UNIVERSITY OF CATANIA

Department of Medical, Surgical Sciences and Advanced Technologies "G.F. Ingrassia"

PhD Program in

PUBLIC HEALTH AND CLINICAL RESEARCH

Program Overview

Administrative seat	University of Catania
Department	Medical, Surgical Sciences and Advanced Technologies "G.F. Ingrassia"
Teaching location	Catania, Italy
Program duration	3 years
Coordinator	Prof. Giuseppe A. Palumbo, Full Professor of Hematology (MEDS-09/B)
Curricula	Precision Medicine and Innovation Technology in Clinical and Surgical Research – Environmental Health – Forensic Sciences – Clinical Research and Neurosciences

Program Overview

The PhD Program in Public Health and Clinical Research is an advanced academic and scientific training program of the University of Catania, promoted by the Department of Medical, Surgical Sciences and Advanced Technologies "G.F. Ingrassia". The program is designed to train highly qualified researchers with a solid methodological, theoretical and applied background in public health, nursing science, clinical research and translational medicine, able to rigorously address emerging challenges in health promotion, prevention, diagnosis, therapy and healthcare system management.

The training project adopts an integrated and systemic approach to health, combining biomedical sciences, social sciences applied to health, epidemiology, biostatistics, public health, nursing science and the most advanced digital technologies, in line with the One Health approach and the Planetary Health perspective, and consistent with the goals of the 2030 Agenda for Sustainable Development. The program places strong emphasis on translational research, understood as a continuous process linking basic research, development and clinical application, turning fundamental scientific discoveries into concrete solutions for diagnosis, treatment, care and prevention.

The curriculum is modular and flexible: PhD candidates can tailor their research pathway by choosing among several highly specialized thematic tracks, with particular focus on precision medicine, pharmacogenomics, innovative diagnostic and surgical technologies, molecular epidemiology, multi-omics analysis, artificial intelligence applied to healthcare, and health big data analytics.

Training Objectives

The program aims to train a new generation of researchers and professionals able to address, critically and innovatively, the complex health challenges of contemporary local, national and global contexts. In particular, the training pathway is designed to develop the following competences:

- design, conduct and analysis of epidemiological, observational and experimental studies, as well as clinical, translational and health-services research;
- critical appraisal of the scientific literature and independent production of original research contributions;
- use of advanced statistical methods and management of large, heterogeneous health datasets (big data), including clinical registries, administrative databases and health information systems;
- application of computational techniques, artificial intelligence and machine learning to the development of predictive models and clinical decision-support systems;
- integration of molecular, genetic, omics, digital and technological approaches for the design of personalized diagnostic-therapeutic pathways, in both adult and paediatric settings;
- enhancement of the health professions, with particular reference to nursing research and the validation of innovative care-organization models;
- impact evaluation of health policies, social determinants of health and equity of access to care;
- effective communication of research findings in academic, institutional and international settings.

Upon completion of the program, graduates will be able to work within multidisciplinary research teams, to design and lead complex research projects, and to take on roles of responsibility and leadership in biomedical research, public health, healthcare institutions and international organizations.

Curricula

The Doctoral Program is organized into four curricula, allowing candidates to develop specialist expertise in complementary thematic areas:

1. Precision Medicine and Innovation Technology in Clinical and Surgical Research

Trains researchers specialized in precision medicine and in technological innovation applied to clinical, surgical, epidemiological and preventive research, including pediatric settings. The curriculum develops competences in the design of personalized diagnostic and therapeutic solutions through the use of biomarkers, multi-omics analysis, artificial intelligence, surgical robotics, advanced imaging and clinical decision-support systems, following the principles of P4 medicine (predictive, preventive, personalized, participatory).

2. Environmental Health

Trains researchers in epidemiology focused on the environmental determinants of health, following the One Health approach and the Planetary Health perspective. The pathway integrates general and environmental epidemiology, hygiene, preventive medicine, toxicology and environmental sciences, with particular attention to the study of the exposome, human biomonitoring, GIS systems and predictive models supporting sustainable health and environmental policies. It also includes in-depth study of organizational models for community-based and hospital nursing care.

