

## From the Guest Editors:

### Artificial Intelligence and Big Data in the Health Sciences

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Artificial intelligence (AI) and big data are rapidly transforming the landscape of health sciences, from clinical care and biomedical discovery to population health and public health policy. Advances in machine learning, large-scale data integration, and digital health technologies are enabling new approaches to diagnosis, treatment personalization, disease prevention, and healthcare delivery. At the same time, these technologies raise important questions regarding trust, equity, governance, and responsible innovation. This issue of the *Delaware Journal of Public Health* highlights emerging developments at the intersection of AI, robotics, data science, and health systems, bringing together perspectives from clinicians, computer scientists and engineers, public health researchers, and policy leaders.

The contributions in this issue include 16 papers in five categories, reflecting the diverse ways AI is reshaping healthcare practice and research. Several articles explore **human–AI collaboration in care delivery**, including the integration of autonomous mobile robots and intelligent systems into clinical environments. These studies illustrate how nurses, physicians, and rehabilitation specialists are increasingly working alongside AI-enabled technologies, from collaborative robots to autonomous mobility systems, to enhance patient care, improve workflow efficiency, and support clinical decision-making. Importantly, these efforts emphasize that successful innovation requires careful design that centers on the expertise and needs of healthcare professionals.

Another set of articles examines the role of **biomedical intelligence and predictive health modeling**, highlighting how data-driven methods can deepen our understanding of complex biological systems and chronic diseases. Research on cognitive effort estimation, predictive modeling of blood glucose dynamics in type 1 diabetes, and large language models for clinical decision support demonstrates AI's growing capacity to extract insights from biomedical signals and clinical data. At the same time, authors in this section underscore the importance of addressing bias, ensuring model transparency, and developing appropriate training frameworks to enable emerging tools to be used safely and effectively.

Beyond clinical settings, AI and big data also hold promise for **community health and public health innovation**. Articles in this section illustrate how data infrastructure, wearable sensors, and digital interventions can support preventive health strategies, improve risk awareness, and promote healthier behaviors across communities. By integrating real-time data streams with behavioral and environmental information, public health systems may increasingly move toward proactive, personalized, and context-aware interventions.

Delaware provides a particularly compelling environment in which to explore these innovations. The state's **compact geography, integrated healthcare networks, and strong academic–health systems partnerships** create unique opportunities to test and deploy data-driven health technologies at scale. Institutions such as the University of Delaware, ChristianaCare, Nemours Children's Health, and the Delaware Division of Public Health have increasingly collaborated on initiatives spanning biomedical research, health data analytics, and community health programs.

This collaborative ecosystem enables researchers and practitioners to connect clinical insights with population-level data, accelerating the translation of digital health technologies into real-world impact.

At the same time, Delaware faces many of the same health challenges seen across the United States, including chronic diseases such as diabetes and cardiovascular disease, behavioral health needs, and health disparities across communities. AI and big data approaches offer new tools to address these challenges by enabling earlier risk detection, more personalized prevention strategies, and improved coordination across health systems and public health programs. With the right governance frameworks and community engagement, Delaware has the potential to serve as a **living laboratory for responsible, community-centered health innovation**.

Finally, the issue highlights the critical role of **policy, leadership, and responsible health transformation**. As AI becomes more embedded in healthcare systems, policymakers and institutional leaders must navigate complex challenges related to governance, regulation, workforce training, and ethical implementation. Contributions in this section discuss evolving vaccine policies, emerging industry partnerships, and strategic visions for responsible AI adoption in Delaware's health ecosystem.

Together, the articles in this special issue demonstrate that AI and bigdata in health sciences is not solely a technological development—it is an **interdisciplinary transformation** that requires collaboration across computer science, engineering, public health, and policy. The future of AI-enabled healthcare will depend not only on advances in algorithms and data infrastructure but also on thoughtful implementation, equitable access, and sustained engagement with the communities these technologies aim to serve.

We want to thank Dr. Omar Khan, the Editor-in-Chief of DJPH, for giving us the opportunity to serve as the guest editors of this timely and important special issue. The support from Dr. Kate Smith was greatly appreciated and instrumental in bringing this issue to completion. We hope the perspectives shared in this issue stimulate dialogue, inspire collaboration, and help position Delaware as a leader in the responsible integration of AI and big data into health sciences — ultimately improving the health and well-being of individuals and communities across the state and beyond.

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