KEMRI | Wellcome

THE ANNUAL REPORT 2023

FROM THE DIRECTORS DESK

Prof. Edwine Barasa
Acting Executive Director
KEMRI-Wellcome Trust
Research Programme

2023 was another extremely productive year for us, 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. The 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.

In 2023, we mobilized grant income worth GBP 26.2 million to support research and capacity development. We published 256 peer-reviewed papers in 2023 and additionally implemented several strategies to engage with the community and public, and translate evidence generated from our research into accessible forms to policymakers. We awarded 52 studentships and graduated 51 individuals across the range of our studentship schemes.

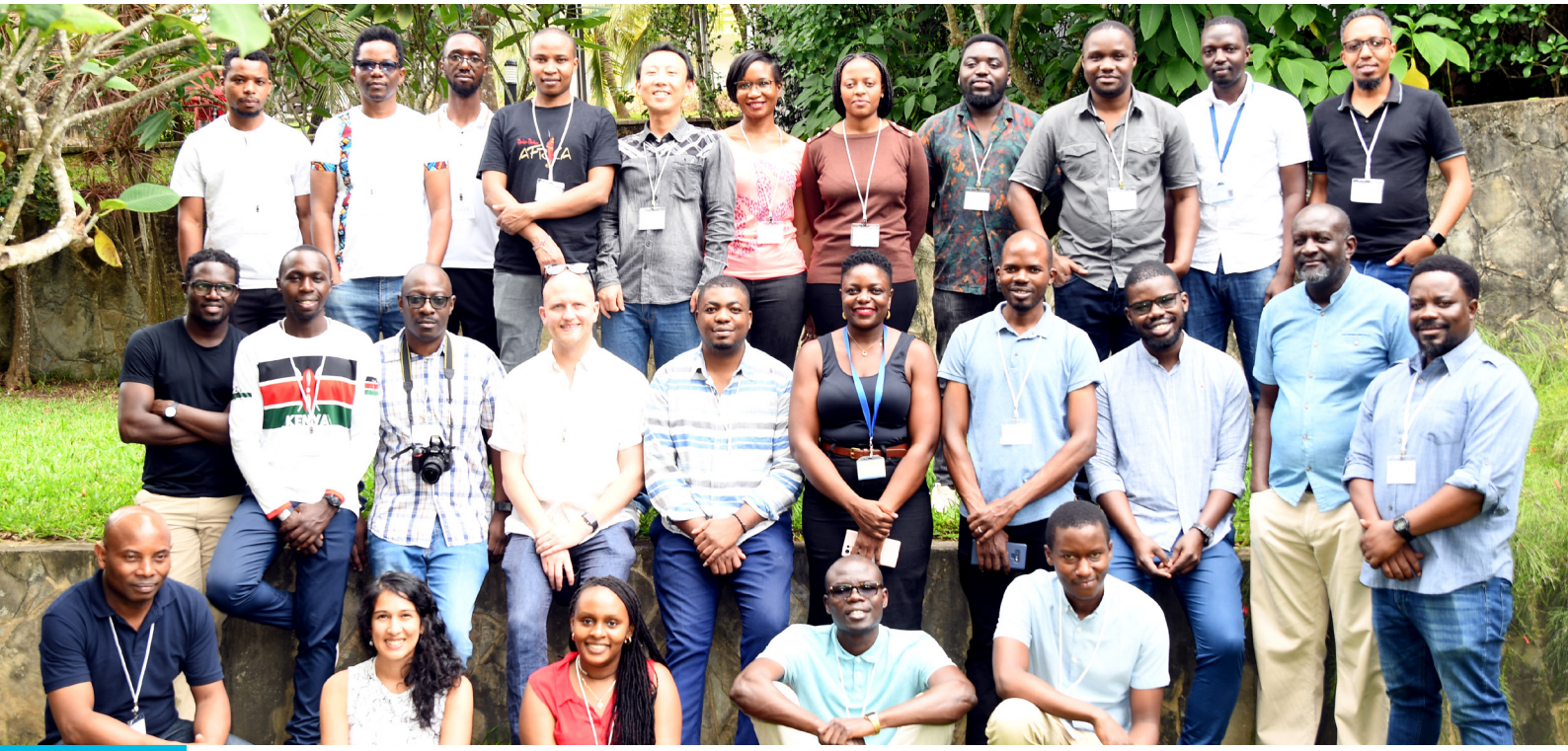
We continued to enhance our research environment by making progress on diversity, equity, and inclusion. We deepened our support for the development of the careers of researchers and non-research staff, and advanced on our goal to strengthen local research leadership. Our research yielded major impacts, both in terms of fundamental discovery, and impact on policy and practice, underscoring the purposefulness of our scientific strategy. In this report, we highlight our progress on science, capacity development, and impact, and celebrate our people, highlighting both individual and collective achievements. All this was made possible not only by the KWTRP family, but also by the immense contribution and support from our funders, collaborators, communities, policy makers and the entire range of stakeholders that we engage with.

£26.2 M
Grant income mobilized to support research and capacity development

256
Peer-reviewed papers published in 2023

52
Number of studentships awarded in 2023

51
Number of graduands across the range of our studentship schemes



WHO WE ARE

The KEMRI-Wellcome Trust Research Programme (KWTRP) is a partnership between the Kenya Medical Research Institute (KEMRI), the Wellcome, and the University of Oxford. Established in 1989, the Programme has evolved from conducting research in the immunology and epidemiology of malaria in 1990's, to a world class research institute conducting multi-disciplinary research that spans molecular biology to health systems and policy research. We are physically located in Kilifi at the KEMRI Center for Geographic Medicine Research- Coast, and Nairobi in Kenya, and in Mbale, Uganda, and have research collaborations globally.

Alongside research we have a focus on research capacity development, to support and nurture the next generation of researchers, as well as community, public, and policy engagement to enhance the relevance and impact of our research work.

