

Success Stories of Africa-Europe Research Collaboration in Personalised Medicine

KEMRI | Wellcome Trust

KEMRI Wellcome Trust Research Programme



EU-Africa PerMed has been funded by the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement Number 964333.



Table of contents

Executive summary.....	3
Overview of the Programme	3
Background	3
Objectives	4
Duration	4
Funding	4
Participating Partners	5
Other Partners	5
Beginning of the collaboration	6
Funding of the Kenya Wellcome Trust Research Programme	7
Current organization of the team and key personnel.....	7
Innovative approach	7
Main Challenges of the Collaboration	7
Key milestones so far	8
Impact of KEMRI Wellcome Trust Research Programme	9
Future steps and sustainability of the collaboration	10
Acknowledgements	11
References	11

Executive summary

The KEMRI Wellcome Trust Research Programme (KWTRP) is a world-renowned health research unit of excellence based within the Kenya Medical Research Institute (KEMRI) Centre for Geographic Medical Research in Kenya. It is a partnership which began in 1989 between KEMRI, Wellcome Trust and the University of Oxford. Other partners include Kilifi County government, Nairobi County Government, Ministry of Health, Kenya and Mbale Regional Referral Hospital, Uganda. Its initial focus was on malaria, a major cause of child mortality where over 15 years, Kilifi saw a 90% drop in malaria cases, and KWTRP now supports malaria control programs in 14 countries.

Over the years, the research areas of interest have evolved, which has seen identification of Genomics and Infectious Disease Transmissions research theme added in the Programme. This aims to use genomic tools to enhance understanding of how infectious diseases spread, and informing outbreak control measures. Additionally, it seeks to provide real-time insights into the evolution of resistance to both host immunity and drug treatments.

Key challenges include low funding support from the Kenyan government, and initially, unsynchronized staff remuneration based on the employer, which led to development of institutional reforms with internationally competitive salaries aimed at attracting top notch scientists from collaborating partners.

For sustainability, it is important to expand the partnership beyond the initial three, as the needs of the programme continue to grow, both financial and research requirements. It is also critical to strengthen research capacity development and support the platforms for long term surveillance data sets collection and extensive sample collection, which strengthens the outputs born out of these health surveillance platforms.

Overview of the Programme

Background

The KEMRI Wellcome Trust Research Programme (KWTRP) is a world-renowned health research unit of excellence based within the KEMRI Centre for Geographic Medical Research. The programme was formed in 1989 when KEMRI formed a partnership with the Wellcome Trust and the University of Oxford. The Programme has grown from a small group of 12 to a state-of-the-art facility hosting over 850 employees, that work across three main hubs located in Kenya (Nairobi and Kilifi) and a satellite site Uganda (Mbale). The main center is located in Kilifi County, adjacent to Kilifi hospital connecting basic research with local clinical applications and utilises the Kilifi Health and Demographic Surveillance System of about 290,000 residents to carry out clinical phenotyping and molecular biology (Strategic Plan 2016-2023). The Nairobi hub mainly coordinates the health systems research which includes a network of hospitals involved in clinical trials, as well as undertaking national and international epidemiological studies. It maintains strong ties with the Ministry of Health to translate research findings into health policy, in collaboration with other KEMRI centers and local health ministries. Additionally, a Ugandan unit was established in 2008 in Mbale, within the Mbale Regional Referral Hospital, that coordinates multicenter clinical trials. The KWTRP also has research collaborations globally. The programme has over the years excelled in use

of novel ideas working with local communities to achieve better health for Africa while also developing African scientific leaders.

The current major research themes in the Programme are clinical research, population health, health systems, genomics and infectious disease transmissions, vaccines and Covid 19. The scientific themes bring together researchers with different expertise and disciplines to work on high priority areas, strengthen dissemination and uptake of research outputs in to policy and practice.

