knowledge resource improvement within the organization.

## Abstract 002

### **Title: Resource tracking for public health facilities in Kenya: experiences from a devolved health system**

**Angela Kairu, Stacey Orangi, Boniface Mbuthia, Joanne Ondera, Edwine Barasa**

**Background:** Health resource tracking can significantly contribute to strengthening health systems. Information on financial resources in the health sector can be applied to government financing of public health care, and is crucial for sound policy making and planning. This study aimed to examine how resources flow through the system to public health facilities and, to document public financial management practices at county level in Kenya.

**Methods:** A cross-sectional study was conducted in five counties in Kenya, using a mixed methods approach. Data was collected at both county and facility level from three purposively sampled public facilities (two hospitals, one health center) per county, using in-depth interviews with 20 relevant health management officials and, financial document reviews for the financial year 2017/2018. Qualitative data was coded and analyzed in NVIVO using a framework analysis approach. Quantitative data was analyzed in Ms Excel 2016.

**Findings:** Planning and budgeting processes occurred both at facility and county levels. Health centers planned and budgeted annually at facility level. However, in some counties, hospitals did not implement their workplans and budgets as this was done at the county level. Majority of the facilities had at least two revenue sources. All health centers and some hospitals fully retained these funds at facility level and generated revenue from multiple sources. Contrarily, hospitals in some counties partially or fully re-directed these funds back to the county revenue fund (CRF) and had fewer revenue sources and limited autonomy on facility expenditure. The actual expenditure for optimal operation of facilities was unclear. Expenditure for hospitals with no access to funds was at county level and was associated with purchase delays and stock-outs. Additionally, there was significant off-budget donor support and predominant facility expenditure incurred at county level.

**Conclusion:** Health facilities are an important unit of healthcare implementation. The visibility and inclusion of health facilities through-out the resource flow processes could enable efficient and quality service delivery, with additional complementary investments in health care.

**Abstract 003****Systems thinking with stakeholders to strengthen primary health care in Kenya: concept mapping in the Health Kiosk in Markets “HEKIMA” study, Vihiga, Kenya**

**Lydia Kaduka** (KEMRI)\*; Joseph Mutai (KEMRI); Erastus Muniu (KEMRI); Joanna Olale (KEMRI); Schiller Mbuka (KEMRI); Melvin Ochieng (KEMRI); Rodgers Ochieng (KEMRI); Elia Christelle (Kings College London); Harriet Boulding (Kings College London); Majella Okeeffe (Kings College London); Gilbert Kokwaro (Strathmore University); Elijah Ogola (University of Nairobi); Boniface Otieno (University of Nairobi); Kennedy Cruickshank (Kings College London); Seeromanie Harding (Kings College London)

**Background:** Cardiovascular diseases (CVD) are a serious and urgent problem, requiring at-scale, multi-component/stakeholder action and cooperation. Kenya, like many lower and middle income countries, will struggle to meet its SDG targets with the rising burden from CVD and under-resourced health systems. Improved evidence on effective strategies for the CVD prevention is required. HEKIMA is a theoretically driven intervention that explores whether kiosks in community markets, manned by community health workers (CHWs) and supervised by health centre (HC) nurses, can improve the reach of preventative care to vulnerable communities. HEKIMA is a multi-phased intervention and here we report on stakeholder consultations. Objective: To co-identify with stakeholders a priority set of important and feasible action domains to inform the factors that could influence creation and use of the kiosk ,and hence the development of the HC-market interface for CVD prevention and control.

**Methods:** A cross-sectionals study using concept mapping, a mixed-methods approach to making use of the best available tacit knowledge of recognised, diverse and experienced actors, actions for co-development were identified and then mapped. Participants included a multisectoral sample of stakeholders representing the community such as traders, practitioners (healthcare workers), local policy actors. Data collection involved the generation and sorting of statements by participants. A series of visual representations of the data were then developed. Ethical considerations were met.

**Key Findings:** A total of 91 statements were distilled into 8 clusters for action, namely equipment and drug supply, competence of nurses and CHWs, motivations of kiosk staff, kiosk accessibility, kiosk referrals, confidentiality, awareness and complexity of market context. Specific areas for action included securing commodity supply, ensuring privacy and confidentiality, training, community sensitization, and leveraging on existing networks and partnerships.

**Conclusion:** There was strong consensus that a HC-community market interface via CHW manned kiosk could have a positive impact on health systems, markets, and CVD in vulnerable communities. Creation and promotion of the use of the kiosk will require cross sectoral action and cooperation to address the actions perceived to be important and feasible. Concept mapping enabled the synthesis of views across stakeholders with differing access to resources and ability to implement change. Both divergent and convergent perspectives emerged, and collectively created signals for where to prioritise actions within a home grown framework.

**Abstract 004****Immunization Coverage in Siaya County, Kenya, Before and After Healthcare Worker Strikes**

**Benard A Opiyo** (Kenya Medical Research Institute)\*; David Obor (Kenya Medical Research Institute); Christie Reed (CDC); Godfrey Bigogo (KEMRI/CGHR); Patrick K Munywoki (CDC, Nairobi, Kenya); Beth Barr (CDC); Jennifer Verani (CDC)

**Introduction:** Vaccines prevent ~2–3 million deaths per year. However, vaccine coverage is variable and sensitive to disruptions in the healthcare sector. In Kenya, following national strikes of doctors (12/2016-2/2017) and nurses (6/2017-10/2017), the Ministry of Health attempted to catch-up children who had missed vaccinations during that time. We examined vaccine coverage among a cohort of children in western Kenya before, during, and after the strikes.

**Methodology:** The Kenya Medical Research Institute and Centers for Disease Control and Prevention operate a Health and Demographic Surveillance System in Siaya County (population ~260,000). Field workers visit all households every 4-6 months and collect vaccination data for children aged <5 years. We analyzed data from children aged 4-11 months and 12-23 with card-confirmed vaccination history to assess coverage of pentavalent vaccine from 2013 to 2018. Each child's age stratum and vaccination were classified based on status at the time of their family's household visit for each data collection round.

**Results:** On average, the number of children aged 4-11 and 12-23 months surveyed each round was 3,484 and 6,184 respectively. The aggregate proportion with card-confirmed vaccination history increased significantly from 30.2% in 2013 to 54.10 in 2015 and 69.3% in 2018 for children aged 4-11 months, and 19.2% in 2013 to 41.39 in 2015 to 53.6% in 2018 for those aged 12-23 months. The aggregate proportion of children aged 4-11 months with <3 pentavalent doses ranged from 10.3-5.5% from 2013-2015, increased to 35.2% in 2016, 58.9% in 2017 and fell to 10.8% in 2018. Among children aged 12-23 months, the proportion with <3 pentavalent doses ranged from 1.0-4.6% from 2013-2015, and 5.9-6.9% in 2016-2018.

**Conclusion:** We observed a sharp increase in the proportion of children aged 4-11 months with insufficient pentavalent doses in 2016-2017, highlighting the immediate impact of interruptions in service. In contrast, coverage among children aged 12-23 months during the same period remained fairly stable, suggesting that there may have been catch-up over time. However our analysis is limited by missing data for those children without cards and a decline in availability for the older cohort, despite an increase in the percent of children with card verified data over the period of observation. Ongoing analysis of longitudinal vaccination data at the level of the individual will provide more insight into whether there are remaining missed children or these aggregate observations reflect successful catch-up and the time course.

**Abstract 005****Laboratory Safety Audits a Game Changer in Infection Prevention and Control****Duncan Ongayi**

Affiliation: Ministry of Health, Chulaimbo County Hospital.

**Background:** Facility and Biosafety is one of the quality system essentials envisaged in the Kenya Quality Manual for medical laboratories. ISO 15189-2012 Management clause 4.12(continual improvement) stipulates that a laboratory shall participate in improvement project activities and laboratory shall conduct internal audits at planned intervals to identify nonconforming activities and institute corrective/preventive actions. Safety requirements are also highlighted in Section 12(Facility and Biosafety) of WHO SLIPTA assessment checklist for clinical and health laboratories undergoing through ISO Accreditation. Chulaimbo County Hospital Laboratory in Kisumu west sub County, Kisumu County begun the journey of ISO Accreditation in October 2016 through mentorship by Global Health Solutions (GIS). Baseline safety audit conducted in October 2016 while exit audit was in April 2019, baseline audit indicated low scores (18%) . In view of this, Chulaimbo County Hospital laboratory embarked on this project to ensure compliance with this section requirement with the ultimate goal of improving safety, infection prevention and control and finally ISO Accreditation.

**Methods:** Baseline safety Laboratory audits was conducted using section 12 of the WHO SLIPTA observational assessment checklist. Action plan with strict timelines were developed with the primary goal being closing the gaps identified during the audits. Laboratory management appointed a safety focal person whose primary role was to spearhead closure of the nonconformities. Three follow up audits were thereafter conducted at an interval of one, three and four months respectively.

**Results:** The key findings identified were :18% score at baseline with waste coming, no annual medical surveillance and Hepatitis B vaccination to staff, no first aid/spill kits and emergency eye wash/showers, no safety audits conducted,

no incidences and occurrences investigated, laboratory staffs not all trained on biosafety/biosecurity, no safety sops developed, sample transporters not trained on biosafety and no clear policies on PEP among others. 58% score in audit one, 95% score in audit two and 98% score at third audit. Baseline (18%), First Audit (58%),Second Audit( 95%),Exit Audit(98%).

**Conclusion:** There was a tremendous progress noted from 2016(18%) to 2019(98%) with regards to SLIPTA scores and ultimately the laboratory safety. Laboratory safety audit is an essential component of IPC in clinical and public health laboratories. It was also an important tool that can be used to mobilize resources for laboratory improvement and ultimately resulting in safe conducive and friendly laboratory working environment. Consistent mentorships on biosafety/biosecurity activities are key and should be implemented in labs implementing ISO 15189:2012 accreditation.

**Abstract 006****Implementation of an Electronic Quality Management System using Q-Pulse: The KEMRI-Wellcome Trust Research Laboratories Experience**

Horace Gumba<sup>1\*</sup>, Brett Lowe<sup>1,2</sup>, Moses Mosobo<sup>1</sup>, **Susan Njuguna**<sup>1</sup>, Jennifer Musyoki<sup>1</sup> and Barnes Kitsao<sup>1</sup>

<sup>1</sup>KEMRI-Wellcome Trust Research Programme, Kilifi, Kenya

**Background:** The KEMRI-Wellcome Trust Research Laboratory's expanded scope, its regulated environment coupled with the complexity of the laboratory processes and procedures to support diagnostic, clinical and basic research has made it difficult to manually manage its quality systems. We sought to automate the process to improve efficiency. **Objectives:** To implement a centralised electronic quality system using Q-Pulse.

**Methods:** A concept note detailing the objectives of automating the laboratory QMS was developed. The implementation strategies employed included provision of technical support through installation, customization, training and data entry.

**Results:** The system was successfully implemented in May 2017. Out of the 30 workflows created, 8 were for document module, 5 each for audit and CAPA modules and 4 each for people, equipment and training modules. A total of 140 laboratory staff were trained.

**Conclusion:** The laboratory can now manage the huge documentation and there is reduced bureaucracy, increased efficiency and awareness.

**Abstract 007****Operationalization and sustainability of an accredited tuberculosis reference laboratory in resource limited setting; met and unmet goals.**

Odero R.<sup>1</sup>, Okumu A.<sup>1</sup>, **Ongalo J.**<sup>1</sup>, Tonui J.<sup>1</sup>, Murithi W.<sup>1</sup>, Khayumbi J.<sup>1</sup>, Sitati R.<sup>1</sup>, Madara P.<sup>1</sup>, Orure J.<sup>1</sup>, Nyongesa L.<sup>1</sup>, Ogolla C.<sup>1</sup>, Odhiambo B.<sup>1</sup>, Wandiga S.<sup>1</sup>

- 1- Kenya Medical Research Institute, Centre for Global Health Research, Kisumu, Kenya.
- 2- Centres for Disease Control and prevention, Atlanta, GA, USA.

**Introduction:** Global Fund, WHO and US CDC have strengthened capacities for national TB reference laboratories to enhance rapid detection of mycobacterium Tuberculosis. By 2010, Kenya had 8 established TB cultures laboratories. Currently, only two support MoH work nationally with major set back inadequate funding to support operation

**Methods:** A stepwise approach and expansion initiated to date for personnel recruitment, equipment capacity, validation, verification of tests, accreditations processes, EQA programs, integration and diversification of services to enhance program and research.

**Results:** In 2004, KEMRI laboratory had 1 staff compared to 13 lab and 2 data currently. Equipment purchased include: 3 Bactec960 MGIT, a twincubator, GT-Blot machine, Bactec1920 for blood cultures, 5 MTB/RIF GeneXpert systems, 6 Biosafety cabinets, 2 MTB/RIF Xpert Ultra, 4 centrifuges, Thermo-cycler and 4 freezers. Annual testing capacity tests; 3616 MGIT cultures, 473 drug sensitivity, 3126 Fluorescence Microscopy, 495 Zeilhl Neelsen microscopy, 3409 MTB/RIF GeneXpert, 490 first line Line probe assay, 461 second line Line Probe assay, and 957 QFT-plus for LTBI diagnosis. 5 EQA program enrolments with assessment performance >80%. Supplies are procured by KEMRI, partners and KEMSA. Several Database systems for program and research work. The laboratory was ISO-15189 accredited by SANAS in 2013 and renewed in 2015, 2017 and 2019 respectively. The KMLTTB licensed laboratory supports MoH/National TB program in MDR/XDR surveillance in 18 counties in western Kenya with estimated population of over 14 million. According to WHO laboratory service in TB control

guide :KEMRI reference Laboratory has met required standards of operation on infrastructure, biosafety measures, Equipment validation ,Specimen transport and referral mechanisms, Management of laboratory commodities and supplies, Laboratory information and data management systems, quality management systems. Currently inadequate strategies for funding for laboratory and human resource development remain a challenge

**Conclusion:** Addressing funding dynamics, erratic guidelines, space challenges, unstable medical supplies procurement guidelines and EQA reference materials are the keys to a sustainable accredited laboratory. Slow policy change and technology transfer, especially in low-and middle-income Insufficient and underfunded laboratory strengthening plans, Inadequate laboratory infrastructure and biosafety, Vastly inadequate numbers of skilled staff; Insufficient technical assistance.

# SCIENTIFIC SESSION 2:

Genomics,  
Diagnostics and  
Innovations

**Abstract 008****Biomarkers associated with inpatient mortality among acutely ill undernourished children**

**James Njunge** (KEMRI - Wellcome Trust Research Programme) [JNjunge@kemri-wellcome.org](mailto:JNjunge@kemri-wellcome.org)

**Background** Children with medically complicated severe acute malnutrition (SAM) have high risk of inpatient mortality. Biological mechanisms that could be targeted for interventions to reduce risk during and after the hospitalization are not well understood. We aimed to enumerate biological mechanisms associated with inpatient mortality using data and samples from a randomized, double-blind controlled trial conducted in Kenya and Malawi. The clinical trial tested whether a lactose-free, low-carbohydrate F75 milk would reduce osmotic diarrhoea, thereby the number of days in the stabilisation phase among children aged 6 months to 13 years with SAM.

**Methods** In this nested case-control study, admission levels of plasma proteins and cytokines were determined using untargeted liquid chromatography tandem mass spectrometry (LC-MS/MS) and targeted Luminex assays. Protein profiles of children who died within 12-72 hours of admission (cases; N = 92) were compared with those of children who had a rapid clinical recovery and were discharged within 5 days of admission (controls; N=92). Using logistic regression, we assessed the relationship between baseline plasma proteins and mortality.

**Results** Baseline median (IQR) plasma protein was low among study participants but not different between cases and controls: cases; med (IQR); 45 mg/ml, (35-53) and controls; 48 mg/ml, (37-57) but not significant P = 0.18. After adjusting for HIV, age, site, mid upper arm circumference (MUAC) and kwashiorkor, elevated levels of C reactive protein, von Willebrand factor, Neutrophil gelatinase-associated lipocalin, Lymphatic vessel endothelial hyaluronic acid receptor 1, Alpha-1-acid glycoprotein 1 and 2, Transforming growth factor, beta-induced as well as cytokines; Tumor necrosis factor, IFN- $\gamma$ -inducible protein 10, and Granulocyte-colony stimulating factor were associated with mortality. Biological processes

associated with mortality include cellular response to lipopolysaccharide, acute phase response, and inflammatory responses.

**Interpretation** Our results show that children who died had evidence of elevated acute phase-response to lipopolysaccharides, inflammatory-, and innate cellular responses. This suggests exposure to circulating bacteria or bacterial products. Survivors were associated with reduced muscle breakdown, increased innate defense against infections, and increased Lipid & cholesterol metabolism.

**Abstract 009****No Evidence of *P. falciparum* K13 Artemisinin Conferring Mutations Over a 24-year Analysis in Coastal Kenya, but a Near Complete Reversion to Chloroquine Wild Type Parasites**

**Kevin Wamae** (KEMRI-Wellcome Trust Research Programme, CGMRC, Kilifi)\*; Dorcas Okanda (Centre for Biotechnology and Bioinformatics, University of Nairobi); Leonard Ndwiga (KEMRI-Wellcome Trust Research Programme, CGMRC, Kilifi); Victor Osofi (KEMRI-Wellcome Trust Research Programme, CGMRC, Kilifi); Kelvin Muteru (KEMRI-Wellcome Trust Research Programme, CGMRC, Kilifi); Abdirahman Abdi (KEMRI - Wellcome Trust Research Programme); Philip Bejon (KEMRI-Wellcome Trust Research Programme, CGMRC, Kilifi); Colin Sutherland (PHE Malaria Reference Laboratory, London School of Hygiene and Tropical Medicine, London); Lynette Ochola-Oyier (KEMRI-Wellcome Trust Research Programme, CGMRC, Kilifi)

**Background:** Plasmodium falciparum malaria remains a public health problem, hence efforts to eliminate malaria remain a priority. Anti-malarial drug resistance impedes malaria elimination as it renders anti-malarial drugs ineffective. Consequently, the emergence of resistance to artemisinin in South East Asia, a component of artemisinin combination therapy (ACTs), is a major concern for malaria elimination. Surveillance of antimalarial drug-resistance is best described using genetic markers as they can be used both in real-time and retrospectively, to assess geographic origins and migration patterns of drug-resistant parasites. Therefore, the current study aimed to assess the diversity of 12 *P. falciparum* drug resistance markers (crt, mdr1, dhps, k13, ap2-mu, falcipain-2a, ubp-1, nfs, arps10, crt, fd and mdr2) in Kilifi over 24 years of changing anti-malarial drug-policies.

**Methods:** Parasite DNA was extracted from frozen blood samples obtained from patients (1 month - 15 years of age) presenting to Kilifi County Hospital with uncomplicated malaria (1995-2018). PCR amplicons from the 12 drug-resistant markers were sequenced using Sanger sequencing and single nucleotide polymorphisms (SNPs) frequencies were calculated per gene per time-point. The difference in the prevalence of SNPs and amino acid haplotypes in pre-ACT

and post-ACT periods was evaluated using the Chi-squared test while Linkage disequilibrium (LD) analysis was performed in DnaSP.

**Results:** The validated kelch 13 (k13) artemisinin resistance markers were not detected, also, mutations that have been found to predispose parasites to acquire k13 mutations were not detected. There was a distinct shift from chloroquine (CQ) resistance alleles to a 99% prevalence of CQ sensitive alleles, following the withdrawal of CQ from routine use. In contrast, mutations associated with sulfadoxine-pyrimethamine (SP) resistance were maintained at a high frequency (>75%), after a change from SP to ACTs. The novel lumefantrine drug resistance marker showed a gradual and significant decline in frequency pre- and post-ACT introduction, suggesting evidence of directional selection in Kenya, potentially not due to lumefantrine. Following the introduction of ACTs in 2004 in Kenya, there has been a rapid increase in the CQ sensitive population to near fixation and this reignites the debate on the use of CQ for malaria treatment, such as in combination therapy. On the other hand, there is still a need for careful monitoring of SP resistance markers since SP has proved useful in reducing morbidity in pregnant women.

**Conclusion:** The decline in the novel marker (nfs) contrary to the observations made in The Gambia, calls for additional studies to determine its role as a potential drug target. Due to the lack of the validated molecular markers of artemisinin and lumefantrine resistance, there appears to be no threat to ACT efficacy from resistance in the population, however, continued surveillance remains a requirement.

**Abstract 010****Title: Update and broader direction of an Indo-African pathogen genomics initiative**

**Pratik Lakhani** (National Centre for Biological Sciences, TIFR, Bangalore,)\*; Moses Masika (KAVI-ICR); Omu Anzala (KAVI-ICR); Arun Sankaradoss (National Centre for Biological Sciences, TIFR, Bangalore); Sudhir Krishna (National Centre for Biological Sciences, TIFR, Bangalore)Abstract:

**Background:** The idea for an Indo-Africa collaborative program was triggered by the Indo-Africa meet which was jointly organized by ICMR and Ministry of External Affairs in 2016. Inspired by the spirit of these meetings, Prof. Sudhir Krishna(NCBS) received a three year philanthropic grant from Narayana Murthy, co-founder Infosys. Using funds from this grant, we have seeded a capacity building pathogen genomics effort at KAVI. The purpose of the grant is to enable a Dengue vaccine and in that context, in India we have undertaken Dengue genomes sequencing from multiple sites (2012-2019) using Illumina Miseq with aim to analyse the circulating dengue virus diversity in India.

**Methods:** 319 samples were sequenced out of which around 120 full length dengue genomes and 122 near complete genome with serotype information were obtained. Our data highlights the parallel evolution of India specific genotypes for all four serotypes of Dengue virus by genetic drift with continuous exchange among various regions.

**Results:** We will present the data from that ongoing study and how it has influenced our choice of vaccine design to tackle the ongoing challenges from other trials and studies. At the KAVI, we are establishing a bioinformatics workstation that facilitates data analysis. Our grant enters the third year and the deeper goal in the coming year is to explore sustainability of the program through partnerships and I will describe how we are going about this process.

**Abstract 011****Title: Phylogenetic analysis and sequence-typing of multi-drug resistant *Neisseria gonorrhoeae* clinical isolates from Kenya using Nanopore sequencing**

**Meshack Juma**<sup>1</sup>, Ruth Chirchir<sup>1</sup>, John Gachie<sup>1</sup>, Patrick Mwaura<sup>1</sup>, Frank Onyambu<sup>1</sup>, Junaid Nazir<sup>2</sup>, Arun Sankaradoss<sup>2</sup>, Moses Masika<sup>1</sup>, Omu Anzala<sup>1</sup>, Sudhir Krishna<sup>2</sup>, Ramanathan Sowdhamini<sup>2</sup>, Awadhesh Pandit<sup>2</sup>, **Iyer Meenakshi S**<sup>2\*</sup>

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**Background:** Recent advances in Next generation sequencing technologies like Oxford Nanopore Technology (ONT) have helped in generation of longer reads of DNA in a shorter duration with minimal cost. However, long-reads are error-prone. The increasing accuracy of base-calling algorithms, high throughput, error-correction strategies and ease of using the mobile sequences in remote areas is leading to adoption of MinION sequencer (ONT), for routine microbial genome sequencing. Africa has one of the highest incidences of gonorrhoea, but not much information is available on the relatedness with strains from other geographical locations. Antimicrobial resistance (AMR) in *N. gonorrhoeae* is a major public health threat, with the bacteria gaining resistance to most of the available antibiotics, compromising treatment across the world. Whole-genome sequencing is an efficient way of predicting AMR determinants and their spread in the human population. Previous studies on Kenyan gonococcal samples have focused on plasmid-mediated drug resistance and fluoroquinolone resistance using Illumina sequencing.

**Methods:** Antimicrobial Susceptibility Tests were done on *N. gonorrhoeae* clinical isolates using E-test (BioMerieux) and interpreted with reference to Clinical and Laboratory Standards Institute (CLSI) standards. Genomic DNA was isolated as recommended in the kit and sequenced using MiniION sequencer. Reads were assembled de-novo using Minimap-Miniasm and Canu and polished using Racon and Nanopolish. Gene annotation was carried out using RAST server.

Mutations causing AMR were identified using BLAST against a database of sequence profiles created from different resources like NCBI Pathogens, CARD and PathogenWatch. Multi-locus Sequence typing (MLST) was carried out using BLAST with a database of profiles derived from web-servers like NG-MAST and PubMLST. Whole genome and MLST gene based phylogeny were inferred using RaxML. 103 already sequenced genomes from Kenya were used to understand the phylogenetic relationships among isolates.

**Results:** We assembled 11 near complete *N. gonorrhoeae* genomes. We observe that Ciprofloxacin resistance is associated with mutations in *gyrA* (S91F/D95G) followed by mutations in other genes like *parC* or *mtrR* promoter region and intermediate resistance to gentamycin is associated with mutations in *mtrR* promoter. We also identified mutations conferring Penicillin (*penA*, *penC*, *ponA1*) and Sulfonamide (*folA*) resistance in a few isolates. Sequence-typing revealed novel variants of MLST genes which are being validated by Sanger sequencing.

**Conclusion:** Here, we demonstrate the utility of mobile DNA sequencing technology supplemented with de-novo assembly in identifying bacterial species, sequence typing and elucidating the basis of AMR. The pipeline developed in this study can be used for the genome assembly and analysis of any clinical isolate for sequence typing and drug resistance analysis.

## Abstract 012

### **Title: Molecular Analysis of Antimalarial Resistance Markers in Parasite Samples Obtained from Children Recruited into a Drug Efficacy Trial in Kwale, Kenya, 2013**

**Leonard Ndwiga** (KEMRI-Wellcome Trust Research Programme, CGMRC, Kilifi)\*; Victor Osofi (KEMRI-Wellcome Trust Research Programme, CGMRC, Kilifi); Edwin Too (Kenya Medical Research Institute); Kevin Thiongo (KEMRI); Francis Kimani (KEMRI); Philip Bejon (KEMRI-Wellcome Trust Research Programme, CGMRC, Kilifi); Abdirahman Abdi (KEMRI - Wellcome Trust Research Programme); Lynette Ochola-Oyier (KEMRI-Wellcome Trust Research Programme, CGMRC, Kilifi)

**Background:** ACT resistance has been reported in Western Cambodia in 2008, thereafter in several countries in Southeast (SE) Asia. Currently, the major concern is the spread of resistance to Sub-Saharan Africa, which necessitates the need for surveillance. Therefore, we used dried blood spot samples collected in 2013 from children during an artemether-lumefantrine (AL) and dihydroartemisinin-piperazine (DP) drug efficacy study, in Kwale, Kenya. This study aims to distinguish recrudescence from new infections and analyse known drug resistance markers, k13, Pfcrt and Pfmdr1 in pre- and post-treatment samples.

**Methods:** At day 0, 363 children with uncomplicated malaria were recruited to the trial; 162 (45%) and 201 (55%) receiving AL and DP, respectively. 49 participants were slide positive following treatment; day 7: 1, day 14: 1, day 21: 8, day 28: 13 and day 42: 26. New and recrudescence infections were determined in the 49 samples by gel electrophoresis of highly polymorphic amplified msp2 and glurp genes. Sanger sequencing was used to determine the frequency of the drug resistance markers. Sequence analysis was done using CLC Main Workbench and the differences in SNPs determined using a McNemar Analysis.

**Results:** 39 of the 49 participants were successfully PCR-corrected revealing: 8 (20.5%) recrudescence infections and 31 (79.5%) re-infections. The day 42 PCR-corrected ACPR was 97.5% for AL and 99.5% for DP. The Pfcrt 76T mutation was seen to decrease from 27% (day 0) to 9.7% (day 42). For Pfmdr1, there was a slight increase in the 86Y mutant frequency from 11% (day 0) to 12% (day 1) with no appearance in the subsequent days. The prevalence of the 184F mutation

remained stable at 41% (day 0), 56% (day 1) and 40% (days 2 to 42) and the mutant 1246Y allele was observed only on day 0 (7%). Only one synonymous mutation at the k13 propeller domain was observed at codon 487 on day 42.

**Conclusions:** Our results suggest that ACTs were still effective at the study site in 2013, since there were no late treatment failures; <10% of the population had parasites on day 3, no k13 mutations were observed and a high PCR-corrected ACPR was recorded. The high re-infection rate suggests a need for continued drug resistance surveillance.

**Abstract 013****Title: Identification of approved drugs with unknown antiplasmodial activity using chemogenomics and in vitro approaches**

**Douglas O Ochora** (KEMRI)\*; Reagan Moseti (KEMRI/Wellcome Trust); Redemptah A Yeda (usamru-k-KEMRI); Agnes Cheruiyot (1Department of Emerging Infectious Diseases (DEID), United States Army Medical Research Directorate-Kenya (USAMRD-K), Kenya Medical Research Institute (KEMRI) ); Hoseah Akala (KEMRI/USAMRD-A/K); Ben Andagalu (1Department of Emerging Infectious Diseases (DEID), United States Army Medical Research Directorate-Kenya (USAMRD-K), Kenya Medical Research Institute (KEMRI) ); Amanda Roth (1Department of Emerging Infectious Diseases (DEID), United States Army Medical Research Directorate-Kenya (USAMRD-K), Kenya Medical Research Institute (KEMRI) ); Abiy Yenesew (University of Nairobi); Bernhards Ogutu (Kenya Medical Research Institute)

**Introduction:** There is need to develop new antimalarial drugs due to the emergence of drug resistance to almost all malaria drugs in use. Unfortunately, drug design and discovery is costly and time consuming. Most compounds that show antimalarial activity fail to get approved due to safety reasons. To overcome this, we aimed to identify approved drugs that have previously unknown antimalarial activity using a protein-target similarity approach. **Methodology:** This study is a follow up on a similar study, in which we identified 28 approved drugs with unknown antiplasmodial activity.

**Methods:** Briefly, the entire *Plasmodium falciparum* proteome was extracted from NCBI RefSeq and used to search for similar drug targets in three databases (TTD, DrugBank and STITCH). Conserved amino acid residues from the drug targets were determined using ConSurf server to fine tune the similarity search. A total of 133 approved drugs were identified that were predicted to target 34 *P. falciparum* proteins. Literature search showed that only 28 of the 133 drugs had not been previously tested for malaria. In vitro drug-susceptibility testing for 10 of the 28 drugs revealed seven to have anti-malarial activity with IC<sub>50</sub> values ranging from 1 µM to 50 µM. In this study, we tested five of the drugs that were unavailable (irinotecan, PD153035 HCL, venlafaxine, pelinitib and epirubicin).

These were tested against D6 parasite strain alongside standard antimalarial drugs as the controls. For in vitro analysis, the SYBR I green assay was used.

**Results:** Three drugs, venlafaxine, pelinitib and epirubicin showed descensible dose-response curves within this concentration. Venlafaxine had the highest antiplasmodial activity with IC<sub>50</sub> of 0.644 ng/mL against a control strain of D6 (mefloquine resistant and chloroquine sensitive) strain while pelinitib and eperubicin were less active at 147.1 ng/mL and 25.12 ng/mL respectively. For 3D7 strain, venlafaxine had the highest activity with IC<sub>50</sub> of 5.545 ng/mL, epirubicin had less activity at 22.586ng/mL and pelinitib at 417.7ng/mL. Epirubicin showed the highest activity with W2 strain at an IC<sub>50</sub> of 24.995ng/mL while venlafaxine and pelinitib showed activity at 270.3 ng/mL and 326.9 ng/mL respectively.

**Conclusion** Continued validation of activities of drugs predicted by chemogenomics is key to identifying approved drugs with antiplasmodial activity, and hence fast-track the identification of new antimalarial drugs.

**Abstract 014****Genetic Diversity of respiratory human adenoviruses isolated in Kenya**

Rachel Achilla<sup>1</sup>, Janet Majanja<sup>1</sup>, Silvanos Opana<sup>1</sup>, Meshack Wadegu<sup>1</sup>, James Njiri<sup>1</sup>, John Distelhorst<sup>1</sup>, Wallace Bulimo<sup>1,2</sup>

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**Background:** Human adenoviruses [HAdvs] primarily cause respiratory and gastro enteric diseases in humans. It is thought that recombination resulting from genetic exchange of parts of Hexon, penton or fiber genes among members of same or different species is a key drive to emergence of new strains of adenoviruses. We sought to characterize the diversity of respiratory HAdvs circulating in Kenya

**Methods:** Viruses were isolated from nasopharyngeal swabs collected from patients with Influenza like Illness [ILI] at eight hospitals in eight counties in Kenya. DNA was extracted using QI Amp viral DNA extraction kit and full genome sequencing carried out using Illumina Miseq platform. Data analysis included NCBI BLAST and Phylogeny using Bayesian methods to determine the virus species and types.

**Results:** Of the 44 samples sequenced by NGS we obtained 25 full genomes and 2 partial adenovirus sequences. Analysis using NCBI Blast showed 13 of the viruses were of B species while 14 were C species. Three HAdv B3 exhibited an identical pattern where their Hexon and Fiber proteins were B3 and their Penton protein was from B7 species. The HAdv B7 had 7 full genomes and 2 partial genomes. The majority of B7 (5) showed B7 Hexon and Penton and B3 Fiber proteins. Two had B7a Hexon, B7 Penton and B3 Fiber proteins respectively. The two partial B7 genomes had B7 Hexon; One of them had a B7 Penton protein. Since these were partial sequences none of them had Fiber proteins. Out of 11 HAdv C2 species with full genomes all had Hexon, Penton and Fiber proteins of C2 species. All HAdv C1 and C5 species had C2 Penton. All C1 viruses had C1 hexon and fiber genes. Similarly, all the C5 viruses also had C5 Hexon and Fiber proteins respectively.

**Conclusion:** Human Adenovirus B7 were the most diverse species of HAdv and C2 were the least diverse. Identification of respiratory adenoviruses B3 and B7 in Kenya, which are generally associated with severe lower respiratory tract illness, highlights the importance of virologic surveillance since knowledge about circulating strains of the adenovirus types is important to inform diagnostics, monitor trends and provide information for actionable decisions that contribute to Force Health Protection, and Global Health Security.

### **Acknowledgement and disclaimer**

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# SCIENTIFIC SESSION 3:

## Infectious Diseases 1

**Abstract 015****Gestational Age at Attendance for Antenatal Care as a Potential Factor for the Success of a Maternal Respiratory Syncytial Virus (RSV) Vaccine Program in Coastal Kenya**

**Joyce U Nyiro** (KEMRI-Wellcome Trust Research Programme)\*, Elizabeth Bukusi, Dufton Mwaengo, David Walumbe, Amek Nyaguara, Bryan Nyawanda, James A. Berkley, Patrick Munywoki and D James Nokes.

**Background:** Maternal immunisation to boost respiratory syncytial virus (RSV) specific antibodies in pregnant women is a strategy to enhance infant protection. Despite progress towards licensure of a leading candidate maternal RSV vaccine, Kenya has no data on gestational age distribution of pregnant women attending antenatal care (ANC) or the proportion of women attending ANC during the proposed window period for vaccination. This would inform appropriate timing for delivery or estimate potential uptake of this vaccine.

**Methods:** A cross-sectional survey was conducted within the Kilifi Health and Demographic Surveillance System (KHDSS), coastal Kenya. A random sample of 1000 women registered pregnant in the years 2017 and 2018 and with a birth outcome by the time of data collection was taken. Selected women were located at their homes, and individual written informed consent obtained. Records of their antenatal attendance during pregnancy were abstracted from their ANC booklet.

**Results:** Of the 1000 women selected, 594 (59%) were available for interview from whom 470 (79%) had ANC booklets (with median age at delivery 28.6 years.) The median (interquartile range) gestational age in weeks at the first to fifth ANC attendance was 26 (21-28), 29 (26-32), 32 (28-34), 34 (32-36) and 36 (34-38), respectively. The proportion of women attending for ANC during a gestational age window for vaccination of 28-32 weeks (recommended) and 26-33 weeks was 76% (358) and 84% (395), respectively.

**Conclusion:** In a sample of pregnant women from Kilifi, Coastal Kenya, all with card-confirmed ANC clinic attendance, 76% would be reached for maternal RSV vaccination in the gestational age window of 28-32 weeks through ANC clinic

visits. Widening of the vaccination window (26-33 weeks) would not dramatically increase vaccine coverage (84% vs. 76%) and would require consideration of antibody kinetics data that might affect vaccine efficacy. Uncertainty in these estimates is due to 21% of women having no ANC card.

**Abstract 016****Title: Measles Outbreak in Remote Area in Unvaccinated Population, Tana River County, Kenya, January 2019**

**Abbas G** Godana (FELTP, Resident, MOH)\*; Ibrahim Kariuki (FELTP Resident); Bridget Wesonga (FELTP Resident); Dave Kareko (DDSR, MOH); Elvis Oyugi (Kenya FELTP)

**Background:** In 2018 measles outbreaks in Kenya occurred in two waves, affecting six counties with 825 suspected cases and 3 deaths. Tana–River hard to reach County had MCV1 and MCV2 coverage of 56% and 26% respectively in 2017, measles outbreak was detected on 30th December, 2018, and by January 7th 2019, 33 suspected cases were reported with five laboratory confirmed. We investigated the outbreak and characterized cases and assessed routine immunization service delivery.

**Methods:** Crosssectionally reviewed health facility records, conducted active case search in community and collected venous blood from suspected cases. We developed case definitions for record review at facilities and active case search in the community. Socio-demographic and clinical information were captured and assessed vaccination service delivery. We conducted data quality audit by ascertaining completeness and accuracy of data from immunization registers and assessed data consistency by comparing measles cases in immunization monthly summary and tally sheets. Data were analysed using Epi Info 7.

**Results:** We identified 97 cases, 12 (12.4%) were laboratory confirmed and one death (Case Fatality Rate: 1%). Males were 49 (50.5%), median age was 6 years (Range 0.5 – 56 years). Age group 1-5 years had 40 (41%) cases. We identified 64 (66%) cases through active case search. Cases were reported in 26 villages with 40 (41.2%) cases from Hamesa Ilati. Eighty-one percent 79(81.4%) were unvaccinated and 6 out of 9 (66.7%) facilities did not achieve  $\geq 80\%$  vaccination coverage. Facilities which attained  $\geq 80\%$  vaccination coverage for specific antigen: BCG 5 (55.6%), Birth OPV 0 (0%), OPV1; 4 (44.4%), OPV3; 3 (33.3%) Penta1; 6 (66.7%), Penta3; 4 (44.4%) and Measles Containing Vaccine (MCV) 1; 3 (33.3%).

One (11.1%) facility had complete and accurate MCV data in immunization register.

**Conclusion:** Measles outbreak occurred in unvaccinated, majorly below 5 years. The area health facilities had suboptimal vaccination performance indicators.

## Abstract 017

### Title: Measles outbreak investigation in Wajir County, Kenya 2019

**Muma Shariff** ( KFELTP) mumafirst@hotmail.com, Ali Mohamed ( KFELTP) drnoorali20@yahoo.com ,Elvis Oyugi ( Kenya FELTP) eoyugi@feltp.or.ke, Adam Hajj ( Wajir County Health Department) hajiadam661@gmail.com, Abdirizak Mohamed (, Disease Surveillance and Response unit, Ministry of Health, Kenya.) abdirizacksheikh@yahoo.com, Maryanne Gachari ( KFELTP) <gacharimaryanne@gmail.com>

**Background:** Measles outbreak continues to occur in many parts of Kenya despite the introduction in 2016 of Nationwide Measles-Rubella (MR) combined vaccine and SIA campaigns. In 2018 there were two waves of outbreak, the first wave occurred between January and April 2018 in two counties; Wajir and Mandera. The second wave of suspected measles outbreak was reported in Wajir County in August 2018. The purpose of the investigation was to establish the magnitude of the suspected measles outbreak and inform response strategies to ultimately interrupt and control transmission in Wajir County.

**Methods:** We did a cross-sectional survey and defined a case as any person who had fever and maculopapular rash with any of the following signs; cough coryza or conjunctivitis and living in Wajir from August, 1st 2018 to January 19th 2019. We reviewed outpatient and inpatient records in 15 health facilities and abstracted Demographic, Clinical, Laboratory and immunization data. We conducted active case search to identify cases using structured questionnaire. We calculated attack rates using age, residence, gender and period of occurrence (Months). We described the outbreak by time, place and person and determined the possible risk factors for measles.

**Results:** We line listed a total of 237 measles cases, Males were 98(50.3%) of the cases with the median age of the 15 years (IQR=27). The <5 years age group had 82(35%) and 99(41.5%) were in ≥25 years age-group. Among 52(26.7%) blood samples tested from suspected cases, 23(9.6%) confirmed for presence of measles-IgM. Wajir north had the highest attack rate of 5 cases per 10, 000 population and Children aged <5 had the highest attack rate of 5 cases per 10,000 population. Among the suspected measles cases 51(26.2%) had no

known status of immunization

**Conclusion:** The measles infection burden is still high among vaccinated or unvaccinated children and adults in Wajir County. We recommend improved and intensified routine measles immunization.

**Abstract 018****Title: Long-term impact of 10-valent pneumococcal conjugate vaccine in Kenya: nasopharyngeal *Streptococcus pneumoniae* carriage among children and adults six to seven years after vaccine introduction**

**Patrick Munywoki**, Daniel Omondi, Arthur Odoyo, Herine Odiembo, Alice Ouma, Juliet Ngambi, George Aol, Allan Audi, Terry Komo, Samuel Kiplangat, Noel Agumba, Clayton O. Onyango, Elizabeth Hunsperger, Fabiana C. Pimenta, Maria da G Carvalho, Cynthia G. Whitney, Fernanda C. Lessa, Godfrey Bigogo, Jennifer R. Verani

**Background:** Kenya introduced the 10-valent pneumococcal conjugate vaccine (PCV10) in 2011, using three primary doses in infants aged <1 year and, in select areas, catch-up campaigns among older children. In the 1–2 years post-introduction, pneumococcal colonization remained stable while vaccine-type (VT) carriage declined. However, it is unknown to what extent vaccine serotypes still circulate in Kenya.

**Methods:** We monitored pneumococcal carriage among participants in the Population-Based Infectious Disease Surveillance (PBIDS) platform in Asembo (rural western Kenya with a 2-dose catch-up for children aged 1–4 years) and Kibera (urban informal settlement in Nairobi with no catch up). PBIDS monitors the health of ~25,000 individuals in each site, and participants receive free care for infectious illnesses at a centrally located health facility in each site. From 1/2017 to 12/2018, nasopharyngeal swabs were collected from consenting PBIDS participants presenting to surveillance facilities with severe acute respiratory infection (SARI). SARI criteria included: for <5 years, cough or difficulty breathing plus indrawing, any IMCI danger signs, or hypoxemia [saturation <90%]; for ≥5 years, cough or difficulty breathing or chest pain plus temperature >38.0 C or hypoxemia. Swabs were frozen in **skim milk**-tryptone-glucose-glycerin media within 4 hours and underwent broth enrichment before isolation/identification. Isolates were serotyped by PCR and/or Quellung reaction.

**Results:** Among 2475 SARI cases (1827 from Asembo and 648 from Kibera), 2048 (82.7%) had swabs collected and tested - 1597 (87.4%) and 451 (69.6%) from Asembo and Kibera, respectively. *Streptococcus pneumoniae* was isolated

from 984 (48.1%); 704/1597 (44.1%) in Asembo and 280/451 (62.1%) in Kibera. Carriage was higher among children aged <5 years than persons aged ≥5 years: 64.8% vs. 34.4% in Asembo and 78.4% vs. 57.3% in Kibera. Among serotyped pneumococcal isolates, 71/681 (10.4%) and 114/950 (12.0%) were VT in Asembo and Kibera, respectively. In Asembo the VT-carriage prevalence was 6.6%, 6.5%, 7.5%, 3.1%, 3.4%, and 3.4% for age categories <12 months, 12–23 months, 24–59 months, 5–17 years, 18–49 years and ≥50 years, respectively. The corresponding VT prevalence by age for Kibera were 10.5%, 16.7%, 8.6%, 10.0%, 5.3% and 0.0%. The most common vaccine serotypes were 19F (n=34), 23F (n=15), 14 (n=12), 4 (n=4), and 1 (n=2) in Asembo and 14 (n=13), 23F (n=11), 5 (n=8), 19F (n=7), and 1 (n=5) in Kibera

**Conclusion:** Pneumococcal vaccine serotypes persist in Kenya 6–7 years post-PCV10 introduction. VT carriage prevalence was lower across ages in the site with initial catch-up campaign (Asembo) relative to that with no catch-up (Kibera). A change in dosing schedule to include a booster dose may be necessary to further decrease carriage of PCV10 serotypes.

**Abstract 019****Title: Seasonality and prevalence of respiratory syncytial virus, parainfluenza, and adenoviruses in Kenya: USAMRD-K supported Influenza-like illness surveillance program (2007-2018)**

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**Background:** Influenza-like illness (ILI) is a viral respiratory syndrome caused by a diverse range of etiologies. The prevalence of ILI varies by viral agent, population, geographical region, season and other factors. Above and beyond influenza viruses, human respiratory-syncytial-viruses (HRSV), human parainfluenzaviruses (HPIV), and human adenoviruses (HAdV) cause substantial ILI morbidity mostly in children ( $\leq 5$  years), elderly ( $\geq 65$  years) and immune-compromised people. Understanding the prevalence and seasonality of ILI etiologies is important because it enables us to recognize timings of the illness, factor that is crucial for planning for preventive and control (vaccination) or curative (treatments) measures. Utilizing data collected through the ILI surveillance program in Kenya between 2007 and 2018, we sought to identify the prevalence, and assess seasonality of HRSV, HPIV and HAdV.

**Methods:** Syndromic surveillance data of participants presenting with ILI were collected from twelve sentinel hospitals, located in the different climatic zones of Kenya by the present Köppen-Geiger climate classification system. Participants were enrolled based on the case definition recommended by the World Health Organization. The nasopharyngeal swabs were analyzed for the specified viruses using polymerase chain reaction and virus isolation assays. We performed

descriptive analyses by estimating overall proportions for each virus infection, and proportion per sentinel sites. Further, we visualized the distribution and observe the seasonal pattern by plotting the total number of cases for each virus per month from January 2007 to December 2018.

**Results:** The overall prevalence of ILI caused by the three viruses were: HRSV 3.03%, HPIV 4.95%, and HAdV 3.17%. Amongst the HPIVs, HPIV-3 was the most dominant at 38.8%, followed by HPIV-1 (33.9%) and HPIV-2 (10.2%). The proportion of multiple parainfluenzavirus infections was 16.9%. This study did not delineate the types for HSRV, HAdV, and HPIV-4. Sentinel sites located in the coastal tropical savanna clime (Malindi and Port-Reitz), and western tropical forest (Kisii and Kericho) mostly showed high proportions for the three viruses. We observed a seasonal pattern for HRSV where cases rose between April and July. There was no identifiable seasonality for HPIV and HAdV.

**Conclusion:** HRSV, HPIV and HAdV are prevalent among ILI patients in Kenya. The three viruses circulated concurrently at all the sentinel sites during the thirteen-year period. HPIV and HAdV were prevalent with no specific seasonal patterns. Further investigations are needed to determine the association of climatic and anthropologic factors with HRSV, HPIV and HAdV infections.

#### **Acknowledgement and disclaimer**

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The views expressed are those of the authors and should not be construed to represent the position of the Department of the Army or Department of Defense.

**Abstract 020****Title: Using the synthetic control method to assess 10-valent pneumococcal conjugate vaccine impact on pneumonia among children aged <5 years in rural and urban Kenya**

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**Background:** Pneumonia is a leading cause of child death, and pneumococcal conjugate vaccines (PCV) are critical for reducing that burden. Data on PCV impact on pneumonia in sub-Saharan Africa are limited, and challenging to assess due to temporal changes in disease burden unrelated to vaccine. 10-valent PCV (PCV10) was introduced in Kenya in 2011. We used the synthetic control method to estimate impact on child pneumonia.

**Methods:** We used data from the Population-Based Infectious Disease Surveillance (PBIDS), which monitors the health of people in defined catchment areas in Asembo (rural, western Kenya) and Kibera (urban informal settlement); each site has ~3,000 children aged <5 years. PBIDS participants receive free care for infectious illnesses at centrally located health facilities (hospital with small inpatient ward in Asembo and an outpatient clinic in Kibera); clinical data are collected by trained staff. We used the synthetic control method to assess PCV10 impact on pneumonia among children aged <12, 12–23, and 24–59 months. This method adjusts for non-vaccine-related trends in disease using a composite of control diseases. Pneumonia was defined as cough or difficulty breathing plus: tachypnea, indrawing, oxygen saturation <90%, convulsions, lethargy or unconscious. For control diseases we used discharge diagnoses, excluding those that could be affected by PCV10. We used data from 01/2008-12/2010 as baseline, 01/2011-12/2012 as transition and 01/2013-12/2018 as evaluation period. The rate ratio (RR) was calculated as sum of the observed pneumonia cases divided by

the sum of the predicted (counterfactual) in the same period.

**Results:** From 01/2008–12/2018, we recorded 55,803 visits for children <5 years in Asembo, including 50,637 (90.7%) outpatient and 5,166 (9.3%) inpatient. Pneumonia accounted for 7,490 (13.4%) visits overall, including 5,922 (79.1%) outpatient visits and 1,568 (20.9%) admissions. Among 71,174 visits in Kibera, 71,002 (98.8%) were managed at the clinic and 172 (0.2%) referred to a hospital. Overall 7,752 (10.9%) visits for were pneumonia, including 7,610 (98.2%) outpatient and 142 (1.8%) referred for admission. In both sites we observed a significant reduction in pneumonia in all age groups. For Kibera, RR by age group were: age <12 months RR 0.37 (95% credible interval [CrI], 0.23-0.56); 12-23 months RR 0.29 (95%CrI, 0.14-0.51); 24-59 months RR 0.56 (95%CrI, 0.31-0.83). In Asembo, RR by age group were: age <12 months RR 0.35 (95%CrI, 0.20-0.64); 12-23 months RR 0.67 (95%CrI, 0.49-0.90); 24-59 months RR 0.51 (95%CrI, 0.35-0.73).

**Conclusions:** PCV10 is associated with substantial reduction of child pneumonia in rural and urban Kenya. Our data contribute to the growing evidence base of PCV impact in sub-Saharan Africa, and notably demonstrate protection against outpatient pneumonia. As Kenya graduates from GAVI support, these results help justify the need for continuous funding for PCV10 in the national immunization schedule.

**Abstract 021**

**Title: Surveillance of Neuraminidase inhibition susceptibility of Influenza A virus (IAV) isolates obtained from Kenya, 2008 to 2017.**

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**Background:** Neuraminidase inhibitors have become the main antiviral agents useful in mitigation of IAV infections. Resistance to NAI both due to drug pressure and transmission of variants has been cited in certain geographical regions. Data on NAI susceptibility profile of influenza A isolates circulating within the Eastern African region remains scanty. **Objectives:** To characterize the NAI susceptibility of the 2008-2017 influenza A strains circulating in Kenya, by profiling known molecular markers in neuraminidase (NA) protein.

**Methods:** The influenza A isolates were derived from samples obtained using parent protocol: WRAIR protocol # 1267 and KEMRI SSC #981). Reverse transcriptase PCR (RT-PCR) using Superscript III One-Step RT-PCR system with primers specific for NA and HA genes of human A/H1N1pdm09, H3N2 and H1N1 isolates. Selection of global NA and HA sequences from Gene bank for inclusion in the alignments was accomplished using BLAST. Multiple sequence alignments of M2 proteins were performed using MUSCLE V3.8. The phylogenetic reconstruction was carried out using the Bayesian method of tree inference.

**Results:** During the study period 2008 to 2017 molecular analyses involving-75HA and 84NA IAV H1N1pdm09; 100HA and 79NA IAV H3N2; 26HA and 33NA seasonal IAV H1N1-genetic fragments was carried out to investigate their susceptibility to oseltamivir. Majority of the seasonal influenza A/H1N1 strains obtained in the 2008-2009 season possessed H275Y marker of Oseltamivir drug resistance. Few seasonal IAV H1N1 strains of 2008 lacked the H275Y substitution. The 2008 IAV H1N1 strains obtained in Kenya belonged to clades

2B.I while the 2009 strains were of the Northern European lineage (clades 2B.II) the dual signature H275Y and D354G substitutions.

All the A/H1N1pdm09 strains obtained from Kenya from 2009-2017 were cluster 2 viruses possessing the main substitution S203T. Majority of the IAV H1N1pdm09 strains obtained from Kenya, 2009-2017 possessed Q136K substitution. The IAV H1N1pdm09 strains of 2015-2016 had S185T substitution same as vaccine strain A/Michigan/45/2015. IAV H1N1pdm09 strains obtained from Kenya, 2009-2017 lacked H275Y substitution. Additional substitutions, I223K and S247N were not detected.

The IAV H3N2, HA phylogeny indicated that the 2012-2013 strains were Brisbane/10/2007-like possessing S144N substitution. Most of the 2016 IAV H3N2 Kenyan strains belonged to Perth/16/2009 clades defined by S/N144K substitution. The 2017 virus strains possessed 144S mutation same as the current vaccine strain Hongkong\_4801\_2014. All the Kenyan IAV H3N2 strains analyzed lacked R292K, Q136KD151V/D and N294S substitutions.

**Conclusion:** Most of the seasonal influenza A/H1N1 strains, 2008-2009 season obtained from Kenya possessed H275Y marker. The IAV H1N1pdm09 and IAV H3N2 strains obtained from Kenya have remained susceptible to Oseltamivir. Targeted NAI surveillance is important in timely detection and control of variant strains of great pandemic potential.

### **Acknowledgement and disclaimer**

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## Abstract 022

### Title: Understanding The Cellular Immunology To Pneumonia.

Elijah Gicheru (Kemri Wellcome Trust)\*

**Background:** Pneumonia both viral and bacterial is a leading cause of mortality in children under 5 years. Respiratory syncytial virus (RSV) is the commonest viral cause of pneumonia. The immune biomarkers for pneumonia mortality are not well understood. Molecular diagnosis including polymerase chain reaction as well as blood culture provide information on the microbial etiology of disease but provides little prognostic indication of survival outcome. Understanding the biomarkers of severe disease and mortality risk will aid in care decisions during admissions.

**Methods:** To understand the mechanism of RSV pathology we analyzed airway immune cell phenotypes, we collected 98 nasal and oral-pharyngeal swabs samples from both RSV positive and negative children during the 2018/9 RSV epidemic season and phenotyped the resident airway immune cells through surface staining for B and T lymphocytes, neutrophils and monocytes using the flow cytometry technique. Difference in the immune cells phenotypes between these groups was analyzed using the FlowJo software V10. We also used parallel high performance liquid chromatography tandem mass spectrometry to analyze airway proteome.

**Results:** Using flow cytometry we observed a diverse population of innate and adaptive immune cells (including neutrophils, monocytes and lymphocytes) that was recruited to address the local infection. Neutrophil abundance in response to respiratory syncytial virus infection was inversely associated with commensal microbiota abundance as well as with a clinical marker of pneumonia severity and low oxygen saturation.

**Conclusions:** This increase in airway neutrophils was associated with increased expression of neutrophil granule proteins. This elevated expression profile was associated with changes in airway microbiota and reduced oxygen saturation

# SCIENTIFIC SESSION 4:

## TB/HIV (1)

**Abstract 023****Title: Continuous Quality Improvement Approach to Scale Up TB Active Case Finding in Suna West Sub County****Peter Omware** (Ministry of Health)

**Background** Suna west sub county, in M which previously had been experiencing a sharp decline in reporting of cases of new incidences of TB in the third quarter despite the 2015/2016 research showing that up to 60% of cases remained undiagnosed in the community. The sub county health management team formed a work improvement team and did a root cause analysis using fishbone diagram to establish the causes which were: Knowledge gap amongst clinicians on active case finding in TB, management of TB patients and isoniazid prophylaxis in under 5 exposed to smear positive TB, Ignorance amongst the members of the community health volunteer on contact tracing of TB patients. Objectives 1. To improve on diagnosis and case detection of TB by clinicians. 2. To promote awareness amongst the community health volunteer on contact tracing, filling of tools and isoniazid prophylaxis in under 5.

**Methodology:** Using a priority matrix the following interventions were put forward from September 2019. 1. ACME on active case finding in TB to all facilities 2. Having focal person to champion TB services in all the TB sites 3. Regular Mentorship of staffs and community health volunteers on the filing of contact tracing tools and isoniazid prophylaxis of under children exposed to smear positive TB.

**Results** In the first quarter of 2019 a total of 45 cases of TB were diagnosed across the sub county of which 22(49%) were bacteriologically confirmed (smear positive) while clinically diagnosed (smear negative) 20 (44%) and extra pulmonary cases were 3 (7%). No child under 5 was put on IPT. In the Second quarter 54 cases of TB were diagnosed across the sub county of which 27(50%) were bacteriologically confirmed (smear positive) while clinically diagnosed (smear negative) 23 (43%) and extra pulmonary cases were 4 (7%). Only 6 children under 5 were put on IPT. In the third quarter 42 cases of TB were diagnosed across the sub county which was a decline by 37% from previous quarter of which 24(57%) were bacteriologically confirmed (smear positive) while clinically

diagnosed (smear negative) 14 (33%) and extra pulmonary cases were 4(10%). Only 6 children under 5 were put on IPT In the fourth quarter in just 2 months (October and November) after the intervention. a total of 70(166.7%) cases of TB were diagnosed across the sub county of which 56 (%) were bacteriologically confirmed (smear positive) while clinically diagnosed (smear negative) 11 (15.7%) and extra pulmonary cases were 3(4.3%). 42(700%) children under 5 were put on isoniazid prophylaxis. This meant an improvement in the number of case diagnosed, number of children on IPT more evidenced based diagnosis of TB patients put on treatment.

**Conclusion:** Continuous quality improvement is essential in improving active case finding in of TB patients and promoting use of IPT in under 5s

Recommendations : Implement Continuous quality improvement inTB settings delivery to improve on active case finding.

**Abstract 024****Title: HIV Epidemiology among the Fisherfolk in the Islands of Lake Victoria in Western Kenya; 2017-2018**

**Anne M Adega** (KEMRI)\*; Daniel Kwaro (KEMRI)

**Background:** Fisherfolk working around Lake Victoria are a priority population for HIV prevention and treatment in Kenya. Studies among fisherfolk residing in mainland communities have found HIV prevalence ranging between 25-35% against 4.8% nationally. We aimed to characterize the HIV epidemic in the often more isolated island beaches.

**Methods:** A cross-sectional household survey of fisherfolk aged 15-64 years residing within sampled island beaches on Lake Victoria in western Kenya was conducted in 2017/2018. Data on demographics and behavior were collected and home-based HIV rapid testing and viral load for HIV positive persons were conducted. Those reporting known HIV-positive status showed clinic cards or drugs for verification. To estimate HIV prevalence, we weighted the sampled participants per number of beaches included and participants interviewed among those mapped. We used logistic regression to investigate variables associated with HIV positivity. Viral suppression was defined as VL<1,000 copies/mL.

