

GHTM/IHMT/NOVA Proposed Action Plan for 2020-2023

The context and the organization: The Instituto de Higiene e Medicina Tropical (IHMT/NOVA) (<http://www.ihmt.unl.pt>) is a Unit of Universidade NOVA de Lisboa, with strong research, development and training components. IHMT/NOVA hosts 6 MSc and 7 PhD programs (<http://www.ihmt.unl.pt/ensino-1/>) and currently has a total of 173 MSc and 137 PhD students, 56% of which are international students. IHMT/NOVA has been recognized at national and international level, for its scientific quality in postgraduate teaching and excellency in specific areas of research which are focused on tropical medicine, biomedical sciences and global health-related areas considered problematic. IHMT/NOVA has been at the forefront of research, training and development of these areas, often within networks and partnership projects, warranting an international global presence, with special emphasis on strong partnerships with Portuguese speaking countries in Africa, the Community of Portuguese Speaking Countries, America and Far East (Figure 1).



Figure 1 - 2020 GHTM/IHMT/NOVA External collaboration network on country level. (Source PURE/NOVA available @ <https://novaresearch.unl.pt/en/organisations/global-health-and-tropical-medicine-ghtm>)

Research at IHMT/NOVA is carried out through its R&D Centre: **GHTM - Global Health and Tropical Medicine** (<http://ghtm.ihmt.unl.pt>), created in 2015 with a four years mandate (Paulo Ferrinho and Henrique Silveira – coordinators). GHTM brings together researchers with a track record in Tropical Medicine, Biomedical Sciences and Global Health and aims at strengthening Portugal's role as a leading partner in the development and implementation of a global health research agenda under the objectives of the UN sustainable development goals (UN SDG). GHTM's evidence-based interventions contribute to the promotion of equity in health and to improve the health of populations.

Between 2015-2019 GHTM/IHMT/NOVA published 644 peer-reviewed international publications, with a field-weighted citation impact of 1,33, 67% with international collaboration and 34% at Top10% scientific journals (Source: Scopus/Elsevier). Over the past 5 years, our

researchers have been involved in 98 funded projects (60% as PI). International sources account for 28% of our budget, mainly the EU, including the Bill and Melinda Gates Foundation, Gilead, Santander and Gulbenkian Foundations, and industry, obtaining an average of 1.5M€/year of funding. Ten prizes were awarded to GHTM researchers as recognition of the excellence of our research.

In 2019, GHTM was evaluated as Excellent by an international panel of experts by Fundação para a Ciência e a Tecnologia of Portugal, with its mandate and funds renewed for 2020-2023.

The **organizational framework of GHTM** (Figure 2) consists of **four research groups (RG): 1- Population Health, Policies and Services (PPS); 2- Individual Health Care (HIC); 3- Tuberculosis, HIV and Opportunistic Diseases (THOP) and 4- Vector Borne Diseases (VBD)**. In order to achieve cutting-edge outputs, the Centre operates in a transdisciplinary context in which relevant data and resources are exchanged between scientists in these groups. The five major research areas that shared interest – **the crosscutting issues (CCIs)** - constitute the guiding principles and the driving force of our working model and are the following: **Diagnostics (DG); Drug discovery & resistance (DDR); Public health information (PHI); Global pathogen dispersion and population mobility (GPPM) and Fair research partnerships (FRP)**. All CCI issues contribute to pursue our “One Health” approach to Global Health.

Our mission: GHTM mission is to produce knowledge, develop tools and strengthen systems, in which individuals, communities and countries need to improve their health status through the promotion of excellence in research, training and systems implementation. GHTM's specific aims are to: a) reinforce local to global capacity to control vector borne diseases, b) contribute to the control of HIV tuberculosis and opportunistic infections, c) support countries to strengthen health systems to achieve Universal Health Coverage and improve health and well-being of vulnerable populations and d) improve individual health care in high-disease burden settings.

