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Review Article

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Public Health Research in Italy: European Projects, Funding and Innovation

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ABSTRACT
Italy has established itself as a major player in the field of biomedical and health research, through an evolving system combining scientific excellence, technological innovation, international collaboration, strategic investment policies and a commitment to a model of sustainable and inclusive development. This paper aims to analyse the transformation of the public health system into a model of responsible innovation and excellence, capable of responding to the challenges of a rapidly changing world

Keywords: Projects, Funding, Challenges, Impact, Regulation

Introduction Examples of Excellence Research Projects

Public health research is a pillar for scientific progress, improved care and the sustainability of the national health system. In Italy, this sector is distinguished by a tradition of excellence, with international research centres, cutting-edge universities and networks of clinical excellence. However, addressing health challenges such as pandemics, chronic diseases, inequalities in access to care and emerging new pathologies requires a continuous strengthening of resources, skills and partnerships. In this context, European funding represents a strategic opportunity to strengthen our country's research capabilities, fostering synergies between public, private and academic bodies, and stimulating technological and clinical innovation. Italy, through its active participation in programmes such as Horizon Europe, PNRR and other European instruments, has funded impact research projects, which help it to position itself as an actor on the scientific scene [1,2].

The public research landscape in Italy: infrastructures and centres of excellence. Italy has a diverse network of research facilities, such as the IRCCS (Institutes of Scientific Shelter and Care), universities, CNR research centres and other public bodies. These centres are linked to public and private hospitals, creating a clinical and translational research ecosystem that facilitates the translation of laboratory discoveries into therapies and diagnostic tools.

In recent years, public and European funds have been invested to modernise research infrastructures with advanced technologies such as genomic sequencers, high-resolution imaging systems, bioinformatics laboratories and artificial intelligence platforms. However, there are still problems with the fragmentation of resources, a shortage of highly qualified personnel and difficulties in attracting private investment into certain strategic areas of research [3,4]. The pandemic emergency prompted Italy to mobilize resources and expertise for a rapid and effective response not only to global health emergencies, but also in other sectors as described below. Major projects include:

"Together for COVID": coordinated by the ISS and involving numerous research centers and hospitals, it produced epidemiological and genomic studies, contributing to the monitoring of variants and to the evaluation of the effectiveness of vaccines and therapies.

E-health and telemedicine: remote monitoring platforms are revolutionizing the management of chronic diseases, reducing hospitalizations and improving patients' quality of life. An

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example is "eHealthItaly", which involved 15,000 patients and reduced hospitalizations by 25%.

Research and Innovation: Recent Data and Trends

According to MIUR and ISTAT data, Italy invests about 1.5% of GDP in Research and Development, below the European average of 2.2%. The share of public resources devoted to health research represents about 20-25% of total R & D investment, highlighting the strategic focus on the health sector. In the European context, Italy participates in Horizon Europe, which is the main funding programme for research and innovation. Between 2021 and 2023, Italy received around €1.6 billion in funding, contributing to some 400 projects. Among the most funded areas are genomics, digital health, personalised therapies and emergency preparedness [5].

European Funding: Successful Instruments and Projects

Horizon Europe, with a budget of around EUR 95 billion, is Europe's main source of funding for research. The "Health" component focuses on rare diseases, digital health, personalised care technologies and emergency preparedness. Italy has obtained about 1.6 billion euros in the period 2021-2023, participating in more than 400 projects. Among the most representative: "Epi-Detect": development of artificial intelligence systems for early diagnosis of Alzheimer's and Parkinson's disease, with over €4 million in funding. Involves IRCCS Fondazione Mondino and universities such as Bologna and Milan.

"EU Rare Genomics": a European network for genetic diagnosis and innovative therapies for rare diseases, with €7 million in funding, coordinated by IRCCS TIGEM and the University of Naples.

"DigitalHealthEU": digital ecosystem for the management of health data, telemedicine and big data analysis, with 15 million euros of investment, involving INAIL, the Agency for Digital Italy and several universities.

"COVID-19 Dynamic Response": surveillance tools and predictive models for emerging variants of SARS-CoV-2, with 5 million euros, to improve the response to epidemics.

Other financing instruments are to be reported as:European Innovation Council (EIC): supports Italian startups such as BioRep and EryDel in the development of personalized therapies and innovative delivery technologies.

