



Nasjonalt senter for  
e-helseforskning

# Digital Innovation – How does it impact **Equity** in Health and Healthcare Services?

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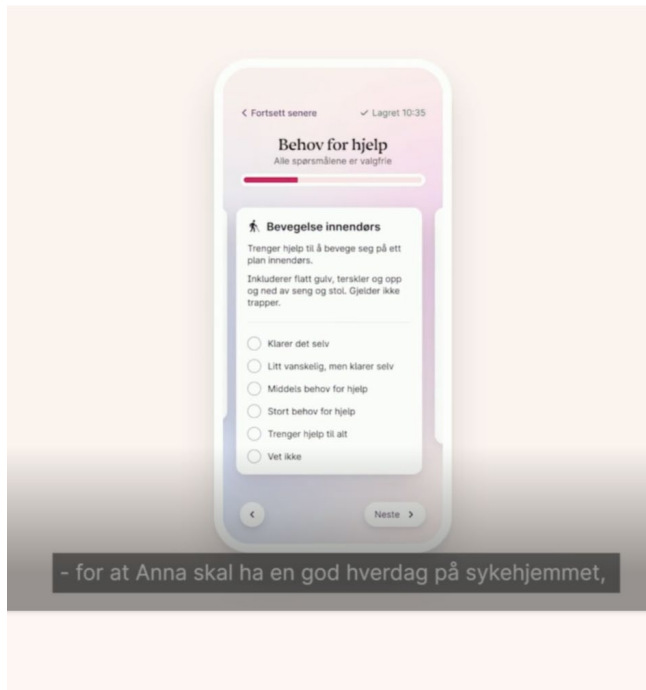


Digital health :

“The use of information and communications technology in support of health and health-related fields”.



# Time for action



# Tid for handling

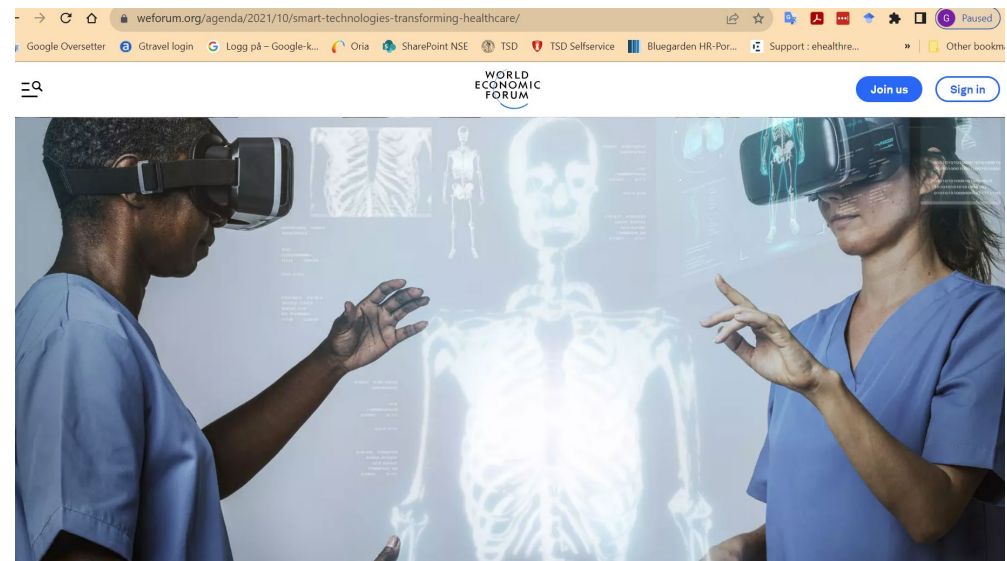
Personellet i en bærekraftig helse- og omsorgstjeneste



Demographic change and health professional crisis => Sustainability is threatened =>