**Results:** A total of 1696 participants were enrolled in the study, of whom 930 (55%) were females; 1651 (97%) reported previously testing for HIV and 1148 (70%) had tested within the last year. The overall weighted HIV prevalence was 31.1% [95% confidence interval (CI) 28.7-33.5%], with females at 35.5% (95%CI 32.2-38.9) and males 25.3% (95%CI 22.0-29.0). Knowledge of HIV positivity status was 82.6% (95%CI 79.0-86.3). Antiretroviral therapy (ART) uptake among those with self-reported positive status was 98.3% (95%CI 97.1-99.5). Viral suppression among those on ART was 83.3% (95%CI 78.5-87.2). Factors associated with HIV positivity were (adjusted odds ratio, 95%CI) being female (1.9, 1.4-2.5), age 35-44 years (2.7, 1.9-4.0), widows/widowers (7.1, 3.8-13.4), having primary/lower versus higher education (0.8, 0.6-1.1), being married to fisherman (1.3, 0.9-1.9) and drinking alcohol versus no drinking reported (2.0, 1.5-2.7).

**Conclusions:** Our results confirm high HIV prevalence among island fisherfolk, equal to high estimates for mainland fisherfolk. Knowledge of positive status is below the national target of 90%. While ART uptake among those self-reporting HIV positive was nearly universal, viral suppression among those on ART was sub-optimal. Prevention and control interventions among the wider fisherfolk community should continue, with focus to reach women, 35 to 39 year-olds, widows and those with limited education.

## Abstract 025

### **Title: Factors associated with bacteriologically confirmed pulmonary Tuberculosis cases in Kwale County, 2016–2019.**

**Samuel G Kimaru** (County government of Kwale)\*; Fatihiyya Wangara (County government of Kwale); Maryanne Gachari (KFELTP); Maurice O Owiny (Kenya FELTP)

**Background:** Tuberculosis (TB) is an infectious disease transmitted through inhalation of droplet aerosols from index cases. Kenya TB prevalence survey conducted in 2016 estimated case notification of 558/100000 population and 40% gap in case finding, Kwale is among the counties with low case finding (135/100 000 people in 2016). The study aimed to identify factors associated with bacteriological confirmed pulmonary TB cases to assist the county in ascertaining the subpopulation to be targeted for intensified case finding.

**Methodology:** We conducted a cross-sectional study through a review of medical records abstracted from an electronic TB surveillance system (TIBU) that had been notified in Kwale County from 2016 through 2019. Bacteriologically confirmed TB case was defined as one from whom a biological specimen was positive by smear microscopy or Genexpert. We excluded transfer-in cases from other counties. Exposure variables analyzed included age, sex, nutritional status, Human immunodeficiency virus (HIV) status, TB type, while the outcome variable was bacteriological confirmation. We calculated descriptive and analytic statistics. We used odds ratios (OR) at a 95% Confidence level to determine the association between the exposures and outcome.

**Results:** We reviewed 3888 records of drug-sensitive tuberculosis patients, the median age was 35 interquartile range 26.9 years, males were 2381(61.2%), those aged 25–34 years were 880 (22.6%). Severe and moderate acute malnutrition accounted for 440 (11.3%) and 731(18.8%), respectively. HIV co-infection was 932 (25%). Pulmonary TB accounted for 3387(87.1%). Being male (OR: 1.6, 95% CI 1.44–1.88), having pulmonary TB (OR 47.0, 95% CI 25.6–88.2), and being aged above 15 years (OR: 9.2, 95% CI 1.4–1.9) were associated with bacteriologically

confirmed TB.

**Conclusion:** Being male, having pulmonary TB, and the age category above 15 years were associated with having bacteriologically confirmed TB. The county should target these groups for active case finding and linkage to treatment.

Keywords: Pulmonary, Tuberculosis, Malnutrition, Kwale

**Abstract 026****Tuberculosis case finding among HIV Positive clients attending HIV care clinic at Kathiani Hospital Machakos County, Kenya.**

**Eunice N Kiilu** (County department of Health Machakos)\*

**Background:** Tuberculosis (TB) is an airborne disease and the leading killer in HIV positive clients. Early diagnosis and treatment of TB has been known to cut transmission, and reduce mortality. We assessed TB screening among HIV positive clients in Kathiani Sub County Hospital in Machakos County.

**Methods:** We conducted a cross-sectional study and reviewed records of patients who had attended HIV care clinic from January 2018 to June 2019 in Kathiani Hospital. Data were extracted from patient files and entered in an MS Excel-based tool. Independent variables were socio demographic, clinical and exposure characteristics and the outcome variable was presumptive TB diagnosis. Active case finding was defined as the systematic identification and screening of people with TB symptoms (presumptive TB). Data were analyzed using MS Excel. We calculated descriptive and analytic statistics and reported odds ratios (OR) and their 95% confidence intervals (CI). Using a standardized tool, we assessed quality and consistency of data by comparing data in the HIV register and that in electronic Kenya Health Information System (DHIS2).

**Results:** We reviewed 790 records, mean age was 39 years (SD± 14.5 years), 70% (553/790) were female, 46.9% (371/790) resided in Kathiani Central, 99.4% (785/790) were screened for TB and 6.8% (53/785) were diagnosed as presumptive TB cases and 22.6% (12/53) were confirmed to have TB while 15.1% (8/53) were not evaluated at all. Factors associated with presumptive TB diagnosis were lack of isoniazid prophylaxis (OR= 10.1, CI: 3.3-31.3, P value 0.00), CD 4 count of <200 (OR= 2.8, CI: 1.4-5.6, P value 0.004) and being a male 2.8 (OR 1.5-5.4, P value 0.001).

**Conclusion:** The data quality was inadequate and we observed inconsistencies in data entered in DHIS2 and that in the TB register. There was low yield of cases

from screening despite majority of them being examined and risk of presumptive TB diagnosis could be due to sub optimal HIV management, especially in men. We recommend evaluation of all presumptive cases and optimal management in all HIV positive clients.

**Key Words:** Tuberculosis, HIV, Active Case Finding, Presumptive.

**Abstract 027****Title: Experiences in successful implementation of a tuberculosis (TB) vaccine trial in a TB endemic setting western Kenya**

**Joshua Ongalo** (KEMRI-CGHR)\*; Jeremiah Khayumbi ( KEMRI-CGHR); Ronald Odero ( KEMRI-CGHR); Joan Tonui (KEMRI-CGHR); Laureen Nyongesa (KEMRI-CGHR); Ben Odhiambo (KEMRI-CGHR); Christine Ogollah (KEMRI-CGHR); Joshua JBO Ongalo (KEMRI-CGHR); Albert Okumu ( KEMRI-CGHR); Steve Wandiga (KEMRI-CGHR); McCathy Kimberly (CDC)

**Introduction:** With global efforts toward tuberculosis (TB) elimination, prevention approaches are key. Currently, the only available vaccine; Bacillus Calmette Guérin (BCG) dates to eighty years with confirmed waning immunity against TB in adults, thus a need for a new, efficacious more robust vaccine for all population is warranted. A well-established Immunology laboratory is critical in vaccine TB trial endpoints. We share our experiences and contribution towards the implementation of Phase 2b controlled trial of M72/AS01E vaccine to prevent tuberculosis.

**Methods:** Samples were conveniently delivered to the KEMRI TB laboratory in cool boxes, and portable incubators by motor vehicles and motorbikes. Transportation temperatures were monitored by Liberors. Samples were received electronically into the TB lab database and LDMS. Samples collected included whole blood for QuantiFERON plus test for LTBI, PBMC processed by CPT method, Paxgene for RNA expression, whole blood stimulation for CMI studies and serum for humoral studies. Sputum for Xpert MTB/RIF and cultures for active pulmonary TB testing. We provided proficient technical expertise in the initial testing, storage and shipment of the vaccine trial samples. All the equipment used in this study were fully serviced in the entire period of the study.

**Results:** Valid QFT plus tests done was above 95% with 100% TAT. Valid Xpert results were above 95% with TAT >95%. All PBMC samples were transported at ambient temperatures with TAT of 100% and successful separation above 95%. All EQAS scores were >90%. Internal quality control for CMI sample 100% pass. All samples were processed, stored and shipped to designated laboratories for further testing. The final data analysis shows that M72/AS01E vaccine is 50%

efficacious. These findings have been published in the New England Journal of Medicine.

**Conclusion:** A well-established quality management system compliant laboratory is essential in the successful implementation of a vaccine trial in a resource-limited setting.

**Abstract 028****Title: Retention of New adult Clients on Anti-Retroviral Therapy at Kisumu County Referral Hospital Comprehensive Care Centre in 2018**

**Larry Ochieng Mwallo** (Ministry of Health)\*; Maryanne Gachari (KFELTP); Elizabeth Oele (MOH); Elvis Oyugi (Kenya FELTP)

**Background:** In Kenya, the HIV prevalence among adults is 4.9%. Retention is significant in reducing HIV-related morbidity, mortality, incidence of new infections and development of Anti-Retroviral Therapy (ART) resistance. Achieving sustained viral suppression becomes a challenge when patient's retention is poor. We determined the factors associated with the low retention rate among new adult clients on Anti-Retroviral Therapy (ART) in Kisumu County Referral Hospital in 2018.

**Methods:** We conducted a cross sectional study that involved retrospective review of records among all newly diagnosed adults clients enrolled for HIV care in 2018. We obtained data from Kenya Electronic Medical Records. A total of 885 records were reviewed and we collected information on socio-demographic and clinical characteristics of the clients. Retention to care was defined as the continuous engagement in HIV Care by a client from enrollment to discharge or death. We conducted Data quality audit and consistency assessment to ascertain the quality of the data. We used MS excel and the epi-info software to calculate the descriptive statistics and two by two table to identify factors that were associated with the low retention rate among the new adult clients on ART.

**Results:** Out of the 885 records reviewed, the median age was 32 years (range 15-75 years), 64% (571/885) were female, 56.3%(498/885) were ever married at one point, 43.3(383/885) had some level of education, 49.0%(434/885) of the clients were diagnosed at outpatient department as an entry point, 62%(549/885) of the clients diagnosed were at WHO stage 1. Median duration on ART was 1 year (range 0-2 years), Most of the clients, 97.9 %( 865/884) were on ART first line regimens. 73.8 %( 653/885) were active (retained) in the program way below 90% target by the UNAIDS. Transfer out 49 %( 114/232) and lost to follow up (LTFU) 31

%( 72/232) were most of the reasons for the exits. Being Male (OR 1.1, CI=0.80-1.5), adults (OR 1.1, CI=0.42-2.72), ever married (OR 0.74, CI=0.51-1.1) and educated (OR 1.7, CI=0.8-3.3).Duration on ART>1 year (OR 15.7, CI=5.74-42.9) was also a factor associated with the exit of the patients on care.

**Conclusion:** About 26% of the patients on care exited the program hence were not retained. We recommend active defaulter tracing by use of peer educators and community Health Volunteers in the community

**Abstract 029****Title: HIV-specific antibody neutralization function in HIV infected children**

**Yiakon O Sein** (KEMRI Wellcome Trust)\*, Yiakon Sein<sup>1</sup>, Tandile Hermanus<sup>2</sup>, Penny Moore<sup>2</sup> & Eunice Nduati<sup>1</sup>

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**Background:** It is envisaged that broadly neutralizing antibodies present before an HIV infection can prevent the entry of a wide range of human immunodeficiency virus strains and therefore forms a core focus on the development of HIV vaccines. Evidence from animal studies shows that antibodies with neutralizing breadth can achieve sterilizing immunity against HIV. While extensive studies have addressed neutralization breadth in adults, for children less is known despite having a unique course of the disease. We sought to screen for antibody neutralization breadth in HIV infected children. To do this, we measured antibody levels and determined antibody neutralization breadth.

**Method:** We screened plasma from a cross-sectional cohort of 50 ART naïve children between the ages of 1-11 years, who were infected with HIV clade A, for neutralizing antibody function. First, HIV-specific antibody levels to total IgG, IgG<sub>1</sub>, IgG<sub>2</sub>, IgG<sub>3</sub>, IgG<sub>4</sub>, and IgA were measured in the children's plasma using an in-house ELISA. Then, the antibody neutralization function was determined against a globally representative panel of 12 pseudoviruses. The neutralization breadth was calculated based on the number of viruses that each serum sample neutralized.

**Results:** All children had detectable gp120-specific IgG levels, and these were significantly associated with antibody neutralization breadth (Spearman's rho=0.368 p=0.021). The subclass analysis revealed that a large proportion of the gp120-specific IgG antibodies were of the IgG<sub>1</sub> subclass, however, this didn't achieve significance when associated with antibody neutralizing breadth

(Spearman's  $\rho=0.2248$   $p=0.1688$ ). Other antibody subclasses were detected at low levels with HIV-specific IgG<sub>2</sub> antibody levels strongly associated with neutralization breadth (Spearman's  $\rho=0.5284$   $p=0.0005$ ), while IgG<sub>3</sub> and IgG<sub>4</sub> were not significantly associated with antibody function. Additionally, IgA was present at low levels, however, a strong association was observed with neutralization breadth (Spearman's  $\rho=0.4158$   $p=0.0085$ ). 50% of the children neutralized more than 50% of the viruses and were classified as having neutralization breadth. 3 children's plasma neutralized 100% of the viruses on this panel.

**Conclusion:** IgG, IgG<sub>2</sub>, and IgA were associated with antibody neutralization which suggests a balance of subclass distribution is necessary to support the generation of antibodies with neutralization breadth. Our results support the observation that a larger proportion of children than the previously observed proportion in adults, generate antibodies with neutralization breadth and warrants further screening of HIV infected children cohorts.

# SCIENTIFIC SESSION 5:

Public Health  
(1)

**Abstract 030****Title: EVALUATION OF HEPATITIS B VACCINATION UPTAKE AND AWARENESS AMONG HEALTH CARE WORKERS AT CHULAIMBO COUNTY HOSPITAL****Author;** Duncan Ongayi**Affiliation;** MINISTRY OF HEALTH, CHULAIMBO COUNTY HOSPITAL, KENYA.

**Introduction:** Hepatitis B is a serious infection that affects liver and caused by hepatitis B virus (HBV). HB is a serious public health problem and the health professionals are most at risk. It is contagious and easy to be transmitted from one infected individual to another by coming in contact with blood, open sores or body fluids of somebody who has Hepatitis B virus. It is estimated that globally out of 150000 people who donate blood, 1200 were found to be HIV positive, while 3000 were diagnosed with Hepatitis B virus (Kemri 2017). The prevalence rate of HBV infection I Kenya is currently three times higher than that of HIV with a prevalence rate of between 5-8%.

**Objective:** The aim of this study was to asses Hepatitis B vaccination uptake and awareness among Health care workers at Chulaimbo County Hospital.

**Methods :** A cross section study was conducted among randomized 42 Health Care workers per carder at Chulaimbo County Hospital in June 2019. Self-administered structure questionnaire was used to collect information which included as to whether the staff knew what is Hepatitis B disease; why be vaccinated against Hepatitis B; How Hepatitis B is spread; Who should get Hepatitis B vaccine; whether staffs have been vaccinated against Hepatitis B; Whether a facility had included Hepatitis B in its training program and whether the facility has Hepatitis B vaccination program for staff.

**Results:** The respondent were as follows ;Out of 42 health care workers interviewed : The staffs who knew what is Hepatitis B disease 71% ; Those who knew why they should be vaccinated against Hepatitis B, 79% ; Those who knew How Hepatitis B is spread 63%; Those Who Knew should get Hepatitis B

vaccine 70%;Whether a facility had included Hepatitis B in its training program and whether the facility has Hepatitis vaccination program for staffs 5%;Those who have been vaccinated against hepatitis B ;33%.

**Conclusion:** The findings of the study indicated there were still gaps in awareness and uptake of Hepatitis B Vaccine at Chulaimbo County Hospital and there was need for consistent sensitization, CMEs, OJT of staffs on importance of Hepatitis B Screening and vaccination.

**Abstract 031****Title: Assessment of HIV Exposed Infants on Follow Up at Mentor Mothers Program Sites, Kwale County, Kenya, 2016- 2018**

**Juma Mwavita** (KWALE COUNTY GOVERNMENT)\*; Elvis Oyugi (Kenya FELTP); juma Ahmad (kwale county Government)

**Background:** Mentor mother's program (MMP) was initiated to accelerate elimination of mother to child transmission (eMTCT) of HIV by addressing psychosocial challenges faced by mothers living with HIV in Kenya. In 2016, rate of mother-to-child transmission of HIV (MTCT) was 22% in Kwale County, higher than Kenya's national rate of 8.3%. We characterized HIV Exposed Infants (HEIs) and mothers on follow up in the MMP. **Methods:** We reviewed records of mothers on follow up at seven MMP sites in two Sub-Counties in Kwale county, from 2016 to 2018. Data were extracted from the MMP register and variables assessed were socio demographic characteristics, mother's HIV status at first visit, male partners' HIV status and HEI outcome at 18 months. Descriptive statistics were calculated using MS Excel. We used a standardized tool to conduct data quality audit.

**Results:** We reviewed 300 records; mean age was 29 years ( $\pm 5.8$  years), 61% (184/300) resided in Matuga Sub-County, 99% (296/300) were married, 74% (223/300) were living with HIV at enrollment, 82% (246/300) had a male partner who was living with HIV and 19% (56/300) were accompanied by their male partner to the MMP clinics. Of 300 infants born alive, 5% (16/300) were not delivered in a health facility and 94% (283/300) received Nevirapine infant prophylaxis, 90% (270/300) were tested by polymerase chain reaction at 6 weeks and 83% (249/300) had ELISA test at 18 months. After 18 months follow up for HEI, 72% (216/300) tested negative to HIV while 4% (12/300) tested positive, 3% (9/300) died and 21% (63/300) were lost to follow up.

**Conclusion:** The MTCT of HIV in the MMP sites was lower than the county average, however, there is need to strengthen defaulter tracing and improve infant care to reduce the loss to follow up and early deaths. Key words: HIV Exposed Infants, Mentor Mothers Program, Kenya

**Abstract 032****Title: Mortality rates and causes of death in an urban informal settlement, Kibera, Kenya, 2017**

**Clifford Oduor**<sup>1</sup>, Irene Omwenga<sup>1</sup>, Alice Ouma<sup>1</sup>, Robert Mutinda<sup>1</sup>, Samuel Kiplangat<sup>1</sup>, Geoffrey Masyongo<sup>1</sup>, David Obor<sup>1</sup>, George Agogo<sup>2</sup>, Patrick Munywoki<sup>2</sup>, Godfrey Bigogo,<sup>1</sup>Jennifer R. Verani<sup>2</sup>

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**Background:** Reliable and timely mortality data are important for health services planning, prioritization, and evaluating the impact of public health interventions. However, data on the rates and causes of death from populations in resource-poor settings are lacking, particularly for those living in urban informal settlements. We aimed to estimate mortality rates and leading causes of death based on verbal autopsy (VA) in an urban informal settlement in Kenya in 2017.

**Methods:** The Population-Based Infectious Disease Surveillance (PBIDS), monitors the health and demographics of ~25,000 individuals in Kibera. Eligible individuals (resident for ≥120 days) are visited at home every 6 months for collection of demographic data; in addition, designated community leaders regularly report on demographic events in the study area, including deaths. A trained field worker performs verbal autopsies on all identified deaths within 1 month using World Health Organization standardized VA questionnaires. Probable causes of death (COD) are generated by InterVA-4, which uses Bayesian probabilistic modeling. We estimated mortality rates using person-years denominator for all groups, and mortality ratios using live birth denominator for deaths among children aged <5 years. We described the most common causes of death as generated from the InterVA.

**Results:** We recorded 84 deaths in 2017, yielding a mortality rate of 3.8 (95% CI: 3.0-4.6) per 1000 person-years (pyo). Among children <5 years old, the mortality rate was 7.6 (95% CI 4.6-11.8) per 1000 pyo, and mortality ratio was 36.4 per 1,000 live births. Infant (<12 months) mortality rate was 37.9 (95% CI: 19.5-66.1) per 1000 pyo and infant mortality ratio was 21.8/1,000 live births. Child (1-4

years) mortality rate was 3.5 (95% CI:1.50-6.87) per 1000 pyo and child mortality ratio 14.5/1,000 live births. The mortality rate among persons aged  $\geq 5$  years was 3.2 (95% CI 2.5-4.1) per 1000 pyo. InterVA assigned a cause to 70 (83.3%) deaths. The leading COD among children aged  $< 5$  years (n=18) were: acute respiratory infections including pneumonia (38.9%), malaria (16.7%), neonatal pneumonia (11.1%) and prematurity (11.1%). For those aged  $\geq 5$  years, the most common COD were: HIV/AIDS (26.9%), acute respiratory infections including pneumonia (15.4%), pulmonary tuberculosis (11.5%) and road traffic accident (9.6%).

**Conclusions:** To achieve the Sustainable Development Goal of under-5 mortality  $\leq 25$  per 1000 live births by 2030, focused efforts are needed to further reduce child and infant mortality in Kibera. Acute respiratory infections cause  $\sim 50\%$  of deaths in this group and should be a priority for policy makers.

## Abstract 033

### Title: Increasing Screening in All Hospital Departments to Improve Active Case Finding The Case of Awendo Sub County

Peter K P.O.O Omware (Ministry of health)\*

**Back ground:** Awendo sub county hospital has a population coverage of 25,103 and an estimated 107 cases of TB in migori county in which from 2015 started reporting declining numbers of New cases of TB .This was mostly due to low screening across departments which was due to knowledge gaps amongst staffs in various departments on active case finding, inadequate screening tools and failure to use facility active case finding data for decision making.Objectives: To improve screening of TB in all the departments in the hospital to increase active case finding.

**Methodology:** This is a retrospective study comparing data from the presumptive TB registers and TB 4 treatment register between 2017 before interventions and 2018 after interventions ;Strategies employed; Regular CME’S on the diagnosis and management of TB. Provision of presumptive registers at the PSC,OPD and the MCH. Giving monthly reports on screening by all the clinical officers and nurses on the facility online platform( Whatsapp group) . Selection of departmental active case finding focal persons per department.Monthly review meetings to discuss the progress of active case finding.

**Results;** In 2017 a total of 43 cases were diagnosed with TB which included smear pos 31 cases, smear neg 5, extra pulmonary 2 and retreatment 5. In 2018 the total number of cases increased to 63 (146.5%), which included 34 (109.7%), smear negative 15 (300%), 14 (700%) extra pulmonary. There was an increase in number of smear positive in 2018 despite lack of gene expert services for 5 months resulting in reliance on sputum microscopy. The greater proportion of them were from the out patient The increase in extra pulmonary cases was from increased screening amongst clients admitted in the wards. There was an increase in number of clinicians and nurses that requested for gene expert in 2018.

**Conclusion:** Increasing screening for TB across all department results in increased active case finding.**Recommendation:** Promote active case finding across all departments in hospital by increasing screening and use of data for decision making.

**Abstract 034**

**Title: Human Papillomavirus (HPV) Infection: Molecular/Genotype Epidemiology, Acceptability of Screening and Vaccination and Risk-factors among women in lower Mt. Kenya region.**

**James Njue ( kemri) <kinoti@hotmail.com>**

**Background:** In 2018, there were 3,286 deaths due to cervical cancer in Kenya with a national cervical cancer screening rate of 3.2%. Lack of awareness on risk factors associated with cervical cancer, HPV screening and vaccination leads to low screening uptake. **Objectives:** This study examined knowledge, attitudes, practices and perceptions (KAPP) on Human Papilloma Virus(HPV) screening, vaccination and cervical cancer risk factors; and how they influenced HPV infections, exposure and screening uptake among women seeking reproductive health services.

**Methods:** women visiting reproductive health and Human Immunodeficiency virus (HIV) voluntary, counselling and testing centers (VCT) in August 2018-June 2019 were recruited at random. This was a cross-sectional study in which a structured close-ended questionnaire was used to obtain socio-demographic and KAPP data on HPV screening, vaccination and cervical cancer risk factors. Vaginal swabs were obtained for HPV Genotyping and cytology. Logistic regression and Pearson chi-square tests were used to analyse statistical relationships between socio-demographics, KAPP variables, HPV and other co-infections.

**Results:** 317 women were interviewed (mean age: 34.3 years); Meru: 81(25.6%), Tharaka-Nithi: 31(9.8%), Kirinyaga: 56(17.6%), Embu: 85(26.8%), and Isiolo: 64(20.2%). Overall screening rate (10.7%) and predominant HPV genotypes (HPV 16, 45 and 81) were significant ( $p < 0.005$ ) by marital status, number of sexual partners, contraceptives use and infections by HIV, genital warts and urinary tract infection. Knowledge on HPV screening was significantly associated with county of residence, <30years age, secondary education, marital status, religion and contraceptive use. Having a relative with history of any cancer was significant by knowledge and perceiving HPV screening as important. Participants who perceived HPV vaccination as important were significant across age, family

planning and parity. Fear of embarrassment, procedures and results, lack of time and cost of test were reported as reasons for failing to screen for HPV. Unavailability of HPV vaccine, lack of time, cost and doubts surrounding HPV vaccine efficacy were reported for failing HPV vaccination.

**Conclusion:** High number of participants with awareness of cervical cancer and exposure to risk factors did not seem to improve cervical cancer screening and vaccination uptake. Knowledge, willingness and perceiving HPV screening as important as well as willingness to vaccinate against HPV may reduce HPV infections among women seeking reproductive health services in lower Mt. Kenya region.

## Abstract 035

### **Title: Process evaluation of the implementation of Linda Mama Free Maternity Programme in Kenya.**

**Stacey K Orangi** (Kemri-Wellcome Trust Research Programme)\*; Angela Kairu (KEMRI Wellcome Trust); Joanne Ondera (ThinkWell); Edwine Barasa (KEMRI Wellcome Trust)

**Background:** In Kenya 362 maternal deaths per 100,000 live births were reported in 2014. This high rate of maternal deaths is because of limited availability of health services, poor access to and low utilization of skilled birth attendance. A key determinant in access to skilled delivery is health financing. To increase access to maternity services, the Kenyan government introduced a free maternity policy in all public facilities in 2013. This policy was revised to the “Linda mama programme” with management under the NHIF. The design of policy is important but its implementation is equally important. This study aimed to carry out a process evaluation of the implementation of Linda Mama programme. By doing so we examined the emergence, fidelity of policy and implementation experiences.

**Methods:** We conducted a mixed method cross sectional study at a national level and in five purposively selected counties. 20 purposively sampled facilities were selected to represent the different types of health facilities that offer free maternity services. Data was collected through semi-structured in-depth interviews (n=102) with MOH officials, NHIF officials, developmental organizations, county officials and health care workers. Patient exit questionnaires (n=108) were also used in data collection from mothers receiving antenatal care, delivery services and postnatal care. Document reviews were also done. Qualitative data was coded and analysed using NVIVO employing a framework analysis approach to identify key issues. Descriptive analysis on quantitative data was done in STATA.

**Results:** The Linda Mama programme was developed to address challenges identified with the previous free maternity. In some of the counties, Linda Mama funds are redirected to the county revenue fund account and not remitted back to the facilities. For facilities that have access to the funds, it is an additional source of income that is used to improve service delivery. However, there are delays in

reimbursements and an unpredictability in the timings and amounts reimbursed. Although the benefit package was expanded, in practice it is not comprehensive because the programme does not reimburse for some essential services. There is inadequate training on how to make claims, lack of staff and equipment to make the claims and system hang ups which disrupt the registration and claiming process. There are challenges in access as a result of a lack of information among the mothers, cultural beliefs, out of pocket payments for services not covered, transport costs, lack of identification documents, among others.

**Conclusion:** MOH and NHIF should improve awareness of the benefit package and how the programme should be implemented in the UHC scale-up. Bottlenecks in the funding flow to public facilities and claims processing challenges should be addressed to ensure timely reimbursements and access to funds. User fee collection from these mothers should be halted to increase access to services.

**Abstract 036****Title: Assessment of Community Knowledge on Tuberculosis in Meru County, Kenya February 2019****Authors: Martin N.Njiru** <sup>1234</sup>, A.Yoos<sup>13</sup>, G.Koome <sup>4</sup>, G.Otieno<sup>5</sup>

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**Background:** In 2017, World Health Organization (WHO) stated that the global community reported 6.4 million new cases of tuberculosis. Despite increase in notification of TB, progress in closing detection and treatment gap is slow and large gaps remain. In the same year, WHO stated that there was a gap of 3.6 million between notification of new and relapse cases and the best estimated incident cases was 10 million. The researcher sought to discover community needs and assets in relation to tuberculosis knowledge in order to improve detection.

**Methods:** Tigania East Sub County was purposely selected. Researchers conducted a cross sectional survey for community members. The sampling process was stratified to cover the five wards of Tigania East Sub County

proportionately. Respondents were adults above 18 years and residents of Tigania East Sub County Meru County, Kenya. Analysis was done using an online sample size calculator at 95% confidence level, a sample of 394 respondents was calculated from the study population.

**Results:** Majority 55% (n=218) of respondents were female. It is only 100 (26%) of respondents who had completed primary school, however 85 (22%) had attained secondary education and 36 (9 %) lacked any formal education. Only 61 (15%) of the respondents could describe three out of four signs of tuberculosis. 87 (8%) of respondents didn't seek health services of what they considered minor ailments.

**Abstract 037**

**Title: Factors associated with outcome of Gender Based Violence Survivors attending care at Makadara Health Center, Nairobi County, January-December,2018**

**Nellie N Motanya** (Nairobi city county government)\*

**Background:** Gender based violence (GBV) is any act perpetrated against a person's will resulting in physical, sexual or psychological harm, occurring in private or public ascribed to gender; affects 3,000 survivors of whom 56% are women. We sought to evaluate the factors associated with the outcome of (GBV) survivors attending care at Makadara Health Centre.

**Methods:** We reviewed records of GBV survivors in Makadara Health Centre from January to December 2018. Using a standard MS Excel data abstraction tool, we collected data on demographic characteristics, clinical care services given, follow up care and patient's outcome from GBV register, and Post Rape Care forms. We calculated descriptive statistics for continuous variables, and used frequencies and proportion to analyse categorical variables. Odds ratios (OR), 95% Confidence Intervals (C.I) and p-Values were used to identify factors associated with GBV. Data completeness and consistency was assessed using standard tools.

**Results:** We reviewed a total of 480 records. The mean age was 17.2 years (SD± 8.3 years), females were 434/480(90.4%); Single were 449/480(93.5%) 159/480 (33.1%) were children aged 5-14 years; 257/480(53.5%) were from Embakasi East Sub-County. Of the survivors, 277/480(57.7%) were referred for care by police. Only 55/480(11.5%) of survivors completed five scheduled visits, had a documented outcome and discharged from care, 94/480(19.6%) of the survivors completed Post exposure prophylaxis (PEP). There was a 17%(OR 0.17,95%CI=0.39-0.71) likelihood of single to be given PEP while survivors aged <18 years were 87%(OR 0.13,95%CI=0.07-0.23) less likely to be given PEP. In addition, 42% (OR 0.58,95%CI =0.25-1.31) of the females were less likely to complete the 5 visits, with a likelihood that 56% (OR 0.44,95%CI=0.25-0.77) <18years completed the 5 visits. There was a moderate association with a 3 times likelihood(OR2.5,95%CI=1.58-4.16) that survivors aged below 18 years were attacked in the evening than in the morning

**Conclusion:** Outcome of SGBV survivors is dependent on care given from time of incident through five follow up visits with documented favourable outcome as per GBV guidelines. We found a high dropout rate in follow up with only 11.5% completing the five visits and documented outcome. Children below 18 years were at a greater risk of GBV; as the singles were more vulnerable than their married counterparts. We recommend further studies to establish reasons for high attrition rates of GBV survivors from attending healthcare, not completing PEP and for the government to beef up security in the area especially in the evening.

# SCIENTIFIC SESSION 6:

Non-Communicable  
Diseases (NCDs)

**Abstract 038****Title: Integration of chronic oncology services in noncommunicable disease clinic in rural Rwanda.**

**Robert RUTAYISIRE** (University of Rwanda)\*; Francis MUTABAZI (Ministry of Health, Rwanda); Alice BAYINGANA (Partners in Health/Rwanda); Ann Miller (Harvard Medical School, Boston, USA ); Neil GUPTA (Harvard Medical School, Boston, USA ); Gedeon NGOGA (Partners In Health/Inshuti Mu Buzima); Eric NGABIREYIMANA (Ministry of Health); Marie Aimee MUHIMPUNDU (Non-Communicable Disease Division, Rwanda Biomedical Center); Ryan Borg (Partners In Health/Inshuti Mu Buzima); Emmanuel RUSINGIZA (University Teaching Hospital of Kigali); Charlotte BAVUMA (University Teaching Hospital of Kigali); Jean Bosco BIGIRIMANA (Partners In Health/Inshuti Mu Buzima); Fulgence NKIKABAHIZI (Ministry of Health); Gene BUKHMAN (Harvard Medical School and Brigham and Women's Hospital); Paul Park (Partners In Health/Inshuti Mu Buzima; Harvard Medical School and Brigham and Women's Hospital)

**Background:** In rural sub-Saharan Africa, access to care for severe non-communicable diseases (NCDs) is limited due to a myriad of delivery challenges. We describe the implementation, patient characteristics, and retention rate of an integrated NCD clinic inclusive of cancer services at a district hospital in rural Rwanda.

**Methods:** In 2006, the Rwandan Ministry of Health at Rwinkwavu District Hospital (RDH) and Partners In Health established an integrated NCD clinic focused on nurse-led care of severe NCDs, within a single delivery platform. Implementation modifications were made in 2011 to include cancer services. For this descriptive study, we abstracted medical record data for 15 months after the first clinic visit for all patients who enrolled in the NCD clinic between 1 July 2012 and 30 June 2014. We report descriptive statistics of patient characteristics and retention.

**Results:** 347 patients enrolled during the study period: oncology- 71.8%, hypertension- 11.2%, heart failure- 11.0%, diabetes - 5.5%, and chronic respiratory disease (CRD)- 1.4%. Twelve-month retention rates were: oncology- 81.6%, CRD- 60.0%, hypertension- 75.0%, diabetes- 73.7%, and heart failure- 47.4%.

**Conclusions:** The integrated NCD clinic filled a gap in accessible care for severe NCDs, including cancer, at rural district hospitals. This novel approach has illustrated good retention rates.

**Abstract 039**

**Title: The epidemiology of sickle cell disease in children recruited in infancy in Kilifi, Kenya: a prospective cohort study.**

**Brian Tawa**, Sophie Uyoga<sup>1</sup>, Alex W Macharia<sup>1</sup>, George Mochamah<sup>1</sup>, Carolyne M Ndila<sup>1</sup>, Gideon Nyutu<sup>1</sup>, Johnstone Makale<sup>1</sup>, Metrine Tendwa<sup>1</sup>, Emily Nyatichi<sup>1</sup>, John Ojal<sup>1</sup>, Mark Otiende<sup>1</sup>, Mohammed Shebe<sup>1</sup>, Kennedy O Awuondo<sup>1</sup>, Neema Mturi<sup>1</sup>, Norbert Peshu<sup>1</sup>, Benjamin Tsofa<sup>1</sup>, Kathryn Maitland<sup>1</sup>, J Anthony G Scott<sup>1</sup>, Thomas N Williams<sup>1</sup>

<sup>1</sup>KEMRI-Wellcome Trust Research Programme, Kilifi, Kenya.

**Background:** Sickle cell disease is the most common severe monogenic disorder in humans. In Africa, 50–90% of children born with sickle cell disease die before they reach their fifth birthday. In this study, we describe laboratory observations among children aged between birth and 5 years with and without sickle cell disease, who were resident within the Kilifi area of Kenya.

**Methods:** This prospective cohort study was done on members of the Kilifi Genetic Birth Cohort Study (KGBCS) on the Indian Ocean coast of Kenya. Recruitment to the study was facilitated through the Kilifi Health and Demographic Surveillance System (KHDSS), which covers a resident population of 260 000 people, and was undertaken between Jan 1, 2006, and April 30, 2011. All children who were born within the KHDSS area and who were aged 3–12 months during the recruitment period were eligible for inclusion. Participants were tested for sickle cell disease using HPLC machine and genotyped by convectional PCR and followed up for survival status and disease-specific admission to Kilifi County Hospital by passive surveillance until their fifth birthday. During this period the children were monitored by checking their hemoglobin and fetus haemoglobin levels which assisted in the clinical care offered at our dedicated outpatient clinic.

**Results:** High-performance liquid chromatography analysis was consistent with sickle cell disease in 128 (0.8%) of 15 702 cohort members. Confirmatory testing by PCR showed that 118 (92.2%) of 128 participants were rs334 homozygotes (HbSS) and ten (7.8%) of 128 participants were rs334 heterozygotes. Mortality

in those with sickle cell disease was significantly lower among those with a recruitment HbF above the age-standardised median versus below the age-standardised median (adjusted IRR 0.40, 0.17–0.94) and among those who enrolled at the sickle cell disease clinic versus those who did not (adjusted IRR 0.26, 0.11–0.62). Besides children with sickle disease were five times more likely to be admitted in hospital than non-sicklers.

**Interpretation:** Although morbidity and mortality were high in young children with sickle cell disease in this Kenyan cohort, both were reduced by early diagnosis and supportive care. The emphasis must now move towards early detection and prevention of long-term complications of sickle cell disease.

## Abstract 040

### **Title: Genotypes and Prevalence of High-Risk Human Papillomavirus among patients diagnosed with Head and Neck Cancer at Alexandria Cancer Centre**

**Eva M Ombiro** (Moi University)\*; Geoffrey Maiyoh (Moi University); Arthur Kwena (Moi University); Elias Melly (Moi Teaching and Referral Hospital); Tabitha Kamau (Alexandria Cancer Centre and Palliative Care Hospital)

**Background:** Head and Neck Cancer is ranked sixth globally, third in Africa, fourth in sub-Saharan, third in Kenya (Adeola et al., 2018). Data from Global Cancer Statistics (2018), shows that the proportion of HNC to all cancers is 4.9% globally, 4.0% in Africa while in Kenya it is 6%. Mortality rates globally are at 51%, 68.4% in Africa, while in Kenya it is 73.4%. **Methods:** This was a retrospective study with laboratory analysis involving histologically confirmed head and neck tissue samples between January 2017 and December 2018. Stored tissues were retrieved and subjected to repeat microscopy, p16 Immunohistochemistry and HPV PCR at the Pathologists Lancet Group of Laboratories. Data was analyzed using descriptive statistics by use of Microsoft Excel (Microsoft office 2016). **Results:** Head and Neck Cancer (HNC) accounted for 8.8% of all malignancies at ACPH. There were more males (64%), with a mean age of 50.9 years. Most patients came from Western Kenya Region. About one third (35.7%) were farmers and students. The most common sub-sites identified were: Nasopharynx (25), Larynx (12) and Tongue (10). 93.5% were Squamous Cell Carcinoma. 16 samples (55.2%) tested p16 positive, of these 2 (12.5%) tested positive with HPV PCR. One of these was from an 87-year-old female diagnosed with Tongue Cancer. Molecular analysis revealed the genotype to be HPV 52 and the other one was from a 49-year-old male with Cancer of the Post Nasal Space who had multiple co-infection with HPV: 35, 52 and 59 genotypes. **Conclusion:** Head and Neck Cancer (HNC) represented 8.8% of the malignancies at Alexandria Cancer and Palliative Care Hospital (ACCPCH). Despite the small sample size, 55.2% tested p16 positive and the study managed to detect 3 high-risk HPV genotypes: 35,52 and 59.

**Abstract 041****Title: Evaluation of Road Traffic Accident Fatal Injury Surveillance System - Machakos County, Kenya, 2015–2019**

**Were Ian**<sup>1, &</sup>, Githuku Jane<sup>1</sup>, Pola Rhoda<sup>1</sup>, Qabale Duba<sup>1</sup>, Mbula Esther<sup>2</sup>, Muthama Ruth<sup>2</sup>, Gura Zeinab<sup>1</sup>

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**Introduction:** Injury from road traffic accidents (RTAs) is a leading cause of preventable death globally. Kenya's cause-specific mortality rate from RTA injuries was 27.8/100000 people with 3146 deaths in 2018, Machakos County accounting for 192(6.1%) of them. We evaluated operations of a Hospital-based Fatal Injury Surveillance System and characterized the fatalities.

**Methods:** Using CDC guidelines, we evaluated the system's public health importance, usefulness and attributes, and Epi Info 7 to calculate frequencies and proportions for quantitative data on fatalities reported between 2015–2019. A Case was defined as any person killed immediately or within 30 days following RTA involving a vehicle within Machakos and cause of death identified through post-mortem.

**Results:** In total, 89 deaths were reported from 74 separate accidents, vulnerable road users accounting for 72(81%) deaths, 57(64.1%) occurring at night/morning hours while 48(60.8%) occurred on rural roads. Establishing a diagnosis using the case definition is uncomplicated. There was poor adaptation to the transition to devolution. Data sources were from police and hospital records. There was no standard data collection tool, with a large proportion of unknown or missing responses. The facility used verbal autopsy to confirm cause of death. Data was collected in real time, stored and provided when required. Annual reports to stakeholders were produced promptly.

**Conclusion:** The system is relevant and useful to stakeholders, has good stability, and is simple in form and design, though poorly flexible to administrative changes and operational hiccups. It has relative sensitivity and robust timeliness but with a predictive value positive that is difficult to ascertain. The poor data completeness and validity makes its' quality unsatisfactory.

Merger and expansion of data sources, follow-up clinical post-mortems, and use of electronic data-capturing standardized forms on all RTA related deaths is also recommended so as to improve the systems efficiency.

**Key Words:** Traffic, RTA's, System attributes, Preventable deaths

**Abstract 042****Title: Evaluation of Palliative Care Surveillance System in Kenya, 2016–2018.****Elizabeth Nzioka<sup>1</sup>, Tura Galgalo<sup>1</sup>, Gathecha Gladwell<sup>2</sup>, Gathitu Eunice<sup>3</sup>**<sup>1</sup>Field Epidemiology and Laboratory Training Program, Ministry of Health, Kenya<sup>2</sup>Division of Non-Communicable Diseases, Ministry of Health<sup>3</sup>National Cancer Program**Corresponding Author:** email: [\\_lizmulee@gmail.com](mailto:_lizmulee@gmail.com), \_P.O. Box 2385-90100

**Introduction:** Palliative care improves the quality of life and reduces the cost of care for patients with chronic illnesses. Globally, only 14% of people who needing palliative care currently receive it. In Kenya, 70–80% of patients with Cancer are diagnosed at an advanced stage and present late hence the need for palliation. We aim to characterise palliative care patients in Kenya and evaluate the surveillance system.

**Methods:** Review of records of patients in 2016–2018 Palliative Care units in Kenya. Data was abstracted from the National Health Information System, analysed using MS Excel and proportions and frequencies calculated. CDC Guidelines were used to evaluate the system attributes. The system used a standard form for data reporting. Completeness of forms was evaluated by calculating proportions of complete data elements. Reporting rate evaluated by dividing the number of facilities actually reporting in the system.

**Results:** We analysed 23,631 records of patients in palliative care, 2016–2018. There were 21 (44%) counties with MOH palliative care units. The age group with the highest number of cases was Adults 20087(85%), Children (under 12yrs) 3544 (15%). Female were 12388 (52%). Conditions of patients in palliative care; Cancer 10634 (45%), HIV/AIDS 8979 (38%), Cardiac 2600 (11%), Pulmonary and Renal 1418 (6%). The number of new cancer patients in 2016 was 1092(27%) and 2018(50%) was 2017 cases. Cervical Cancer was most common 887(22%). The reporting structure was from the facilities to the county then to the national level. The reporting rate was 90% and completeness of forms 70%.

**Conclusion:** Majority of patients were female adults. There was an increase in the number of new cancer cases, the most common type; Cervical Cancer. The surveillance system had a well-defined reporting structure, completeness and reporting rate were inadequate. There is need to scale up palliative care services to the rest of the counties in Kenya and early screening for cervical cancer.

**Key words:** Palliative Care, Surveillance, Cervical Cancer

**Abstract 043****CASE PRESENTATION WHERE MRI SHOWS SUPERIORITY AS A MODALITY FOR BREAST CANCER SCREENING**

**Mazaher H Jaffer (HRA)\***; John Kibe (M P Shah)

**Background:** The most commonly used modality and their respective sensitivities<sup>1</sup> for screening for breast cancer is regular clinical breast exams (73%), breast sonograms (73%) recommended annually in high risk groups, and mammograms (71.5%) which is recommended at once every 3 years for high risk groups - with the notion that this will be able to detect or even over-detect breast cancers at an early stage. It has been noted that MRI has a higher sensitivity of 89.4% and yet this is rarely done to screen of breast cancer even in high risk groups who can afford the test. The Kenyan national guidelines have recommended mammography for screening of the normal risk population and have not recommended MRI for routine screening of the average risk population.<sup>2</sup> This is an interesting case where 60 year old post-menopausal lady with no previous history of hormone replacement, having a parity of 3 and being a smoker - presented with a left sided breast lump and no signs or symptoms on the right side, with an end result of a benign cyst on the left but a very clearly ominous lesion on the right that was not seen on any of the above modalities.

**Method:** The patient was admitted for abdominal pain due to gastroenteritis, and a breast lump on the left breast for 3 months with a strong family history of breast cancer, so she requested to have screening for the same. In the process we found axillary and mediastinal lymph nodes, but the left breast showed a simple harmless cystic lesion. the right breast confirmed a lesion with irregular borders that looked suspicious and a biopsy confirmed ductal Ca of the right breast.

**Results:** The right breast that had no symptoms or signs, and no abnormality on mammogram, ultrasound or CT scan, actually had a grade 3a Ductal Cancer in its initial stage that was clearly seen on a simultaneous MRI.

**Conclusion:** MRI could be a better choice of screening for early breast cancer in high risk groups and in those who can afford the test

**Abstract 044****Title: Myocardial and haemodynamic responses to two fluid regimens in African children with severe malnutrition and hypovolaemic shock (AFRIM study)****Nchafatso G Obonyo** (KEMRI-Wellcome Trust Research Programme)\*

**Background:** Fluid therapy in severely malnourished children is hypothesized to be deleterious owing to compromised cardiac function. Objective: To evaluate World Health Organization (WHO) fluid resuscitation guidelines for hypovolaemic shock using myocardial and haemodynamic function and safety endpoints.

**Methodology:** A prospective observational study of two sequential fluid management strategies was conducted at two East African hospitals. Eligible participants were severely malnourished children, aged 6–60 months, with hypovolaemic shock secondary to gastroenteritis. Group 1 received up to two boluses of 15 ml/kg/h of Ringer's lactate (RL) prior to rehydration as per WHO guidelines. Group 2 received rehydration only (10 ml/kg/h of RL) up to a maximum of 5 h. Comprehensive clinical, haemodynamic and echocardiographic data were collected from admission to day 28.

**Results:** Twenty children were enrolled (11 in group 1 and 9 in group 2), including 15 children (75%) with kwashiorkor, 8 (40%) with elevated brain natriuretic peptide >300 pg/ml, and 9 (45%) with markedly elevated median systemic vascular resistance index (SVRI) >1600 dscm-5/m<sup>2</sup> indicative of severe hypovolaemia. Echocardiographic evidence of fluid-responsiveness (FR) was heterogeneous in group 1, with both increased and decreased stroke volume and myocardial fractional shortening. In group 2, these variables were more homogenous and typical of FR. Median SVRI marginally decreased post fluid administration (both groups) but remained high at 24 h. Mortality at 48 h and to day 28, respectively, was 36% (4 deaths) and 81.8% (9 deaths) in group 1 and 44% (4 deaths) and 55.6% (5 deaths) in group 2. We observed no pulmonary oedema or congestive cardiac failure on or during admission; most deaths were unrelated to fluid interventions or echocardiographic findings of response to fluids.

**Conclusion:** Baseline and cardiac response to fluid resuscitation do not indicate an effect of compromised cardiac function on response to fluid loading or that fluid overload is common in severely malnourished children with hypovolaemic shock. Endocrine response to shock and persistently high SVRI post fluid-therapy resuscitation may indicate a need for further research investigating enhanced fluid volumes to adequately correct volume deficit. The adverse outcomes are concerning, but appear to be unrelated to immediate fluid management.

## Abstract 045

**Title: Factors associated with high prevalence of diabetes among adults in Nyeri County, Kenya, 2019.**

**Gatwiri Murithi**<sup>1, 3</sup>, Munene Johnkennedy<sup>2</sup>, Muriu Nelson<sup>2</sup>, Dr. George Otieno<sup>3</sup>, Alison Yoos<sup>1,4</sup>

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**Background:** Diabetes is a major cause of death and disability worldwide. The global prevalence of diabetes among adults over 18 years has risen from 4.7% in 1980 to 8.5% in 2014. Kenya's prevalence is at 3.3% and may reach 4.5% by 2025, according to WHO.2017 STEP survey gives current estimate at 4.56% amounting to 750,000 persons and 20,000 annual deaths. Nyeri County has an estimated prevalence of 7.2% which is significantly higher than the national prevalence.

Thus, we describe factors associated with increasing prevalence of diabetes among adults of Nyeri County.

**Methods:** A cross-sectional study conducted in Mukurweini Sub County, Nyeri. Systematic random sampling without replacement was used to recruit participants. Sampling frame was all community members  $\geq 18$  years of Rugi ward. Sample size was 190 households calculated by Fishers et al 1998 formula from an estimated population of 20699 persons (Kenya National Bureau of Statistics 2009), a confidence level of 95 and a 5% error margin. Every 7<sup>th</sup> household was picked and respondents were household heads or any adult aged 18 years and above present in the household at the time of survey.

Respondents for Key informant interviews (KII) were selected purposively based on their experience. Focused group discussions (FGD) were conducted with stratified groups of males, females, youth, persons living with diabetes, community

health volunteers (CHVs) and health care professionals. Data was collected using structured questionnaires, FGDs, guided KII and observation checklists. Knowledge levels, health seeking behavior, health care access, physical activity and nutrition were assessed. Data was analyzed using SSPS and collaborated it into a policy, environment and systems rating scale using the CDC CHANGE tool.

**Findings:** The community has low education levels with 65% at primary and below hence low levels of knowledge on diabetes, poor uptake of physical activity 51% never engaged in any and inappropriate dietary choices and meal timing. In the systems low screening levels for diabetes with only 36% having ever been screened. There were no clear policies on community engagement in physical activity.

**Conclusion:** There has been increase of diabetes from 3.3% to 7.2% in 2019 attributed to poor dietary choices and meal timing, low levels of knowledge, low screening and physical inactivity. Intervention measures need to be intensified along these aspects.

**Key words:** Diabetes, Prevalence, Community engagement, Nyeri.

**Abstract 046****Title: Histopathological Patterns of Breast Cancer Diagnosed at Alexandria Cancer Center and Palliative Care Hospital**

**Tabitha N Kamau** (Alexandria Cancer Center and Palliative Care Hospital)\*; Elias Melly (Moi Teaching and Referral Hospital); Eva M Ombiro (Moi University)

**Background:** Breast cancer accounts for 16% of all cancers and one quarter of all females worldwide with 2.2 million cases. In Kenya, it is the most common cancer with 5 985 of all new cases (12.5%) in both sexes. Figures from Alexandria cancer center and Palliative Care Hospital indicate that in the year 2016 and 2017 breast cancer accounted for 13.5% and 12.7% among all malignancies respectively. Invasive ductal carcinoma is the commonest histopathological subtype accounting for about 70-80% of all breast cancers. Of all breast cancers studied in Kenya in 2018, 68.8% were Estrogen Receptor positive, 59.4% were Progesterone Receptor positive and 25.6% were HER2 positive.

**Methodology:** This was a retrospective study design that involved review of all patient records with breast cancer,  $\geq 18$  years of age and histologically confirmed, treated between January 2016 and December 2017 at Alexandria cancer center and palliative care hospital (n=54). Demographic and clinical characteristics were analyzed using descriptive statistics. Survival analysis was estimated using Kaplan Meier curves by use of R-3.6.1 for windows software.

**Results:** There were more females (96.3%) than males (3.7%). Number of cases increased with age, with a peak at 40-49 years (33.3%). Majority diagnosed were invasive ductal carcinoma, 88.7%. Metastases (42.6%) and disease progression (42.6%) demonstrated statistically significant association with death and the overall 2-year survival for breast cancer was 64.8%. Regarding molecular status, double positive (ER<sup>+</sup> and PR<sup>+</sup>) and triple negative combined accounted for 75.8% (22/29).

**Conclusion:** This study identified the most affected age group (40-49), identified invasive ductal carcinoma 88.7% as the most common type, 53.7% had molecular results and 2-year overall survival was 64.8%. Immunohistochemistry as a routine test and community sensitization for early breast cancer screening and treatment is highly recommended.

**Abstract 047****Title: Antiproliferative effects of *Fagaropsis angolensis* (Engl.) Dale (Rutaceae) leaf and root extracts on breast cancer cells in culture**

**Onyancha Jared Misonge**<sup>1\*</sup>, Gikonyo Nicholas Kamindu<sup>2</sup>, Wachira Sabina Wangui<sup>3</sup> and Gicheru Michael Muita<sup>4</sup>

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**Background:** Breast cancer is the leading cause of deaths among women suffering from cancer in Kenya, its prevalence rate is 23.3% making the disease a major public health problem in the country especially with drawbacks such as inadequate health facilities and professionals to manage the disease. Most cancer patients lately diagnosed are known to use plant preparations. However, the efficacy of plants used are observed with scepticism and require scientific evidence of use. Following the claims of using *Fagaropsis angolensis* leaf and root decoctions in treating cancer, the current study aims at determining the antiproliferative effects of methanol and water extracts against breast cancer cell lines.

**Methods:** The methods of study were approved by Scientific Ethical Review Unit (SERU) at KEMRI with certificate number of KEMRI-SERU-CTMDR-00-3024. Methyl thiazole tetrazolium (MTT) assay was used to evaluate the effects of extracts against breast cancer cell lines (HCC 1395 and 4T1). Antiproliferative effects of extracts were measured using enzyme-linked immunosorbent assay (ELISA) scanning multiwell spectrophotometer. The results were analysed by calculation of IC<sub>50</sub> using prism GraphPad version 7.

**Results:** Root extracts had remarkable antiproliferative activities, methanol extracts of the root showed activities at low concentrations, they revealed inhibition of 50% growth against HCC 1395 and 4T1 cell lines at IC<sub>50</sub> of 17.0 ± 2.1 and 1.75 ± 0.3 µg/ml, respectively. The water extracts of roots were effective against the two cell lines with IC<sub>50</sub> = 17.0 ± 2.1 and 14.3 ± 2.3 µg/ml against HCC 1395 and 4T1, respectively. Leaf extracts were also found to be active against human breast cancer cell line (HCC 1395) with IC<sub>50</sub> 30 µg/ml. Antiproliferative activities of doxorubicin against 4T1 and HCC 1395 were recorded with IC<sub>50</sub> = 3.6 ± 1.4 and 3.1 ± 0.8, respectively. Methanol and water extracts of *Prunus africana* also revealed activities against 4T1 and HCC 1395 with IC<sub>50</sub> < 20 µg/ml indicating that the extracts exhibited remarkable antiproliferative activities. It was concluded that *F. angolensis* leaf and root extracts have antiproliferative effects against HCC 1395 and 4T1 cell lines.

**Conclusion:** This data can be used to form a basis of validating the use of *F. angolensis* extracts in traditional medicine.

**Key Words:** 4T1, Ethnomedicine, HCC 1395, IC<sub>50</sub> values, MTT Assay, vero E6

# SCIENTIFIC SESSION 7:

## TB/HIV (2)

**Abstract 048****Preliminary Findings of Scaling up Evidence-based Multiple Focus Integrated Intensified Tuberculosis Screening to End TB in Siaya County, Kenya**

**D. Okelloh<sup>1</sup>**, J.L Awino<sup>1</sup>, L. Amoyo<sup>1</sup>, F. Odianga<sup>1</sup>, F. Nyapara<sup>1</sup>, F. Got<sup>1</sup>, M. Wambura<sup>2</sup>, S. Wandiga<sup>1</sup> <sup>1</sup>Kenya Medical Research Institute – Centre for Global Health Research <sup>2</sup>County Government of Siaya

**Background:** Tuberculosis (TB) remains a major cause of morbidity and mortality in sub-Saharan Africa. This high burden is due to low case detection and delayed diagnosis. Country surveys show unacceptably high TB among those with a low duration cough and more than 50% of bacteriologically confirmed pulmonary TB do not report TB symptoms. Furthermore, the increase in incidence of smear negative pulmonary TB patients serves as source of infection. Objective: The goal of this study is to implement and evaluate EXIT-TB package that involves intensified active TB case-finding at the out-patient department for cough of any duration).

**Methods:** Integrating TB case-finding into reproductive and child health clinics (RCH) and diabetic clinics; screening for TB irrespective of symptoms among HIV-infected individuals attending Comprehensive Care Clinics (CCCs), and targeted contact tracing for all TB patients.

**Results:** Out of the targeted 4079, study consented 1187 for screening. Out of which 732(62%) were females. Out of the enrolled 1065, 402(38%) were males and 663(62%) were females. Majority of participants were enrolled from the out-patient department. A total 124 TB cases were diagnosed with 56 definite- and 68 probable-TB.

**Conclusion:** Implementation of the EXIT TB package is feasible within the routine health system settings.

**Abstract 049****Title: Characterization of Drug Sensitive Tuberculosis cases in the Coastal region of Kenya, 2015-2017****Emily Chinyavu Kurera (FELTP Kenya)\***

**Background:** Tuberculosis is the fourth leading cause of death in Kenya. Its prevalence is 533/100,000. There is limited data on characterization of tuberculosis cases in the coastal region of Kenya. This study will help to improve tuberculosis surveillance, active case finding to capture the 40% cases that go undetected and untreated. We aimed to characterize tuberculosis cases in the coastal region of Kenya from 2015 –2017.

**Methods:** We conducted a retrospective review of TB patients' records from the six counties in the coastal region. Data was downloaded from national Tuberculosis patients' management system-TIBU surveillance system. Variables assessed were: age, sex, type of patient, HIV status, county of residence and treatment outcomes. A case was defined as record with a biological specimen positive by Genexpert MTB/RIF, smear microscopy, culture or diagnosed clinically. Means and medians were calculated for continuous variables, Counts, frequencies and proportions for categorical variables.

**Results:** We reviewed 24,208 records, males were 15505(64%), mean age 34 years SD (16.4 years). The age group 25-34 years 6,853(28.3%) was affected. Pulmonary tuberculosis cases were 20,665 (85.4%), 17,229(71.2%) were HIV negative. Newly diagnosed cases were 21830(90.2%). Tuberculosis cases seen in Public health facilities were 18318(75.7%). Treatment outcomes, successful outcomes were cured 9927(41%) and 9698(32%) completed treatment. Unsuccessful outcomes were 1420 (5.9%) Died, 1169(4.8%) Lost to follow up, 87(0.4%) treatment failure, 1095(4.5%) not completed treatment. Tuberculosis cases in Mombasa county were 11794(48.7%), Kilifi 5,160(23%), Kwale 2,839(13%), Taita-taveta 1,497(7%), Tana-river 1,210(5%) and Lamu 769(3%).

