

# Digital Public Health Transformation for Noncommunicable Diseases: A Narrative Perspective on the Difficulties and Possibilities.

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## Abstract:

The efficacy and speed of digital public health interventions particularly digital proximity tracing apps that use Bluetooth to track and alert users of possible infection exposures were highlighted by the recent SARS-CoV-2 pandemic. Digital proximity tracings, supported by prominent institutions like the European Union and the World Health Organization, demonstrated the potential of digital public health. Noncommunicable diseases (NCDs), which cause the great majority of health care costs and premature disability-adjusted life years lost, must be addressed as the world shifts away from pandemic responses. Compared to infectious diseases, the story of digital transformation in the field of NCD public health is different. With its diverse approach spanning fields like medicine, epidemiology, and psychology, public health works to promote healthy choices and lifestyles through "Assessment," "Policy Development," "Resource Allocation," "Assurance," and "Access." It is remarkable how powerful artificial intelligence (AI) is in this digital revolution. Health care providers can prioritize human interactions particularly those that cannot be digitalized, like emotional support by using AI to automate repetitive tasks. Additionally, AI gives people the means to manage their health proactively. AI is a companion that helps navigate the health care system, but the human touch is still invaluable. Despite being revolutionary, digital evolution comes with its own set of difficulties. At the forefront are concerns about access and equity. Vulnerable groups risk further marginalization, whether as a result of financial limitations, geographic obstacles, or a lack of digital literacy. This shift necessitates an inclusive approach that aims to eradicate current health disparities rather than exacerbate them. Social consensus is required for population-level digital interventions in NCD prevention. Even though they work, laws like sugar taxes or smoking bans may have an impact on people who aren't directly benefited. Transparent benchmarks and criteria that guarantee maximum benefits without excluding vulnerable or minority groups are essential to the wider success of digital public health. AI's ability to avoid bias is crucial, particularly when

making population-centric decisions like allocating resources. As a result, the advancement of AI-integrated digital public health depends critically on the ongoing participation of stakeholders, including patients and minority groups.

**Keywords: digital public health, artificial intelligence, non-communicable diseases, public health efficiency, digital innovation.**

## **Introduction**

Digital proximity tracing (DPT) was the first digital public health intervention to be widely implemented and used at scale during the SARS-CoV-2 pandemic. In the event of a confirmed SARS-CoV-2 infection, the basic concept behind DPT smartphone apps is to use the capabilities of common Bluetooth sensors to track proximity contacts and alert those who have been exposed to previous proximity encounters. On a number of levels, the creation and extensive use of DPT apps have been a success. Their quick development and early release during the pandemic is a testament to the successful international cooperation and support of numerous pertinent organizations, including the European Union and the World Health Organization ( Gansel, 2019).

It will be crucial to expand the digital transformation of public health in the area of noncommunicable diseases (NCDs) in order to sustain the momentum for digital public health. Before the pandemic, NCDs were responsible for 63.8% of the premature loss of disability-adjusted life years and about 80% of all health care expenses. The public health response to prevent infectious diseases like SARS-CoV-2 is very different from the opportunities and challenges of NCD digital public health. An outline of the most recent definitions of digital public health will be presented at the beginning of this perspective paper.

Additionally, we will examine various factors that can direct the identification of possible use cases for digital public health applications in NCDs, in addition to the requirements for digital transformation. An outlook on the obstacles and circumstances to further advance the digital transformation of NCD public health will conclude the paper ( Ayaz, 2021).

## **Principal Roles of Public Health:**

The science and practice of creating circumstances that allow people to lead healthy lives and make healthy decisions is known as public health. It incorporates techniques and expertise from a wide range of fields, including epidemiology, medicine, psychology, law, and the social sciences, among many others. It demonstrates the fundamental public health duties that jurisdictions should carry out in order to attain fair access to health care ( Oemig, 2022 ).

In general, public health also places a lot of emphasis on communities and discusses population-based preventive measures (like childhood vaccinations) as well as the pillars of healthy living (like living conditions, education, or economic factors).

## **Digital Change Levels:**

By facilitating better, more effective, and more economical public health interventions, digital transformation aims to have an impact on health care and public health. As a result, it reflects the three goals of healthcare: lowering costs, improving patient outcomes, and improving patient experiences. Therefore, the 4Ps—preventive, predictive, personalized, and participatory—may be the focus of digital transformation in public health ( Brommeyer, 2023).

