

Pathogen Genomics and Bioinformatics Fellowship Program

Information Booklet

Africa Pathogen Genomics Initiative (Africa PGI)
Division of Laboratory Systems and Networks
Africa Centres for Disease Control and Prevention (Africa CDC)

In collaboration with



April 2023
Addis Ababa, Ethiopia

1. Background

In the past two years, the need for rapid scale-up of genomics surveillance for COVID-19 revealed a need to increase the competent genomics and bioinformatics workforce in Africa. Since the launch of the Africa Pathogen Genomics Initiative (Africa PGI) in 2020, Africa CDC, and its partners have conducted an aggressive training agenda through short courses on genome sequencing and bioinformatics lasting one to two weeks in an attempt to rapidly scale-up and build the capacity for genomic technology in the continent. Much as this approach was suitable under the continental COVID-19 pandemic response owing to travel restrictions, it has been largely limited by both the lack of sustained trainer–trainee interactions, which is a core part of quality training, and short durations which constrain the amount of learning that can be achieved. Furthermore, the lack of standardized training curricula and the mixed level of expertise of the participants were other limitations of the short-term training. To address these gaps, the Africa CDC in collaboration with ASLM and with support from the Africa CDC Saving Lives and Livelihoods Initiative (SLL) is launching the Africa PGI Pathogen Genomics & Bioinformatics Fellowship Program to create a comprehensive learning environment that will prepare trainees for a variety of experiences in public health pathogen genomics surveillance in Africa.

2. The rationale for a fellowship program

The fellowship is a tailored training opportunity intended to train a pathogen genomics and bioinformatics workforce with expertise to improve outbreak detection and disease surveillance in Africa. The fellowship program offers a competency-based core curriculum providing the opportunity to standardize processes while also supporting fellows to gain an in-depth understanding of core thematic areas. The program will allow immersion in work settings beyond SARS-CoV-2 genomic surveillance. It will additionally provide opportunities for an alumni network that includes the chance to stay in contact and continue to learn from each as well as create professional relationships between the fellows and their mentors, hence fostering future collaborative opportunities. The fellowship will be the first step toward an institutionalized professional training program in Africa by Africans.

3. Fellowship overview and priorities

By the end of 2022, at least 39 African Union Member States had NGS capacity being deployed for disease surveillance. This is reshaping outbreak detection, investigation, and surveillance as already seen in the COVID-19 pandemic response when two SARS-CoV-2 variants of concern were first detected and reported from the continent. Furthermore, a number of hubs have expanded and strengthened their pathogen genomics and bioinformatics capacity and expertise, and are positioned to support the Africa PGI Pathogen Genomics & Bioinformatics fellowship program. As the continent transitions to the effective use of NGS to inform public health decision-making, we intend to use a model that effectively utilizes the existing NGS platforms and computational infrastructure as well as continental expertise to deliver an in-person hands-on skills training experience. This will be done through lectures, guided personal coursework, group discussions, and continuous close mentorship and assessment of trainees over a period of 3 months at the selected Africa CDC's collaborating genomics and bioinformatics hubs in Africa. By the end of the training period, the fellows will have received experiential training in outbreak investigation and genomic surveillance, including data analyses and interpretation of sequence data to identify and characterize pathogens. They will be able to apply their genomics and bioinformatics skills to a range of important and emerging disease threats under Africa's new public health order.

4. Fellowship program description

The fellowship is a twelve-week program designed to promote fellowship recipients' career development and foster collaboration between institutions in different countries. Fellows will be trained in one of two tracks i) next-generation sequencing (NGS); and ii) basic public health bioinformatics and data analytics. Fellows will obtain tailored training and experience through a standardized approach based on partnership with selected Centers of Excellence in pathogen genomics and bioinformatics across Africa (see [Appendix 1](#)). Fellows will work closely with their respective mentors to provide a progressive report of their training (See [Appendix 1](#)). Up to 25 fellowships may be awarded each year to fellows from national public health institutions and national reference laboratories in Africa.

5. Content design and delivery

Specific project and training activities will be designed collaboratively with the host institutions through a standardized approach (see [Appendix 2](#)). To ensure that the program meets the fellows' expectations, as part of the application process, fellows will be required to submit a motivation statement that includes a brief description of their training, public health interest, and future plans. The two thematic areas below cover the priorities for the Africa CDC and the capacity needs across the continent.

