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PERSPECTIVES

The Landscape of Clinical Genetics in Honduras, Central America

Edwin Francisco Herrera-Paz [1,2], Delmy Aracely Mejía-Mejía[1,3]

1. COCINH LAB-Honduras, Secretaría de Infraestructura y Turismo (SIT), Gobierno de la República de Honduras, Tegucigalpa, Honduras;
2. Universidad Católica de Honduras, School of Medicine, Campus San Pedro and San Pablo, San Pedro Sula, Honduras;
3. DEMEDICA Research Center, San Pedro Sula, Honduras.

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Abstract

In Honduras, clinical genetics is still at an early stage of development despite the country's rich genetic diversity and important research contributions from isolated academic groups. Distinct populations, such as Indigenous communities and the Afro-descendant Garifuna, illustrate unique genetic profiles and founder effects with direct public health relevance. However, the practice of clinical genetics in Honduras faces major barriers, including the absence of nationally trained specialists, limited diagnostic capacity, lack of neonatal screening legislation, and the absence of registries for genetic diseases. Recent initiatives, including civil society advocacy and the planned COCINH LAB-Honduras project, signal opportunities to advance diagnostics, research, and training. To fully realize this potential, Honduras must invest in human resources, establish legal and ethical frameworks, and foster regional and international collaborations. Strengthening clinical genetics is essential for Honduras to address its population's health needs and to ensure equitable access to modern genomic medicine.

Clinical genetics represents one of the most promising fields for transforming health systems in the 21st century. Its ability to explain the hereditary basis of disease, prevent complications, guide therapeutic decisions, and pave the way toward personalized medicine has made genetics a cornerstone of public health in many countries. However, in Honduras, despite isolated efforts in gene discovery by independent academic groups [1], the development of this discipline, both in research and clinical practice, remains incipient, facing significant structural challenges that demand urgent attention.

Corresponding author
Dr. Edwin Francisco Herrera-Paz

Email
eherrera@unicah.edu

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Genetic diversity in Honduras and relevance to public health

Honduras is located at the heart of the Central American isthmus and is home to a population of over 9 million people, resulting from admixture among Amerindian, European, and African ancestries in different proportions throughout the country. In addition, six recognized Indigenous groups (Lenca, Miskito, Tolupan, Pech, Tawahka, and Maya-Chortí) and a unique Afro-descendant community, the Garifuna, inhabit the country. This genetic tapestry offers invaluable opportunities for biomedical research but also presents clinical challenges: diseases with higher prevalence in specific communities, founder variants, and epidemiological patterns requiring tailored attention [2].

The Garifuna population, the most studied in the country, provides a paradigmatic case. Originating during the 17th century from the admixture of Red Caribs that inhabited the island of Saint Vincent in the Lesser Antilles, and Africans from the African Slave Trade that survived a shipwreck, this group experienced a severe founder effect when a small number of individuals (less than 3,000) were deported to the Honduran coast in the late 18th century [3]. The founder effects substantially differentiated the group from other African diaspora populations in the Americas [4].

Interestingly, the Garifuna have the region's highest fertility rates [3], and a notably high prevalence of bronchial asthma [5]. Recently in some communities, a pathogenic variant in the MYBPC3 gene (p.Arg495Gln) associated with hypertrophic cardiomyopathy was found in frequencies strikingly higher than those observed globally (personal communication, unpublished data). This finding was incidental, resulting from the screening of samples from a GWAS study on asthma [6]. Despite its substantial epidemiological relevance, it has not yet led to further clinical research, screening, or community-based interventions, underscoring the national system's limitations in conducting research and translating scientific knowledge into public health policy.

Limitations of clinical genetics in Honduras

The practice of clinical genetics in Honduras faces long-standing obstacles. There are no formal academic training programs in medical genetics, resulting in the absence of nationally trained specialists. Molecular testing capacity is limited to a few public laboratories, focusing mainly on forensic and paternity analyses. Some private laboratories offer molecular tests for infectious diseases, but access to genetic diagnostic studies—such as single-gene sequencing, multigene panels, or clinical exomes—almost always depends on patients' ability to send samples abroad, which is prohibitively expensive for most families.

Another critical gap is the absence of legislation on neonatal screening. Currently, Honduras has no laws mandating the early detection of congenital diseases, in contrast to practices established decades ago across much of Latin America. As a result, Honduran newborns are deprived of diagnoses that could prevent disability or early death.

The lack of national registries for genetic diseases also hampers health planning. Physicians and researchers face significant difficulties in accessing reliable epidemiological data on the prevalence of inherited disorders, reinforcing a vicious cycle: the lack of data prevents evidence-based public health policies, and the absence of policies perpetuates the invisibility of genetic diseases.

Recent initiatives and opportunities

Despite this discouraging landscape, there are hopeful signs. Local academic groups have contributed valuable research of national and international relevance, particularly in Indigenous and Afro-descendant populations [1-10]. Civil society organizations, such as FUNHEPA (https://funhepa.org/), have advocated to the National Congress and the Ministry of Health to develop facilities and legislate on neonatal screening. Results are still pending.

At the governmental level, a project called Complejo Científico Industrial Honduras (COCINH LAB-Honduras) stands out. This ambitious initiative includes facilities for the development and production of therapeutic drugs and medical devices to supply the Honduran healthcare system, and a genetics and genomics laboratory with capabilities in cytogenetics, whole-exome and whole-genome sequencing, biobanking, and bioinformatics. Additionally, alliances with academia will provide the country with undergraduate and postgraduate programs in human genetics and genomic medicine. Although still under development and its continuity subject to political changes, the realization of this project could represent an unprecedented qualitative leap in the country's diagnostic capacity.

Structural challenges

For these efforts to have a real impact, several structural challenges must be overcome. First, the country must invest in training human resources specialized in medical genetics and genomics, genetic counseling, and bioinformatics. Without trained professionals, even state-of-the-art infrastructure risks becoming underutilized.

Second, legal frameworks must be established, such as legislation to guarantee newborns' right to screening for congenital diseases, access to adequate genetic testing for patients with rare diseases, and laws to regulate ethical standards in genetic research. This step is not only a matter of public health but also of social justice.

Third, regional and international partnerships are imperative. Honduras can greatly benefit from collaborations with universities, research centers, other genetics and genomics laboratories in the region, and multilateral organizations that support technology transfer, training, and funding.

Conclusion

Clinical genetics in Honduras stands at a crossroads: on one hand, severe structural limitations have hindered its development; on the other, concrete opportunities exist that, if seized, could radically transform the landscape of the discipline within a few years.

The genetic diversity of the Honduran population, far from being an insurmountable challenge, consti-

tutes a unique scientific resource with direct implications for public health. Yet this potential will only be realized if the country commits to clear investments in human resources training, legislation, institutional strengthening, and international collaboration.

It is urgent for health authorities, academia, civil society, and international partners to recognize that clinical genetics is not a luxury but a necessity for guaranteeing the right to health in modern societies.

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