

Delegate Pack

MalariaGEN-PAMCA
Anopheles genomic surveillance training
2022-2023

About the partnership

MalariaGEN
GENOMIC EPIDEMIOLOGY NETWORK



MalariaGEN and the Pan-African Mosquito Control Association (PAMCA) are collaborating to establish a new programme of genomic research and data generation on African malaria vectors.

The partnership is supported by the Bill & Melinda Gates Foundation.

[Find out more](#)



Progress towards malaria elimination has stalled since 2015.

Part of the reason for this may be mosquitoes developing resistance to the insecticides being used in long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS).

Vector genomic surveillance could enable early detection of new insecticide resistance variants emerging in mosquito populations. This intelligence could be beneficial in designing and adapting insecticide resistance management plans.



Data come from multiple sources, and they can be messy, complex, and confusing.

This course — developed as a partnership between MalariaGEN and PAMCA — introduces participants to the basics of data analysis for genomic surveillance, with particular reference to African malaria vectors.



At the end of this course, participants will be able to:

- 1. Perform a range of analyses of Anopheles genomic data that are relevant to malaria vector surveillance.**
- 2. Generate plots, tables and statistics that can be used in a surveillance report.**
- 3. Interpret results and explain to others what they mean.**



Course Leads

Alistair Miles, Vector Surveillance Lead, Wellcome Sanger Institute, UK

“I’m currently the malaria vector product lead at the Wellcome Sanger Institute. My role involves the design and implementation of genomic surveillance systems to monitor and track changes in populations of the mosquitoes that transmit malaria in Africa.”



Paballo Chauke, Training Coordinator, MalariaGEN, Wellcome Sanger Institute, UK

“I’m the training coordinator for MalariaGEN at the Wellcome Sanger Institute. I help organise and coordinate training opportunities for members of our community/network in order to build capacity. I also help coordinate our bioinformatics fellowship programme. My background is in training and outreach coordination in Bioinformatics, Climate Change, and Genomic Medicine.”



Instructors/Teaching Assistants

Marilou Boddé, PhD Candidate, University of Cambridge/Wellcome Sanger Institute, UK

“I am interested in monitoring *Anopheles* populations, in particular their intra- and inter-species diversity. The Lawniczak group has developed a genus-wide targeted amplicon sequencing approach, which facilitates large scale population monitoring of major and minor vector species as well as non-vector species.”



Kelly Bennett, Senior Data Scientist, Wellcome Sanger Institute, UK

“I am an evolutionary biologist interested in disease vectors and how their genomic variation is distributed across space and time. After completing my PhD at the University of Manchester, I worked as a Postdoctoral Fellow at the Smithsonian Tropical Research Institute. My research focused on the biology and evolution of *Aedes* mosquitoes. Since joining the Wellcome Sanger Institute, I have been working to accelerate the genomic surveillance of *Anopheles* mosquitoes for disease control.”



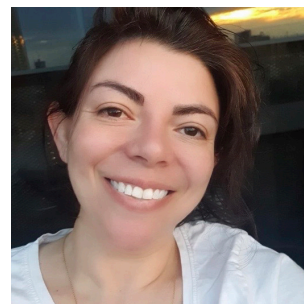
Jon Brenas, Post-doctoral Fellow, Wellcome Sanger Institute, UK

“My research is centered around population structure and activation/migration of Anopheles mosquitoes. I completed a double-masters in applied mathematics and computer engineering and my PhD dealt with logics and graphs. I spend my free time reading and, more recently, practicing taekwon-do.”



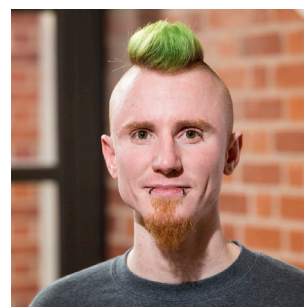
Louise Cerdeira, Post-doctoral Research Associate, Liverpool School of Tropical Medicine, UK

“I have a background in Computer science and developing tools for genomic surveillance. I work as a Bioinformatician in Martin’s Donnelly group, performing resistance screening, genomic populations and GWAS analysis to track changes and resistance-associated variants in populations of the mosquitoes that transmit malaria in East, West, and Central Africa.”