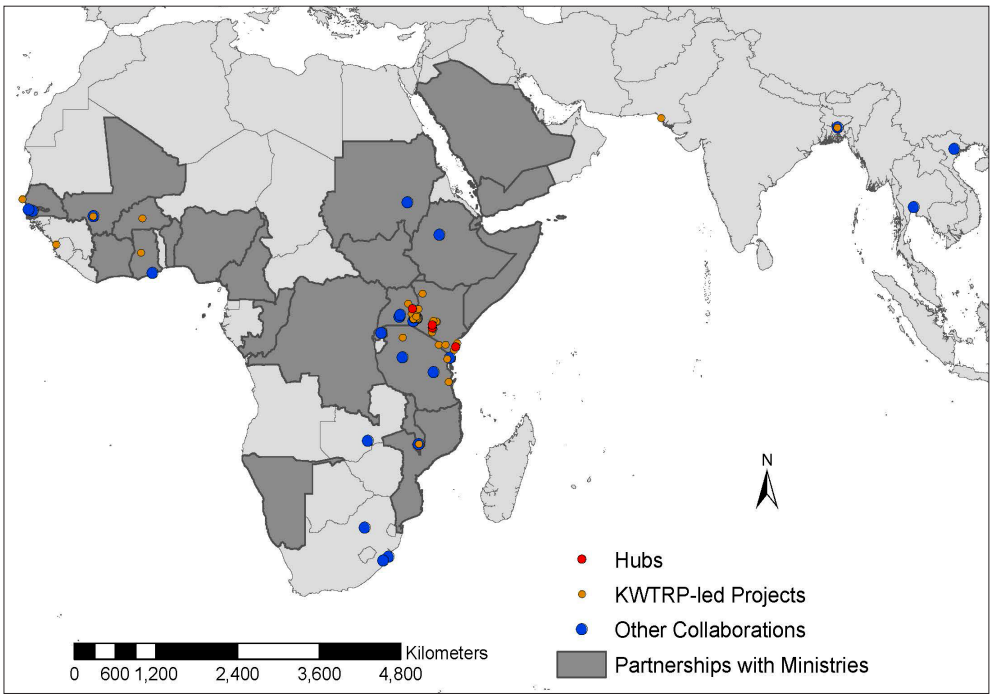
Our research work leverages core operational and research platforms that include the Kilifi health and demographic surveillance site (DSS), state-of-the-art laboratories, a network of three hubs (i.e. Nairobi and Kilifi in Kenya, and Mbale in Uganda) additional sites including Bagamoyo (Tanzania), a network of 24 Kenyan hospitals (Clinical Information Network), an engagement team (community, policy and public), and operational team that ensures to maintain working structures for the research teams including finance, research governance among others.

Our mission is to conduct high quality, purposeful, and relevant research in human health, building sustainable research capacity and leadership

OUR RESEARCH WORK FOCUSES ON FIVE THEMATIC AREAS

- Pathogen biology
- Vaccines
- Clinical research
- Population health
- Health systems research

OUR GLOBAL FOOTPRINT



KEY HIGHLIGHTS IN 2023

£91m

Renewal of our Core Award £91 Million from Wellcome for another 7 years

$4.4m

Renewal of IDeAL 2.0 Award USD 4.4 Million funded till 2027 through the Science for Africa Foundation

20

Celebrating the 20-year anniversary of excellence in demographic and health research in the Kilifi Health Demographic Surveillance System

Scale up of the School Engagement Program model to Nairobi County and other KEMRI centres in Kenya

Certificate of registration from the Office of the Data Protection Commissioner

PEOPLE AND EXCELLENCE

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.

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

Our Research

SNAPSHOTS

Pathogen Biology

Our pathogen biology theme employs a discovery approach to tackle the challenges posed by high burden infectious diseases by advancing the understanding of host responses, host-pathogen interactions, and the mechanisms for disease transmission and resistance.
This work leverages our state-of-the-art molecular and immunological laboratory facilities in Kilifi, and three unique resources: a) a controlled human infection model platform; b) active surveillance of a 20-year longitudinal cohort of children acquiring immunity to malaria and other pathogens; c) primary and secondary care febrile episode surveillance.
These platforms are supported by a unique biobank facility that contains over 1 million samples linked to well-curated epidemiological and clinical datasets, and pathogen genomics data. We consider pathogen biology from the perspective of: the host response; direct properties of the pathogen; and the role of the vector in transmission.

New Projects

We secured several grants and initiated new projects to advance our pathogen biology research. These include:

- The set-up of a platform to characterize antigen-specific precursors that will inform germline targeting HIV vaccines. This approach is being used for the eOD-GT8 60mer vaccine trial in Africa, funding from IAVI (PI Eunice Nduati) to determine if the vaccine activates broadly neutralizing antibody precursors in African populations.
- Funding from Wellcome (Intermediate Fellowship to James Njunge) to understand the impact of systemic inflammation on growth and identify its drivers among underweight and stunted children in LMIC settings.
- Funding from Wellcome (Training Fellowship to Silvia Kariuki) to conduct functional studies of the malaria protective Dantu polymorphism. This work will harness information from human genetic variants that are naturally occurring in malaria-endemic populations to contribute to finding new approaches for combating malaria.
- Funding from the Department of Health and Social Care, UK (PI George Githinji) for rapid virus genomics (RaViG) for outbreak analysis to explore the added value of portable genomics in outbreak investigation and develop a policy for deploying portable sequencing in LMIC.
- Funding from BMGF (Calestous Juma science leadership fellowship awarded to Isabella Oyier) to integrate malaria molecular epidemiology into routine surveillance in Kenya
- Funding from BMGF (PI Marta Maia) to develop matrix assisted laser desorption/ionization flight of time mass spectrometry (MALDI TOF MS) for cost-effective analysis of mosquito samples from surveillance programs.

Vaccines

Research under our vaccines theme aims to accelerate the development, access, and uptake of the most effective vaccines against local and global health priorities. We do this by leveraging in-house multi-disciplinary capabilities in epidemiology, immunology, molecular biology, and expertise in health economic evaluation, and health systems. We leverage our longstanding community and public engagement platform and a broad network of stakeholders within the vaccines ecosystem to achieve translational impact against infectious diseases. We develop the next generation of vaccinologists through a dedicated workforce development program.