3. Forensic Sciences

Trains researchers with advanced expertise in forensic pathology, toxicology and forensic genetics. The curriculum integrates forensic pathology, legal medicine, pharmacology, genetics and toxicology, with a strong experimental component dedicated to the characterization of new post-mortem diagnostic markers and new biomarkers of exposure, effect or harm, including in the context of sudden cardiac death and the abuse of doping substances.

4. Clinical Research and Neurosciences

Trains researchers able to integrate clinical, neuro-epidemiological and neuro-scientific competences with advanced biomedical research methodologies. The pathway explores the epidemiology and pathophysiology of neurological and psychiatric diseases, neurophysiological and neuroimaging techniques, the use of biomarkers and kinematic monitoring systems, with a strong translational orientation and a focus on artificial intelligence applied to neuroscience.

Structure of the Training Pathway

The doctoral pathway lasts three years and is organized progressively, with common cross-cutting courses in the first year and specialized, curriculum-specific activities in the following years. Scheduled teaching covers scientific research methodology, biomedical statistics, research ethics and scientific integrity, scientific writing and communication, and artificial intelligence applied to digital health, alongside specialist modules specific to each curriculum.

The training project is complemented by a wide range of integrative activities:

- cross-cutting seminars on research methodology, ethics, international regulation (ICH-GCP, GDPR), scientific writing, competitive grant design (Horizon Europe, PRIN, PNRR) and technology transfer;
- curriculum-specific seminars delivered by experts from academia, clinical practice and industry;
- laboratory activities, both common and specialized, carried out at the Department's facilities and at partner institutions, in Italy and abroad;
- interdisciplinary rotations, internships and periods of mobility and research at national and international partner institutions;
- teaching support and tutoring activities, as well as third-mission activities.

International mobility is actively encouraged, with research periods envisaged both in Italy and abroad, at partner institutions or external organizations, to strengthen the international dimension of the doctoral training.

Career Opportunities

Graduates of the PhD Program in Public Health and Clinical Research acquire advanced, transversal competences that make them highly qualified profiles for a wide range of professional pathways, in academic, clinical, institutional and industrial settings, at national and international level, including:

- universities and academic institutions, for careers in scientific research and teaching;
- public and private research organizations, foundations and Centers of excellence in the biomedical, clinical, nursing and public-health fields;
- national and international health regulatory and planning bodies (Ministry of Health, National Institute of Health, WHO, OECD, EMA, ECDC);
- facilities of the National and Regional Health Service (local health authorities, hospital trusts, IRCCS research hospitals, university hospitals);
- epidemiology, medical statistics and Health Technology Assessment (HTA) services;
- the biomedical and pharmaceutical industry, in areas such as research and development, medical affairs, market access and pharmacovigilance;
- international organizations, multilateral agencies and NGOs engaged in health cooperation and global health promotion.

For professionals with a nursing background, the doctorate also represents a privileged pathway to academic, managerial and nursing-research coordination roles.

Admission Requirements and Procedures

Applications are open to candidates holding a Master's degree (Laurea Magistrale), an equivalent Italian qualification, or a university degree obtained abroad recognized as suitable for admission. Candidates are selected on the basis of an evaluation of qualifications, an oral examination and the presentation of a research project. Admission procedures, specific requirements for candidates who graduated abroad, and deadlines are published, for each cycle, in the relevant call for applications available on the University's website.

Facilities and Resources for PhD Candidates

PhD candidates have access to the scientific facilities of the Department of Medical, Surgical Sciences and Advanced Technologies “G.F. Ingrassia”, which include laboratories of cyto-histopathology, molecular epidemiology, environmental and food hygiene, forensic histopathology, forensic toxicology, forensic genetics, cell culture, cytogenetics, cytofluorimetry, and molecular biology and HLA, together with a regional reference laboratory for HIV surveillance and Legionella control.

Candidates also have access to the Library of the School of Medicine, with an extensive collection of volumes and access to leading biomedical databases and journals (PubMed, Web of Science, Scopus, UpToDate, Cochrane), multimedia classrooms equipped for teaching and computing, and the scientific software made available by the University for statistical analysis, bioinformatics and research data management.