KEMRI | Wellcome Trust

PROGRAMME HIGHLIGHTS

CONDUCTING HIGH QUALITY, PURPOSEFUL, AND RELEVANT RESEARCH IN HUMAN HEALTH, BUILDING SUSTAINABLE RESEARCH CAPACITY AND LEADERSHIP

ABOUT KEMRI-WELLCOME TRUST

The KEMRI-Wellcome Trust Research Programme (KWTRP) is a partnership between the Kenya Medical Research Institute (KEMRI), Wellcome, and the University of Oxford. Established in 1989, the programme has evolved from conducting research in the immunology and epidemiology of malaria in the 1990s to a world-class research Programme conducting multidisciplinary research that spans molecular biology to health systems and policy research.

The past year was yet another extremely productive year for the Programme, with significant achievements across our core mission to conduct high-quality, purposeful, and relevant research in human health and to build sustainable research capacity and leadership. A key milestone was the renewal of our Core Award from Wellcome for another 7 years.

Developing Africa's Future Generation of Leaders (DELTAS Africa) funding of our capacity development initiative, the Initiative to Develop African Research Leaders (IDeAL), was also renewed. This is a testament to our exemplary track record and our funders and partners' confidence in our capacity to deliver on our mission.

The Programme mobilised grant income worth GBP 26.2 million to support research and capacity development. In 2023, we published 256 peer-reviewed papers and implemented several strategies to engage with the community and public. Our core focus was translating evidence generated from our research into accessible forms for policymakers. We highlight these achievements below.

PEOPLE AND EXCELLENCE

256
Papers published in 2023

9
Policy consultative forums

13
Policy briefs

The most cited paper published in 2023 was: Michael Abouyannis et al, "A global core outcome measurement set for snakebite clinical trials" published on the Lancet Global Health.

Graduates' breakdown by scheme

3
Postdoctoral Fellows

20
PhD graduates

14
Master's Students

5
Graduate attaches

9
SLAS students

Full professorships


Emelda Okiro


Sassy Molyneux

Associate professorships


Anthony Etyang


Mainga Hamaluba

Scientific Excellence Recognitions

- **Charles Agoti was awarded the 2022 Ben Barres Spotlight Awards.**
- **Nchafatso Obonyo won the Africa Top 40 under 40 award.**
- **Louise Downs was one of the winners in this year's Lasker Foundation essay contest.**
- **Alice Kamau was awarded the Africa Academy of Sciences affiliate.**
- **Dorothy Oluoch was selected by the Aga Khan University for the "Supporting Women in Science programme".**
- **James Nyagwange was appointed to the International Veterinary Vaccine Network (IVVN) board**
- **George Warimwe was appointed to the CEPI Vaccines scientific advisory Committee.**
- **Francesca Orenge received an award from the Africa Research Excellence Fund (AREF) Essential Grant Writing Skills Programme.**

Most cited paper in the last 5 years was: Barasa E, Mbau R, Gilson L. (2018). "What Is Resilience and How Can It Be Nurtured? A Systematic Review of Empirical Literature on Organizational Resilience" published on the International Journal of Health Policy and Management.

OUR IMPACT

Discovery Science

Our pathogen biology work has led to several fundamental discoveries that include:

- The discovery of angiotensinogen (AGT), as a sensitive plasma biomarker that distinguishes febrile acute infection caused by invasive bacterial infection, from febrile viral or malarial episodes with higher sensitivity than the current gold standard, C-reactive protein (CRP). This discovery is valuable as it will improve the clinical management of children with febrile infections that is typically hindered by poor access to diagnostic tools to determine whether the cause of an infection is bacterial, viral, or parasitic in LMIC setting. Potential impacts include a reduction in unnecessary antibiotic prescriptions, which are typically prescribed for febrile illness as a safety precaution when the aetiology of the febrile illness is unknown.
- The development and validation of a microarray designed for the serological surveillance of about 40 different infections and strains that are highly prevalent in LMIC.
- A new biomarker for paediatric sepsis in African children
- Extracellular vesicles in Plasmodium falciparum revealing new insights into the biology of malaria which provide a novel potential avenue for interventions.
- We reported, for the first time, that the Dantu blood group is associated with high-level protection against early, non-clinical, *P. falciparum* malaria infections *in vivo.*
- We established the protective mechanism for Dantu *in vitro*, where the inhibitory impact on *P. falciparum* invasion is mediated by its impact on RBC membrane tension. This is a new paradigm in terms of a type of malaria-protective mechanism that involves membrane tension of the red blood cell, and it also advances what we know about the biology of host-parasite interactions.
- Our team supported the work that led to the first report of the invasive species *Anopheles stephensi* in Kenya. Specifically, we led the sequencing and the bioinformatic analysis of the larval samples found in Turkana County incriminated as *An. stephensi*, thus confirming its presence in the region.