New Projects

We secured several grants and initiated new projects to further our vaccinology work. These include:

- Funding from CEPI (PI Francis Ndung'u) to support a randomised, controlled clinical trial to assess and compare the immunogenicity, safety and reactogenicity of the bivalent Omicron BA.4/BA.5 adapted, and the original Wuhan-Hu-1-strain, BNT162b2 COVID-19 vaccine formulations in healthy East African adults. The study is a collaborative project with Ifakara Health Institute in Tanzania. The Vaccine is supplied by Pfizer.
- A Costed extension to evaluate different booster schedules (4th, 5th, 6th doses of R21/Matrix-M™ versus control) of the R21 malaria vaccine following a 3 dose primary series and booster at 12 months post 3rd dose. The study is funded by Serum Institute of India, with Mainga Hamaluba as local PI.
- We previously assessed whether immunogenicity was non-inferior after fractional doses of PCV10 (GlaxoSmithKline plc.) or PCV13 (Pfizer Inc.), when compared to full doses, and analysed vaccine serotype (VT) carriage prevalence. This work was funded by BMGF (PI Anthony Scott) and UK NIHR (PI Katherine Gallagher). We now have a costed extension of the study to allow long-term follow-up of a sub-set of participants at 36 months of age between October 2023-October 2024. This will inform the long-term immune response of fractional pneumococcal conjugate vaccine doses (Full, 20%, 40% PCV13 and rescue immunisation after PCV10) and memory responses in further subsets.
- Funding from the MRC (PI Faith Osier) to support local manufacturing of human vaccines in Africa.

The CIN is a partnership between KWTRP, Kenya Paediatric Association, MoH and County Hospitals. It provides Comprehensive inpatient data from 24 county hospitals. The CIN is a shared resource for audit and feedback, health systems research, surveillance/ epidemiology, and pragmatic clinical trials.

160,000
Neonatal Episodes

+250,000
Pediatric Episodes

70,000+
Adult Episodes

Clinical Research

Our clinical research aims to generate evidence to improve care and outcomes for sick children. Research in this theme tackles major global health challenges that include malnutrition, antimicrobial resistance, high burden infectious diseases among paediatrics that include malaria and pneumonia, neonatal care, critical care, and research in neurodevelopment disorders and mental health. This research is supported by an integrated surveillance platform linking data from our demographic and health surveillance site (HDSS), clinical surveillance, and laboratory platforms, our clinical trials unit (CTU) in Kilifi, and the clinical research platform in Mbale, Uganda. The research also leverages the Clinical Information Network (CIN), a hospital surveillance network of 24 public hospitals in 19 counties in Kenya, were we collect routine data on admissions, care and outcomes in paediatric, neonatal, and adult wards.

New Projects

In 2023, we secured two major grants to support clinical trials addressing pressing health challenges in our context.

- A Wellcome Intermediate fellowship (BAMI-2) awarded to Martha Mwangombe aims to determine the effectiveness of a structured home-based breastfeeding support intervention on growth and neurodevelopment amongst malnourished infants under 6 months of age discharged from hospital following serious illness. Post-discharge mortality of infants under 6 months admitted with acute illness and malnutrition is a significant public health problem in LMICs.
- We (Mainga Hamaluba as co-applicant) collaborated on a Wellcome Trust Discovery Award that will support a multi-centre antivenom trial in Africa that seeks to assess the relative effectiveness of 7 antivenom therapies in the treatment of systemic envenoming, and provide the data on the best antivenom, at the right dose in the correct region of Africa in this neglected condition. Venomous snake bites are a leading cause of death in sub-Saharan Africa. A major challenge is the lack of availability and effective antivenoms targeting the correct snake species.

Three clinical studies were initiated in 2023, all focused on neurodevelopment disorders and **mental health**.

- The Epilepsy Pathway Innovation in Africa (EPInA) is a clinical trial (PI Charles Newton), funded by the NIHR that aims to trial the effectiveness of the creation of community awareness and implementation of innovative technologies and capacity-building interventions in improving the diagnostic and treatment gaps of all epilepsies in Kilifi, Kenya.
- The SPARK study (PI Amina Abubakar) is a cluster randomised trial that aims to evaluate the effectiveness of the World Health Organisation (WHO) Caregiver Skills Training (CST) compared to enhanced usual care in reducing emotional and behavioural problems in children with developmental disabilities and improved quality of life of their caregivers at 4 months after randomisation.
- Lastly, we initiated a study (PI Amina Abubakar) funded by the NIH that aims to develop, validate and disseminate artificial intelligence and machine learning prediction models for poor maternal, neonatal, and early childhood outcomes, and **mental health** outcomes in at risk adolescents and young adults.

Population Health and Surveillance

The Population Health theme aims to provide timely and actionable evidence on the infectious and non-communicable conditions that account for the largest burden of disease in Africa. Some of the broad questions that these theme aims to answer include: what are the effects of (a) introduction of various interventions (e.g. COVID-19, malaria, pneumococcal vaccines) and (b) disruptions such as climate change, pandemic restrictions and health worker strikes on population health; and (c) how can community based interventions be tailored to reduce the increasing burden of non-communicable diseases. Under this theme, we conduct demographic, clinical, and genomic surveillance, leveraging highly adaptable platforms in order to generate data that is used to conduct descriptive epidemiology, measurement of the coverage, safety and effectiveness of interventions, as well as modelling the dynamics of various threats to health including climate change.

Our population health and surveillance research leverages the Kilifi Health and Demographic Surveillance System **(KHDSS)** which is an integrated surveillance and research platform capturing vital events and hospital admissions among 300,000 residents of Kilifi County, established in 2000

New Projects

A number of new grants were secured, and studies initiated under the population health theme with a focus on demography, genomic surveillance, non-communicable diseases and mental health, and sero-surveillance:

a) **Demography:** Emelda Okiro (Wellcome Senior Fellowship) and Amek Nyaguara (funding from Africa Field Epidemiology Network/CDC Foundation) initiated work aimed at understanding challenges to and developing potential solutions for achieving universal registration of births and deaths as well as cause of death certification across the country.