**Conclusion:** Majority of TB cases occurred among males and those of age group 25-34 years. Mombasa County had the highest number of TB cases. We recommend the counties health departments to scale up TB surveillance with

special focus on males and individuals of age group 25-34 and to sensitize residents on Tuberculosis treatment.

**KEY WORDS:** Kenya, Tuberculosis, Pulmonary Tuberculosis, Treatment outcomes.

**Abstract 050**

**Title: Comparative testing for MDRTB cases among presumptive multidrug resistant tuberculosis patients, in western- Kenya.**

**Albert Okumu** ( KEMRI-CGHR)\*; Steve Wandiga (KEMRI-CGHR); Joshua Auko (KEMRI-CGHR); Ronald Odero (KEMRI-CGHR); Timothy Malika (JOOTRH,Kisumu); Christine Ogollah (KEMRI-CGHR)

**Introduction:** The emergence of multidrug resistance (MDR) has long been a major hindrance in relation to tuberculosis (TB) control. Diagnosis and successful treatment of people with TB averts millions of deaths annually but there are still persistent gaps in detection and treatment (WHO, 2018).

**Methodology:** This cross-sectional survey, conducted between January to November 2019, where patients from the various MOH facilities across counties referring specimens to KEMRI-Kisian TB laboratory for MDRTB surveillance collected and submitted sputum each for testing at referral laboratory. Sputum cultures, smear microscopy and line probe assays (LPA) were performed to all patients to evaluate DR-TB.

**Results:** A total of 694 patients, 435(62.8%) males and 259(37.3%) females had their samples tested. Of these, 283(40.7%) were HIV infected, 154 (54.4%) males, and 129(45.6%) females respectively. Mycobacterium tuberculosis complex (MTBc) yielded 209(30.1%) by culture, 186(26.8%) by smears and 314(45.2%) vide LPA. Of those MTBc positive by culture, 23(11%) confirmed DR-TB cases, and 28(8.9%) by LPA. Culture technique had a sensitivity (95% CI), 0.25(0.20-0.30) and specificity [(95% CI), 0.66(0.61-0.71) ], LPA, sensitivity [(95% CI), 0.38(0.33-0.44)] and specificity [(95% CI), 0.50(0.45-0.56)], while smears sensitivity [(95% CI) 0.21(0.17-0.27) and specificity [(95% CI), ( 0.70(0.65-0.75)], respectively.

**Conclusion:** Molecular techniques increase rapidity of diagnosis as well as identify more cases from viable and non-viable organisms. Culture remains the gold standard of TB diagnosis among patients.

**Abstract 051****Title: Recovery of Mycobacterium Tuberculosis From Negative Mgit Cultures With Growth Units Above 1 After Protocol Incubation Period Of 42 Days**

**Joseph** Orure (KEMRI-CGHR)\*; Patrice Madata (KEMRI-CGHR); Ronald Odero ( KEMRI-CGHR); Lauren Nyongesa (KEMRI-CGHR); Ruth Sitati (KEMRI-CGHR); Jeremiah Khayumbi ( KEMRI-CGHR); Ben Odhiambo (KEMRI-CGHR); Joshua JBO Ongalo (KEMRI-CGHR); Christine Ogollah (KEMRI-CGHR); Joan Tonui (KEMRI-CGHR); Albert Okumu ( KEMRI-CGHR); Steve Wandiga (KEMRI-CGHR); McCathy Kimberly (CDC)

**Background:** Tuberculosis (TB), is a disease caused by the pathogen Mycobacterium tuberculosis (M.tb) and is currently responsible for more deaths than any other pathogen. It is one of the top 10 causes of death worldwide. The BACTEC MGIT 960 system was therefore introduced as a culture diagnostic method for rapid detection of mycobacterium in clinical specimens other than blood, which remains a golden standard for the recovery of MTBC. However, there seem to be challenges of turnaround time for the Negatives with growth units (GU)  $\geq 1$ . Objectives: The major objective for the study was, therefore, to determine if there could be yield of any value if given more time after the incubation period of 42 days of protocol period, to three more weeks.

**Methodology:** Samples were received from the study mapped areas in western Kenya and brought to the KEMRI/CDC testing facility and evaluated based on rejection and accepting criteria, the qualified samples were decontaminated using the set standard operating procedures (SOP) as required and inoculated into mycobacterium growth indicator tube (MGIT), incubated into BACTEC MGIT 960 machine for the period of 42 days at 37°C.

**Results:** Between June 2017 to June 2018, a total number of 3656 samples were cultured into MGIT incubator machine. After incubation protocol period, 2956 samples came out as negatives of which, 100 of them had different level of growth units that were further re-incubated at 37°C for three more weeks. The same procedures were followed, and the following outcomes were observed: 6

were true MTBC, 4 were MOTT while 90 were negatives.

**Conclusion and recommendations:** Isolation of MTBC is not determined by the amount of GU present on the sample, but by the nature of bacteria present. Therefore, since the MTBC can be recovered even from the GU of 1, negatives of should be given more time to determine any yield beyond 42 days of incubation.

**Abstract 052****Title: Predictors of unfavorable treatment outcomes among drug sensitive TB patients at the County Referral Hospital, Taita Taveta, Kenya, 2014–2017**

**Williamson Mwadime Mwanyika** (Department of Health services Taita Taveta)\*; Maria Nunga (Kenya Field and Epidemiology Laboratory Training Program)

**Background:** Tuberculosis (TB) is the leading cause of death from a single infectious agent. The risk of continuous TB transmission and emergence of drug resistance TB is increased when patients are not successfully treated. There is limited data on unfavorable treatment outcomes among drug sensitive TB patients in Taita Taveta County. We sought to establish predictors of unfavorable treatment outcomes among drug sensitive TB patients treated at the County Referral Hospital.

**Methods:** We conducted a cross-sectional retrospective study using data abstracted from Treatment Information Based Unit (TIBU), an electronic TB register, for drug sensitive TB patients on treatment at the county referral hospital from January 2014 through December 2017. We collected Socio-demographic and clinical information. The outcome variable was “Unfavorable treatment outcome”. We considered failure (F), Lost to follow up (LTFU) and death to be the unfavorable outcomes. We used MS Excel® and OpenEpi to calculate descriptive and analytic statistics respectively. We used Chi square to test for statistical significance and factors with a P-value of  $\leq 0.05$  at bivariate analysis were considered to be statistically significant.

**Results:** A total of 393 records were reviewed, males were 68% (267), mean age was 35years (SD  $\pm 16$ ), age category of 25–34 years were 35.4% (139) of the cases, HIV co-infection was 26% (102) with ART uptake of 89% (91). Treatment success rate (TSR) for all cases was 83.2% (327). Patients with unfavorable outcomes were 16.8% (66), with those who died contributing 9.7% (38), lost to follow up 5.8% (23) and Failure 1.3% (5). Being previously treated (OR 2.4, 95% CI 1.19–4.96), clinically diagnosed (OR 2.1, 95% CI 1.24–3.63), HIV positive (OR 2.5, 95% CI 1.45–4.38) and Underweight (OR 1.8, 95% CI 1.05–3.06) were factors associated with an unfavorable treatment outcome.

**Conclusion:** Almost a fifth of the TB patients had unfavorable treatment outcomes, with being clinically diagnosed, undernourished, HIV positive and previously treated as associated factors. We recommend proper clinical evaluation and targeted monitoring to TB patients with these characteristics.

**Key Words:** Tuberculosis, Treatment Outcome, Kenya

**Abstract 053**

**Title: The distribution and trends of drug resistant Mycobacterium tuberculosis among patients' sputum samples referred to KEMRI-TB laboratory for drug resistance surveillance in western Kenya.**

**Joshua Ongalo** (KEMRI-CGHR)\*; Wilfred Murithi (KEMRI-CGHR); Patrice Madata (KEMRI-CGHR); Ronald Odero (KEMRI-CGHR); Joseph Orure (KEMRI-CGHR); Cecelia Dete (KEMRI-CGHR); Laureen Nyongesa (KEMRI-CGHR); Joan Tonui (KEMRI-CGHR); Joshua JBO Ongalo (KEMRI-CGHR); Ben Odhiambo (KEMRI-CGHR); Jeremiah Khayumbi (KEMRI-CGHR); Ruth Sitati (KEMRI-CGHR); Christine Ogollah (KEMRI-CGHR); Albert Okumu (KEMRI-CGHR); Steve Wandiga (KEMRI-CGHR); McCathy Kimberly (CDC)

**Introduction:** Emergence of multi-drug resistance tuberculosis (MDR-TB) strains poses a major challenge to TB control. First-line TB treatment regimens consist of Isoniazid (H), Rifampicin (R) Ethambutol (E) and pyrazinamide (Z). Kenya's Ministry of Health guidelines requires first-line drug susceptibility testing (DST) for patients with smear-positive at months 2nd, 5th and/or 6th of treatment, defaulters or relapse. KEMRI-CGHR TB laboratory is one of two laboratories that support TB culture and DST in Kenya. We sought to explore the distribution and trends of resistance.

**Methodology:** This cross-sectional retrospective study considered 4129 sputum samples collected between 2014-2018 for culture and DST. Tuberculosis culture and phenotypic DST were performed by inoculating 0.5ml of confirmed Mycobacterium tuberculosis complex suspension into five pre-labelled Middlebrook 7H9 tubes containing first-line anti-TB drugs; Streptomycin (1µg/ml), H (0.1µg/ml), R (1µg/ml), E (5µg/ml), and Z (100 µg/ml) respectively and incubated at 37 c in the BACTEC™ Mycobacterium Growth Indicator Tube 960™ machine for 4-21 days. Growth unit cut-off of 100 was used to score drug susceptibility as resistant or susceptible.

**Results:** Of 1349 samples in 2014; HR=16.27%, RR=12.60%, ER=2.37% and ZR=6.08%. In 2015, of 1196 samples; HR=17.57%, RR=13.63%, ER=2.30%, and ZR=6.13%. In 2016 of 765 samples; HR=20.00%, RR=14.51%, ER=2.88%, and ZR=5.46%.

In 2017, of 549 samples; HR=20.26, RR=13.84%, ER=3.10%, and ZR=6.12%, and in 2018, of 270 samples; HR=22.22, RR=6.21%, ER=3.05%, and ZR =4.10%.

**Conclusion:** Resistance to Isoniazid (H) and Rifampicin(R) was greater than in Ethambutol(R) and Pyrazinamide (Z) . Regular monitoring of distribution and trends of drug-resistant TB is valuable in monitoring shifts in resistance patterns.

# SCIENTIFIC SESSION 8:

## MALARIA

**Abstract 054**

**Title: Gametocyte clearance in children, from western Kenya, with uncomplicated Plasmodium falciparum malaria after artemether-lumefantrine or dihydroartemisinin-piperazine treatment**

**Protus Omondi** (Kenya Medical Research Institute)\*; Marion Burugu (Kenyatta University); Damaris Matoke (KEMRI); Edwin Too (Kenya Medical Research Institute); Eva Aluvaala (KEMRI); William Chege (KEMRI); Maureen Otinga (KEMRI); Francis Muregi (MKU); Brian Musyoka (JKUAT); Francis Kimani (KEMRI); Kevin Thiongo (KEMRI)

**Background:** The efficacy and safety of Artemether-Lumefantrine (AL) and Dihydroartemisinin-Piperazine (DP) against asexual parasites population has been documented. However, the effect of these anti-malarials on sexual parasites is still less clear. Gametocyte clearance following treatment is essential for malaria control and elimination efforts; therefore, the study sought to determine trends in gametocyte clearance after AL or DP treatment in children from a malaria-endemic site in Kenya.

**Methods:** Children aged between 0.5 to 12 years from Busia, western Kenya with uncomplicated Plasmodium falciparum malaria were assigned randomly to AL or DP treatment. A total of 334 children were enrolled, and dried blood spot samples were collected for up to 6 weeks after treatment during the peak malaria transmission season in 2016 and preserved. Plasmodium falciparum gametocytes were detected by qRT-PCR and gametocyte prevalence, density and mean duration of gametocyte carriage were determined.

**Results:** At baseline, all the 334 children had positive asexual parasites by microscopy, 12% (40/334) had detectable gametocyte by microscopy, and 83.7% (253/302) children had gametocytes by RT-qPCR. Gametocyte prevalence by RT-qPCR decreased from 85.1% (126/148) at day 0 to 7.04% (5/71) at day 42 in AL group and from 82.4 % (127/154) at day 0 to 14.5% (11/74) at day 42 in DP group. The average duration of gametocyte carriage as estimated by qRT-PCR was slightly shorter in the AL group (4.5 days) than in the DP group (5.1 days) but not significantly different ( $p=0.301$ ).

**Conclusion:** The study identifies no significant difference between AL and DP in gametocyte clearance. Gametocytes persisted up to 42 days post treatment in minority of individuals in both treatment arms. A gametocytocidal drug, in combination with artemisinin-based combination therapy, will be useful in blocking malaria transmission more efficiently.

**Abstract 055****Title: Monthly malaria chemoprevention for the post-discharge management of severe anaemia in children in sub-Saharan Africa**

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**Background:** Children hospitalized with severe anaemia in malaria-endemic areas of Africa are at high risk of readmission or death within six months post-discharge. No strategy specifically addresses this period. We conducted a multi-centre, two-arm, randomised placebo-controlled trial in nine hospitals in Kenya and Uganda to determine if three months of malaria chemoprevention could reduce morbidity and mortality post-discharge.

**Methods:** Children aged <5 years with admission haemoglobin of <5g/dL were eligible. They received standard in-hospital care for severe anaemia and a 3-day course with artemether-lumefantrine at discharge. At two weeks post-discharge, they were randomised to receive 3-day dihydroartemisinin-piperaquine treatment courses or placebo at two, six, and ten weeks post-discharge and followed until week 26 inclusive using passive case-detection. The primary outcome was death or all-cause hospital readmissions by six months post-discharge. Conditional risk set modeling for repeated events (Prentice-Williams-Peterson total-time) was used to obtain hazard ratios (HR).

**Results:** Between May 2016 and November 2018, 1049 participants were randomised (dihydroartemisinin-piperaquine=524, control=525). In the intention-to-treat analysis there were 184 primary outcome events in the intervention arm and 316 in the placebo arm between 2-26 weeks post-discharge (HR=0.65, 95% CI 0.54-0.78,  $p<0.001$ ). The HR was 0.30 (0.22-0.42,  $p<0.001$ ) during the PMC-intervention period (3-14 weeks) and 1.13 (0.87-1.47,  $p=0.35$ ) during the post-intervention period (15-26 weeks) (pinteraction $<0.001$ ).

**Conclusion:** In areas with intense malaria transmission, three months of malaria chemoprevention with monthly 3-day treatment courses of dihydroartemisinin-piperaquine in children recently transfused for severe anaemia results in major reductions in all-cause readmissions and death post-discharge.

**Abstract 056**

**Title: The Efficacy of Artemisinin Combination Therapy in Kenya; the status at four malaria endemic regions' sentinel sites.**

**Francis Kimani (KEMRI)**

**Background:** Artemisinin-based combination therapies (ACTs) and its derivatives are the most rapidly acting of all the current antimalarial drugs and are what is in use for treating uncomplicated malaria in Kenya, a malaria endemic country. Monitoring their efficacy at regular intervals is essential to prevent unnecessary morbidity and mortality due to treatment failures. In this study, the efficacy of AL and DP was evaluated for the treatment of uncomplicated malaria in children in four malaria transmission zones of Kenya. Study Objective; To evaluate the efficacy and safety of fixed dose combinations, Artemether-lumefantrine and dihydroartemisinin-piperazine in uncomplicated malaria patients in Kenya with an aim to inform malaria treatment policy and practice in Kenya.

**Methods:** The study was a multi-site two arm single blinded randomized clinical trial. In this study the efficacy of two artemisinin-based anti-malarial combination drugs, AL and DP, was evaluated in four Counties namely; Kwale, Kisumu, Kisii and Busia. The in-vivo (clinical and microscopy) and molecular (corrected) treatment outcome was evaluated. Parasitological response at day 28 and 42, day 3 positivity rates, cure ratios in the two treatment arms, Fever Clearance Time (FCT), Asexual Parasite Clearance Time (PCT), Gametocyte carrier rates and adverse events were evaluated.

**Results:** A total of 352 children in Kwale, 315 in Kisumu, 334 in Busia and 314 in Kisii aged between 6 months and 12 years were randomized and treated with either AL or DP. Four (<1%) of the study participants were parasite positive by microscopy on day 3 in all the study sites. For Kwale and Kisumu cumulatively, in the Intention to treat (ITT) analysis, at day 42, 483 participants had ACPR, ACPR rate of 72 % (95% CI 69-76%), 268 participants in arm A (ACPR rate of 77% (95% CI 72-81%)) and 215 in arm B (ACPR rate of 68% (95% CI 62-73%)); P-value 0.008. By day 28, participants with ACPR were 542, ACPR rate of 81% (95% CI 78-84%),

293 in arm A (ACPR rate of 84% (95% CI 80-88%)) and 249 in arm B (ACPR rate of 78% (73-82%)); P-value=0.06. Upon molecular correction, the ACPR in the study sites was in the range of 97.4-100% in both drugs at Day 28 and 97.0-100% for both drugs at day 42. Kisii had the lowest ACPR on Day 28 at 97.4% (95%CI; 96.6-98.4) while Busia had the lowest ACPR on Day 42 at 97.0% (95%CI; 95.8-98.2).

**Conclusion:** AL and DP remain efficacious for the treatment of uncomplicated malaria among children in malaria endemic zones of Kenya. However, the results from these study sites indicate a note worth trend of the ACT efficacy in the regions and calls for further monitoring on the same for appropriate policy measures.

**Abstract 057**

**Title: An effective method for enrichment of Plasmodium falciparum DNA from cryopreserved infected red blood cells.**

**Brian K Bartilol** Domtila Kimani<sup>1</sup>, Irene Omedo<sup>1</sup>  
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**Introduction:** Over the past decade, the cost of generating genomic data has decreased rapidly coupled with the increase in knowledge required for the analysis and interpretation of the data. Genomic data is essential in monitoring migratory patterns of Plasmodium populations, monitoring drug resistance and identification of candidate targets from drug and vaccine development. The natural populations of Plasmodium falciparum are ideal for these studies but can only be obtained from clinical samples. However, a major setback is the abundance of human DNA which substantially reduces the Plasmodium DNA coverage through shot-gun sequencing technology since the human genome is approximately 100-fold larger than the Plasmodium genome. We therefore sought to develop a method to reduce human DNA contamination from cryopreserved infected red blood cells.

**Materials and methods:** This was a retrospective study where we analysed blood samples from malaria positive patients that had been stored overtime at -176 C liquid nitrogen tanks at KEMRI, Kilifi to maintain viability of the infected red blood cells. The vials containing the cells were retrieved from the liquid nitrogen tanks and thawed gradually using an increasing concentration of water dissolved in sodium chloride to avoid haemolysis. Thereafter, the cells were treated with DNASE I enzyme(Invitrogen) to denature any extracellular DNA followed by inactivation of the enzyme with 0.25M EDTA. DNA was extracted using the QIAamp DNA blood Mini kit (Qiagen, Germany). The isolated DNA was then quantified using Qubit(Invitrogen) and the Parasite and Human DNA proportions determined using target (human and parasite) specific SYBR Green real time PCR.

**Results:** The difference in the parasite DNA with the human DNA was highly significant ( $p < 0.01$ ), where the mean was 15.56ng/ $\mu$ l and 6.16 ng/ $\mu$ l respectively. Year-wise analysis showed that the age of the samples did not affect the yield of

the DNA as well as the parasite-human DNA proportions. There was also limited haemolysis of the red blood whereby 70% of our samples were not lysed at all. A positive correlation was observed between parasitaemia and the yield of DNA ( $R=0.27$ ,  $P<0.01$ ). Comparisons between the total DNA and the target specific PCR data showed that the parasite DNA and total DNA yield were significantly correlated ( $R = 0.99$ ,  $P<0.01$ ) unlike human DNA ( $R = 0.25$ ,  $P<0.01$ ). This therefore shows that the method is highly effective in the enrichment of *Plasmodium falciparum* DNA.

**Conclusion:** We therefore show that human DNA contamination in samples meant for shot-gun sequencing of *Plasmodium falciparum* can be significantly reduced with minimal loss of the infected red blood cells due to haemolysis during the thawing process of cryopreserved infected red blood cells.

**Abstract 058****Title: Diagnostic performance of ultra-sensitive rapid diagnostic tests (uRDTs) for malaria in pregnant women attending antenatal care clinics in western Kenya**

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**Background:** In settings with moderate to high malaria transmission, infection with *Plasmodium falciparum* can cause adverse outcomes in pregnant women and their fetuses, such as maternal anemia and low birthweight neonates. In these settings, infections during pregnancy may have a low density of parasites or associated antigens in peripheral blood; particularly amongst multi-gravid women. Such infections are more likely to be below the detection limit of blood smear microscopy (BS) and standard rapid diagnostic tests (RDTs). Diagnostic tests with increased sensitivity, and subsequent treatment, may prevent adverse pregnancy outcomes.

**Methods:** In the high transmission setting of western Kenya, we compared the diagnostic characteristics of expert BS, First Response Malaria Ag. (pLDH/HRP2) Combo RDTs (RDT), and the ultra-sensitive Alere™ Malaria Ag P.f. RDT (uRDT), using polymerase-chain reaction (PCR) as the gold standard for detection of *P. falciparum* infections in women attending their first antenatal clinic (ANC) visit in 9 ANC clinics.

**Results:** From May-September, 2018, 488 individual women attended these clinics for their first ANC visits and 483 had all 4 tests performed. The median parasite density per  $\mu\text{L}$  determined by qPCR was 148 (Interquartile range: 11-1260); 122 (25.2%) were positive by PCR; 105 (21.7%) were positive by uRDT; 96 (19.9%) were positive by RDT; and 66 (13.7%) were positive by BS. Compared to

PCR, the sensitivity and specificity for BS were 52.5% (95% Confidence Interval [CI]: 43.2-61.6) and 99.5% (CI: 98.0-100); RDT 63.1% (CI: 53.9-71.7) and 94.7% (CI: 91.9-96.8), and uRDT 69.7% (CI: 60.7-77.7) and 94.5% (CI: 91.6-96.6). When stratified by gravidity, the sensitivity of RDTs and uRDTs in pauci-gravidae (primi- and secundi-gravidae) were 69.9% (CI: 58.0-80.1) and 79.5% (CI: 68.4-88.0), respectively. In multi-gravid women, the sensitivity of RDTs and uRDTs were 53.1 (CI: 38.3-67.5) and 55.1% (CI: 40.2-69.3), respectively.

**Conclusions:** In this setting, the performance of uRDTs in pregnant women at first ANC visit was marginally better than that of a standard RDT. Evaluation of other more sensitive point-of-care tests in the ANC setting should be considered.

**Abstract 059****Title: Assessment of Community Case Management of Malaria in Muhoroni Sub County from January to September 2019**

**John Seda** (County Department of Health - Kisumu)\*; **Bella Amihanda** (Kisumu County Department of Health); **Maurice O Owiny** (Kenya FELTP); **Elvis Oyugi** (Kenya FELTP)

**Background:** Community case management of malaria (CCMm) is a key strategy for improving prompt and effective treatment of malaria in Kenya, and is aimed at reducing delays in receiving treatment. World Health Organization (WHO) recommends management of uncomplicated malaria at home by a trained community health volunteers (CHVs) on CCMm. The study sought describes the ability of CHVs in identifying suspected cases of malaria, testing and treatment of positive cases within Muhoroni Sub County.

**Methods:** We conducted a cross-sectional study involving review of 4824 entries of CCMm records from January to September, 2019, from ten CCMm sites. Data sources included daily activity register for malaria and monthly summery report for malaria commodities, variables included; patient Sociodemographic, clinical characteristics and treatment data. We defined suspected malaria case as entry of a temperature of  $>37.50^{\circ}\text{C}$ . Collected data using MS Excel tool, and analysis performed using MS Excel and OpenEPI to calculate descriptive and analytical statistics respectively, and tested measure of association using CI at 95%.

**Results:** Data showed that 54.9% (2650) were males, 14.9% (719) under-fives with mean age of 15.8 (SD  $\pm$  0.27), 57.5% (2773) were from cane growing areas. Fever cases identified stood at 40.9% (1970), of which 50.66%(2878) had malaria rapid diagnostic test (mRDTs) done with 63.3% (1823) being positive (OR 1.2, 95% CI 1.1–1.4) for sex, (OR 0.4, 95% CI 0.3–0.4) for age, (OR 1.6, 95% CI 1.4–1.9) for season, (OR 4.5, 95% CI 3.7–5.4) for fever as factors associated a malaria positive test, positive cases accounted for 85.93% (1203) treatment with artemether-lumefantrine (AL) (OR 10.4, 95% CI 8.6–12.6)

**Conclusion:** With as strong association between fever and outcome of a positive mRDTs test, more support is needed to improve fever identification at community level by CHVs.

**Key Words:** Kenya, Malaria, Community Case Management, Community Health Volunteers

**Abstract 060****Title: ANTIPLASMODIAL ACTIVITY  
OF *SECURIDACA LONGIPEDUNCULATA* FRESEN (POLYGALACEAE)**

**Douglas Ochora**, Esezah Kakudidi, Jane Namukobe, Hoseah Akala, Matthias Heydenreich, Máté Erdélyi, Abiy Yenesew

**Introduction:** Malaria is the most significant parasitic disease in the world with 228 million clinical cases reported in 2018 of which over 405,000 deaths occurred. Almost 85% of these cases occur in Sub-Saharan Africa. This high incidence of malaria is due to increased resistance of malaria parasites to the available drugs. Studies that are continuing to document the spread of artemisinin resistant strains globally require reciprocal innovation of new lead antimalarial drug compounds. In this quest, the organic root extracts of *Securidaca longipedunculata* that is traditionally used for fever relief have shown *in vivo* chemosuppression activity of 91.03% against *Plasmodium berghei* (ANKA). However, the compounds responsible for this activity have not been identified.

**Methodology:** The ethyl acetate extract of the roots of *Securidaca longipedunculata* was subjected to a combination of chromatographic separation including Column Chromatography, Preparative Thin Layer Chromatography. The structures of the isolated compounds were elucidated by mass spectrometry and NMR (<sup>1</sup>H NMR, <sup>13</sup>C NMR, COSY, HSQC and HMBC) spectroscopy. The crude extract and pure compounds were tested for *in vitro* antiplasmodial activity using SYBR Green I method against chloroquine-resistant W2 and CQ-sensitive D6 reference strains of *Plasmodium falciparum*.

**Results:** The root EtAOc extract of *S. longipedunculata* showed very good activity with IC<sub>50</sub> value of 1.43 µg/mL and 2.58 µg/mL against W2 and D6 reference strains respectively. The standard drug chloroquine had IC<sub>50</sub> values of 0.082 µg/mL and 0.0101 µg/mL while mefloquine had IC<sub>50</sub> values of 0.00064 µg/mL and 0.00493 µg/mL, against W2 and D6 reference strains respectively. This study justify the antimalarial traditional use of *S. longipedunculata*. From this extract nine compounds were isolated of which four are new. Some of these compounds were tested and showed good to moderate activities.

**Conclusion:** The ethyl acetate extracts of the roots of this plant showed potential antiplasmodial activity, the extract yielded nine compounds, four of which are new.

**Key words:** *Securidaca longipedunculata*, *Plasmodium falciparum*, Malaria.

# SCIENTIFIC SESSION 9:

Neglected Tropical  
Diseases (NTDS)

**Abstract 061****Title: Ujplus: A Novel Approach to National School Based Deworming Programs**

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**Background:** *Schistosoma mansoni* (*S.mansoni*) is classified as among the world's neglected tropical diseases (NTD). Morbidity to *S. mansoni* is greatest among school-age children who typically have the highest burden of infection. In 2001, World Health Organization (WHO) passed a resolution for large-scale mass drug administration (MDA) using praziquantel to deworm vulnerable children through school- based programs. Though effective, a subset of children under six years are not covered by current schistosomiasis treatment regimens. Additionally, the current school based MDA does not consider child malnutrition a very common malady in African countries. Furthermore, there are concerns of emerging resistance to praziquantel with long term use. We report a pilot evaluation of Ujplus, a novel homegrown innovation that combines school feeding and deworming.

**Methods:** We developed Ujplus , a maize and millet flour fortified with extracts of papaya (*Carica papaya*) seeds which have been known for centuries to have anthelmintic effect . Four schools in Mwea Division of Kirinyaga County were chosen based on their high prevalence of schistosomiasis and given the Ujplus

to prepare porridge (Uji) as per their usual school meal recipe and provide to all children in their Early Childhood Development (ECD) classes. Prior to Ujiplus feeding, all children had their stool samples taken for *S. mansoni* microscopy (Kato-Katz) after which each child received 300ml Ujiplus porridge every school day for 25 days. A follow-up stool sample was taken at end of the follow-up period. Schools were then closed for the 1 month August holidays without Ujiplus and on reopening a stool sample was again taken from the children for analysis.

**Results:** A total of 270 children participated in the trial (140 female vs 130 male). The mean age was 5 years (SD1.0; range 3- 11); and mean weight 17.2kg (SD 2.5 range 10-28.4). The overall prevalence of *S. mansoni* at baseline was 37.1% (100 of 270). Ujiplus reduced the prevalence of *S. mansoni* to 19.3% (52 of 270,  $p < 0.001$ ) after 25 days of use. The prevalence however rebounded to 27.03% (73 of 270) after the school holidays. *S. mansoni* mean egg count similarly reduced by 79% on feeding with Ujiplus (82.2 epg to 17.3 epg,  $p < 0.0001$ , ) but rebounded to 73.9 epg after the holidays.

**Conclusion:** Ujiplus school feeding may act as an alternative or supplement to current national school based deworming programs in Kenya especially to child populations that are out of reach to current chemotherapeutic approaches. As a simple school meal, Ujiplus brings the added benefit in the fight against child malnutrition. There is a need to evaluate Ujiplus in large vulnerable children populations to confirm efficacy and optimal duration of dosing.

**Abstract 062****Prevalence and genotyping of *Taenia* species in dogs from five counties in Kenya**

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Malika Kachani (College of Veterinary Medicine, Western University of Health Sciences);  
Thomas Romig (Parasitology Unit, University of Hohenheim)

**Background:** *Taenia* species of dogs cause cysticercosis and coenurosis in a wide range of intermediate hosts and in humans. Diversity of these taeniid cestodes varies across endemic regions and in many localities, little is understood of the prevailing species, which impacts control strategies. This study determined the prevalence of *Taenia spp.* in dogs from five endemic counties in Kenya.

**Methods:** Dog faecal samples were collected from the environment in five counties and examined microscopically for the presence of taeniid eggs. Individual taeniid eggs were characterized by a nested polymerase chain reaction (PCR) of the NADH dehydrogenase subunit 1 (*nad1*) gene, restriction fragment length polymorphism (RFLP) and partial sequencing of the PCR amplicons.

**Results:** Overall 90/2066 (4.4%) faecal samples contained *Taenia spp.* or *Hydatigera spp.* eggs, representing (8.0%) in Turkana, (4.8%) in Isiolo, (4.0%) in Maasai Mara, (2.0%) in Kajiado and (1.3%) in Meru. Out of the eight *Taenia spp.* identified *T. hydatigena* and *T. multiceps* were the predominant cestodes, found in 37/90 and 18/90 faecal samples, respectively. Other taeniid species identified included *T. serialis* (11/90), *T. madoquae* (6/90), *T. ovis* (6/90), *T. saginata* (1/90), unknown *Taenia spp.* (1/90) and *Hydatigera taeniaeformis* (1/90).

**Conclusions:** The *Taenia* spp. reported here show the existence of both domestic and sylvatic transmission cycles and the interface of the two. The study revealed aspects of Taeniasis and the important role of the domestic dogs as reservoirs, an insight that provides baseline data for further studies into cysticercosis and coenurosis in livestock and humans in the region.

**Abstract 063****Title: Occurrence of Cryptosporidium infection among children aged under 24 months in Kibera, Kenya**

**Daisy C Mutai** (KEMRI/CGHR)\*; George O. Agogo (CDC); Patrick K Munywoki (CDC, Nairobi, Kenya); Lydia Mwasi (KEMRI/CGHR); Samwel Kiplangat (KEMRI/CGHR); Victor Omballa (KEMRI/CGHR); Elizabeth Hunsperger (CDC); Godfrey Bigogo (KEMRI/CGHR); Jennifer Verani (CDC)

**Introduction:** Cryptosporidium is estimated to cause 2.9 million cases of diarrhea annually among children aged <24 months in sub-Saharan Africa. The burden of cryptosporidiosis in rural areas of sub-Saharan Africa is well characterized, but data from urban informal settings are limited. This study aims to characterize Cryptosporidium infections among young children in Kibera, Kenya.

**Methods:** We used data from the Population-Based Infectious Disease Surveillance (PBIDS) platform in Kibera. PBIDS participants (~25,000 individuals including ~3,000 children aged <24 months) receive free health care at a centrally located clinic. Patients presenting with diarrhea ( $\geq 3$  loose stools in 24-hours) are eligible for stool sample collection. We tested archived stools collected between January 2009 and June 2015 from children aged <24 months using TaqMan<sup>TM</sup> Array Card (TAC) polymerase chain reaction panel which included a target for Cryptosporidium species. We examined the proportion of children with Cryptosporidium infection and explored associated factors using logistic regression.

**Results:** During the study period, 477 children aged <24 months reported with symptoms of loose stools; 336 (70.4%) met the diarrhea case definition ( $\geq 3$  loose stools in 24 hours). Most of these patients (313, 93.2%) had complete data including test results for Cryptosporidium infection. The drop off (336 to 313) was attributed to insufficient samples for the TAC assay. Overall 86 (27.5%) were positive for Cryptosporidium species. By age groups, the proportion positive was: 0–5 months (1/86, 1.2%), 6–11 months (36/86, 41.9%), 12–17 months (28/86, 32.6%) and 18–23 months (21/86, 24.4%). The proportions of Cryptosporidium-positive cases by year during 2009–2015 were 18/86 (20.9%), 12/86 (13.6%), 11/86 (12.8%), 8/86 (9.3%), 11/86 (12.8%), 15/86 (17.4%) and 11/86 (12.8%),

respectively in that order from 2009 to 2015. Dry season (which spans from December to March) was significantly associated with cryptosporidiosis (odds ratio 1.73 [95% confidence interval, 1.05 - 2.86]), while age, gender, breastfeeding, and residence (cluster) were not significantly associated with *Cryptosporidium* infection.

**Conclusion:** We found a high proportion of *Cryptosporidium* infection among children <24 months, especially among those aged 6-11 months. Our data indicate that risk for infection may be seasonal in urban informal settlements. Additional analysis will ascertain the burden and environmental risk factors for cryptosporidiosis in this population.

## Abstract 064

### **Title: Magnitude and Epidemiological Characteristics of Visceral Leishmaniasis Outbreak in Arid Northern Kenya - April 2019**

**Qabale Anna Duba** (Kenya Field Epidemiology and Laboratory Training Program)\*; Elvis Oyugi (Kenya FELTP)

**Introduction:** Visceral Leishmaniasis (VL) is a neglected vector-borne tropical disease endemic in some parts of Kenya. In April 2019, Marsabit County reported increased number of people diagnosed with VL. We conducted an outbreak investigation and instituted control measures by distributing VL prevention, diagnosis and management guidelines to health facilities.

**Methods:** We reviewed health records in selected health facilities which reported high number of cases and had attended to laboratory confirmed VL cases from August 1, 2017 through May 10, 2019. Active case finding was conducted in the community using case definition of history of fever for  $\geq 2$  weeks, with splenomegaly or hepatomegaly. The suspected cases with similar symptoms were referred to the hospital for further investigation. A standardized questionnaire was used to interview cases. We calculated descriptive statistics and attack rates was calculated using the number of confirmed cases divided by the projected population of the area. Case fatality rates (CFR) was calculated using number of deaths reported divided by number of confirmed VL cases.

**Results:** We line-listed 652 VL cases of whom 350/652 (53.7%) were from active case search. A total of 203(31.1%) were confirmed cases, with attack rate 203/372,931(0.05%). Eight deaths were reported with CFR of 8/203(3.9%). Five deaths occurred in Referral Hospital and three in the community. Median age was 6 years (Interquartile Range: 15 years), 472/652 (73%) were aged  $\leq 14$  years, males were 392/656 (60%). Laisamis Sub-County had 515/652 (79%) cases, Logologo Ward had 241/652 (37%) cases. Majority of the cases were diagnosed between Epi weeks 16 to 18 while deaths occurred mainly in Epi weeks 12 and 13 which is usually a dry season.

**Conclusion:** There was delay in outbreak detection and children were the most affected. The guidelines helped health care workers give health talks to the

community. We recommend heightened community based surveillance on VL to help in early detection of cases and early initiation of treatment followed by close monitoring of patients.

**Key words:** Visceral Leishmaniasis, Disease Outbreak, Arid Kenya

## Abstract 065

### Title: High incidence of human brucellosis in a rural Pastoralist community in Kenya, 2016

Peninah Munyua (CDC)\*

**Background:** Brucellosis is a zoonotic infection of ruminants. Humans are generally infected through unpasteurized milk or contact with infected animals. Globally, incidence is higher in the Middle East and Asia, but data in sub-Saharan Africa are scarce. We estimated the incidence of human brucellosis in a pastoralist community with high brucellosis seroprevalence in humans and livestock.

**Methods:** We enrolled all household members of randomly selected households in Kajiado County. Between February 2015 and January 2016, any household member who fell ill was asked to visit any of three study health facilities. Those aged  $\geq 1$  years who met the brucellosis clinical case definition (a temperature  $> 38^{\circ}\text{C}$  at the time of clinic visit or history of recurrent or continuous fever and no identified cause of fever such as diarrhea and respiratory illness, and any two of night sweats, joint pains or swelling, headache, fatigue, anorexia, muscle pain, or backache) provided a blood sample. Samples were tested by Rose Bengal test (RBT) for agglutination antibodies on site then further tested at the Kenya Medical Research Institute laboratory for Brucella IgM and IgG by ELISA and for Brucella DNA and other pathogens by TaqMan Array Card (TAC). A confirmed brucellosis case was one that tested positive by RBT and Brucella IgG or IgM antibodies, or one that tested positive by Brucella IgG or IgM ELISA and Brucella DNA by TAC. Data on demographics, clinical presentation and risk factors were collected using a standardized questionnaire. Annual incidence was calculated as the number of confirmed cases in one year/total number in the study population. Incidence was calculated by age group, gender and location of residence

**Results:** Of 4,746 enrolled persons in 804 households, 52% were males and median age was 18 (range, 1-99) years. We enrolled 236 suspect brucellosis cases at the health facilities; 64% were females and median age was 41 (range, 1-97 years). Of 236 enrollees, 39 (16.5%) were positive for Brucella antibodies by IgG ELISA, 5/236 (2.1%) by IgM ELISA and 4/236 (1.7%) by RBT and 22/217 (10.1%) were positive by TAC. Other pathogens identified by TAC included HIV-1

(n=6), Plasmodium spp (n=2), Rickettsia spp (n=1), hepatitis E (n=1), Rift Valley fever virus (n=1), Salmonella spp (n=1), West Nile virus (n=1) and Yersinia pestis (n=1). We confirmed seven (2.8%) brucellosis cases giving an annual incidence of 147/100,000 persons (95% CI 114,190). The incidence did not vary significantly by gender, age and location of residence.

**Conclusion:** We report a high incidence of brucellosis in humans among members of a pastoralist community. Education on risk factors for Brucella transmission and animal vaccination would help reduce the high incidence of brucellosis in this pastoralist community.

**Abstract 066****Title: An evaluation of *Trichuris trichiura* prevalence in Kwale County****Stella Kepha (KEMRI)\***

**Background:** The London declaration in 2012 renewed the commitment to supply anthelmintics for mass drug administration to facilitate the soil-transmitted helminths (STH) elimination campaigns. Kenya was among the first African countries to implement a national school based deworming (SBD) programme that has been running since 2012. However, despite the constant regular treatment from SBD with additional community treatment from preventive chemotherapy control programme such as the Lymphatic filariasis, among the school aged children there are some communities that have high prevalence of *Trichuris trichiura* (TT) infection.

**Methods:** A cross-sectional survey was conducted among school children aged 5-18 years in 15 schools in Kwale County. Single stool samples were collected to screen for helminth infections using the Kato-Katz technique. In a subset (200) of the individuals positive at baseline were followed up to assess the efficacy of treatment with abendazole 21 days post treatment.

**Results:** Overall, 34.4 % of the children were infected with at least one STH species, with TT (28.3%) being the most common followed by hookworm (9.7%) and *A. lumbricoides* (5.7%). Overall 6% of the children had more than one STH infection, with TT-hookworm (4.8%) coinfection being the most common. Geographical variation in the prevalence of coinfection occurred between schools. In multivariable logistic regression analysis, TT was positively associated with age, sex and TT infection at school and home.

**Conclusion:** These findings demonstrate TT infections are still prevalent, despite the ongoing national deworming programme in Kenya. School children with specific risk factors in the studied area were vulnerable subpopulation with elevated risk of TT infection. There is need to integrate improvement of water and sanitation into STH control programmes. Our study indicated that identifying risk factors and dynamics of transmission in vulnerable groups can help to plan for effective prevention strategies.

# SCIENTIFIC SESSION 10:

SRACH (Sexual,  
Reproductive,  
Adolescence And  
Child Health) (1)

**Abstract 067****Title: Uptake of antenatal care services among women of reproductive age in Mandera County, Kenya.****Ismail Adow Ahmed**<sup>1</sup>, Dr. Isaac Mwanzo<sup>2</sup>, Prof. Okello Agina<sup>2</sup>

1 Centre for Public Health Research (CPHR), Kenya Medical Research Institute.

2 Kenyatta University. Correspondence: [ismailadow@yahoo.com](mailto:ismailadow@yahoo.com)

**Background:** Mandera County is leading with highest maternal mortality in the Kenya with MMR of 3795 deaths per 100,000 live births (KDHS, 2014). Antenatal care is an opportunity for prevention and management of existing and potential causes of maternal and newborn mortality and morbidity. W.H.O recommend four and above ANC visits with the first visit to occur in first trimester of pregnancy. In Mandera County, only 37% of women of reproductive age receive ANC at least 4 times during pregnancy, which is considerably lower than the national rate of 58 % and only 51% receive ANC once compared to 96% of the national (KNBS, 2015). There is limited literature explaining low uptake of ANC in this County. The study assessed uptake of ANC in order to inform stakeholders on the development of appropriate ANC service provision program.

**Methods:** The study adopted cross-sectional design using both quantitative and qualitative methods. Mandera South sub-County was randomly selected out of the Six- Sub-Counties. Stratified and Sample random sampling were used to get a sample of 348 respondents. Data collected using questionnaires, KII and FGD. Quantitative data was analyzed using SPSS version 25. Descriptive analysis conducted and cross tabulation (Chi-Square test) used to determine factors associated ANC uptake. Binary logistic regression used to establish the strength of the association. Odds Ratio (OR) and 95% Confidence Interval (CI) was used with statistical significance of  $p < 0.05$ . The qualitative data analyzed thematically and corroborated with the quantitative results.

**Results:** Proportion women who have utilized ANC at least once is 83.0% and recommended four visits at 60.3%. Distance to health facility, transport cost and do not see the need are the top three reasons for non-uptake of ANC. The following individual factors influence ANC uptake: Age (OR= 8.956;  $p < .001$ ),

Level of education (OR= .157;  $p<.001$ ), Monthly income (OR= 3.137;  $p=0.002$ ), Gravid (OR=0.103;  $p<.001$ ) and Parity (OR=0.071  $p<.001$ ) and contextual factors include; Complication during pregnancy (OR=2.136;  $p<.028$ ), time taken to reach health facility (OR=0.207;  $p=.028$ ), Source of maternal information (OR=0.057;  $p<.001$ ) and local discouragements (OR=14.135;  $p<.001$ ).

**Conclusions/Recommendation:** We recommend making ANC services accessible to women and improving quality of care. Health education targeting old mother with high parity. Supporting TBAs by attaching them to a specific health facility. Strengthen CHVs capacities on maternal and child health as it will strengthen primary health care and accelerate realization of Universal Health Coverage in Kenya. Designing effective maternal service delivery programme with monitoring and evaluation measures to optimize ANC uptake.

Funding: Child Health Foundation, USA.

## Abstract 068

### **Title: Classification of Semen Parameter Results for Patients Visiting the University of Nairobi Obstetrics and Gynecology Andrology Laboratory.**

**Dennis N Chalo** (KEMRI-CCR PHRD)\*

**Background:** Semen analysis is an important test in evaluation of male infertility. It is preferred because of its simplistic, informative nature and the quality of being non-invasive. It is performed to evaluate semen and sperm parameters as well as the number of pus cells in the semen. Objectives: In this study, the social and demographic characteristics of men presenting for semen analysis at the Obstetrics and Gynecology Andrology laboratory, UoN were evaluated. The prevalence of abnormal semen analysis results was determined and the quality assurance measures taken for semen analysis were documented.

**Methodology:** This was a retrospective descriptive study conducted between July and December 2018. Data was collected by retrieving reports of semen analysis in the laboratory. Data for quality assurance was obtained from the laboratory books, observations and guided key informant interviews. Results on the semen and sperm parameters were classified as normal or abnormal based on the WHO reference values and the percentages calculated.

**Results:** A total of 85 semen analysis reports were studied. Almost half of the men (39/85) were between 30 and 39 years of age and most (50/85) reported that they did not have any children. Review of the semen analysis reports showed that 48.24% of the study subjects had normal semen and sperm parameters. The most common disorders of sperm parameters were oligozoospermia (23.53%) followed by azoospermia (14.12%). Abnormal sperm motility was found in 23.53% and abnormal sperm morphology in 21.18%. Most subjects had normal semen volume (89%), appearance (98.8%), consistency (98%) and white cell count (57.65%). The laboratory scored 5/5 in 7 of the 10 quality indicators assessed. Notable quality lapses included non-participation in an external quality assurance program and failure to review semen analysis results before dispatch.

**Conclusion:** In this study, majority of semen analysis subjects had primary infertility. This is similar to a previous report from KNH in 2013, which found primary infertility in 55.7% of the men. The most common abnormality is oligozoospermia followed by azoospermia. This study showed a significant increase in the proportion of men affected by azoospermia when compared with the 2013 study from KNH, which reported azoospermia at 7.6%. The laboratory scored high in most of the quality indicators assessed. This study provides a basis for further scientific research into the etiology of these semen and sperm disorders and the analysis of the changing causes of male infertility over time.

**Abstract 069****Title: Safety and Pharmacokinetic profile of Fosfomycin in hospitalized neonates in rural Kenya**

**Christina Obiero** (KEMRI - Wellcome Trust Research Programme)\*; Phoebe Williams (University of Sydney); Sheila Murunga (KEMRI-Wellcome Trust Research Programme); Raymond Omollo (DNDi); Borna Nyaoke (DNDi); Erika Correia (GARDP); Sally Ellis (GARDP); James Berkley (KEMRI - Wellcome Trust Research Programme)

**Background:** Infection is amongst the leading causes of neonatal deaths, accounting for about 35% of deaths in sub-Saharan Africa and South Asia and is associated with long-term neurological impairment if not adequately treated. The WHO and Kenyan paediatric guidelines recommend ampicillin plus gentamicin for treatment of neonatal sepsis, with third-generation cephalosporins listed as second-line therapy. However, increasing resistance to these regimens have been reported and there is need to develop antimicrobial regimens with better sensitivity profiles. Fosfomycin is a bactericidal peptidoglycan with broad-spectrum activity against both Gram-negative and Gram-positive organisms, including Methicillin-Resistant *Staphylococcus aureus* (MRSA) and Extended Spectrum Beta-Lactamase (ESBL) producing infections. Although fosfomycin is licenced for treating paediatric and adult infections such as urinary tract infections and bacteraemia in developed countries, it has never been used in Africa. There is limited data on its safety profile and oral dosing schedule in neonates. This study aimed to investigate the safety and pharmacokinetic profile of fosfomycin in amongst neonates hospitalised with clinical sepsis.

**Methods:** We conducted an open-label randomised trial in which 120 neonates aged  $\leq 28$  days and hospitalised to receive intravenous (IV) antibiotics were randomised 1:1 to receive either standard-of-care (SOC) antibiotics (i.e. ampicillin plus gentamicin, or third-generation cephalosporins if indicated) or SOC plus fosfomycin (SOC-F). Neonates were eligible if they weighed  $>1.5$ kg and were born at an estimated gestation of  $>34$  weeks and did not have serious underlying comorbidities such as impaired renal function. Written informed consent was provided prior to enrolment. Neonates receiving SOC-F had two PK samples

taken at designated time points (early (5, 30 or 60 minutes)) and late (2/4/8 hours)) after both the first IV and oral fosfomycin dose. Haemogram and clinical chemistry was done at admission, 48 hours and day 7 for those still hospitalised. Neonates discharged home alive were reviewed at the study clinic on day 28.

**Results:** Between March 2018 and March 2019, we enrolled 120 neonates of whom 61 were allocated to the SOC-F arm. 55 SCO and 52 SOC-F neonates completed the study as per protocol. Overall median age, weight and gestation were 1 day (interquartile range (IQR) 0-3), 2.8 kg (2.4-3.2) and 39 weeks (38-40) respectively. Analysis of safety and pharmacokinetic data is currently in the final stages.

**Conclusion** Results are expected to feed into the design of a larger trial aimed at comparing fosomycin plus an aminoglycoside combination to currently recommended antimicrobials, with the expectation that this will lead to the availability of antimicrobial regimens with broader coverage against multidrug resistance organisms, resulting in improved survival in this at-risk population.

**Abstract 070****Title: Coverage and timeliness of antenatal services in an urban informal settlement in Nairobi, Kenya**

**Alice Ouma**<sup>1</sup> Clifford Oduor<sup>1</sup>, George Agogo<sup>2</sup> Robert Mutinda<sup>1</sup>, Samuel Kiplangat<sup>1</sup>, Daisy mutai<sup>1</sup> Patrick Munywoki<sup>2</sup>, Godfrey Bigogo<sup>1</sup>, Jennifer R. Verani<sup>2</sup>

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**Background:** Antenatal care (ANC) is critical for ensuring the health of pregnant women and their newborns is maintained. The World Health Organization (WHO) previously recommended a minimum of four ANC visits during pregnancy, and in 2016 increased the target number of visits to eight. However, uptake of ANC services in sub-Saharan Africa remains low, with ~50% pregnant women having <4 visits and ~25% with a first ANC visit during the first trimester. We assessed the coverage and timeliness of ANC among pregnant women in an urban informal settlement in Nairobi, Kenya.

**Methods:** We analyzed data from the Population Based Infectious Disease Surveillance (PBIDS) platform in Kibera, an informal settlement in Nairobi. Pregnancies among PBIDS participants are recorded during household visits by trained field workers every six months; additionally, designated community health workers in the study area report on pregnancies, births and deaths, with follow-up by study field workers. For each pregnancy, an outcome form is completed which includes number and timing of ANC visits and birth outcome. We analyzed data on pregnancies from July 2016 to August 2019 with an outcome form completed. We calculated the proportion of pregnant women with any ANC, adequate number of ANC visits (at least 4 over the pregnancy period) and (≥8 as recommended by WHO), and timely ANC (visit during the first trimester). The association between timely ANC and adequate number of visits was tested using the chi-square test.

**Results:** Among 2073 pregnancies reported during the study period, 1582 (76.3%) had a recorded pregnancy outcome; 1578 (99.7%) had a live birth and 4 (0.3%) had a miscarriage or stillbirth. Among those with a recorded outcome, the median age was 26 years (range 14–48 years), 1168 (73.8%) were married/cohabiting, and 642 (40.6%) had secondary level education. Overall, 1567 (99.1%) reported  $\geq 1$  ANC visit, 1022 (66.3%) had  $\geq 4$  visits, and 56 (3.6%)  $\geq 8$  visits. The numbers of women with an initial ANC visit in the first, second and third trimester were 456 (29.7%), 964 (62.4%), and 123 (8.0%), respectively. Women with an initial ANC visit in the first trimester more frequently had  $\geq 4$  visits than those starting ANC in the second and third trimester (428/453 [94.5%] vs. 593/1083 [54.8%],  $p < 0.001$ ). The type of ANC provider (possible to have  $> 1$  for each pregnant woman) reported most frequently was nurses 1552/1609 (96.5%), followed by doctors 51/1609 (3.2%).

**Conclusions:** Despite high attendance of  $\geq 1$  antenatal visit and adequate ANC visits, initial visits mostly took place in the second trimester and a third of women had fewer than 4 visits. As Kenya moves towards adopting the new WHO recommendation of a minimum of 8 visits, efforts are needed to increase optimal utilization of ANC in Kibera.

**Abstract 071****Multi-sectorial approach; a road map for joint implementation of Adolescent and Youth Sexual Reproductive Health interventions****L. Njoki<sup>1</sup>, J Aketch<sup>2</sup>, M. Ngoya<sup>3</sup>, V Rasugu<sup>4</sup>, D Muthama<sup>5</sup>, E. Mgamb<sup>1</sup>**

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**Introduction:** Adolescent and youth (AY) form an integral segment of the global population. Migori County has a youthful population with 49% of the total population being below age 15 years and 25% being between 10-19 years. A young population provides opportunities for the country's development if they get opportunities to accomplish their educational goals and receive an all round preparation for responsible adulthood. Previously in Migori, provision of AY services to meet their health, education, hygiene, shelter, employment and security needs was not provided in a harmonized and well coordinated manner across all sectors. Increased rate of teenage pregnancy, new HIV infections, sexual and gender-based violence and school dropout was attributed to lack of holistic approach to AY services. In view of this, Migori County envisioned the need for a multi-sectorial action plan to improve the health and wellbeing of AY.

**Methodology:** County appointed AY health coordinator to improve multisectoral collaboration, referral and linkages in provision of AY services. A county costed multisectoral action plan to improve the health and wellbeing of AY (2018-2022) was developed. The main aim of the action plan was to increase universal access to information, education and sexual reproductive health services to the AY. The priority areas of intervention in the action plan are; teenage pregnancies, sexual Gender based violence, HIV/AIDs, Coordination and Governance, Advocacy and Monitoring and Evaluation. The action plan was adopted as a county document to guide implementation of AY interventions. A web based multisectoral M&E framework was developed to track progress on implementation of the interventions across all sectors. A multi-sectoral taskforce team was established to coordinate implementation and biannual stock taking of the action plan. Kenya

Health Information system data on adolescent pregnancy, family planning (FP) uptake, SGBV case reporting and management and HIV AIDs services was compared for two equal periods during pre-intervention and post intervention period to assess access to AYservices.

**Results:** Adolescent pregnancy for age 10-19 among first antenatal attendance reduced from 34% in 2017 to 26% in 2019. Family Planning uptake for 10-14 and 15-19 years old increased from 597 and 19717 in 2017 to 1536 and 25571 in 2019 respectively. Likewise, SGBV case reporting at health facilities increased from 277 in 2017 to 377 in 2019 with successful prosecution of perpetrators. Access to HIV testing services for age 10-24 years increased from 126,927 in 2017 to 214,668 2019.

**Conclusion/lessons learnt:** An all-inclusive and well-coordinated multi-sectoral response to adolescent and youth health and socio-economic needs can spur county actors into action to address a common goal.

This initiative requires good political will, passion and commitment from players in all sectors

The county has realized efficiency in leveraging resources in AY programming and effective collaboration in intersectoral referral and linkages.

**Abstract 072****Title: Causes of Low Birth Weight and Preterm Neonatal Mortality in Migori, Kenya: Evidence from Verbal Autopsy**

**Beatrice Olack**<sup>1</sup>, Nicole Santos<sup>2</sup>, Vincent Moshi<sup>1</sup>, Polycarp Oyoo<sup>1</sup>, Mary Inziani<sup>1</sup>, Grace Nalwa<sup>3</sup>, Linet Ouma<sup>1</sup> Christopher Otare<sup>1</sup>, Dilys Walker<sup>2</sup>, Phelgona Otieno<sup>1</sup>

<sup>1</sup>Kenya Medical Research Institute, <sup>2</sup> University of California San Francisco, <sup>3</sup> Maseno University.

**Background:** Under-five mortality in Kenya has declined over the past two decades. However, the reduction in the neonatal mortality rate has remained stagnant and is a big hindrance to achieving Sustainable Development Goals.

**Objective:** We aimed to establish the causes of neonatal low birth weight and preterm mortality.

**Methods:** We conducted a cross-sectional study nested within 17 health facilities participating in the Preterm Birth Initiative study in Migori County. All preterm (<37 weeks gestation) and low birth weight (LBW) babies (<2500grams) were eligible for enrollment. Trained research assistants interviewed the caregivers of the deceased neonate using a structured questionnaire. The probable cause of death was assigned by two independent pediatricians trained on the WHO International Classification of Diseases (ICD-10). If necessary, a third clinician resolved discrepancy on the assigned cause of death. Data were analyzed using Stata 12 statistical software.

**Results:** Between January 2017 to December 2018, 3175 babies were born preterm or LBW, and 162 (5.1%) died. Verbal autopsy was conducted for 88 (53.7%) deaths; 45.5% were male. The mean gestational age was 31.8 ±5 weeks while the mean birth weight was 1675.5 ± 686 grams. Almost half 38 (43.2%) of the neonates died within the first 24 hours. Over three-quarters (78.4%), died in the health facilities within their first week of life. The leading causes of death reported by caregivers were birth asphyxia (45.5%), neonatal sepsis (26.1%), respiratory distress syndrome (12.5%) and hypothermia (11.0%).

**Conclusion:** Deaths among preterm/LBW neonates occurs early in life due to preventable causes. This calls for enhanced intrapartum care and reinforcement of low-cost life-saving interventions targeting asphyxia, sepsis, respiratory distress syndrome and hypothermia.

## Abstract 073

**Title:** Early detection of neurodevelopmental impairment: Comparing the use of caregiver report with direct assessment of pre-term and low birth weight babies in Migori County, Kenya.

**Olieng'o O Geoffrey** (KEMRI PTBiKenya)\*; SUSANNE MARTIN HERZ (UCSF Institute for Global Health Sciences); GRACE NALWA (KEMRI PTBiKenya); NICOLE SANTOS (UCSF Institute for Global Health Sciences); VINCENT MOSHI (PTBiKenya); WALKER DILYS (UCSF Institute for Global Health Sciences); PHELGONA OTIENO (KEMRI)

**Background:** Early detection of neurodevelopmental impairment in pre-term (PT) or low birth weight (LBW) babies is key in initiating early interventions to improve neurodevelopmental outcomes. In low and middle-income (LMIC) settings, lack of a single standardized and validated tool for assessing infant neurodevelopment has made early detection of developmental delays significantly challenging, with several studies recommending the complementary use of more than one available tools.

