

INTEGRATIVE BIO/GEOMEDICINE AND HEALTH FOR ALL IN THE AI AGE

Miro Jakovljević¹ & Milenko Bevanda²

¹University of Zagreb, School of Medicine, Zagreb, Croatia

²University of Mostar, School of Medicine, Mostar, Bosnia and Herzegovina

SUMMARY

Bio/Geomedicine with AI represents a powerful intersection between geography, medicine, and technology to improve medical understanding, prediction, decision-making and therapeutic effectiveness as well as health promotion and diseases prevention. This intersection provides a holistic transdisciplinary understanding of how life, environment, and health affect each other in order to promote health at all levels and predict, prevent, and manage diseases through an eco-geographical model. Human health is significantly influenced by the places where people live and work, including natural, man-made and social environments. Bio/geomedicine involves environmental epidemiology, public health planning and precision medicine and gives a hope for integrative holistic health care.

Key words: integrative medicine, geohealth, medical geology, bio/geomedicine, health for all, artificial intelligence.

INTRODUCTION

In the past three decades much interests has been attracted by bio/geomedicine and geohealth concepts around the globe. Geohealth (geography and public/global health) is the discipline that focuses on the natural environment has impacted the health of plants, animals and humans (Finkelman 2025). Bio/Geomedicine (geography and personalized medicine) using artificial intelligence and modern technology may help physicians in more precise clinical understanding of their patients and more successful health care. The concept of bio/geomedicine is not new, it has a long past but a short history. It is well known that there is a strong connection between human and animal health and the state of environment. The ancient Greek Physician Hippocrates (ca.460-370 BC), known to history as the “Father of Medicine” and the ancient Greek philosopher Aristotle (384-322 BC) recognized connection between the places in people live and their respective influence on individual and collective health. Paracelsus (1493-1541) called the “father of pharmacology” claimed that “all substances are poisons”... and “the right dosage differentiates a poison and a remedy”. Medical geology is a field of geomedicine studying the relationship between natural geological factors and their effects on human health.

“Health for all in the 21st century” aims to help realize the vision of “Health for All”, launched at the Alma-Ata conference in 1978. Committed action at all levels – global, regional, national and local – will be crucial to transforming the “Health for all and All for Health” vision into a practical and sustainable public and global health reality. This proclamation of the World Health Organization (WHO) is fundamental to achieve that every individual has access to the health services

they need, regardless of the geographical position and economic status. Bio/Geomedicine with AI represent as a powerful intersection between geography, medicine, and technology may improve medical understanding, prediction, decision-making and treatment outcome in medical care and diseases prevention and likewise health promotion.

BIO/GEOMEDICINE: AN INTEGRATIVE HOLISTIC APPROACH

Bio/Geomedicine is a more and more important interdisciplinary and integrative field that studies the interaction between the environment and health at all levels, from individual, to public and global level. The air we breathe, the food we eat, the water we drink, and the ecosystems which sustain us are estimated to be responsible for 23 per cent of all death worldwide (Setia et al. 2016). The ultimate goals of health promotion as well as disease prediction, prevention, and person-centered treatment can be achieved with various disciplines to collaborate together and complement each other in additive (multidisciplinary), interactive (interdisciplinary) and holistic (transdisciplinary) way (see Kamel Boulos & Le Blond 2016). The focus of bio/geomedicine is on the impact of various factors such as climate specifics and changes, industrialization, agricultural production, deforestation, water and air pollution, demographic changes, population growth and e/migrations, natural disasters, political and socio-economic transformations, and cultural practices in the health-disease-illness processes. For bio/geomedicine as an interdisciplinary and intersectorial field according the concept “One health – One medicine” the earth as well as the population and its environment is the patient (see Roa-Castellanos et al. 2016). The environment form

people as the environment are formed by people. Health is strongly influenced by the physical, social, mental, spiritual, cultural, economic, and political environment of the communities in which we live. Good health is both a resource for, and an aim of development at all levels.

The three terms *bionomia* (law or order of life), *biophilia* (love of life and nature) and *bioempathy* (ethical understanding of all life) are cornerstones of better understanding bio/geomedicine and human-nature/environment relationship. *Bionomia* refers to the principles or laws that govern life and how living beings interact with their environment. It represents the concept of natural order, sustainability, ecological harmony and balance. It is interesting that Erich Fromm coined the term “*biophilia*” meaning “passionate love of life and of all that is alive” what refers in general to the innate human affinity for nature and living beings. *Biophilia* represents the concept of connection, attraction, well-being, and nature-inspired design. *Bioempathy* is the capacity to cognitively understand and emotionally respect life from the perspective of other living beings, animals, plants, and ecosystems. Emphasizing individual, family, community and public commitment to health literacy is the best way towards health promotion.