Track 1: Next-Generation Sequencing of pathogens

This track will cover the basis of next-generation sequencing for outbreak detection and disease surveillance using long and short read technologies. This includes sample collection, sample transportation, sample handling, biosafety & biosecurity, biobanking; quality control, metadata standards, and requirements; nucleic acid extraction methods; library preparation techniques for different platforms and assays; internal quality control steps; purification and quantification of libraries; loading, running, and the use and maintenance of sequencing instruments. Fellows will also be trained in optimizing assays for sequencing of viral, microbial, and parasitic pathogens.

Track 2: Public health bioinformatics, data analytics, interpretation, and reporting

In this track, fellows will be trained in basic data skills and analysis of sequencing data from long and short read technologies, with an emphasis on best practices and reproducibility. The training fellowship will provide hands-on training on NGS applications, mapping or assembly of genomes, use-case dependent data analytics, interpretation of sequence analyses, data mining and visualization, reporting, good data management practices, and quality control. In addition, fellows will be trained on metadata standards; data harmonization, storage, and sharing.

6. Host Institutions

Fellows are placed at one of the specialized or regional hubs listed under Annex 1. Fellows must submit an agreement letter from host institution with a confirmation to accept and support the fellow during the fellowship application, training period, and

provide post training mentorship. The training site will grant the fellow access to supervised activities, laboratory trainings and/or datasets in order to achieve the objectives of the fellowship. Africa CDC and ASLM, will provide guidance to fellows and assists supervisors on how to best develop the required competencies. The supervisor must immediately notify the Africa CDC and ASLM of any significant incidents occurring during the fellowship (in particular professional incompetence, prolonged absences, sicknesses, accidents, unprofessional behavior, or interruption of the fellowship). Africa CDC and ASLM will finalize administrative issues based on the number of fellows the host institution accepted.

7. Requirements for participation

Applicants must commit to working full-time in one of the selected centers of excellence for 12 weeks. Fellows are expected to remain in the employment of their home institutions for the entire duration of the fellowship.

8. Eligibility criteria

To be eligible for the Africa PGI Pathogen Genomics & Bioinformatics Fellowship, the applicant must:

- be a citizen of an African Union Member State;
- be a full-time member of staff of a national public health institution or a national reference laboratory in Africa;
- have a bachelor's degree in a relevant discipline and experience in molecular biology, genomics, next-generation sequencing, bioinformatics, data science, or other disciplines that can be applied to pathogen genomics and bioinformatics;
- have demonstrated an ability to engage in pathogen genomics and bioinformatics in a public health setting;
- attach an acceptance letter from a host institution;
- have adequate fluency in the language spoken at the host institution;
- there is no upper age limit for eligibility; however, priority will be given to female applicants and youth (i.e. those in the early stages of their careers).

9. Logistic information

- **Living Allowance:** the fellowship does not provide a salary or stipend; instead, awardees will receive a living allowance to cover the cost of accommodation, local transportation, and living expenses;
- **Travel:** return economy-class air-ticket between the fellow's home and the fellowship host institution will be included;
- **Health and Travel Insurance** will be covered during the fellowship period;
- **Visa costs to the host country:** the applicable visa fees for the fellow will be covered;
- **Institutional Allowance:** The award will provide an allowance to the host institution to cover eligible costs including mentor compensation, bench space, laboratory and office supplies, and other eligible costs of the training. For track 1 fellows, the cost of sequencing reagents will be covered through existing arrangements between the host institutions and the Africa CDC and will be provided *in kind*;

10. Application process

Application Submission: Page and word limits will be strictly enforced, and general guidelines regarding the length of each section are provided below. The application must use the provided application form (See [Appendix 3](#)), and will include the following sections:

1. **Fellowship and training plan (two pages max.):** The application must include a detailed mentorship and training plan developed in consultation with the host institution, describing i) the details of the project and genomic use-cases; ii) details of the training and mentorship activities including key milestones and related dates within the fellowship period; iii) the resources committed by the host institution and applicant's home institution - this includes a description of the specimens, isolates, or resources the fellow will use during the training period; and iv) the expected outcomes of the fellowship, including the track that will advance pathogen genomics and bioinformatics in the applicant's home country.

2. **Statement addressing Africa CDC and ASLM priorities (500 words):**
Applicants must identify which of the two tracks aligns with the project plan and describe how their project addresses stated priority pathogens and focus areas.
3. **Personal Statement (500 words):** Applicants must describe how their background, experience, and future plans prepare them for this fellowship, with an emphasis on their role in their home institution.
4. **Additional Required Attachments:**
 - Applicant's CV and academic transcript;
 - Letter from the applicant's institution recommending the applicant for the fellowship, providing approval of the proposed project and time commitment; and
 - Host institution approval letter, indicating that the host institution agrees to host the fellow for the duration of the fellowship, with a start and end date. Africa CDC and ASLM will support fellows to identify host institutions

No additional attachments beyond those listed here are allowed.