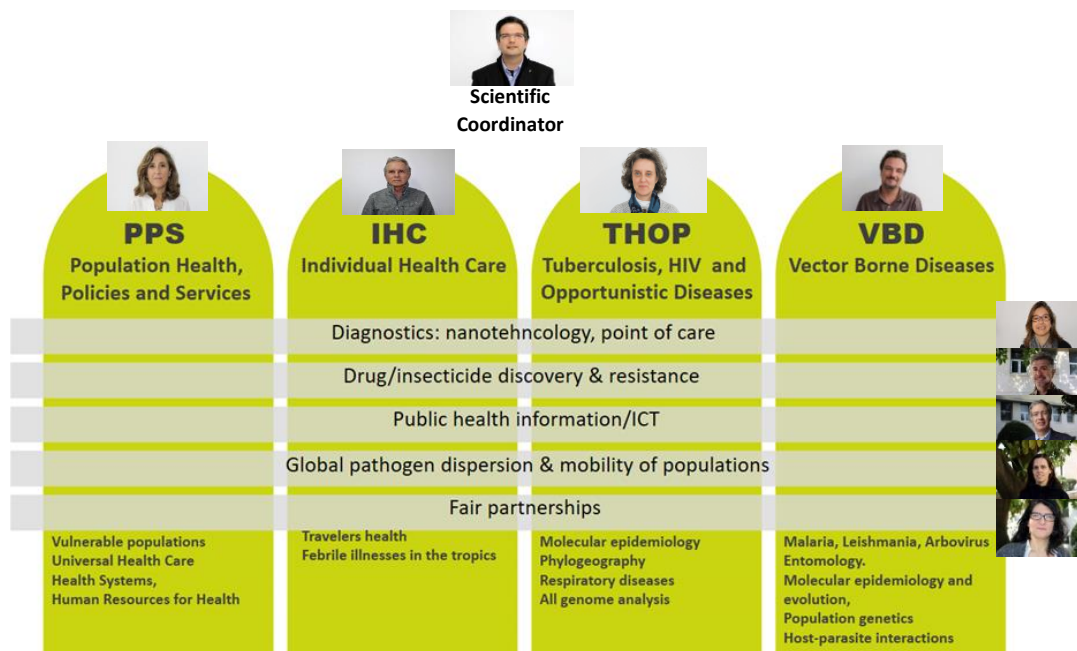


Figure 2 - 2020 GHTM/IHMT/NOVA proposed organizational framework.

Why?: The challenges of the UN SDGs in view of the environmental changes and globalization, global warming, global emergent diseases, migrations, aging, as well as the new scientific and technological advances and big data processing, personalized medicine and the rise of health costs related with the universal access to the health system determine: a) a priority on improving health and achieving equity for all people worldwide, b) the need for transnational global thinking on health issues, determinants and solutions, c) the involvement of many disciplines within and beyond the health sciences and the promotion of interdisciplinary collaboration in biomedical and social sciences, d) the embracement of both prevention in populations and clinical care of individuals for personalized medicine; e) global cooperation to develop and implement solutions.

What? GHTM is uniquely placed to address these issues both at the national and international settings, in terms of in-house expertise, infrastructure and biological resources. Our multidisciplinary knowledge ranges from specialists on genetics and genomics, molecular biology, biochemistry, immunology, statistics, bioinformatics, veterinary science, social sciences, travel and tropical medicine, and health systems. The ongoing COVID-19 pandemic sadly illustrates the need and power of such multidisciplinary approaches on Global Health issues. In addition to human resource capabilities, GHTM/IHMT is ideally placed to undertake integrated basic and translational research since it holding unique infrastructures (two BSL3 laboratories; state-of-the-art animal house, security insectary), animal models of infection (Malaria, TB, Trypanosomiasis, Leishmaniasis, Schistosomiasis, Virology), well characterized (phenotypic and genotypically) collections of drug resistant bacteria, parasites and viruses and access to clinical samples with a fully operational Biobank and Bioinformatics Hub. In terms of organization, our framework of four groups supports the driving-force from the five CCIs, which constitute the guiding principles of our working model and action plan.

How? Our forthcoming strategy and action plan within each of these issues is:

a) GLOBAL PATHOGEN DISPERSION AND POPULATION MOBILITY will address global dispersion of infectious diseases (ID) using transdisciplinary and integrated approaches in collaboration with partners in endemic countries. Will focus on factors that underpin the spread or containment of ID globally and locally, particularly environmental changes and population mobility, in control or elimination contexts. Will also focus on tracking and monitoring strategies for ID in mobile populations and travelers; monitoring risk of introduction (via travel clinic follow-up and global public health surveillance approaches) of new agents, producing risk maps for vector-borne and emerging ID diseases based on the environmental modelling, geographic information systems and bioinformatics tools and data bases, developed together with international partners (FioCruz, Liverpool and London SHTM, 1000 Genomes Consortium). Will monitor reservoirs (e.g. MosquitoWeb expansion to other vectors), develop infection and disease dissemination prevention tools, including evaluation of vaccines or transmission blockers and the implementation of control tools particularly in resource-poor areas. Global public health Implementation of evidence-based interventions in Portuguese-speaking countries (CPLP) (e.g. design of public health surveillance systems). The focus will be on supporting initial

