

# A Public Health Perspective on Digital Health and Equity

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# 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

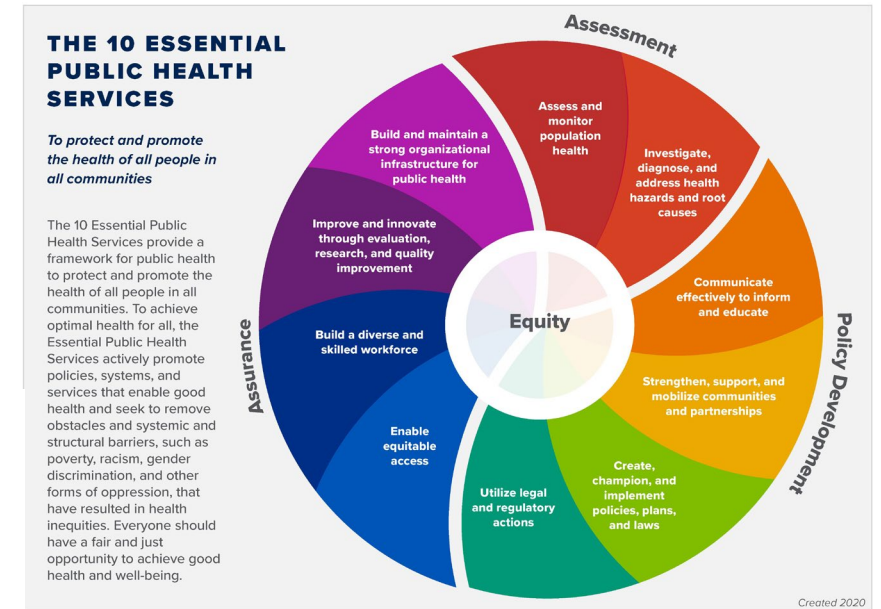


# An Informatics Perspective

- 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/publichealthservices/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

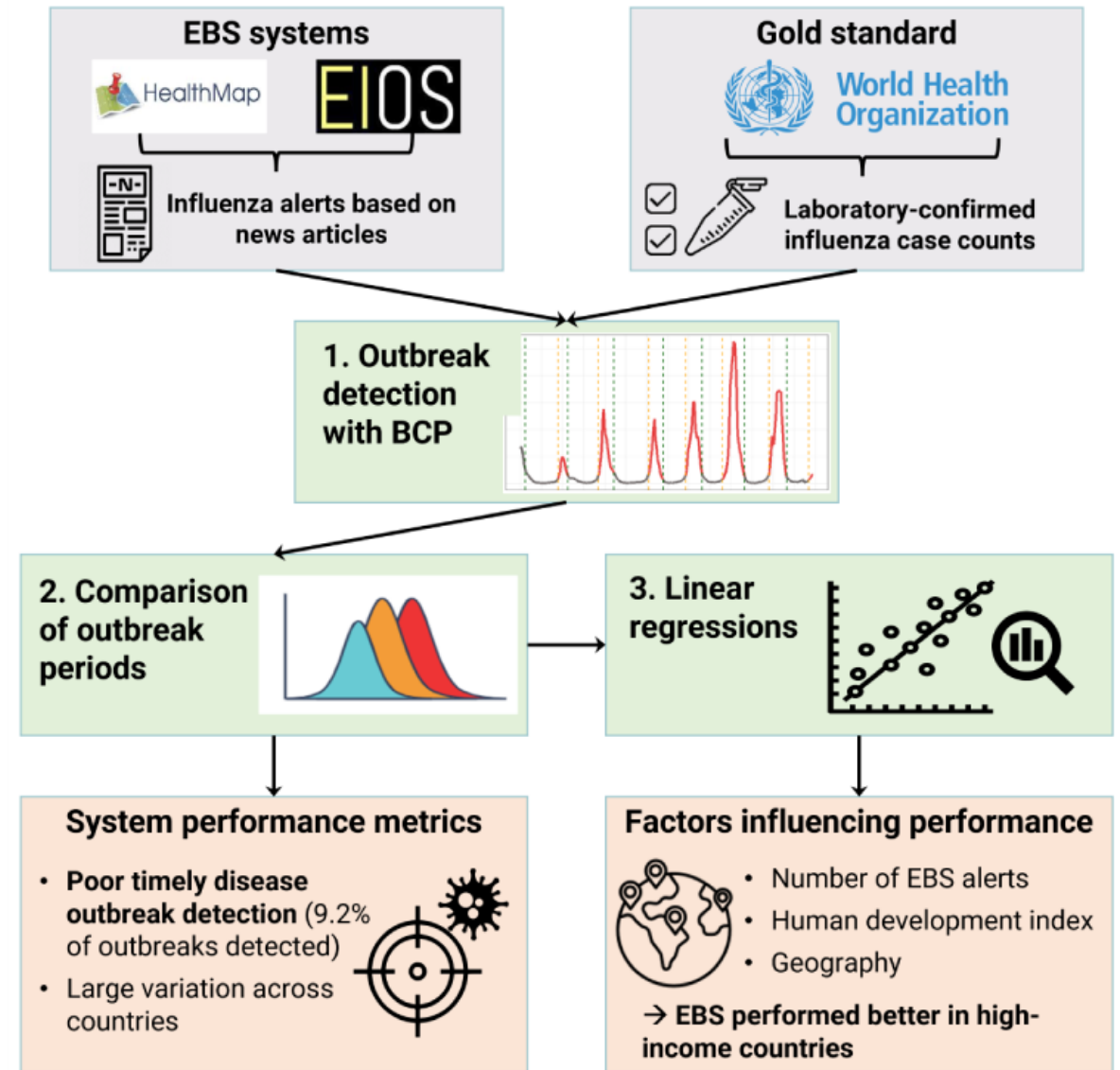
- Digital media articles filtered for relevance
  - News media
  - Bulletin boards
  - Web sites
  - Social media
- NLP used to extract information from text, summarize
- Statistical and ML methods used to
  - Identify events of interest
  - Monitor topics and sentiment



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



# 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



