Artificial intelligence: opportunities and risks for public health

Artificial Intelligence has been applied in academic research and in inference tasks across the broader economy with demonstrable success,[1] but less so for the core functions of public health, namely protecting and promoting the health of populations.[2]

To date, vision statements on the future of public health[3] have focused on the technical possibilities of artificial intelligence and less on how social determinants might influence outcomes achieved by it. Artificial intelligence has the potential to improve the efficiency and effectiveness of processes across an expanded public health continuum[4] (table) to make possible personalised predict and prevent approaches,[5,6] applied differentially across populations to match preventive services to individual need. This approach is potentially a radical expansion in the scope of public health and many of these activities will be led by organisations beyond the established public health institutions.

Equity must be central to the implementation of artificial intelligence across health systems. Large datasets are pivotal to the development of these technologies, but must be representative of the population to ensure all can benefit. Typically, minority groups are less represented in datasets used to develop artificial intelligence algorithms and the health challenges for these communities are less obvious to data science teams, which tend not to be representative of these populations. The rhetoric around artificial intelligence involves greater emphasis on personalised recommendations and individual action, however, this should not undermine the importance of continued collective action to address social and structural determinants of health. Achievement of primary prevention benefits depends more on social factors than secondary prevention irrespective of the marginal benefits of artificial intelligence.

	Potential use of artificial intelligence	Example
Health protection	Analysing patterns of data for almost real-time surveillance and disease detection	Using Google search and phone GPS information to predict restaurants that are causing foodborne illness[7]
Health promotion	Offering targeted and personalised health advice based on personal risk profile and behavioural patterns	Using machine learning to generate improved cardiovascular disease risk models[8]
Increasing efficiency of health services	(1) Using machine learning to detect abnormalities in screening tests such as mammography or cervical cytology; (2) machine learning-facilitated automated evidence synthesis	(1) Deep learning algorithms for detecting diabetic retinopathy;[9,10] (2) the Human Behaviour-Change Project uses machine learning for evidence synthesis and interpretation around behaviour change[11]

Table: **Public health domains and potential uses of artificial intelligence within them**

It is plausible that the effect of artificial intelligence on public health could be principally indirect. Broad automation of manual jobs through artificial intelligence might cause near-term unemployment in low-income communities, with adverse health effects. However, automation will probably augment efficiency of logistics and human resources, with profound benefits through improved productivity and performance of health systems. However, the net effect of these trends is difficult to predict, especially in the context of political and economic uncertainty.

Even if the primary effects of artificial intelligence are beyond the operations of public health organisations, as the present trajectory suggests, there will be immediate and enduring consequences for public health. Artificial intelligence has the potential to widen social disparities and divert attention from collective action, ignoring the lessons of decades of public health innovation. The public health community must be actively involved in not just creating the circumstances for the safe and effective development of artificial intelligence that delivers for whole populations but also in the development of artificial intelligence technologies to ensure the narrative around personalisation and the responsibilities of the individual does not distract governments from their continued responsibility for the health of their citizens.

The reality of public health organisations is that they face mounting cost constraints and challenges in recruiting the talent and resources necessary for the development of artificial intelligence. Limited resources should not be used to duplicate massive investments that have already been made by the private sector. Hence, collaborations should use these investments while ensuring mutual benefit by aligning the profit motive of private organisations with social responsibility and the advancement of public health. Public health organisations will need to show leadership regarding private sector involvement in the application of artificial intelligence in public health and in the creation of specific contracting instruments that ensure any such partnerships deliver material returns and protections for the health institutions and populations that they serve.

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