Applicant Information Sessions: Africa CDC and ASLM will host an informational webinar. Please check Africa CDC (www.africacdc.org) and ASLM (www.aslm.org) websites for announcements. Participation in one of the information sessions is strongly recommended.

Submission: Applications must be submitted by completing the online application forms:

- Application form – English - <https://bit.ly/3ztLuaQ>
- Application form – French - <https://bit.ly/3KqnQ5o>

It is the applicant's responsibility to follow the rules, procedures, and timelines for submitting a proposal. The proposal submission deadline will be strictly enforced. Application templates are available on Africa CDC and ASLM websites for reference. Africa CDC and ASLM will be responsible for overseeing a fair, transparent, and robust recruitment process. In addition, Africa CDC and ASLM will give final approval for customized work plans and will monitor the performance of the fellowship.

11. Key dates

RFA release date	03 April 2023
Program Information Sessions	18 April 2023
Application due date	28 April 2023

12. Selection Criteria

All eligible submissions will be evaluated by the Africa CDC and ASLM Academy. The review of the application will be based on scored criteria listed below and will evaluate the scientific merit of the proposed work. The selection of fellows who will receive support will be solely at the discretion of Africa CDC and ASLM.

- **Quality of the Application:** The expected outcomes of the fellowship should directly relate to the expected impact on pathogen genomics and bioinformatic work in the home institution and be feasible in the proposed time frame. The timeline should indicate clear milestones for completion in the fellowship period. The fellow's proposed project and future plans will both score 30% and 30% will be their educational background and experience.
- **Qualifications of the Applicant and Experience:** The adequacy of the educational background and proven experience of the applicant in public health pathogen genomics and/or bioinformatics (15%).
- **Alignment with the Africa CDC goals and thematic priorities (10%)**
- **Other criteria:** priority will be given to female applicants, youth, and to those applying from Member States with limited genomics and bioinformatics capacity as identified by the Africa CDC recent assessment of genomics and bioinformatics capacity (15%).
- Top-ranked candidates will be invited for a virtual interview with the selection committee. The number of candidates should be sufficient in relation to the number of available fellowship posts for the respective track.

- Final decisions and selection will be made jointly by Africa CDC and ASLM. Applicants will be notified of their status in writing within four weeks following the submission of a complete application. On receipt of the notice of fellowship award, the fellowship may be activated within four weeks of the award date. Awards are contingent on the availability of funding.

13. Fellowship Administration

The fellowship will be administered by the Africa CDC in collaboration with ASLM. Fellows will be required to virtually report every 2 weeks and submit a written progress reports 6 weeks after the start of the fellowship. At the end of the fellowship, the fellows are required to submit a final report of the activity done at the host institution, using a specific template, within two weeks after the completion of the fellowship. The report must be signed by the host institution. Furthermore, this report must also include a statement from the home institution confirming that the fellow has returned to the home country after completing the fellowship.

14. Examination and Certification

At the end of the fellowship, the fellow will submit a report and go through a standard examination for each track. Africa CDC and ASLM will present a certificate of completion at a suitable event marking the successful completion of the fellowship.

15. Branding and communication

Support from the Africa CDC, ASLM, and partners must be acknowledged in any work published relating to the fellowship news articles, blogs, publications, and presentations by the fellow and host institutions. For further information on branding and communication, please contact SofoniasT@africa-union.org and EShumba@aslm.org.

16. Contact Information

- For questions on fellowship scope, priorities, and host institutions, please contact africapgi@africa-union.org with a copy to SofoniasT@africa-union.org and MboowaG@africa-union.org
- For administrative questions regarding the application process, please contact: EShumba@aslm.org and nvere@aslm.org