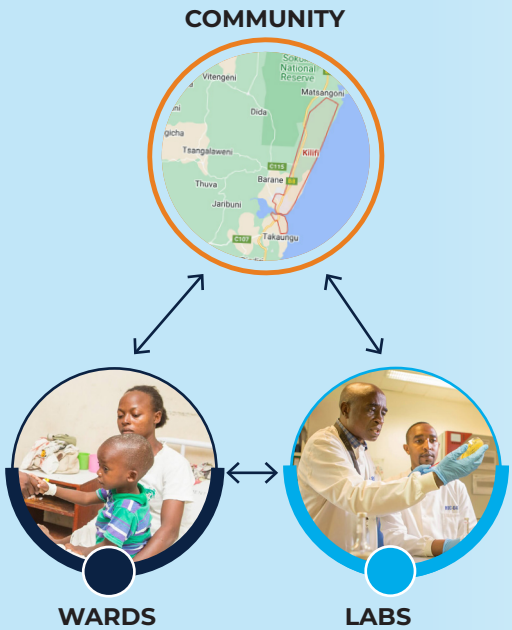
b) **Genomic surveillance:** The Wellcome funded Respiratory Virus Reinfections (RESVIRE) (Charles Agoti PI), and the NIHR funded Virus Genomics for Outbreak Response (Charles Agoti PI) studies will show how genomic investigation coupled to outbreak surveillance and modern quantitative epidemiological approaches can provide detailed data on viral pathogens and their distribution and transmission in the context of a disease outbreak.

c) **Serosurveillance:** Isabella Oyier and colleagues secured funding to establish a platform for the rapid immunological characterization of SARS-CoV-2 variants in Kenya and the Eastern Africa Region. This project will utilize the CIN platform and other data sources to generate data that will guide public health agencies on what measures to take to curb the impact of emerging SARS-CoV-2 variants and other pathogens.

d) **Non-communicable diseases:** The Improving Hypertension Control in Rural Africa (IHCoR) (Etyang PI, NIHR funded) aims to develop a community-centered approach for reducing the high burden of uncontrolled hypertension in Kenya and the Gambia.

e) **Mental Health:** Amina Abubakar and colleagues secured NIH funding to develop and validate artificial intelligence and machine learning prediction models for poor maternal, neonatal and early childhood outcomes at the KenyancCoast (UZIMA DS study). This project will rely on data collected from maternity ward surveillance in 2014-2017 and linked to the KHDSS to develop prediction models for incident mental health and neurodevelopmental problems following pregnancy complications.

The Kilifi Health and Demographic Surveillance System (KHDSS)



300,000

The KHDSS represents 25 years of regular surveys capturing vital events among 300,000 residents of Kilifi. Linked to morbidity and mortality surveillance at Kilifi County Hospital

Our health services & implementation work examines how the effectiveness and safety, quality, and responsiveness of healthcare delivery can be optimized in resource-constrained settings, with a focus on pediatric and neonatal care in public hospitals.

Health Systems Research

Our health system research aims to generate evidence to guide the development of equitable, efficient, quality, ethical, and responsive health systems. Research on health system spans health policy and systems analysis (HPSR), health economics, health services and implementation research, and empirical ethics. The HPSR team applies systems thinking approaches and complexity theories in examining how the governance, organization, functioning, and actor dynamics can promote responsive and resilient health systems. Our Health economics research seeks to examine how LMICs can make sustainable progress towards Universal Health Coverage (UHC), while enhancing the equity and efficiency of health systems. Our health services & implementation work examines how the effectiveness and safety, quality, and responsiveness of healthcare delivery can be optimized in resource-constrained settings, with a focus on paediatric and neonatal care in public hospitals. Lastly, the empirical ethics team seeks to understand how the ethics of research in LMICs could be enhanced and examine the responsibilities of research institutions in situations of increasing vulnerabilities, and inequities.

New Projects

We secured several major grants to advance our health systems work in 2023. These include:

- A Wellcome Discretionary award that aims to enhance the use of economic evidence in vaccine decision-making in Africa. This multi-country study will be implemented in Kenya, Zambia, and Nigeria.
- A grant by BMGF to examine primary healthcare financing reforms in Kenya. This project is timely and relevant in Kenya given the governments introduction of major PHC reform and will seek to generate evidence to inform the refinement and implementation of these government reforms.
- An award for the Global Health Bioethics Network (GHBN) to support research ethics enquiry that addresses contextually relevant questions, build capacities on ethics and engagement.
- A Wellcome Community Engagement Award to support a realist review of participatory engagement.
- An NIHR award for the Novel Extreme Weather Risk Insurance System for Kenya (NEWRISK) Project. This project is focused on climate change, and will examine vulnerabilities, adaptation, and resilience of the Kenyan health system to extreme weather events.
- A Wellcome Career Development award to Dr. Edna Mutua focused on examining AMR governance structures at national and subnational levels in Kenya and a comparative site in Vietnam.

ENGAGEMENT

ENGAGEMENT

Engagement at the Programme aims to: a) Build, sustain, and deepen respectful relations and mutual learning; b) Support responsive, mutually beneficial, and ethical research; c) contribute to regional and global engagement policy and practice; and d) strengthen translation of research findings into policy and practice.

To achieve these goals, a range of engagement activities are conducted by researchers and engagement staff. Engagement activities are broadly divided into 'programme-wide' and 'study specific' activities, all of which span engagement with local communities and stakeholders (community engagement), with the media, schools, universities, and the public (public engagement) and with policy makers.and with policy makers.

Key 2023 Highlights

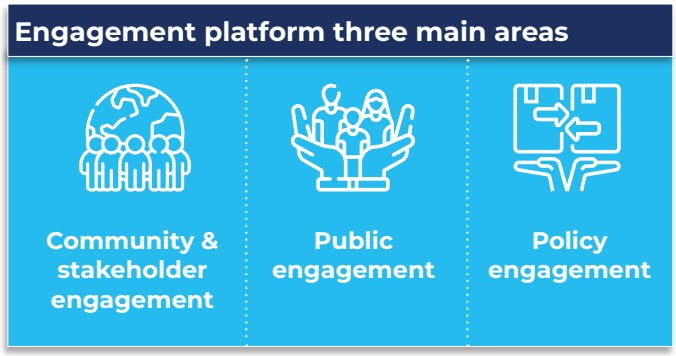
Community and Stakeholder Engagement

i. The KEMRI Community Representatives (KCRs) Network engagement

This is a hybrid community advisory board (CAB) of typical community members directly elected by their communities every 3-4 years from the Kilifi Health and Demographic Surveillance System (KHDSS) area to interact with KWTRP and represent their views. In 2023 KCRs were involved in two scheduled meetings held at the start and at the end of the year. A total of 140 KCRs and 41 Chiefs attended the first meeting. Discussions during the first meeting revolved around updates on the COVID-19 pandemic and its vaccines (safety and efficacy). The end of year meetings had a total of 188 KCRs and 48 Chiefs. During these meetings, KCR reflected on achievements and challenges of the year. They also heard updates from Sickle Cell, Neurodevelopmental disorders, and Malaria studies. We conducted two Malaria Blood Stage Human Infection study consultative sessions within the end year meetings, with two groups of KCRs (36 KCRs from Ngerenya, Kijipwa and Kidutani; 37 KCRs from Junju, Kauma and Matsangoni locations).