and scale-up small local interventions within a collaborative network of partners in the scope of Universal Health Coverage (UHC). Will include health economic evaluations (cost-effectiveness and cost-benefit analysis) for different types of interventions related to UHC, Human Resources for Health, Maternal and Child Health, Malaria and other VBD, HIV and TB.

b) DRUG DISCOVERY AND DRUG RESISTANCE will be leveraged by existing funded research, knowledge and infrastructures as well as drug resistant pathogen collections and collaborative databases and clinical samples access. Will focus on the identification and/or testing of new therapeutic chemophores, repurposing drugs and transmission/resistance-blocking agents, alongside with characterization of drug and insecticide resistance mechanisms on key pathogens and vectors. Will use Computer-aided Drug and Insecticide Discovery (CADD), chemogenomics and *in silico* repurposing drug design and development tools and Big Data Analysis, aiming drug repositioning approaches. Will also provide testing data on lab models and predictive data on development and dynamics of resistance to new drugs or insecticides prior to or upon market release and will create the conditions for GHTM to be an active partner of the Portuguese pre-clinical and clinical trials agency (AICIB) as well as EDCTP ongoing projects (eg. the clinical trail for Human African trypanosomiasis treatment) Will also continue to track and study the prevalence and spread of drug resistance in infectious agents such as HIV, *M. tuberculosis*, Pneumocistis and neglected infected diseases, allowing national treatment policies to be adjusted and improved.

c) DIAGNOSTICS, is grounded on technical and scientific expertise in common fields to target early ID diagnosis, including pre-clinical evaluation and shared collection of methods. Will continue the development of nanotechnology based, affordable, point-of-care, multi-pathogen diagnostic tools designed to serve the needs of both low-income countries, where misdiagnosis is due to lack of resources and personnel, and non-endemic countries with low awareness and experience in the diagnosis of imported diseases. We will continue to develop (and improve the existing ones) novel low-cost, fast and accessible point-of-care diagnostic and genotyping tools using innovative molecular supports.

d) PUBLIC HEALTH INFORMATION will focus on the global health demand for more advanced information and management tools to support public health decision-making , specifically for epidemiological surveillance and modelling of early warning systems (e.g. arboviruses (ZikaAlliance and Dengue Madeira), HIV (Uni. Leuven HIV data base), rotavirus and emerging viruses, some already being developed in and with CPLP countries and monitoring the spread of M/XDR-TB with the London School of Hygiene and Tropical Medicine WGseq&Bioinformatic network. Early identification and management of outbreaks, promoting health information, communication and policy-making for Healthcare decision-support systems (e.g. HAITool for antibiotic resistance control in Hospitals). Will continue to promote public health information and education, contributing to health workforce strengthening observatories and citizen-science, focusing on health systems in CPLP and driven by the EU Joint-Action on Health Information projects.

d) FAIR RESEARCH PARTNERSHIPS will continue to ensure North/South partnerships on health research integrating GHTM's work in the emerging field of "research partnerships", building upon IHMT and GHTM's historical work within the CPLP and benefiting from collaborations with other leading institutions in the field of health research in low and middle-income countries. It builds on several ongoing funded projects (Africa Erasmus+; EDCTP) to develop innovative research on partnership development and sustainability and to carry out inter and transdisciplinary teaching, learning, and knowledge management, strengthening our commitment with the Fair Research initiative (<http://rfi.cohred.org>) and the network of Public Health Institutes at CPLP (RINSP).

Knowledge creation, advanced training and capacity building: The critical mass of young researchers required for continue, improve and excel the scientific objectives proposed in this action plan will come from a strong investment on advanced training in Portugal and in the CPLP countries, building capacity to improve their health systems and for establishing closer overseas collaborations. GHTM will, thus as a priority, support post-graduate program in Portugal, actively collaborating with the UNESCO Ciência LP - International Centre for Advanced Training of Scientists from Portuguese Speaking Countries in Basic Sciences, recently launched and also hosted by IHMT/NOVA with the support of FCT and UNESCO (<http://www.ciencialp.pt/>). Joint international MSc and PhD programs on Tropical and Global Health, Biomedical Sciences and Entomology, are already implemented or in accreditation within the framework of GHTM CCIs, integrating MSc and PhD students in GHTM research groups providing them with critical mass and working environments for development of their research. GHTM has been awarded with 12 PhD grants for four years that will attributed under the scope of GHTM objectives.

