COMMENTARY

Algorithmic governance in artificial intelligence-driven health systems: A southern African perspective

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The use of algorithmic systems in public health is expanding rapidly in southern Africa, particularly in areas such as disease prediction, resource allocation and personalised healthcare. While these technologies offer efficiencies, their outputs are shaped by the quality, representativeness and governance of the underlying data. Tools such as polygenic risk scores and pathogen genomics often underperform in black African populations owing to under-representation in genomic datasets, limiting clinical accuracy and access to precision health benefits. In low- and middle-income countries, these disparities are amplified by fragmented health data systems, limited digital infrastructure, and weak regulatory oversight. Such conditions undermine the ability to detect and correct algorithmic bias, increasing the risk that digital health tools perpetuate inequities affecting rural, low-income and marginalised populations. In this context, algorithmic systems may unintentionally reinforce existing health disparities. This commentary draws on the concept of biopolitics to highlight how algorithmic tools classify and manage populations through data-driven processes. It emphasises the need for greater transparency, inclusion and accountability in the development and deployment of these technologies. Aligning health technology assessment processes with equity-driven metrics and locally governed standards is essential to ensure that algorithmic governance supports, rather than undermines, equitable public health outcomes in the region.

Keywords. Algorithmic governance, algorithmic bias, public health, genomic under-representation, biopolitics

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Algorithmic systems in public health governance

Public health governance in southern Africa is embracing algorithmic technologies as vital instruments for allocating resources, predicting disease outbreaks, and personalising health interventions.[1] These systems, relying on complex datasets – including electronic health records, social determinants of health, and geographical risk factors – have already shown their utility in critical areas. For instance, during the COVID-19 pandemic, some countries used algorithms to determine vaccine distribution priorities based on factors such as age, comorbidities and geographical vulnerability.[2] Similarly, predictive tools have been employed to anticipate disease outbreaks, using real-time data such as weather patterns and mobility trends.[1] Social vulnerability mapping has further allowed public health entities to assess risks at the community level, focusing on areas of high need.[3] These examples demonstrate how algorithms transform populations into objects of measurement and intervention. By turning people into risk scores and intervention targets, such systems realise the biopolitical ambition of rendering populations observable and controllable.[4] At the same time, they raise urgent questions about their wider social effects.

Biopolitics and algorithmic population management

Foucault's[5] framework of biopolitics is particularly illuminating in this context. Biopolitics refers to the ways in which modern states govern populations using statistical, biomedical and regulatory means. In public health, this logic is evident in how data-driven systems aim to optimise health outcomes, reduce risk, and allocate resources efficiently.[4] However, such governance also entails forms of surveillance, normalisation and exclusion. Algorithmic systems regulate populations by embedding mechanisms that normalise behaviours, optimise health, and manage risks. Population management becomes a central function as these systems aggregate individual data into statistical models to classify risk and allocate resources. These forms of algorithmic population management are especially relevant in resource-constrained settings such as southern Africa, where decisions about allocation are deeply consequential. At the same time, these technologies

establish benchmarks for 'normal' health, potentially marginalising those who deviate from these standards.[4] Rural populations and individuals with rare conditions often find themselves excluded from such normative frameworks. Additionally, health technologies encourage self-surveillance and regulation, fostering a neoliberal ethos of personal responsibility in contexts where systemic support remains limited.

Data bias and genomic under-representation

As illustrated in Fig. 1, data-driven systems mediate public health governance by rendering populations visible, classifying them through statistical models, and shaping access to care through embedded norms and prioritisation rules. Despite their potential, algorithmic tools are not neutral – they are products of the societies and institutions that design them. As such, they inherit biases from their creators, training datasets, and implementation contexts.[6] In southern Africa, where healthcare access has historically been unequal, these biases can exacerbate existing disparities. Algorithms, dependent on data, often reflect the under-representation of rural populations, women, and low-income groups. This is particularly evident in biologically informed systems that estimate genetic susceptibility to complex diseases. In genomics, polygenic risk scores trained largely on European cohorts perform poorly in black African populations, reducing clinical utility and exacerbating inequity.[7,8] These limitations reflect broader structural inequities in biological data governance.[7] Black African populations remain under-represented in genomic research, and locally relevant molecular datasets are often generated through externally funded projects that afford limited regional oversight or benefit sharing. H3Africa shows how African-led governance can counter this by promoting data sovereignty and inclusive consent frameworks.[7] Yet national health technology assessment (HTA) processes seldom incorporate such standards, leaving policy gaps that permit opaque commercial deployments.[9]

These governance gaps, whether in national HTA processes or broader digital health policy, contribute to underdiagnoses in marginalised communities, limited inclusion of black African and rural populations in clinical trials, and a geographical focus that prioritises urban over rural areas.[6] The design of these algorithms also carries subjective choices that can entrench inequities.[10] Indicators such as economic productivity steer healthcare resources towards working-age urban populations, sidelining chronically ill or disabled people, who are more common in poorer regions. The same bias arises in pathogen-genomics platforms. Tools such as Nextstrain and Pangolin demand high-throughput sequencing facilities, stable internet, and skilled bioinformaticians – assets clustered in tertiary hospitals and national institutes. Rural clinics rarely meet these requirements, so local outbreaks of HIV, tuberculosis or emerging pathogens are sequenced late or not at all, leaving their dynamics poorly characterised and responses slow.