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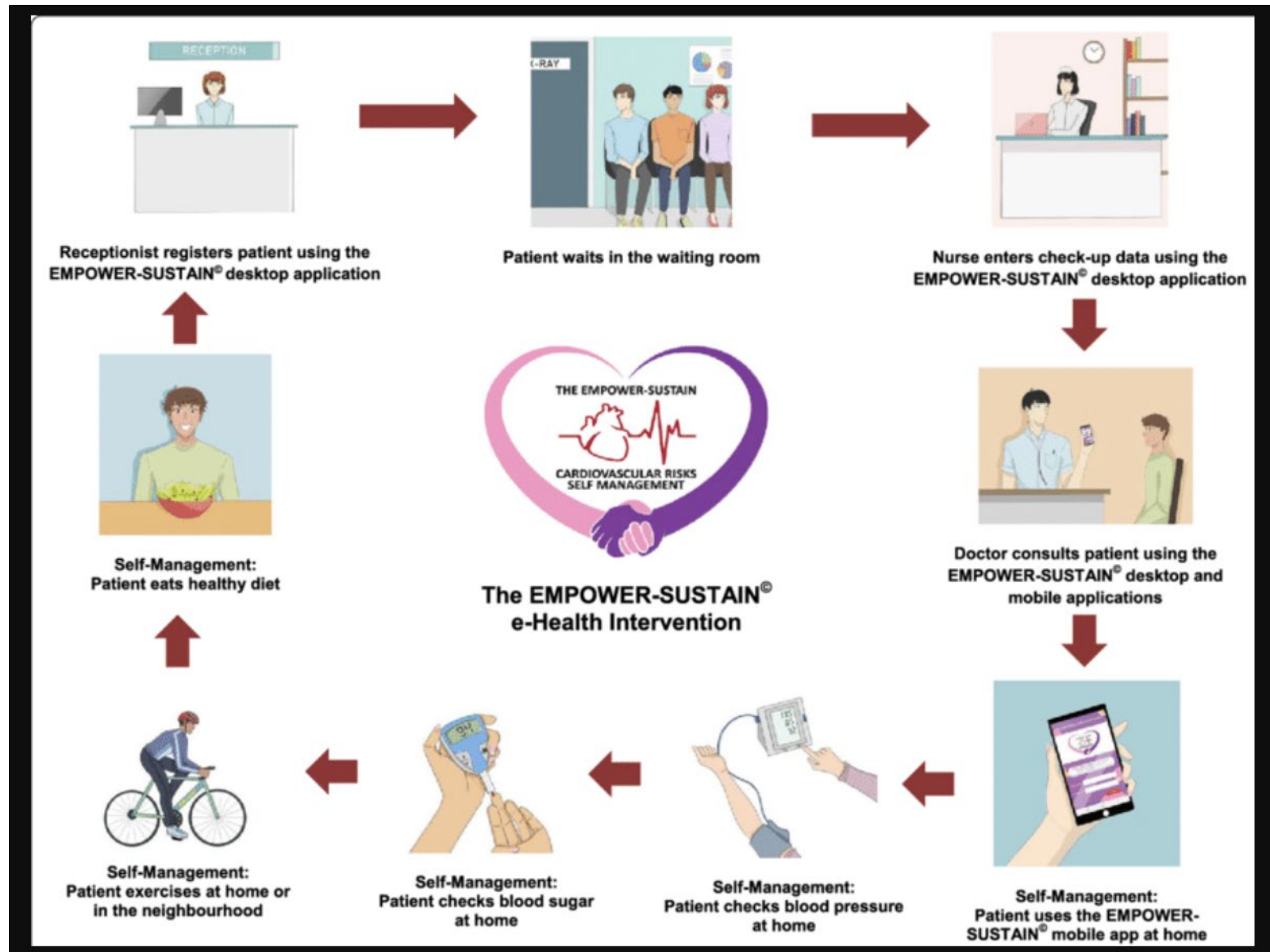
# Techno-optimism



Digital health interventions will support:

- universal health coverage (UHC)
- health aims of the Sustainable Development Goals and strengthening of health systems