ii. Study engagement support

In 2023, new and ongoing research projects received



engagement support. This includes support to research teams to plan and implement engagement activities for their studies through reviewing engagement plans in research protocols, reviewing communication study materials including information and consent sheets, and training of research staff in Communications, Consenting. Some of these studies include: Improving Hypertension Control in Rural Sub-Saharan Africa (IHCoR), Enhancing growth and development among malnourished infants recovering from a serious illness (IBAMI2), Beyond Survival Study, and the Maternal RSV Study. An average of 100 frontline workers in these studies, based in Kilifi, Nairobi and Kwale were trained on communication and consent processes

Public Engagement

i. Schools and Universities Engagement

Our schools and universities engagement work aims at building an interest in science and science careers among young people in Kenya. Primary and secondary school students are engaged by KWTRP scientist in Kilifi, through virtual and in-person events. An online *I am A Scientist get me out of here* event enables students to engage virtually with our scientists. The table below gives an overview of 2023 achievements.

Activity	Achievement
Engaging education stakeholders	· We conducted engagement meetings with the office of the County Director of Education, teachers, and quality assurance officers to get input into 2023 planned activities. · We held an engagement meeting with the Permanent Secretary in the Ministry of Education, which led to the KWTRP school engagement getting recognition and approval from the national level stakeholders to continue carrying out school engagement activities.
Engaging primary and secondary school students (ages 10 to 19 years)	· Over 1,400 primary and secondary students from schools around Kilifi County were engaged by scientist through various activities which included: 5 Career talk sessions given by school leavers attachment students, 1 science symposium event, 3 Young Persons Advisory Group sessions, I am *A Scientist get-me-out-of-Here* online competition, and 1 science and engineering competition.
School Leavers Attachment Scheme (SLAS)	· 9 brilliant high school leavers participated in a 3-months attachment at KWTRP Kilifi Campus. They spent time rotating in both scientific and operations departments, learning about science careers.

Table 1: Schools engagement 2023 highlights

ii. Radio and media engagement

KWTRP researchers are supported to engage journalists and the broader public through a health and research radio programme named '*Jukwaa la Utafiti*' (a platform for research). Other engagement approaches include media workshops and engagement meetings with a Media Advisory Group (MAG) that plays an important role in advising scientists on how to tell human-stories from their research findings. Key achievements in 2023 included successfully running 55 radio shows in 6 radio stations (1 local-Kilifi; 3 regional-Coastal; 1 national Swahili; and 1 national English). About 33 scientists drawn from KWTRP, and 11 County Department of Health officials participated in live studio discussions. Worth noting are activities of the MAG in which we partnered to plan and implement a Genomics Public and Policy engagement project on developing an animation video to explain genome sequencing and its importance

Policy Engagement

We are intentional about ensuring that the evidence we generate informs policy and practice. Our policy engagement combinate several strategies that include a) research co-production with policy makers and practitioners b) policy dialogues c) knowledge translation through policy briefs, and c) researcher embeddedness in various policy making spaces. In 2023, we produced 13 policy briefs that were disseminated to various local (County) and national level stakeholders. KWTRP researchers also engaged with local, regional, and global policy makers through policy dialogues and research co-development workshops. KWTRP researchers also participated in policy capacity development sessions held in Kilifi and Ethiopia. Aside from being participants, we also had role in facilitating a session in these trainings on how to engage policy makers on genome sequencing data.

New Funding

$ 9900

Amount in grant from SANTHE to pilot a mobile laboratory project

The school engagement team won a USD 9900 grant from SANTHE to pilot a mobile laboratory project aimed at taking the lab to secondary schools around the KHDSS. The project is a collaboration between KWTRP and AHRI.

CAPACITY DEVELOPMENT

Initiative to Develop African Research leaders.

Our research capacity development initiative - the Initiative to Develop African Research Leaders (IDeAL) aims to develop sustainable health research capacity by establishing a critical mass of local research leaders across all domains, including laboratory sciences, epidemiology, clinical research, social sciences, health systems, and implementation research. The Initiative employs a comprehensive framework for attracting recent graduates to health research through graduate research, internship schemes, offering high-quality Masters and PhD training, and retaining those trained in Kenya, the region, or research relevant to Africa. IDeAL ensures quality through financial support, operational assistance, a vibrant training environment, technical and leadership development, and post-training support. This framework is underpinned by core values that include diversity, inclusivity, equity, and long-term horizon. IDeAL aims to empower young Africans to become influential health research leaders who can shape the continent's research priorities and provide sustainable solutions to the health-related issues that hinder economic and social progress in Africa.

Capacity development at the Programme is supported by multiple awards from the Developing Africa's future generation of leaders (DELTAS Africa) initiative, and PI led research project funds. The department also partners with non-financial institutions for joint supervision and support of students. These include Jomo Kenyatta University of Agriculture and Technology (JKUAT), Egerton, University of Nairobi, Kenyatta University, Pwani, and Strathmore University.

New Projects

In 2023, our DELTAS capacity development award – the Initiative to Develop African Research Leaders (IDEAL 2.0) was renewed for another 4 years. IDeAL 2.0, which is funded till 2027 to the tune of **USD 4.4 million** through **The Science for Africa Foundation,** seeks to expand the Initiative's activities beyond East Africa through a formal partnership with the Centre for Infectious Diseases Research in Zambia (CIDRZ), Epicentre in Niger, University of Glasgow, and Oxford in the UK and, Strathmore and Pwani universities in Kenya.

The Programme is also a consortium partner in two DELTAS funded training programmes: the Sub-Saharan Africa Advanced Consortium for Biostatistics (SSACAB), and the Sub-Saharan African Network for TB/HIV Research Excellence (SANTHE).

Student category	Male	Female	Total
Postdoctoral fellows	1	2	3
Career development year fellows	1	7	8
PhD students	22	45	67
Masters students	23	15	38
Post graduate diploma students	8	11	19
Interns	0	3	3
Undergraduate attachments	3	2	5
School leavers attachment	4	5	9
Total	**62**	**90**	**152**

A table with new and continuing students in 2023

The training department also collaborated with several PI led project to mobilize funding for capacity development. These include the NIHR funded project on Vaccines for Vulnerable People in Africa (Vanguard), and the NIH funded project on Improving Hypertension Control in Rural Africa grant (IHCoR Africa).