Chris Clarkson, Principal Data Scientist, Wellcome Sanger Institute, UK

“After an undergraduate degree in Zoology at QMUL, where I discovered an interest in coding and population genetics, I moved to LSTM to study the genomics of insecticide resistance and speciation in malaria vectors. In 2015, after receiving a PhD from LSTM, I joined the MalariaGen team at the Wellcome Sanger Institute.”



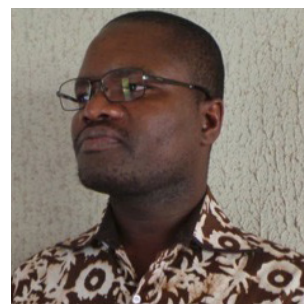
Nsa Dada, Assistant Professor, Arizona State University, USA

“I am a vector biologist and microbial ecologist interested in how mosquito-microbe interactions shape mosquito biology and evolutionary responses to changes in their habitats. I also lead the Mosquito Microbiome Consortium, an international collaborative initiative for the advancement of mosquito microbiome research.”



Luc Salako Djogbenou, Director, Institut Régional de Santé Public; Deputy Director, Tropical Infectious Diseases Research Centre, University of Abomey-Calavi, Benin

“I’m a parasitologist and medical entomologist. From 2010 to 2012, I was a post-doctoral research associate at the Liverpool School of Tropical Medicine, where I’ve been an Honorary Staff fellow since 2013. In 2010, I started setting up a laboratory at the University of Abomey-Calavi in Benin.”



Penny Hancock, Lecturer, Imperial College London, UK

Elijah Juma, Program Manager, Pan-African Mosquito Control Association (PAMCA), Kenya

Nace Kranjc, Post-doctoral Researcher, Imperial College London, UK

Eric Lucas, Senior Research Associate, Liverpool School of Tropical Medicine, UK

“I am a bioinformatician at the Liverpool School of Tropical Medicine, where I study the genomics of insecticide resistance of malaria mosquitoes. My research has particularly focused on the evolution and importance of Copy Number Variations (CNVs) in metabolic resistance, and in the prediction of resistance from genomic data.”



Carlo de Marco, PhD Candidate, Sapienza University of Rome, Italy

Joachim Nwezeobi, Postdoctoral Fellow, Wellcome Sanger Institute, UK

Sanjay Nagi, PhD Candidate, Liverpool School of Tropical Medicine, UK

“I’m a third year PhD student working on genomic surveillance of the major malaria mosquito, *Anopheles gambiae*. I am particularly interested in the evolution and spread of insecticide resistance. Outside of my research, I like to play football, climb, and enjoy the outdoors.”



Eric Ochomo, Senior Research Officer/Head of Entomology, Kenya Medical Research Institute (KEMRI), Kenya

“I am a field entomologist, interested in finding practical vector control tools, surveillance to make sure they are working and insecticide resistance mitigation to ensure their sustainability”



Josh Reynolds, PhD Candidate, Imperial College London, UK

“I am a PhD student working as part of the Target Malaria project. My work uses population genomic data from the Anopheles gambiae 1000 Genome Project to help improve our understanding of mosquito demography, with a focus on migration and dispersal.”



Helga Saïzonou, PhD Candidate, University of Abomey-Calavi (UAC)/Tropical Infectious Diseases Research Center (TIDRC), Benin

“I am doing a Ph.D. in Biochemistry and Molecular biology. I have a great interest in bioinformatics and am passionate about this field. My current work as a Ph.D student is very much in line with my passion as I am working on transcriptomic data generated by insecticide-resistant mosquitoes.”



Brandy St. Laurent, Staff Scientist, Wellcome Sanger Institute, UK

“I am a vector ecologist leading population genomic studies of multiple Southeast Asian malaria vectors as part of the Malaria-GEN Vector Observatory. I am interested in investigating the role of diverse mosquito species and their feeding behaviors in malaria transmission, with the ultimate goal of developing new tools for malaria control.”



