# A Public Health Perspective on Digital Health and Equity

David Buckeridge, MD PhD FRCP

Professor, McGill University | Chief Digital Health Officer, MUHC | Associate Member, Mila







## Digital Health

- Includes categories such as mobile health (mHealth), health information technology (IT), wearable devices, telehealth and telemedicine, and personalized medicine (US FDA)
- Tools and services that use information and communication technologies (ICTs) to improve prevention, diagnosis, treatment, monitoring and management of health-related issues and to monitor and manage lifestyle-habits that impact health (EC)



# The Public Health Context for Digital Health

### Public Health

- The science and the art of preventing disease, prolonging life, and promoting health through organized community efforts (Winslow 1920)
- Efforts can be formalized as public health functions, and it these functions that must be {automated -> transformed} by digital health to advance public health

### Public Health Informatics

- Systematic application of information and computer science and technology to public health practice, research, and learning (Yasnoff 2000)
- Digital interventions are implemented and introduced into practice as software
- There is an evidence base about how (and how not) to incorporate digital tools into public health settings

# Thinking about Equity and Digital Health

### Gómez-Ramírez:

- ethics (justification, impact, transparency),
- health equity (benefits, burden, root causes, upstream action), and
- social justice (context, profit distribution, misuse, public goods)
- HEAAL (Health Equity Across AI Life Cycle):
  - accountability,
  - fairness,
  - fitness for purpose,
  - reliability and validity, and
  - transparency

Gómez-Ramírez, O. et al. On the imperative of thinking through the ethical, health equity, and social justice possibilities and limits of digital technologies in public health. CJPH 112, 1–5 (2021).

Kim, J. Y. et al. Development and preliminary testing of Health Equity Across the AI Lifecycle (HEAAL): A framework for healthcare delivery organizations to mitigate the risk of AI solutions worsening health inequities. PLOS Digit. Heal. 3, e0000390 (2024).

## A Global Perspective

### Guiding principles

- institutionalization of digital health,
- an integrated strategy, promotion of appropriate use,
- and recognition of impediments faced by least-developed countries

### Strategic objectives

- Promote global collaboration and advance transfer of knowledge on digital health
- Advance implementation of national digital health strategies
- Strengthen governance for digital health at global, regional, national levels
- Advocate people-centred health systems that are enabled by digital health

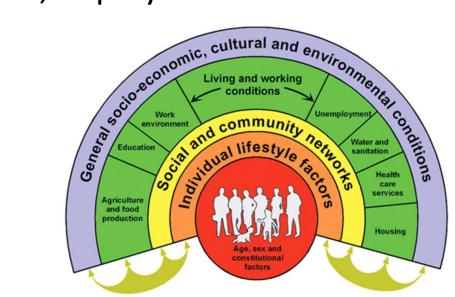


Global strategy on digital health 2020-2025

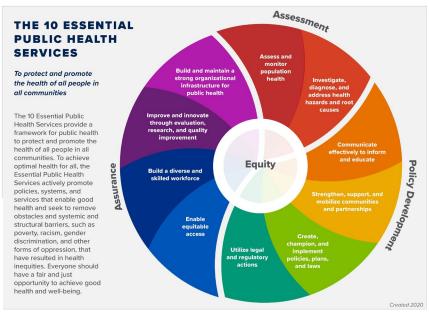


# An Informatics Perspective

- Public health use case
- Level of intervention
- Data, algorithm, deployment



Dahlgren G, Whitehead M. (1991). Policies and Strategies to Promote Social Equity in Health. Institute for Futures Studies.



https://www.cdc.gov/publichealthgateway/publichealth services/essentialhealthservices.html

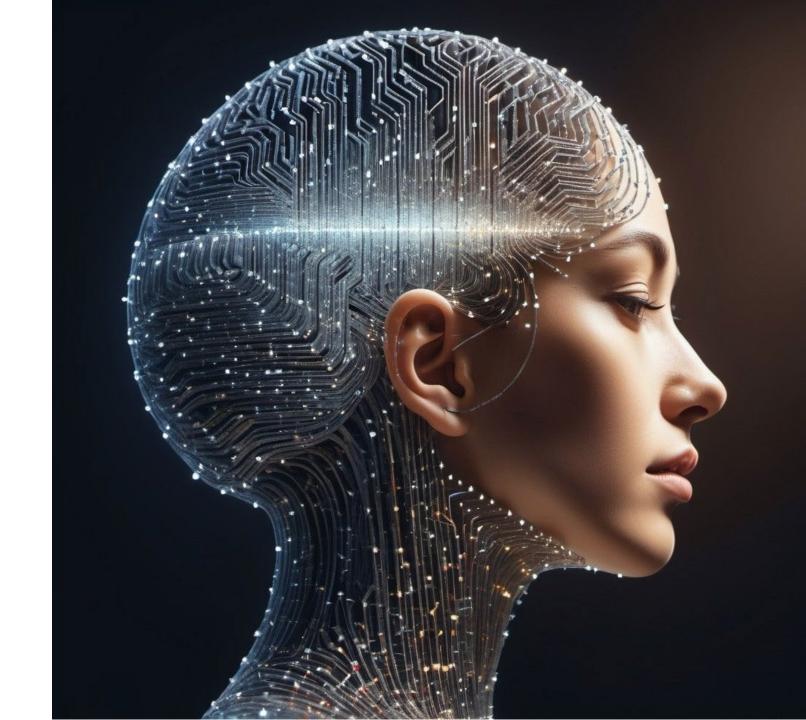


### Data Allow Measurement

- What is (not) being measured?
   How well can it be measured?
- Algorithms can ingest (and generate) many data types
  - Tabular
  - Free text
  - Images
  - Sound
- Data must be digital