The deployment of algorithmic tools during the COVID-19 pandemic also illustrates these inequities.[2] Vaccine distribution algorithms aimed to prioritise the most vulnerable, yet their reliance on biased data and digital systems created barriers. Marginalised groups would have faced challenges ranging from limited internet access to technological literacy requirements, further widening inequities. Additionally, predictive analytics tools may have used data that under-reported rural areas or lacked the granularity needed to address the specific vulnerabilities of informal settlements. Similarly, social vulnerability mapping tools, though useful, relied on aggregate data that would have obscured local disparities, leading to interventions that inadequately addressed the needs of subgroups.[3]

Towards equitable algorithmic governance in southern Africa

Addressing these challenges requires concerted policy action to ensure equitable algorithmic governance in southern Africa. A critical step is improving the diversity and representativeness of datasets.[3] Policy-makers and health organisations must invest in data collection efforts that specifically target under-represented populations, including rural and marginalised groups. Collaborations with community organisations can help identify data gaps and address inaccuracies. Regular audits of datasets will be essential to mitigate biases and ensure fairness.[10]

Transparency in algorithm design and decision-making processes is another cornerstone of equitable governance. Public health

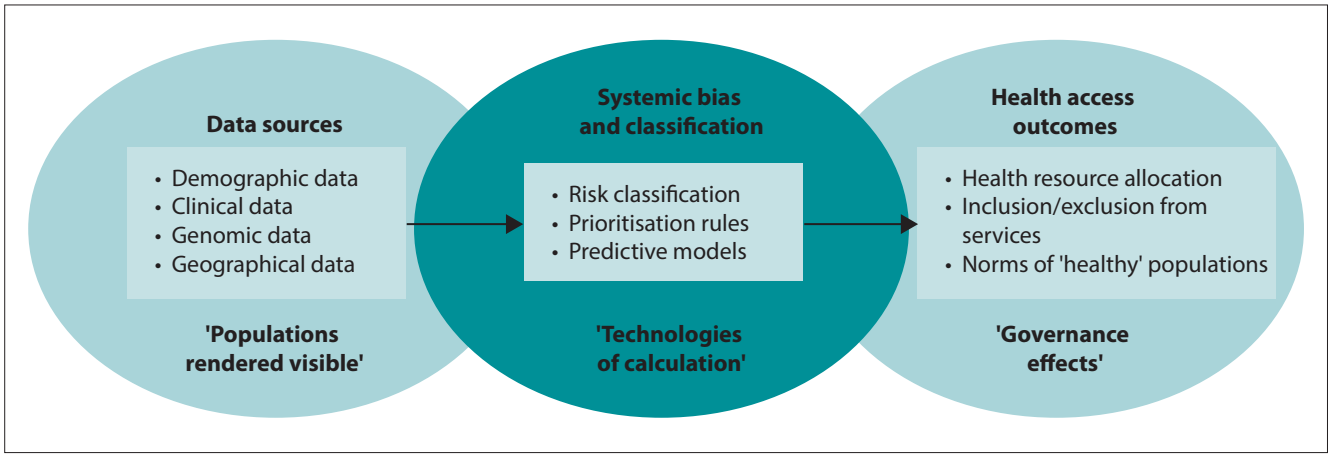

Fig. 1. Conceptual framework of algorithmic governance and biopolitical effects in health systems.

systems should mandate clear explanations for algorithmic decisions and encourage the publication of open-source algorithms and datasets to allow for independent audits.[2] Engaging stakeholders – including affected communities – in designing and evaluating these tools is vital for building trust and accountability. Health systems must also adopt an equity-first approach to algorithmic design and application.[6] This approach entails embedding equity metrics into system objectives and allocating resources to address both clinical needs and social determinants of health. Impact assessments can further identify and mitigate potential harm to vulnerable populations.[3] The growing influence of biological data in health algorithms demands not only technical scrutiny but also ethical foresight. Without meaningful integration of equity metrics and locally governed standards, the promise of omics-driven public health may devolve into yet another layer of digital exclusion. Ethical governance frameworks grounded in principles of fairness, accountability and inclusivity will be instrumental in guiding the development and deployment of these tools.[9]

Policy opportunities and future directions in southern Africa

Building algorithmic literacy among policy-makers, healthcare professionals and the public is essential. Educational initiatives should demystify these technologies, highlighting their strengths and limitations while addressing their ethical and political implications. Empowering communities to advocate for equitable policies ensures that algorithmic governance aligns with the broader goals of social justice and public health. Algorithmic governance embodies the biopolitical logic of managing populations through calculative and statistical means. While these systems offer transformative potential for improving health outcomes in southern Africa, they also risk entrenching systemic inequities.[4,5] Drawing on Foucault's insights, it is imperative to critically examine the power dynamics embedded in these technologies.

South Africa's National Digital Health Strategy (2019 - 2024), which outlines the country's digital health priorities, is now due for revision. The upcoming 2025 - 2030 framework presents a key opportunity to explicitly address algorithmic governance and establish equity-focused standards for artificial intelligence systems in healthcare. Without such efforts, commercial algorithmic deployments may continue without sufficient oversight or ethical safeguards. Initiatives such as H3Africa have promoted the development of regionally governed genomic data frameworks and encouraged broader participation in research. These efforts aim to improve data sovereignty and ensure that consent processes and data-sharing practices reflect local priorities. Despite this progress, national health policy frameworks, including HTA processes, have yet to consistently incorporate these standards. Finally, ensuring that algorithmic tools serve the collective good, particularly for marginalised and vulnerable populations, is both a technical challenge and a moral imperative. Equitable algorithmic governance represents a pathway to realising a more just and inclusive future for public health in the region.

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