Our clinical research led to several discoveries. Key among them include:

- A GWAS meta-analysis of over 29,000 people with epilepsy that led to the discovery of 26 genetic risk loci for epilepsy, some of which provide biological targets for medications that can be repurposed/trialled for seizure control in generalised epilepsy such as Orphenadrine and Quetiapine, and also inform the development of new therapeutic targets for epilepsy management. Scientists (Charles Newton and Symon Kariuki) from our Neurodevelopmental disorders and mental health group (Neuro Group).
- The neuro group also led the development and validation of a diagnostic aid for convulsive epilepsy in sub-Saharan Africa. This work produced a culture- and region-specific predictive model and app for detecting and diagnosing epilepsy by non-specialist primary healthcare workers.
- Research lead by Michael Abouyannis developed a global core outcome measurement set for snakebite clinical trials. These data provide patient-centred , globally relevant , evidence based core outcomes to inform meta-analysis, clinical trial design for what is a major but neglected public health problem in Africa.

Genomic Surveillance

- Our genomic surveillance work is closely integrated and provides near real-time data to support: a) surveillance of febrile episodes in longitudinal cohorts under active surveillance; b) direct primary and secondary healthcare surveillance in Kilifi County; c) links with a network of County Hospitals and Ministries of Health across Kenya, and national agencies such as the malaria control programme; and d) links in with Africa CDC and WHO AFRO as a sequencing hub for East Africa.

Yellow Fever

- Evidence from the fractional Yellow Fever vaccine dosing trials informed the inclusion of fractional doses in WHO guidelines for managing Yellow Fever outbreaks.

OUR IMPACT

Malaria

- KEMRI-Wellcome was one of the sites that implemented the phase 3 trial on the safety and efficacy of the R21/Matrix M malaria vaccine. Evidence from this trial informed the WHO pre-qualification of the R21/Matrix-M™ malaria vaccine and licensure in several African countries, including Kenya.
- KEMRI-Wellcome was part of a consortium of partners that evaluated the implementation of the RTSS malaria vaccine national immunization programmes in Kenya, Malawi, and Ghana. Preliminary findings from this work informed the WHO recommendation for use of the vaccine in all areas with moderate to high transmission. The final findings from this work showed that the implementation of RTSS vaccine through the national immunization programmes was feasible, safe and effective, and lent further credence to the WHO recommendation. This finding has informed the adoption of the RTSS malaria vaccine by national immunization programmes by several other African countries.
- We have established protocols for genomic surveillance of *Anopheles stephensi* and monitoring the spread of the invasive vector species in Kenya. Our team has also led the development of MALDI-TOF-MS for screening malaria vector species and bloodmeal sources. The approach is a remarkably cost-effective solution and has the potential to revolutionize mosquito typing. All databases have been made open-access and we are currently working with officials to implement the technology at NMCP partner labs in Kenya.
- We are also supporting the establishment of the first malaria molecular surveillance (MMS) technical working group and MMS strategy document within the NMP and National Public Health Laboratory Genomics Unit.

Epilepsy and Mental Health

- The Epilepsy Pathway Innovation in Africa (EPInA) project examined if the creation of community awareness and implementation of innovative technologies and capacity-building interventions can improve the diagnostic and treatment gaps of all epilepsies in Kilifi, Kenya. In a context where the identification of convulsive epilepsy in sub-Saharan Africa relies on access to resources that are often unavailable, and infrastructure and resource requirements can further complicate case verification, the project used machine-learning techniques to develop and validate a region-specific questionnaire panel and predictive model (The epilepsy diagnostic companion) to identify people who have had a convulsive seizure. The epilepsy diagnostic companion has been incorporated into community-based surveys, involving clinicians in the diagnosis of epilepsy.
- Evidence from the EPInA project also contributed to updates in the WHO mental health gap action programme intervention guidelines (mhGAP-IG). Further, the EPInA project also resulted in the creation of a neurological and mental health disease dashboard in Kilifi and Nairobi counties in Kenya.
- Our scientists (Symon Kariuki, and Charles Newton) contributed to the development of the WHO intersectoral global action plan on epilepsy and other neurological disorders.
- Our mental health team has collaborated with the Kilifi County and supported the development of first costed mental health action plan for Kilifi County.

Universal Health Coverage (UHC)

- The health economics research unit (HERU) supported the Kenyan government to develop an evidence-based health benefit package for UHC that will be purchased by the newly formed Social Health Insurance Authority (SHA).
- HERU supported the Kenya government in the development of legislation that institutionalizes the use of a systematic, and evidence-informed healthcare priority setting process in Kenya. This legislation will ensure that for the first time in Kenya, process for the development of a health benefit package is systematic, transparent, inclusive, and evidence-based, and is the culmination of HERU's research work and policy engagement on this topic since 2015 (9 years).

Malnutrition

- Work led by Martha Mwangome has led to the updating of the WHO 2023 WHO guideline for treatment of acute malnutrition to use Mid-Upper Arm Circumference (MUAC) to define nutritional risk among infants under 6 months.
- Evidence from the Childhood Acute Illness and Nutrition Network (CHAIN) led to the establishment of a WHO paediatric risk stratification working group.

Health System Resilience

- Our researchers produced a Regional Position Paper on "Health System Resilience Strengthening" that was presented to and adopted at the WHO AFRO regional committee meeting in September 2023. The paper was as a result of a specific request form WHO AFRO regional office, and in recognition of our previous body of work which was aimed at understanding and strengthening health system resilience.