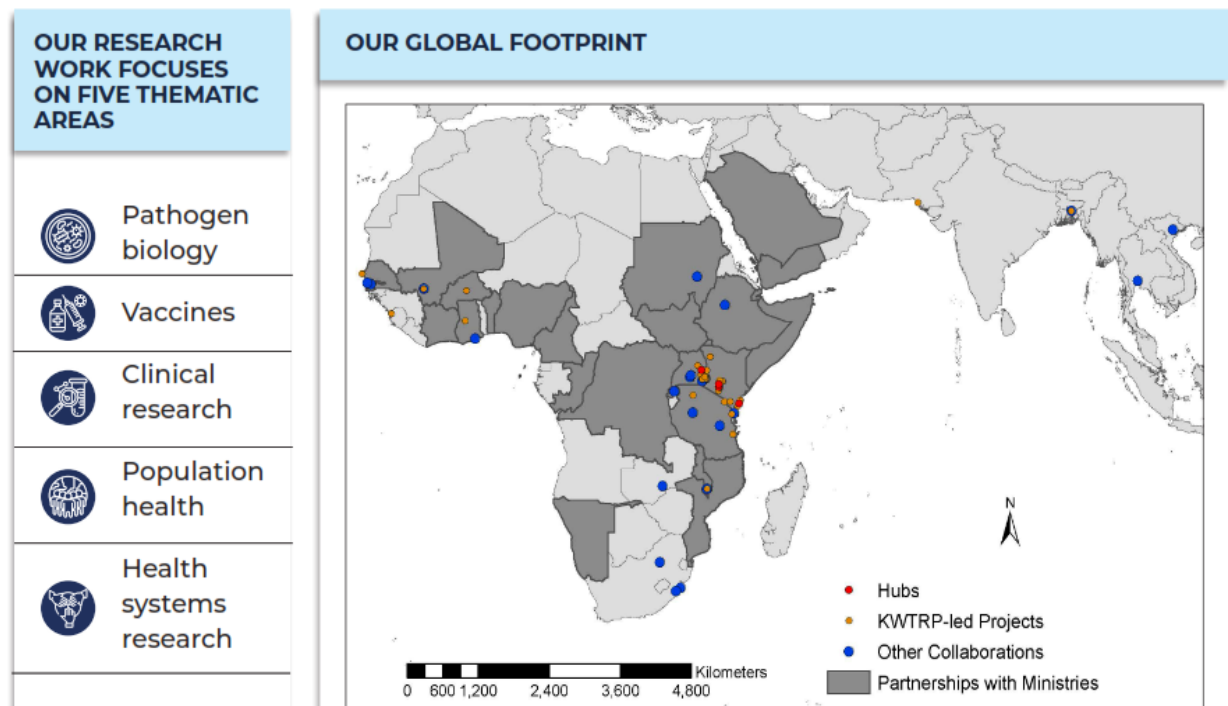


Figure 1. KWTRP Global Footprint (Source: KWTRP 2023 Annual Report).

Objectives

- To conduct research to the highest international scientific and ethical standards on the major causes of morbidity and mortality in the region and to provide the evidence base to improve health.
- To train an internationally competitive cadre of Kenyan and African research leaders to ensure the long-term development of health research in Africa







Duration

1989 – open ended



Funding

The Wellcome Trust has been the primary funding source, providing support for foundational research platform that leverages additional resources to support individual research projects.

Participating Partners

Institution	Country	Contribution
 Wellcome Trust	 United Kingdom	<p>The Wellcome Trust was established in 1936 through an endowment left by Henry Wellcome, a philanthropist from United Kingdom. It is an independent charity dedicated to funding research to improve human and animal health.</p>
 Kenya Medical Research Institute	 Kenya	<p>The Kenya Medical Research Institute was established through the Science and Technology (Amendment) Act of 1979, which was later amended to Science, Technology and Innovation Act, 2013, with a mandate to carry out health science research in Kenya. The Centre for Geographic Medicine Research, which houses the KWTRP is among the 12 KEMRI centers. KEMRI provides the legal framework for the KWTRP operations.</p>
 University of Oxford	 United Kingdom	<p>The University of Oxford is globally recognized for its high-quality and diverse research, with over 3,000 academic staff and 3,000 postgraduate students engaged in research activities. It is a center of excellence with interdisciplinary research centers and partnerships with international academic and industrial collaborators. The University has a critical mass of supported researchers both local and international, who work within the KWTRP. This collaboration has also resulted into a well-defined research capacity building platform for researchers in Africa. The Oxford University provides operational support for the partnership.</p>

Other Partners

Institution	Country	Contribution
 The County Government of Kilifi	 Kenya	<p>The Department of Health in the County provides overall leadership in health service delivery and facilitates a cordial co-existence with KWTRP. Medical staff from the county and periphery health facilities participates in research activities, including clinical research. The KWTRP is located next to Kilifi County Hospital, and the two have been working very closely. Through KWTRP support, the paediatric wing of the hospital received a facelift, and continues to support the wing in different activities. The KWTRP participates in hospital activities as it has membership in different health committees of the hospital.</p>



Kenya

The Nairobi Programme has close working relations with the Nairobi City County health department working closely with the various health institutions under its mandate to facilitate research work. Focus is mainly on policy and improvement of health care systems. This has over time been extended to include research in key populations in the city.