Graduating, New and Continuing Students

A highlight of 2023 is the graduation of 51 students (25 Female, 26 Male) across the various schemes supported by our capacity development initiative. These included 3 Postdoctoral graduates, 20 PhD graduates, 14 Masters Students, 5 graduate students, 9 SLAS students.

In 2023 we recruited 52 students across various training schemes. These included 8 career development year fellows (CDY) 9 PhD students, 16 masters students, 19 postgraduate diploma students. This added up to a total cohort of 152 students (Male: 62, Female 90) as at 2023. Studentships were supported by a range of funding sources including IDeAL 2, PI project grants, and third-party institutions supporting visiting studentships. Of the 152 studentships, 42 were supported by IDeAL, 89 by PI project grants, while 21 were visiting studentships.

Vaccines Work force development

In the last year we have developed a capacity building program aimed at developing a sustainable African human resource capacity with the necessary skills and experience in designing, making, producing, and evaluating vaccines in the continent. This with the aim of creating a multi-disciplinary, multi-sectoral ecosystem to strengthens the vaccine ecosystem. We have achieved this through 1) 4 webinars in vaccinology aimed at early career researchers, to provide basic concepts in various topics of the vaccine's ecosystem and guide participants to potential career options and 2) through an apprenticeship scheme for talented African scientists and placed them at vaccine manufacturing entities globally to acquire skills in biomanufacturing activities. In 2023, we recruited 18 African apprentices (of whom 9 were female) who were placed at the International Vaccine Institute and SK Bioscience in South Korea and 6 African apprentices who will spend 12 months at the Hilleman Laboratories in Singapore.

4

Webinars in vaccinology held aimed at early career researchers, to provide basic concepts in various topics of the vaccine's ecosystem

18

African apprentices (of whom 9 were female) who were placed at the International Vaccine Institute and SK Bioscience in South Korea

6

African apprentices recruited and will spend 12 months at the Hilleman Laboratories in Singapore gaining knowledge in Vaccines

Health Economics capacity development

The health economics team made significant contributions to health economics capacity development in the African continent in 2023. A highlight was the establishment of the Africa Health Economics Study Group (AFHESG), a platform aimed at delivering peer learning sessions to young health economists across the African continent. AFHESG run 6 monthly hybrid health economics building sessions reaching a total of 1518 participants (57% male, 43% female), across 41 countries (28 in Africa, 6 in Europe, 5 in Asia, Australia, and the USA). Another initiative that HERU founded, and coordinates are the Africa Health Technology Assessment (AfroHTA) network, which aims to enhance the use of evidence-informed healthcare priority-setting processes in Africa. AfroHTA implemented 2 HTA training courses, one in Uganda reaching 56 policy makers and academics, and a second one alongside the International Health Economics Association conference in Cape Town South Africa, reaching 110 participants.

1518

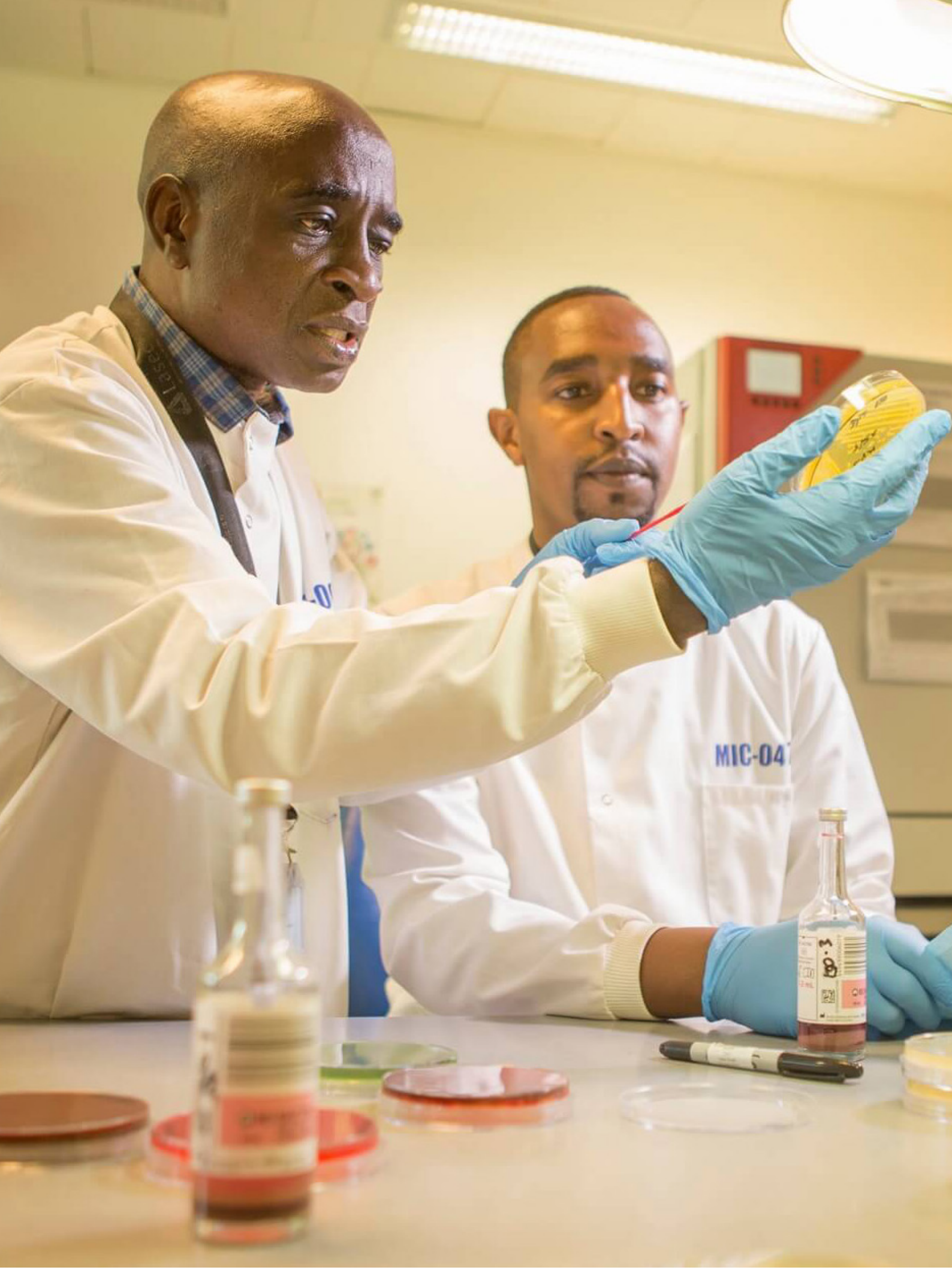
Number of participants trained through the AFHESG initiative

41

Number of countries (28 in Africa, 6 in Europe, 5 in Asia, Australia, and the USA where the participants were drawn from.