**Methods:** We compared the detection of neurodevelopmental delays among PT/LBW babies in 17 healthcare facilities in Migori County, Kenya, using a caregiver-reported screening tool and direct assessment. We administered an age appropriate modified version of the Ten Questions Questionnaire (TQQ) to caregivers, and used the Malawi Developmental Assessment Tool (MDAT) to directly assess neurodevelopmental delays among children.

**Results:** We assessed 362 PT/LBW infants at 6-, 12- and 18-months corrected age. Eighty-two (22.7%) infants had caregiver-endorsed concerns, while 26.8% (97) infants showed developmental delays on MDAT. When the caregivers endorsed no concerns, 24.6% (69 of 280) of children showed delays on the directly administered MDAT. In comparison, when caregivers did endorse concerns about their child's development, 34.1% (28 of 82) children showed delays on the MDAT ( $p > 0.05$ ). The tools had an overall agreement of 66% for neurodevelopmental delay, and caregiver concern on the TQQ had a 34% positive predictive value

for neurodevelopmental delay on direct assessment. More than half (51%) of caregivers reported neurodevelopmental delay for 12 month olds, compared with 22.2% for 6 month olds and 25% for 18 month olds. While on direct assessment, 36% had delays at 6 months corrected age, 56.4% at 12 months corrected age and 7.4% at 18 months corrected age.

**Conclusion:** This is a first report comparing outcomes of TQQ and MDAT among PT/LBW in a rural setting in Kenya. Caregivers report concern about the development of their infant, particularly at 12 months of age, a time when motor milestones and language milestones are particularly prominent. Engaging caregiver attitudes and belief will therefore be very important for success of early detection and interventions. Given the age differences at which neurodevelopmental delays were detected on each tool, a longitudinal study is needed and early direct assessment will be important in the immediate months after birth.

## Abstract 074

### Title: Factors associated with stillbirths and neonatal deaths in Lamu County, January – December 2017

Khadija Athman<sup>1&</sup>, Maryanne Gachari<sup>2</sup>, Victor Tole<sup>1</sup>, Elvis Oyugi<sup>2</sup>

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**Background:** Globally 2.6 million stillbirths occur annually and 98% are reported from Lower and Middle Income Countries (LMIC). Kenya's neonatal mortality rate (NMR) is 22 deaths/1000 live births, in the coastal region, Lamu County has an NMR of 25 deaths/1000 live births. This study aimed to identify factors associated with neonatal deaths in Lamu County.

**Methods:** This was a cross sectional study that involved review of health records from four high volume health facilities in Lamu County. Data were collected from maternity register (MOH 333) and maternal perinatal death surveillance audit reports (MPDSR). Variables assessed were social, demographic and clinical characteristics and outcome of delivery. A standardized MS Excel based tool was used to conduct data quality audit (DQA) and data consistency assessment (DCA). We calculated descriptive and analytical statistics using MS Excel and Epi- info.

**Results:** We reviewed a total of 2,081 records of all children born whether alive or dead; 47% (978/2081) were male. Of the 5.9% (122/2081) deaths, 39.3% (48/122) were fresh still births and 31.1% (38/122) were macerated stillbirths and 29.5% (36/122) were neonatal deaths. About 9.7% (202/2081) had Apgar score <7 at one minute after birth, 8.7% (181/2081) had low birth weight (<2500 grams) and 67 (3.2%) were born preterm (<37 weeks' gestation). Mothers who attended antenatal clinic for at least four times were 1,282 (61.6%) and 17.2% (357/2081) of the deliveries were through caesarean section. Increased odds of neonatal death were associated with preterm delivery (OR= 34.0, CI: 19.9-58.0), low birth weight (OR= 10, CI: 7.0-16), maternal antenatal care attendance <4 times (OR=

2.0, CI: 1.3-3.1) and male sex (OR= 1.7, CI: 1.2-2.6).

**Conclusion:** Neonatal mortality was associated with lack of focused maternal ANC, premature delivery and low birth weight, consistent with factors that have been reported in other past studies in Kenya. Proportion of neonatal deaths was also lower than national average. We also observed inconsistencies in the data entered in the DHIS and that in the primary register. We recommend education of women attending ANC on need for at least 4 ANC visits to avoid adverse outcomes for the baby

**Key words:** Neonatal mortality rate, stillbirths, Kenya.

# SCIENTIFIC SESSION 11:

Antimicrobial  
Resistance (AMR)  
(1)

**Abstract 075****Title: Gentamicin susceptibility profiles among *Neisseria gonorrhoeae* isolates from different regions in Kenya****V. Oundo**<sup>1</sup>, S. Wachira<sup>1</sup>, E. Wanguche<sup>1</sup>, W. Sang<sup>1,2</sup>, **M. Mbuchi**<sup>1,2</sup><sup>1</sup>U.S. Army Medical Research Directorate-Africa, Nairobi, Kenya<sup>2</sup>Kenya Medical Research Institute, Nairobi, Kenya.

**Background;** Gonorrhoea caused by *Neisseria gonorrhoeae* (GC) is among the most common sexually transmitted infections (STI) globally. Untreated gonorrhoea causes infertility in women and sterility in males with morbidity and socioeconomic consequences. *N. gonorrhoeae* readily develops resistance to multiple classes of antimicrobial agents. Following emergence of fluoroquinolone resistance, the Kenya Ministry of Health recently recommended dual therapy for treatment of uncomplicated gonococcal infection using azithromycin in combination with a cephalosporin or a combination of azithromycin and gentamicin. The aim of this study was to evaluate gentamicin susceptibility among *N. gonorrhoeae* isolates obtained from symptomatic male and female patients between 2011 and 2019.

**Methods;** Urethral and endocervical swabs were collected from symptomatic individuals seeking treatment at selected hospitals as part of an ongoing gonococcal antimicrobial resistance surveillance project funded by Armed Forces Health Surveillance Branch (AFHSB), Global Emerging Infectious Diseases System (GEIS). Swabs were plated on to a GC transport medium which was then shipped to a central laboratory for processing. Colonies from transport medium were sub-cultured on Modified Thayer Martin for the isolation of *N. gonorrhoeae*. Gram negative diplococci confirmed to be *N. gonorrhoeae* using APiNH® biochemical test were subjected to antimicrobial susceptibility testing to a panel of drugs using Etest® strips. Susceptibility to gentamicin was characterized using published data which defines Minimum Inhibitory Concentrations (MICs) of 4ug/ml or less as susceptible, 8 to 16ug/ml as intermediate and 32ug/ml or more as resistant.

**Results;** Out of 1071 swabs collected, 246 (23%) cultures were obtained. Out of these cultures, 200(81.3%) were confirmed to be *N. gonorrhoeae* while the rest were non-gonococcal. Gentamicin MICs ranged from 0.125-12ug/ml. Of the 200 isolates, 155(77.5%) were susceptible, 45(22.5%) had elevated MICs (6.0 – 12.0ug/ml) with 3.0% of isolates obtained from four of the five regions having an MIC of 12.0 ug/ml.

**Conclusion;** The observed wide distribution of *N. gonorrhoeae* exhibiting intermediate gentamicin MICs is a cause for concern and continued surveillance and monitoring is critical for better clinical and public health decision making. However, most of the isolates were still susceptible to gentamicin suggesting that the drug can still be used but with caution due to emerging gonococcal resistant strains.

**Abstract 076****Title: Prevalence of Shigella serogroups and their antimicrobial resistance among patients with diarrhea in urban and rural Kenya: 2010-2018**

**Richard O. Onyando** (KEMRI-CGHR)\*; John B. Ochieng (KEMRI-CGHR); Jane Juma (KEMRI-CGHR); Billy Ogwel (KEMRI-CGHR); Newton Wamola (KEMRI/CGHR); Jane Alice Ouma (KEMRI/CGHR); Clayton Onyango (CDC-Kenya); George Aol (KEMRI-CGHR); Patrick K Munywoki (CDC, Nairobi, Kenya); George O. Agogo (CDC); Allan O. Audi (KEMRI-CGHR); Elizabeth Hunsperger (CDC); Godfrey Bigogo (KEMRI/CGHR); David M. Berendes (Division of Foodborne, Waterborne, and Environmental Diseases, Centers for Disease Control and Prevention, Atlanta, GA); Pindyck Talia (Division of Foodborne, Waterborne, and Environmental Diseases, Centers for Disease Control and Prevention, Atlanta, GA); Joel M. Montgomery (National Center for Emerging and Zoonotic Infectious Diseases (NCEZID), Centers for Disease Control and Prevention, Atlanta, Georgia); Marc-Alain Widdowson (Institute of Tropical Medicine Antwerp, Brussels, ); Robert F. Breiman (Global Health Institute, Emory University, Atlanta, GA, ); Eric D. Mintz (Division of Foodborne, Waterborne, and Environmental Diseases, Centers for Disease Control and Prevention, Atlanta, GA); Jennifer Verani (CDC)

**Background:** Antibiotic treatment for diarrheal illness due to *Shigella* can reduce duration and severity of disease. However, multi-drug resistant (MDR) *Shigella* strains circulating in sub-Saharan African limits effective therapeutic options. We examined susceptibility patterns of *Shigella* isolates from patients with diarrhea in a rural and urban area of Kenya from 2010-2018.

**Methods:** We used data from the Population-Based Infectious Disease Surveillance, which monitors the health of ~25,000 individuals in Asembo (rural Western Kenya) and in Kibera (urban informal settlement); participants receive free medical care from centrally located health facilities. Patients presenting with diarrhea ( $\geq 3$  loose stools in 24 hours) have stool collected and cultured. *Shigella* is identified biochemically and confirmed by serology. Antimicrobial susceptibilities are determined by Kirby Bauer disk diffusion and interpreted according to Clinical and Laboratory Standards Institute guidelines. *Shigella* isolates were classified as resistant (intermediate or fully resistant) or susceptible to each antibiotic; those resistant to  $\geq 3$  antimicrobial classes were considered MDR.

**Results:** In Asembo, among 1,733 stool specimens collected and cultured, *Shigella* was isolated from 433 (25.0%). *S. flexneri* was most common (268 [61.9%]), followed by *S. sonnei* (59 [13.6%]), *S. dysenteriae* (45 [10.4%]), *S. boydii* (37 [8.5%]) and non-typable *Shigella* (24 [5.5%]). Antibiotic resistance was detected against trimethoprim-sulfamethoxazole (398/422 [ 94.3%]), nalidixic acid (11/423 [ 2.6%]), ceftriaxone (7/423 [1.7%]) and ciprofloxacin (5/423 [1.2%]); 354/423 (83.7%) were MDR. The proportion of ceftriaxone and ciprofloxacin resistance detected were highest in 2010 (2/36 [5.6%]) and 2016 (2/24 [8.3%]), respectively. In Kibera, among 3,234 stools cultured, 537 (16.6 %) had *Shigella* isolated. *S. flexneri* (359 [66.9%]) was most common, followed by *S. sonnei* (55 [10.2 %]), *S. dysenteriae* (39 [7.3%]), *S. boydii* (35 [6.5%]) and non-typable *Shigella* (49 [9.1%]). Resistance was observed to trimethoprim-sulfamethoxazole (442/475 [93.1%]), nalidixic acid (32/479 [6.7%]), ciprofloxacin (14/489 [2.9%]) and ceftriaxone (6/484, [1.2%]); 394/490 (80.4%) were MDR. The proportion of ceftriaxone resistance and ciprofloxacin resistance detected were highest in 2015 (2/75 [2.7%]) and 2013 (4/48 [8.3%]), respectively; 2/483 (0.4%) *Shigella* isolates (*S. sonnei* [1] in 2013, and *S. dysenteriae* [1] in 2015) were resistant to both ciprofloxacin and ceftriaxone. Furthermore; 1/473 (0.2%) isolate (*S. flexneri*) was resistant to ceftriaxone and nalidixic acid in 2014.

**Conclusions:** We observed relatively low levels of *Shigella* resistance to fluoroquinolones and cephalosporins in Kenya. However, detection of strains resistant to both ceftriaxone and ciprofloxacin in Kibera is worrisome and suggests an urgent need for restricted use of these drugs and continued monitoring of *Shigella* resistance patterns.

**Abstract 077****Title: Human *Campylobacter* spp., susceptibility patterns and capsular types**

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**Background:** Over the last decade, there has been an increase in campylobacteriosis, which is one of the four key diarrheal threats to global health worldwide. The disease accounts for approximately 25% and 20% of diarrheal infections in sub-Saharan Africa and Kenya respectively, with *Campylobacter jejuni* and *C. coli* being the most common bacteria. Increased resistance has been reported with *Campylobacter* spp., leading the World Health Organization to categorize this serious pathogen as high priority with regard to new drug development. The ongoing efforts to develop *Campylobacter* capsular vaccine, point to the need to identify essential capsule types circulating in Kenya.

**Methods:** *Campylobacter* isolates from human stool specimens from an ongoing case-control study were revived on blood agar, confirmed using MALDI-ToF biotyper and antimicrobial susceptibility testing to azithromycin (AZM), erythromycin (ERY), nalidixic acid (NAL), ciprofloxacin (CIP), tetracycline (TET),

ampicilin (AMP), chloramphenical (CL), moxifloxacin (MOX), and trimethoprim/sulfamethoxazole (T/S) by E-test. Genomic DNA extracts from 83 *C. jejuni* isolates were analyzed for capsular types by multiplex PCR assays targeting 47 capsule types using 35 primers grouped into 4 (10 alpha, 10 beta, 7 delta and 8 gamma).

**Results:** Resistance was observed in AZM, CIP, TET and T/S while all *Campylobacter* isolates were susceptible to ERY, CL, and MOX. Capsule types detected in *C. jejuni* isolates were 77/83 (74.7%) with 61/77 (79%) from subjects <5yrs and 16/77 (21%) in >5yrs. Of the 61 detected in <5yrs, 36/61 (59%) were from cases and 25/61 (41%) controls while in >5yrs, 13/16 (86%) from cases and 3/13 (14%) controls.

**Conclusion:** Although these results indicate lower resistance patterns from human *Campylobacter* isolates it is critical for continuous surveillance to inform drug use and development. Consequently, these findings have significant implications for future vaccine development in regards to evaluating more capsule types and strategic implementation of biocontrol measures for public health interventions. **Keywords:** *Campylobacter*, susceptibility, capsules

**Abstract 078****Title: Assessment of antibiotic stewardship among patients admitted in Migori County Referral Hospital (MCRH) - June 2018-June 2019**

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**Background:** Improper use of antibiotics increases antibiotic resistance limiting antibiotics availability for prevention and treatment of infectious diseases. It is estimated that by 2050, 10 million lives a year will be at risk due to rise of drug-resistant infections if no action is taken.

**Objective:** To assess antibiotic prescribed to inpatients admitted at Migori county referral Hospital, June 2018- June 2019 focused on; Indication for antibiotic use, duration of treatment, factors influencing rational use

**Methods:** We conducted a facility based cross-sectional study among patients admitted to the medical ward at Migori County Referral Hospital from June 2018 to June 2019. We extracted socio-demographic variables and clinical factors from inpatient files using Microsoft Excel abstraction tool. We assessed rational antibiotic use by indication and duration of antibiotic prescribed. We calculated descriptive statistics by calculating measures of central tendency for continuous variables and proportions for categorical variables and odds ratio with their respective 95% confidence intervals and P values using rational antibiotic use as the outcome variable.

**Results:** We reviewed 833 records. Females were 451/833 (60.1 %). Patients who had antibiotics prescribed were 705/833(84.6%). Indications for antibiotic use were anemia 88/705(12.4%), pneumonia 62/705(8.8%) and cryptococcal meningitis 52/705 (7.4%). Those who had no defined diagnosis were 43/705 (6.1%). Antibiotics prescribed were third generation cephalosporins 438/705 (62.1%), imidazoles including metronidazole 248/705 (35.2%) and broad

spectrum penicillins 219/705 (31.0%). Patients in whom there was an indication for rational antibiotic use were 260/705 (36.9%), those in whom antibiotic choice was correct for diagnosis were 171/705 (24.3%) and those in whom adequate duration of treatment was prescribed were 137/671(20.4%). The odds of irrational use of antibiotics in patients aged more than 60 years was higher (OR 1.5, 95%CI 1.04-2.13). The odds of irrational antibiotic use in males was less (OR 0.9, 95%CI 0.67-1.3).

**Conclusion:** Less than half of files reviewed had proper indication and duration of use indicating irrational antibiotic use in this hospital. We recommend establishment of Antimicrobial Stewardship Committee in Migori County to spearhead antimicrobial stewardship activities and implement guidelines on antibiotic use and development of a hospital formulary.

**Abstract 079****Title: Direct evidence of the role of environmental contamination in transmission of hospital acquired infections****Lillian Musila (KEMRI)\***

**Background:** Factors contributing to hospital-acquired infections are widely debated with a major emphasis on hand hygiene. Contaminated hospital environments can act as reservoirs for the transmission of hospital-acquired infections (HAIs) and cause local outbreaks. Environmental hygiene is an overlooked opportunity to manage and control HAIs because, although there is plenty of evidence of the persistence of multidrug-resistant (MDR) bacterial pathogens in the environment, direct evidence of patients being infected with the environmental isolates are more limited. This study was designed to assess the role of environmental contamination in the transmission of HAIs in Kenyan hospitals.

**Methods:** Samples from patients with bacterial infections and swabs of surfaces and equipment in 5 county and referral hospitals in Kenya were evaluated for the presence of three target bacteria known to cause significant HAI in humans (*A. baumannii*, *P. aeruginosa*, and *K. pneumonia*) by culture on standard and selective media. Bacterial identification and antimicrobial susceptibility profiles were determined on a Vitek2. DNA was extracted from MDR isolates using the DNeasy UltraClean Microbial Kit, libraries constructed using the KAPA HyperPlus Library preparation, and genome sequencing performed on an Illumina Miseq. PanSeq v3.1.1 was used to identify the core genome of all draft assemblies, and core genome SNP trees were used to cluster highly related isolates for whole-genome SNP analysis. After additional reference mapping and SNP filtering, RAxML v8.2.12 was used to construct trees based on concatenated SNP positions. Transmission between patient and environmental samples was inferred by the temporal and phylogenetic relationship between isolates from the two sources.

**Results:** The study found that the target bacteria were widespread in hospital environments. *Pseudomonas* and *Acinetobacter* spp were the most abundant MDR bacteria in both the environment and patients. The MDR bacteria were from patients with CAI and HAI and the isolates from the community were not distinct

from hospital strains suggesting co-circulation of bacterial strains between the hospital and the community. *A. baumannii* isolates from the environment and from patients shared the same AST profiles and were closely related both phylogenetically and temporally indicating the significance of the environment as a reservoir for bacterial transmission from patient to patient.

**Conclusions:** The study has established the presence of the same strains of pathogenic MDR bacteria in both the hospital environments and in patients and provided evidence of direct transmission between the two. The study demonstrates that hospital contamination poses a threat to patient safety and that if hospitals invest in maintaining the hygiene of the hospital HAIs and the cost of managing patients with MDR infections could be reduced.

**Abstract 080****Title: Regional Distribution and Antimicrobial Resistance Patterns of Methicillin resistant Staphylococcus aureus isolated from humans in Africa**

**Brian M Ogoti** (WSU-GH)\*; Sylvia Omulo (Paul G. Allen school of Global animal Health, WA, USA)

**Background:** The burden of methicillin resistant Staphylococcus aureus (MRSA) is a public health concern worldwide. In 2017, the incidence of MRSA infections was 1.5 per 100,000 persons globally. The prevalence of MRSA is above 40% in most African countries. MRSA poses a threat to healthcare systems in Africa. Reports indicate 80% of Staphylococcus aureus infections are resistant to methicillin, rendering treatment with standard antibiotics ineffective. Sustainable development goals under universal health coverage requires individuals to have access to quality and effective medicines. Establishing the antimicrobial resistance profiles of MRSA is important in guiding selection of patient therapy in order to optimize the use of antimicrobial medicines. In Africa, data on MRSA particularly antibiotic susceptibilities are limited. The objective of the review was to determine the rates and antibiotic resistance profiles of MRSA in Africa. We sought to determine the prevalence and antimicrobial resistance patterns of MRSA isolates in Africa.

**Methods:** Articles published in English from the year 1978 in Africa were included. PubMed and google scholar were searched using specified keywords ('MRSA AND Africa AND susceptibility'). Articles with restricted access were excluded. Percentage of resistant isolates to different antibiotic classes was determined.

**Results:** The regional prevalence of MRSA in Africa were reported as follows; Eastern Africa (45.45%), Southern Africa (30.30%), West Africa (12.12%) and lowest MRSA prevalence reported in Northern Africa (9.03%). The antibiotic resistance results were as follows; cephalosporins 30.24%, amphenicols 24.29%, trimethoprim 45.45%, tetracyclines 46.47%, aminoglycosides 37.8%, macrolides 32.16% and glycopeptides 7.05%.

**Conclusion:** We recommend inclusion of a wider panel of drugs in antimicrobial testing of MRSA in accordance to the recommendations of antimicrobial testing standards. In addition, testing of newer antibiotics to establish where they fit in therapy. More studies on MRSA are required in Africa.

# SCIENTIFIC SESSION 12:

Genomics,  
Diagnostics And  
Innovations (2)

**Abstract 081****Title: Genetic Diversity of Plasmodium falciparum Parasites in Pregnant and Non-pregnant Women and Potential Resistance to Antimalarial Drugs in Western Kenya****Brenda L Makena** (USAMRDA-K)\*

**Background:** Malaria infection during pregnancy has detrimental effects owing to decreased host immunity. In high transmission regions where most individuals are presumed malaria-immune; non-pregnant women have been shown to have faster parasite clearance compared to the pregnant. The continued retention of parasites in that non-immune environment in pregnant women may select for parasites strains associated with artemisinin resistance. This study determines genetic variations in Plasmodium falciparum parasites in pregnant versus non-pregnant women to determine if pregnancy is a risk factor for the emergence of resistance to ACTs.

**Methods:** Blood samples were collected at hours 0, 8, 24, days 7 and 28 from 75 malaria positive women grouped as 25 pregnant in 2nd trimester, 25 in 3rd trimester and 25 non-pregnant women in Ahero, Kenya. Samples at all the time-points were diagnosed for malaria using microscopy and 18s rRNA rtPCR. Species composition determined by speciation analysis rtPCR. Single nucleotide polymorphisms (SNP) genotyping for K13, Pfmdr1, Pfmpr1, Pfdhfr, Pfdhps, and Pfcr1 genes was done to determine mutations in parasites with varying clearance using Sanger sequencing or MassARRAY.

**Results:** Pregnant women showed slower clearance of non-falciparum parasites after 24hours of ACTs treatment with 2nd-trimester cases (40.0%), 3rd-trimester (16.7%) and non-pregnant (5.6%). Additionally, 66.7% in 2nd-trimester had parasites on day 7 while the rest had all cleared. No mutations were detected in the K13 gene after sequencing. SNP genotyping for Pfmdr1, Pfmpr1, Pfdhfr, Pfdhps, and Pfcr1 genes showed a similar frequency pattern between pregnant and non-pregnant women.

**Conclusion:** Pregnant women had higher cases of non-falciparum infections

compared to non-pregnant women. This could be attributed to their low immunity and/or the IPTp-SP prophylaxis which targets falciparum parasites. Pregnant women did not carry parasites strains having mutations conferring resistance to artemisinin. There were no statistical differences between the two groups to support suggestions that low immunity in pregnancy could be a source of resistant parasite strains or their reservoir. Use of ACTs for uncomplicated malaria in pregnant women was not seen to affect parasite genotypes probably since the loss of immunity is transient, relative to parasite lifecycle, hence is not a risk factor for the development of resistance to ACTs. This also means IPTp/i-SP continues being effective as prophylaxis for malaria during pregnancy although its role in the selection of species needs to be considered.

**Abstract 082****Title: Evaluation of Plasmodium falciparum Histidine-Rich Protein 2 and 3 (PfHRP2 and PfHRP3) gene polymorphisms in Kenya**

**Martha N Kivecu** (KEMRI-US Army Medical Research Directorate)\*; Hoseah Akala (KEMRI/USAMRD-A/K); Ben Andagalu (1Department of Emerging Infectious Diseases (DEID), United States Army Medical Research Directorate-Kenya (USAMRD-K), Kenya Medical Research Institute (KEMRI) )

**Introduction:** Globally, about 75% of malaria suspected cases are diagnosed by malaria rapid diagnostic tests (RDT). The accuracy of the most commonly used Pfhrp2-based RDTs can be impaired by either deletion in the Pfhrp2 gene or cross-reaction with Pfhrp3 antibodies. The World Health Organisation (WHO) criteria that require greater than 95% accuracy as the threshold for selection or withdrawal of RDTs argue for active mapping of Pfhrp2 deletions. This study aims to determine the frequency and trends of Pfhrp2 and Pfhrp3 genes deletions in three of five malaria transmission regions in Kenya.

**Method:** 350 samples comprising 255 collected between 2013 and 2017 (post-RDTs) from Kombewa (n=121), Kericho (n=101), Malindi (n=33) plus 95 collected between 2003 and 2005 (pre-RDTs) Kericho (n=11), Malindi (n=28), Alupe (n=6) and Kisumu (n=50) were diagnosed for malaria by microscopy, Pfhrp2 based RDT and 18S rRNA PCR. RDT was not done for the 95 samples collected between 2003 and 2005. All *P. falciparum* PCR positive samples with at least 32 CT values (30 parasites per microliter) were genotyped using primers targeting Pfhrp2 and Pfhrp3 encoding genes to identify genes deletions.

**Results:** The sensitivity of RDT was 85.7% in reference to *P. falciparum* PCR for samples with at least 30 parasites per microliter. 32 (14.3%) of 224 *P. falciparum* PCR positive samples were negative by RDTs. Genotype analysis showed that all the 32 samples had at least Pfhrp2 and Pfhrp3 genes; 28 (Both Pfhrp2 and Pfhrp3), 2 (Pfhrp2 only), 2 (Pfhrp3 only). Malindi and Kericho sites had the highest prevalence of false-negative RDTs results (33%) and (23%) respectively while Kombewa had 4.3%. Kisumu and Malindi had the highest prevalence of Pfhrp2 deletion (16.7% and 14.5% respectively) while Kericho had the lowest (2.2%). Pfhrp2 gene deletions were higher in pre-RDTs samples than in post-

RDTs samples (18.3% and 4.4% respectively). However, Pfhrp3 deletions had no significant difference between pre and post-RDTs. **Conclusion:** This study shows false-negative RDTs are present, however, these false-negative RDTs could not be attributed to the Pfhrp2 and Pfhrp3 gene deletions among the symptomatic individuals enrolled in this study. This finding heralds the need for investigating additional mechanisms of false-RDTs negativity and expanding the study population to include asymptomatic cases since the method used for screening in the positive could present a bias.

**Abstract 083****Title: The differences in haemoglobins A, A2, F and S in the context of the haemoglobinopathies HbS and  $\alpha$ -thalassaemia in Kenyan infants**

**Alex W. Macharia**<sup>1</sup>, Sophie Uyoga<sup>1</sup>, Carolyne Ndila<sup>1</sup>, Gideon Nyutu<sup>1</sup>, **Johnstone Makale**<sup>1</sup>, Metrine Tendwa<sup>1</sup>, Emily Nyatichi<sup>1</sup>, John Ojal<sup>1</sup>, Sarah Atkinson<sup>1,2</sup>, and Thomas N. Williams<sup>1,3</sup>

<sup>1</sup>KEMRI-Wellcome Trust, Kilifi

<sup>2</sup>Department of Paediatrics, John Radcliffe Hospital, Oxford.

<sup>3</sup>Department of Medicine, Imperial College.

**Background:** Various forms of haemoglobin are expressed at different stages of human development. For example, while fetal haemoglobin (HbF;  $\alpha 2\gamma 2$ ) predominates in newborns, levels decline during the first year of life during which time HbF is replaced by adult haemoglobin (HbA;  $\alpha 2\beta 2$ ). Although the determinants of variation in the production of different forms of haemoglobin remain incompletely understood, factors such as age, sex, ethnicity, environment and genetics all play significant roles. To date, few studies have described the pattern of production of the common haemoglobin variants in African populations, where the prevalence of haemoglobinopathies, especially HbS and  $\alpha$ -thalassaemia, is frequently high.

**Methods:** We studied the relative concentrations of HbA, HbA2, HbF and HbS, among 15301 infants 3-12 months of age who were recruited to the Kilifi Genetic Birth Cohort (KGBC) study on the Indian Ocean coast of Kenya. Demographic data and capillary EDTA blood samples were collected at recruitment. Blood was stored at 4°C and haemoglobin variants were quantified on a Bio-Rad Variant™ Classic HPLC analyser using the  $\beta$ -thalassaemia Short Program (BioRad, Hercules, CA, USA) within five days of collection. DNA was extracted on an ABI PRISM 6100 Nucleic Acid PrepStation™ and genotyped for the common African 3.7kb  $\alpha$ -thalassaemia deletion.

**Results:** The HbF level was at 4.5% (95% CI 4.5-4.6) among all samples tested overall. Levels were lowest in infants with HbAA (4.4; 95% CI 4.3-4.4) and highest in those with HbSS (21.9; 95% CI 20.1-23.8) (OR=4.5; 95% CI 4.2-5.0). HbF levels declined with age both overall and within infants with different haemoglobin phenotypes individually, although this was more rapid among HbAA and HbAS infants than those with HbSS. HbF levels were significantly higher in females than males (OR 1.09\*\* (1.07-1.11)). We found no significant association between HbF levels and  $\alpha$ -thalassaemia genotype, although significant differences were seen in sub-analyses by HbS phenotype.

**Conclusions:** Our study represents a rare report on the dynamics of haemoglobin production in a large population of African children born in an area with a high frequency of haemoglobinopathies. Our findings suggest that a small proportion are carriers of  $\beta$ -thalassaemia, a condition that until recently has not been reported from the East Africa region. Additional studies are planned through which we aim to confirm this finding and investigate its molecular basis.

**Abstract 084**

**Title:** Investigation of *Plasmodium falciparum* piperaquine resistance in Kenya using molecular marker analysis and growth inhibition assays.

**Duncan M Wakoli** (USAMRD-K/KEMRI)\*; Hosea Akala (USAMRD-K/KEMRI); Bartholomew Ondigo (Laboratory of Malaria Immunology and Vaccinology, National Institute of Allergy and Infectious Disease, NIH, Bethesda, Maryland, USA); Agnes Cheruiyot (1Department of Emerging Infectious Diseases (DEID), United States Army Medical Research Directorate-Kenya (USAMRD-K), Kenya Medical Research Institute (KEMRI) ); Benjamin Opot (1Department of Emerging Infectious Diseases (DEID), United States Army Medical Research Directorate-Kenya (USAMRD-K), Kenya Medical Research Institute (KEMRI) ); Dennis Juma (1Department of Emerging Infectious Diseases (DEID), United States Army Medical Research Directorate-Kenya (USAMRD-K), Kenya Medical Research Institute (KEMRI) ); Ben Andagalu (1Department of Emerging Infectious Diseases (DEID), United States Army Medical Research Directorate-Kenya (USAMRD-K), Kenya Medical Research Institute (KEMRI) ); Roth Amanda (KEMRI/YSAMRD-A/K)

**Background:** With the progress on malaria vaccines still way off, chemotherapy is central in malaria case management globally. Piperaquine (PPQ), in combination with dihydroartemisinin (DHA) is the recommended second-line antimalarial in Kenya, replacing quinine. However, reports of resistance to PPQ in South Eastern Asia (SEA) are a public health threat in Africa due to previously determined pattern of dispersion. As the country continues to implement this regimen for second-line treatment it is essential to establish a sustainable system of detection of emergence of resistant *P. falciparum* strains by *in vitro/ex vivo* susceptibility testing and molecular marker analyses.

**Methodology:** 2-3mL of blood samples were collected from *P. falciparum* positive individuals presenting to selected hospitals with uncomplicated malaria after consenting to participate in the epidemiology of malaria drug resistance study. 400 samples were collected from six sites in Kenya including; Kisumu, Kombewa, Malindi, Kericho, Kisii and Marigat. Each isolate was assessed for immediate ex

*vivo/in vitro* drug susceptibility to piperazine using Piperazine Survival Assay (PSA) and SYBR Green I technique. Further, each sample was genotyped for polymorphisms in targeted codons of *Pfcr1*, *Pfmdr1*, *Pfpm2* and *Pfpm3* genes using qPCR, Sanger and Agena MassARRAY platform.

Preliminary

**Results:** 70 out of 400 samples analyzed using *in vitro* susceptibility IC<sub>50</sub> assay had Median IC<sub>50</sub>s values of 0.8122, interquartile range of 0.3794-3.853, a range of 0.03837-15.32 and median 8.352, interquartile range of 3.997-15.91, a range of 0.271-30.14 for DHA and PPQ respectively. A statistically significant variation in piperazine performance was recorded between Kisii (median 13.07, 95% CI, range 1.275-33.79) and Malindi (median 3.528, 95%CI, range 1.392-10.71, P value=0.0469).

**Conclusion:** Genotyping and PSA susceptibility assay are ongoing. Findings from this study provide great importance in defining the relevance of PPQ deployment and monitoring its resistance in Kenya.

**Abstract 085**

**Title: Four separate low frequency  $\beta$ -thalassemia pathogenic variants are found within a cohort of children on the East African Coast: results from a sequencing project in Kilifi, Kenya.**

**Alexander w Macharia** (Kemri-wellcome.org)\*

**Background:**  $\beta$ -thalassemia is rare in sub-Saharan Africa where most studies suggest that it is limited to specific parts in the West of the continent. Based data regarding hemoglobin A2 (HbA2) levels, we recently speculated that  $\beta$ -thalassemia might also be present on the coast of Kenya. Here, we follow up that hypothesis by use of molecular methods.

**Methods:** We used hemoglobin A2 (HbA2) values derived by high pressure liquid chromatography (HPLC) to target subjects for  $\beta$ -thalassemia sequencing from among 15,577 members of a cohort study in Kilifi, Kenya. Because HbA2 values are unreliable in subjects carrying sickle hemoglobin (HbS) we sequenced all participants with an HPLC pattern that documented HbS without HbA (n=116), 310 infants with patterns documenting the presence of HbA in the absence of HbS and 304 infants with patterns showing both HbA and HbS.

**Results:** In total, we identified 83 carriers of four separate  $\beta$ -thalassemia pathogenic variants: three  $\beta^0$ -thalassemia [CD22 (GAA TAA), initiation codon (ATG ACG) and IVS1-3 end del 25bp] and one  $\beta^+$ -thalassemia pathogenic variants (IVS-I-110 (G A)). We estimated the overall allele frequency of all variants combined within the study population at 0.3%.

**Conclusions:**  $\beta$ -thalassemia is present in Kenya, an observation that has implications for the diagnosis and clinical care of children from the East Africa region.

**Abstract 086****Title: Comparing Diagnostic Performance of Pronto Dry Rapid Urease® and Culture to Histopathology among Endoscopy Patients at the Aga Khan University Hospital, Nairobi-Kenya****Stephen Njoroge (Jkuat)\***

**Background:** *Helicobacter pylori* infections diagnosis in endoscopy unit can be readily done by use of a Rapid urease test. Pronto dry rapid urease is faster giving results within 1 hour. This study sought to evaluate Pronto dry rapid urease® diagnostic test and compare its performance with culture.

**Study Design:** Cross-sectional study Place and Duration: From September 2017 to July 2018, across-sectional study was conducted at the Aga Khan University Hospital.

**Methodology:** Patients attending endoscopy unit at the hospital were randomly sampled to provide gastric biopsy specimen. One specimen was tested for presence or absence of *Helicobacter pylori* using Pronto dry rapid urease® test and another specimen subjected to in vitro culture test which were then compared with histology reference results. Test validity and reliability was determined using Graph Pad Prism v5.01.

**Results:** Of 274 study specimens, 121(44%) were positive for histology. Ninety-one (33%) of the study specimen were positive for culture compared to 147(54%) for Pronto dry rapid urease®. Pronto dry rapid urease® test had sensitivity of 100% (97.5%-100%) against 73.6% (64.8%-81.3%) for culture. Specificity was 96.1% (91.1%-98.7%) for Pronto dry rapid urease® compared to 35.3% (95% CI 24.1%-47.8%) for culture. Positive predictive value was 96.7% (92.5-98.9%) for Pronto dry rapid urease® compared to 97.8% (92.3%-99.7%) for culture. Negative predictive value was 100% (97%-100%) for Pronto dry rapid urease® against 82.5% (76.2%-87.7%) for culture. There was significant difference between both Pronto dry rapid urease® and culture test performance with histology in all validity measures,  $P < 0.001$ . On the other hand, there was no significant difference between Pronto dry rapid urease® and culture in all validity measures due to overlapping confidence intervals.

**Conclusion:** Pronto dry rapid urease® out-performed culture in sensitivity and NPV. It would be the method of choice in H. pylori detection where histology is untenable and antimicrobial profiling which require culturing the bacterium is needless. No data so far showing use of Pronto dry rapid urease is Kit within Kenya and surrounding region.

## Abstract 087

**Title: PfHRP2-PfHRP3 diversity among Kenyan isolates and comparative evaluation of PfHRP2/pLDH malaria RDT with microscopy and nested PCR methodologies**

**Maureen Otinga (KEMRI)\***

**Background:** Rapid diagnostic tests (RDT) are valuable tools that support prudent and timely use of antimalarial drugs, particularly if reliable microscopy is not available. However, the performance and reliability of these tests vary between and within geographical regions. **Methodology:** The present study evaluated the performance of routine malaria RDT in Kenyan febrile patients in Busia County, Kenya. A cross sectional study design was employed to recruit febrile patients attending health facilities between August and November 2016.

**Results:** A total of 192 febrile patients who were slide positive and negative were evaluated for their infection status by nested PCR and rdts (pfhrp2/pldh). In addition, *P. Falciparum* diversity of the histidine-rich proteins 2 and 3, that influences the RDT test results were determined. All individuals were *P. Falciparum* positive. Among the investigated 192 febrile patients, 76 (40%) were positive by microscopy, 101 (53%) by rdts and 80 (42%) were PCR positive. The performance of the carestart™ HRP2/pldh (pf) rdts was better than microscopy (Sensitivity 94%; Specificity 75%) and Nucleic acid testing (sensitivity 95%, specificity 77%) with high negative predictive values, indicating the suitability of the RDT in routine practice.

**Conclusion:** Specific pfhrp2/pfhrp3 deletions shown to associate with RDT false negativity was not observed. However, high genetic diversity among pfhrp2 gene was observed. Eleven new pfhrp2 and nine pfhrp3 repeats were observed. False positivity by microscopy and under reporting of infections may thus be a barrier in malaria control and elimination programs. The HRP2/pldh(Pf) based RDT yet demonstrate to be an effective tool for malaria surveillance program.

**Keywords:** pfhrp2, pfhrp3, Malaria, Kenya, rdts, Microscopy

# SCIENTIFIC SESSION 13:

Antimicrobial  
Resistance (AMR)  
(2)

**Abstract 088**

**Title: Socio-economic factors related to antimicrobial resistance in middle and low Income countries, a literature review.**

**Beatrice Atieno Oduor** (Washington State University-Global Health)\*; Sylvia Omulo (Paul G. Allen school of Global animal Health, WA, USA); Brian M Ogoti (WSU-GH)

**Background:** Antimicrobial resistance (AMR) is a global challenge and efforts to reduce its burden are gaining priority. Recent CDC data estimates that 208 million antimicrobial resistant infections occur each year, with more than 35,000 reported deaths. The rise of incidences due to AMR are majorly driven by socio-economic factors resulting in extensive and often unnecessary use of antimicrobials in healthcare, agriculture, food and animal production. Unfortunately, there is a scarcity of accurate and reliable data on AMR in Low and middle income countries (LMICs) and thus the true extent of the burden of AMR cannot be depicted. The aim of this study was to determine the socio-economic factors related to AMR and to show how they influence antimicrobial use in the community and among healthcare workers.

**Method:** PubMed and google scholar databases were used to identify relevant articles between 1980 to 2019. Articles addressing social, cultural, ethical and economic factors associated with antimicrobial resistance in the community and clinical settings were included.

**Results:** Among 87 eligible papers, 36 publications that matched the inclusion criteria were retrieved. This literature review identified various factors related to AMR. The socio-cultural factors included; the desirable and curative power of antimicrobials, religious and traditional beliefs regarding antimicrobial use. Socio-economic factors included; antimicrobial selling for profitable gains without patient education, purchasing substandard or insufficient antimicrobials, using left over antimicrobials and antimicrobials sharing due to poverty. Healthcare related determinants included; healthcare practitioners' attitude and beliefs with regard to antimicrobial use, irrational antimicrobials prescriptions guided by professional profiteering or patients demands. Antimicrobial overuse

in agriculture was majorly driven by the desire to reduce costs and increase margins in food and animal production by using the drugs to reduce likelihood of infections at sub-therapeutic levels.

**Conclusion:** There is a dire need to address the socio-economic factors driving AMR in order to attain sustainable universal health coverage. Public health interventions should be centered on population-tailored health education, regulation of antibiotic sales, the potential role of pharmacists in guiding antimicrobial prescriptions and the need for a national antimicrobial stewardship programme.

**Abstract 089****Title: Water, sanitation and hygiene (WASH) and AMR (Antimicrobial Resistance) in an urban slum in Nairobi, Kenya****Odwar J.<sup>1</sup>, Ita T. <sup>1</sup>, Omulo S.<sup>1 2</sup>**<sup>1</sup> Washington State University, Global health – Kenya <sup>2</sup>Paul G. Allen school of Global animal Health, WA, USACorresponding Author: Joyce Arua Odwar,  
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**Background:** Antimicrobial resistance (AMR) is a growing global threat to public health. It threatens the effective prevention and treatment of infectious diseases in sub-Saharan Africa by minimizing the effectiveness of antimicrobials. Effective antimicrobials are essential for provision of quality healthcare which is at the centre of universal health coverage (UHC). Unregulated access to cheap antibiotics and antibiotic misuse in low income, informal settings could be invoked to explain the high prevalence of AMR in the region. However, the same settings are also characterized by poor water supply, sanitation and hygiene which has been shown to impact antimicrobial resistance indirectly (increasing demand of antibiotic use for the treatment of infectious diseases) or directly (facilitating transmission of resistant bacteria into new host or environment). The study sought to test the association between exposure to WASH risk factors and household carriage of antimicrobial resistant *Escherichia Coli* (*E. coli*) in an urban slum in Nairobi, Kenya.

**Methods:** A nested case control study design was used for this study. Stool samples were collected from children under 5 years of age from 196 random households in Kibera slum and processed for the presence of resistant *E.coli*. Data on WASH risk factors that might directly impact the child such as hygiene of the mother and child, general sanitation practices, water source and treatment were collected using survey questionnaires. Mixed effect linear regression analysis was conducted to identify any association between these risk factors evaluated from the household members and the surrounding environment and

the outcome variable relating to the study.

**Results:** WASH Risk factors found to have a statistically significant association with carriage of resistant *E. coli* included; cleaning the toilet  $p = 0.029$ , washing hands after a short call  $p=0.013$  and child eating soil  $p=0.009$ .

**Conclusion:** The significant association observed between WASH risk factors and carriage of resistant *E. coli* in individuals should encourage targeted AMR intervention strategies to also take into account alternative AMR transmission risk factors (such as involves water, sanitation and hygiene) to ensure continuity of successful treatment and prevention of infectious diseases with effective and quality antimicrobials. This is especially so in highly dense populations, characteristic of informal urban settings, where poor sanitation is likely to contribute substantially to the prevalence of AMR.

**Key Words:** Antimicrobials, Antimicrobial resistance, *E. coli*, Water, Poor Sanitation and hygiene, Infectious diseases, Informal settings, Children under 5.

**Abstract 090****Title: Carriage of Antimicrobial Resistance (AMR) among children with Acute Childhood Illness in Kenya**

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**Introduction:** Carriage of antimicrobial resistance is recognized as a serious global public health problem. Multidrug-resistant organisms (MDRO) are increasingly prevalent in Africa because of widely available unregulated antibiotic use. This is also due to transmissibility of resistance determinants mediated by plasmids, transposons, and gene cassettes in integrons in bacterial pathogens. International literature suggests that up to one third of deaths may be attributable to antimicrobial resistance (AMR) in hospital and post-hospitalization. The main aim of the study was to determine the pattern of acquisition and loss of AMR, the prevalence of MDRO carriage and risk factors associated with carriage.

**Methods:** This was a prospective cohort study enrolling children aged 7 days to 23 months being admitted to hospital. Rectal swabs were collected at admission, discharge, follow-up (Day 45, 90 and Day 180 after discharge) and from community participants in three Kenyan sites. Rectal swab culture was done using selective and differential media to isolate and identify common enteric pathogen and their antimicrobial resistance status determined as per the CLSI guidelines. Extended Spectrum Beta Lactamase (ESBL) positive Enterobacteriaceae was determined using blood agar plates with ceftriaxone and ceftazidime disk combinations and Gent-MacConkey agar a selective media. ESBL positive pathogens were then identified using biochemical tests and API 20E strips.

**Data analysis:** The proportions between children with different AMR were compared using Pearson's Chi square test/Fisher's exact test as appropriate. Risk factors analysis for AMR carriage association with inpatient mortality were done using logistic regression. Time to post-discharge deaths and hospital re-admissions curves were fitted using the Kaplan-Meier method. The effects of AMR carriage on post-discharge mortality and hospital re-admissions were estimated using Cox proportional regression models.

**Results:** Our preliminary results suggest that 50% of children admitted to Kenyan hospitals are already carrying ESBL-E among intestinal bacteria, that 80% have carriage at discharge, 35% in healthy community controls and over 80% for readmissions. The predominant risk factor for ESBL carriage seen so far at the time of admission is prior hospitalization and at discharge is duration of stay in hospital. We aim to determine other risk factors for carriage i.e. age, hygiene, nutritional status, HIV status, clinic visit, family size, household waste, sanitation and hygiene, and prior use of antibiotics.

**Impact:** Knowledge of burden of resistance to antibacterial agents, risk factors and transmission patterns in both hospital and community will contribute in development of control measures and development of interventions to improve prevention and control, such as targeting hygiene or inpatient isolation to separate rooms or areas based on prior admission that are relevant for implementation in Kenya's public health system.

**Abstract 091****Status of Antimicrobial Resistance Surveillance Systems In Selected Facilities in Kisumu County, Kenya.****Duncan ong'áyi .**

Affiliation; Ministry of Health, Kisumu County Government.

**Background:** Antimicrobial activity is viewed as a major threat to humanity and we are witnessing the emergence of new strains of infections that are resistant to many antibiotics .In Kenya, several factors are known to contribute to Antimicrobial resistance(AMR);misuse of antibiotics ,availability of substance drugs and poor infection prevention and control practices. Though IPC activities have been strengthened ,there is still much to be done in terms of Laboratory investigation of Antimicrobial resistant micro- organisms e.g. Methicillin resistant staphylococcus aureus,clostridium defficile,gram negative drug resistant micro-organisms like E. coli,klebsiella pneumonie,proteus and pseudomonas auriginosa species.Purpose: To understand the status of Antimicrobial resistance surveillance in public and private hospitals in Kisumu county, Kenya.

**Methods:** A survey was conducted by Medicines, Technology and Pharmaceutical Services( Mtaps) and Medicine science for Health(MSH) in selected seven public hospitals ,two private hospitals and one faith based organization in Kisumu County in the Month of May 2019.This was conducted by administering the infection prevention and control tool to the selected facilities. This tool had Infection Prevention and Control(IPC),occupational health, water analysis and waste management.The tool was administered in the following areas:Administration,Opd,Mch,Wards,Labour room,Pharmacy,Kitchen and Incinerators(waste handlers).The findings were entered in excel spread sheets and presented in pie charts.

**Results:** The seven public hospitals visited had a big gap in terms of surveillance and investigation of nosocomial infections, catheter related infections, pulmonary related infections and intravascular cannula associated infections. For the two

private hospitals visited, there was surveillance systems in place however lacked laboratory to investigate the Antimicrobial Resistance activities was lacking as most of the samples were being referred to Nairobi for analysis. Though in IPC, Waste management, Occupational health and water analysis, best practices were in place in both public, private and faith Based facilities. Though waste management was well practiced in faith based facility however it lacked an incinerator and most of its wastes were being networked to referral facility.

**Conclusion:** There is an urgent need for establishment of a fully well-equipped labs in the public and faith based organization to handle the issues of antimicrobial resistant which is a major threat to humanity. There is need to strengthened the surveillance systems to capture most of the antimicrobial resistant organisms. There is also need to have active IPC committees\Medicine and Therapeutics committee\AMR handling the issues of IPC and AMR in the facilities through continuous medical education and sensitization of staffs.

**Abstract 092****Title: Molecular mechanisms of low level azithromycin resistance in *Neisseria gonorrhoeae* isolates from Kenyan**

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**Background:** Treatment of gonorrhoea is complicated by development of single or multiple antimicrobial resistance (AMR) mechanisms to all drug classes recommended for treatment. Currently gonococcal infections are treated using a dual therapy comprising of cephalosporin plus azithromycin (AZM) which was recommended by Centre for Disease Control (CDC) in 2015. Multiple mechanisms of resistance to AZM have been reported in gonococci from different countries. These mechanisms include 23S rRNA modification, reduced drug accumulation, and point mutations in large subunit ribosomal proteins L4 and L22. A2143G mutation in 23S rRNA is specifically associated with high levels of AZM resistance (MICs >256mg/L) while the other mechanisms are associated with lower levels of AZM resistance. This study analyses molecular mechanisms underlying low level phenotypic AZM resistance among *N. gonorrhoeae* isolates obtained as part of an ongoing STI surveillance from different regions in Kenya under Armed

Forces Health Surveillance Branch-Global Emerging Infections Surveillance (AFHSB-GEIS).

**Methods:** Genomic DNA was extracted from 39 sub-cultured drug resistant GC isolates and whole genomes sequenced using Illumina platform. Sequence reads were assembled *de novo* using CLC Genomics Workbench. Genome annotation was performed using Rapid Annotation using Subsystem Technology. Mutations and amino acid alterations were identified using both Bioedit sequence alignment editor and Geneious Prime 2019. Susceptibility results were interpreted with reference to European Committee on Antimicrobial Susceptibility Testing standards (EUCAST).

**Results:** None of the isolates had rRNA methylase encoding *erm (B/C/F)* and *mefA* genes. All the isolates had wild-type 23S rRNA encoding *rpl* genes. Amino acid substitutions in proteins L4 and L22 were not observed in any of the study isolates. *macAB* operon promoter of all isolates were wild type. No significant increase in AZM MICs was observed in isolates harboring PenB alterations.

**Conclusion:** Lack of mutations in 23SrRNA corresponds with the absence of high AZM MICs in the analyzed isolates. The observed low level AZM resistance could be caused by reduced drug accumulation resulting from active MtrCDE efflux pump. Absence of molecular markers specifically associated with high levels of AZM resistance shows that AZM is still a useful antibiotic for treatment of gonococcal infections in Kenya. Since AZM is one of the antibiotics in the dual therapy recommended in the Kenyan National Guidelines for treatment of gonococcal infections, continued molecular surveillance is required so as to monitor the emergence and spread of its resistance.

**Keywords;** Azithromycin, Antimicrobial resistance (AMR), *Neisseria gonorrhoeae*, and mutation

**Abstract 093****Title: Phenotypic and genotypic characteristics of uropathogenic *Escherichia Coli* isolates from Kenya**

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**Introduction:** Uropathogenic *Escherichia coli* (UPEC) is the major cause of community and hospital-acquired urinary tract infections (UTIs). In Kenya,  $\beta$ -lactams are widely used to empiric treat UTIs with culture and antimicrobial sensitivity testing rarely performed.  $\beta$ -lactamase enzymes have been reported among *E.coli* and other gram negative pathogens in Kenya. The indiscriminate use of  $\beta$  lactams for treatment of UPECs could lead to unnecessary morbidity and further drive  $\beta$  lactamase resistant *E.coli*. Although  $\beta$ -lactamases have been studied among diverse *E.coli* populations in Kenya few studies have focused on the antibiotic profiles,  $\beta$ -lactams resistance genes and phylogenetic groups of UPEC in Kenya. This study therefore, undertook to examine archived UPEC isolates obtained from several hospitals across Kenya.

**Methodology:** A total of 95 UPEC isolates isolated from patients with urinary tract infections and meeting the threshold for clinical infection, were tested for ESBL and AmpC  $\beta$ -lactamase production using the combined disk diffusion test and disk approximation test. Real-time Polymerase chain reaction (PCR) was used to detect *bla*<sub>TEM</sub>, *bla*<sub>CTX-M</sub> and *bla*<sub>SHV</sub> genes. The isolates were then assigned to phylogenetic groups using the Clermont extended quadruplex PCR.

**Results:** Twenty-three out of 95 UPEC isolates (24.2%) were positive for ESBL production. Five out of 23 ESBL positive isolates were cefoxitin resistant, an indication of a possible novel ESBL production in Kenya due to the overuse of the

antibiotics. The predominant ESBL genes were *bla*<sub>CTX-M</sub> and *bla*<sub>TEM</sub> each present in 95.6% of the isolates followed by *bla*<sub>SHV</sub> (21.7%). Sixteen isolates (69.6%) had both *bla*<sub>CTX-M</sub> and *bla*<sub>TEM</sub> genes, whereas five isolates (21.7%) had all the three genes (*bla*<sub>TEM</sub>, *bla*<sub>CTX-M</sub>, and *bla*<sub>SHV</sub>). A total of 93/95 UPEC isolates were assigned to 5 of the eight phylogenetic groups. Phylogenetic groups B2 (31/95, 32.6%) and D (30/95, 31.6%) predominated. Two out of 95 (2.1%) isolates were unassigned to a phylogenetic group. A majority of the isolates (65.2%) that were ESBL producers belonged to phylogenetic group B2.

**Conclusion:** This study has determined that less than a quarter of UPEC are ESBL producing, so beta-lactam drugs still have utility in treating UTIs. CTX-M and TEM genes, were the predominant beta-lactam resistance genes suggesting that the ESBL resistance mechanisms are not yet highly diversified. Globally ESBL UPEC belong predominantly to B2 and D phylo-groups similar to the UPEC populations in Kenya. These phylo-groups are high-risk clones for ESBL production that can be monitored as a proxy for increasing beta-lactam resistance.

**Keywords:** *Escherichia coli*, beta-lactamase, Phenotypic, Genotypic, ESBL, AmpC, uropathogenic, UPEC

# SCIENTIFIC SESSION 14:

## Public Health (2)

**Abstract 094****Title: Evaluation of Community Led Total Sanitation in Lungalunga Sub County October 2017 to September 2019**

**Mohammed Matano Mwachakure** (Kwale County Government)\*; Maurice O Owiny (Kenya FELTP); Elvis Oyugi (Kenya FELTP)

**Background:** Open defecation (OD) remains a risk factor for infestation by soil transmitted helminthes and diarrheal diseases through contamination of water and food by harmful pathogens. Kwale County has been running campaign to promote creation of Open Defecation Free (ODF) zones. We assessed the impact of eradicating OD on incidence of diarrhea in two wards in Lungalunga Sub County.

**Methods:** A cross sectional study was conducted by reviewing diarrhea morbidity data in outpatient register (MOH 204B). Data were from facilities within two Wards in Lungalunga Sub County: Dzombo Ward with fourteen open defecation free (ODF) villages and Vanga ward with only one ODF village. A case was a record of diarrheal disease in a person aged >5 years who was a resident of villages within Dzombo and Vanga Wards. We excluded records that were >80% incomplete. Variables assessed were demographic and clinical characteristics and OD/ODF status of the village the case resided in. We calculated descriptive statistics and used Chi square to test for statistical significance at 95% confidence level. We assessed data quality and consistency by comparing entries in the outpatient register, monthly summary (MOH 705B) and entry in Kenya Health Information System (DHIS2).

**Results:** A total of 3,697 records were reviewed; 64.9% (1,299/3,697) were female, median age was 18 years (IQR= 18), 70% (2,590/3,697) were aged ≥13years, 54.7% (2,024/3,697) were reported between October 2017 and September 2018, 72.2% (2,669/3,697) and 10% (368/3,697) resided in Vanga Ward and Kiwegu village respectively, and 11.8% (437/3,697) were done stool microscopy. Regarding diagnosis, 85.5% (3,161/3,697) had gastroenteritis and 13.1% (485/3,697) had amoebiasis. Living in Vanga ward OD had higher odds of diarrhea incidence (OR=26.8, CI: 15.6 – 45.8). All the variables met upper threshold (90%). Data consistency between MOH204B, MOH705B and DHIS2 was 100%.

**Conclusion:** Living in Vanga Ward was associated with getting a diarrheal disease. We recommend health promotion strategies to ensure OD villages become ODF as a way to reduce diarrheal morbidities. Keywords: Open defecation Diarrhea, Amoebiasis, Kenya.

**Abstract 095****Title: Improving Water Sanitation and Hygiene in Public Hospitals**

**Michuki J Maina** (KEMRI Wellcome Trust)\*; Olga Tosas-Auguet (Nuffield Department of Medicine, University of Oxford); Jacob Mc Knight (Nuffield Department of Medicine, University of Oxford); Constance Schultsz (Amsterdam Institute for Global Health and Development); Mike English (KEMRI Wellcome Trust)

**Background:** Poor water sanitation and hygiene (WASH) in health care facilities increases hospital-acquired infections and the resulting greater use of second-line antibiotics promotes antimicrobial resistance (AMR). Existing WASH tools are not designed for survey work of larger facilities or summary reporting from multiple facilities. **OBJECTIVES** To modify an existing WASH Facility improvement tool to improve accountability for action.

**Methods:** We modified the WASH facility improvement tool developed by the world health organization and collected data at ward and facility level in 14 Kenyan hospitals. The facility-level assessment considered pooled observations from individual inpatient wards, outpatient areas, other service areas. 65 indicators in 4 domains were each assessed, as either not meeting target-0; partially-1 or fully meeting target-2. An aggregate score was then generated for each ward and facility. We established three levels of accountability for WASH. The regional/county level, hospital management and the infection prevention and control committees(IPC)to improve tracking and implementation of WASH.

**Results:** Out of the 65 indicators provided, the regional/county government is responsible for a total of 9 indicators, the hospital management 31 and the IPC committee 25 indicators. Using a novel scoring approach focused on providing scores linked to who is responsible for action data suggest indicators under the hospital infection prevention committee had the poorest performance at ward level, with a median score of 44.6[IQR 35.3-57.5] and those under the hospital management had a median score of 55.7% [IQR 53.0-59.4].