Course Participants

Akena Stephen Abwoye, Biostatistician/Field Epidemiology Graduate, Msc. Clinical Epidemiology & Biostatistics; Ministry of Health, Uganda

“My area of expertise is in data management, developing manuals, monitoring, evaluation, weekly epidemiological surveillance on malaria across the country using health informatics software.”



Jewelna Akorli, Senior Research Fellow & Principal Investigator, Noguchi Memorial Institute for Medical Research, University of Ghana, Ghana

“My research interests focus on using molecular and genomic tools to understand the tripartite relationship between mosquito vectors, their endosymbionts and transmissible human pathogens, and harnessing this for innovative and effective vector and disease control strategies. I hold a PhD in Evolutionary Genetics from the University of Cambridge, UK.”



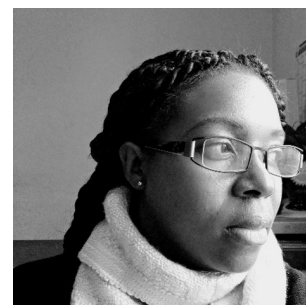
Lucas Amenga-Etego, Senior Research Fellow, West African Centre for Cell Biology of Infectious Pathogens (WACCBIP), University of Ghana, Ghana

“I come from Navrongo and hold a DPhil in genetic epidemiology of malaria. My research interest is in infectious diseases but focused on malaria genetic epidemiology. I use bioinformatic tools to address questions in malaria parasite biology, population genetics, host-parasite interactions, antimalarial drugs, and insecticide resistance surveillance.”



Nathalie Amvongo-Adjia, Post-doctoral Research Assistant, Centre for Research in Infectious Diseases (CRID); Research Officer, Institute of Medical Research and Medicinal Plant Studies (IMPM), Cameroon

“I am a Cameroonian. I read Animal Biology and Physiology at the University of Yaoundé 1, and specialized in Parasitology during my postgraduate studies. I have over 10 years working experience in vector-borne disease epidemiology and control. My current research focuses on resistance genes in malaria vectors from wetlands across the volcanic chain of Cameroon.”



Antonio Nkondjio Christophe, Senior research staff, OCEAC Yaoundé, Cameroon

“I am a medical entomologist working at OCEAC in Yaoundé Cameroon. My research activities are mainly focused on vector bionomics, insecticide resistance, and vector control using larviciding or bed nets. I also contribute to capacity building in Cameroon and across the central Africa subregion”



Moussa Diallo, Scientific Officer, Medical Research Council Unit the Gambia at London School of Hygiene and Tropical Medicine (MRCG at LSHTM), The Gambia

“I hold a MSc degree in Medical Entomology. My current research investigates the evolution of target sites and metabolic mutations, and their potential impact on the use of insecticides in vector control in Senegal.”



Albert Gangbadja, MSc Candidate, University of Abomey-Calvi/Tropical Infectious Diseases Research Center, Benin

“I am an MSc student in Applied Biochemistry and Molecular Biology. My thesis is focused on the characterisation of *Anopheles gambiae*'s bacteriophage community involvement in insecticide resistance. After my bachelor's degree, I developed a deep interest in bioinformatics and would like to contribute to projects to strengthen my skills.”



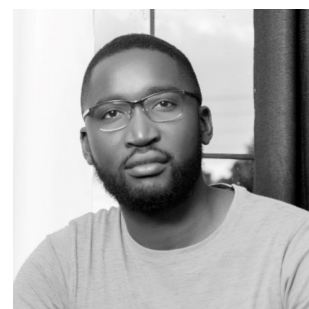
Lemu Golassa, Associate Professor of Medical Parasitology/Head of Medical parasitology Research, Aklilu Lemma Institute of Pathobiology, Addis Ababa University, Ethiopia

“I am an instructor and researcher at Addis Ababa University, where I lead malaria research at ALIPB. I have an MSc in Medical Parasitology and a PhD in Tropical and Infectious Diseases. My current research interest is on malaria and other vector-borne infectious diseases.”