"EU4Health": with some €5 billion, it strengthens emergency response systems and health surveillance networks.European Reference Networks: networks of highly specialised centres for rare diseases and complex pathologies, in which Italy plays an active role, encouraging the sharing of resources and expertise at European level [6].

Innovation and Future Trends and Challenges in European Research

Innovation is a pillar for the progress of medicine and health. New therapies, technologies, advanced medical devices and innovative diagnostic approaches have the potential to improve the quality of care, reduce diagnosis and treatment times and address emerging health challenges. However, this rush to innovation must be balanced with the need to ensure safety, efficacy and reliability for patients. In recent years, regulatory authorities such as the AIFA in Italy and the EMA at European level have adopted new strategies and tools to facilitate the introduction of innovations into the market without compromising safety standards. In emergency situations, such as the COVID-19 pandemic, faster processes for approval of vaccines and drugs have been introduced, through procedures such as conditional authorisation or accelerated approval. These tools allow innovative products to be brought to market more quickly, provided they are monitored during use. For advanced medical devices, such as those based on digital technologies, artificial intelligence or biotechnology, specific regulations have been developed that facilitate innovation and experimentation while maintaining high safety standards. In addition, collaborative programmes such as public-private partnerships promote the development of solutions and allow them to be tested in controlled environments, reducing development and approval times. Some countries are creating "regulatory sandboxes" or experimental laboratories, which allow new technologies or practices to be tested in a controlled way, with temporary and flexible rules [7].

Looking to the future, Italy is preparing for tomorrow's challenges by focusing on emerging technologies such as synthetic biology, with artificial organisms and molecules designed in the laboratory, and robotics, with surgical and assistive robots improving the accuracy and safety of medical procedures. Artificial intelligence will continue to be a key tool for analysing large epidemiological datasets, modelling epidemics and optimising health resources. These innovations pose major challenges, such as the sustainability of public funding, the ethical regulation of new technologies, attracting talent and reducing inequalities in access to advanced services. However, the opportunities are immense: harnessing the convergence of AI, nanotechnology and synthetic biology can lead to breakthrough therapies, improving people's quality of life and longevity.

New health challenges will require more resilient systems, with advanced epidemiological surveillance networks, predictive models and rapid response capabilities, through international collaboration and the adoption of innovative technologies in addressing global health pandemics and crises.

In the future, the digitalisation of the health sector is expected to accelerate with investments in interoperable systems, artificial intelligence, big data analysis and telemedicine. The creation of integrated digital ecosystems between public, private and citizens will improve the quality of care, prevention and efficiency of services.

Genetic technologies, such as gene therapy and personalised medicine, will become central to intervention strategies. Research projects will focus on the identification of predictive biomarkers and the development of tailor-made therapies for rare, oncology and neurodegenerative diseases. The future of European research will be based on collaborative networks between universities, public authorities, biotech companies

and start-ups. The multidisciplinary nature and integration of biomedical sciences, informatics, engineering and social sciences is an element in developing innovative solutions.

Impacts, Prospects, Chances

In conclusion, Italy has a wealth of skills, infrastructure and innovation capacity that puts it in a good position to become a global leader in the field of biomedical and digital research. Supporting this evolution means investing in new technologies, strengthening public-private partnerships, promoting long-term policies oriented towards sustainability and ethics, and actively involving citizens and stakeholders. Only in this way will the Italian public health system be able to successfully face future challenges, offering high-quality services and contributing to an innovative, inclusive and sustainable healthcare model.

Participation in European programmes enables Italy to strengthen its research and innovation capacities, attract talent and investment, as well as accelerate the development of innovative therapies and technologies, reducing translation times from basic research to clinical practice. Another area of development concerns the creation of international networks of excellence, sharing data, resources and expertise, promoting the training of professionals and competent in the health sector and biotechnology.

In order to consolidate results, it is crucial to increase public R & D investment to 2% of GDP, develop interoperable data infrastructures, and encourage public-private collaboration.

Research policies will also aim to promote environmental and social sustainability, reduce inequalities in access to care and foster the inclusion of vulnerable and marginalised populations Health research in Italy, supported by European funding, is developing and innovating. The opportunities of European programmes are a driver for growth and excellence, which can help improve health, system competitiveness and sustainability of welfare. In order to meet the challenges ahead, continued commitment, a targeted investment strategy and collaboration between the actors involved are required. This is the only way to build an innovative, inclusive and resilient health system capable of responding to the needs of a constantly changing society.

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