**Conclusion:** Gaps exist in the state of WASH in Kenyan hospitals. While the world focuses on the need for new antibiotics they are neglecting basic

preventive measures that promote patient safety / reduce harm and that will help prevent AMR in the long run. But assigning responsible for action may improve performance and make follow up easier.

**Abstract 096****Title: Vitamin D insufficiency is highly prevalent among children living in Africa**

**Reagan Moseti** (KEMRI/Wellcome Trust)\*; Alexander Mentzer (Wellcome Centre for Human Genetics, Nuffield Department of Medicine, University of Oxford, UK); John Muriuki (Kenya Medical Research Institute (KEMRI)-Wellcome Trust Research Programme, Kilifi, Kenya); Wandia Kimita (Kenya Medical Research Institute (KEMRI)-Wellcome Trust Research Programme, Kilifi, Kenya); Francis Ndungu (Kenya Medical Research Institute (KEMRI)-Wellcome Trust Research Programme, Kilifi, Kenya); Alexander w Macharia (Kemri-wellcome.org); Clare Cutland (MRC: Respiratory and Meningeal Pathogens Research Unit, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa); Sodiomon Sirima (Groupe de Recherche Action en Sante (GRAS), 06 BP 10248, Ouagadougou 06, Burkina Faso); Amidou Diarra (Groupe de Recherche Action en Sante (GRAS), 06 BP 10248, Ouagadougou 06, Burkina Faso); Alfred Tiono (Groupe de Recherche Action en Sante (GRAS), 06 BP 10248, Ouagadougou 06, Burkina Faso); Emily Webb (London School of Hygiene and Tropical Medicine, London, UK); Swaib Lule (MRC/Uganda Virus Research Institute and London School of Hygiene & Tropical Medicine Uganda Research Unit, Entebbe, Uganda); Alireza Morovat (Department of Clinical Biochemistry, Oxford University Hospitals, Oxford, UK); Adebowale Adeyemo (National Human Genome Research Institute, National Institutes of Health, Bethesda, USA); Thomas Williams (Department of Medicine, Imperial College, London, UK); Sarah Atkinson (Department of Paediatrics, University of Oxford, Oxford, UK)

**Background:** There is limited information on the prevalence of vitamin D deficiency in African children despite its link to various diseases. We aimed to determine the prevalence and risk factors for vitamin D deficiency among children living in Africa.

**Methods:** In this study, we included 3,880 community-based children from Kenya, Uganda, Burkina Faso and South Africa. We measured 25-hydroxyvitamin D (25(OH)D), C-reactive protein (CRP), malaria parasitaemia, and anthropometry. We defined vitamin D deficiency as 25(OH)D concentrations below 50 nmol/L and vitamin D insufficiency as concentrations between 50-75 nmol/L. Inflammation

was defined as CRP > 5 mg/L. We evaluated the association between vitamin D status and age, gender, stunting, underweight, wasting, inflammation, and *P falciparum* parasitaemia using regression analyses.

**Results:** The prevalence of vitamin D deficiency and insufficiency were 7.4% and 35.4%, respectively. The mean 25(OH)D level was 78.1 nmol/L (95% CI 77.3, 78.9). Children from South Africa had lower 25(OH)D levels than other cohorts. The vitamin D status of the children decreased with age and increased with higher CRP levels across all cohorts. Malaria parasitaemia was significantly associated with vitamin D insufficiency in children from Kenya, but little association was observed in other countries. We found no association between vitamin D status and gender or poor nutrition, as indicated by stunting, underweight, and wasting.

**Conclusions:** Our findings indicate that vitamin D insufficiency rather than deficiency is common in African children. Health care providers and policy-makers in Africa should be aware of vitamin D insufficiency and its possible consequences in young children

**Abstract 097****Title: Improving Pre-Analytical Processes of Hiv Viral Load and Early Infant Diagnosis Services through Laboratory-Clinical Interface**

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**Background:** Over 300 health facilities in western Kenya are networked to the Kenya Medical Research Institute-Centre for Global Health Research (KEMRI-CGHR) laboratory for HIV viral load (VL) and Early Infant Diagnosis (EID) testing. Specimens from these facilities are transported to twenty-three viral load hubs (central health facilities) for plasma harvesting, temporary storage, batching and final transportation for testing. The pre-analytical workflow in these health facilities including the hubs affect the specimen integrity and the overall quality of test results. In January 2018, KEMRI-CGHR HIV research laboratory, with the support of CDC technical team, adopted a laboratory-clinical interface that incorporated ten clinical implementing partners (CIPs) supporting HIV program in the health facilities. We evaluated field related performance indicators of pre-analytical phase of testing following implementation of the laboratory-clinic interphase.

**Methods:** We reviewed VL/EID national (NASCO) dashboard data for specimen rejection rates, redraw of rejected samples, sample dispatch turnaround time (TAT) and requisition data completeness for the period 2016-2017 and 2018-2019. Sample shipment records were reviewed for evidence of tracking tools and temperature monitoring during specimen transportation.

**Results:** Rejection rate for VL samples reduced to 0.5% in the period 2018-2019 from 1% in 2016-2017 whereas rejection rate for EID was up at 1.2% from 0.8%. Only 6.3% of EID samples and 10.7% of VL samples were redrawn for retesting in 2018-2019 compared to 21% and 34.6% in 2016-2017. The duration taken by EID and VL samples at the collection site prior to dispatch for testing reduced to a maximum of 3 days from 6 days. Missing patients' data on gender decreased

to 0.03% from 0.7% while missing age decreased to 0.1% from 0.9%. Sample shipment tracking logs and temperature monitoring systems were used by all the 23 viral load hubs in 2018-2019 whereas there was no documentation of the same for the period covering 2016-2017.

**Conclusion:** The results show that implementation of a laboratory-clinical interface can improve EID and VL sample quality, sample dispatch TAT and sample shipment conditions in the field. These variables can ultimately impact positively on the overall quality of EID and VL results. However, there is need to focus on refresher trainings on EID sample quality requirements and frequent reminders on recollection of rejected EID and VL samples.

**Abstract 098****Title: Assessment of Utilization of Blood Transfusion Services among Medical Patients admitted in Migori County Referral Hospital in 2018****\*Catherine Menganyi**<sup>1</sup> E.Mgamb<sup>1</sup>, E Oyugi<sup>2</sup>, M. Gachari <sup>2</sup>

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**Background:** In Kenya, the demand for blood supply is not met due to shortages in stores and blood banks. In low income countries, 52% of blood transfusions are given to children aged <5 years, Adults aged ≥ 65 years account for 75% of those transfused. We sought to characterize patients who received blood transfusions in Migori County.

**Methods:** We carried out a cross sectional study that involved retrospective review of records of patients who received blood transfusion in medical, pediatrics and Maternity wards in Migori County Referral Hospital (MCRH) from January to December 2018. Data was extracted from in patient files using a Microsoft Excel abstraction tool. We collected socio demographic variables and clinical information. We calculated descriptive statistics by calculating measures of central tendency for continuous variables and proportions for categorical variables. We calculated odds ratio with their respective 95% confidence intervals and P values using patient outcome and turnaround time of transfusion as the outcome variable. Factors that had a P value of less than 0.05 were considered statistically significant.

**Results:** We reviewed 704 records. Females were 503/704 (71.5%), median age was 24 inter quartile range (25 years), patients referred from other facilities were 145/704 (20.6%), the highest number of admissions were in the female medical ward 210/704(29.8%). Patients with hemoglobin level below 5g/dl were 392/704 (56.7%), number of transfusions due to severe anemia and postpartum hemorrhage were 381/705 (51.1%) and 122/704(17.3%) respectively. Patients transfused in less than 24 hours were 680/704(98%) and those who died were 99/704(14.1%). Observations during transfusions was not done in 558/704

(80.7%) patients. The odds of transfusion within 24 hours in pediatrics was higher compared to the adults (OR: 3.83, 95%CI 1.31-11.2). The odds of being transfused within 24 hours was more likely to occur among patients diagnosed with obstetric emergencies (OR: 0.67, 95%CI 0.15-3.07) as compared to other systemic conditions. The odds of dying were less among transfused women with obstetric emergencies compared to other systemic conditions (OR: 0.52, 95% CI 0.27-0.98)

**Conclusion:** Majority of patients were transfused due to anemia and PPH. More blood should therefore be provided in these wards to cater for this conditions. Further research should be done to find out why vitals are not taken to most of the patients.

**Abstract 099****Assessment Of Makueni County Healthcare Workers Capacity To Acquire, Summarize And Adopt Research Evidence For Decision Making Processes, Kenya**

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**Introduction:** There has been an increasing momentum towards evidence-informed health systems since early 1990s. The need to bridge governments' demand for research evidence and use in policy and decision-making has been recognized for a long time. Study objective was to assess Makueni County healthcare workers' capacity to acquire, summarize and adopt research evidence for decision-making processes.

**Methodology:** A cross-sectional study design was used. The study was carried out in all public hospitals in Makueni County, Kenya. Thematic domains evaluated included articulation, acquisition, appraise, adapt and application of research evidence. Study respondents were clinical and administrative staff. A semi-structured questionnaire was administered to staff on duty. Study limitation: Majority of medical doctors did not participate citing heavy workload.

**Results:** A total of 10 public health facilities were visited. Overall, 142 healthcare workers participated in the survey. Articulation had 33.3% of the staff involved in discussions on how research evidence relates to hospital / programme goals thus generating relevant research agenda. Acquisition had 32.6% of respondents knew where and how to search for evidence. Adaptation had 31.2% of the respondents reporting they were able to communicate evidence appropriately to management. In addition, 21.7% reported there were staff who could synthesize research from multiple sources, while 23.2% were able to link research results

to key issues / programmes expectations. Assessment had 28.6% of the respondents had ability to appraise the quality and methodologies used in research studies. Application had 40.3% of respondents reported that decision makers gave formal consideration to recommendations given by staff who had evidence that address local health issues.

**Conclusion:** Makueni County health workers have untapped capacity to acquire, summarize and adopt research evidence. Most of the issues if capacity is developed, could probably facility change in generation, demand and sustained use of research evidence.

**Policy recommendation:** Capacity development for research evidence uptake needs to be problem-based, participatory, prolonged and supportive environment, not just training.

## Abstract 100

**Title:** Factors associated with exit of HIV stable patients on Fast track ART refill at Homabay County Teaching and Referral Hospital, November 2014 – December 2018

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**Background:** In 2018, Homabay County had a HIV prevalence of 20.7% compared to National HIV prevalence of 4.8%. A fast track antiretroviral (ART) refill approach was introduced to manage HIV stable clients and those who were not managed effectively were referred to the unstable clinic. The County referral hospital implemented a Fast track ART refill to reduce clinician workload and improve on patient management. We determined the factors leading to exit of stable patient from the model.

**Methods:** We reviewed records of patients enrolled in Fast track between November 2014 – December 2018 in Homabay County hospital HIV Clinic. Data was abstracted from Kenya Electronic Medical Records system, Fast track electronic register, and sociodemographic and clinical variables were collected. Data quality assessment was done and descriptive statistics and corresponding percentages were used to summarize categorical variables. The outcome variables were patient active in fast track and Patients exiting. We calculated odds ratios and used Chi Square to test for significance at 95% confidence interval using Open EPI menu.

**Results:** We reviewed 3069 records, mean age was 50(SD 17.6). Females were 60%(1829/3069) and married 60%(1836/3069). Those in WHO Stage 3 were 46% (1398/3069), patients on Nucleoside reverse transcriptase inhibitors plus Non Nucleoside Reverse Transcriptase/integrase inhibitors regimen were 94% (2877/3069) and 81% (2477/3069) had a baseline VL < 400 copies at entry.

Those who exited the model were 28% (858/3069). Reasons for exit were treatment failure and non adherence 57% (491/858), malnutrition 9% (80/858) and pregnancy 6 % ( 55/858). The odds of exit were higher in patients on Nucleoside Reverse Transcriptase Inhibitors and Protease inhibitors drugs 7.4(CI 4.4-12.6), those aged 24 years and below (OR 0.7, CI 0.2-2.0), baseline VL< 400 copies (OR 0.6, CI 0.3-1.4), WHO Stage 1 & 2 (OR 0.9, CI 0.8-1.0) and duration of ART< 3 years (OR 1.0, CI 0.8-1.3).

**Conclusion:** More than half of the patients who exited had treatment failure and non-adherence. Patients on PI based regimen had greater odds of exit. We are recommending, integration of adherence support clubs especially for those on PI regimens, nutrition and contraceptive services for patients on Fast track.

**Key Words:** HIV stable, fast track ART refill

## Abstract 101

### **Title: Feasibility, implementation and experiences of TB integrated laboratory information management system in a referral lab in western Kenya**

**Ben Odhiambo** (KEMRI-CGHR)\*; Ronald Odero ( KEMRI-CGHR); Joshua JBO Ongalo (KEMRI-CGHR); Albert Okumu ( KEMRI-CGHR); Christine Ogollah (KEMRI-CGHR); Edwin Ochieng (APHL); Steve Wandiga (KEMRI-CGHR); McCathy Kimberly (CDC)

**Introduction:** Data management is critical in the public health sector for policy and decision making. In 2018, US Centers for Disease Control and Prevention (CDC) contracted Association of Public Health Laboratories (APHL) to design, develop and install a Laboratory Information Management System (LIMS) in Kenya Medical Research Institute Tuberculosis laboratory. We sought to evaluate the implementation of the Integrated LIMS in our laboratory.

**Methodology:** APHL conducted infrastructural assessments of the laboratory. Labware company, designed and installed the system incorporating the laboratory testing algorithm between March-August 2018 with facilitation from Centre for Global Health Research's ICT department for server hosting, networking and hardware. Consultant Company was contracted. System and assays algorithm testing with dummy data and end-user training for one week were done. System went live in August 2018 followed by super-user training.

**Results:** TB LIMS system was installed and launched on 27 August 2018. Key components of LIMS include: sample login, instrument management, reagent management, result entry and quality management reports are optimally utilized while inventory management is sub-optimally utilized. Five (5) training were conducted pre- and post-installation for 13(100%) staff and 2(15%) super users on-site and additional super user training off-site. A total of 1904 samples were received between September 2018 and 2019. Of these, 1352(71%) culture, 1180(62%) microscopy, 777(41%) Line Probe Assay 552(29%) GeneXpert. LIMS interfaced with only 1(33%) instrument out of possible 3(66%).

**Conclusion:** LIMS has assisted the laboratory in the proper management of its operations by reducing turnaround time and enhancing patient care.

# **SCIENTIFIC SESSION 15:**

Sexual,  
Reproductive,  
Adolescent and  
Child Health  
(SRACH)(2)

**Abstract 102****Title: Healthcare-related stigma experiences among MSM in sub-Saharan Africa: Findings from the HPTN 075 study**

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**Background:** In many sub-Saharan African countries, men who have sex with men (MSM) are often marginalized. The stigma associated with homosexuality has been linked to low self-esteem, depression and reduced use of healthcare services. The objectives of this analysis were to determine the proportion of MSM who reported any healthcare-related stigma experiences, and to identify factors associated with these experiences. HPTN 075 is a cohort study designed to assess the feasibility of recruiting and retaining MSM in sub-Saharan countries into research studies.

**Methods:** Four sites in sub-Saharan Africa (Kisumu, Kenya; Blantyre, Malawi; Cape Town and Soweto, South Africa) enrolled a total of 401 MSM. Men were recruited into the study using various site-specific strategies. Psychosocial and behavioral data were collected at enrollment using a structured questionnaire. Healthcare-related stigma experiences was based on a six point scale (e.g., afraid to go to healthcare services, avoiding healthcare services.). Data from the enrollment visit were available for 396 men and were analyzed using univariate and multivariate logistic regression models.

**Results:** Almost half of all MSM, (45.5%; 180/396) reported healthcare-related stigma experiences across all sites most frequently feeling afraid to seek healthcare services (36.4%) and avoiding seeking services because of worries of discovery their sexual involvement with men (29.3%). Few men (2.5%) reported

denial of health services because of having sex with men. The proportion of men reporting any healthcare-related stigma at each site was 64.0% (Soweto), 51.5% (Cape Town), 45.0% (Kisumu) and 20.6% (Blantyre). Compared to Kisumu, adjusted odds ratio of reporting any healthcare-related stigma experiences were greater for Soweto (2.60, 95% CI=1.30, 5.19, p-value=0.007) and less for Blantyre (0.27, 95% CI=0.13, 0.54, p-value=0.001). The AOR of health care-related stigma was greater for participants who more strongly felt that they did not have a supportive gay community to rely on (AOR=1.46, 95%CI=1.09, 1.95) and smaller for participants who never engaged in transactional sex compared to those who said they did (AOR=0.43, 95%CI=0.26, 0.72) and the more social support they experienced (AOR=0.76 per one point increase on the scale, 95%CI=0.61, 0.95).

**Conclusion:** A large proportion of MSM enrolled in a cohort study at four sites in sub-Saharan Africa reported any healthcare-related stigma experiences. Relatively few men reported being denied healthcare due to being MSM. Our results suggest that living in a community with MSM support groups and aid and assistance would reduce stigma, improve access to healthcare, and might ultimately reduce HIV transmission

**Abstract 103****Title: Morbidity and Mortality of Neonates: Preliminary Findings from Inpatient Neonatal Register (MOH 373) Within Selected Health Facilities in Kenya.**

**Enock Sigilai**<sup>1</sup> Beatrice Olack<sup>2</sup>, Allan Govoga<sup>1</sup>, Caroline Mwangi<sup>1</sup>, Grace Nalwa<sup>3</sup>, Phelgona Otieno<sup>2</sup>, Benard Wambu<sup>1</sup>, Laura Ayiengo<sup>1</sup>

<sup>1</sup> Ministry of Health, <sup>2</sup> Kenya Medical Research Institute, <sup>3</sup> Maseno University

**Background:** Neonatal morbidity and mortality are major public health challenges in Kenya that hinder attainment of child survival Sustainable Development Goals. Data provides opportunity to document and keep track morbidity and mortality patterns of neonates for appropriate action and evidence based decision making. MOH 373 is an inpatient newborn register introduced in Kenya on July 2019. It that allows for collection of consistent and standardized data on causes of neonatal morbidity and mortality in Kenya. We aim to describe causes of neonatal morbidity and mortality as documented in MOH 373 within selected health facilities in Kenya.

**Methods:** This was a cross sectional study conducted in 13 health facilities within different counties. Data was collected from the newly introduced inpatient neonatal register. Sensitized health care providers working in the newborn units collected data on daily basis using the register and filled in summary sheets that were later on sent to the Ministry of Health headquarters. Data were analysed using excel.

**Results:** Between July and October 2019, 3866 babies, were admitted in the new born unit. The major reasons for admission were: prematurity 27%, birth asphyxia 25%, respiratory distress syndrome 19% and sepsis 15%. More than half 2552 (66%) of the admitted babies died within the first 24 hours and 18% died within 7days. The deaths reduced with increasing birth weight as follows; <1000g (74%), 1001g-1499g (39%), 1500g-1999g (15%), 2000g-2499g (10%) and >2500g (8%). The leading cause of death was birth asphyxia (30%), prematurity (26%), anaemia (18%) sepsis and jaundice (9%). More than half (70%) of the neonates admitted received chlorhexidine for cord care and only 40% of the preterm babies

were initiated on Kangaroo Mother Care. Continuous Positive Airway Pressure was administered to only 8% of neonates who had respiratory distress syndrome.

**Conclusion:** MOH 373 provided timely documentation on causes of morbidity and mortality of sick neonates. Data generated from this register provides opportunity for proper planning and evidence based decision making for survival of the neonates.

## Abstract 104

### **Title: Community Perceptions on Preterm Births, Practices and Care for Preterm Newborns in Migori County Kenya: Preliminary Analysis of a Qualitative Study.**

**Beatrice Olack**<sup>1</sup>, Lilian Nyandieka<sup>1</sup>, Beryl Odipo<sup>1</sup>, Susanne Martin-Herz <sup>2</sup>, Kevin Achola<sup>1</sup> Grace Nalwa<sup>3</sup>, Linet Ouma<sup>1</sup>, Priscah Lihanda<sup>1</sup>, Phelgona Otieno <sup>1</sup>

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**Background:** Community is a significant voice on how health delivery is received and utilized by its members. Acceptance and utilization of interventions for premature babies is highly dependent on community's knowledge, perceptions, beliefs and accepted norms. The study aimed to explore the community's perceptions on preterm births, their practises and care for preterm new-borns.

**Methods:** The study was conducted among rural and peri urban community members within six sub counties of Migori County. Twelve Focus Group Discussions with parents of children under five years and twenty-four Key Informant Interviews with grandparents, opinion leaders and Community Health Volunteers were conducted using a qualitative facilitation guide. Discussions were audio-recorded, transcribed verbatim and translated to English. Data analyses was conducted using Atlas ti software.

**Results:** Participants perceived maternal related causes of preterm births as; family planning, heavy work load, use of conventional and herbal medication, promiscuity, and illnesses of the womb. Paternal causes cited were; physical violence on the expectant mother, verbal abuse and extramarital affairs. Social causes mentioned were; cultural taboos, witchcraft or will of God. Care strategies for the preterm babies commonly mentioned included: provision of warmth by dressing the baby in layers of clothing and placing the baby skin to skin contact on the chest, and feeding the baby breast milk or other feeds like glucose water and fruit juices for babies unable to feed on breast milk. Perceived strategies to prevent preterm births included advising pregnant mothers to visit health care facilities as soon as they know they are pregnant and educating the members of

the community on the causes of preterm births.

**Conclusion:** Community perceptions on causes of preterm births and care for these babies are varied from facts to myths. Community sensitization is key in providing knowledge on facts related to causes of preterm births and care for the preterm babies. Positive practices like Kangaroo Mother Care and breastfeeding are promotive towards survival of the preterm babies need to be reinforced.

**Abstract 105****Title: Prevalence of Self-Reported Sexually Transmitted Infections (STIs) and Associated Factors among Fisherfolk Community in the Islands of Lake Victoria, Kenya**

**Diana M Aluko** (UCSF Global Programs)\*; Wanjiru Waruiru (5. University of California San-Francisco); Mary Mwangome (1. Global Programs for Research and Training); Mary Schmitz (2. Centers for Disease Control and Prevention (CDC)); George Mgomella (2. Centers for Disease Control and Prevention (CDC)); Felix Humwa (1. Global Programs for Research and Training ); Sheru Muuo (1. Global Programs for Research and Training); Helgar Musyoki (4. National AIDS and STI Control Programme ); Daniel Kwaro (3. Kenya Medical Research Institute – Center for Global Health Research ); Anne M Adegga (KEMRI); Hellen Awuoche (3. Kenya Medical Research Institute – Center for Global Health Research ); Sammy Khagayi (3. Kenya Medical Research Institute – Center for Global Health Research )

**Background:** Sexually transmitted infections (STIs) can increase the risk of acquisition and transmission of HIV and interfere with the effectiveness of HIV treatment for prevention. According to 2012 Kenya AIDS Indicator Survey, 0.9% of adults and adolescents reported having STI symptom(s) in the past 12 months. Fisherfolk communities are among the groups that exhibit high risk sexual behavior with high HIV/STIs prevalence. Improving our understanding of the prevalence of STIs and associated risk factors can inform targeting of interventions and programming for these communities.

**Methods:** In 2017/2018, a cross-sectional household survey was conducted among fisherfolk communities (15 to 64 years) residing in eight Lake Victoria islands. Demographic and behavioral characteristics, and blood samples for HIV testing were collected. Self-reported STI status was defined as presence of ulcer or sore on or near the vagina or penis; or abnormal discharge from the penis or vagina in the past 12 months. Stepwise logistic regression was used to identify factors associated with self-reported STIs. Variables which were had a p-value

<0.15 in the bivariate analysis were selected for the multivariate model. Analyses were weighted to account for the sampling design. Statistical significance was taken at  $p < 0.05$ .

**Results:** Among 1696 fisherfolk interviewed, 1591 (93.8%) responded to questions regarding self-reported STIs. Of these, 720(43.5%) were men and 821(56.5%) women. Overall prevalence of self-reported STIs was 13.7% (95% Confidence Interval [CI] :11.9-15.8); with women reporting higher prevalence 14.5% (95% CI 11.9-17.4) compared to men 12.8% (95% CI:10.5-15.6). Factors associated with self-reported STI in the overall study population were having four or more lifetime sexual partners (adjusted odds ratio (AOR)=2.2, 95% CI:1.0-4.8); and transactional sex in the past 12 months (AOR 1.9, 95% CI:1.3-2.7)\*. Among women, having four or more lifetime partners (AOR=3.1, 95% CI:1.3-7.5) was associated with self-reported STIs\*\*. Among men, residing in the northern islands (AOR=1.7, 95% CI:1.0-2.9) and having transactional sex (AOR=2.3, 95% CI:1.4-3.8) were associated with self-reported STIs\*\*\*.

**Conclusions:** The fisherfolk community have a higher prevalence of self-reported STIs than the general population. These findings highlight the need to target interventions focused on reduction of sexual partners and social-economic interventions to address transactional sex while considering geographical variation.

## Abstract 106

### Title: Maternal VL monitoring in PMTCT: coverage and clinical action at 4 Kenyan hospitals

**Matthew Sandbulte** (University of Kansas Medical Center); Melinda Brown (University of Kansas Medical Center); Catherine M Wexler (University of Kansas Medical Center)\*; May Maloba (Global Health Innovations); Brad Gautney (Global Health Innovations); Kathy Goggin (Children's Mercy Kansas City); Shadrack Babu (Kenya Medical Research Institute); Elizabeth Muchoki (Kenya Medical Research Institute); Martin Ochieng (Kenya Medical Research Institute); Nicodemus Maosa (Kenya Medical Research Institute); Sarah Finocchario-Kessler (University of Kansas Medical Center)

**Background:** Routine viral load (VL) monitoring of HIV-positive pregnant and breastfeeding women and prompt clinical action are essential to prevent mother to infant HIV transmission (PMTCT). Kenyan PMTCT guidelines recommend baseline VL testing at first antenatal care (ANC) visit (previously diagnosed) or after 6 months of ART (newly diagnosed), with repeated testing every 6 months; yet implementation and documentation are poor.

**Methods:** We conducted a retrospective record review to evaluate guideline-adherent VL testing during PMTCT at four Kenyan government hospitals located in geographically diverse cities in Coastal (n=1), Central (n=2), and Western (n=1) Kenya. Pregnant women enrolled in the HIV Infant Tracking System (HITSsystem 2.0) from May 2016-March 2018 were eligible for inclusion (n=424). This version of the HITSsystem did not have mechanisms to track or reinforce VL testing; therefore, engagement of patients in VL testing approximated the local standard of care. Paper-based facility records supplemented HITSsystem data to capture complete data for the following: dates of ART initiation, ANC enrollment, last menstrual period (LMP), and delivery date as well as any VL sample collection, results, and clinical action in response to a detectable VL result (>1000 copies/ml) documented during the priority period for PMTCT VL monitoring (between LMP and 6m postpartum). The window for guideline-adherent VL testing was extended 30 days beyond the recommended date. For those without a documented infant

date of birth (DOB), antenatal or postpartum testing period was determined using estimated due date. VL tests occurring between the LMP date and 6 months postpartum were included in analysis, and each patient's first VL test within this period was designated as the baseline. We computed proportions who received VL testing within recommended timeframes and who received clinical action after unsuppressed VL result.

**Results:** Of 424 participants, any VL testing was documented for 305 (71.9%) women and repeat VL testing was documented for 79 (18.6%). Only 107 women (25.2%) received a guideline-adherent baseline VL test and 26 (6.1%) received a guideline-adherent baseline and repeat VL test sequence. Return of baseline and repeat VL test results to the facility was high (average 96.4%), but patient notification of VL results was low (36.1% baseline and 48.8% repeat). Clinical action for unsuppressed VL results was even lower: 11 of 38 (28.9%) unsuppressed baseline results and 2 of 14 (14.3%) unsuppressed repeat results triggered clinical action.

**Conclusions:** Guideline adherent VL testing during PMTCT must be prioritized to identify and support women at high risk of perinatal HIV transmission in Kenya. We have added features to the HITSsystem 2.1 intervention to prompt guideline adherent maternal viral load monitoring in the antenatal and postpartum periods. A cluster-randomized trial is planned to evaluate the impact on viral suppression at the time of delivery and 6 months postpartum.

**Abstract 107****Title: Piloting at-birth HIV DNA PCR testing at four government hospitals in Kenya**

**Sarah Finocchario-Kessler** (University of Kansas Medical Center); Catherine M Wexler (University of Kansas Medical Center)\*; May Maloba (Global Health Innovations); Melinda Brown (University of Kansas Medical Center); Kathy Goggin (Children's Mercy Kansas City); Shadrack Babu (Kenya Medical Research Institute); Elizabeth Muchoki (Kenya Medical Research Institute); Martin Ochieng (Kenya Medical Research Institute); Nicodemus Maosa (Kenya Medical Research Institute); Brad Gautney (Global Health Innovations)

**Background:** To optimize infant survival, HIV-positive infants should be diagnosed and initiated on ART by 12 weeks of age. In Kenya, early infant diagnosis (EID) with HIV DNA PCR testing at 6 weeks postnatal achieves in less than 20% of HIV+ infants. Kenya's new EID guidelines tentatively proposed adding PCR testing at-birth to facilitate earlier ART initiation for infants with intrauterine infections, maintaining repeat testing at 6-weeks to detect intrapartum transmission.

**Methods:** This study was embedded in a non-blinded pilot study for HIV testing using both point of care (POC). The study was conducted at four Kenyan hospitals implementing randomly assigned POC technologies (n=2 GeneXpert, n=2 Alere q). HIV-exposed infants born between November 3, 2017 and November 3, 2018 were eligible for enrollment. Enrolled infants were offered both POC and PCR HIV testing at birth (0 to <4 weeks) and at 6-weeks (4-12 weeks), with optimal testing defined as receipt of a birth test at 0-2 weeks of age and receipt of a 6-week testing at 4-8 weeks of age. We examined the proportion of infants tested within the birth window, the proportion receiving birth and 6-week testing, and median age at PCR testing (birth and 6-weeks).

**Results:** Of 626 HEIs included in the study, 452 (72.2%) received a PCR test within the birth window. The median infant age at birth PCR was 0.86 weeks. 448 (99.1%) results were returned to the facility and 440 (98.2%) mothers were notified of their infants results at the median infant age of 3.0 weeks. In the

standard 6-week window, 577 (92.3%) HEIs received a PCR test, at a median age of 6.14 weeks. 573 (99.3%) results were returned to the facility and 562 (98.1%) mothers were notified at a median infant age of 10.0 weeks. Out of the 452 HEIs receiving an initial birth PCR, 418 (92.5%) returned for a repeat test in the 6-week period—or 66.8% of all enrolled infants. Of retested infants, 332 (73.5%) achieved optimal testing - just over half (53.0%) of all infants enrolled. The only significant predictors of complete PCR testing (birth and 6 weeks) was hospital of service and timing of study enrollment (before, during or after delivery). Five infants were initiated on ART from a positive HIV DNA PCR result at-birth (n=2) and at 6 weeks (n=3). Mean age at ART initiation for those diagnosed through PCR at-birth was 27 days, while mean age at ART for those diagnosed at 6-weeks was 77.3 days.

**Discussion:** These pilot data suggest birth PCR testing is feasible in Kenyan government hospitals and can result in significant reductions in infant age at notification of results and earlier ART initiation for positive infants. In order for successful implementation of PCR testing at birth, continued sensitization for patients and collaboration among facility providers and laboratories is needed to ensure consistent and timely sample collection and processing, as well as immediate ART initiation for HIV-positive infants.

**Abstract 108****Title: Perception on alternative medicine for children under five years among community members in western Kenya: A qualitative study**

**Sarah H Ngere** (KEMRICGHR)\*; Peter Otieno (KEMRICGHR); Maryanne Nyanjom (KEMRICGHR); Kelvin Akoth (KEMRICGHR); Kennedy Ochola (KEMRICGHR); Janet Agaya (KEMRICGHR); Victor Akelo (CDC)

**Background:** Kenya's national child mortality rate is 49/1000 live births, and in Siaya and Kisumu counties, 99/1000 and 79/1000 respectively. The Child Health and Mortality Prevention Surveillance Program and the Kenya Mortality Study are some of the recent efforts to better understand causes of child deaths in Kenya and to inform interventions aimed at reducing child mortality. Understanding responses to childhood illness and care-seeking behavior is important for success of these efforts. We qualitatively assessed the perception of community members on the use of alternative medicine in children under 5.

**Methods:** We conducted 29 in-depth interviews, 5 focus group discussions and 11 semi-structured interviews with caregivers, healthcare workers, religious leaders and opinion leaders in a peri-urban informal settlement in Kisumu and a rural setting in Siaya County. Purposive sampling was used for participant selection. All participants provided consent. Participants were asked about the medicines sought for childhood illnesses. Interviews were audio recorded, transcribed and translated from Dholuo and Swahili to English. Thematic qualitative analysis was done using Nvivo 11.

**Results:** Caregivers believed that certain childhood illnesses such as measles respond better to alternative medicine; in some cases conventional medicine was perceived as harmful. Preference for conventional versus alternative medicine varied; some caregivers considered alternative medicine first before switching to conventional medicine if there was slow or no improvement. Others only resorted to alternative care after conventional medicine failed, while

in other cases the primary method was selected based on the specific child illness. Herbal remedies and spiritual healing were the most frequently used methods of alternative medicine. Reasons associated with use of alternative medicine included cultural preference, belief in witchcraft, lack of confidence in the health system, peer influence, religious beliefs and fear of blame by the community for failure to conform to traditional health beliefs and practices.

**Conclusion:** Alternative medicine is used either as first or sometimes last form of treatment for childhood illnesses suggesting health education gaps as well as the need among healthcare providers to better understand the meanings and values given to alternative medicine by caregivers. Better understanding and communication about health seeking behavior is needed to improve child survival indicators.

# SCIENTIFIC SESSION 16:

Public Health And  
Health Systems

## Abstract 109

**Title: Rapid point-of-care testing for genital tract inflammatory cytokine biomarkers to diagnose asymptomatic sexually transmitted infections and bacterial vaginosis in women: cost estimation and budget impact analysis**

**Angela Kairu** (KEMRI Wellcome Trust)\*; Edina Sinanovic (Univeristy of Cape Town- Health Economics Unit); Lucy Cunnama (Univeristy of Cape Town- Health Economics Unit); Jo-Ann Passmore (Univeristy of Cape Town- Division of Medical Virology); Lindi Masson (University of Cape Town- Division of Medical Virology)

**Background:** Screening for genital inflammation predicts asymptomatic cases of sexually transmitted infections (STIs) and bacterial vaginosis (BV), useful in settings where only syndromic management is available. This study aimed to estimate the costs of genital inflammation screening using a new cytokine biomarker rapid test device and, to determine the budget impact of providing this service in primary health facilities in South Africa.

**Methods:** Costs of screening were estimated for women (15 to 49 years) attending three different family planning clinics in 2016. Unit cost per patient screened from a provider's perspective were calculated using a micro-costing approach, which were used to analyze the budget impact of scaling-up and providing this service in primary health facilities countrywide. Univariate sensitivity analyses tested the robustness of the findings.

**Results:** The cost per woman screened for genital inflammation ranged between US \$13.27 and \$24.26. The scaled-up costs ranged between US \$99,355,214 and US \$183,062,066 countrywide, annually. This was based on the number of women of reproductive age currently seeking contraceptive care at all primary health care facilities, as a proxy for those most susceptible to asymptomatic STIs/BV. The cost estimates were sensitive to changes in personnel costs, utilization rate and population coverage rates.

**Conclusion:** This screening tool is likely to increase case detection, contributing towards better STI/BV management and control, in addition to reducing women's risk of HIV acquisition. However, the cost estimates are high, which could make implementation difficult.

## Abstract 110

### Title: Use of regression calibration to correct for measurement error in assessment of gestational age in a low-resource setting

George O. Agogo (CDC)\*

**Introduction:** Accurate assessment of gestational age (GA) is important to guide patient care, public health interventions and to conduct unbiased research into pregnancy outcomes. Gestational age is most accurately measured by ultrasound (US), which is considered the gold standard. Access to US technology is limited in low-resource settings. We used fundal height (FH) and date of last menstrual period (LMP) and adjusted these for measurement error using estimates derived from US, which were available for a sub-set of participants enrolled in a maternal-child cohort study in rural Western Kenya.

**Methods:** We used data collected from 01/2015 through 09/2019 from women enrolled at public hospitals in Siaya county with pregnancy confirmed by blood test. We used regression calibration to adjust for measurement error in GA data from FH and LMP accounting for various maternal and child characteristics, and Pearson correlation to validate calibrated FH and LMP relative to US. Bland-Altman method was used to quantify the mean bias in the calibrated GA estimates. We further classified GA as preterm (<37 weeks) and calculated the sensitivity, specificity and accuracy of the calibrated FH and LMP measurements compared to US.

**Results:** The GA at delivery was assessed for 1176 mothers using US, 2521 mothers using FH, 2720 mothers using LMP, and 1068 mothers using all the three assessment methods. The mean GA for calibrated FH was 38.6 (standard deviation, SD = 2.14) and for calibrated LMP was 38.7 (SD = 1.27) weeks gestation. Calibration improved the correlation between FH and US from 0.82 to 0.83 ( $P < 0.0001$ ), and between LMP and US from 0.48 to 0.57 ( $P < 0.0001$ ). Calibrating FH /LMP eliminated the bias in mean GA estimates relative to US. Percent preterm births increased from 13.5% to 14.9% by calibrating FH but decreased from 19.9% to 8.6% by calibrating LMP. Calibrating FH improved sensitivity from 0.74 to 0.78 but not specificity (0.95 to 0.94) or accuracy (0.93 to 0.92). Calibrating LMP improved specificity from 0.86 to 0.96 and accuracy from 0.83 to 0.89 but

not sensitivity (0.60 to 0.39).

**Conclusion:** Fundal height may be a more reliable alternative to US in assessing GA in a low- resource setting. Where it is not financially feasible to use US in the whole study population, calibrating the more affordable but error-prone instruments may improve the accuracy of GA assessment.

## Abstract 111

**Title: Preparedness of primary care and community markets to develop a system interface to drive health equity: The Health Kiosk in Markets “HEKIMA” study in Vihiga, Kenya**

**Lydia Kaduka** (KEMRI)\*; Joanna Olale (KEMRI); Erastus Muniu (KEMRI); Joseph Mutai (KEMRI); Boniface Otieno (University of Nairobi); Gilbert Kokwaro (Strathmore University); Harriet Boulding (Kings College London); Majella Okeeffe (Kings College London); Kennedy Cruickshank (Kings College London); Elijah Ogola (University of Nairobi); Seeromanie Harding (Kings College London)

**Background:** The WHO puts primary health care as the most efficient and cost effective way of achieving Universal Health Coverage. The increasing prevalence of non-communicable diseases poses a threat to the healthcare system and the effects are worse in poor communities. Lack of access to quality healthcare remains problematic in LMICs. HEKIMA is a multi-phased feasibility study in Vihiga (Kenya) that explores whether kiosks in community markets, manned by community health workers and supervised by nurses, can improve the reach of preventative care to vulnerable communities.

**Objective:** This was a cross-sectional study to assess the preparedness of primary health centres (HCs) and community markets for a system interface for the prevention and control of cardiovascular diseases (CVD).

**Methods:** Ten out of a total of 18 HCs and 15 of a total of 19 community markets were mapped in each of the two ecological zones of Vihiga. Existing tools were adapted to assess physical infrastructure, human resource, service delivery, NCD-related community outreach, kiosk intervention acceptability and feasibility of supervision domains in the HCs. Market domains assessed included the market profile, leadership and organization of markets, market-based NCD-related activities, feasibility and acceptability of the kiosk intervention. The respondents were health facility in-charges and the leadership of markets (market chairpersons). Descriptive statistics were used to analyze quantitative data, continuous data were expressed as frequency, percentages, mean and

standard deviation. An inductive thematic approach was used to identify patterns and themes. Ethical considerations were met.

**Findings:** The median, size of population served by a HC, number of nurses and community health workers per HC was 20607, 8 and 22 respectively. All HCs had access to electricity but lacked internet connectivity, had basic equipment for blood pressure and blood sugar testing. Majority lacked essential CVD medications, 50% had central databases, and offered diabetes and hypertension services but did not have CVD risk assessment tools. There was no HC-market interface for provision of services. Respondents felt that a sustainable HC-market interface is dependent on governance arrangements, funding, government support, regular communication, acceptability of program by community members and frequent monitoring. Markets had established organizational systems and hosted health related (social) activities. There was willingness from market leadership to partner with health facilities.

**Conclusion:** Significant infrastructural, technical, and resource HC gaps were observed that would need to be addressed to develop HC-market system interface. The qualitative responses, however, signaled strong motivations to co-develop HEKIMA and a recognition of the potential positive impact on health equity.

## Abstract 112

### **Title: Cost-effectiveness of Kenya's former early infant diagnosis (EID) of HIV guidelines**

**Segars James** (Medical University of South Carolina); Catherine M Wexler (University of Kansas Medical Center)\*; Melinda Brown (University of Kansas Medical Center); May Maloba (Global Health Innovations); Brad Gautney (Global Health Innovations); Raphael Lwembe (Kenya Medical Research Institute); Sarah Finocchario-Kessler (University of Kansas Medical Center)

**Background:** Antiretroviral therapy (ART) for infants diagnosed with HIV can extend infant life expectancy by 26 years.<sup>1</sup> Early infant diagnosis (EID) services play a critical role in early detection and ART initiation among infants. From 2006-2016, Kenyan EID guidelines<sup>2</sup> called for: HIV DNA PCR testing at 6 weeks of infant age, if negative, antibody testing at 9- and 18-months with confirmatory PCR testing, and immediate ART initiation for all HIV-positive infants. Kenyan EID guidelines were revised at the end of 2016 to include earlier and more frequently testing (4 PCR/1 antibody vs 1-2 PCR/2 antibody tests). The objective of this study was to evaluate a preliminary cost-effectiveness analysis of EID services under Kenya's former guidelines to serve as a baseline for comparison to the new, more intensive guidelines.

**Methods:** Retrospective review of clinical data from n=1,960 infants born between Jan 1-Dec 31, 2015 and enrolled in the HIV Infant Tracking System (HITS) at n=24 government health facilities in Kenya were analyzed. 393 infants were discharged early and excluded from HIV status analysis due to: facility transfer/relocation (n=351), infant death (n=37), or mother refusal of treatment (n=5), thus 1,567 infants were included in the final analysis. Criteria for determination of final HIV status were: 1) HIV+ (PCR+ at any time point, Ab+ 18 months or ART initiation), 2) HIV-negative (PCR- results and AB- at 18m), 3) incomplete testing (PCR -, but no Ab result at 18 months). Kenya-specific costing data from USAID and Health Policy Project for antibody (\$1.50) <sup>3</sup> and PCR (\$25.05) <sup>4</sup> tests informed total costs for guideline indicated diagnostic costs. Cost per life year saved was calculated as total costs per tests divided by (number of infants on ART \* 26 life years saved).

**Results:** The total costs for infant PCR and antibody testing per EID guidelines for this sample was \$58,275.80. 5.7% (n=90) of infants were diagnosed with HIV, of whom 76 (84.4%) were initiated on ART. 70.5% (n=1105) infants were confirmed HIV-negative at 18 months, and 23.7% (n=372) had incomplete testing. Costs per infant diagnosed with HIV and per confirmed HIV-negative status were \$647.51 and \$52.74, respectively. Costs per infant with incomplete testing or early discharge were \$23.76 and \$27.19, respectively. The cost per life year saved, driven by treatment initiation among HIV-positive infants, was \$28.74.

**Discussion:** While this is a preliminary and simplified cost-effectiveness analysis limited only to costs per diagnostic tests, findings indicate that infants diagnosed under Kenya's previous EID protocol (2006-2016) met the WHO criteria for a "very cost effective" intervention.<sup>5</sup> The health and economic impact of the new EID guidelines is still unknown. These findings will be compared to those incurred by the new and more intensive EID guidelines.

**Abstract 113**

**Title: Avoiding a band-aid solution: Addressing key health determinants as a responsive approach in the implementation of UHC.**

**Sharon Mokuia MSc,<sup>1</sup> Zipporah Bukania PhD<sup>1</sup>, James Kariuki MSc<sup>1</sup>, Priscah Otambo PhD,<sup>1</sup> David Mathu MA <sup>1</sup>Richard Mutisya MSc, <sup>1</sup>Lillian Nyandieka MA, <sup>1</sup>Joseph Mutai PhD, <sup>1</sup>Mercy Karimi PhD, <sup>2</sup>David Kariuki MBChB Elizabeth Echoka, PhD<sup>1</sup>**

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**Introduction:** There has been increased recognition that improving health and achieving health equity will require broader approaches that address social, economic, and environmental factors that influence health beyond the health sector which goes back to the basics of Primary Health Care. The objective of this paper is This particular paper sought to explore the various key determinants in the four UHC pilot counties in Kenya and if so, the role of different actors in better addressing these broader health determinants of health.

**Methodology:** This study used an exploratory qualitative study design to collect information on population-driven needs for an effective Universal Health Coverage program in the selected pilot counties, Isiolo, Kisumu, Machakos and Nyeri. The study purposively selected respondents in the general population (men, pregnant women, Elderly, Youth, Women of Reproductive Age and other key informants in the health sector such as Health service providers, County Health Management Teams, Implementing partners. Focus Group Discussions and In-depth interviews were conducted using respective guides. The data was transcribed verbatim and translated into English. Occurring themes and subthemes were then identified and developed from the data to describe the current needs, expectations, shortcomings and opportunities for UHC. Ethical approval was sought from the relevant institutions as well as targeted study partners.

**Findings:** Different respondents reported on various key determinants that may have positively or negatively influenced the implementation process and subsequent achievement of UHC in future. They ranged from the role and access to mass media and emerging technologies, poor geographical access to health facilities, road infrastructure, household poverty resulting in lack of money for transportation to facilities. Also in counties such as Isiolo, some community members reported on the ingrained cultural norms which to date still impede the effort to ensure mothers give birth at health facilities even when the services offered are free. Some service providers also reported on crucial multisector action ensuing adequate nutrition for communities or ensuring access to safe water and sanitation.

**Lessons to date:** Health is everybody's business. Based on needs, it is crucial that the environment in which people live and work promotes health, prevents risk factors, and supports their efforts to live healthy lives. Also no one program such as UHC or one sector of society alone will be able to effect the change necessary to prevent unnecessary illness, death and costs to business and the economy: this must encompass a multi-stakeholder approach and everybody's involvement.

**Main messages/Implication for policy:** Each county is unique The effectiveness of any interventions, as well as their success in reaching all relevant target populations, is highly influenced by their implementation in a given context and how it interacts with given interventions. Empower communities to optimize their own health, recognize and address health-related social needs through the health care system, focus on health in non-health sectors.

**Abstract 114****Title: Completeness, Accuracy and Legibility of Tuberculosis Culture Test Requisition Forms with Reference to The Laboratory Information System (LIMS) Implementation in MOH Facilities in Western Kenya.**

**Odero R.<sup>1</sup>, Okumu A.<sup>1</sup>, Ongalo J.<sup>1</sup>, Tonui J.<sup>1</sup>, Murithi W.<sup>1</sup>, Khayumbi J.<sup>1</sup>, Sitati R.<sup>1</sup>, Madara P.<sup>1</sup>, Orure J.<sup>1</sup>, Nyongesa L.<sup>1</sup>, Ogolla C.<sup>1</sup>, Odhiambo B.<sup>1</sup>, Wandiga S.<sup>1</sup>.**

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**Introduction:** In Kenya, National TB program through APHL have commissioned the Tuberculosis laboratory information system (TB- LIMS) for the National and KEMRI Tuberculosis reference laboratories. using request form (MOH/DPPH/NPHLS/NTRL/F/138-version 1.0) to link facility and reference laboratories on patient information is critical in care and management . We sought to review the completeness, accuracy and legibility of laboratory request forms sent to KEMRI TB reference laboratory.

**Methods:** All mycobacterium culture and drug sensitivity (DST) sputum sample accompanied with request forms were submitted to KEMRI TB laboratory .The TB culture and DST request form was used as reference to log patients sample in the TB-LIMS database receive between August 2018 and November 2019. A number of variables were assessed for completeness on the Request form: patient name, age, gender, clinician mobile contact, collection date, facility name, MFL code, HIV status, patient type, County, GeneXpert result, reason for examination, clinician email and MDR-TB register number.

**Results:** A total 4640 request forms from public health facilities in western Kenya were received and assessed .Patient name and age were 100% documented accurately however incomplete information were rated as : gender 1388(30%), mobile contact 2839(61%), Counties 1085(23%) sample collection date 1362(29%), facility name 1042(22%), MFL code 1042(22%), HIV status 1640(35%), patient type 3444(74%), Gene xpert undocumented 3255(70%), reason of examination 3339(72%), clinician email 1042(22.5%) and MDR register number 3966(86%) .Incomplete and incorrect request form information may result to delayed results

submission and prompt patient initiation on treatment

**Conclusion:** Laboratory data influence 70% of diagnoses and enhances quality patient diagnosis and prompt care to avert delayed testing, sample rejection and for planning. Incorrect or incomplete data provided to the laboratory could significantly impact the success and cost of overall treatment . Need for sensitization and retraining on Good clinical practice should be supported .

**Abstract 115****Title: Provider Experience with Implementing Birth Point of Care Infant HIV Testing: An Implementation Study at 4 Rural Hospitals in Kenya.**

**Yvonne Kamau,<sup>1</sup> Shadrack Babu,<sup>2</sup> Nicodemus Maosa,<sup>2</sup> Elizabeth Muchoki,<sup>2</sup> Catherine Wexler,<sup>1</sup> May Maloba,<sup>3</sup> Melinda Brown,<sup>1</sup> Brad Gautney,<sup>3</sup> Raphael Lwembe,<sup>2</sup> Sarah Finocchiaro-Kessler<sup>1</sup>**

<sup>1</sup>University of Kansas Medical Center, <sup>2</sup>Kenya Medical Research Institute, <sup>3</sup>Global Health Innovations

**Background:** HIV Point-of-Care (POC) diagnostic technologies have shown mounting evidence suggesting superiority over current lab-based infant HIV testing, which is associated with loss to follow up and delayed results. At-birth, infant POC HIV testing, results in earlier infant diagnosis and initiation of antiretroviral therapy (ART). This study sought to longitudinally characterize providers' experiences POC HIV infant testing, using the Consolidated Framework for Implementation Research (CFIR) constructs to identify facilitators and barriers to successful implementation.

**Methods:** This study was nested within a pilot study to assess the impact and feasibility of implementing at-birth POC testing at 4 Kenyan hospitals. Between December 2017 – March 2019, we conducted 29 focus group discussions (FGDs) with providers directly involved in the implementation of the pilot study (nurses, clinical officers, nurse managers, mentor mothers, lab and specimen processing technicians, data managers and site coordinators). FGDs assessed experiences, barriers, and facilitators using the CFIR model to explore factors related to the inner settings, outer settings, process, individual and intervention characteristics, specific to each implementation site. Four independent analysts coded transcripts to identify emergent themes before coming to a consensus. A few targeted quantitative outcomes from the larger POC pilot study have been included to corroborate the qualitative findings regarding the competitive

advantages of POC over standard of care.

**Results:** Preliminary results indicate that initial complexity of the intervention increased workload and hindered workflow. Inner setting facilitators of POC implementation were the size of the facility, availability of resources, effective communication and working relationships between clinical and laboratory staff, and the ability to adjust to setbacks (i.e., cartridge supply stock outs for the POC machine) and adapt to ensure success of the intervention (i.e., need to move the POC machine from the maternity ward to the lab during the nurses' strike). Other key facilitators include the relative advantage of same day results with POC HIV testing (95.3%) compared to standard PCR testing (0%), which expedited ART initiation at a younger infant age (median of 27 days) vs. standard of care (median of 25.1 weeks), and increased mothers' engagement in their clinical management and that of their infants. Having a designated individual to whom POC issues were reported was important. Facility-dependent facilitators included a positive implementation climate for new innovations and engagement spearheaded by champions. Outer setting factors included the nurses' strike leading to logistical changes across all the facilities to ensure that the pilot would continue.

**Conclusions:** Relative advantage of the intervention, implementation climate, adaptability, and the coordination between departments were key facilitators of implementation success. Initial complexity, size of the facility and organizational readiness were identified as key barriers to at-birth POC testing. Our findings can be used to inform future intervention efforts in low resource settings with goal of ultimately driving actionable change within the healthcare organizations involved.

# SCIENTIFIC SESSION 17:

Infectious Diseases  
(2)

**Abstract 116****Title: ESBL-producing Enterobacteriaceae among children with and without severe malnutrition at three public hospitals in Kenya**

**Caroline Ogwang** (KEMRI WTRP, Kilifi)\*; Joseph Waichungo (KEMRI WTRP, Kilifi); Sheila Murunga (KEMRI-Wellcome Trust Research Programme); Shalton Mwaringa (KEMRI WTRP, Kilifi); Johnstone Thitiri (KEMRI WTRP, Kilifi); Isaiah Njagi (KEMRI WTRP, Kilifi); Neema Mturi (KEMRI WTRP, Kilifi); Laura Mwalekwa (KEMRI WTRP, Kilifi); Molly Timbwa (KEMRI WTRP, Kilifi); Christine Manyasi (Mbagathi Hospital); Victor Bandika (Coast General Hospital); James Berkley (KEMRI - Wellcome Trust Research Programme)

**Background:** Children with complicated severe acute malnutrition (SAM) have much greater risk of mortality from infections during hospitalisation and post-discharge than better-nourished children. Antimicrobial resistance (AMR), intestinal dysbiosis and bacterial translocation may contribute to mortality, but it is unclear if AMR is commoner in SAM. We sought to determine the prevalence of faecal carriage of extended-spectrum beta-lactamase-producing Enterobacteriaceae (ESBL-E) among children with and without SAM at admission and discharge.

**Methods:** A prospective cohort of children admitted to three hospitals in Kenya, stratified by SAM status. Rectal swabs were collected at admission and discharge and cultured for detection of ESBL-E.

**Results:** Among 819 children, ESBL-E carriage was detected at admission among 194/411 (47%) and 169/408 (41%) with and without SAM respectively (crude  $P=0.096$ ). In multivariable analysis, age ( $P=0.028$ ), site ( $P=0.000$ ), recent hospitalization ( $P=0.000$ ), Sickle cell disease ( $P=0.000$ ) and Malaria ( $P=0.006$ ) were associated with ESBL-E carriage at admission, whilst SAM ( $P=0.226$ ) was not. At discharge, 288/402 (71.6%) of those without ESBL-E carriage at admission had acquired. Age (adjusted OR 1.02, 95% CI 1.01-1.02;  $P=0.000$ ), hospital site CGH (adjusted OR 1.91, 95% CI 1.83-1.99;  $P=0.000$ ), HIV with Cotrimoxazole (adjusted OR 4.01; 95% CI 1.25-12.8;  $P=0.019$ ), malaria (adjusted OR 0.52; 95% CI 0.36-0.76;  $P=0.001$ ), length of child stay in hospital (adjusted OR 1.8; 95% CI 1.1-2.2;  $P=0.000$ ) were strongly associated with ESBL-E acquisition by discharge.

**Conclusion:** Healthcare exposure, and antibiotic use rather than SAM itself was associated with ESBL-E carriage and acquisition.

## Abstract 117

### Title: Cholera Outbreak in Narok County- Kenya, January 2019: A Case Control Study

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<sup>3</sup>National Tuberculosis, Leprosy and Lung Disease Program, Ministry of Health, Kenya **Corresponding author:** Judith .W. Gachau; [wanjirujudy850@gmail.com](mailto:wanjirujudy850@gmail.com) ; +254 712888243

**Background:** Cholera outbreaks in Kenya have been on increase. On January 9, 2019, Disease Surveillance and Response Unit (DSRU) was notified of increased cases of acute watery diarrheal (AWD) in Narok County. We investigated suspected outbreak to characterize the cases, verify diagnosis, assess outbreak preparedness and response and identify associated factors.

**Method:** We reviewed health records and performed active case search in the community. A suspected case was occurrence of AWD from 29/12/2018– 20/1/2019 in persons aged  $\geq 2$  years from Narok County. We conducted community case control study, age-matched at 1 case: 2 controls. A suspected case was occurrence of  $\geq 3$  episodes of AWD from 29/12/2018 –20/1/2019 in persons aged  $\geq 2$  years from Narok South Sub County (NSSC). Controls were persons aged  $\geq 2$  years without diarrhea since 29/12/ 2018. We administered questionnaire to cases and controls to assess socio-demographics, clinical profile and exposures. Key informant guide was administered to County and Sub County managers on outbreak preparedness and response. Bacteriological analysis was performed on stool samples and water from river Olare and Ewaso Nyiro. We performed descriptive, bivariate and multivariate analysis.

**Results:** We line listed 152 cases, 5 confirmed for *vibrio cholera* 01 Ogawa. Females were 87(57.2%) and age-group 5-14 years were 32(21.1%). Two cases died (CFR=1.3%). Overall attack rate was 10.3/1000 population. Sampled water contained 30 *Escherichia coli* /100 ML. We enrolled 51 cases and 102 controls. Multipurpose use of drinking water containers (aOR: 9.09 [95% CI 2.87-28.76]); never heard of cholera disease (aOR: 4.4 [95% CI 1.22-16.10]) and visiting a suspected case (aOR: 12.43 [95% CI 2.71-56.90]) were independently associated with being a cholera case.

**Conclusion:** *Vibrio cholera* 01 Ogawa caused the outbreak. Lack of cholera awareness, multipurpose use of drinking water container and visiting cases were main drivers of the outbreak. We recommended restricted access to cholera cases, provision of safe water, improved sanitation and public health education on cholera.

**Keywords:** Cholera outbreak, case control study, Narok County, serotype Ogawa

## Abstract 118

### **Title: Characterization of *Shigella* species causing disease in children admitted to Kilifi County Hospital, Kenya**

**Anne Amulele** (KEMRI Wellcome Trust Research Programme)\*; Michael Ooko (KEMRI Wellcome Trust Research Programme); Alfred Mwanzi (KEMRI Wellcome Trust Research Programme); Nicola Gordon (KEMRI Wellcome Trust Research Programme)

**Background:** *Shigella* spp is one of the leading causes of bacterial diarrhoea and related mortality worldwide especially in young children under five years in developing countries. Though childhood mortality attributed to the pathogen has reduced significantly in recent years, most of the deaths occur in Africa and Asia. Infections can be prevented by improving sanitation and hygiene practices, however, an affordable and efficacious vaccine would accelerate disease reduction in resource limited countries. At present there is no licensed vaccine though several potential candidates are in research and development. It is important to understand the epidemiology and characteristics of *Shigella* circulating in our region to estimate the impact of a potential vaccine.

