

Editorial

The Impact of Artificial Intelligence and Emerging Technologies on Contemporary Public Health El impacto de la inteligencia artificial y las nuevas tecnologías en la salud pública actual

Arturo Salazar Campos ^{a*}

Public health stands at the threshold of its most profound transformation since the emergence of modern epidemiology in the 19th century. The transition from models based on retrospective observation toward systems driven by Artificial Intelligence (AI) and Information and Communication Technologies (ICT) represents more than a mere change in tools; it constitutes an epistemological shift in how societies protect life. Currently, public health must be understood as a complex digital ecosystem where data is the primary resource and algorithms serve as the engines of social equity. The capability to process massive volumes of information in microseconds is shifting the paradigm of prevention from a generalized concept to one of surgical precision.¹

Traditional surveillance –historically constrained by passive case reporting and the bureaucratic delays inherent in manual notification systems– is being superseded by Surveillance 4.0. This new architecture facilitates the processing of Big Data from non-traditional sources, such as pharmaceutical consumption patterns, mobility trends inferred from cellular signals, and sentiment analysis on digital platforms. Through machine learning, health systems can now identify early warning signals of infectious outbreaks or surges in chronic diseases days or even weeks ahead of conventional clinical methods.^{1,2} This "predictive capacity" is essential for the resilience of healthcare systems, enabling a transition from a reactive stance –which often lags behind– to a proactive approach that saves lives and optimizes public expenditure through early risk containment.²

A critical area of expansion, facilitated by new technologies, is public mental health. The integration of chatbots based on natural language processing and mood-monitoring applications enables large-scale intervention that traditional in-person systems cannot accommodate. These tools provide a primary level of care and screening that assists in identifying risks of depression or anxiety within the general population before they escalate into clinical crises.³ If managed appropriately, these technologies can significantly reduce the burden of mental illness at the population level, provided that technological support complements rather than replaces the human component in high-risk cases.⁴

Beyond logistics, the true value of these technologies lies in their ability to analyze the social determinants of health at scale. By cross-referencing data on housing, air quality, food security, and educational attainment with clinical indicators, public health departments can design precision territorial interventions. Furthermore, the convergence of AI with population genomics is paving the way for "Precision Public Health." This approach enables the identification of population subgroups with specific genetic predispositions to certain pathologies, allowing for personalized screening campaigns that are much more cost-effective than universal screening strategies.^{5,6}

However, the deployment of AI in public health is not without ethical and operational tensions. Current literature underscores that algorithmic efficiency must be balanced with rigorous data governance. While the integration of electronic health records and genomic data offer previously unprecedented personalization, it also poses significant risks to privacy and cybersecurity. The World Health Organization has emphasized that ethics must be at the core of health technology design, warning that algorithms can inherit and amplify human biases. Without absolute transparency in programming and auditing, these systems risk perpetuating discrimination against ethnic minorities or vulnerable socioeconomic groups.^{3,5}

Telehealth and mobile health (mHealth) have the potential to democratize access to specialized care by eliminating geographic barriers that have historically marginalized rural or remote populations.^{6,7} However, this gives rise to the "digital divide" paradox: if access to high-connectivity devices and bandwidth remains a privilege of social class, technology –far from acting as a social leveler– will emerge as a new determinant of inequity. Consequently, digital public health fundamentally requires robust public infrastructure and state-led digital literacy policies to ensure that no citizen is excluded from "algorithmic protection."^{7,8}

Within the context of administrative management, AI optimizes pharmaceutical supply chains, vaccine distribution, and hospital bed allocation through operations research models. During global health crises, these tools facilitate scenario simulations that assist decision-makers in evaluating the impact of interventions, such as lockdown or targeted vaccination strategies.⁹ Administrative efficiency driven by technology is more than a management concern; it is a fundamental public health issue, as it enables the reallocation of funds saved from inefficient processes toward direct patient care.¹⁰ In conclusion, the integration of AI and emerging

^a Área Académica de Medicina, Instituto de Ciencias de la Salud, Universidad Autónoma del Estado de Hidalgo. Pachuca, Hidalgo. Mexico, <https://orcid.org/0000-0002-2200-7970>, Email: arturo_salazar10347@uaeh.edu

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technologies represents the only viable path to addressing the challenges of an aging population, climate change, and an increasingly complex epidemiological landscape. Twenty-first-century public health should not be viewed merely as a discipline that "uses" technology, but as a science that fundamentally reinvents itself through it. The challenge for States, academic institutions, and managers lies in training transdisciplinary professionals capable of simultaneously interpreting code and social context. The ultimate goal must remain steadfast: to ensure that every technological advancement serves the paramount purpose of social justice, equity, and collective well-being.^{1,10}

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