To pursue these goals we need to invest on areas central to GHTM objectives such as equipment, infrastructures and human resources. The completion and operation start of the In Vivo Arthropod Security Facility (VIASEF) and the renovation of the BSL-3 infrastructures are urgent priorities. The strength of the Clinical outpatient and Research Datacenter and the Bioinformatics Hub (Next-Generation Sequencing (NGS) portable equipment and analytic tools (Nanopore-MinION), chemogenomic and drug-discovery capacity leverage and improvement of the management of data and biological materials are also imperative. RG in collaboration with IHMT infrastructures (Common Services and Infrastructures, Travel Clinic and Ethics Committee) will work towards the continuous strength of the Biobank (BioTropical - <https://www.ihmt.unl.pt/investigacao/biobanco/>). We will also promote internal scientific debate to strengthen research interactions and dialogue between RG and CCIs through regular internal scientific meetings, to discuss projects, international collaborations and opportunities, to detect and overcome fragilities. This will increase international project submission and success rates, and better impact of research. Strengthening the Project Support Office (GAP) to increase the support to researchers, particularly for large grant submission and management is of utmost necessity.

Governance: This proposal builds upon the previous GHTM program, maintaining most of the structure/goals and management team that lead to the successful 2019 international evaluation. The Scientific Committee (SC) led by the Scientific Coordinator, will include the four RG-Leaders and five CCI-Coordinators. The SC will be responsible for the strategic plan implementation, creation of operation regulations and procedures and monitoring of productivity and financial management. RG and CCI leadership will promote activities where GHTM has potential impact and can generate high quality results. The SC will meet regularly, at least monthly. Besides the proposed Scientific Coordinator (Miguel Viveiros), the team proposed for GHTM's SC is the following: RG Leaders: PPS (Rosário Martins), HIC (Reynaldo Dietz), THOP (Isabel Couto), and VBD (João Pinto); CCI-Coordinators: DG (Ana P. Arez); DDR (Pedro Cravo); PHI (Luis Lapão); GPPM (Ana Abecasis) and FRP (Isabel Craveiro). Each RG will be responsible for: i) developing high-standard research work within the framework of the RG/CCIs/GHTM objectives; ii) integrating activities and sharing resources with other researchers; iii) seeking funding by means of project submissions and other sources; iv) supervising PhD and MSc students; v) promoting networking and internationalization; vi) contributing to outreach and dissemination actions and vii) manage the allocated budget and implement the approved regulations and operational procedures according to their SC approved annual objectives plan. Membership: inclusion of future members will be subject to minimum scientific quality criteria defined by SC in their approved regulations, to be annually revised. Incentives: In order to increment research in the RG, internal Grant Projects will be implemented. These projects are small grants to develop novel ideas within and involving several RG. An internal call will be launched late 2020 and will be awarded after positive evaluation by external reviewers.

Expected results - Through this action plan and above described research framework, our intended outputs are to:

- strength GHTM/IHMT/NOVA as a R&D Center with consolidated areas of international excellence producing new control strategies, technologies and therapeutic approaches to be incorporated in health care systems;
- create a reference center for Global and Tropical Health in Portugal and worldwide generating improved tools for pre-elimination settings and improving planning and implementation strategies to achieve Universal Health Coverage in CPLP;
- create an effective platform for evidence-based policy development and evaluation fostering a more comprehensive understanding of the health patterns of global pathogen dispersion and population mobility including major infections and epidemiological indicators, from the country of origin to the host country;
- discover, repurpose, develop ecological-biochemical-molecular targets for vector control and prevention of environmental-human transmission as well as new diagnostic tools using innovative molecular supports for early detection of tropical and neglected diseases;
- knowledge-basis necessary for the development of appropriate human resources for health regulatory frameworks, stronger educational institutions, better understanding of transnational issues (such as health worker migration) and stronger health systems, including global HRH governance and monitoring.

The proponent on behalf of the Scientific Committee, Miguel Viveiros

Lisboa, 23 Março 2020