2

Number of HTA training courses, one in Uganda reaching 56 policy makers and academics, and a second one alongside the International Health Economics Association conference in Cape Town South Africa, reaching 110 participants.

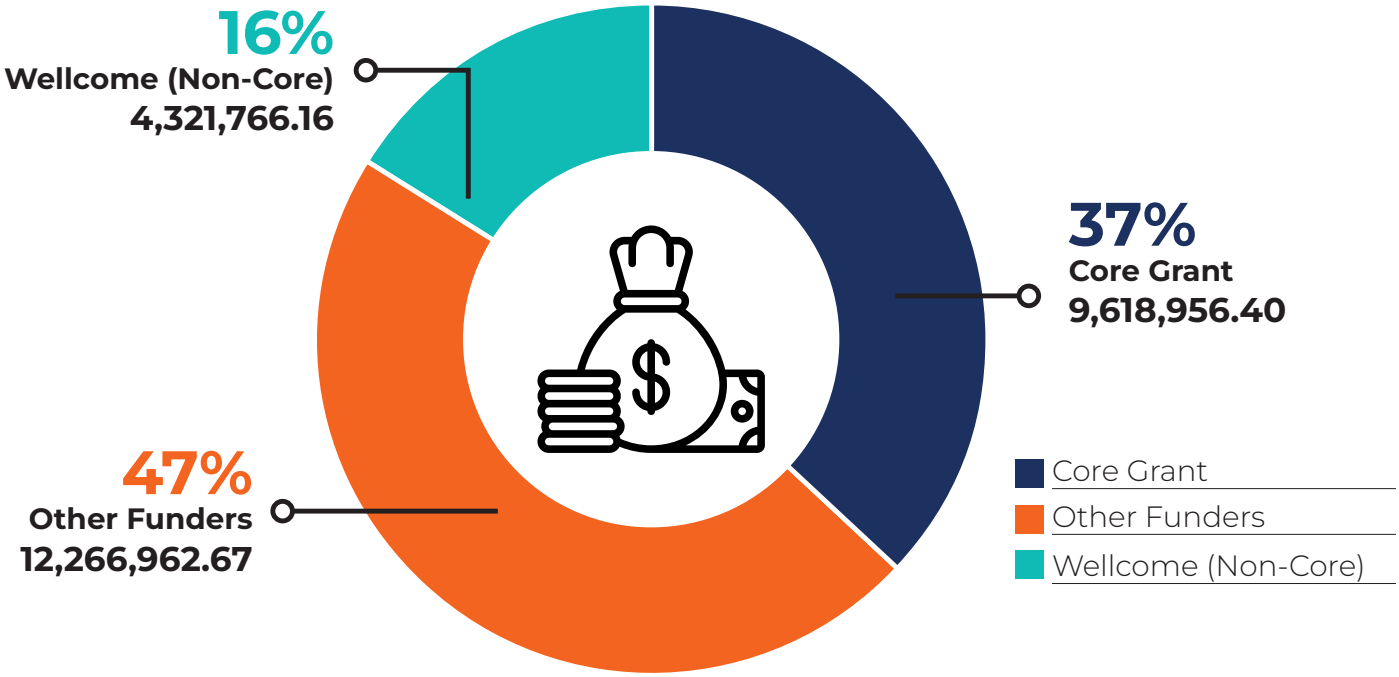

MIC-04

STRATEGIC FINANCE SUMMARY

The Programme was funded through a Wellcome Core grant that supports core operational and scientific platforms, Wellcome research grants awarded to individual PIs, and grants from other (non-Wellcome) funders awarded to individual PIs. In 2023, income from the Wellcome Core grant contributed 37% of the total Programme income, with income from research grants from both Wellcome and other 3rd party funders contributing 63% of total annual income.

Major non-Wellcome funders of programme research includes the Bill and Mellinda Gates Foundation (BMGF), the National Institute of Health Research (NIHR), and the Medical Research Council (MRC).

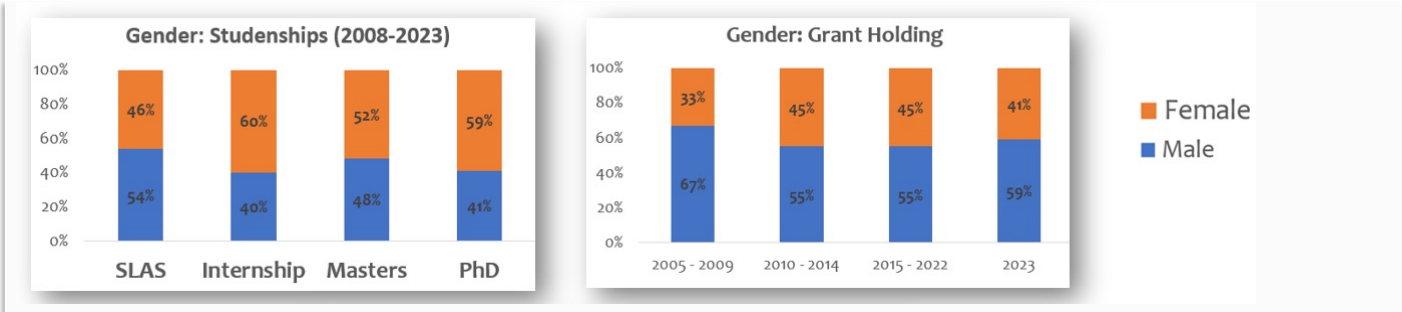
Figure below displays the contribution of different funding sources to total Programme expenditure in GBP.



Annual expenditure by source in GBP.

