Going digital in Public Health
3 statements:

1. Digital public health ≠ digital health

2. Digital technologies hold the chance to solve public health challenges.

3. Digital health literacy is key to successful digital (public) health
Digital Public Health

- use of digital technologies in achieving public health aims and mission
- benefits and harms of digitalization of society
- resources and capacities for a digital health system
Digital public health ≠ digital health

- Health Care infrastructure/processes
  - E-Health
  - Digital Health
  - M-Health
- (Public) Health Provision
- Prevention & Health promotion

Individual Level - Population Level

Adapted from Wienert et al. JMIR 22
Impact of digitalization on health and disease
Global public health challenges

- **Affordability**
  - **Financial coverage**: The proportion of patients protected from impoverishment due to health-related costs

- **Quality**
  - **Effective coverage**: The proportion of individuals receiving satisfactory health services among the target population

- **Demand**
  - **Continuous coverage**: The extent to which clients receive the full course of intervention required to be effective
  - **Contact coverage**: Proportion of clients who have contact with relevant facilities, providers and services among the target population

- **Supply**
  - **Availability of commodities and equipment**: Ensuring availability of commodities and equipment
  - **Availability of human resources**: Ensuring availability of human resources
  - **Accessibility of health facilities**: Ensuring access to health facilities

- **Accountability**
  - **Accountability coverage**: The proportion of those in the target population registered into the health system

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Potential for digital health interventions

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Target population
Features supporting public health aims

Table 1 The potential added value of digitalization for public health: a conceptual framework

<table>
<thead>
<tr>
<th>Public health Pillars</th>
<th>Public health Domains</th>
<th>Digital Health Technologiesa</th>
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</thead>
<tbody>
<tr>
<td>Practice</td>
<td>Health prevention</td>
<td>Genomics</td>
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<tr>
<td>Research</td>
<td>Health communication</td>
<td>Telehealth</td>
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<tr>
<td>Training and</td>
<td>Health education</td>
<td>Smartphone apps (MHEALTH)</td>
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<td>Education</td>
<td>Health promotion</td>
<td>Social media</td>
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<td>Policy</td>
<td>Health services</td>
<td>Wearables and sensors</td>
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<td>organization,</td>
<td>Virtual and augmented</td>
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<td>management and</td>
<td>reality</td>
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<td>delivery</td>
<td>Drones</td>
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<td>Epidemiology and</td>
<td>Internet of things</td>
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<td>control of</td>
<td>Big data</td>
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<td></td>
<td>communicable diseases</td>
<td>Artifical intelligence</td>
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<td>Risk management,</td>
<td>(incl. predictive analytics,</td>
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<td>hospital hygiene and</td>
<td>speech recognition and</td>
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<td>safety</td>
<td>natural language processing</td>
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<td></td>
<td>Epidemiology and</td>
<td>Robotics</td>
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<td>control of</td>
<td>Distributed ledger</td>
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<td></td>
<td>non-communicable</td>
<td>technologies</td>
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<td>diseases</td>
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<td>Food safety</td>
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<td>Environmental health</td>
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<td>Surveillance</td>
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<td>analysis and</td>
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<td>reporting</td>
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<td>Impact assessment</td>
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<td>monitoring and</td>
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<td>evaluation</td>
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</table>

Potential Public health Benefits and advantages

Shift from cure to prevention
Care closer to people
People-centered care
Safer, faster and more efficient services
Less expensive care
Targeted communication
Evidence-based policies & prevention

Adapted Odone et al. 2019
Example 1: Health education - Social media – Precision – Targeted information

Discourse on tick-vaccination

Tick born encephalitis
• highly endemic country
• 30 – 40% vaccination rate
• severe cases in 15%

parental website posts
~5200 threads collected
qualitative and linguistic analysis
Temporal distribution of topics
Empowerment – Apps – Personalization – shift from cure to prevention

Development of a transparent rating system

<table>
<thead>
<tr>
<th>Domains</th>
<th>&quot;Must Have&quot;-criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Health literacy</td>
<td>12</td>
</tr>
<tr>
<td>2. Expediency (+BCT)</td>
<td>93</td>
</tr>
<tr>
<td>3. Technical adequacy</td>
<td>15</td>
</tr>
<tr>
<td>4. Content validity</td>
<td>7</td>
</tr>
<tr>
<td>5. Ethical innocuousness</td>
<td>2</td>
</tr>
<tr>
<td>6. Risk appropriateness</td>
<td>4</td>
</tr>
<tr>
<td>7. Usability</td>
<td>12</td>
</tr>
<tr>
<td>8. Transparency</td>
<td>4</td>
</tr>
</tbody>
</table>
Surveillance – big (health) data – data analytics – evidence-based policy & prevention

Dearth of data on accidents & circumstances
Magnitude of locally stored health information - narrative text fields
Automatization of data extraction & analysis

machine learning of anamnestic narratives is most promising.