# Algorithms Encapsulate Knowledge

- Integrate multiple types of data
- Draw inference (rarely), predict, classify, optimize, recommend
- Output determined by model, training data, maintenance
- Algorithms are becoming increasingly complex
- Knowledge is rarely accessible



# Algorithms Support Decisions

- For populations
  - Often focused on targeted application within a single 'Field'
  - Equity dependent on data, algorithm developer
  - Limited market
- For individuals
  - Often focused on single behavior
  - Inequities in access and appropriateness of guidance
  - Large market, but skewed



# How Digital Disease Surveillance (DDS) Works

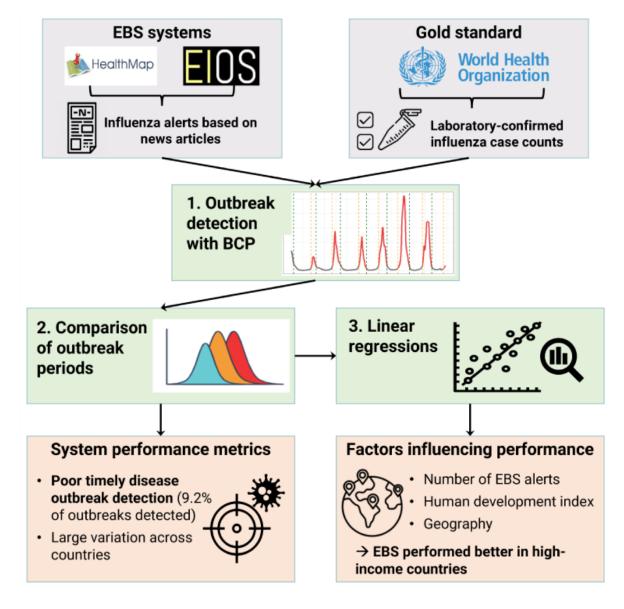
- Digital media articles filtered for relevance
  - News media
  - Bulletin boards
  - Web sites
  - Social media
- NLP used to extract information from text, summarize
- Statistical and ML methods used to
  - Identify events of interest
  - Monitor topics and sentiment



Brownstein JS et al. Advances in Artificial Intelligence for Infectious-Disease Surveillance. NEJM 388, 1597–1607 (2023).

# Sampling and Bias influence on Equity in Global DDS

- Digital media must be selected
  - Data sources
  - Languages
- Choices introduce a risk of bias
  - A perspective of harm reduction in sociotechnical systems can be helpful in managing biases



Ganser I, Thiébaut R, Buckeridge DL. Global Variations in Event-Based Surveillance for Disease Outbreak Detection: Time Series Analysis. JMIR Public Health Surveill. 2022 Oct 31;8(10):e36211.

# Expand our Focus Beyond the Digital Tool

# Focus has been on the digital technology at the expense of

- Data access and quality
- Fit with public health context
- Interoperability and integration
- Evidence of benefit and cost
- Training



https://hannellbim.com/2016/07/26/beware-the-technology-magpie/

### WHO WE ARE

Al4PH is focused on building capacity in Al and big data skills for transformative change in addressing population and public health challenges, and understanding how these tools impact health equity.

### OUR MISSION

To establish a workforce of public health researchers and practitioners who develop and apply innovations in equitable artificial intelligence (AI) and machine learning (ML) to public health research, policy, and practice in Canada.

### WHAT WE'LL OFFER

### **CERTIFICATE PROGRAM**

Certificate program focused on core competencies related to Al, **Public Health and Health Equity** 

Learn More

### **SCHOLARSHIPS**

Scholarships to support multidisciplinary co-supervision of Masters, PhD, DrPH, and postdoctoral fellows

Learn More

### INTERNSHIPS

Internships in public health and policy settings to develop and apply Al for public health

Learn More

### ON-DEMAND COURSES

On-demand courses, workshops and webinars that are open to trainees and public health professionals at any career stage

Learn More

### DATA

Creation of labelled public health data sources for research and training using Al methods

### COMMUNITY

Networking and communitybuilding

Learn More

### AI4PH

••• • • <

ai4ph-hrtp.ca

ABOUT COURSES TRAINEESHIPS TRAINEES SUMMER INSTITUTE COMMUNITY

### SUMMER INSTITUTE



Urban view of Calgary. Photo credit: Unsplash - Kyler Nixon

### APPLY TO THE AI4PH SUMMER INSTITUTE!

July 23-26, 2024, The University of Calgary, Calgary, Alberta

The Artificial Intelligence for Public Health (AI4PH) Summer Institute will be held in Calgary, Alberta in 2024. Successful applicants will have the opportunity to expand their skills and knowledge related to the application of Al innovations in public health research and practice while exploring the potential impact of AI technologies on the widening or narrowing of health inequities. This year's theme will be "Introduction to image analysis and applications to public health", with methods and examples organized around this topic.

The deadline to submit an application for the 2024 AI4PH Summer Institute has been extended to Friday, April 5th, 2024. A minimum \$1,000 of travel support will be available to each accepted applicant into the program.

### APPLICATIONS ARE NOW OPEN.

### What's happening this year?

- The theme this year will be "Introduction to image analysis and applications to public
- Attendees will get materials before the Summer Institute to help them prepare.