## **Prerequisites for a Successful Digital Transformation in Public Health and Healthcare:**

Technically speaking, the implementation of digital public health depends on system readiness, interoperability, technical application programming interfaces, and nontechnical interfaces. System readiness guarantees that digital technologies work with the infrastructure and systems of health care that are currently in place. For various systems to function together seamlessly and for data and information to be exchanged between platforms, interoperability is necessary. Additionally, interoperability facilitates the real-time collection and analysis of enormous volumes of health data, giving citizens, policymakers, and public health professionals important new information about disease trends, treatment efficacy, and health outcomes ( Flores, 2013).

As health care systems seek to expand their operations, provide care to more patients, and improve the democratization of public health and health care, the scalability of technical systems and processes is another crucial component of digital transformation pathways. These public systems can be made more scalable with the aid of cloud-based platform solutions, which can also lower expenses, increase efficiency, and lessen public health inequities. Scalability is also relevant to human-in-the-loop practices. In order to close the skills and digital literacy gaps in the upcoming generation of public health practitioners and guarantee that health care systems can fully benefit from digital technologies, it is crucial to prepare the workforce in the fields of public health and health care for digital changes ( Kokko, 2022).

## **Digital Change + Public Health = Digital Public Health?**

The clear link between "digital" and "public health" is relatively new and has been succinctly described; the term "digital public health" dates back to a 2017 Public Health England report. As recently expressed by representatives of the European Public Health Association, this report essentially advocates for a digital transformation of public health by reimagining it through digital tools (Naik, 2022).

Some authors propose that as part of the transformation process, in addition to concentrating on the technical possibilities, one should also seek inspiration from the tech industry's start-up culture. They emphasize the importance of experimenting and adapting (pivoting) rather than waiting for scientific evidence to become clear. According to other definitions, digital public health is an "asset" that can be used to accomplish conventional public health objectives, such as by utilizing newly created data, techniques, and workflows brought about by digitization. As Iyamu has already noted, these current definitions seem to diverge primarily in their interpretations of the meaning and function of "digital" on the spectrum of digitalization and transformation. However, all authors concur that a meaningful digital public health requires rethinking and redesigning public health service pathways and the entire health care delivery system, going far beyond the digitization of current services and interventions (Fernando, 2006).

## **Goal and Purpose of Digital Change:**

To make further inroads toward digital change in public health functions and NCD public health in particular, it seems sensible to distinguish between the goal and purpose of making these functions and processes more digital. By goal, we mean the high-level public health goals of broad health care quality, access, efficiency, and equity of health promotion and health care provision, which can be fostered by digital changes. For instance, in light of the shortage of mental health care providers in many

settings, apps for mental health assessments may ease access to at least some basic level of mental health care ( Sørensen, 2012 ).

### **New Developments in AI and Their Potential Impact on Digital Public Health:**

AI-driven digital transformation can replace repetitive tasks like data entry and administrative work in stable environments, as well as automate complex data analysis and predictions. Health care providers and public health experts can now concentrate on face-to-face interactions with patients and citizens. Accordingly, it is critical to determine which human interactions or tasks like counseling and emotional support cannot be readily replaced by digital technologies and should be reinforced ( Ballouz, 2022).

AI can also give patients and citizens new tools to help them manage their health more actively. However, digital health is a guide to help people navigate the health care system, not a substitute for physicians or other medical professionals. Patients and citizens can take a more active role in their health management and care access by utilizing digital tools. By enhancing underprivileged populations' access to care, this can support health equity and help address some of the issues related to aging, such as managing chronic diseases.

Additionally, by eliminating the need for in-person visits and expediting the delivery of care, digital health can support sustainability in the healthcare industry ( Kim, 2021).

