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## Modern approaches to Epidemiology

Climate change, Artificial Intelligence, genetics and biomarkers were the main themes at the 7th Event in memory of Professor Dimitris Trichopoulos,

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**C**limate change , Artificial Intelligence , genetics and biomarkers were the main themes at the 7th Event in memory of Professor Dimitris

Trichopoulos, within the framework of the 51st Annual Panhellenic Medical Congress of the Athens Medical Society, entitled "Modern Approaches to Epidemiology".

The special session was attended by Konstantinos Tsilidis, Clea Katsougianni, Christos Papadimitriou and Periklis Makrythanasis. The speakers were introduced by the Emeritus Professor of Medicine of the National University of Athens, Mrs. Antonia Trihopoulou.

The first to speak was Professor **Konstantinos Tsilidis** , University of Ioannina and Imperial College London, on the

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topic "The role of OMIKS data in epidemiological research".

As he pointed out, until recently, most molecular epidemiology studies were limited to measuring a few biomarkers to assess their association with disease prevention, diagnosis, treatment and prognosis. In recent years, rapid technological developments in the field of molecular biology and chemistry, combined with lower costs, have allowed the measurement of hundreds and/or thousands of biomarkers in large samples of epidemiological studies. These biomarkers come from different hierarchical levels of biological organization and include, among others, the genome, the epigenome, the transcriptome, the proteome and the metabolome.

This extremely rich biological information helps us to better understand the human body's response to external stimuli and risk factors (e.g. diet, smoking, air pollution) and how we behave biologically in health and disease, with the ultimate goal of improving public health and clinical medicine. During his speech, Mr. Tsilidis presented the characteristics of omic biomarkers, the possibilities and challenges of their use and their contribution to the future improvement of medical precision.

Afterwards, Ms. **Clea Katsougianni**, Emeritus Professor of the National University of Athens and Professor of Public Health, Imperial College London, delivered her speech on the topic "Climate change and health: modern methodological approaches".

According to Ms. Katsougianni, climate change affects human health in many direct and indirect ways, including changes in the natural environment, social and economic conditions, as well as the functioning of health systems. Thus, in addition to the direct effects related to temperature increases and changes in meteorological conditions or extraordinary catastrophic events, it can also act as a multiplier of indirect effects, jeopardizing the progress achieved in health issues in recent decades. The effects on health include, among others, an increase in mortality and the incidence of non-communicable diseases, the emergence and spread of infectious diseases and emergencies with consequences for public health.

According to a WHO estimate, between 2030 and 2050, an additional 250,000 deaths per year will occur globally, related to climate change, from malnutrition, malaria, diarrhea and increased temperatures alone. The Intergovernmental Panel on Climate Change (IPCC) reports that the risks from climate change are occurring faster and more intensely than expected, making adaptation to new conditions significantly more difficult.

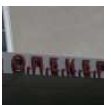


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Although we already have this evidence, there are also many methodological challenges related to the quantitative expression of the correlations that should be used to calculate the effects of climate change on health in the future, based on IPCC scenarios or others, which take into account specific policies of local importance.

Mr. **Christos Papadimitriou** , Member of the Academy of Athens, spoke about the “Role of Artificial Intelligence in Medical Research”. As he said, Artificial Intelligence (AI) has made impressive progress since 2012 – it is as if antibiotics, anesthesia and insulin were discovered in medicine within a decade. AI promises to improve our lives and our health, to greatly influence medical research and to radically change the medical profession. Approximately four articles on the use of AI in medical research are published daily, while the major medical journals Lancet and NEJM have started new journals specialized in the applications of AI in medicine.

Areas of medical research in which AI seems to have particularly many applications are oncology, pathology, ophthalmology, molecular biology, cardiology, pharmacology and clinical trials, epidemiology, as well as nutrition research: the important branch of medical science that the honoree Dimitris Trichopoulos brilliantly addressed. Finally, he also referred to the problem of explainability – that is, how an AI program will be able to justify its decisions – which is of course particularly crucial in medical applications.

Mr. **Pericles Makrythanasis** , Assistant Professor at the National University of Athens, referred in his speech to the "Role of Genetics in Epidemiological Research". As he mentioned, genetics is now an integral tool in epidemiological research, offering valuable knowledge about the factors that contribute to the occurrence and progression of diseases in the population. Understanding genetic predisposition allows the identification of individuals with an increased risk of developing common multifactorial diseases, such as cardiovascular diseases, cancers and psychiatric disorders, contributing to prevention in the context of Precision Medicine. Through large-scale genome-wide association studies (GWAS), thousands of genetic variants have been identified that influence the occurrence and progression of these diseases.

The integration of these data into epidemiology allows for a deeper understanding of the pathogenesis of diseases, the underlying molecular mechanisms and at the same time is used to develop polygenic risk scores, enhancing the possibility of prediction and early intervention. In addition, the contribution of genetics to epidemiological research is also crucial for the interpretation of variants identified in patients with rare diseases. The existence of large databases of genomic

information from the general population (such as gnomAD, AllofUS, etc.) allows for the comparison of the frequency of variants in patients with that in the healthy population. This comparative population character is essential for the characterization of variants to document causal relationships with rare genetic syndromes, while it is also a key tool for the discovery of new genes responsible for monogenic diseases and ultimately for a better understanding of the structure and function of the genome.

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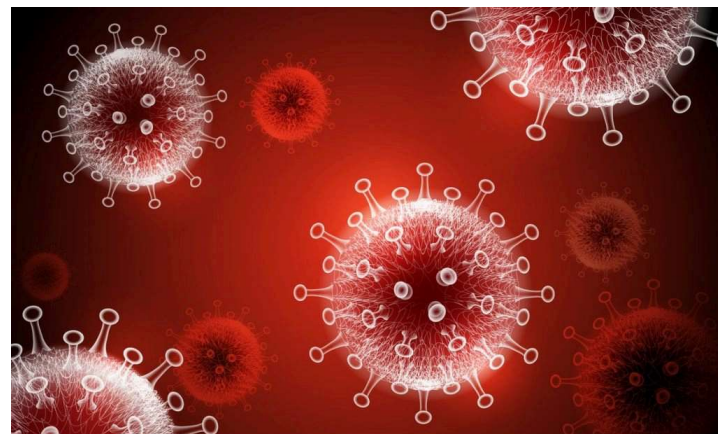


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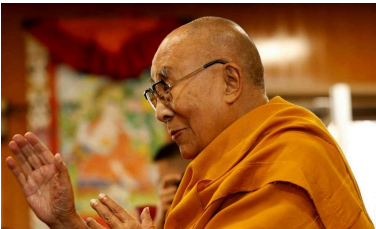
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