Westone Hamwata, Scientific Officer, Entomology, Tropical Diseases Research Centre, Ndola, Zambia

“I have over 7 years in the field of vector control and public health entomology. My interests include vector ecology and bionomics of vector mosquitoes, as well as the use of xenosurveillance in the control of vector-borne diseases. Further, I have a special interest in conducting community trials for the evaluation of insecticides for public health vector control.”



Kondwani Kachali, Research Assistant, Malaria Alert Centre-Communicable Diseases Action Centre (MAC-CDAC), Kamuzu University of Health Sciences, Malawi

“I am a research assistant on *Anopheles funestus* entomological surveillance, insecticide resistance, and genomic diversity studies. I am also a pending MSc research student at the University of Pretoria, where I will focus on malaria entomology and insecticide resistance. I am particularly interested in molecular identification of insecticide resistance in high disease burden areas.”



Luna Kamau, Principal Research Scientist & Deputy Director, Centre for Biotechnology Research and Development, Kenya Medical Research Institute, Kenya

“I hold a PhD in molecular entomology of malaria. My current research focuses on molecular and population genetic studies of disease vectors, vector ecology and behaviour, insecticide resistance and development and testing of novel tools for vector identification, analysis and control.”



Ruth Kouamé, PhD Candidate, Centre Suisse de Recherches Scientifiques, Côte d'Ivoire

“My current research is about understanding mosquito management among rural households and the spread of insecticide resistance in *Anopheles gambiae s.l* populations. I am interested in acquiring new knowledge and learning tools for better pest management. I am also very passionate about programmes based on engaging communities in their own health and development.”



Mahamadi Kientega, PhD Candidate (Applied Biology and Modelling of Biological Systems/Medical Entomology), Nazi Boni University (ACE ITECH-MTV), Burkina Faso

“I’m interested in vector genomics and population genetics. As a student supported by the Target Malaria Project, I’m investigating the genetic variation within the sex determination genes (fruitless and doublesex), the population structure, and differentiation as well as the pattern of gene flow between the *An. gambiae s.l* populations in Burkina Faso”



Zandile Langa, MSc. Candidate, Wits University; Research Assistant, Vector Control Reference Laboratory, National Institute of Communicable Diseases, South Africa

“My research is on the characterisation of understudied *Anopheles* species using morphological and DNA-based approaches. I also work on the Sterile Insect Technique Project as a lab technician at the Vector Control Reference Laboratory (NICD). I want to pursue a career in bioinformatics. ”



Ibra Lujumba, Bioinformatics Trainer Fellow, PAM-CA, Uganda

“I am a Bioinformatics Trainer Fellow with PAMCA. I am interested in genomic surveillance of insecticide resistance markers in mosquito populations geared towards malaria control strategies in Africa.”



Mbanga Muleba, Scientific Officer, Tropical Diseases Research Centre, Ndola, Zambia

“I have wide experience, expertise, and leadership in malaria entomology research. My work contributed immensely to understanding the identity, distribution, and insecticide-resistance status of major malaria vectors in different parts of Zambia. I also established a network of strategic collaborations within and outside national borders to contribute to the control and eventual elimination of malaria.”



Givemore Munhenga, Principal Medical Scientist, National Institute for Communicable Diseases; Senior Researcher, University of the Witwatersrand, South Africa

“I am an NRF-rated scientist with over ten years of experience providing expertise and research in agriculture and public health. My work portfolio includes giving entomological support to the National Malaria Control Program, assisting in designing a framework for vector control operations, and developing vector collection tools applicable under low malaria transmission. I am leading the assessment of new vector control methods.”



Sophia Hussein Mwinyi, Research and Data Scientist, Ifakara Health Institute, Tanzania

“I am currently leading a research project that assesses the feasibility of the application of Mid-Infrared Spectroscopy (MIRS) & Artificial Intelligence (AI) to diagnose and quantify *Onchocerca volvulus* in blackflies that transmit river blindness in humans. My research interests include the application of AI and genomic data science in vector surveillance research.”



