

## A LETTER FROM

BELGRADE, SERBIA

# Why Should Medical Practitioners Be the Goalkeepers of Medical Data Analysis?

– *Written by Natasa Milic and Vedrana Pavlovic, Serbia*

Biomedical science is radically changing. According to Medline, over 1.5 million peer-reviewed papers were published in 2022, marking an era of academic overproduction. Once reserved for dedicated health professionals, scientific research is now the vocation of many — possibly too many. With the tendency toward greater output come unavoidable risks, including the proliferation of publications with marginal relevance and a lack of scientific rigor. Quantity over quality equals counting over resounding, thus casting doubt on the medical community and impeding scientific progress. To restore balance, we must learn how to differentiate the good from the bad. To create and recognize the work that matters, we must make sense of the gathered data and hone our ability to interpret it. The solution? We posit no progress without the foundation — biostatistics.

To successfully apply statistical methods and advance high-quality healthcare

research, a biostatistician needs not only advanced statistical skills but also fundamental medical knowledge and effective communication abilities. With such broad requirements, focusing on technical development is often prioritized and increasingly incentivized. Without proper medical input and the accompanying ability for contextual critical thinking, biostatistics is at risk of reducing itself to pure data science.

At the Institute for Medical Statistics and Informatics, Faculty of Medicine, University of Belgrade, Serbia, we recognize the biostatistician's role in medical research, which requires both technical and social skills while building and maintaining core competencies as a scientist. In a world where data is the currency of communication, biostatisticians have a unique role in setting up the studies, generating and interpreting the research outputs, and also providing guidance for further development to collaborators.

As medical practitioners who perform biomedical data analyses, our mission is to support students, doctors, and researchers to become modern-day scientists and help them understand the fundamental

principles (and practices) of biostatistics throughout their entire educational journey. Methodologies about data collection, analysis, and critical appraisal of results are focal points across the curriculum, while fostering interdisciplinary collaboration with fellow colleagues and scientists. Observing patterns is a common denominator throughout the life sciences; however, biostatisticians are in the best position to formalize it. As healthcare research now frequently includes engineers, programmers, mathematicians, and other academic and industry members, we hold ourselves to high education standards to ensure our students are equipped for the modern era of healthcare research.

What constitutes a modern-day biostatistician? A thorough understanding of the research field that leads to an appropriate study design on the grounds of an evidence-based methodology; conducting research as part of an interdisciplinary team; applying appropriate statistical models to analyze the data and critically evaluate the findings; translating findings into clinically meaningful conclusions with relevant limitations; and, whenever possible, generalizing study results with recommendations for both clinical practice



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**Image:** Institute for Medical Statistics & Informatics, University of Belgrade Medical Faculty Belgrade, Serbia

and research directions. Among patients, physicians, decision-makers, and other scientists, biostatisticians see the “big picture” and orient the overall research process from start to finish in the right direction.

This approach allowed our Institute and its members to advance medical science through a wide range of research fields, including preclinical and clinical studies. We used systematic reviews, meta-analyses, and economic analyses to assess population health and health technologies. We champion modern approaches to multi-omics research and expand our capabilities with machine learning. The outputs of our work led to several exceptional research papers by our team members, who participated in multidisciplinary national and international projects funded by the European Commission and the US National Institute of Health (NIH). The joint research with the Mayo Clinic in Rochester, USA, led to the recognition of new risk factors for cardiovascular diseases, now incorporated into the official recommendations of both European and American societies.

Research outputs produced by our team have had a global impact, improving the transparency and reproducibility of

reporting results in biomedical science, pointing out the widespread use of inappropriate statistical methods, and leading to numerous initiatives to modernize education. The Institute for Medical Statistics and Informatics at the University of Belgrade has been developing tools and strategies to promote education and the dissemination of statistical knowledge in the broader scientific community. Such efforts have led to changes in instructions for data visualization and reporting in high-impact biomedical journals, as evidence of our ongoing duty to promote objectivity in scientific research.

#### Further Reading

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2. Pavlovic V, Weissgerber T, Stanisavljevic D, Pekmezovic T, Milicevic O, Lazovic JM, Cirkovic A, Savic M, Rajovic N, Piperac P, Djuric N, Madzarevic P, Dimitrijevic A, Randjelovic S, Nestorovic E, Akinyombo R, Pavlovic A, Ghamrawi R, Garovic V, Milic N. *How accurate are citations of frequently cited papers in biomedical literature?* *Clin Sci (Lond).* 2021;135(5):671-681.
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4. Weissgerber TL, Garovic VD, Milin-Lazovic JS, Winham SJ, Obradovic Z, Trzeciakowski JP, Milic NM. *Reinventing Biostatistics Education for Basic Scientists.* *PLoS Biol.* 2016;14(4):e1002430.
5. Weissgerber TL, Milic NM, Winham SJ, Garovic VD. *Beyond bar and line graphs: time for a new data presentation paradigm.* *PLoS Biol.* 2015;13(4):e1002128.

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