Artificial intelligence (AI) enhances bio/geomedicine by analyzing vast and complex datasets that traditional statistical methods struggle with detecting patterns, make predestinations, and provide personalized recommendations based on spatial and environmental data. Geographic information system (GIS) is “computerized system that relates and displays data collected from a geographic entity in the form of a map (see Setia et al. 2016). Moulding of AI and the GIS dimension creates geospatial artificial intelligence (GeoAI), a more intelligent, predictive, and automated analysis. The use of GeoAI in medicine has tremendous potential in changing the way we understand, diagnose, and respond to health issues as well as in improving public health and addressing global health challenges (Amponsah et al. 2023). Precision medicine is an effort to tailor prevention and treatment strategies through considering individual variability in genetics, environment and life-style. Bio/geomedicine has the potential to transform the way physicians see patients and to provide a more holistic view of the many hidden factors that often defeat achieving successful long-term health outcomes (Setia et al. 2016). Applications of AI in precision medicine have included using machine learning for prediction of patient diagnosis and outcome (Kamel Boulos et al. 2019).

HEALTH FOR ALL IN THE 21ST CENTURY: IS IT UTOPIAN VISION IN AN ANTIUTOPIAN WORLD?

“Our task must be to free ourselves...by widening our circle of compassion to embrace all living creatures and the whole nature and its beauty.”

– Albert Einstein (1879-1955)

“Health for all” is the slogan of an idealistic humanistic project of the World Health Organization (WHO) that has been initiated in the 1970s to promote global health, human dignity, well-being and quality of life to be attained by the year 2000. “Health for All in the 21st century” is aimed to “provision of the highest attainable standard of health as a fundamental right; continued and strengthened application of ethics to health policy, research and service provision; implementation of equity-oriented policies and strategies that emphasize solidarity; and incorporation of a gender perspective into health policies and strategies (https://apps.who.int/gb/ebwha/pdf_files/EB101/pdfangl/ang8.pdf). “Health for all and All for Health” sounds as a utopia but we have still a real hope to make progress through the emphasizing culture of global mind to lay the foundations for the earth sustainability and global health enlightenment (Jakovljevic). It seems bio/geomedicine is moving toward becoming practical in contributing to global health, in other words to health for all. However, can “health for all” be achieved in a fundamentally unequal world and within capitalistic system in which the goals of equity, egalitarianism and inclusion are undervalued by commodification, profit-making, inequality and division (Kehr et al. 2023). The concept “health for all” is related to concepts of human rights for all, social justice, solidarity and culture of empathization. Bio/geomedicine and “health for all” attend to language of ethical universalism, epistemic justice, and global health, collective welfare and social security. Bio/geomedicine may be a great support to “WHO as the world’s health conscience to advocate global health and health equity between and within countries; identify policies and practices that benefit or harm health; and protect the health of vulnerable and poor communities (https://apps.who.int/gb/ebwha/pdf_files/EB101/pdfangl/ang8.pdf). Health for all as one of the conceptual foundations for empathic civilizations in the age of the clash of civilizations can be a powerful bridge to peace.

CONCLUSIONS

In this century medical geology and bio/geomedicine have been recognized around the globe. Bio/Geomedicine is important interdisciplinary and integrative field that focuses on geographic location and environment into account when analyzing individual and public health. There is an emerging role for GeoAI in health and healthcare as location is an integral part of

both population and individual health. Health for all in the 21st century tends to ensure that everyone has access to essential health care and the opportunity to achieve appropriate health literacy and a high level of well-being enabling a productive life and self-actualization.

REFERENCES

1. Amponish, A., Latue, P., & Rakusa, H. (2023). *Utilization of GeoIA applications in the health sector: A review. Journal of Health Science and Medical Therapy*, 1:49-60.
2. Finkel, R.B. (2025). *Evolution from Medical Geology to GeoHealth and future development. China Geology*, 8:471-474.
3. Jakovljevic, M. Brave New Psychiatry (2024a): *Culture for empathy and mental health for all. Psychiatria Danubina*; 36(suppl 2):S9-S14
4. Jakovljevic, M. (2024b). *Global Mental Health Enlightenment and culture of empathy: How to navigate a world in existential crisis and wars. Psychiatria Danubina*; 36:287-292
5. Kamel Boulos, MN., Peng, G., VoPham, T. (2019): *An overview of GeoAI applications in health and healthcare. International Journal of Health Geographics* 18, article number 7
6. Kehr, J., Muinde, JVC., & Prince, R.J. (2023). *Health for all? Pasts, presents and futures of aspirations for universal healthcare. Social Science & Medicine* 339;115660
7. Roa-Castellanos, R.A., Anadon Baselga, M.J., & Capo Marti, M.A. (2016). *Biogeomedicine: The earth as the new patient for biomedical sciences under the "one health" concept facing climate change. Medicina Balear* 31(3):11-17
8. Setia, S., Singh, S., Mathur, A., Makkar, D.K. & Aggarwal, W.P. (2016). *Health care and geomedicine: A review. World Journal of Environmental Biosciences* 6; 1:1-3
9. World Health Organization: *Health for All in the 21st Century.*
https://apps.who.int/gb/ebwha/pdf_files/EB101/pdfanagl/ang8.pdf

Correspondence:

Miro Jakovljević, Professor Emeritus
School of Medicine, University of Zagreb
Šalata 3, 10000 Zagreb, Croatia
jakovljevic.miro@yahoo.com