Appendix 1: Participating Centers of Excellence

Track 1: Next generation sequencing of SARS-CoV-2 and other pathogens and/or			
Track 2: Public health bioinformatics, data analytics, interpretation, and reporting			
Region	Country	Institution	Contact Person
Western Africa	Nigeria	African Centers of Excellence for Infectious Disease (ACEGID)	Prof. Christian Happi
Western Africa	Nigeria	University of Ibadan	Prof Iruka Okeke
Central Africa	DRC	Institut National de Recherche Biomédicale (INRB, Kinshasa)	Prof. Placide Mbala
Western Africa	Senegal	Institut Pasteur de Dakar (IPD)	Dr. Amadou Sall
Western Africa	Ghana	Noguchi Memorial Institute for Medical Research (NMIMR)	Prof. Dorothy Yeboah-Manu
Southern Africa	South Africa	National Institute of Communicable Diseases (NICD)	Prof Anne von Gottberg
Southern Africa	Botswana	Botswana Harvard AIDS Institute Partnership (BHP)	Dr. Sikhulile Moyo
Eastern Africa	Kenya	KEMRI-Wellcome Trust Research Programme	Dr. Isabella Oyier
Northern Africa	Morocco	Institut Pasteur du Maroc (IPM) Morocco	Dr. Abdelhamid Barakat
Western Africa	Ghana	The West African Centre for Cell Biology of Infectious Pathogens (WACCBIP)	Prof. Gordon Awandare
Southern Africa	South Africa	Centre for Epidemic Response and Innovation	Prof. Tulio de Olivera
Eastern Africa	Kenya	ILRI	Dr. Sam Oyola
Track 2: Public health bioinformatics, data analytics, interpretation, and reporting			
Southern Africa	South Africa	The South African National Bioinformatics Institute	Prof Alan Christoffels
Eastern Africa	Ethiopia	Armauer Hansen Research Institute (AHRI)	Dr. Markos Abebe
Eastern Africa	Uganda	African Center of Excellence in Bioinformatics & Data-intensive Sciences(ACE)	Dr. Daudi Jjingo

Appendix 2: Priority areas and core competencies for the fellowship

The inaugural Africa PGI Pathogen Genomics & Bioinformatics Fellowship Program will cover the following priority use cases and focus areas. Fellows are expected to develop their competencies, progress will be assessed every two weeks virtually and through a written report every six weeks.

Track	Priority use cases	Core competencies to be developed
Track 1	<ul style="list-style-type: none"> • Viral genomics with a focus on outbreak detection and integrated SARS-COV-2 variant surveillance • Outbreak detection and response • Microbial genomics with a focus on AMR, Cholera, and other bacterial pathogens • Malaria drug resistance and diagnostics 	<p>Sample collection, handling, and storage</p> <ul style="list-style-type: none"> • Identify appropriate sampling strategies • Identify appropriate laboratory investigation and sampling preparation techniques • Safe packaging and transportation of infectious materials across national and international boundaries as per local, regional, and international regulations • Understand and apply the principles and practices of biosafety and biosecurity according to regional and international guidelines <p>Quality Management</p> <ul style="list-style-type: none"> • Understand the principles and practices of quality assurance for pathogen testing and sequencing • Understand and apply the concepts of internal and external quality assurance <p>Laboratory</p> <ul style="list-style-type: none"> • Identify appropriate methods for detection of pathogen/cause of unusual events • Prepare a SOP and running a standard sequencing protocol that includes nucleic acid extraction methods; library preparation techniques and assays; internal quality control steps; purification and quantification of libraries; and the use and maintenance of sequencing instruments • Able to solve technical and practical problems <p>Data analyses and Bioinformatics</p> <ul style="list-style-type: none"> • Describe role of pathogen genomics in surveillance, outbreak investigation, applied public health research • Understand the principle and practices of bioinformatics and sequence analyses • Define type of analysis depending on the sequencing methodology used • Extract, present and report useful and relevant pathogen genomic data for public health utility
Track 2		<p>Basic bioinformatics competencies</p> <ul style="list-style-type: none"> • Understand the role of computation and bioinformatics in hypothesis-driven processes within the public health space • Understand computational concepts used in bioinformatics, e.g., meaning of algorithm, bioinformatics file formats • Know basic statistical concepts used in bioinformatics, e.g., E-value, z-scores • Know how to upload and access pathogen genomic data, e.g., in NCBI nucleotide databases, GISAID or other databases • Able to use bioinformatics tools to analyze pathogen genomic data • Be able to use bioinformatics tools to detect outbreaks, detect mutation of public health interest, detect variants, and monitor evolution of pathogens • Be able to use bioinformatics tools to examine metagenomics data, • Be able to use software packages to manipulate and analyze bioinformatics data • Use bioinformatic tools to extract, present and report useful and relevant pathogen genomic data for public health utility

Appendix 3: Application Forms and Templates

Application forms can be found in the following links

- Application form – English - <https://bit.ly/3ztLuaQ>
- Application form – French - <https://bit.ly/3KqnQ5o>