Kenya

Ministry of Health

In Nairobi, the Programme has forged strong links with the Ministry of Health, with several of the Programme researchers acting as technical advisers to the Kenyan Government departments and playing a major part in the development of national strategies.



Uganda

**Mbale Regional
Referral Hospital**

There are Clinical trials focused on in-patient hospital care particularly at Soroti and Mbale Regional Referral Hospitals where the Mbale Clinical Research Unit is located. Mbale Regional Referral Hospital.

Beginning of the collaboration

The Wellcome Trust was amongst the first collaborators that partnered with the Government of Kenya in 1964, immediately after gaining independence, thus creating the Wellcome Trust Research Laboratories which were located near Kenyatta National Hospital in Nairobi. In the 1980s, a few Wellcome Trust funded scientists including Stephen Oppenheimer and Bill Watkins began working in Kilifi District Hospital in collaboration with KEMRI. A weekend trip to Kilifi on the Kenyan coast by clinician and parasitologist Kevin Marsh together with Bill Watkins led to a decision to establish a bedrock for malaria research in the region (McCall, 2014). In 1989, the KWTRP was formed, led by Kevin Marsh and Norbert Peshu. Due to the continued growth of research activities in Kilifi, in 1995 KEMRI granted the Kilifi Station a full Centre status and named it the “KEMRI Centre for Geographic Medicine Research – Coast (KEMRI CGMRC).

The initial focus of the KWTRP was on malaria, a major cause of child mortality. Researchers collaborated with the Ministry of Health to study insecticide-treated bed nets, antimalarial drugs for pregnant women, and severe malaria cases. Over 15 years, Kilifi saw a 90% drop in malaria cases, and KWTRP now supports malaria control programs in 14 countries using statistical models for risk mapping. Through KWTRP support, Kilifi Hospital has established a High Dependency Paediatric Unit for severely ill children, where early studies on severe malaria were conducted. Research has since evolved to include advanced lab work and clinical trials on treatments for severe cases. Recognizing that malaria is part of a broader health crisis, KWTRP expanded its focus to include pneumonia, meningitis, HIV, and malnutrition, along with community health perspectives. The programmes research platforms include state-of-the-art laboratories, a demographic surveillance system covering a 290,000 residents, partnership with Kilifi County Hospital in health care and hospital surveillance, a clinical trials facility, a vibrant community engagement programme and a dedicated training facility.

Funding of the Kenya Wellcome Trust Research Programme

The programme’s strategy is to use Wellcome Trust core funding to provide the basic research platform, but source for funding for research projects. The table below shows different funders by financial year.

Funder	2015-16 (£'000)	2016-17 (£'000)	2017-18 (£'000)	2018-19 (£'000)	2019-20 (£'000)
Wellcome	6,747	3,647	3,684	4,109	11,652
EDCTP		1,454	4,892	696	382
MRC	307	1,109	3,360	782	1,266
IAVI	929	860	1,037	784	2,554
U Oxford	500	500	675	550	681
DFiD/FCDO	690	316			2,040
Broad		269	432		
DNDi		114		135	
BMGF	8,397	86	2,390	1,770	9,965
UK DoH			98		
GAVI	1,961		1,985		
NIHR			1,434		
LimmaTech				987	
WHO				451	
Others	2,174	178	269	618	855
Total	21,704	8,533	20,256	10,881	29,394

Table 1. Awards Given by Financial Year (Source: Strategic Plan of 2016-2023; Link: <https://kemri-wellcome.org/wp-content/uploads/2022/07/Strategic-plan-2016-23-Final.pdf>).