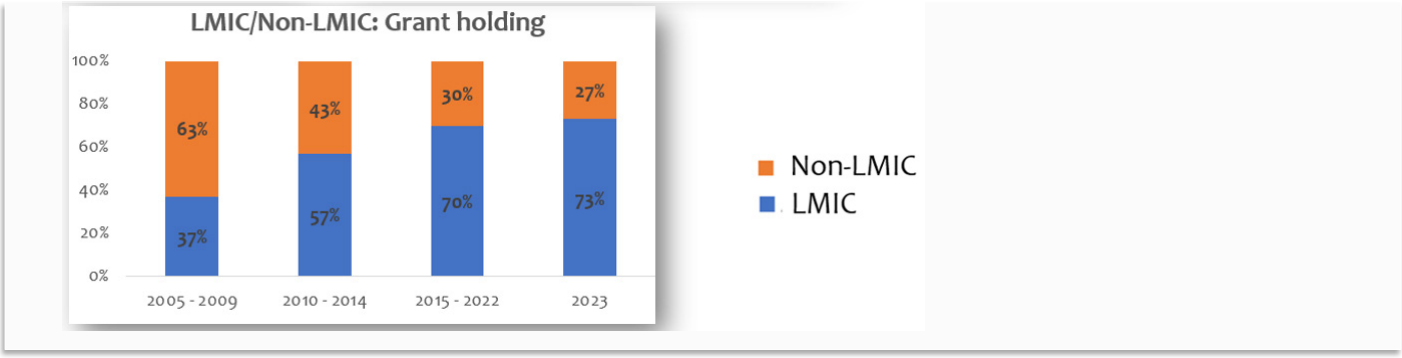
ENABLING ENVIRONMENT

We are intentional about ensuring that we nurture an enabling research environment that supports diversity, equity, and inclusion, as well as promotes staff wellbeing. This includes ensuring diversity in the stakeholder groups we engage. Internally we support **equity, diversity, and inclusion** by ensuring that our staff (scientific and non-scientific) and students reflect diversity in gender and ethnicity. To achieve this, we have established transparent practices that remove barriers to entry for specific groups. In our stakeholder engagement, we intentionally seek to ensure diversity by include the voices of marginalised populations in science.



Gender balance in studentships and grant holding.

We also track grant holding by local researchers, as part of our intention to develop local research capacity and to transition research leadership to the African continent. The figure below shows trends in grant holding by LMIC researchers at the Programme. We have seen a substantial growth in the share of research grants by LMIC researchers over the years.




I. OYARO IAVI

VOICES IN RESEARCH

Our engagement with KWTRP has provided opportunity for us to network with different stakeholders in non communicable diseases identifying gaps, for example the harmonisation of guidelines for care and management of Epilepsy not just clinically but also psychosocial management.

Fredrick Beuchi, National Secretary, Epilepsy coordinating committee

Our priority as KPA is to ensure optimal and quality care for children, to ensure this we have worked together with the KWTRP to harmonise our priorities for research including capacity building of our members, clinical and implementation research.

Dr Dorcas Supa Tunje, Chairperson, Kenya Paediatric Association

Engaging differently-abled young people in research activities provides an external source of motivation and contributes to fostering inclusivity within the research community. This involvement ensures that research efforts are guided by the perspectives and insights of those directly affected, adhering to the principle of "nothing about us without us.

Mr. Kwarula, Pwani School for the Deaf

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.

Making a difference in Policy and Practice

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.

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.

Making a difference in Policy and Practice

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.

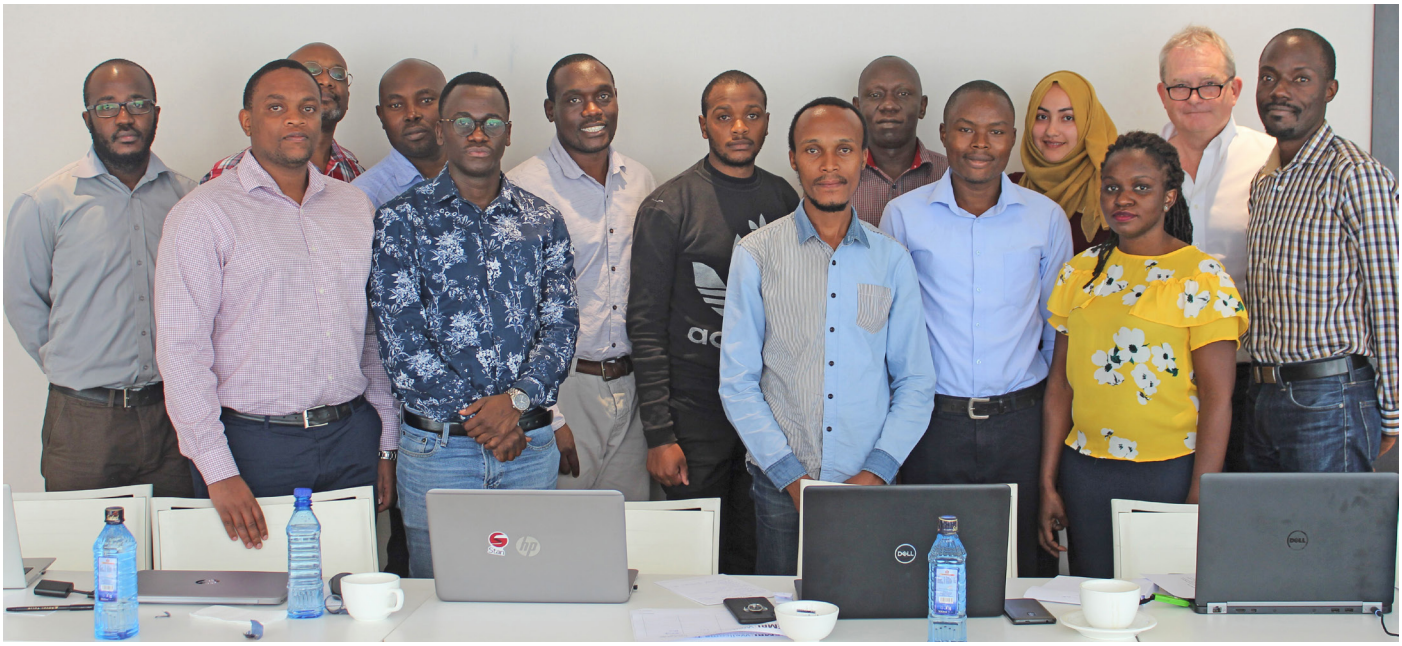
THANK YOU TO OUR PARTNERS

Thank you to all our partners, funders and collaborators who made all this possible.

OUR PARTNERS

Funders

Partners



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