**Methods:** We undertook a descriptive retrospective study of *Shigella* gastroenteritis and bacteremia cases occurring in children up to 14 years of age presenting to a public hospital in Kilifi County from 1994 to 2016. The demographics and clinical characteristics of the patients were obtained while the antibiogram profile, species identification, *S. flexneri* serotypes and virulence diversity of stored isolates was determined by disc diffusion, agglutinating sera and PCR.

**Results:** We identified 200 patients from whom *Shigella* spp was cultured: 183 (91.5%) with gastroenteritis, 13 (6.5%) with bacteremia, and 4 (2%) with both. Children aged 12-59 months were the most affected accounting for 62% (124) of all cases. 11% (21) of the patients died in hospital. *S. flexneri* was the dominant species identified in both gastroenteritis and bacteremia cases with serotypes 2a, 3a and 6 accounting for 68% of *S. flexneri* serotypes. *S. dysenteriae* was isolated in 35 (18%) cases while *S. sonnei* and *S. boydii* were the least identified in 18

(9%) and 13 (7%) cases respectively. We observed high rates of resistance to tetracycline (96%), cotrimoxazole (92%) and ampicillin (83%) and no resistance to cephalosporins and ciprofloxacin. The most frequently identified virulence genes were *sen*, *set1A* and *sepA*, while shiga toxin gene was present in half of *S. dysenteriae*.

**Conclusion:** *S. flexneri* is therefore an important pathogen and a vaccine that includes *S. flexneri* serotypes 2a, 3a, 6 and *S. sonnei* could have potentially prevented 55% of all *Shigella* disease cases and 71% of the related deaths in Kilifi County.

**Abstract 119****Title: Burden of bacterial and parasitic infections in children aged below 16 years in Mukuru informal settlements**

**Susan Mutile Kavai**<sup>1\*</sup>, Celestine Wanjiku<sup>1</sup>, Ronald Ngetich<sup>1</sup>, Frida Njeru<sup>1</sup>, Steve Anyona<sup>1</sup>, Georgina Odityo<sup>1</sup>, Cecilia Mbae<sup>1</sup>, Robert Onsare<sup>1</sup>, Samuel Kariuki<sup>1</sup>

<sup>1</sup>Centre for Microbiology Research, Kenya Medical Research Institute, Nairobi, Kenya.

**Background:** Food borne diseases caused by bacteria and parasites continue to pose a threat to human health globally. These diseases are considered important worldwide as they result to considerable mortality and mobility. Seemingly these diseases contribute largely to global burden of disease. Food-borne pathogens such as Salmonella spp, Escherichia coli, Campylobacter spp, Vibrio spp as well as Staphylococcus spp result to gastrointestinal infections that if not addressed immediately can be fatal. Objectives: This study aimed at determining the burden of bacterial and parasitic infections in children aged below 16 years in Mukuru informal settlements.

**Methods:** The samples examined in this study were obtained from patients attending three outpatient sites in Nairobi County namely, Mukuru kwa Njenga clinic, Municipal county council clinic (Mukuru health centre), and Mukuru kwa Reuben clinic in Nairobi, Kenya. The samples were processed in CMR-KEMRI using basic microbiology procedures for identification and characterization.

**Results:** A total number of 18,238 (100%) patients were involved in this study, 9549 (52.4%) were cases while 8689 (47.5%) were from controls. From these patients, 1150 cases had a total of 1489 bacterial isolates found in their blood samples Both protozoans and helminths were isolated from stool obtained from cases. Across all the three sites patients (cases) aged 6-10 had the highest burden of bacterial infections. Out of the total 1498 (100%), 506 (33.8%) bacterial isolates came from Mukuru Kwa Reuben, 152 (10%) in Mukuru Kwa Njenga, 61(4%) in Municipal county council.

**Conclusion:** WHO regulations on effective ways of prevention and control of food borne diseases require further reinforcement in order to reduce further on the global burden of disease.

**Abstract 120****Title: Enhanced surveillance for early detection of MERS-CoV in Kenya: findings from returning pilgrims in 2016.**

**Janet Majanja**<sup>1</sup>, Rachel Achilla<sup>1</sup>, Silvanos Opanda<sup>1</sup>, Meshack Wadegu<sup>1</sup>, James Njiri<sup>1</sup>, Samwel Lifumo<sup>2</sup>, John Distelhorst<sup>1</sup> and Wallace Bulimo<sup>1</sup>

<sup>1</sup>Department of Emerging Infectious Diseases. United States Army Medical Research Directorate – Africa

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**Introduction:** Middle East Respiratory Syndrome Coronavirus (MERS-CoV) has recently emerged as a viral cause of respiratory illness in humans. Since detection of the virus in 2012, 27 countries have reported human cases of MERS with majority occurring in Saudi Arabia. Cases reported outside the Middle East are often due to importation by travelers. Thus, the Kenya Ministry of Health (MoH) partnered with USAMRD-A's Respiratory laboratory to carry out enhanced surveillance for early detection of MERS-CoV in Kenya with special emphasis on travelers in and out of the Middle East.

**Methods:** Emphasis was placed on travelers in and out of the Middle East in the period between June and September 2016. Sentinel surveillance sites were placed at hospitals that served pilgrims returning from Hajj in Nairobi, Mombasa and Malindi towns. Patients reporting to the selected hospitals were identified using criteria provided by WHO for MERS-CoV patient under investigation. Nasopharyngeal swabs and serum samples were collected from patients and transported to the Respiratory laboratory while maintaining the cold chain. MERS CoV was detected using NCV-2012 Reverse transcriptase real-time polymerase (rRT-PCR) assay primer and probe set provided by CDC. rRT-PCR assay was also used to detect other respiratory viruses namely, human coronavirus (HCOV) subtypes, Influenza A and B viruses, adenovirus, enteroviruses, herpes simplex virus, human parainfluenza viruses (HPIV), respiratory syncytial viruses (RSV), rhinoviruses and human metapneumoviruses. Detection of antibodies against MERS-CoV was carried out using Anti MERS-CoV IgG ELISA (Euroimmun AG, Lubeck, Germany) according to the manufacturer's instructions.

**Results and Discussion:** A total of 84 patients participated in the study. The study population comprised 53% male and 45% female patients. Respiratory viruses were identified in 23 (27.4%) of the patients. Of the positive samples Influenza viruses were detected in 12 (52.3%) patients. Of these, 8 patients had Influenza A including one coinfection of Influenza A and Adenovirus and another coinfection of Influenza A and B virus. Four patients had Influenza B. Enterovirus was detected in 2 patients (8.7%) while a single infection of adenovirus alone was detected in another patient. Human parainfluenza virus type 1, HPIV type 3 and RSV were each detected in 1 (4.3%) patient. HCOV - OC43 was detected in 2 patients (8.7%), HCOV - 229E in 2 (8.7%) patients and HCOV-NL63 in only 1 (4.3%) patient. Two (2.4%) samples were seropositive for MERS-CoV using ELISA. Interestingly, one of the seropositive samples was positive for HCOV-NL63 thus confirming that ELISA is not a definitive test for MERS-CoV because it may cross react with seasonal coronavirus antibodies.

**Conclusion:** Respiratory viruses are common among returning pilgrims with Influenza being the most prevalent. Surveillance for respiratory viruses among travelers should continue to monitor trends and detect any new viruses. Pilgrims travelling to the Hajj should consider vaccination against Influenza viruses.

**Disclaimer:**

The findings and conclusions presented in this abstract are those of the authors and do not necessarily reflect the official position of the Walter Reed Army Institutes of Research, U.S. Army Medical Department, U.S. Department of the Army, or the U.S. Department of Defense.

**Abstract 121****Title: Investigation of unknown febrile illness in Semi-Arid Region in Kenya, September 2019**

**Ihahi Josphine**<sup>1\*</sup>, Joseph Ogutu <sup>1</sup>, Hosea Serech <sup>1</sup>, Robert Rono <sup>2</sup>, Peter Limaris<sup>2</sup>, E.Oyugi<sup>1</sup>

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**Background:** On 22<sup>nd</sup> August 2019 Ministry of Health was notified of a suspected malaria outbreak in Baringo County. Malaria epidemics occur when climatic conditions favor transmission in non-endemic areas where people have little or no immunity. The county has in the past reported cases of febrile illnesses i.e malaria, hepatitis B and Rift valley fever. This study therefore, aimed to verify and investigate the suspected malaria outbreak in one of the county's remote pastoral community.

**Methods:** This was a mixed study method, which involved using outbreak case definition to update existing line list, conducted active case search (ACS) in affected villages and reviewing facility health records. Questionnaires were administered to cases that tested malaria positive via mRDT, health care workers (HCWs) and County health managers. We treated the sick, collected blood samples from suspected cases, distributed mosquito nets and provided health education on malaria prevention and control.

**Results:** A total of 1,224 cases were line listed; 1109/1224 (89.3%) found through ACS. The outbreak was propagated with high attack rate among female 0.76% (92,191/180,766) and children <5 years 1.4% (29,778/180,766). Seventy two cases were interviewed, 90.3% (65/72) presented with fever, headache 65.3% (47/72) and chills 51.4% (37/72). Majority 90.3% (65/72) lived in traditional houses, 66/72 (91.6%) lived in close proximity to mosquito breeding sites, 72.2 % (52/72) were not sleeping under mosquito nets and 87.5% (63/72) had mosquito bite < 7 days before becoming sick. Of 21 HCWs were interviewed, 20/21(95%) were

knowledgeable on malaria case management. Weak surveillance system was noted to contribute to inadequate outbreak emergency planning and response. Malaria infection was detected in 40/63 (63%, 95% CI 50.4-75.3) via mRDTs, *Plasmodium falciparum* parasite was isolated in 28/63(44%, 95% CI 31.9-57.5) and 30/63(48%, 95% CI 34.9-60.6) from first and second microscopic analysis respectively. The two microscopic reading yielded a kappa value of 90.3%. mRDTs had 93% sensitivity and specificity of 63.6% against microscopy. Of 60 samples analyzed for serological and molecular assays, 17/60 (28%) were reactive for anti-DENV IgM, 32/60 (53%) for anti-CHIKV IgM and 13/60 (22%) for anti-DENV IgG.

**Conclusion:** HCWs had adequate knowledge on malaria case management. The county had not adequately prepared for malaria epidemic. Species *Plasmodium falciparum* was the only parasite identified although circulation of dengue and chikungunya viruses were also confirmed.

## Abstract 122

### **Title: Infectious Diseases and Poly-Drug Use among Medically Assisted Therapy clients enrolled at Kisauni Clinic, Kenya, January 2017 – December 2018.**

**Nassoro J Mwanyalu** (Mombasa County Government, Department of Health)\*; Elvis Oyugi (Kenya FELTP)

**Background:** Drug users, especially people who inject drugs (PWIDs) are at higher risk of acquiring HIV, Hepatitis B (HBV) and Hepatitis C (HCV) infection due to risky injection and sexual practices. Approximately 18.3% of PWIDs are living with HIV in Kenya. We describe infectious diseases and poly drug use in clients enrolled in Medically Assisted Therapy (MAT) clinic in Kenya's coastal region.

**Methods:** We reviewed records of persons enrolled in Kisauni MAT clinic. Data sources were the MAT register, laboratory register (MOH 240) and MAT cards. We used unique I.Ds instead of names and MAT numbers to maintain confidentiality. Poly drug use was defined as use of methadone in combination with one or more psychoactive drugs. We assessed social demographic characteristics, HIV/HCV/HBV status, injecting or non injecting, type of psychoactive drug abused, duration on medication and current methadone dose. Descriptive statistics were calculated using MS Excel.

**Results:** Total records reviewed were 446; median age 36 years (Range 19 – 63 years). Enrolled male clients were 90.2% (402/446) and PWIDs were at 29.1% (130/446). Proportion of HIV positive clients enrolled to the program was 11.7% (52/446) while for PWIDs HIV was at 16.2% (21/130). For females, HIV positive proportion was at 40.9% (18/44). Overall HCV proportion was at 8.7% (39/446), 22.3% (29/130) in PWIDs and 3.2% (10/316) in non-injectors. Overall HBV was reported at 7.4% (33/446), 6.2% (8/130) in PWIDs and 7.9% (25/316) in non-injectors. Poly drug use was observed in 29.2% (38/130) of PWIDs and 28.7% (91/316) in non-injectors. For poly drug users 42.6% (55/129) were positive for cannabis followed by Benzodiazepine at 24% (31/129) while those who were abusing both Cannabis and Benzodiazepine were 16.3% (21/129). Cannabis abusers had methadone dose >60ml and were on program for >18 months. The 24% (7/31) who abused Cannabis and Benzodiazepine were on program for >18 months.

**Conclusions:** The PWIDs and females had higher prevalence of HIV, HCV and poly drug use. We recommend psycho-social interventions and development of score cards for early detection of poly-drug use in the clinic and regular screening for HIV and Hepatitis viruses in PWIDs and female clients.

Key words: PWIDs, Methadone, poly-drug use, Medically Assisted Therapy, Kenya

## Abstract 123

### **Title: Towards Managing and Controlling Aflatoxin Producers Within *Aspergillus* Species in Infested Rice Grains Collected from Local Markets in Kenya**

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**Background:** Rice grains can be attacked by a range of pathogens, including *Aspergillus* species, which can cause the accumulation of aflatoxins and represent a serious threat to the consumers. Aflatoxins remain a major threat to global food security, these metabolites could be resisted into foodstuffs during processing and in additional may remain within the food chain. Aflatoxins are carcinogenic, hepatotoxic, mutagenic, teratogenic and can inhibit numerous metabolic systems and immunosuppressive properties. In this study, we sought to analyze the prevalence of aflatoxin-producing *Aspergillus* spp. in rice grains currently sold in Kenyan local markets.

**Methods:** A total of 98 samples randomly collected from local retail markets and millers in Mwea and at Jamhuri Market in Thika (Kenya) had moisture content and fungal growth analyzed by the direct plating of suspected grains method. We then isolated *Aspergillus* species, characterized them morphologically and using the Internal Transcribed Spacer (ITS) primers. Finally, we screened them for aflatoxin-producing isolates targeting Norsolorinic Acid (nor-1) and Versicolorin (ver-1) specific genes involved in aflatoxin biosynthesis.

**Results:** We observed that all 98 samples tested were contaminated by *Aspergillus* species. The highest prevalence of *Aspergillus* species and aflatoxigenic fungal species, had values of 66% and 36.4% for nor-1 and ver-1, respectively. In total, 66% of all isolates were confirmed to be aflatoxin producers by targeting specific genes nor-1. The occurrence of high contamination levels of *Aspergillus* species

could be an indicator to the possibility of aflatoxins production in rice grains.

**Conclusion:** Prevalence of *Aspergillus* species in rice grains sold at the markets is high, and indicates the possible high level of aflatoxigenic strains in rice grains under study. In addition, 66% of isolates were used to confirm aflatoxin production genes considered as indicators of aflatoxin production. This is indicative of exposure of population to aflatoxins and could lead to possible health problems. Millers need to be enlightened on proper ways of handling rice grains during business and awareness needs to be raised in order to reduce fungal contamination. Mechanisms for inspection and certification of imported rice should be established accompanied by regular monitoring for aflatoxin levels of the imported rice to ensure that they comply with set limits. The Kenya Bureau of Standards should strengthen monitoring for compliance to set standards and enforce regulations of aflatoxins in foodstuffs and commodities.

## Abstract 124

### Title: The Use of Zinc and ORS for Treatment of Childhood Diarrhea in Rural Western Kenya, 2010-2017

**George AOL Otieno** (KEMRI)\*; George O. Agogo (CDC); Patrick K Munywoki (CDC, Nairobi, Kenya); Allan O. Audi (KEMRI-CGHR); Joshua Auko (KEMRI-CGHR); Godfrey Bigogo (KEMRI/CGHR); Jennifer Verani (CDC)

**Introduction:** Diarrhea is a leading cause of death among children worldwide, but morbidity and mortality can be reduced by treating acute diarrhea with zinc and oral rehydration salt (ORS) solutions. We examined the uptake and factors associated with use of zinc and ORS among children aged <5 years with medically attended diarrhea in rural western Kenya.

**Methods:** We used data from an ongoing Population-Based Infectious Disease surveillance (PBIDS), which monitors the health of ~25,000 individuals in Asembo, a rural area in western Kenya with a high burden of diarrhea disease. In this setting, zinc for diarrhea was officially launched in 2010; ORS has been in use for several decades. PBIDS participants receive medical care for infectious illnesses at a centrally located health facility, where trained study staff collect clinical and demographic data. We analyzed data from January 2010 to December 2017 for PBIDS clinic visits among participants aged <5 years which met the surveillance diarrhea case definition ( $\geq 3$  loose stools in 24-hour period) or had a clinician diagnosis of diarrhea. We used multivariable logistic regression to determine factors associated with receipt of zinc and ORS treatment. We defined dehydration based on multiple variables reflective of hydration status (e.g., sunken eyes, skin turgor, etc.).

**Results:** Among 40,749 clinic visits over the study period, 4,064 (10%) met the surveillance case definition for diarrhea or had a diagnosis of diarrhea. Of those, 2,546 (63%) received zinc alone and 3,082 (76%) received ORS alone while 2,357 (58%) received both Zinc and ORS. Use of zinc ranged from 40% in 2010 to 80% in 2017; ORS ranged from 60% in 2010 to 70% in 2017. Factors positively associated with receipt of zinc included young age (<24 months vs

≥24 months) odds ratio [OR] 1.5 (95% confidence interval [1.3-1.8]), increase in year of surveillance (OR 1.4[1.3-1.4]), vomiting everything (OR 1.3 [1.1-1.5]) and dehydration (OR 1.7 [1.4-2.2]). Factors negatively associated included cough (OR, 0.7 [0.6-0.9]), unable to feed/breastfeed (OR 0.6 [0.5-0.8]), convulsions (OR 0.4 [0.2-0.8]) and malaria (OR 0.5 [0.4-0.5]). Factors positively associated with receipt of ORS include young age (<24 months vs ≥24 months) (OR 1.5 [1.3-1.8]), increase in year of surveillance (OR 1.1[1.1-1.2]) and dehydration (OR 1.2 [1.0-1.6]). Factors negatively associated included cough (OR, 0.8 [0.6-0.9]), unable to feed/breastfeed (OR 0.7 [0.6-1.0]), convulsions (OR 0.4 [0.3-0.8]), diagnosis of dysentery (OR 0.5 [0.3-0.8]) and diagnosis of malaria (OR 0.5 [0.4-0.5]).

**Conclusion:** Zinc and ORS uptake improved over the course of the study and was used more frequently for young children and those with signs of dehydration. However, our analysis highlighted the need to improve use of these life-saving treatments for children with diarrhea, particularly those aged ≥24 months, and those with signs/symptoms of another illness that might lead clinicians to overlook treatment of diarrhea.



# POSTER PRESENTATIONS

# Genomics, Diagnostics and Innovations

## Abstract 125

### Investigation of Plasmodium falciparum Cytoadherence Proteins Interaction with Sulfated Polysaccharides Containing Anti-malarial Properties

Jennifer M Mutisya (United States Army Medical Research Directorate-Kenya)\*

**Background:** Diversity in merozoite proteins mediating pathogenesis is the main challenge in developing drugs targeting intracellular parasites. Merozoite surface protein 2 (MSP2) with Duffy Binding-Like Domain (DBLMSP2) is a protein that initiates attachment of merozoite to erythrocytes. Plasmodium Helical Interspersed Subtelomeric domain b with RESA (Ring-infected Erythrocyte Antigen) Like Protein (PHISTb/RLP1) mediates remodeling and cytoadherence to microvascular of infected red blood cells.

**Methods:** We explored inhibitors of these proteins in the sulfated polysaccharides compounds which contain anti-malarial properties and have pre-determined efficacy. Plasmodium falciparum 3D7 reference strain protein sequences were obtained from PlasmoDB. Motifs of the two sequences were predicted using MEME software. Functional motifs were shown to be repeated in the protein sequences. Protein structures were modeled using I-TASSER tool. Ten sulfated polysaccharides whose chemical properties fulfilled rules of a drug compound were obtained. Sulfated polysaccharides compounds were screened from PubChem. Interaction simulations were achieved using auto-dock vina. The docking results were visualized in PyMOL.

**Results:** Results revealed the interaction of specific residues that were identified in the binding sites with the drug compounds. The findings of this work reveal chemical inhibitors of the intra-erythrocytic parasite stages. Sulfated polysaccharides such as carrageenan and sulfated fucan were found to interact with specific residues within the functional domains of DBLMSP2 and PHISTbRLP1 proteins. The chemicals block the interactions of the proteins with their receptors on erythrocytes and thus terminate schizont multiplication.

**Conclusion:** This study supports further exploration of the identified compounds as a new group of antimalarial molecules that can be used independently as new drugs or in combined therapies to overcome parasite resistance.

**Abstract 126****Title: Genomic characterization of invasive *Salmonella enterica* serovar Typhi isolates from Population-Based Infectious Disease Surveillance in Kibera, Kenya, 2007 – 2018**

**Caroline A Ochieng** (KEMRI-CGHR)\*; Elizabeth Hunsperger (CDC); Lee Katz (CDC); **MikePowel Osita** (KEMRI-); Victor Omballa (KEMRI/CGHR); Eric Ngeno (Washington State University-KEMRI); Geoffrey Masyongo (KEMRI); Jane Alice Ouma (KEMRI/CGHR); Newton Wamola (KEMRI/CGHR); Patrick K Munywoki (CDC, Nairobi, Kenya); Molly Freeman (CDC); Matthew Mikoleit (CDC); Bonventure Juma (CDC); Godfrey Bigogo (KEMRI/CGHR); Jennifer Verani (CDC); Heather Carleton (CDC)

**Background:** More than 7 million cases of typhoid fever occur each year in sub-Saharan Africa. A high burden of *Salmonella enterica* serovar Typhi (*S. Typhi*) bacteremia has been observed in Kibera, an urban informal settlement in Nairobi, Kenya, characterized by high population density, limited access to safe water, and poor sanitation. However, the incidence in recent years has declined. We genetically characterized invasive *S. Typhi* from ongoing surveillance in Kibera for underlying adaptation, evolution and the presence of multidrug resistant (MDR) genes.

**Methods:** We revived and sequenced archived *Salmonella* isolates from blood culture of patients with acute febrile illness or pneumonia collected through the Population-Based Infectious Disease Surveillance in Kibera from 2007 to 2018. Genomic DNA was extracted using Wizard Genomic DNA Purification kit (Promega), library prepared using Illumina Nextera XT Kit followed by paired end sequencing on a HiSeq/ MiSeq platforms (Illumina) in 300/500cycle reactions respectively. Serotype was confirmed using SeqSero v1, Plasmids were predicted using PlasmidFinder, resistance genes and classes identified using ResFinder implemented in BioNumerics v7.6. Sequence data was further analyzed by core genome MLST (cgMLST, Enterobase scheme) and wgMLST. MDR was defined as genotypic resistance to chloramphenicol, co-trimoxazole and ampicillin.

**Results:** Among 493 *Salmonella* isolates from 15,777 blood cultures, we revived and sequenced 401 (81.3%); 304 (75.8%) were confirmed *S. Typhi*. Up to 216

cgMLST allelic differences and 3 major clades were identified. The predominating clade contained 283 (93%) isolates and a median of 11 allele differences (range 0-40). The frequency of resistance gene classes were aminoglycosides in 242 isolates (79.6%), tetracycline in 228 (75.0%), chloramphenicol in 242 (79.6%), sulphonamide in 242 (79.6%), trimethoprim in 242 (79.6%), aminopenicillins in 241 (79.3%), quinolones in 55 (18.1%) and spectinomycin in 1 (0.3%). From 2007 to 2012, antibiotic resistance genes were detected in >10% of isolates each year, with the highest prevalence in 2012 (16.0%). From 2013-2018, the prevalence of antibiotic resistance genes was <5.0% per year, although the number of isolates was relatively small (average 9 per year). Quinolone resistance was the least across the years (<4.0% per year). MDR genes were seen in 241 isolates (79.3%), with the highest frequency (>10.0% per year) in 2007-2012, lowest (<4.0% per year) in 2013-2017, and none detected in 2018. Predicted plasmids included IncHI1B R27 in 228 isolates (75.0%), Col440I in 1 isolate (0.3%) and ColE1 in 1 isolate (0.3%).

**Conclusion:** Circulating *S. Typhi* strains in Kibera have remained fairly stable over a 12-year period, with three predominant lineages. Antibiotic resistance genes, particularly MDR genes, were more prevalent in earlier years and lower from 2013 on; however, the small number of isolates from this period limits interpretation

**Abstract 127****Title: The utility of Taqman Array Card technology for determination of the cause of death in children under 5 years of age in Western Kenya.**

**Fredrick O Ade** (KEMRI-CGHR)\*; Clayton Onyango (CDC-Kenya); Jim Katieno (KEMRI-CGHR)

**Background:** Despite reductions over the past two decades, childhood mortality remains high in low income settings in sub-Saharan Africa and south Asia. In lower- and middle-income countries (LMIC), children often die without being attended to by qualified medical personnel. Most health facilities in sub-Saharan Africa are unable to determine specific cause of death due to limited access to laboratory services while the patient is alive, and the lack of post-mortem services, complicated further by low cultural acceptability of autopsies.

**Methods:** The Child Health and Mortality Prevention Surveillance (CHAMPS) study has employed advanced laboratory methods, including custom syndromic TaqMan Array Card (TAC), a microfluidic real-time PCR system, for pathogen detection in deceased children < 5 years old. Tissue and non-tissue specimens were collected using minimally invasive techniques. Total nucleic acid (TNA) was extracted using QIAamp DNA Mini kit from cerebrospinal fluid (CSF), whole blood, homogenized lung tissue, nasopharyngeal/oropharyngeal swabs, and using QIAamp Fast stool mini kit for rectal swabs from 185 enrolled cases in western Kenya. TNA was tested on specimen-specific custom TAC configurations. TAC results were analysed and interpreted along with pathology reports and other clinical data according to program-specific laboratory and diagnostic standards in order to determine the cause of death.

**Results:** In the 185 cases enrolled, pathogens identified by TAC that were attributed as the probable cause of death included *Klebsiella pneumoniae* (12.5%, n=23), *Plasmodium falciparum* (11.4 %, n=21), *Streptococcus pneumoniae* (11.9%, n=22), *Escherichia coli/Shigella* (8.1%, n=15), *Haemophilus influenzae* (4.9%, n=9), adenovirus (4.3%, n=8), cytomegalovirus (4.3%, n=8), *Staphylococcus aureus* (4.3%, n=8), and enterovirus (2.7%, n=5).

**Conclusion:** This study shows that TAC can be a useful molecular diagnostic tool for identification of pathogens in various specimen types. Application of TAC testing to post-mortem specimens can help determine the cause of death. Together with clinical records, clinical laboratory results and verbal autopsy, TAC results provide useful information that can be used by a team of specialists to bring closure to individual mortality cases enrolled in CHAMPS and to inform public health strategies needed to improve child survival.

**Abstract 128****Title: Prevalence of mutations in Plasmodium falciparum genes associated with resistance to different antimalarial drugs in Nyando, Kisumu County in Kenya**

**Brian Musyoka** (JKUAT)\*; John Kiiru (KEMRI-CMR); Eva Aluvaala (KEMRI-CBRD); Protus Omondi (Kenya Medical Research Institute); William Chege (KEMRI); Terry Judah (KEMRI-CMR); Daniel Kiboi (JKUAT); Joseph Nganga (JKUAT); Francis Kimani (KEMRI)

**Background:** Resistance to the mainstay antimalarial drugs is a major concern in the control of malaria. Delayed Plasmodium falciparum parasite clearance has been associated with Single Nucleotide Polymorphisms (SNPs) in the kelch propeller region (K13). However, SNPs in the Pf-adaptor protein complex 2 mu subunit (Pfp2-mu), Pfcrt and Pfmdr1 are possible markers associated with multi-drug resistance.

**Methods:** Here, we explored the prevalence of SNPs in the K13, Pfp2-mu, Pfcrt, and Pfmdr1 in 94 dried blood spot field isolates collected from children aged below 12 years infected with P. falciparum during a cross-sectional study. The samples were collected in 2015 during the peak malaria transmission season in the Nyando region of Western Kenya before treatment with Artemether-Lumefantrine, the first-line artemisinin-based combination therapy (ACT) in Kenya. However, 47 of the 94 samples had recurrent parasitemia and were interrogated for the presence of the SNPs in K13 and Pfp2-mu. We used PCR amplification and sequencing to evaluate specific regions of K13 (codons 432-702), Pfp2-mu (codons 1-350), Pfmdr1 (codons 86, 1034-1246), and Pfcrt (codons 72-76) gene(s).

**Results:** The majority of parasites harbored the wild type K13 sequence. However, we found a unique non-synonymous W611S change. In silico studies on the impact of the W611S predicted structural changes in the overall topology of the K13 protein. Of the 47 samples analyzed for SNPs in the Pfp2-mu gene, 14 (29%) had S160N/T mutation. The CVIET haplotype associated with CQ resistance in the Pfcrt yielded a 7.44% (7/94), while CVMNK haplotype was at 92.56 %. Mutations in the Pfmdr1 region were detected only in three samples (3/94; 3.19%) at codon D1246Y.

**Conclusion:** Our data suggest that parasites in the western part of Kenya harbor the wildtype strains. However, the detection of the unique SNP in K13 and Pfap2-mu linked with ACT delayed parasite clearance may suggest slow filtering of ACT-resistant parasites.

# Non-Communicable Diseases

**Abstract 129****Title: The effects of Zinc supplementation in children with sickle cell disease in Western Kenya: a pilot study.**

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**Background:** Zinc is a nutritionally essential trace element found in studies to reduce growth retardation and improve immune function, which may result in decreased incidence of infectious diseases including malaria, pneumonia and diarrhea. Sickle Cell Disease (SCD) patients are known to be susceptible to zinc deficiency. SCD is a major, but widely neglected, public health issue in low-income countries with the burden in many parts of Africa estimated at around 1% of all births. Previous studies showed that zinc supplementation in adults improved immune function and reduced infection and in prepubertal children improved linear growth. Despite these findings, current treatment guidelines for SCD patients in Kenya have not included zinc supplements as part of its management. This pilot study assessed whether oral zinc supplementation reduced morbidity, incidence of malaria and bacterial infections and had a positive impact on growth in children 6 months to 12 years with SCD in western Kenya.

**Methods:** This was a pilot trial conducted at the KEMRI-Obama Children's Hospital in Kisumu, Western Kenya over a period of 12 months beginning May 2016. It involved 40 SCD children aged 6 months to 12 years. The children were randomized 1:1 (intervention group (oral zinc + standard of care)) while the control group (standard of care). At baseline, 3 months and 6 months, clinical and laboratory evaluations, including plasma zinc levels, malaria blood films, complete blood count, alanine aminotransferase, creatinine, C - reactive protein

(CRP) and anthropometric measurements were carried out. The differences in incidence of morbidity and other secondary endpoints were compared between the zinc group and the control group. ClinicalTrials.gov, **NCT03293641**.

**Findings:** A total of 53 infants and children were screened and 40 SCD subjects enrolled into the study with 100% completion. The baseline characteristics were similar between the two groups in terms of age, gender, haemoglobin, creatinine and CRP. The baseline nutritional status (height for age, weight for age and mid upper arm circumference) showed higher Z-scores in the control group. At baseline in the per-protocol cohort, zinc plasma level was normal ( $\geq 0.65\text{mcg/mL}$ ) in 16/18 (89%) in the intervention group and 14/19 (73%) in the control group. The percentage of infants with normal zinc levels was not different between the two groups at 3 or 6 months. At 3 months, zinc plasma level was normal in 13/18 (72%) in the intervention group and 14/19 (73%) in the control group. At 6 months, zinc plasma level was normal in 16/18 (89%) in the intervention group and 17/19 (90%) in the control group. Serious adverse events (SAEs) were experienced by 20% (95% CI: 2.0-3.8) and 30% (95% CI: 9.9-50) (in intervention group and control group, respectively). The difference in the number of SAEs in intervention and control was not statistically significant ( $p\text{-value}=0.716$ , CI: 0.1-3.1). The most frequently reported SAEs were painful crisis (5: 1 intervention group vs. 4 control group), anaemia (4: 2 intervention group vs. 2 control group) and malaria (3: 1 intervention group vs. 2 control group). The frequency of adverse events was 43 (39%, 95% CI: 18-60) in the intervention group compared to 68 (61%, CI: 47.6-88.4) in the control group over the study period ( $p\text{-value}=0.001$ ). The most common causes of adverse events were URTI, painful crisis, and malaria. The weight for age mean z-score and standard deviation (SD) was: -1.53 (0.99) intervention group vs. -0.98 (0.49) at baseline, -1.04 (1.50) vs. -0.85 (0.56) at 3 months and -0.79 (1.14) vs. -0.43 (0.49) at 6 months. The height for age Z-score (SD) was: -1.24 (0.99) vs. -0.40 (0.79) at baseline, -0.81 (1.15) vs. -0.10 (0.78) at 3 months, and -0.46 (1.36) vs. -0.07 (0.73) at 6 months. Beyond the routine care for SCD, the study did not control for infection nor dietary Zinc intake.

**Conclusion:** Zinc supplementation did not result in a greater improvement of zinc levels in SCD patients even though a positive impact on morbidity was observed. Zinc was well tolerated with a trend showing reduction in the adverse events, and an improvement in anthropometric indices over time but with a non-significant

difference between the two groups. The results though not conclusive showed a beneficial effect of zinc supplement in the management of SCD. However, it remains unclear why we did not find improvements in Zinc levels after Zinc supplementation.

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### **Disclaimer**

The opinions and assertions herein are the views of the authors and not those of KEMRI or Strathmore University.

**Abstract 130****Title: Description of drug users enrolled in MEWA( Muslim education and welfare association) Drop in center from October 2017 to September 2019**

**Kassam A Yusuf** (DOH Mombasa)\*; Maria Nunga (Kenya Field and Epidemiology Laboratory Training Program); Fatma Jeneby (MEWA Drop in center); Maryanne Gachari (KFELTP)

**Background:** Kenya is currently experiencing concentrated epidemics of HIV in sub-groups of the population that engage in high risk behavior such as injecting drug users (IDUs). There is limited data on the impact of interventions targeting IDUs such as the Needle and syringe program (NSP), pre exposure prophylaxis (PrEP), Medically assisted therapy for opioid dependents (MAT) and condom provision that aim to reduce new infections. We sought to identify the factors associated with HIV positivity among drug users in MEWA Drop in Centre in Kisauni Mombasa.

**Methods:** We conducted a cross-sectional study that involved retrospective analysis of records in MEWA drop in Centre. We used a case definition of any record of a drug user seen in MEWA drop in Centre between October 2017 and September 2019. We collected data from an Electronic Medical Register (EMR) at the facility, patient files and registers. We collected Socio-demographic, clinical and exposure information. Continuous variables were analyzed using measures of central tendency and dispersion, categorical variables were analyzed using frequencies and proportion. Chi square test was used to identify factors associated with the HIV positivity, those with P-values  $\leq 0.05$  were considered statistically significant.

**Results:** A total of 995 records were reviewed, males were 802 (80.6%), median age of drug users was 34 (IQR-10), 935 (95%) were never married, 615 (61.8%) were enrolled in the NSP and 392 (38.2%) in the MAT program. Thirty-seven (3.7%) were HIV positive, 29 (3%) had been treated for an STI, 11/416 (2.6%) of those tested were positive for HBsAg and 37/379 (9%) of those tested positive for HCV. Seven (1%) of the drug users were on PrEP. Being female (OR 3.72, C.I 1.939–7.358), syndromic ally managed for sexually transmitted infection (OR7.87, C.I 2.992–20.69) and enrollment in the MAT clinic (OR; 29.46, C.I 7.044–123.2) were

factors associated with turning HIV positive while on care in the drop-in centre.

**Conclusion:** A very small proportion of drug users was on HIV pre-exposure prophylactic care (PrEP). We recommend improved uptake of PrEP to help reduce new HIV infections.

**Key words:** HIV, Sexually Transmitted Infection, Drug User, Epidemic

**Abstract 131****Title: Baseline Assessment of Occupational Health Exposure Incidents among Laboratory Personnel who attended Biosafety and Biosecurity Trainings in Kenya, 2015 - 2018**

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**Background:** Occupational hazards pose potential health risks to healthcare workers at the work place. In Kenya, the status of occupational health exposure incidents (biological, chemical, mechanical, psychological and ergonomic hazards) has been an issue of growing concern over time and despite this, there are no defined statistics of how many medical laboratory personnel are victims of occupational hazards. We sought to assess the occupational health exposure incidents among laboratory personnel who attended biosafety trainings.

**Methods:** We conducted a cross-sectional study by retrospective review of data from laboratory personnel who were trained on occupational safety across the country. We abstracted data from a healthcare workers survey tool, an occupational safety and health evaluation form administered at the end of biosafety and biosecurity trainings from 2015 to 2018. We collected information on demographics and types of occupational health exposures using a preformed Microsoft Excel data abstraction tool. We calculated descriptive statistics for continuous and categorical variables. We calculated odd ratios with their respective p values and confidence intervals using occupational exposure as the outcome variable. Factors with P-values of  $\leq 0.05$  were considered to be statistically significant.

**Results:** We reviewed 325 records of which those with work experience of <15 years were 289 (89%), 131 (40%) obtained 3 doses (fully vaccinated) against

Hepatitis B, those who had an occupational exposure incident were 205 (63% , those exposed through routine medical laboratory diagnostic procedures were 108 (30%). Of the 205 occupational exposure incidents, those undocumented and unreported accounted for 116 (57%) and 73(36%) respectively. The odds of specific occupational exposures was 7 times in those having insufficient waste handling disposal mechanisms (OR 7.3 CI 4.38-12.01) compared to those handling hazardous chemicals (OR 1.6, CI 1.03-2.56)and lacking standard safety equipment (OR 1.2, CI 0.79-1.90).

**Conclusions:** Over half medical laboratory personnel experienced at least a specific exposure incident, most of which are largely undocumented and unreported. We recommend effective implementation of facility safety mechanisms to mitigate the occupational safety exposures at the work place.

# One Health, Infectious & Parasitic Diseases

**Abstract 132****Title: Profiling of malaria infection in asymptomatic population in Kisumu County, Western Kenya.**

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**Background:** Countries in malaria-endemic zones aim to enter the pre-elimination phase. There is scanty information on the burden of asymptomatic malaria and its contribution to sustaining transmission in malaria holoendemic regions. This study aims to determine the burden of malaria parasite among asymptomatic cases.

**Methods:** 480 individuals from Kisumu County were grouped into 29 clusters. Each cluster containing 4 households was followed up monthly between July 2015 and June 2016 and each was tested for malaria by real-time reverse transcription PCR (rt RT-PCR). Malaria positive cases were treated with artemether-lumefantrine and further screened for *Plasmodium falciparum* 16 (Pf16) early, 25 (Pf25) late gametocytes stages and *Plasmodium* species. The prevalence of malaria was established at baseline diagnosis and incidence per household and per cluster across the study period.

**Results:** Fifty-six percent (2375/4214) of the tested participants were positive for malaria at multiple follow-up time-points. A case study of one of the clusters showed subsequent positive malaria detection of 72.2±21% infected during visit 5 to visit 9. Of these malaria positive samples, 68% harbored gametocytes comprising 48% both Pf16 and Pf25 stages, 19% Pf16 only and 1% Pf25 only. 70% were positive for *P. falciparum* mono-infection, 6.7% had mixed-infections of *P. falciparum* and *P. malariae*, 10% had *P. falciparum*, *P. malariae*, and *P. ovale* while 1 was *P. falciparum* and *P. ovale* mixed infection. The Pf16 positive samples comprised 11 *P. falciparum* mono infections and 1 *P. falciparum* and *P. ovale*. Only 15% of samples that had no gametocytes were positive for *P. falciparum* single-species infections. Gametocyte prevalence remained comparable despite artemisinin-based combination therapy (ACT) administration upon positive diagnosis suggesting that asymptomatic cases are involved in the transmission of malaria.

**Conclusion:** The high rate of gametocytaemia among mixed-species infections than those comprising *P. falciparum* single species infections suggest that other species are involved in modulating Pf transmission. Analyses are underway to determine if recurrent gametocytaemia is due to recrudescence or new infections.

**Abstract 133****Title: Therapeutic response of non-falciparum versus pure falciparum species to ASMQ and AL treatment in Kisumu County, Western Kenya**

**Gladys C Chemwor** (U.S ARMY MEDICAL RESEARCH DIRECTORATE KENYA , KEMRI)\*

**Background:** There is little empirical data on the response of non-falciparum species to the present treatment Artemisinin Combination Therapy (ACT) during this period where malaria elimination progress seems unresolved. This study compares the therapeutic response of mixed Plasmodium species versus *P. falciparum* mono-infection to artemether-lumefantrine (AL) and artesunate-mefloquine (ASMQ).

**Methods:** 528 blood samples were collected at different time points for day 0, 7, 14, 21, 28, 35, and day 42) from 88 individuals enrolled in an ACT efficacy study between 2013 and 2015 in Kisumu. They were tested for the presence of malaria parasites by 18s rRNA real-time PCR and typed for Plasmodium species composition using species-specific primers to detect Plasmodium falciparum(Pf), Plasmodium malariae(Pm), Plasmodium ovale curtisi(Poc) and Plasmodium ovale wallikeri(Pow). Recurrent parasitemia for the subsequent time points specifically days 28 and 42 was also monitored. 85% of the day zero samples were Pf mono infections while 14% were co-infections that included; Pf/Pm, Pf/Pow & Pf/Poc/Pm at 6 %, 4 % & 3% respectively.

**Results:** Pf declined to 13% on day 7 and 7% on day 14 but its rising trend started from day 21 at 16% up to day 42 at 27%. Pm was present on day 0 at 5% and disappeared only to reappear at day 21, 28, 35 at 1% for all these days as well as day 42 at 3%. Poc was present on days 0 at 8% followed by a decline on days 7, and 14 with a slight increase on day 21 at 3% then disappeared completely only to be seen on day 42 at 3%. Pow was persistent throughout the subsequent days with an increase on day 21 at 8%. For outcome 28, mono falciparum infections had a higher percentage of Adequate Clinical and Parasitological Response (ACPR) at 75% than mixed-species 58 %. Importantly, mixed-species infections had a higher percentage of Late Clinical Failure (LCF) at 33% than single Pf at 20% similar to outcome 42 at 41%. The median parasite clearance slope half-life

for single Pf species and mixed-infections was 2.32 hours and 2.77 hours with ranges of (0.97 - 3.60) and (1.78 - 4.21). The median time taken to clear 99% of the parasite load was 18.57 and 22.26 hours for the single falciparum infection and mixed-infections respectively.

**Conclusion:** ASMQ had a higher percentage of ACPR 81% than AL 54% with significant p-values of 0.0000 and 0.004 for outcome 28 and outcome 42 respectively. ASMQ cleared the parasites faster than the AL arm even though Pow persisted throughout the subsequent days apart for day 35 for ASMQ. The rise in the frequency of non-falciparum malaria from day 21 to day 42 had marginal effects on the treatment outcomes at days 28 and 42 and it took a longer period to clear the symptoms.

Funding: Armed Forces Health Surveillance Branch (AFHSB)

Disclaimer: Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication.

**Abstract 134****Title: *Plasmodium falciparum* gametocyte sex ratio in an asymptomatic population: impact on malaria transmission**

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**Background:** The burden of asymptomatic and sub-microscopic malaria infections in endemic settings is playing a role in sustaining transmission. *Plasmodium* gametocyte stage that is infectious to mosquito is central to sustained transmission. This argues for innovative transmission-blocking strategies in order to meet global elimination goals. Mosquito infection is mainly determined by gametocyte density and its sex ratio is crucial in ensuring fertilization. Conventional means of sex ratio quantification - microscopy - is imperfect and quantification has been improved by the introduction of molecular detection tools that allow detection at lower densities. It has been shown that adequate numbers of male and female gametocytes need to be generated during infection for successful fertilization. However, the range of the sex ratio that would allow transmission is not clear. Here, we aim to estimate a range of gametocyte sex ratio that would allow transmission in an asymptomatic population in a malaria holoendemic region.

**Methods:** A total of 4214 blood samples collected from 29 clusters in a malaria transmission dynamics study in Kisumu between July 2015 and June 2016 were used in this study. *Plasmodium* and gametocyte detection was then carried out using a RT-qPCR. Subsequently, *Plasmodium* species composition of each positive sample was determined. Participants who had gametocytes underwent either a membrane or direct landing feeding assay and on day 8, all the fed mosquitoes were dissected and diagnosed for the presence of oocyst

- suggestive of successful infection. Gametocyte sex ratio analysis has been carried out as described by Schneider *et al.* with few modifications – replacing *Pfs230p* with *PfMGET* as the male gametocyte marker.

**Results:** Approximately 56% (2375/4214) of the samples were positive for malaria and 25% (1065/4214) positive for gametocytes. The predominant species was *P. falciparum* and a majority of samples had female gametocytes.

**Conclusion:** The results from this study depict a high burden of subclinical infections within the study area. Data analysis on gametocyte proportions and densities is ongoing.

**Funding:** Armed Forces Health Surveillance Branch (AFHSB)

**Disclaimer:** Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the author and are not to be construed as official, or as reflecting true views of the Department of the Army or the Department of Defense. The investigators have adhered to the policies for the protection of human subjects as prescribed in AR 70–25.

**Abstract 135****Title: Evaluating microscopy performance among trainees trained in Malaria Diagnostics Center in Kisumu.**

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**Background:** Lack of metrics to uniformly ascertain effects of intervention such as drugs, vaccines impact and control hinders efforts to transition to malaria pre-elimination phase. Training and assessment of the competence of the various professionals involved in these crucial stages of malaria management is key. Malaria Diagnostics Center (MDC) was established in 2004 by United States Medical Research Directorate – Africa/Kenya, Kenya Medical Research Institute to standardize malaria diagnostics in the region. MDC designed a curriculum which is able to assess the competence of candidates at various proficiency levels. As part of entrenching this habit among malaria diagnosis professionals, it is essential to rate impact of the training on trainees. The aim of this study was to determine the uptake of diagnostic skill sets acquired before and after training among trainees who attended a total of 6 MDC training sessions throughout the year 2013.

**Methods:** Ten-day malaria microscopy course was conducted for microscopists drawn from both private and public institutions. The course contained theoretical and practical sessions. The impact of training was evaluated by practical and theoretical pre- and post-training assessments on parasite detection (sensitivity and specificity), species identification and parasite quantification.

**Findings:** A total of 61 participants completed the training which comprised of Ministry of health personnel at 48(79%) and other research organizations 13(21%). The knowledge of basic malariology (theory) at pre- and post-tests

were 64% (95% CI 61-67%) and 93% (95% CI 91-94%), respectively ( $P < 0.001$ ). The mean parasite detection (sensitivity) were 57% (95% CI 50-64%), during the pre-test and 90% (95% CI 87-93%) for the post-test ( $P < 0.001$ ), improvement of 32% (95% CI 26-39%). However for specificity, there was negative reduction from a mean of 57% (95% CI 51-64%) in pre-test to 51% (95% CI 42-60%) post-test ( $P = 0.254$ ), improvement -6%, (95% CI -12 to -0.7%). Conclusion: Overall improvement was observed in all areas tested except for specificity which had negative (-6) improvement.

**Conclusion:** Findings show improvement in performance, if maintained would improve the quality of microscopic diagnosis of malaria over time.

## Abstract 136

### Title: Prevalence of Malaria Infection among ABO Blood Groups within Kenyan Isolates

Redemptah A Yeda (usamru-k-KEMRI)\*

**Introduction:** The ABO blood groups consist of A, B and H carbohydrate antigens which regulate protein activities during malaria infection in humans. Understanding the interplay between malaria parasite and blood group antigens is essential in understanding new interventions to reduce the global burden of malaria. This study assessed association between malaria infection and presence of ABO blood groups among individuals seeking treatment at selected hospitals in Kenya.

**Methodology:** A total of 367 samples from an ongoing malaria surveillance study were diagnosed for malaria by microscopy and further typed for blood group using the ABO blood grouping. Age and sex of each individual was recorded. Data was analyzed using STATA Version 13.1. Chi-square ( $\chi^2$ ) was used to determine association between blood group and malaria infection as well as age and sex. Mean difference was analyzed using Students t-test and one-way ANOVA test. Binary Logistic regression was done to determine independent associations between blood groups and presence of malaria infection.

**Results:** Of the 367, 314 were malaria positive, mean age was 9.83 years for <5 years 152 (48.41%), 6 to 17 years 101 (32.16%) and > 18 years 61(19.43%). Malaria prevalence was higher among females than males 54.46% and 45.54% respectively. Kisumu enrolled the highest number of malaria cases 111(35.35%), Kombewa 108(34.39%), Malindi 32(10.19%), Kisii 28(8.92%), Marigat 23(7.32%) and Kericho 12(3.82%). Blood group O+ was the most prevalent among the enrolled individuals (46.50%), A+ (27.71%), B+ (21.02%) and AB+ (4.78%) respectively. Compared to blood group O+, blood group A+ individuals were (19%) more likely to have *P. falciparum* infection as opposed to B+ and AB+ individuals that were 17% and (38%) respectively, less likely to have *P. falciparum* infections. The mean parasite density was 3.46% [95% CI; 2.09 – 4.84]. Chi-square test showed no difference statistically association between sex and malaria infection ( $\chi=1.96,df=3,p=0.58$ ). Mean parasite density showed no difference statistically

among levels of age groups ( $p=0.55$ ,  $F=0.60$ ).

**Conclusion:** The present study shows individuals of blood group A+ are more susceptible to malaria infection compared to individual of blood group O+.

**Abstract 137****Title: Molecular characterization of *P. falciparum* multidrug resistance protein 1 (Pfmrp1) SNPs in correlation with in vitro *P. falciparum* drug sensitivity patterns pre and post-ACTs in Kenya**

**Winnie Adhiambo Okore** (KEMRI/Walter Reed Project, Kenya)\* 1Department of Emerging Infectious Diseases-Global Emerging Infections Surveillance and Response System (DEID-GEIS) Program, United States Army Medical Research Directorate-Kenya (USAMRD-A/K).

**Background.** Emergence and spread of resistance to chloroquine (CQ) and sulfadoxine-pyrimethamine (SP) have increased concerns of emerging resistance to artemisinin-based combination therapy (ACT) in sub-Saharan Africa. Single nucleotide polymorphisms (SNPs) of the Pfmrp1 gene have previously been associated with resistance to artemisinin and its partner drugs. No suitable alternatives exist for ACT as first-line treatments of falciparum malaria yet. Identifying molecular markers contributing to resistance and correlation with anti-malarial drug sensitivity patterns will facilitate understanding the mechanisms of ACT resistance.

**Methods:** A total of 240 samples collected from 6 hospitals under an ongoing study, Epidemiology of malaria and drug resistance sensitivity patterns in Kenya. Were assayed for SNPs at Pfmrp1 gene codons; H191Y, S437A, I876V and F1390I associated with resistance to artemisinin (ART), lumefantrine (LU), amodiaquine (AQ), mefloquine (MQ), quinine (QN) and CQ on Agena MassARRAY platform. Additionally, in vitro anti-malarial drug sensitivity testing by the malaria SYBR Green I-based fluorescence assay was used to assess, malaria parasite growth in different concentrations of the drugs. Categorical data was analyzed as proportions showing rates of frequency and median IC<sub>50</sub> values.

**Results:** Out of 240 samples, 86 have been typed. SNPs at codons I876V and F1390I were shown to be at 42% (36/86) mutants, 19% (16/86) mixed and 35% (30/86) wild type, 1.2% (1/86) mutants and mixed and 94% (81/86) wild type respectively. CQ had a median 50% inhibition concentration (IC<sub>50</sub>s) of 6.440 ng/

ml (95% CI, 0.6920 to 44.61), MQ had a median of 4.962 ng/ml (95% CI, 0.6362 to 9.978), QN had a median of 35.84ng/ml (95% CI, 0.01441 to 222.9), ART had a median of 2.946 ng/ml (95% CI, 0.3056 to 39.43), AQ had a median of 1.832 ng/ml (95% CI, 0.1560 to 8.036), LU had a median of 15.26 ng/ml (95% CI, 1.468 to 49.47). Further analysis is still ongoing.

**Conclusion:** This study will correlate the frequency of SNPs in the Pfmpr1 gene with anti-malarial drug sensitivity patterns and facilitate tracking of the emergence and spread of ACT resistance in Kenya. Samples tested during the study period showed susceptibility to selected antimalarials.

**Abstract 138****Title: Comparison of Plasmodium infections between adults and children in Kombewa village**

**Cornel Arima**<sup>1</sup>, Cephas Aguko<sup>1</sup>, Agneta Ogolo<sup>1</sup>, Catherine Sumbi<sup>1</sup>, Michael Ayaya<sup>1</sup>, Everlyne Omondi<sup>1</sup>, Victor Otieno<sup>1</sup>, Vincent Akolo<sup>1</sup>, Rose Adeny<sup>1</sup>, Hoseah M. Akala<sup>1</sup>, Bernhards Ogutu<sup>1, 2</sup>, Jim Ray Managbanag<sup>1</sup> Institution: <sup>1</sup>United States Medical Research Directorate – Africa/Kenya, <sup>2</sup>Kenya Medical Research Institute

**Introduction:** Malaria remains one of the major causes of preventable illnesses and mortality in developing countries. In 2005, WHO estimated 214 million new malaria infected cases with 438,000 malaria associated mortalities. Malaria morbidity and mortality is higher in children under five years than adults. Studies have shown that recent up-scaled integrated vector control interventions have eased disease burden in Africa. Specifically, the world health organisation recommends that in endemic areas with intense malaria transmission, all infants at their first immunization and all pregnant women as early as possible in pregnancy should receive one long-lasting insecticidal net through immunization and antenatal care visits. As this guideline continues to be followed, it is essential to continue tracking the impact of these guidelines on disease burden across ages in the population. The aim of this study was to estimate the frequency of malaria in Kombewa by age group.

**Method.:** A total of 1451 potential study subjects were screened in the blood collection protocol survey between 2007 and 2011 in Kombewa sub county, Kisumu. A total of 20µl of whole blood was drawn from each study subject. Each sample was tested by both RDT and confirmed by expert microscopy.

**Results:** Out of 1451, 940(64.8%) samples tested positive for Plasmodium species by microscopy. Of the 940 positive cases, children < 5 years were 400(43%), ages of 5-17years 385(26.6%) while adults above 18yrs were 150(10.5%) positive cases. Further, children ages <5 years had highest parasite counts than older children aged 7-17 years and adults based on expert microscopy confirmed read-outs (P<0.005).

**Conclusions:** These findings show decreasing frequency of infection with increase in age suggesting sustained burden among children despite heightened intervention targeting this age group.

**Abstract 139****Title: The Role of malaria rapid diagnostic tests in screening of asymptomatic individuals to be enrolled in Clinical Trials****CATHERINE S SUMBI (Walter Reed Project KSM)\***

**Background:** Malaria is one of the world's most prevalent parasitic diseases with the highest prevalence reported in Sub-Saharan Africa. The parasites that cause malaria are from the Plasmodium genus. Clinical trials for effective treatments against malaria are reliant on microscopy and malaria rapid diagnostic kits (mRDTs) for determining treatment response. The antigen specific mRDTs are preferred for their ease of usability where microscopy may not be available. Recent studies showing genotype-based variability in response to mRDT marker proteins warrant assessment of performance of this method in clinical efficacy studies.

**Method:** 1451 participants were enrolled in Blood Collection Protocol 1, a clinical efficacy study between 2007 and 2011 in Kombewa HDSS. They were tested for malaria using microscopy and Parascreen mRDTs as part of assessing eligibility for enrollment into the study. While mRDT indicated the presence or absence of malaria parasites in whole blood samples, microscopy was done to determine the presence or absence of malaria parasites, species and parasites enumeration. Data generated readouts from microscopy were compared with those from mRDT using descriptive statistics.

**Results:** Of the 1451, 1175(81%) were positive while 272(19%) were negative by mRDT. 940 (64%) were positive while 503(35%) were negative by microscopy.

**Conclusion:** This finding showing higher positive predictive rates for mRDTs than microscopy suggests the mRDTs usability alongside microscopy in efficacy studies.

**Abstract 140**

**Title: Evaluating the prevalence of *Plasmodium* parasites among asymptomatic individuals using Microscopy and malaria rapid diagnostic test in kombewa HDSS area, western Kenya.**

**Agneta Ogolo** <sup>1</sup>Cornel Arima<sup>1</sup>, Cephas Aguko<sup>1</sup>, Catherine Sumbi<sup>1</sup>, Michael Ayaya<sup>1</sup>, Everlyne Omondi<sup>1</sup>, Victor Otieno<sup>1</sup>, Vincent Akolo<sup>1</sup>, Rose Adeny<sup>1</sup>, Hoseah M. Akala<sup>1</sup>, Bernhards Ogutu<sup>1,2</sup>, Jim Ray Managbang<sup>1</sup>.

Institutions: <sup>1</sup>US Army Medical Research Directorate-Africa/Kenya, <sup>2</sup>Kenya Medical Research Institute

**Background:** Three microscopically distinguishable species, *Plasmodium falciparum* (Pf), *Plasmodium malariae* (Pm) and *Plasmodium ovale* (Po) cause malaria infection in Kenya. In malaria endemic areas, people tend to develop partial immunity, allowing occurrence of asymptomatic infections. The asymptomatic infections are an important reservoir for sustaining vector infections, and anchor the disease in eco-epidemiological settings. Though asymptomatic individuals significantly impacts transmission dynamics, they are often obscure to the health systems since they do not seek treatment. The aim of this study is to determine frequency of plasmodium infections in asymptomatic persons using Microscopy and malaria rapid diagnostic test (mRDT) diagnostic methods.

**Methods:** 1451 individuals between 5 months to 65 yrs, from randomly selected households were enrolled between 2007 and 2011 within Kombewa HDSS. 250µl finger prick EDTA blood was collected from each individual. 2 thick and thin smears were made, complete blood count and RDT done using Parascreen®. Giemsa stained slides were read by expert microscopists to determine plasmodium species and parasitemia. Data was analyzed using descriptive statistics for frequency of positive infections per test methods used. Inferential statistics was used to describe variations in between diagnosis methods.

**Results:** Of the 1451, 940 (65%) samples were positive by microscopy and 1175 (81%) samples were positive by RDT. Of the 940, 213 (23%) were asymptomatic. The distribution of *Plasmodium spp* was; *Plasmodium falciparum* 197 (21%),

*Plasmodium falciparum* with *Plasmodium malariae* 7(0.7%), *Plasmodium malariae* 3(0.3%), *Plasmodium ovale* 2(0.2%), *Plasmodium falciparum* with *Plasmodium ovale* 4 (0.4%).

**Conclusion:** This finding shows high burden of asymptomatic infections using the most frequently used microscopy and RDT diagnostic method. Asymptomatic individual presents the risk of transmitting infections since they would not seek treatment. Strategy should be developed for diagnosis and treatment of asymptomatic individuals.