Current organization of the team and key personnel

The KWTRP is headed by an Executive Director, who is based in Kilifi, but who works closely with Chief Operating Officers, supported by four scientific departments. The scientific departments are Biosciences, Epidemiology/Demography, clinical research and health systems/research ethics. The Nairobi hub is led by a Director, who together with the four heads of scientific departments determine and oversee the scientific strategy (Strategic Plan - 2016-2023).

Innovative approach

The KWTRP has consistently proven its relevance by addressing evolving community health research needs. Originally focused on malaria research, the program has expanded to tackle emerging challenges, such as pathogen genomics, as evidenced by its response to the COVID-19 pandemic. This adaptability is facilitated by flexible program structures and supportive partnerships that align closely with local, regional, and global health priorities. A robust capacity-building program, which fosters long-term career development, has been instrumental in mitigating the impact of brain drain and ensuring a sustainable pipeline of skilled researchers.

Main Challenges of the Collaboration

- There is asymmetrical research funding support at KWTRP, with the government of Kenya providing comparatively low funding for the high-level research activities being carried out by the programme. This in turn means that research activities may not always focus on the country's own needs, as much of the funding comes from foreign sources. This could lead to priorities being shaped by external interests rather than

domestic concerns. Even though the KWTRP has over the years built human and infrastructural capacity for genomic and related studies, government funding is important as emerging technologies have been identified as a local priority.

- Initially, the scientists that worked in the programme received different remuneration packages based on the employer. While Oxford University scientists were competitively paid by KWTRP, KEMRI's scientists' remuneration was managed using government of Kenyan salary schemes which were comparatively lower. This created a perception among Kenyan scientists that the programme was an outpost of Oxford University. This perception on labour malpractices in favour of expatriates led to litigations, which prompted institutional reforms aimed at ensuring that the KWTRP attracts and retains top notch scientists, both from KEMRI and Oxford University. The institution acted by shifting leadership from expatriate based to Kenyan based leadership including institutionalization of capacity building programme for scientists which started in 2008. Additionally, the program advocates for competitive salaries to attract and retain top talent from both domestic and international institutions.

Key milestones so far

The vision of the Genomics and infectious disease transmissions research theme in the Programme, is to utilize genomic tools to detail the transmission of infectious diseases to guide outbreak control policies and offer real-time insights into the evolution of resistance against host immunity and drug pressure.

- The Programme is well-positioned to provide insights due to over 25 years of continuous sampling with detailed clinical and spatial data, access to geographically diverse samples through international partners, bioinformatics and sequencing technology available in Kilifi, and established collaborations with the Wellcome Trust Sanger Institute (England) for high-throughput sequencing.
- KWTRP has been instrumental in phase I – IV clinical trials that led to the development of the RTS,S malaria vaccine¹, and the subsequent integration in the essential immunisation programme in malaria endemic regions of the country.
- The KWTRP has also been instrumental in carrying out high impact research that led to adoption of government policy on use of insecticide treated bed nets. Large, controlled community trial of insecticide-treated nets in Kilifi, led by KWTRP demonstrated a 44% reduction in the incidence of severe malaria presenting to hospitals and a 33% reduction in all-cause mortality among children ages 1–59 months (Kamau et al., 2022). Findings from impact of large-scale distribution of insecticide treated mosquito nets under programme conditions, among other studies further led to WHO global guidance for the use of insecticide-treated mosquito nets to protect people from malaria. In 2009, Professor Abdisalan Mohamed Noor of KWTRP was awarded the African Union National Scientific Award in Life and Earth Sciences in recognition of his high impact research work in malaria.

¹ On October 6, 2021, the World Health Organization (WHO) recommended RTS,S/AS01, the world's first malaria vaccine, for use in children at risk of malaria caused by *Plasmodium falciparum*. The WHO recommendation was informed by available evidence on RTS,S, including findings from a pilot implementation of the vaccine through routine childhood immunization in areas of Ghana, Kenya, and Malawi. <https://www.malariavaccine.org/existing-vaccines/rtss>