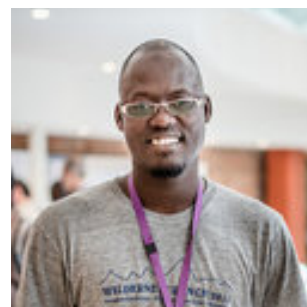
Faridah Nansamba, Data Manager, Division of Health Information, Ministry of Health, Uganda

“I am passionate about data analytics and using data for action and better health outcomes. I have 11 years experience in District Health Information Systems and 8 months experience at the National level. I hold a Post Graduate Diploma in Monitoring and Evaluation and have a Bachelor’s in Science degree in Quantitative Economics.”



El Hadji Amadou Niang, Deputy director, Laboratoire d’Ecologie Vectorielle et Parasitaire, Université Cheikh Anta Diop, Senegal

“My interests encompass various aspects related to insect vector ecology, population genetics and genomics, evolution and applied consequences of insecticide resistance. I provide technical support to National Malaria Control Programs (NMCPs) and train their staff in designing and implementing targeted vector control interventions. I am also a medical entomology lecturer at the Université Cheikh Anta Diop.”



Jane Njeri Mwangi, Bioinformatics Fellow, Pan-African Mosquito Control Association, Kenya

“I am interested in understanding the genomics of mosquito vectors that transmit malaria in Africa, whilst assisting in building capacity on vector genomics in the continent. I’m currently on a rotation scheme within the MalariaGEN team at the Wellcome Sanger Institute.”



Joel Odera, PhD Candidate, University of Glasgow, UK and Ifakara Health Institute, Tanzania

“I study population biology of the malaria vector, *Anopheles funestus* in Tanzania. I utilize classical biology approaches to understand aspects of its ecology, host feeding patterns, insecticide resistance profiles, and vector genomics to study its population-wide diversity and gene flow patterns.”



Fatoumata Seck, PhD Candidate, African Centre of Excellence in Biotechnological Innovations for the Elimination of Vector-borne Diseases (ACE ITECH-MTV), Burkina Faso

“I am conducting my PhD research at the Medical Research Council Unit the Gambia at London School of Hygiene and Tropical Medicine (MRCG at LSHTM) in collaboration with the Institute Pasteur of Dakar, to investigate inhibitors targeting Anopheles reproductive proteins as an innovative pathway to reduce malaria transmission. I hold an MSc in Entomology and a BSc in Biology, Chemistry, and Geosciences from the University Cheikh Anta Diop of Dakar.”



Additional Participants

Deriba Abera

Faraji Abilahi

Enock Kofi Amoako

Kala Chouakeu Nelly Armanda

Benoit Sessinou Assogba

Mayi Marie Paul Audrey

Alex Auyang

Catherine Bakari

Lemonde Bouafou

Soromane Camara

Joseph Chabi

Edi Constant

Joseph Gichuhi

Alexandria Harrot

Mahamadi Kientega

Pilate Kwi

Ruth Lekundayo

Edward Lukyamuzi

Surina Maharaj

Mara Maquina

Sylvia Milanoi

Leon Mugenzi

Emmanuel Mwanga

Dyane Nanmede

Edwin Ogola

Diana Omoke

Brian Polo

Nsango Sandrine

Jacqueline Waweru

Rosine Z. Wolie

Ayebi Hermann

Florent Yapo

Josue Zanga



Resources

Course website:

<https://anopheles-genomic-surveillance.github.io/home.html>

Contact:

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pc24@sanger.ac.uk

MalariaGEN:

www.malariagen.net

Twitter: @MalariaGenomics

LinkedIn: www.linkedin.com/company/MalariaGEN

PAMCA:

www.pamca.org

Twitter: @pamcafrica

World Malaria Report 2022:

<https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2022>

Amplicon sequencing toolkit:

<https://www.malariagen.net/resources/amplicon-sequencing-toolkit>