**Abstract 141****Title: A systematic review of Malaria Diagnostics Centre's comprehensive malaria microscopy training coverage in Kenya and beyond**

**Rose Adeny**<sup>1</sup>, Agneta Ogolo<sup>1</sup>, Cornel Arima<sup>1</sup>, Cephas Aguko<sup>1</sup>, Catherine Sumbi<sup>1</sup>, Michael Ayaya<sup>1</sup>, Everlyne Omondi<sup>1</sup>, Victor Otieno<sup>1</sup>, Vincent Akolo<sup>1</sup>, Hoseah M. Akala<sup>1</sup>, Bernhards Ogutu<sup>1,2</sup>, Jim Ray Managbang<sup>1</sup>

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**Background:** Microscopy as a gold standard for malaria diagnosis is dependent on microscopist's expertise, periodic re-training and certification. Unskilled microscopy has inherent with diagnostic errors such as false negatives, false positive, and inaccuracies in species identification and parasite quantification. Enhance qualitative and quantitative malaria diagnostic skills globally is essential for: highlighting microscopy as a reliable tool for malaria diagnosis, improving malaria diagnosis in both clinical and research settings, standardizing malaria microscopy procedures and practices, establishing competency and performance standards for malaria microscopy

**Methods:** The Malaria Diagnostics Centre (MDC) was established in 2004 to enhance qualitative and quantitative malaria diagnostic skills in laboratories globally. The aim of this study was to estimate training impact since its inception. Seven publications by various researchers revealed limited expertise in malaria microscopy among individuals working in public hospitals. Between 2004 and 2008, MDC implemented a 14 day training syllabus for individuals with no malaria microscopy training and a 5-day refresher for previous trainees. Prior to training commencement, a pre-test was conducted to gauge the knowledge of participants and a post test to gauge the skill sets acquired. Microscopy time was allotted more than 50% overall training time. Training comprised of theoretical and practical sessions.

**Results:** A total of 1843 laboratory trainees from 28 countries were trained between 2005 and 2018. Countries reached by regions were; East Africa 10,

West 8, North 2, South 4, Central 2 and Asia 2. Total number of countries trained in Africa 26(93%), outside Africa 2(7%). Number of microscopy classes held was 126, within Kenya 109(87%), outside Kenya 17(13%). The 1843 laboratory trainees comprised those from Kenya 1472(80%), outside Kenya 371(20%). MDC then established sister malaria diagnostics centers in three countries after 10 day mentorship program for facilitators.

**Conclusion:** These results show that East and West Africa had the highest number of trained personnel compared to other regions with Africa at 93% compared to Asia at 7%. This findings show the need for establishment of malaria diagnostic training centres across regions. This argues for dedicated funding for this framework as it would warrant an increase in coverage of trained malaria microscopists globally as a prerequisite for adopting pre-elimination phase.

**Abstract 142**

**Title: Comparing co-infection of Plasmodium ovale and Plasmodium malariae in symptomatic and asymptomatic individuals in Kombewa HDSS area, Western Kenya.**

**Cephas Aguko** 1, Cornel Arima<sup>1</sup>, 1Agneta Ogolo, 1Catherine Sumbi, 1Michael Ayaya, 1Everlyne Omondi, 1Victor Otieno, 1Vincent Akolo, 1Rose Adeny, Hoseah M. Akala<sup>1</sup>, Bernhards Ogutu<sup>1, 2</sup>, Jim Ray Managbang<sup>1</sup>

**Institution:**

1United States Army Medical Research Directorate – Africa/Kenya,

2Kenya Medical Research Institute

**Background:** The prevalence of malaria infection in Kombewa, Western Kenya still remains high despite heightened interventions. Three Plasmodium species; Plasmodium falciparum (Pf), Plasmodium ovale (Po) and Plasmodium malariae (Pm), Plasmodium falciparum plus plasmodium malariae (pfm), Plasmodium falciparum, Plasmodium malariae and Plasmodium Ovale (pfmo) and Plasmodium falciparum and Plasmodium ovale (pfo) exist sympatrically. Bites from mosquitoes carrying different species of parasites often leads to co-infection in humans. Co-infection with different species has been shown to modulate disease progression to either asymptomatic or symptomatic. As studies continue to highlight mortality among children less than 5 years, it is essential to understand variability in species carriage among the different age groups. The aim of this study was to estimate the role of species composition in malaria mortality in Kombewa, Western Kenya.

**Methods:** 1451 samples were collected under the Blood Collection protocol between 2007 and 2011. These samples from Kombewa HDSS randomly screened for malaria included both asymptomatic and symptomatic individuals. Each blood sample was tested for presence or absence of Plasmodium parasites, species present determined by malaria rapid diagnostic test kit (mRDT) Parasreen® and confirmed by microscopy. Counts of positive Pf, Po, Pm, Pfm, Pfo, Pfmo were obtained and recorded.

**Results:** From asymptomatic individuals screened, a total of 41(3%) had pfm, 18(1%) pfo, 2(0.1%) pfmo, 322(22%) pf and 204(14%) were negative. As for children between 6-17 years, 37 (3%) had pfm, 5(0.3%) pfo, 1(0.1%) pfmo, 331(23%) pf and 121(8%) were negative. Adults above 18 years had 2(0.1%) pfm, 2(0.1%) pfo, 149(10%) pf 164(11%) were negative, no pfmo species were found in adult samples. The findings above show that children <17 years were more vulnerable to plasmodium infections compared to adults.

**Conclusion:** Disease burden could be as a result of poor health seeking behavior especially in the absence of fever and lack of mechanisms to trace them within house holds

**Abstract 143**

**Title:** Co-infection of *Plasmodium ovale* and *Plasmodium falciparum* species associated with symptomatic malaria in the endemic region of western Kenya.

**Jackline Juma** (1Department of Emerging Infectious Diseases (DEID), United States Army Medical Research Directorate-Kenya (USAMRD-K), Kenya Medical Research Institute (KEMRI) )\*

**Introduction:** Malaria prevalence continues to decline across sub-Saharan Africa as a result of various intervention strategies. However, the diseases still pose a public health concern in endemic regions. *Plasmodium falciparum* (Pf) infections occur sympatrically with *Plasmodium ovale curtisi* (Poc), *Plasmodium ovale wallikeri* (Pow) and *Plasmodium malariae* (Pm). Po is rarely detected by microscopy owing to low parasite density. Estimating the burden of species among symptomatic and asymptomatic cases is significant. This study assesses the composition of *Plasmodium* species among symptomatic and asymptomatic cases in Kombewa.

**Method:** Between 2013 and 2016, 435 symptomatic malaria individuals presenting at Kombewa Sub-County hospital were recruited for a malaria drug resistance surveillance study. Concurrently, 454 asymptomatic individuals within the same area were enrolled in a transmission dynamics study. About 2mL of blood drawn from participants, tested for the presence of malaria parasites by 18s rRNA real-time PCR, typed for *Plasmodium* species composition using the genus-specific small subunit ribosomal RNA gene (ssrRNA).

**Results:** Of 435 symptomatic cases, Pf had the highest prevalence at 96%, followed by Pow, Poc, and Pm at 28%, 9%, and 7% respectively. Co-infections between Pf/Pow were highest 21%, Pf/Pm, Pf/Poc, Pf/Poc/Pow, Pow,Pf/Pm/Poc and Poc/Pow at 6%, 5% 3%,0.5% and 0.2% respectively. In asymptomatic cases, single species of Pf, Pm, Pow, and Poc prevalent at 90%, 15%, 11%, and 10% respectively. Pf/Poc and Pf/Pow co-infections were observed at 5%, 2% while Pf/Pm, Pf/Pm/Pow, Pm/Pow,Pf/Pm/Poc, Pm/Poc , Pf/Pm/Pow/Poc and Pm/Poc were prevalent at 6%, 4%, 2%, 4%, 0.6% and 0.4% respectively. Comparison of overall species frequency between two infections showed a stronger association between Pow/Pf co-infections with symptomatic malaria (OR of 10.4, 95% CI

range [5.6 – 19.4 and  $P < 0.0001$ ).

**Conclusions:** Higher frequency of non-falciparum species especially Pow/Pf co-infections among symptomatic than asymptomatic malaria cases was observed. However higher Pm frequency was observed among asymptomatic than symptomatic cases suggesting low virulence. It is necessary to identify these two types of Po because relapse periodicity and drug susceptibility, need to be studied to reduce ovale malaria burden based on analyses of treatment-seeking habits.

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Disclaimer: Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the author and are not to be construed as official, or as reflecting true views of the Department of the Army or the Department of Defence. The investigators have adhered to the policies for the protection of human subjects as prescribed in AR 70–25.

**Abstract 144****Title: A trend of in vitro antimalarial performance in a span of ten years during artemisinin combination therapy in Kenya****Agnes C Cheruiyot (USAMRU-K)\***

**Background:** Emergence of antimalarial drug resistance in south East Asia is a major obstacle in elimination of malaria, thus need for continued surveillance. In vitro testing of malaria isolates has increasingly provided an additional platform to monitor susceptibility of antimalarials. In vitro antimalarial testing provides useful drug susceptibility information that has in the past influenced malaria drug prescription, thus the need for continued surveillance.

**Methodology:** Susceptibility data from an ongoing surveillance study of malaria and drug sensitivity patterns in Kenya were further analyzed for 2008 to 2019 study period. Antimalarials screened included: chloroquine (CQ), quinine (QN), atovaquone (AV), primaquine (PQ) and mefloquine (MQ). Inhibition curves in, in vitro assays, were obtained from the relative fluorescence units (RFU) using Graph Pad Prism (San Diego, CA, USA).

**Results:** During study period, trend in chloroquine median drug concentration that inhibits parasite growth by 50% (IC<sub>50</sub>) was 17.33ng/ml (95% CI, 2.863 to 42.54) in 2008, 6.903 ng/ml (95% CI, 0.4013 to 62.06) in 2013 and decreased to 5.646 ng/ml (95% CI, 1.272 to 19.25),  $p < 0.0001$  in 2019. Atovaquone median (IC<sub>50</sub>) was 1.280ng/ml (95% CI, 0.2242 to 4.072) in 2008, 0.6612 ng/ml (95% CI, 0.1390 to 7.210) in 2013 and decreased to 0.600 ng/ml (95% CI, 0.0610 to 3.534),  $p < 0.0001$  in 2019. Quinine median (IC<sub>50</sub>) was 68.05ng/ml (95% CI, 14.16 to 362.4) in 2008, 61.84ng/ml (95% CI, 1.423 to 1306) in 2013 and 13.48 ng/ml (95% CI, 0.4279 to 152.6),  $p < 0.0001$  in 2019. Primaquine median (IC<sub>50</sub>) was 367.5ng/ml (95% CI, 54.45 to 973.3) in 2009, 333.8ng/ml (95% CI, 4.842 to 1010) in 2013 and 36.36 ng/ml (95% CI, 1.650 to 1137),  $p < 0.0001$  in 2019. Mefloquine median (IC<sub>50</sub>) was 5.208ng/ml (95% CI, 0.5840 to 13.57) in 2008, 3.187 ng/ml (95% CI, 0.1680 to 12.36) in 2013 and 4.855 ng/ml (95% CI, 0.8768 to 10.37),  $p = 0.0030$  in 2019. Results show a reducing median in antimalarials tested suggesting higher susceptibility to Plasmodium falciparum strains.

**Conclusion:** A lower median (ng/mL) observed over years suggests improved susceptibility of antimalarials hence this data may support their continued usage, for the drugs that have been approved by the ministry of health. This study appears to underscore the importance of surveillance studies using sustainable methods to provide data on antimalarials susceptibility.

**Abstract 145****Title: Prescription of Antimalarials among Malaria-negative Febrile Patients in an Urban Informal Settlement in Nairobi, Kenya**

**Terry Komo** (KEMRI)\*; Patrick K Munywoki (CDC, Nairobi, Kenya); George O. Agogo (CDC); Jane Alice Ouma (KEMRI/CGHR); Daisy C Mutai (KEMRI/CGHR); Samwel Kiplangat (KEMRI/CGHR); Newton Wamola (KEMRI/CGHR); Lillian Opiyo (KEMRI/CGHR); Elizabeth Hunsperger (CDC); Godfrey Bigogo (KEMRI/CGHR); Godfrey Bigogo (KEMRI/CGHR); Jennifer Verani (CDC)

**Background:** The World Health Organization (WHO) recommends prompt malaria diagnosis by microscopy or rapid diagnostic test in all patients with suspected malaria before treatment is given. Failure to confirm malaria infection before treatment can increase the overuse of antimalarials and raise the risk of drug resistant parasites. We examined the prescription of antimalarials for patients with negative laboratory test results for malaria in a clinic in Nairobi, Kenya, and identified factors associated with the practice.

**Methods:** We used data from the Population Based Infectious Disease Surveillance (PBIDS) (May 2013-December 2018), which monitors the health of ~25,000 individuals in Kibera, a large urban informal settlement in Nairobi. Nairobi is a low malaria risk area, although many Kibera residents travel to areas within Kenya with a higher risk. PBIDS participants receive free care for infectious illnesses at a centrally located health facility. At the clinic, epidemiological and clinical data were collected by trained study staff. Malaria microscopy was performed at the discretion of the treating clinician. Thick and thin blood smears were prepared and stained according to WHO guidelines. We examined the proportion of patients with a malaria-negative blood smear who were prescribed antimalarials, and investigated associated factors using logistic regression.

**Results:** Among 97,127 clinic visits between May 2013 and December 2018, 10,502 (10.8%). were made by patients with measured fever; of these, 7,565 (72.0%) had a blood smear performed for malaria testing. Among those tested, 2,130 (28.2%) were positive for malaria, 5,405 (71.4%) were negative and 30 (0.4%) had missing results. Among 5,405 with a negative blood smear, 270 (5.0%) were prescribed antimalarials. The proportion of antimalarial prescription among

those with a negative test, stratified by age-group was: 5/125, (4.0%) for those aged < 6 months; 7/31, (1.9%) for ages 6–11 months; 92/2015, (4.6%) for ages 1–4 years; 76/1553, (4.9%) for ages 5–14 years; 20/309, (6.5%) for ages 15–19 years; and 70/1032, (6.8%) for ages ≥20 years. Travel out of Nairobi in the past month before testing was significantly more common among those treated than untreated (198/270 [73.3%] vs. 760/5135 [14.8%], odds ratio 15.9 (95% confidence interval 12.0-21.2). Age and gender were not significantly associated with prescription of antimalarials to malaria-negative patients.

**Conclusion:** The prevalence of antimalarial prescription among febrile patients who tested negative for malaria was relatively low. However, health providers should adhere to antimalarial prescribing guidelines, even for patients who have traveled to areas with a high burden of malaria, to reduce the risk of malaria parasites developing drug resistance.

**Abstract 146****Title: Hepatitis C Virus Infection in People Who Inject Drugs in Mombasa and Kilifi Counties**

**Rajiv Shah**, Pauline Boucheron, Kishor Mandaliya, Alex Kattamaiyo, Stéphane Chevaliez, Yusuke Shimakawa, Elijah Songok, Maud Lemoine

**Background** Hepatitis C Virus infection(HCV) among people who inject drugs (PWID) in sub-Saharan Africa is a neglected public health issue which requires urgent interventions to increase coverage of harm reduction services as well as access to HCV screening and treatment.

**Methods** 400 PWID were recruited in community-based harm reduction centres in Mombasa County (Reachout Centre and Muslim Education & Welfare Association) and Kilifi County (Kenya Red Cross Society, Watamu). We systematically administered socio-epidemiologic and behavioural questionnaires, performed physical examination and blood tests including HCV serology (Biokit BioElisa 4.0 Kit confirmed with Fujirebio Inno-Lia® Score assay). Positive HCV-antibody samples were tested for HCV RNA and genotyped (Roche Molecular Systems Pleasanton, California).

**Results** Most of the participants (85%, 340/400) were male, median age of 33 years (interquartile range: 28-39). About one third (34%) were on Methadone. 81% used to inject in network groups and more than a half (64%) with regular new members. 95% reported previous incarceration because of drug use. We found a high prevalence (36%, 143/400) of positive HCV serology with a striking geographical variation. HCV prevalence was higher in Mombasa (59%, 118/200) than in Watamu (13%, 26/200). We also observed a high prevalence (35%) of HIV-HCV coinfection. Importantly 92% of the participants had never been tested for viral hepatitis and most were not aware of HCV infection and its consequences. The following factors were found to be independently associated with HCV seropositivity: higher age (adjusted OR 1.05, 95% CI 1.02-1.09, p=0.003), being single (adjusted OR 1.85, 95% CI 1.04-3.28, p=0.04), sharing needles (adjusted OR, 2.09, 95% CI 1.29-3.29, p=0.003), and being part of a group of injectors (adjusted OR, 2.17, 95% CI 1.31-3.59, p=0.003). Of the 143 HCV-positive PWID, 89 (62%) were viraemic. Genotype 1a (45%) and 4a (54%) were predominant but genotype 2a

was also detected (1%) We also assessed the liver disease severity of all the HCV-antibody positive participants using aspartate aminotransferase-to-platelet ratio index (APRI) and found that 6% had suspected cirrhosis.

**Conclusion** Our findings underscore the urgent need of HCV screen-and-treat interventions combined with a campaign to raise awareness about HCV among PWID. In order to achieve the WHO HCV elimination goals in Kenya, no one should be left behind, especially PWID, a too often stigmatised and neglected population.

**Abstract 147****Title: Human Rhinovirus associated with hospitalizations in Western Kenya 2014–2015****Clayton Onyango (CDC-Kenya)\***

**Background:** Infection with human rhinoviruses (HRV) is associated with mild upper respiratory infections that are usually self-limiting. However, HRV has been linked with lower respiratory tract infections in children leading to hospitalization. Prevalence studies from Africa, Europe and in the USA have detected HRV among 17–41% of children aged <5 years hospitalized with acute respiratory illness (ARI). Cases in Kenya have primarily been described from children aged <5 years who reside in the coastal county of Kilifi. Our study focuses on Western Kenya, an area recognized as having the highest prevalence of HIV and malaria in the country, and reports on the molecular epidemiology of HRV in patients of all ages hospitalized with ARI during December 2013–December 2015.

**Methods:** Combined naso- and oropharyngeal swabs collected from study participants of all ages hospitalized with respiratory illness at the Siaya County Referral hospital in western Kenya were tested by polymerase chain reaction (PCR) using a TaqMan array card (TAC) that tested for a panel of 22 pathogens. Samples with either HRV or enterovirus detected at a threshold cycle (CT) value of <40 were considered positive and sequenced at the VP4/VP2 junction to determine virus species and serotype/genotype.

**Results:** A total of 398 TAC-positive samples that detected nucleic acid for HRV (319), dual HRV/enterovirus (72), and enterovirus (7) were tested by individual real time PCR (IRTP) and sequenced. Of the 398 TAC-positives, 70.6% (281) were successfully sequenced: 44.1% (124) identified HRV-A, 18.5% (52) HRV-B, 35.9% (101) HRV-C, 0.4% (1) echovirus 11, 0.4% (1) coxsackievirus A21, and 0.7% (2) enterovirus D68 (EV-D68). The samples that failed to sequence (29.4%) had mean CT value  $28.6 \pm 5.3$  and IQR (15.7 – 39.8). Consistent with other studies in Africa, there was no clear seasonal pattern of occurrence for any species or viruses.

**Conclusion:** This is the first study that describes the distribution of HRV in Western Kenya and also documents the presence of EV-D68, coxsackie and

echoviruses in this population. Furthermore, the frequency of HRV-B species was higher than that reported from other studies in Kenya. Further analysis will be performed to understand changes in prevalence, severity, and age associated with viral-species distribution.

## Abstract 148

### Title: Rising prevalence of HIV-1 drug resistance among adults in Busia Boarder, Kenya

Olipher Makwaga

**Background:** Busia County has 7.7% HIV prevalence, higher than the national (4.9%) with current antiretroviral therapy coverage of 95% among adults. The prevalence of HIV drug resistance ranged from 22% to 23% in adults prior to WHO guidelines that everyone infected with HIV be started on ARVs. Limited data exists after the implementation of these guidelines. Therefore this study was carried out to determine the current prevalence of HIV-1 drug resistance among adults in Busia Boarder.

**Methods:** This was a cross sectional study conducted in 2019. Scientific and ethical approval for this study was sought from the KEMRI Scientific Ethical Review Unit. After obtaining informed consent from participants, 5 ml of blood was collected in EDTA tubes and plasma was separated and analyzed. RNA was extracted from 140 µl of plasma samples using the Qiagen RNA extraction kit according to the manufacturer's instructions. Reverse transcriptase and nested polymerase chain reactions were performed using six primers targeting HIV-1 pol genes. The genes sequenced using Sanger sequencer. Alignment of sequences was done using Recall software. Drug resistance was determined using the International Aids Society algorithm and the Stanford University HIV database.

**Results:** Of the 50 (31 female; 19 male) samples that were successfully sequenced, 70% prevalence had HIV-1 drug resistant major mutations of any kind. The prevalence in female was 61.3% and male was 84.2%. Resistant major mutations against NRTIs was 60%(30/50); NNRTIs, 66%(33/50) and PIs, 8%(4/50). Among major mutations encoding for NRTI were D67N, M184V, T215F, K219E, K70N, K65R, K70E, M41L; NNRTIs were K103N, P225H, A98G, K101E, E138A, G190A, K103S, K100I, H221Y, Y188C and PIs were V82A, I54V, G48V, I50I, L231, I50L, M46I.

**Conclusion:** The study reveals rising of HIV-1 drug resistance among patients who are on ARVs, this calls for routine drug resistance testing prior to administration of any ARVs. This will reduce development of resistant HIV-1 type

**Abstract 149****Title: Implementing a 4-tier Quality Control System in an Evidence Based Multiple Focus Integrated Intensified Tuberculosis Screening Study to End TB in Siaya County.**

**Josephine Awino**<sup>1</sup>, D. Okelloh<sup>1</sup>, N. Ouma<sup>1</sup>, M. Wambura<sup>2</sup>, S. Wandiga<sup>1</sup> Kenya Medical Research Institute, Kisumu, Kenya<sup>1</sup> County Government of Siaya<sup>2</sup>

**Introduction:** Quality Control (QC) plays an important role by assuring data integrity, and thus valid study results. We describe and share results of the quality control process used to guide the data collection process in this study.

**Methods:** Participants were consented followed by a 1st level QC on the consent forms by the consentor. Then the field supervisor for 2nd level QC confirmed whether quality was maintained before the other procedures were performed. The consent forms then moved to 3rd level QC performed by a QC officer. Any query issues would mean returning forms to the consentor for correction. Otherwise forms would move to study coordinator for 4th level QC. This iterative process was conducted for all study case report forms entry into the web-based database.

**Results:** We enrolled 1065 participants using CRF1 Out of this, 713(66.9%) of the CRFs had errors at tier 1, 391(36.7%) at tier 2 and 30(2.8%) at tier 3. The error rates reduced significantly across tiers and finally after tier 4, verified and clean CRFs were uploaded into the database only 9(0.8%) CRFs had errors that were picked by the system.

**Conclusion:** Implementation of a 4-tier QC system ensures adherence to standards and improves quality of processes and reaffirms credibility of data.

## Abstract 150

### Title: Updated CNS-TAC detects *Cryptococcus* and malaria in previously undiagnosed patients in Siaya and Nairobi counties

Shirley A Lidechi (KEMRI-CGHR)\*

**Background:** Acute central nervous system (CNS) infection causes hospitalization and high mortality in sub-Saharan Africa. CNS infections have a wide range of etiologies, and patient diagnosis and management in developing countries is based mainly on clinical diagnosis and bacterial culture.

**Methods:** Previously, we developed and evaluated a TaqMan Array Card (TAC) that tested for pathogens associated with encephalitis using polymerase chain reaction; the first version (V1) of the encephalitis TAC lacked important pathogens that are frequently associated with encephalitis (lacking malaria and fungal pathogens). We developed a second version (V2) of encephalitis TAC by including 14 targets from the first version and introducing 11 new targets in the second version. We re-tested (using V2) 490 cerebrospinal fluid (CSF) samples collected from admitted patients with suspected acute CNS infections from western Kenya (Siaya County Referral Hospital n=284, 58%) and from Nairobi (Mbagathi County Hospital n= 206, 42%).

**Results:** Of the 490 samples tested, 139 targets were positive with both cards. CNS-TAC V1 had 88 targets amplify while CNS-TAC V2 had an additional 77 positive tests that were not detected using the V1 card. When both cards were compared for concordance test results, there was 80–100% agreement on a range of pathogens with Epstein-Barr virus having 80% concordance ( $p=0.625$ ) while *Mycobacterium tuberculosis* showing 100% concordance. *Cryptococcus* was more prevalent in fatal cases ( $n=16$ , 12.7%), with the most affected age group being patients aged 18–50 years with 17 cases (11.6%). A total of 30 cases had dual infection mostly with V2 card while a single case had triple infection with *Cryptococcus*, *Neisseria meningitidis* and Epstein-Barr virus.

**Conclusion:** CNS-TAC V2 detected pathogens including *Cryptococcus* and malaria that were previously missed in the earlier version of card. In these samples, the updated version detected 77 additional pathogens compared to TAC V1, as well as multiple infections from patients. CNS-TAC V2 is considered more useful in this setting for diagnosis and clinical management of patients presenting with

encephalitis, and enhances the sensitivity of surveillance and outbreak detection.

## Abstract 151

**Title: Comparing co-infection of Plasmodium ovale and Plasmodium malariae in symptomatic and asymptomatic individuals in Kombewa HDSS area, Western Kenya.**

**Cephas Oyieke** 1, Cornel Arima<sup>1</sup>, 1Agneta Ogolo, 1Catherine Sumbi, 1Michael Ayaya, 1Everlyne Omondi, 1Victor Otieno, 1Vincent Akolo, 1Rose Adeny, Hoseah M. Akala<sup>1</sup>, Bernhards Ogutu<sup>1, 2</sup>, Jim Ray Managbang<sup>1</sup> Institution: 1United States Army Medical Research Directorate – Africa/Kenya, 2Kenya Medical Research Institute

**Background:** The prevalence of malaria infection in Kombewa, Western Kenya still remains high despite heightened interventions. Three Plasmodium species; Plasmodium falciparum (Pf), Plasmodium ovale (Po) and Plasmodium malariae (Pm), Plasmodium falciparum plus plasmodium malariae (pfm), Plasmodium falciparum, Plasmodium malariae and Plasmodium Ovale (pfmo) and Plasmodium falciparum and Plasmodium ovale (pfo) exist sympatrically. Bites from mosquitoes carrying different species of parasites often leads to co-infection in humans. Co-infection with different species has been shown to modulate disease progression to either asymptomatic or symptomatic. As studies continue to highlight mortality among children less than 5 years, it is essential to understand variability in species carriage among the different age groups. The aim of this study was to estimate the role of species composition in malaria mortality in Kombewa, Western Kenya.

**Methods:** 1451 samples were collected under the Blood Collection protocol between 2007 and 2011. These samples from Kombewa HDSS randomly screened for malaria included both asymptomatic and symptomatic individuals. Each blood sample was tested for presence or absence of Plasmodium parasites, species present determined by malaria rapid diagnostic test kit (mRDT) Parasreen® and confirmed by microscopy. Counts of positive Pf, Po, Pm, Pfm, Pfo, Pfmo were obtained and recorded.

**Results:** From asymptomatic individuals screened, a total of 41(3%) had pfm, 18(1%) pfo, 2(0.1%) pfmo, 322(22%) pf and 204(14%) were negative. As for children between 6-17 years, 37 (3%) had pfm, 5(0.3%) pfo, 1(0.1%) pfmo, 331(23%) pf and 121(8%) were negative. Adults above 18 years had 2(0.1%) pfm, 2(0.1%) pfo, 149(10%) pf 164(11%) were negative, no pfmo species were found in adult samples. The findings above show that children <17 years were more vulnerable to plasmodium infections compared to adults. Disease burden could be as a result of poor health seeking behavior especially in the absence of fever and lack of mechanisms to trace them within house holds

## Abstract 152

### **Title: Discriminating malaria recrudescence and reinfection in a two-arm randomized trial**

**Brenda Onyango (USAMRD-K/KEMRI)\***

**Introduction:** The rise of drug-resistant *P. falciparum* could hamper malaria elimination efforts. In vitro drug testing, molecular marker analysis and drug efficacy studies have long been used to monitor the emergence and spread of drug-resistant parasites. In drug efficacy studies, accurate discrimination of reinfection and recrudescence is vital in depicting treatment outcome. However, the most commonly used technique used to distinguish the two is labor-intensive, time-consuming and prone to contamination. The recently described real-time quantitative PCR with high-resolution melt (HRM) method offer accurate effective and time saving alternative. This study aims to assess the validity and performance of this novel assay by typing drug efficacy study samples.

**Methods:** DNA samples were extracted from dried blood spots obtained from study participants in a two-arm artemisinin combination therapy (ACT) efficacy study. A qPCR was used for malaria detection and subsequent species determination. Validated *P. falciparum* strains and DNA samples from 88 participants (day 0 and subsequent positive follow-up samples) are being analyzed using qPCR and HRM analysis to distinguish *P. falciparum* recrudescence and reinfection.

**Results:** About 100% (88/88) and 98.86% (87/88) of the samples were positive for Plasmodium (PLU) and *P. falciparum* (Pf) respectively. There was a significant reduction in PLU and Pf positive samples on day 14, both standing at 0.06% (5/88). A subsequent increase in positive samples was observed at day 42, 25% (22/88) for both PLU and Pf. Recrudescence and reinfection analysis using qPCR and HRM analysis is ongoing.

**Conclusion:** There was a drop in malaria positive rate during treatment period, followed by a gradual rise to maximal on day 42. The onward analysis will discern if these infections were as a result of recrudescence or re-infection and this will be determined in our ongoing assay.

Funding: Armed Forces Health Surveillance Branch (AFHSB)

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**Abstract 153****Title: Prevalence and associated risk factors of Soil Transmitted Helminths among pregnant women living in Vihiga County Kenya: a cross-sectional study**

**Sylvie B Araka** (KEMRI)\*; Doris Njomo (KEMRI); Collins Okoyo (KEMRI); Bridget Kimani (KEMRI); Janet M Masaku (Kemri); Elses Simiyu (KEMRI)

**Introduction:** Intestinal geohelminths are among the most common and widespread human infections in the developing world. In Africa alone, almost 40 million women of childbearing age are infected with hookworms, including almost 7 million pregnant women are at greater risk of severe anemia, higher mortality, and experience poor neonatal outcome (reduced birth weight and increased infant mortality). Previously, preschool and school aged children in Kenya have been targeted through the National School Based Deworming Program for deworming interventions. However, the problem has left out pregnant women who are also at risk of infection with STHs.

**Methods:** A cross sectional study was carried out to assess the prevalence and intensities of worm infections and associated risk factors among 250 mature minors and adult pregnant women within Vihiga County. Study participants seeking antenatal care services were purposively sampled at selected health facilities. Stool samples were collected and examined for STHs using Kato-katz technique. A structured questionnaire was also administered to determine associated risk factors. Statistical analysis was carried out using STATA version 14.1 (STATA Corporation, College Station, TX, USA). Differences in proportions by age and health facility were assessed using chi-square ( $\chi^2$ ) test and differences in means using a Student t-test.

**Results:** The prevalence of STHs was 12.4% (95% CI: 9.1%-16.9%). Infection caused by *A. lumbricoides* was 9.6% (95% CI: 6.3% - 14.6%), hookworm was 2.4% (95% CI: 1.2% - 4.7%) and *T. trichiura* was 2.0% (95% CI: 0.8% - 5.3%). The overall mean intensity for *A. lumbricoides* infection was 375 (95% CI: 107 - 1308) hookworm was 101 (95% CI: 8 -1355), and *T. trichiura* was 3 (95% CI: 0 - 29). All the infections were categorized as light infections. Univariable analysis of factors associated with infections did not reveal any significant associations. However,

participants with primary level of education had higher odds of *T. trichiura* infection as compared to other participants (OR=2.58, p=0.400). Farmers had higher odds of STH and *A. lumbricoides* infections (OR=3.47, p=0.076) and (OR=3.75, p=0.089) respectively as compared to other occupations. Participants in the second trimester had higher odds of hookworm infection (OR=3.36, p=0.272) and those with children under three years had higher odds of *T. trichiura* infection (OR=3.60, p=0.165).

**Conclusion:** The study revealed that STH infection is prevalent among pregnant women in Vihiga County. Although there were no significant risk factors associated with the infection. This study suggests that health facilities should conduct regular health education on the risks of getting infected with STH and if possible inclusion of deworming interventions for this group.

**Key words:** Soil Transmitted Helminths, Pregnant women, Prevalence, Intensity

**Abstract 154****Title: Blood-meal preferences of malaria vector populations within a holoendemic setting in Kisumu County, Western Kenya****Risper Maisiba (USAMR-A/K)\***

**Introduction:** Blood meal preferences of malaria vectors are closely associated with malaria transmission risk patterns in a given population. These preferences govern host-vector interactions that are central in shaping transmission patterns of vector borne pathogens. The aim of this study was to determine blood meal preferences for *Anopheles gambiae* s.s, *An. arabiensis* and *An. funestus* mosquitoes in a holoendemic setting.

**Methods:** A longitudinal study of malaria transmission dynamics was carried out in Maseno and Kombewa areas that are under Kisumu West Health and Demographic Surveillance System from July 2015 to August 2016. Randomly selected clusters within one kilometre square were targeted for Indoor mosquito collections. The mosquitoes were collected once a month between 0600hrs and 0800hrs. The collected mosquitoes were separated into pools comprising same species. *Anopheles* mosquitoes were separated and stored for further analysis. They comprised of *Anopheles gambiae* s.l and *Anopheles funestus* mosquitoes. Conventional polymerase chain reaction was used to differentiate between the sibling species of *An.gambiae* s.l mosquitoes-*An. gambiae* s.s. and *An. arabiensis*. Bloodmeal ELISA was performed on the blood fed mosquitoes to determine host preference.

**Results:** A total of 575 out of the 929 collected female *anopheles* mosquitoes were blood fed. The blood fed *Anopheles* mosquitoes collected were discerned to have fed on human, cow, donkey, goat, chicken, and cat in order of increasing preference. *An. gambiae* s.l comprised exclusively of *An. gambiae* s.s mosquitoes, and they also exhibited mixed blood-meal sources exclusive of human blood. *An.funestus* highest source of blood-meal was human and they exhibited mixed blood-meal sources inclusive of human blood. *An. gambiae* s.s has been known to be largely endophilic and anthropophilic but this study shows shifts in its biting preferences to include non human hosts.

**Conclusion:** These findings show an increased tendency of *Anopheles gambiae* s.s mosquitoes to feed on non-human hosts. This appears to suggest enhanced vector interventions in the region are limiting human-mosquito interactions. These mosquitoes may have caused behaviour changes or behaviour resiliencies in malaria vectors as seen in this study. It is important to monitor these shifts as they will greatly affect malaria control and possible elimination strategies.

**Abstract 155****Title: Increasing prevalence of Plasmodium ovale during implementation of artemisinin combination therapy****Hoseah M Akala** (U.S Army Medical Research Directorate KEMRI Kenya, Africa)\*

**Background:** The predominant malaria species in Kenya, *Plasmodium falciparum* (Pf), occurs sympatrically with *Plasmodium ovale curtisi* (Poc), *Plasmodium ovale wallikeri* (Pow) and *Plasmodium malariae* (Pm). Diagnosis of malaria often uses microscopy or rapid diagnostic kits. However, studies have shown that these methods can often miss some species in mixed infections. More sensitive molecular methods for malaria speciation are needed to define the temporal prevalence of non-falciparum malaria across Kenya.

**Methods:** In response, we have collected 2027 surveillance study samples from six locations across Kenya, between 2008 and 2015. Samples were diagnosed for malaria and *Plasmodium* species composition using small subunit ribosomal RNA gene (ssrRNA) polymerase chain reaction (PCR) method.

**Results:** Out of the 2027 samples, 72.47% were *P. falciparum* single species infections, 23.80% were mixed infections and only 1.73% occurred as single non-falciparum species infections. Mixed-effect logistic regression models identified a significant increase of *P. ovale* spp over time, with a significant likelihood of occurring in co-infection with *P. falciparum*,  $p=1.14 \times 10^{-12}$ . In addition there was a significant decrease in both the frequency of infections containing *P. malariae* ( $p = 0.091$ ) and infections caused by a single species infection due to *P. falciparum* ( $p = 0.026$ ). The increasing frequency of *P. ovale* spp could be responsible for the increased risk of traveler malaria reported in the last two decades.

**Conclusion:** Follow-up screening of nationally representative samples, such as those collected during malaria indicator surveys as well as from asymptomatic infections, is needed to ascertain the national distribution of non-falciparum malaria.

**Abstract 156****Title: Carriage of *Comamonas kerstersii* from asymptomatic participants enrolled in a case-control diarrheal study in Kisumu, Malindi and Eldoret Hospital in Kenya**

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**Background:** *Comamonas* species are common environmental bacteria organisms that cause human infection. These bacterial species are non-fermenting, gram-negative rods, oxidase and catalase positive. Recently in East Asia and Europe, *C. testosteroni* and *C. kerstersii* have been detected in perforated appendix and bacteremia infections. However, in Kenya there are no known studies that have reported or identified *Comamonas* species, most currently available identification systems will identify *Comamonas* to genus level, if at all. Therefore identification of *Comamonas* species in routine microbiology using the automated bacterial identification platforms is very challenging because *C. kerstersii* is misidentified as *C. testosteroni* making matrix-assisted laser desorption ionization–time of flight mass spectrometry (MALDI-TOF-MS) and PCR gene sequencing by amplification of the 16S rRNA the recommended method of correctly identifying *Comamonas* species.

**Methodology:** Stool samples collected from an ongoing case-control diarrheal study were sent to the Microbiology Hub Kericho laboratory where they were cultured on several selective and differential media including MacConkey, MacConkey sorbitol and Hektoen agar. Non-lactose fermenting colonies from six samples that could not be correctly identified by biochemical tests and Microscan WalkAway 40 plus were further identified using Bruker MALDI-TOF-MS.

**Results:** The six isolates were identified as *C. kerstersii* were from participants between 2 years and 40 years. Interestingly, *C. kerstersii* was detected more in asymptomatic subjects 5/6 (83.3%) than symptomatic subjects 1/6 (16.7%) as compared to previous studies done in other countries where it was found in

mainly in symptomatic subjects only. Co-infection with diarrheagenic *Escherichia coli* such as enteroaggregative *E.coli* and enteroinvasive *E.coli* occurred in 2/6 (33%) of the samples.

**Conclusion:** Due to observed incidence of *Comamonas* species isolates in Kenya more surveillance needs to be conducted to identify its circulating and resistance patterns that could easily be transferred or acquired from other gut microbes leading to severe bacteremia infection.

**Disclaimer** Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the author, and are not to be construed as official, or as reflecting true views of the Department of the Army or the Department of Defense. The investigators have adhered to the policies for protection of human subjects as prescribed in AR 70–25; study protocol WRAIR #1549.

## Abstract 157

### **Title: Invasive pneumococcal disease and serotype distribution in children aged less than five years before and after the introduction of 10-valent pneumococcal conjugate vaccine in urban and rural areas of Kenya**

**Arthur Odoyo (KEMRI-CGHR)\***

**Introduction:** *Streptococcus pneumoniae* is an important cause of pneumonia and sepsis among children, with a high burden of disease in sub-Saharan Africa. Globally, pneumococcal conjugate vaccines (PCV) have led to reductions of invasive pneumococcal disease (IPD) caused by vaccine serotypes (ST). However, data on long-term PCV impact in African settings are limited. We examined IPD among children aged <5 years in a rural and urban area of Kenya before 10-valent PCV (PCV10) introduction (in 2011) and during the eight subsequent years.

**Methods:** The Population-Based Infectious Disease Surveillance (PBIDS) platform monitored the health of individuals in defined catchment areas in Asembo (rural Western Kenya) and Kibera (informal settlement in Nairobi). PBIDS participants received free medical care for infectious illness at a centrally located clinic. Blood samples were collected for culture from patients meeting surveillance case definitions for acute febrile illnesses or pneumonia; pneumococcal isolates were serotyped at the Kenya Medical Research Institute laboratory in Kisumu by polymerase chain reaction and/or Centers for Disease Control and Prevention in Atlanta by Quellung. We examined average IPD (defined as pneumococcus isolated from blood) case counts per year and frequency of vaccine-type IPD (VT-IPD) during the pre-PCV10 baseline (2009-2010), early post-PCV10 period (2012-2015) and late post-PCV10 period (2016–2019).

**Results:** In Kibera during the baseline period, among 24 IPD cases, (average 12 cases per year); 14 (58.3%) had ST data, and 13 (92.9 %) were VT-IPD (ST1 n=5, 38.5%; ST5 n=3, 23.1%; ST4 n=2, 15.4%; ST14 n=2, 15.4%; ST23F n=1, 7.7%). In early post-PCV10 period, among 18 IPD cases (average 4.5 per year), 17 (94.4%) had ST data, and 16 (94.1%) were VT-IPD (ST1 n=11, 68.8%; ST9V n=2, 12.5%; ST5 n=1, 6.3%; ST14 n=1, 6.3%; ST4 n=1, 6.3%). In the late post-PCV period, we identified 2 IPD cases (average 0.5 per year); 1 (50.0%) had ST data that was VT

(ST1 n=1). In Asembo during the baseline, we observed 16 IPD cases (average 8 per year); among 11 (68.8%) with ST data, 8 (72.7 %) were VT-IPD (ST23F n=3, 37.5%; ST14 n=2, 25.0%; ST1 n=1, 12.5%; ST9V n=1, 12.5%; ST19F n=1, 12.5%). In the early post-PCV period among 12 IPD cases (average 3 per year), 11 (91.67%) had serotype data, and 6 (54.5%) were VT-IPD (ST1 n=4, 66.7%; ST14 n=1, 16.7%; S19F n=1, 16.7%). In the late post-PCV period, we identified 4 IPD cases (average 1 per year), all of which were serotyped; 3 (75.0%) were VT-IPD (ST14 n=3, 100%).

**Conclusion:** Preliminary analysis shows a decline in overall IPD and VT-IPD among children aged <5 years following introduction of PCV10 in both areas; ongoing analysis of adjusted incidence will better quantify this impact. However, the persistence of VT-IPD cases 6-7 years after PCV10 introduction highlights the need for continued monitoring of IPD trends and better understanding of risk factors for VT-IPD in the post-PCV10 era.

**Abstract 158****Title: Genetic Determinants of Extended-Spectrum Beta-Lactamase and Quinolone Resistance in *Shigella* spp. in Kenya**

**Ronald K KIRERA** (United states army medical research directorate Africa/Kenya)\*

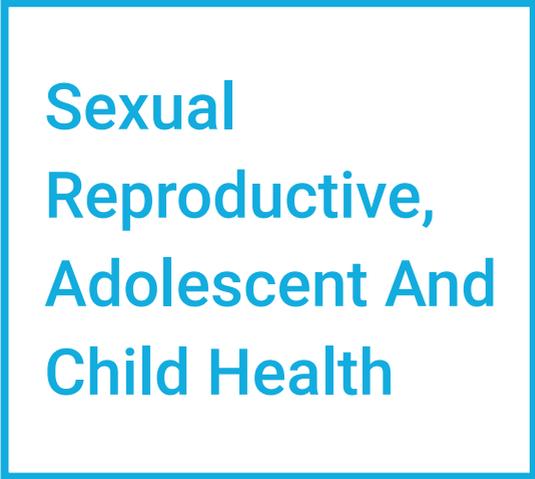
**Background:** Bacterial pathogens are a major cause of diarrheal disease in the developing world. Shigellosis infections account for more than 91 million cases and 1.1 million deaths per year worldwide. The global emergence of multidrug-resistance in *Shigella* spp. to various antimicrobials used to treat enteric disease is now a significant threat to effective treatment and management of the pathogen. In Kenya, beta-lactams and quinolones are the most commonly used drugs in treatment. The production of extended-spectrum  $\beta$ -lactamases (ESBLs) of the TEM, SHV, OXA and CTX-M type are important mechanisms of resistance to  $\beta$ -lactam. This study sought to detect the presence of the resistance genes in *Shigella* spp. isolates from patients in Kenya.

**Methods:** A prospective analysis of the resistance markers by molecular PCR was done to determine presence of resistant genes in phenotypically susceptible/resistant *Shigella* spp. from stored isolates. Specifically, we looked for ESBL resistance gene targets: TEM, SHV, OXA, OXA-48, CTX Groups 1, 2, 9, 8, and 25, CTX-M, ACC, FOX, MOX, DHA, CIT, EBC, GES, PER, VEB, IMP, VIM, KPC and as well as quinolones resistance genes: qnrS, aac(6')-Ib-cr, gyrA, gyrB, parC and parE.

**Results:** Resistance genes detected from *Shigella* spp. were ESBL- TEM 21% (47/220), QXA-564bp 29.1% (64/220), VIM 3.2% (7/220), IMP 0.5% (1/220). Plasmid-mediated quinolone resistance (PMQR) genes - qnrS 17% (26/220), aac(6')-Ib-cr 16% (35/220) and quinolone resistance-determining regions (QRDRs) - gyrA and gyrB 100% (220/220), and parC and parE 99% (217/220) were detected.

**Conclusion:** This study indicates that *Shigella* isolates from Kenyan patients possess resistance genes to commonly used antibiotics. This molecular analysis

of the resistance genes and specific mutations among the multi-drug resistance *Shigella* spp. isolates provides a critical and important contribution to the knowledge of circulating antimicrobial resistance genes in Kenya.



**Sexual  
Reproductive,  
Adolescent And  
Child Health**

**Abstract 159****Title: The feasibility of using peer mothers to deliver a community-based package of interventions to low birth weight infants post discharge from hospital care in Homa Bay County, Kenya**

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4. Action Against Hunger, Nairobi, Kenya
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**Background:** Globally, 2.5 million newborns die every year. Low birth weight infants (LBW) i.e. birth weight < 2,500g, have the highest risk of adverse outcomes. In Kenya, hospitalised LBW infants have a 59-fold increased risk of mortality. Post discharge outcomes of survivors are largely unknown as community follow-up strategies are inadequate. Data from Malawi and Rwanda shows that before 2 years, nearly half of these infants die, and survivors have impaired growth and neurodevelopment. The aims of this study were therefore to develop and test the feasibility of a community-based package of interventions for LBW infants post-discharge from hospital care, delivered by peer mothers.

**Methods:** The study was conducted in Homa Bay County. Forty peer mothers attended a 5-day training programme that focussed on communication skills, breastfeeding support, Kangaroo Mother Care, hygiene and identification of danger signs. Competency-based scenarios were used to select the 16 (40%) peer mothers, who delivered the interventions to the mother-LBW infant pairs at 24 hours post discharge and at 6 other time points until infants were 3 months old. Mother-LBW infant pairs were recruited from Homa Bay County referral hospital and Marindi health centre. A mixed methods approach was employed using questionnaires, semi-structured interviews and focus group discussions

among mothers. Descriptive statistics were used to analyse the quantitative data. A thematic framework was used to analyse the qualitative data.

**Results:** From March-August 2019, 60 mother-LBW infant pairs were recruited. Fifty-five (92%) completed follow-up alive. Five mother-infant dyads were lost to follow up due to incorrect locator information and a maternal death. Thirty-nine (65%) were male, median birth weight was 2050g (Interquartile range, IQR 1640, 2305) and median discharge weight was 2100g. The median duration of admission was 1 day (IQR 1, 9) and median post discharge weight gain at 3 months was 2820g (IQR 2020g, 3338g). Fourteen (88%) peer mothers completed all the follow-up visits. Change of residence and opting out of the study prevented two peer mothers from completing the follow-up visits. Mothers of LBW infants valued the support of the peer mothers. The key themes were the promotion of resilience among mothers against community misconceptions of LBW infants, improved knowledge and practice of breastfeeding, Kangaroo Mother Care and hygiene practices, and enhanced family relationships. Breast feeding difficulties were the greatest challenge.

**Conclusion:** Community-based interventions for LBW infants delivered by appropriately trained and mentored peer mothers has the potential to improve the survival of LBW infants in rural communities in Kenya. This preliminary data including the observed implementation challenges will be used to design a future trial to rigorously evaluate this potentially sustainable approach to addressing adverse post discharge outcomes of these vulnerable infants.

## Abstract 160

### Title: Maternal Mental Health and CHAIN

**Molline O Timbwa** (KEMRI-Wellcome Trust)\*; Priya Sukhtankar (KEMRI-Wellcome Trust); Julie Jemutai (KEMRI-Wellcome Trust Research Programme); James Berkley (KEMRI - Wellcome Trust Research Programme); Judd Walson (University of Washington); Lilian Mulemi (KEMRI-Wellcome Trust Research Programme)

**Background:** Acutely ill and undernourished children under the age of 5 years have a high risk of mortality, with a staggering 5.4 million deaths of children under 5 in 2017. In low- and middle-income countries, under - 5 mortality rates can be as high as 14 times that in high income countries.<sup>1</sup> The Childhood Acute Illness and Nutrition Network is a global research network focused on optimizing the management and care of highly vulnerable children in resource limited settings to improve survival. CHAIN Network aims is to identify and prioritize actionable intervention time points and targets to reduce mortality among acutely ill undernourished children. Potential targets, in addition to child related factors (infections, immune responses and metabolism), include care giver related factors such as maternal mental health, time spent with away from the child, involvement of the wider household, and care seeking behaviour. Having a care giver who is engaged and able to provide care is a key factor in the recovery of a child from an acute illness, both within hospital and after discharge. In hospital it is usually the caregiver who gives prescribed oral medication and nutrition, emotional and neurological stimulation. In most societies, mothers are the primary providers of nutrition and care to young children. Poor maternal health, physical or mental, can interfere with these care giving tasks and negatively impact children's health and nutrition.<sup>2</sup> Maternal antenatal and postpartum depression has been associated with a variety of negative infant outcomes including undernutrition, diarrheal diseases,<sup>3</sup> and death in the first year of life.<sup>4</sup> Given this established association between maternal mental health and child outcomes, any program that aims to improve child health would be incomplete without including attention to maternal mental health. In populations with a high prevalence of maternal depressive symptoms, treatment of maternal depressive symptoms could reduce undernutrition in children at a population level: a 25%, 50% and 75% reduction in the number of depressed women will reduce the prevalence of underweight

by 7%, 26% and 36%, respectively.<sup>2</sup> Mothers of children hospitalized with Severe Malnutrition at Mbagathi Hospital scored significantly higher than their counterparts with children with moderate malnutrition and normal nutritional status. Feelings of guilt, hopelessness and depression were associated with poor socio-economic status. One mother self-confessed that she is forced to engage in commercial sex to fend for her family. She reported to have attempted suicide thrice as she had no hope. . Periodic reassessment and psychological support resulted in better outlook in subsequent assessment 45 days after discharge. Given this high rate of depressive symptoms and the association between anhedonia and child mortality, we propose to develop an intervention package to be delivered to the mother at the time of the child's hospitalization.

## Abstract 161

### **Title: Intended and actual reasons for exclusive breastfeeding cessation in Naivasha, Kenya**

**Joyceline Gaceri Kinyua** (Kenya Medical Research Institute)\*, Nduati R3, Denno D2, Lemein S 5, Iannotti L2, Singa B1, Farquhar C2, Walson JL 2, Ickes S1,2,4

1 Kenya Medical Research Institute

2, University of Washington 3,

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**Background/Objective:** Kenyan law requires that work-places with over 50 employees provide an on-site breastfeeding room for lactating mothers and a flexible work schedule that includes a one-hour break for breastfeeding. We sought to identify the availability and use of breastfeeding support resources at workplaces among formally employed mothers in Naivasha, Kenya – where a high proportion of mothers work in commercial agriculture and the hospitality industry.

**Methods:** We conducted a cross-sectional survey among 1186 mother-child dyads at three health facilities from September 2018 to October 2019. Mothers were surveyed regarding child feeding practices as well as the availability of breastfeeding resources at their workplaces. This study is part of a larger survey that examines the prevalence of exclusive breastfeeding by maternal employment status.

**Results:** Of the entire survey sample, 564 of mothers (47.6%) were formally employed, of whom 416 (35.1%) worked at commercial farms. Among all formally employed mothers, 16.9% had on-site housing provided by their workplace and this was similar for women working in commercial farms (17.1%). Few formally employed mothers (9.2%) reported the availability of a childcare facility at their workplace, and this proportion was also similar among mothers employed at

commercial farms (10.1%). In addition, few formally employed mothers reported visiting the on-site childcare facility during working hours to breastfeed (9.1% among all formally employed mothers and this was significantly lower (5.3%) among commercial farm workers. Very few (2.3%) of formally employed mothers (1.7% of farm workers) reported the availability of a private breastfeeding space at their workplace.

**Conclusions:** The majority of formally employed mothers in Naivasha, Kenya do not have access to the mandated lactation rooms required by Kenyan law. The availability of childcare facilities at workplaces is low and among mothers who do have access to on-site childcare, very few report visiting these facilities to breastfeeding during working hours.

**Keywords:** maternal employment, breastfeeding policy, workplace lactation support, low-and middle-income countries, infant and young child feeding  
**Abbreviations:** Exclusive breastfeeding (EBF), LMIC, low-and-middle-income countries

**Acknowledgements:** Supported by the National Institutes of Health Fogarty International Center (Grant # K01TW010827).

**NAPREDA**

**Abstract 162****Title: Discovery and exploration of dual stage-active antimalarial compounds for development of Plasmodium transmission-blocking candidates**

**Jackson Mbithi Muema** (US Army Medical Research Directorate-Africa (USAMRD-A))\*

**Jackson M. Muema**<sup>1,2,3\*</sup>, Joel L. Bargul<sup>1,3</sup>, James M. Mutunga<sup>2</sup>, Ramadhan S. Mwakubambanya<sup>4</sup>, Meshack A. Obonyo<sup>4</sup>, Merid N. Getahun<sup>3</sup>, Redemptah A. Yeda<sup>2</sup>, Agnes C. Cheruiyot<sup>2</sup>, Hoseah M. Akala<sup>2</sup>, Ben Andagalu<sup>2</sup>, Jaree L. Johnson<sup>2</sup>, & Amanda L. Roth<sup>2</sup>

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<sup>2</sup>United States Army Medical Research Directorate Africa-Kenya (USAMRD-A/K), KEMRI Centre for Global Health Research, Kisumu, Kenya

<sup>3</sup>International Centre of Insect Physiology and Ecology (icipe), Nairobi, Kenya

<sup>4</sup>Egerton University, Egerton, Kenya \*Corresponding author: jackson\_mbithi@yahoo.com

**Background:** Recent research showing inefficiency of artemisinin-based chemotherapies in clearing intraerythrocytic parasite replications and suppressing Plasmodium gametocytogenesis heralds the need for new antimalarials. Current antimalarials are mostly asexual growth inhibitors while only few drugs and 6 plant-derived compounds target transmissible stage V gametocytes. In an effort to identify and optimize potential transmission-blocking agents, this study screened 13 selected medicinal plants with ethnobotanical value. **Methods:** Extracted plant materials were screened against culture-adapted CQ-resistant W2 strain and clinical isolate MDH 0038 using SYBR Green I-based readouts after 72-h incubation. Active extracts were fractionated through column chromatography, generating a total of 18 pooled fractions. The fractions were subsequently evaluated for immediate ex vivo activity against malaria-positive clinical samples and CQ-sensitive D6 strain. Half-maximal inhibitory concentrations (IC<sub>50</sub>) for individual test materials relative to selected antimalarial drugs were calculated

by fitting a nonlinear regression model in GraphPad Prism 7.

**Results:** Our initial antimalarial screening identified promising activity in *Cissampelos pareira* (Menispermaceae) (IC<sub>50</sub> 2.09 µg/mL) and *Prosopis juliflora* (Fabaceae) (IC<sub>50</sub> 1.02 µg/mL) extracts, leading to their prioritization for further characterization. On fractionation, relative to the clinically-approved gametocytocidal drug primaquine (PQ) that registered an IC<sub>50</sub> value of 0.3126 µg/mL, two polar fractions; CP08 and PJ10 were established to comparably inhibit *P. falciparum* growth at IC<sub>50</sub> values of 1.517 µg/mL and 0.863 µg/mL, respectively. Moreover, CP08 and PJ10 afforded mean IC<sub>50</sub> values of between 1.124-1.158 µg/mL and 0.385-0.484 µg/mL, respectively, against D6. These findings, pending potency validation against gametocytes, suggest possible availability of transmission-blocking agents in these two plants.

**Conclusion:** Full activity profiling alongside identification of the active compounds would plausibly generate new leads and pave pipelines for further development into potential transmission-blocking antimalarial agents.

## Abstract 163

### **Title: Determinants associated with adherence to mass drug administration guidelines among community health volunteers in three counties in western Kenya**

**Charity Warigia Hungu (Ms.)\***; Jabulani Ncayiyana (University of Cape Town); Relebogile Mapuroma (University of the Witwatersrand); Martin Atela (Partnership for African Social and Governance Research)

**Background:** Most neglected tropical disease (NTD) interventions rely on community-directed mass drug administration (MDA) due to weak or absent health system infrastructure. This has led to the delegation of tasks from qualified health workers to less specialised health volunteers to bridge this gap. Community health volunteers (CHVs) are then the primary implementers of MDA programmes for various NTDs in sub-Saharan Africa and are key to meeting programme's goals. It has been suggested that factors such as socio-demographic factors, skill, training and supervision and knowledge of programme activities influence CHV performance. Evaluation of CHV performance during interventions is important to understand how well or poorly they are performing and to target efforts so as to improve their performance. The conceptual framework for implementation fidelity by Carroll et al. provides a mechanism to assess the effectiveness of individual components of adherence to identify what is essential to successful implementation. The aim of the study was to determine the relationship between adherence and the determinants of adherence.

**Methods:** This was a cross-sectional study which collected primary data from 72 CHVs on their use of guidelines provided for MDA in Western Kenya. Quantitative methods were used to measure adherence based on Carroll's framework (Carroll et al., 2007). Frequencies and proportions were used to describe the background characteristics of the CHVs. Logistic regression analyses from the questionnaire data were employed to establish determinants associated with adherence using Stata v14.1.

**Results:** More female (54/72, 75%) CHVs participated in the MDA activities compared to male CHVs. The CHVs ages ranged from 27 years to 67 years. Of these, (56/72, 78%) CHVs were married and the majority (38/72, 53%) were women.

In the three counties, Kisumu, Siaya and Homa Bay, 81% of the CHVs scored high adherence to the MDA guidelines. CHVs socio-demographic and socio-economic characteristics were not associated with adherence. Quality of delivery was associated with high adherence. The odds of scoring high adherence were significantly higher for the CHVs who waited for side effects in the community members compared to those who did not wait (OR 4.05, 95% CI:1.05-15.59).