- KWTRP played a key role in pathogen surveillance especially at the onset of COVID 19 pandemic in Kenya. The programme already had human and infrastructural capacity to support the government pathogen genomic surveillance and testing. Since the confirmation of the first COVID-19 case in Kenya on 13th March 2020, KWTRP was mandated by the Kenyan government to support the COVID-19 testing for all the six coastal counties.
- The KWTRP continues to be instrumental in research activities on viral outbreaks including dengue, measles, norovirus, influenza, SARS-CoV-2 and currently M-pox. The RaViG project for example, launched at KWTRP and led by Dr. George Githinji is aimed at assessing whether implementation of real-time, in-field genomics to support investigation and management of suspected viral outbreaks in coastal Kenya is feasible and provides added value to the conventional response, to support public health surveillance and enhance outbreak response. The RaViG project assessments will involve coordinating with Kenyan Coastal counties rapid response teams, to work out the logistics of deploying portable sequencing alongside conventional responses. The teams will then deploy portable sequencing during outbreaks of suspected or confirmed viral origin. This will also include stakeholder engagement to inform the development of processes for evaluating portable sequencing. The project team will use a mixed methods approach to compare the sequencing for two selected outbreaks with the conventional outbreak responses to evaluate the added value from the portable sequencing. The project is a collaboration between the KWTRP in Kilifi, Kenya, the UK Public Health Rapid Support Team (UK-PHRST), the Kenya Ministry of Health (MoH) and public health officials of six coastal counties. The work has been funded by UK Government Department of Health & Social Care (DHSC) Official Development Assistance via UK-PHRST research funds. The UK-PHRST is funded by UK Aid from the Department of Health and Social Care and is jointly run by UK Health Security Agency and the London School of Hygiene & Tropical Medicine.
- The Kilifi Health and Demographic Surveillance System (KHDSS), nested in the KWTRP and which was established in 2000 to capture majority of patients who attend the Kilifi hospital is a key resource for genomics research. The KHDSS has approximately 290,000 residents, with about 4400 paediatric and 3400 adult admissions (Scott et al., 2012). Morbidity events are captured in real time in the population register. The KHDSS data has been used to study childhood infectious diseases, association with genetic risk factors such as thalassemia and sickle cell disease and defining community prevalence of chronic diseases, including establishing operational effectiveness of identified public health interventions. The KHDSS is an important platform for studies related to personalized medicine at KWTRP.

Impact of KEMRI Wellcome Trust Research Programme

- What initially started as a programme for malaria research has grown to tackle a broad range of child and adult health issues, expanding to cover a wide range of thematic research areas. Already the programme has achieved immense contribution towards health policy and medical practice. In particular, the local malaria prevalence has reduced by 90%, with translation of research findings prompting wide scale acceptance and use of insecticide treated bednets effectively reducing malaria incidence.

- The programme has also contributed to the strategy guiding intermittent anti-malarial treatment as a prophylactic measure during pregnancy.
- With the expansion of research themes to include genomic research, it is expected that the programme will use its well-founded research infrastructure as well as community and policy engagement structures to contribute to precision medicine regarding prevention, diagnostics and treatment of important diseases in the country. Already, there are studies aimed at discovery of host susceptibility factors to inform vaccine designs and public health interventions. Chip-based methods for screening several hundred full length antigens simultaneously have already been developed and assessments are being conducted in large multicentre immuno-epidemiological studies with partners in thirteen west and east African sites that is likely to provide the largest postgenomic integrated assessment of malaria vaccine candidates to date (Strategic Plan 2016-2023).
- From experiences gained during Covid 19 pandemic where the programme played immense contribution in informing initial public health response strategies in the country and contributing to the global science through sharing of over 500 SARS COV 2 genomes from Kenya (Strategic Plan, 2016-2023), KWTRP is expected to continue filling the science, research and response strategy gaps in cases of such emergencies as well as viral epidemics.

Future steps and sustainability of the collaboration

The KWTRP collaborating institutions draw mutual benefits from the programme. In-order to sustain the inherent benefits that result from the collaboration, it is important to ensure that all partners continue to mutually benefit from the partnership. Its also critically important to expand the partnerships beyond the initial three, as the needs for the programme continue to grow, both financial and the research questions that require the attention of the programme.