### **A Realistic Approach to Entering the Digital Transformation of NCD Public Health:**

A previously unheard-of chance to address the significant burden of NCDs at scale is presented by digital transformation. Nonetheless, the use of digital technologies must be carefully matched with the objectives, roles, and wider societal ramifications of public health. Better public health monitoring, decision-making, public engagement, and education can all be facilitated by digital platforms. Prevention at the individual level necessitates ongoing personal efforts and behavioral adjustments. In a micro-level (individual) perspective, the psychosocial mechanisms mediated by social support, social influence, and social engagement are among the most important downstream factors. A successful impact on the digital transformation of public health may result from addressing these factors. Personalized prevention techniques have shown promise, but they are not scalable. However, by enhancing user experience, efficacy, and efficiency, digital solutions like telehealth platforms and health monitoring apps may provide more scalable methods ( Ayaz, 2021).

### **Recommendations:**

Digital transformation creates new opportunities, but it also presents access and equity issues. Populations at risk of falling behind in the digital transformation process include those that are (1) economically disadvantaged, (2) geographically remote, or (3) lack digital literacy. Any initiative needs to have a thorough plan to make sure that these adjustments don't make health disparities worse instead of better. Furthermore, societal agreement is necessary for both digital and nondigital NCD prevention to be effective at the population level.

People who are not directly at risk must frequently be willing to engage in a broader social contract. Smoking bans and "sugar taxes," for instance, may have an impact on people who do not directly profit from them. As a result, all parties involved—from legislators to healthcare professionals and the general public—must have reasonable expectations regarding the advantages, possible drawbacks, and expenses of digital transformations in the provision of public health or healthcare services. Mechanisms for continuous monitoring and assessment must be established in order to assess the wider-ranging

effects of digital transformation.

## Conclusion:

In Conclusion, AI and digital health in particular have enormous potential to improve the quadruple aim of public health and NCD care by making it more effective, efficient, equitable, and user-friendly. Any digital transformation in any of the five key public health function domains should be intentional, improve at least one quadruple aim dimension, and not materially impair the other dimensions. However, clearly defined criteria, monitoring, and benchmarks on how to achieve benefits for the majority without putting minorities and vulnerable groups at a disadvantage will ultimately be necessary for the success of digital public health and AI-supported public health initiatives. Therefore, AI explainability and the ability to unlearn biased or discriminatory decision-making will be even more important for population-level decisions (like resource allocation, which is common in public health) than for individual-level health care. Therefore, the creation, implementation, and oversight of AI-powered digital public health will require the close participation of stakeholders, including citizens, patients, and vulnerable and minority groups.

## References:

**Ballouz T, Menges D, Aschmann HE, Jung R, Domenghino A, Fehr JS, Puhan MA, von Wyl V. Individual-level evaluation of the exposure notification cascade in the SwissCovid digital proximity tracing app: observational study. *JMIR Public Health Surveill.* 2022;8(5):e35653.**

1. Sørensen Kristine, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, Brand H, (HLS-EU) Consortium Health Literacy Project European Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health.* 2012 Jan 25;12:80.
2. Fernando D, Gunawardena N, Weerasinghe C. Essential public health functions. *J Coll Community Physicians Sri Lanka.* 2006;11(2):24–26.
3. Naik N, Hameed BMZ, Sooriyaperakasam N, Vinayahalingam S, Patil V, Smriti K, Saxena J, Shah M, Ibrahim S, Singh A, Karimi H, Naganathan K, Shetty DK, Rai BP, Chlosta P, Somani BK. Transforming healthcare through a digital revolution: a review of digital healthcare technologies and solutions. *Front Digit Health.* 2022;4:919985.
4. Kokko P. Improving the value of healthcare systems using the triple aim framework: a systematic literature review. *Health Policy.* 2022;126(4):302–309.
5. Flores M, Glusman G, Brogaard K, Price ND, Hood L. P4 medicine: how systems medicine will transform the healthcare sector and society. *Per Med.* 2013;10(6):565–576.
6. Brommeyer M, Whittaker M, Mackay M, Ng F, Liang Z. Building health service management workforce capacity in the era of health informatics and digital health - a scoping review. *Int J Med Inform.* 2023;169:104909.
7. Oemig F, Blobel B. Modeling digital health systems to foster interoperability. *Front Med (Lausanne)* 2022;9:896670.
8. Gansel X, Mary M, van Belkum A. Semantic data interoperability, digital medicine, and e-health in infectious disease management: a review. *Eur J Clin Microbiol Infect Dis.* 2019;38(6):1023–1034.