**Conclusion:** During the MDA activities, CHVs should be encouraged to wait after administration of treatment not only to manage the side effects but to also ensure that all community members are taking the medication and thus achieve the 75% treatment goal. This is important for programme managers to monitor the process of implementation where CHVs are involved to ensure that programmes are implemented as intended.

## Abstract 164

### **Title: Accessibility and Affordability to Healthcare for Children with Severe Acute Malnutrition: Mapping Patients' Costs**

**Rebecca Gathoni Njuguna** (KEMRI-Wellcome Trust Research Programme)\*; Julie Jemutai (KEMRI-Wellcome Trust Research Programme); James Berkley (KEMRI - Wellcome Trust Research Programme)

**Background:** Undernutrition remains highly prevalent in low and middle-income countries with sub-Saharan Africa (SSA) and Southern Asia accounting for majority of the cases. Apart from the health and human capacity impacts to children affected by malnutrition, there are significant economic impacts to households which needs further exploration. Health and nutrition programmes, including inpatient and outpatient care, are usually intended to be free of charge for children under five years of age. However, many families face various costs that include transport, medicines, clinic or hospital bed charges, referral and loss of income. Such costs underlie late presentation, not remaining in care, exacerbation of poverty and ultimately poor nutritional recovery and ongoing mortality risk. The main aim of the study was to assess the costs incurred by patients for treatment of acute illness and undernutrition in sSA.

**Methods:** The study setting was in Kilifi, Mbagathi, Coast General hospitals in Kenya and Mbale hospital in Uganda. We interviewed 450 caregivers of children with severe acute malnutrition. Information on direct (out-of-pocket expenses), indirect costs, socio-economic information and coping mechanisms were collected using a costing tool administered at discharge.

**Results:** On average the out of pocket costs was \$41.44 per child. In all the households, this was catastrophic as it was more than 20% of their income, 21% borrowed to cope with the costs. The main drivers of these costs were bed (\$21.57) and food (\$5.29) per child. Findings also indicate that the caregivers spent an average of 8 days off their income activities due to their child's illness.

**Conclusion:** There is need to curb the burden of direct and indirect costs of child undernutrition to households to address issues of cost that may limit delivery, uptake and effectiveness of interventions.

# SYMPOSIA

# SYMPOSIUM 1:

**1. Names of Organizers/Chairs: Dr. James H. Kimotho**

**2. Names of Rapporteur(s): Missiani Ochwoto, Dr. Cecilia Wanjala, Ruth Nyangacha**

**Brief summary of Symposium description** (Up to 300 words maximum):

**Title: Strengthening of exploitation of Science, Technology and Innovations as a key enabler of realization of UHC**

## **Synopsis of the Symposium:**

The East African Community member states have embraced the implementation of the Universal Health Coverage (UHC) as stipulated in the UN General Assembly resolution of 2012. Various elements are involved in ensuring the achievement of this noble goal. One of these elements will be harnessing of the existing pool of regional scientists, technical personnel, research and technology institutions to come up with innovative solutions such as cheaper and high quality medicines, medical devices and processes, to support the UHC. This will only happen if the regional scientists and technical personnel are organized to identify the exploitable technologies and existing gaps and formulate solutions that are appropriate to the region. This symposium will provide such a platform. It intends to invite at least two scientists from Malaysia who have been involved in providing such solutions to healthcare system in their country. They will be joined by regional scientists who will also make their presentation based on their research and experience.

## **Names of presenters and titles of presentations**

- **Prof Dominic Byarugaba**, Executive Director, African Institute for Capacity Development (AICAD),
- **Fadzila Adibah**, University of Malaysia
- **Dr. James H. Kimotho**, HoD, KEMRI Innovation and Technology Transfer Division ·

## Symposium 2: NAPREDA:

**Title: Herbal and Traditional Medicine in Universal Health Coverage: The Potential and Need for Evidence Based Products**

- 1. Name of Organizer/Chair: \_Dr. Festus M. Tolo\_**
- 2. Name of Co-chair: Dr. Peter Mwitari**  
**Rapporteur: Dr. Beatrice Irungu**  
**Institution / Project: NAPREDA-KEMRI**

### **Synopsis:**

The Natural Products Research and Drug Development Programme (NAPREDA) is one of the six research programmes of the Kenya Medical Research Institute (KEMRI). The programme is a KEMRI vision 2030 flagship project. The mission of the programme is to identify and develop effective herbal/traditional/phytomedicines and drugs for use against human diseases in partnership with relevant institutions, collaborators and government ministries. At the 10<sup>th</sup> KASH conference, NAPREDA intends to bring together stake holders to discuss ways and explore avenues in identification, research and development of medications from natural products as a contribution to the Universal Health Coverage (UHC) and more specifically, for management Non-Communicable Diseases (NCDs). Natural products of plant origin have been a valuable source of drug regimens that form the cornerstone of modern pharmaceutical care. The NAPREDA also intends to use the KASH platform to share information on ongoing research within programme in KEMRI. The programme will invite keynote speakers from collaborating institutions.

## SYMPOSIUM 3: PAMCA

### Title: It Is Not Just Malaria: Arboviral Transmission, Disease, Surveillance, And Prevention In Kenya

#### Synopsis:

Mosquito-borne diseases spread by the *Aedes aegypti* mosquito pose an increasing public health threat around the world, especially in Africa, South America, and Asia. Diseases spread by *A. aegypti* include dengue, chikungunya, yellow fever, Rift Valley fever, and Zika. Infections from these viruses range in severity from mild flu-like symptoms to debilitating arthritis that can linger for decades, as well as encephalitis or hemorrhage that can cause irreversible cognitive damage or death. Dengue viruses infect approximately 400 million people annually with up to 65 million in Africa. In 2004, chikungunya virus (CHIKV) re-emerged in Kenya and spread throughout countries around the Indian Ocean. Almost yearly outbreaks of CHIKV and dengue virus (DENV) have been reported in coastal Kenya for last one decade. Despite more frequent outbreaks of *A. aegypti* viruses throughout Kenya, there has been little attention to the issue from government and community organizations.

Worse still most of the clinical symptoms' manifestations camouflage those of malaria. For instance, most arboviral infections often result in self-limited, nonspecific febrile syndromes, which lead to frequently misdiagnosis and the most of the arboviruses become mistaken culprits as malaria. The viruses are missed out at the treatment stage especially when they co-present with *Plasmodium falciparum* malaria in a given patient. The misdiagnosis coupled with missed out determination of the presence of the arboviruses lead to increased arboviral morbidity and mortalities among communities especially in endemic regions of the world. Thus, increased disease burden, and limit emphasis on adequate efforts towards control of these non-malarial arboviral diseases. Although often arboviruses are mild, they can result in significant impact on emotional and social functioning, leading to decreased performance in adulthood. Arboviral co-infections also occur in populations of both human and vector, highlighting the high transmission burden in Kenya and the reality of multiple simultaneous exposures.

Despite overwhelming evidence of arboviruses becoming both endemic and epidemic in Kenya, neither vector surveillance nor control programs currently exist. In most of Africa, arboviral prevention strategies focus on vector control, although those efforts (typically, distribution of bednets) are often conflated with prevention of malaria, which is transmitted by night-biting anopheline mosquitoes and not the diurnal *Aedes* species involved in most arboviral infections transmission. In addition, waste management remains inadequate, resulting in dump sites that contain mounds of tires and small domestic plastic containers, which can serve as the most productive local breeding sites for *Ae. Aegypti*.

The symposium discusses and creates awareness of the challenges of arboviral prevention, control and management in Kenya. In this symposium, we will take a multi-disciplinary approach to the complex problem of arboviral transmission and circulation in Kenya with the aim of integrating the contribution of vector, host, and environmental dynamics in arboviral control.

### Presentations

- **Prof. Charles Mbogo:** Overview & Introduction
- **Dr. Eric Ochomo & Dr. Damaris Matoke:** Potential of integrated vector management and innovative technologies for efficiently controlling arboviral diseases
- **Dr. Francis Mutuku:** Human arboviral disease burden in coastal Kenya: Short and long-term childhood burden of arboviral infection, manifestations and consequences of concurrent *Plasmodium falciparum*-arbovirus infections.
- **Dr. Bryson Ndenga:** The ecology and dynamics of *Aedes aegypti* immature and adult stages in coastal and western Kenya: A potential risk for the outbreak of arboviral diseases.
- **Prof Rosemary Sang & Dr Joel Lutomia:** Current status of arboviral surveillance in Kenya.
- **Dr Lydiah Kibe:** Community based mosquito control: Empowering schoolchildren and communities in the control *Aedes Aegypti* mosquito in coastal Kenya

## 1) TITLE: CURRENT STATUS OF ARBOVIRUS SURVEILLANCE IN KENYA

**Authors:** Joel Lutomiah<sup>1,2</sup>, Fredrick Eyase<sup>2</sup>, Samson Konongoi<sup>1,2</sup>, Victor Ofula<sup>2</sup>, James Mutisya<sup>2</sup>, Francis Mulwa<sup>2</sup>, Albert Nyunja<sup>2</sup>, Edith Chepkorir<sup>3</sup>, Edith Koskei<sup>2</sup>, Samuel Owaka<sup>2</sup>, Hellen Koka<sup>2</sup>, and Rosemary Sang<sup>1,2</sup>

<sup>1</sup> Kenya Medical Research Institute (KEMRI), <sup>2</sup> United States Army Medical Research Directorate Kenya USAMRD-K, <sup>3</sup> International Center of Insect Physiology and Ecology (ICIPE)

Arboviruses are transmitted to humans by blood feeding arthropods majorly mosquitoes. There are over 500 arboviruses globally listed in the arbovirus catalogue with at least 130 known to be of public health importance. Most arboviral infections are asymptomatic while others may cause symptoms ranging from mild flu-like illness to severe symptoms and even death.

The first detection of arbovirus circulation in Kenya was in 1930-31 during an outbreak of RVF. Since then many outbreaks of the disease and circulation of other arboviruses have continued to occur. Following the outbreaks of Chikungunya in Lamu and subsequently, Rift Valley Fever in 2006 the KEMRI Arbovirus and Viral Hemorrhagic Fevers (VHF) laboratory, with the support of USAMRD-K and other partners, launched an entomologic arbovirus surveillance in most ecological zones of the country, covering seventeen counties. The objective was to determine circulation and distribution of arboviruses and the associated vectors responsible for their transmission and maintenance across the country; to serve as early warning system for outbreak occurrence. Active and passive surveillance in humans is also conducted to determine the extent to which communities are affected; and increase knowledge and understanding of epidemiology of viruses. The VHF laboratory also supports countries like Somalia, Eritrea and South Sudan in detection of arbovirus activity in the region.

Through the entomological surveillance activities, over 250 virus isolates have been obtained to date from diverse mosquito species and geographic regions. These viruses, many of which are of significant public health importance, belong to the Alphavirus, Flavivirus and Orthobunyavirus genera. These include WNV, Bunyamwera, Pongola, Usutu, Ngari, dengue, chikungunya, Ndumu, Usutu and Sindbis. Some of the viruses like RVFV (1997, 2006/07, 2016, 2018/19),

chikungunya (2004, 2016-date) and dengue (1982, 2011-date) were isolated from mosquito and human samples during outbreaks.

Our data spanning many years suggest that geographic/ecologic factors probably influence vector distribution and densities and hence virus transmission and disease occurrence in the diverse ecological zones. Inherent behavioral characteristics of vector populations have also been found to influence disease transmission geographically.

## 2) Community based mosquito control: Empowering schoolchildren and communities in the control *Aedes Aegypti* mosquito in coastal Kenya

Authors and institutional affiliation

**Lydia Kibe**<sup>1\*</sup>, Francis Mutuku<sup>2</sup>, Jenna E. Forsyth<sup>3</sup>, Angelle LaBeaud Desiree<sup>3</sup>, Amy Krystosik<sup>3</sup>

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### Abstract

**Background:** *Aedes aegypti*, which likes to breed in water storage containers around people's homes spreads dengue, Zika, chikungunya, and yellow fever. Understanding mosquito breeding behavior as well as human perspectives and practices are crucial for designing interventions to control *Aedes aegypti* mosquito-borne diseases.

**Objectives:** The objectives of this study were to design and test the effectiveness of a school and community source reduction intervention to improve knowledge and behaviors to reduce the abundance of immature mosquitoes and household breeding sites in coastal Kenya

**Methods:** This operational research study was conducted in Kwale County of Coastal Kenya in May and December 2016. During a 10 months formative phase, we conducted a stakeholder focus group discussion and piloted the curriculum ideas with 60 children and their parents from 3 schools. Using this information, we designed an intervention programme to involve female heads of households

during 1-hour home sessions, children during 5-hour interactive after-school lessons using games and poetry, and everyone during school recycling events to collect and reuse “no purpose” containers. The intervention content included mosquito lifecycle, types of mosquitoes, disease caused by mosquitoes, ways to prevent mosquitoes. We implemented the intervention with 500 children and parents: 50 children (ages 10-16) and their parents from 5 control and 5 intervention schools. We assessed entomological indices, knowledge, and reported behaviors at baseline, 3 months, 12 months and 3 months post-intervention.

**Results:** Follow-up at 3 months showed a significant increase in knowledge and self-reported behavior than the control arm in adult ( $p < 0.05$ ): 69% vs. 30% and (83% vs. 17%) in children respectively. Those who knew stages of the mosquito life cycle; 68% vs. 29% of adults and 41% vs. 20% of children knew how to reduce mosquito breeding; and 56% vs. 19% of adults practiced source reduction. During recycling events, participants collected 17,200 containers (1 ton of plastics) and planted 4,000 native trees. At the 12-month follow-up, intervention households had fewer no purpose containers and immature mosquitoes than control households. 13-15 months post intervention, participants described barriers to continued source reduction behaviors especially citing limited time to conduct activities and continued motivation to sustain control efforts.

**Discussion:** Our study demonstrates changes in knowledge about mosquitoes. Container clean-ups events were successful way to engage children. However, their participation in source reduction behaviors was affected by barriers thus compromising sustainability of the control efforts.

**Conclusion:** Empowering school children and community in source reduction for mosquito control is important in increasing their knowledge of mosquito borne diseases risk. However, structural changes such as improving solid waste collection and disposal services should be made for more impact in reducing the mosquito breeding sources.

**3) Title: The ecology and dynamics of *Aedes aegypti* immature and adult stages in coastal and western Kenya: A potential risk for the outbreak of arboviral diseases**

**Authors:** Bryson Ndenga<sup>a</sup>, Francis Mutuku<sup>b,c</sup>, Harun Ngugi<sup>d</sup>, SindisoNyathi<sup>e</sup>, Desiree LaBeaud<sup>e</sup>

**Author affiliations:**<sup>a</sup>Kenya Medical Research Institute, <sup>b</sup>Technical University of Mombasa, <sup>c</sup>Msambweni District Hospital's Vector-Borne Disease Unit,<sup>d</sup>Chuka University, <sup>e</sup>Stanford University

**Abstract:**

**Background:***Aedes aegypti* is the main vector for yellow fever, dengue fever, chikungunya and Zika viruses. Presence and abundance of this vector is associated with the risk for the occurrence and transmission of these arboviruses and potential introduction of new viruses.

**Methods:** Presence and abundance of *Ae. aegypti* immature and adult mosquitoes were assessed indoors and outdoors in two western (urban Kisumu and rural Chulaimbo) and two coastal (urban Ukunda and rural Msambweni) sites in Kenya. Collections were performed using larval and pupal sampling, human landing catches, Prokopack automated aspirators and Biogents-sentinel traps.

**Results:** Collections were made from a total of 22,144 container visits: Chulaimbo (7575) and Kisumu (8003) in the west, and from Msambweni (3199) and Ukunda (3367) on the coast. Of these, only 4–5.6% were positive for *Ae. aegypti* immatures. In all four sites, significantly more positive containers were located outdoors than indoors. The main risk factor for pupal abundance was presence of bushes and tall grass ( $OR = 2.19$ , 95%CI 1.63 – 2.94). A total of 2,247 adult *Ae. aegypti* mosquitoes were collected: 785 by human landing catches, 459 by Prokopack and 1003 by Biogents-sentinel traps. About three times as many *Ae. aegypti* mosquitoes were collected in urban than rural sites (1665 versus 582). Comparable numbers of them were collected in western (1201) and coastal (1046) sites. Over 80% of them (999/1244) were collected outdoors through human landing catches and

Prokopack aspiration. The probability of collecting *Ae. aegypti* mosquitoes by human landing catches was significantly higher in the evening than morning hours ( $P=0.002$ ), outdoor than indoors ( $P<0.001$ ) and in Ukundath than in Chulaimbo ( $P<0.001$ ). Significantly more *Ae. aegypti* mosquitoes were collected using Prokopack aspiration outdoor than indoors ( $P<0.001$ ), in Ukundath than in Chulaimbo ( $P<0.001$ ) and in Kisumuth than in Chulaimbo ( $P=0.005$ ). Significantly more mosquitoes were also collected using Biogents-sentinel traps in Kisumu than in Chulaimbo ( $P<0.001$ ).

**Conclusions:** Tall grass or bushes in the peri-domicile area are strongly associated with increased risk of pupal persistence and abundance. The probability of exposure to *Ae. aegypti* bites was highest outdoors, in urban areas and in evening hours. Targeting intervention efforts towards these productive containers, places and times is likely to be a cost-effective way to reduce arboviral transmission in these regions.

#### **4) Potential of integrated vector management and innovative technologies for efficiently controlling arboviral diseases**

Damaris Matoke, PhD<sup>1</sup> and Eric Ochomo, PhD<sup>1</sup>

##### **1. Kenya Medical Research Institute, Nairobi, Kenya**

Arboviral diseases are of global public health concern with the greatest burden seen in South America, South East Asia and sub-Saharan Africa. In Kenya, dengue, rift valley fever and chikungunya are the most common arboviral diseases. The most effective methods used for control of these diseases is vector control using insecticides. Considering the current challenges in vector control such as insecticide resistance, Integrated Vector Management (IVM) approach is important to achieving the global targets set for control of arboviruses. The World Health Organization (WHO) recommends IVM as a pragmatic approach to tackling one or several vector borne diseases (VBDs) using single or multiple interventions simultaneously. In 2008, WHO issued a position statement supporting IVM which was intended to accelerate the development of national IVM policies and strategies, and encourage international organizations, donor agencies and other stakeholders to support capacity building necessary for IVM

implementation. Unfortunately, the potential benefits of IVM have not been fully realized in most African countries due to certain barriers including the lack of clear policy guidelines and situation-based implementation frameworks, and poor public engagement in the control of vector-borne diseases. Kenya has in place an IVM policy guidelines developed in 2009, and is currently set to enact the Integrated Vector Control Strategy 2019-2024 which will guide the implementation of the IVM strategy for VBD control. Novel vector control tools such as Wolbachia mediated biological control, spatial repellents, attractive toxic sugar baits and vaccines could be implemented alongside IVM strategy to contribute to the control of arboviruses.

#### 5) Human arboviral disease burden in coastal Kenya: Short and long-term childhood burden of arboviral infection, manifestations and consequences of concurrent *Plasmodium falciparum*-arbovirus infections

Francis M. Mutuku<sup>1</sup>, David M. Vu<sup>2</sup>, Bryson A. Ndenga<sup>3</sup>, Elyse N. Grossi-Soyster<sup>2</sup>, Amy Krystosik<sup>2</sup>, A. Desiree LaBeaud<sup>2</sup>

<sup>1</sup>Technical University of Mombasa, Mombasa, Kenya; <sup>2</sup>Stanford University School of Medicine, Stanford, California, USA; <sup>3</sup>Kenya Medical Research Institute, Kisumu, Kenya

**Background:** Diagnosis of dengue (DENV) and chikungunya (CHIKV) occurs infrequently during the evaluation of childhood febrile illness in Kenya, leaving the burdens of arboviral infections in Kenyan children largely unknown.

**Methods:** Two cohorts of children (Jan 2014- 2019) were enrolled at four Kenyan study sites (rural west, rural coast, urban west, urban coast): a healthy child cohort followed every six months to document asymptomatic CHIKV and/or DENV infections via IgG ELISA testing, and an acutely febrile child cohort followed to convalescence to document symptomatic disease via PCR and IgG ELISA. Questionnaire data were collected to describe demography, socioeconomic status (SES), and household environment.

**Results:** Overall prevalence was 4.2-5.9% for DENV and 3.7-5.5% for CHIKV. For acutely ill participants, 0.7% (13/1844) seroconverted for CHIKV and 5.4% (97/1790) for DENV. CHIKV was more common in the west (4.9% vs. 1.7%). DENV was more common in rural sites (5.4% vs 3.6%). Up to 78% of DENV and CHIKV viremic cases were also co-infected with *P. falciparum*. Among healthy cohorts (500 children per site), 11 seroconverted for CHIKV (0.6%) and 3 for DENV (0.1%). Higher proportion of CHIKV-infected subjects reported abdominal pain (43%) than did subjects with either DENV infection (15%) or malaria (26%,  $p=0.025$ ,  $\chi^2$ ). Unexpectedly, bleeding symptoms were reported by 7% of CHIKV-infected subjects, compared with 0.01% and 0.0056% of DENV- or malaria-infected subjects, respectively ( $p=0.011$ ,  $\chi^2$ ). Our findings suggest some differences in patterns of clinical symptomatology of DENV or CHIKV infection in children, which may aid clinicians in establishing alternative diagnoses to malaria when evaluating febrile illness. In our cohorts, 86% of CHIKV- and 58% of DENV-infected subjects were treated with antimalarial medications despite available malaria test results. Seroconversion for CHIKV or DENV was associated with age, SES, mosquito exposure and avoidance behaviors, and hygiene and wealth indices. Infections were spatially clustered in all sites, indicating important ecological risks. Increased vector abundance and human transmission were noted during dry seasons, likely due to unsafe water storage.

**Conclusions:** These data demonstrate ongoing transmission of DENV and CHIKV across diverse regions in Kenya and undocumented disease burden. Given the overtreatment of malaria in sub-Saharan Africa, prioritizing development of arbovirus clinical diagnostic aids, in the form of accessible rapid diagnostic tests or clinical disease pattern recognition algorithms, is an important strategy for combating the growing problem of antimalarial and antibiotic overuse.

## Symposium 4: SERU

### Synopsis:

The KEMRI's Scientific and Ethics Review Unit was inaugurated in April 2014. Prior to this, the then ERC had been operational since 1980. The Unit houses three (3) sub-committees that are accredited by the National Council for Science, Technology and Innovation (NACOSTI) as well as the Federal Wide Assurance of the Office for Human Research Protections, US. KEMRI/SERU strives to protect human subjects and provide oversight to human subject's research. This symposium will provide an interactive forum between SERU and the scientists. Scientists will get an opportunity to learn more on SERU processes, our review timelines, our study monitoring process and get a chance to ask questions and clarifications from the team.

### SESSION 1: ABSTRACT

**Abstract Title: Respect for Persons by Whom and for Whom.**

*Mariam Macharia<sup>1</sup>, Enock Kebenei<sup>1</sup>, Caroline Kithinji<sup>1</sup>*

*Scientific and Ethics Review Unit/ Kenya Medical Research Institute<sup>1</sup>*

Research Ethics is guided by the principles of Non-Maleficence (Do no Harm), Beneficence (Risk-Benefit analysis), Justice (Fair selection) and Respect for Persons. Respect for persons ensures that each individual is treated as an autonomous being. It from proposal idea formulation, through the IRB Process to the research outputs, dissemination and closure.

There are several stakeholders involved in the adherence to the Respect for Persons. The Principal Investigator commits to protocol fidelity, reports non adherence and keeps participants informed and respected. Research regulation committees are the wheels that ensures that the four principles are adhered to. Their main role is to ensure the safety of the participants. Taking the analogy of a system with various components, Scientific and Ethics Review takes the systems approach. The input are the submissions that the Principal Investigator provides to the SERU. The secretariat acts as a linkage between the committee and the

applicant. The committee is the processor that makes the ultimate decision. The output is the committee verdict that needs to be communicated to the applicant. The participants are expected to adhere to study procedures and maintain confidentiality and report any significant occurrences.

This session will focus of the significant role played by the three mentioned stakeholders through a case study of reporting, submissions and review process at the Scientific and Ethics Review Unit of the Kenya Medical Research Institute.

## **SESSION 2: CASE STUDIES**

1. **Case study 1:** Upholding the Ethical Principle of “respect for persons”
2. **Case study 2:** Research Regulation in KEMRI and Beyond
- 3.

## **SESSION 3: PRESENTATIONS**

**Title:** The SERU Experiences on the Shipment of Biological Materials

## **SESSION 4: QUESTIONS AND ANSWERS**

## SYMPOSIUM 5: Disease Surveillance/Discovery

**Title:** New approaches for disease surveillance/discovery

### Synopsis

Febrile illnesses are caused by a diverse group of pathogens that include viruses, bacteria and parasites. As the initial presenting symptoms of these infections can be quite similar (influenza like), there is need to rethink our diagnostic approaches. The symposium will present new ideas/approaches to disease surveillance and discovery. These will include: 1) The use of 3base PCR for arbovirus identification instead of the traditional 4base amplification. 2) A new look at 16S and 18S rRNA approaches that allow bacteria and parasite identification up to species level. 3) Demystifying whole genome sequencing (WGS) and associated bioinformatics (BI). 4) Essential QA/QC for quality WGS/BI. 5) What alternatives are available when WGS fail? 6) Examples on targeted approaches for WGS. 7) Alternative approaches to improving malaria RDTs. 8) Identification of a hitherto unknown disease in Kenya. 9) Measuring malaria transmissibility by assessing gametocytemia

**Names of presenters:** John Waitumbi; Josphat Nyataya; Beth Mutai; Allan Lemtudo; Faith Sigei; Gathii Kimita; Eric Murimi; Clement Masakhwe; Brian Andika; Esther Omuseni; Rehema Liyai; Carol Kifude

## **SYMPOSIUM 6: IMPALA**

### **International Multidisciplinary Programme to address Lung Health and TB in Africa**

**Chair: Dr. Hellen Meme**

**Rapporteur: Barbara/Kendi**

#### **Synopsis:**

International Multidisciplinary Programme to Address Lung health and tuberculosis in Africa (IMPALA), is a consortium of multidisciplinary expertise drawn from 11 African countries and managed at the Liverpool school of Tropical Medicine.

The goal of the consortium is to improve lung health in sub-Saharan Africa through research and subsequent application of results obtained to inform policy for better health care.

To achieve this goal for Kenya, the country is represented by KEMRI addressing the research in human health and AFIDEP a continental policy expert organization. Through this approach, IMPALA is spearheading improvement of lung health through capacity building by ongoing training of 4 PHD students in Clinical, Health systems, health economics and policy with a view of improving conduct of research in this critical area. Additionally, transfer of spirometry testing skills in line with Pan African Thoracic Society guidelines has been realised in more than 20 clinicians under the IMPALA initiative.

Through this consortium there are several ongoing population and health systems based projects that are envisioned to not only shed light on the burden of non-communicable diseases but also establish the risk factors and health system response to the same in a bid to holistically address the issue of chronic lung diseases in Kenya and the region.

**Presentations:**

1. Childhood asthma and maternal diet during pregnancy -Prof. Graham Devereux.
2. Overview of pediatric asthma-Dr. Evans Amukoye.
3. Advancing lung health in low and middle income countries: role of international partnerships-Dr. Jeremiah Chakaya-
4. Assessing the societal burden of airflow obstruction and modelling the potential impact of leading interventions amongst adults in Malawi - Martin Njoroge
5. Distribution of lung abnormalities on chest X-ray images taken during the Kenya Prevalence survey 2016: A pilot study-Dr. Brenda Mungai
6. The Utility of Clinician-Performed Cardiopulmonary Ultrasound Assessment of the Acutely Breathless Patient: Breathlessness Early Detection with Ultrasound trial (BED-US Trial)-Dr. Jackline Kagima
7. A Vicious Cycle Of Inadequacies In Diagnosis And Management Of Chronic Non-Communicable Lung Diseases In Kenya; A Case Study Of Nairobi County- Stephen Mulupi
8. A multifaceted approach in determining non-communicable lung diseases and associated factors in Kenyan children: Implementation of Tupumue study-Fred Orina
9. A cross-sectional study, of the characteristics of adults with chronic respiratory symptoms attending outpatient department at Mbagathi Hospital in Nairobi, Kenya: A Multi-Center study -Lung health in Africa across the life course (LuLi)- Barbara Miheso
10. Burden of Lung Diseases in Nairobi-Preliminary results-Sophie Matu/Hellen Meme
11. Spirometry in Africa-Lindsay Zurba
12. Air pollution and health in low & middle income countries: assessing exposure with new technology-Dr Ruairaidh Dobson

## ABSTRACTS

### 1. Childhood asthma and maternal diet during pregnancy.

Graham Devereux- Liverpool School of Tropical Medicine

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Asthma is a lung disease associated with a modern, urban lifestyle. Globally 300 million people have asthma, with prevalence being higher in children. Asthma prevalence in some low-middle income countries (LMIC)s is now as high as in high income countries (HIC)s, e.g. in Nairobi about 16% of children have asthma. In LMICs the prevalence of severe asthma, and asthma mortality rates far exceed that observed in HICs, probably because of underdiagnosis and the expense of medications. In LMICs, primary asthma prevention would seem more appropriate than the HIC approach of widespread use of costly asthma medication.

The increase in asthma observed in HICs has generated hypotheses implicating temporal changes in nutrient intakes to the increase in asthma. Observational studies in HICs have reported associations between childhood wheeze/asthma and maternal nutrient status during pregnancy, specifically: n-3 polyunsaturated fatty acids, vitamin D, vitamin E and iron. Intervention trials have shown that supplementation during pregnancy with n-3 polyunsaturated fatty acids or vitamin D reduces the risk of childhood wheezing/asthma and lower respiratory tract infections.

The available data indicate that there are widespread deficiencies of n-3 polyunsaturated fatty acids, vitamin D, vitamin E and iron in African women of child bearing age, whether this contributes to childhood respiratory mortality and morbidity remains an unanswered question. Studies are required to investigate this hypothesis because of the potential for primary asthma prevention by nutrient intervention during pregnancy. The IMPALA study includes a study relating maternal dietary intakes during pregnancy with infant lung function.

## 2. Overview of Pediatrics Asthma

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**Introduction:** Prevalence of asthma in Kenya from ISAAC studies was up to 14% in Eldoret and 18% in Nairobi. There are no current studies to show recent trends and the ongoing BOLD study being undertaken by Meme et al will shed some light. Why Asthma prevalence is high in Kenya is not clear, use of solid fuel at 74% with many homes keeping poultry and animals and increase of motor vehicles could be contributing. Recurrent wheezing in infants is quite common. Up to 20% will wheeze more than 3X per year. It's important to rule out other causes but by and large are treated as asthma

**Diagnosis:** A history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, and variable expiratory airflow limitation is most likely asthma but Lung function test where available should be done. There should be a 12% improvement of FEV1 from baseline or an increase of 200mls  
FEV1/FVC < 85% in children and 75% in adult is indicative of obstructive airway disease

**Treatment:** The aim is to reduce the risk of asthma-related exacerbations and death, including in patients with so-called mild asthma, to provide consistent messaging about the aims of treatment, including prevention of exacerbations, across the spectrum of asthma severity and to avoid establishing a pattern of patient reliance on SABA early in the course of the disease

**Initiatives:** GAN grew out of ISAAC studies. It periodically publishes reports, the latest was published in 2018 and KEMRI was actively involved. Its Targets are: Decrease severe asthma by 50% by 2025 proportion of symptomatic people with asthma not on inhaled corticosteroids • time off work/school because of asthma • unplanned visits for asthma • hospital admissions for asthma • severity of asthma • mortality from asthma  
Increase the access to quality-assured essential asthma medicines by 2018:

On the WHO prequalification list - 2014• On National Essential Medicines Lists - 2015• Available in all countries - 2018• Affordable in all countries – 2018  
Pan Africa Thoracic Society in which the author is a founder member has also been active and currently improving the capacity to perform Spirometry in Africa

**Conclusion:** Asthma is a common chronic lung disease affecting 339 million widely and is grossly underdiagnosed and mismanaged but there is hope in the horizon

### **3. Advancing lung health in low and middle income countries: role of international partnerships.**

Dr. Muhwa, Jeremiah Chakaya , Respiratory Society of Kenya, Immediate Past President, International Union Against Tuberculosis and Lung Disease ( the Union).

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The burden of lung disease in low and middle income countries (LMIC) is high and may be increasing. Several factors are contributing to this situation, including high levels of indoor and outdoor air pollution, tobacco smoking , a continuing high burden of infectious disease and behavioral factors resulting from the adoption of “modern living”. Health system weaknesses across low and middle income countries are at the same constraining the ability to effectively prevent these diseases and provide the care and treatment needed. This gloomy scenario can however be mitigated through multi-pronged interventions. This presentation will review the burden of chronic respiratory diseases in LMIC, discuss the interventions that need to be undertaken and highlight the role of partnerships, including South- South and North South linkages, to contribute to the promotion of lung health in under-resourced settings.

#### 4. Assessing the societal burden of airflow obstruction and modelling the potential impact of leading interventions amongst adults in Malawi: The Adult Lung Diseases in Malawi Study.

Martin W. Njoroge<sup>1,2</sup>, Patrick Mjojo<sup>2</sup>, Catherine Chirwa<sup>2</sup>, Chifundo Mhango<sup>2</sup>, Frank Jonas<sup>2</sup>, Faith Zumazuma<sup>2</sup>, Edgar Ngwira<sup>2</sup>, Jamie Rylance<sup>1,2</sup>, Angela Obasi<sup>1</sup>, Louis Niessen<sup>1</sup>, Graham Devereaux<sup>1</sup>

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**Background:** Non-communicable respiratory diseases are the third leading cause of NCD deaths with 3.9 million deaths in 2017. The commonest NCRDs are those characterized by airflow obstruction, namely asthma and chronic obstructive pulmonary disease. Despite this, little is known about the economic burden of these diseases in LMICs. This is important because the diseases are strongly influenced by potentially modifiable environmental factors, including material deprivation.

**Purpose:** The study aims to calculate the health burden and economic cost of airflow obstruction in Malawi from a societal perspective and to model efficient interventions to address this.

**Methodology:** This is a follow-up observational survey of an established cohort of participants in Chikwawa coupled with model-based analyses of existing data. A minimum sample of 584 participants will be required to detect a meaningful change in lung function between the two phases of follow up. However, we will aim to collect data from as many of the 1481 participants from whom we were able to get data in the baseline study conducted between August 2015 – November 2016.

**Results (Preliminary):** Data collection commenced in June 2019 and will go on until March 2020. The study has recruited 393 participants to date with a gender distribution of 56.9% female and a mean age of 43.8 (SD:17.8). From the villages we have visited so far, 86% of the baseline participants have been located and

71% of the baseline participants have had spirometry done.

**Conclusion:** There is an urgent need to better understand the economic costs of NCRDs in LMICs given the large number of people with abnormal spirometry. Abnormal spirometry has been associated with premature mortality. However, how this translates to disease and economic burden is unknown

## 5. Distribution of lung abnormalities on chest X-ray images taken during the Kenya Prevalence survey 2016: A pilot study

Mungai, B<sup>1.</sup>, Joekes, L<sup>2.</sup>, Masini, E<sup>3.</sup>, Obasi, A<sup>1.</sup>, Manduku, V<sup>4.</sup>, Ong'ang'o, J<sup>4.</sup>, Mugi, B<sup>5.</sup>, Kirathe, D<sup>6.</sup>, Kiplimo, R<sup>6.</sup>, Sitienei, J<sup>6.</sup>, Oronje, R<sup>7.</sup>, Morton, B<sup>1,8,9.</sup>, Squire, B<sup>1.</sup>, MacPherson, P<sup>1,8,10.</sup>

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**Background:** In the year 2015-2016, Kenya carried out a tuberculosis (TB) prevalence survey to determine the prevalence of bacteriologically confirmed pulmonary TB and to assess the health seeking behavior of TB patients and those reporting TB symptoms. This was a countrywide population based cross sectional survey with a sample size of 72,000 individuals. The WHO recommended screening strategy for TB prevalence surveys based on two tools; Symptom questionnaire and chest X-ray (CXR) was used. During the prevalence survey the

CXR were taken with a focus on TB. This pilot study sought to describe and quantify the other abnormalities that CXR in the prevalence study picked in order to have prevalence values for calculation of sample size for a full study.

**Aim and Methodology:** This was a cross sectional survey. Stratification by cluster of the study participants was done and a sample of 150 participants with abnormal suggestive of TB CXR and 350 participants with abnormal other CXR obtained. A reporting template was developed and five radiologists identified and trained to report the CXRs. Reporting was done on an electronic online platform in January 2019.

**Results:** A total of 484 films were reported. 36.6% of those classified as abnormal other and 40.2% of abnormal suggestive were normal (Table 1). 45.9% of abnormal other (not TB suggestive) CXR showed cardiac abnormalities with 35.5% with cardiomegaly, 23% with aortic pathologies, 3.8% emphysema/COPD. For abnormal TB suggestive 45.1% were lung abnormalities, 13.9% had possible old latent TB, 13.1% active TB, 10.7% aortic pathology, 9% emphysema/COPD.

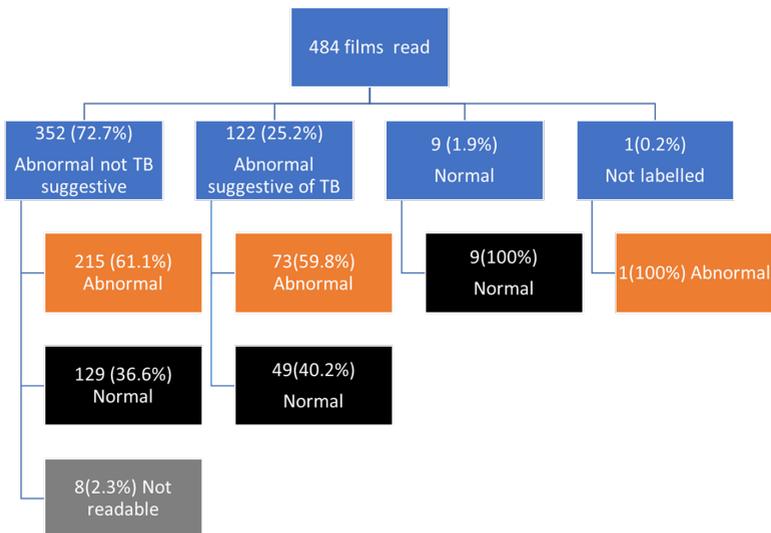


Table 1: Outcome of the CXR reporting

**Recommendations:** CXR has been shown to be a good screening tool for TB. There is however need for planning for the other lung and cardiac conditions that were identified. A follow up full study is ongoing.

## **6. The Utility of Clinician-Performed Cardiopulmonary Ultrasound Assessment of the Acutely Breathless Patient: Breathlessness Early Detection with Ultrasound trial (BED-US Trial)**

Kajima JW, Rylance J, Meme H, Morton B, Welters I.

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**Introduction:** Breathlessness can be a diagnostic challenge as it is the primary manifestation of disparate pathologies including cardiopulmonary, haematological and neuromuscular diseases. Careful clinical examination can direct diagnostic suspicion, although a diagnosis often also relies on radiologic and laboratory results, which can delay appropriate therapy. Treating physicians may therefore have to base treatment decisions on limited clinical information. A cardiopulmonary, clinician performed point-of-care ultrasound (CP-PoCUS) could rapidly capture images of soft tissues and organs, thereby provide more accurate information for clinical decision making.

**Aim:** The aim of this study is to investigate which pathology can be detected using a CP-PoCUS in a low and middle income (LMIC) population, and how these data have potential to alter clinical impression and management plans.

**Study site:** The study is ongoing at the emergency department of the Kenyatta National Hospital (KNH), Nairobi, Kenya.

**Study design:** A single centre prospective cohort study conducted between May 2019 and March 2021 with a patient follow-up of 72 hours post admission.

**Study participants:** Convenient sampling of 207 acutely breathless patients presenting at the emergency department at KNH and purposeful sampling of the doctors who reviewed the recruited patients.

**Methods:** Acutely breathless patients are scanned using a point of care ultrasound (PoCUS) which is performed by a dedicated physician, blinded to

the other clinical, laboratory or imaging tests, according to the modified Rapid Assessment of Dyspnoea with Ultrasound (RADiUS) protocol. Proportion of pathology accurately identified using experts review as the criterion reference standard will be calculated and expressed as percentages. The agreement between CP-PoCUS and expert reviewed ultrasound will also be described by using the Cohen kappa statistics. The relationship between pre- and post CP-PoCUS changes in clinical impression will be investigated by using the Wilcoxon test for dependent variables (Wilcoxon signed rank tests). To compare diagnosis of point of care ultrasounds with chest X-rays as a parameter for comparison in patients with acute breathlessness, the concordance between the two methods will be assessed using kappa statistics.

**Expected outcome measures:** Our findings will be useful in backing up influencing activities regarding the usefulness of clinician performed bedside ultrasound in the assessment of acutely breathless patients.

### **7. A Vicious Cycle of Inadequacies in Diagnosis and Management of Chronic Non-Communicable Lung Diseases in Kenya; A Case Study of Nairobi County.**

Stephen Mulupi

PhD student: Liverpool School of Tropical Medicine, in collaboration with KEMRI-Centre for Respiratory Diseases Research.

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**Introduction:** Chronic lung diseases (CLD) are among the four main non-communicable diseases (NCDs), associated with approximately 40 million deaths worldwide. Key risk factors of CLD include exposure to tobacco smoke, indoor and outdoor air pollution and genetic factors. Asthma and chronic obstructive lung diseases (COPD) are the main CLD. Low- and middle-income countries such as Kenya, are expected to bear the largest burden of NCDs by 2030, partly due to weak healthcare systems.

**The aim of the study:** This study aimed to investigate the major constraints in diagnosing and managing CLD in public health facilities in Nairobi county, Kenya.

**Methods:** This was a case study, using qualitative methods. 5 facilities were

sampled; Ngaira dispensary, Rhodes clinic, Lungalunga health centre and Mbagathi District Hospital. Study participants included senior officials in the Ministry of Health (national n=3 and Nairobi county government, n=4) and healthcare providers in the sampled facilities (n=14), and community health volunteers (n=3), and representatives of nongovernmental organizations (n=2). Data were collected using in-depth and key informant interviews, between 16<sup>th</sup> August and 20<sup>th</sup> September 2018.

**Key findings:** A vicious cycle of “*inadequacies*” at the community, health facility, county and national levels-imposed barriers to appropriate diagnosis and management of CLD. Lack of national level population data on chronic lung disease burden undermined policy processes and investment in healthcare for chronic lung diseases. National and county level systemic weaknesses in budgetary allocations and low human resources capacity for healthcare undermined diagnosis and appropriate management of chronic lung diseases. Household poverty affected access to healthcare services and imposed barriers to community health services.

**Conclusions:** This case study identified important constraints to diagnosis and management of chronic lung diseases, from household to national level. There is urgent need to enhance the visibility of chronic lung diseases on the national policy agenda, and progressively invest more in healthcare facilities’ capacities, generation of appropriate data and strengthening the community health system.

## **8. A multifaceted approach in determining non-communicable lung diseases and associated factors in Kenyan children: Implementation of Tupumue study**

Orina F., Meme H., Amukoye E. Devereux G, Chakaya J, Mortimer K

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**Rationale:** Lung diseases rank 4<sup>th</sup> as a cause of mortality globally. The highest burden is in low- and middle-income countries (LMIC). The commonest non-communicable lung diseases in LMIC are asthma and chronic obstructive pulmonary disease: both characterised by airflow obstruction. *In utero* and early

childhood exposures can predict adult lung health and this is more prevalent in resource poor settings.

**Objectives:** This study utilizes an interdisciplinary, collaborative, participatory approach to determine and compare the burden of non-communicable lung diseases in children living in two communities in Nairobi and to investigate the role of early life factors and air pollution

**Methods:** a multilayered study implementation approach was deployed in two communities (Mukuru and Buru Buru) in Nairobi. Firstly a qualitative creative approach for community sensitization, immediately followed by a quantitative survey for collection of early life factors, lung function and air pollution measurements, lastly a qualitative study including focus group discussions to assess the sensitization strategies and walking interviews for exploring community life, lived life experiences both on lung health and air pollution in the community.

**Expected outcome:** Quantification of the burden of non-communicable lung disease in Kenyan children living in two communities in Nairobi, while identifying possible early life and environmental determinants as well as determine most effective community sensitization strategy for human health research studies for similar setups.

## **9. A cross-sectional study, of the characteristics of adults with chronic respiratory symptoms attending outpatient department at Mbagathi Hospital in Nairobi, Kenya: A Multi-Center study**

Miheso B, Meme H, Amukoye E, Devereux G, Mortimer K  
[bbmiheso@gmail.com](mailto:bbmiheso@gmail.com)

**Introduction:** Chronic Respiratory Diseases (CRDs) describes a range of non-communicable diseases of the airways and the other structures of the lungs. Some of the most common are asthma, chronic obstructive pulmonary disease (COPD), lung cancer, cystic fibrosis, sleep apnea and occupational lung disease.

CRDs are associated with substantial morbidity, mortality and suffering globally and are currently under-recognized, under-diagnosed, under-treated and insufficiently prevented. In Kenya, NCDs accounts for 27% of deaths and of these deaths 109 per 100,000 are deaths from CRDs.

**Aim:** To estimate prevalence of common chronic respiratory conditions in patients with chronic respiratory symptoms visiting the outpatient department in Mbagathi Hospital, Nairobi Kenya and identifying determinants of lung function, risk factors for chronic respiratory diseases in the same setting.

**Study site:** Mbagathi Hospital Outpatient department.

**Study Design:** A cross sectional study

**Study participants:** Adult patients age 18 and above who present with chronic respiratory symptoms.

**Sampling Strategy:** Sequential adults presenting with chronic respiratory symptoms and visiting the outpatient department of Mbagathi Hospital.

**Methodology:** After a patient is consented, a questionnaire is administered to collect data on demographics, symptoms, exposures to outdoor and indoor pollutants, occupation, known triggers of allergies, tobacco smoking, educational status, income, psychosocial profile, co-morbidities, past medical history, HIV status, adherence and inhaler technique if already on treatment . In addition, Vital signs including SpO<sub>2</sub>, height, weight will be recorded. Then their general examination, lung functions (evaluated using spirometry), skin prick ( allergy test) , chest radiograph, 6 minutes walking test and quality of life assessments are done.

**Expected outcomes:** Our findings will provide a better understanding of the risk factors and clinical categories that outpatients presenting with chronic respiratory symptoms fall into. This will lead to more efficient diagnosis and improved management of Chronic Respiratory Diseases in resource-constrained outpatient settings in Kenya. The results also have the potential to inform resource

allocation during strategic planning of health service provision.

## 10. Spirometry in Africa

Lindsay Zurba

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Spirometry is an important tool in the surveillance, epidemiology, diagnosis, and management of respiratory disease, yet its accessibility is currently limited in Africa where the burden of respiratory diseases is amongst the highest globally. The reasons for limited access to spirometry in Africa include poor access to training and skilled technicians, limited availability of equipment, consumables, and technical support, and lack of human and financial resources. The Pan African Thoracic Society, working together with regional African thoracic societies and key research initiatives in Africa, have made progress in training and education, but a lot of work is still needed to meet the challenges faced. Accurately defining these challenges of access to high quality spirometry, development of local, standardised, and context-specific training and quality assurance tools; development of appropriate reference standards and innovative approaches to addressing the challenges of access to equipment, consumables and technical support are needed. Training and research collaborations that include regional thoracic societies, health system leaders, the Pan African Thoracic Society and international role players in the field are key to maximising available intellectual and financial resources. Hence ensuring that access to high quality spirometry measures that are used effectively in tackling the burden of respiratory disease in Africa.

## 11. Air pollution and health in low & middle income countries: assessing exposure with new technology

Dr Ruaraidh Dobson, Institute for Social Marketing and Health, University of Stirling

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**Background:** Air pollution is a leading cause of ill-health globally. One important form of air pollution is fine particulate matter (PM<sub>2.5</sub>), which is estimated to lead to seven million deaths worldwide each year. Important sources of PM<sub>2.5</sub> include transport, industry and natural factors outdoors and second-hand tobacco smoke and biomass fuel smoke indoors.

While outdoor sources are important, indoor sources may lead to much higher personal exposures as individuals spent most of their time at home and work. Personal exposure may vary based on gender, age and occupation among other factors. Methods of assessing this exposure have changed as new technology has been developed. Capabilities which would once have cost tens of thousands of dollars are now available for a few hundred. This has allowed larger and more complex studies of personal exposure to PM<sub>2.5</sub> to be conducted, and made it possible to conduct these studies in resource-limited settings in low and middle income countries (LMICs).

**Methods:** Our research group is engaged in a number of studies on air pollution in LMICs using these new techniques.

In the “Monitoring Air Quality in Africa for Advocacy” (MA3) project we are developing a network of outdoor PM<sub>2.5</sub> sensors in locations around Africa, many of which have never had any air quality monitoring capability before. These sensors will measure PM<sub>2.5</sub> concentrations over the course of a year.

In “Muslim Communities Learning About Second-hand Smoke” (MCLASS II) we have monitored 24-hour PM<sub>2.5</sub> concentrations in 1,800 homes in Dhaka, Bangladesh, as part of a randomised controlled trial to encourage parents to smoke outside.

In the “Tupumue” study, we are monitoring air pollution in the homes of 200 children in Nairobi to uncover the link between early exposure to high levels of PM<sub>2.5</sub> and poor lung health.

**Results:** These ongoing studies have already provided valuable lessons in the use of new low-cost sensing instruments in LMICs. Piloting the MA3 study has allowed us to test new instruments capable of monitoring PM<sub>2.5</sub> for months at a time. Baseline data from MCLASS II has demonstrated the impact of smoking indoors and outdoor air pollution on PM<sub>2.5</sub> indoors in Dhaka. Tupumue will provide wholly new information on children’s health in underserved areas.

**Conclusion:** New monitoring technologies have led to significant new opportunities in exposure science in LMICs. Ongoing research on personal exposure to PM<sub>2.5</sub> will allow us to understand the extent of exposure to PM<sub>2.5</sub> better and improve policy to reduce harm to health.

## SYMPOSIUM 7: Knowledge Management (KM)

**Symposium Convener: - Prof. Jennifer Orwa**

**Title: LEVERAGING ON KNOWLEDGE MANAGEMENT AND KNOWLEDGE TRANSLATION TO INFORM UNIVERSAL HEALTH COVERAGE (UHC) SCALE-UP IN KENYA**

### Synopsis

Research evidence is crucial for successful decision and policy-making processes. However, in Kenya just like many other African countries, empirical findings point to an existing gap between supply side (research outputs) and demand side (uptake of evidence) among researchers, policy actors and decision makers. Nevertheless, Kenya's health sector has made some progress in promoting and institutionalizing the use of research and other forms of evidence to inform decision-making processes. This is demonstrated through the various institutional structures and policy instruments and tools that have been put in place to enhance evidence informed decision-making (EIDM).

Our symposium is timely as there is need to deliberately intensify efforts aimed at enhancing and incentivizing the use of research evidence to inform universal health coverage (UHC) related policies, programming, and practices in Kenya.

This half-day symposium objectives include:

- To share lessons learnt and opportunities in supporting knowledge management and knowledge translation to support UHC related programming and practices in Kenya;
- To identify and explore opportunities for increased engagement between research scientists (including their affiliate institutions) and county health departments.

The session will focus on knowledge assets and knowledge translation efforts as *catalytic drivers of UHC*. It will start with a 30minutes keynote presentation of the role of research in driving UHC, followed by a panel discussion of the multiplicity of efforts needed to ensure research plays a key role on UHC efforts. Also, the

panelist will discuss what minimal reforms are required to ensure sustainability of research demand and use within the State Department of Health (MoH) and county governments. The panelists should include: KEMRI, MoH, Council of Governors, AFIDEP/Policy Expert.

## Symposium 8: The Japan Africa Collaborative Research on *Helicobacter Pylori* Project

Names of **Organizers/Chairs**: Prof. Yoshio Yamaoka/ Prof. Elijah Songok

Names of **Rapporteur(s)**: Assistant Prof. Matsumoto/ Dr. Elizabeth Matey

### Synopsis

*Helicobacter pylori* (Hp) – a Gram-negative bacterium, is etiologically associated to a wide spectrum of gastroduodenal diseases including chronic gastritis, peptic ulcers and gastric cancer. By infecting half of living people worldwide, Hp constitutes a worldwide Public Health issue. Africa likely play a central role in the global epidemiology of Hp as evidences for the highest prevalence, the geographic origin and the widest genetic diversification of the species. However the continent is still not explored enough and is surrounded by enigma regarding the Hp infection (e.g. so-called “African Enigma”; high Hp infection, but low gastric cancer incidence). The current project had been developed in 2017 to empower cross-border multidisciplinary collaboration between scientists in Japan and in Africa, by fueling research works related to Hp and gastric cancer with interaction through a scientific Network. The project has been granted for 3-years (2017, 2018, and 2019) by the Japan Society for Promotion of Science (JSPS). Currently, a Network is underbuilding and is already connecting five African countries (Kenya, DR Congo, Rwanda, Nigeria and Cameroon) to Japan. Works under this Network has led to field surveys, training for African researchers in Japan and Joint-Meetings between countries. This project serves as a momentum to hasten further developments for establishing strong inter-institutional partnerships and building valuable human resources. This is needed for the continuation of the joint effort in harnessing the vast potential of research for improving human well-being through a good understanding of the gastroduodenal diseases burden useful for efficient allocation of public health efforts in Africa.

### Names of presenters and titles of presentations

1. **Yoshio Yamaoka**: The Japan–Africa Collaborative Research on *Helicobacter pylori* Project.
2. **Stephen Njoroge**: Comparing Diagnostic Performance of Pronto Dry Rapid Urease® and Culture to Histopathology among endoscopy patients at the Aga Khan University Hospital for diagnosis of *H. pylori* from gastric

biopsies.

3. **Trésor Pata:** Seroprevalence and risk factors of the *Helicobacter pylori* infection in Bukavu city in the Democratic Republic of Congo.
4. **Patrick de Jésus Ngoma-Kikoso:** Congolese registry for the management of *Helicobacter pylori* infection: Trends in the results at 5 months of a pilot clinical trial comparing concomitant and sequential non-bismuth quadruple therapies.
5. **Evariste TShibangu-Kabamba:** Mechanistic insights of metronidazole resistance revealed by Next-Generation Sequencing of whole genome of *Helicobacter pylori* clinical isolates from the Democratic Republic of Congo
6. **Takeshi Matsumoto:** *Helicobacter pylori* infection and gastric microbiota

## Symposium 9: HATUA



EDCTP

### HATUA - ENABLING COMPLIANCE, BUILDING CAPACITY AND COMMUNITY FOR CLINICAL RESEARCH IN KENYA (HATUA-Kenya Project).

#### Synopsis

HATUA-Kenya Project is funded by the European & Developing countries Clinical Trials partnership (EDCTP) through KEMRI in collaboration with the National Commission of Science and Technology (NACOSTI), the Pharmacy and Poisons Board (PPB), Synergy Informatics, IntelliSOFT Consulting and Council of Health Research for Development (COHRED)

The goal of the projects is to improve the regulatory oversight for clinical trials at both the national level (NACOSTI and PPB), improve competence at the institutional level, and facilitate communication between regulators and the Institutional Research Ethics Committees (IRECs) and lastly to provide opportunity for sharing of best practices and networking by building a community of support and learning. This project can be described by **3 C's: Compliance** (improving functions for oversight of clinical trials through development of electronic systems for reporting, review and submission of research protocols), **Capacity** (building technical capacity through training in Bioethics, pharmacovigilance, clinical monitoring and research administration) and **Community** (build a network for sharing and a community of best practices through seminars conferences and online consultation).

The symposium during the KASH conference will provide an overview on the regulation and conduct of clinical trials in Kenya.









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\*NB. These are the minimum requirements; other conditions may apply for individual programmes.

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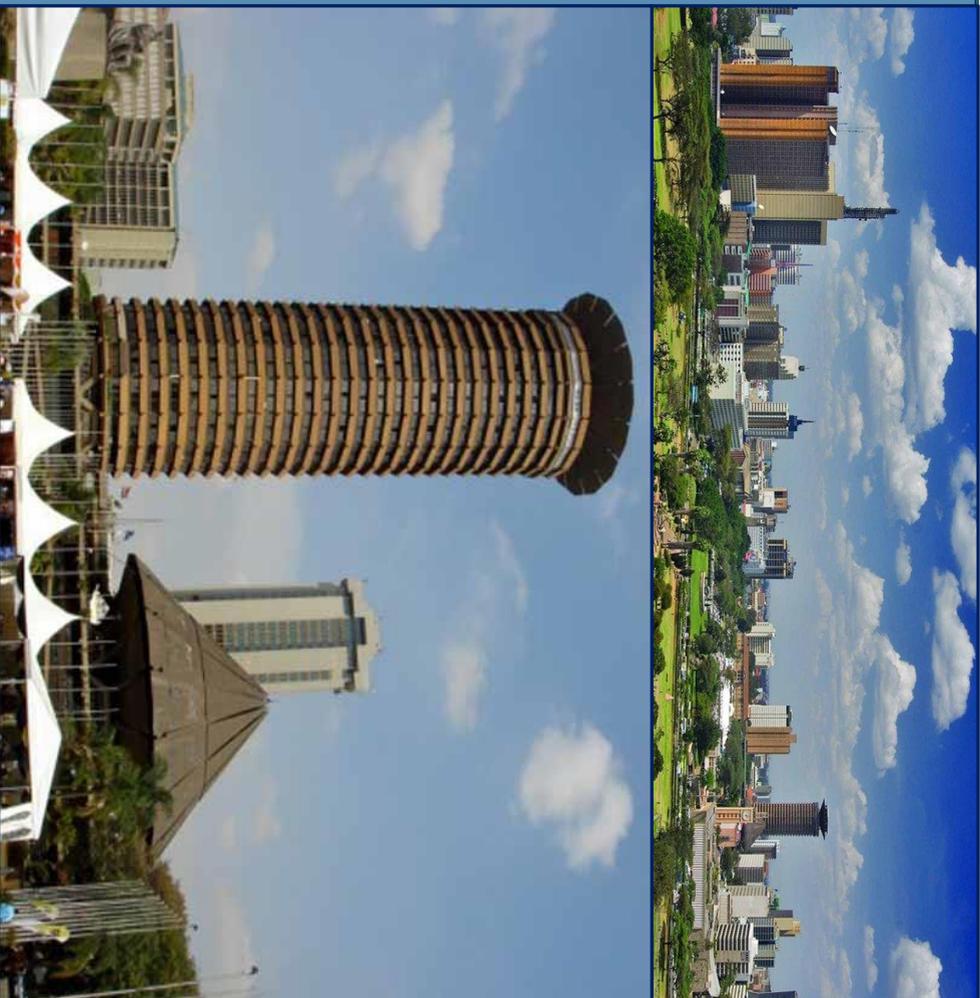
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