- By being in the programme, the Wellcome trust is fulfilling the mission of the founder, Henry Wellcome, of supporting human and veterinary health.
- Oxford University gain by having a global reach in their research outputs availing an opportunity to staff and faculty who may be interested in global health and in particular tropical medicine such as malaria, which increases the University's rating as a top university in the world.
- KWTRP started a strategy to build research capacity, and welcome trust supported these efforts with an initial grant of £8M, which was used for setting a framework for attracting and training young Kenyans in clinical research. The capacity building conceptual framework is anchored on "attract, train and retain" with a systematic approach of ensuring that individuals progress along the research career path, becoming technically proficient and equipped with ability to lead internationally competitive science, and act as mentors for next generation scientists. To date, the programme has trained over 1000 students with 135 graduating with PhDs in different fields.
- The KHDSS is an important platform for the programme and forms a foundation for collection of long-term surveillance data sets and extensive sample collection through space and time that will be helpful in population studies, particularly for studies related to genetic predisposition, environmental and lifestyle conditions. Integration

with e-platforms such as medical information systems such as KEMIS will strengthen the outputs that will be born out of these health surveillance platforms.

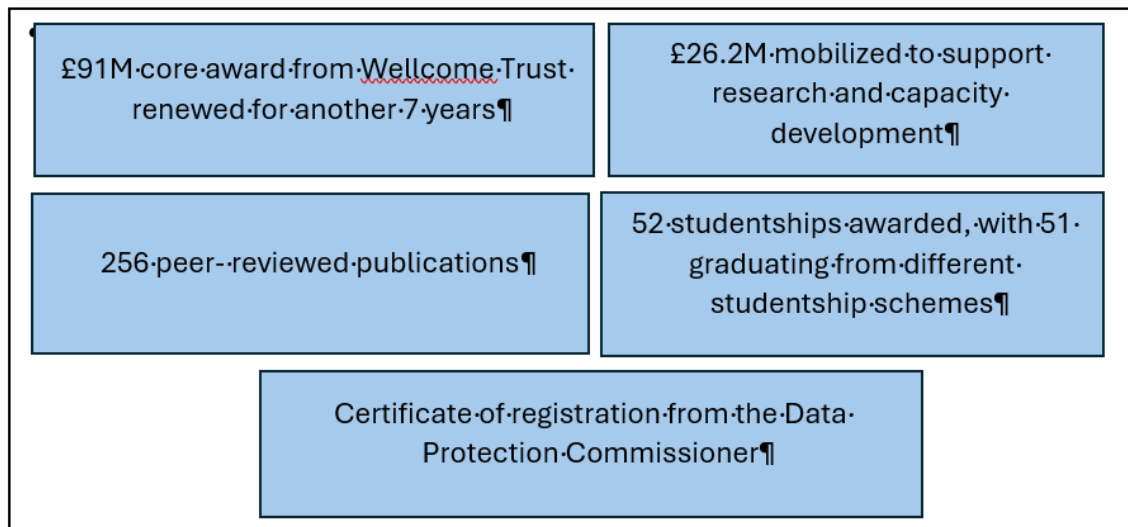


Figure 2. Key highlights for KWTRP in 2023 (Source: KWTRP 2023 Annual Report)

Acknowledgements

We acknowledge Prof. Samson Kinyanjui, the Head of Training and Capacity Building Programme at KWTRP for invaluable insights that have shaped the documentation of this success story.

References

- KEMRI Wellcome Trust website.
- <https://kemri-wellcome.org/kwtrp-2023-annual-report/> Accessed 29th October 2024
- Scott, J.A.G., Bauni, E., Moisi, J.C., Ojal, J., Gatakaa, H., Nyundo, C., Molyneux, C.S., Kombe, F., Tsofa, B., Marsh, K. and Peshu, N., 2012. Profile: the Kilifi health and demographic surveillance system (KHDSS). *International Journal of Epidemiology*, 41(3), pp.650-657.
- Kamau A, Musau M, Mtanje G, Mataza C, Bejon P, Snow RW. Long-lasting insecticide-treated net use and malaria infections on the Kenyan coast. *Trans R Soc Trop Med Hyg.* 2022 Oct 2;116(10):966-970. doi: 10.1093/trstmh/trac029. PMID: 35415749; PMCID: PMC9526839.
- Strategic Plan (2016-2023) *Link:* <https://kemri-wellcome.org/wp-content/uploads/2022/07/Strategic-plan-2016-23-Final.pdf>. Accessed 14th November 2024
- McCall, Becky. (2014). Profile: KEMRI-Wellcome Trust Programme celebrates 25