Funder: Federal Advisory Service for Accident Prevention (BfU)
Public health challenge

Intervention does not reach or address population at risk

Health goal
- Quality & Coverage of Health Intervention
  - insufficient supply of commodities
  - insufficient supply of qualified health workers
  - geographic inaccessibility

Digital Health Interventions

Intervention of known efficacy

- low demand for services/intervention
- poor adherence to guidelines

Adapted from https://www.who.int/publications/i/item/9789241550505
Digital technologies solving public health challenges?

- Quality & Coverage of Health Intervention
  - insufficient supply of commodities
  - insufficient supply of qualified health workers
  - geographic inaccessibility

- poor adherence to guidelines
- low demand for services
- Service does not reach or address population at risk

digital health literacy

Intervention of known efficacy
Digital Health Literacy

...competencies and resources important for searching and finding, understanding, evaluating, and applying digital health information.

(Kolpatzik 2020)
Keeping up to date in digital health literacy

- Skill 2) Information literacy - must include new modes of information seeking behavior
- Skill 3) Media literacy - extends to a far larger variety of media.
- Skill 4) Computer literacy - has been replaced by digital device literacy.
- Skill 5) Science literacy - must extend to data literacy
- Skill 6) Inclusion of organizational and societal health literacy

context specific and objective digital health literacy
Little data on digital health literacy

Rate your own qualification to decide on data access for health professionals

"Fühlen Sie sich aktuell sehr gut qualifiziert, eher gut qualifiziert, eher schlecht qualifiziert oder sehr schlecht qualifiziert, um über den Zugriff durch Gesundheitsfachpersonen auf Ihre Daten zu entscheiden?"

in % Einwohner ab 18 Jahren*

© gfs.bern, Öffentliche Meinung eHealth, Januar 2022 (N = jeweils ca. 1000). * bis 2017: In % Stimmberechtigte
## Digital literacy

<table>
<thead>
<tr>
<th>Levels of Influence*</th>
<th>Individual</th>
<th>Interpersonal</th>
<th>Community</th>
<th>Societal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Biological Vulnerability and Mechanisms</td>
<td>Caregiver-Child Interaction Family Microbiome</td>
<td>Community Illness Exposure Herd Immunity</td>
<td>Sanitation Immunization Pathogen Exposure</td>
</tr>
<tr>
<td>Behavioral</td>
<td>Health Behaviors Coping Strategies</td>
<td>Family Functioning School/Work Functioning</td>
<td>Community Functioning</td>
<td>Policies and Laws</td>
</tr>
<tr>
<td>Physical/Built Environment</td>
<td>Personal Environment</td>
<td>Household Environment School/Work Environment</td>
<td>Community Environment Community Resources</td>
<td>Societal Structure</td>
</tr>
<tr>
<td>Digital Environment</td>
<td>Digital Literacy, Digital Self-Efficacy, Technology Access, Attitudes Towards Use</td>
<td>Implicit Tech Bias, Interdependence (e.g. shared devices), Patient-Tech-Clinician Relationship</td>
<td>Community Infrastructure, Healthcare Infrastructure, Community Tech Norms, Community Partners</td>
<td>Tech Policy, Data Standards, Design Standards, Social Norms &amp; Ideologies, Algorithmic Bias</td>
</tr>
<tr>
<td>Sociocultural Environment</td>
<td>Sociodemographics Limited English Cultural Identity Response to Discrimination</td>
<td>Social Networks Family/Peer Norms Interpersonal Discrimination</td>
<td>Community Norms Local Structural Discrimination</td>
<td>Social Norms Societal Structural Discrimination</td>
</tr>
<tr>
<td>Health Care System</td>
<td>Insurance Coverage Health Literacy Treatment Preferences</td>
<td>Patient–Clinician Relationship Medical Decision-Making</td>
<td>Availability of Services Safety Net Services</td>
<td>Quality of Care Health Care Policies</td>
</tr>
<tr>
<td>Health Outcomes</td>
<td>Individual Health</td>
<td>Family/ Organizational Health</td>
<td>Community Health</td>
<td>Population Health</td>
</tr>
</tbody>
</table>

Richardson, npj Digital Medicine 2022
“the enthusiasm for digital health has also driven a proliferation of short-lived implementations and an overwhelming diversity of digital tools, with a limited understanding of their impact on health systems and people’s well-being.” (WHO 2019)

- short- and long-term impact on health outcomes
- identification of population groups of lower effectiveness
- digital health literacy as moderator
- impact of diversion of resources
- sustainability - carbon foot print
- ensuring human resources
- potential to reduce disparities
- unintentional increase in health inequities