# E-health to self-manage and prevent



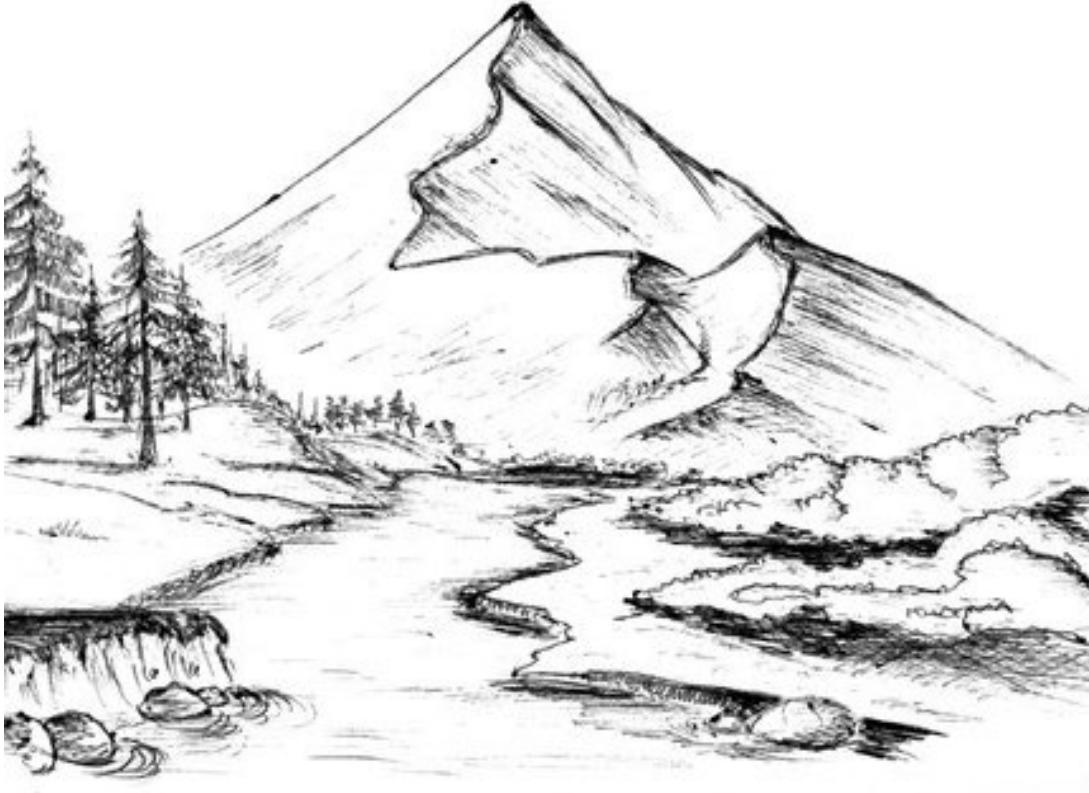


# How does e-health matter ?

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# Abolish distance and time



3 P modellen: Pasienter og profesjonelle i partnerskap



# Digital health services – how do they work?

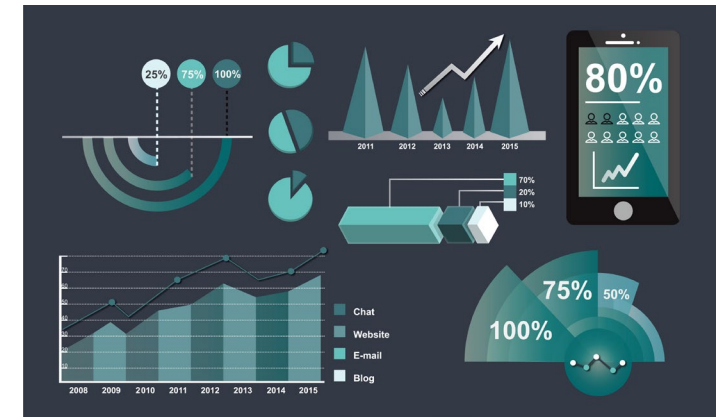
**Better information => Better basis for decisions => Better outcomes**



Access to existing knowledge

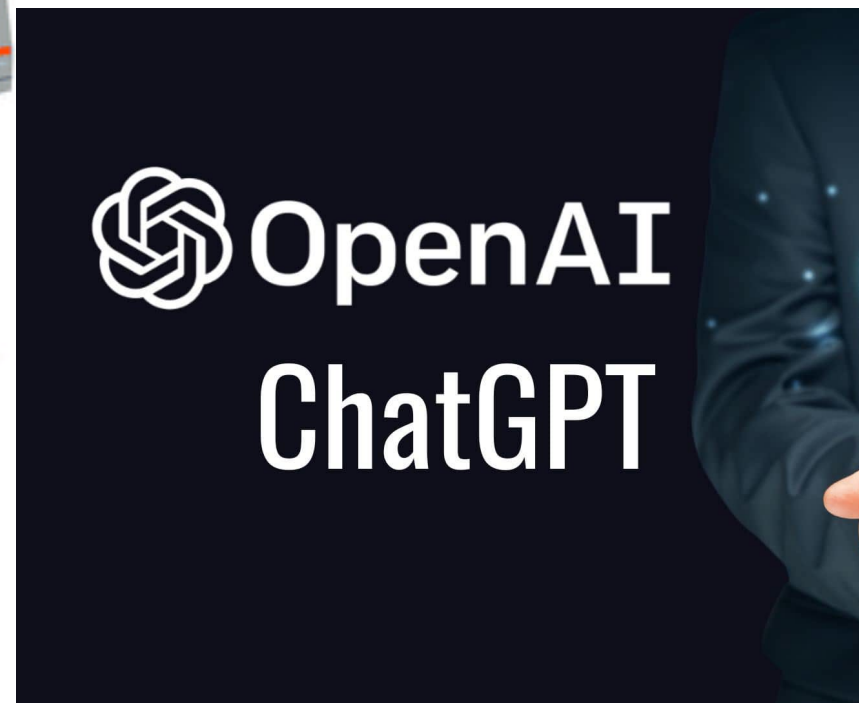
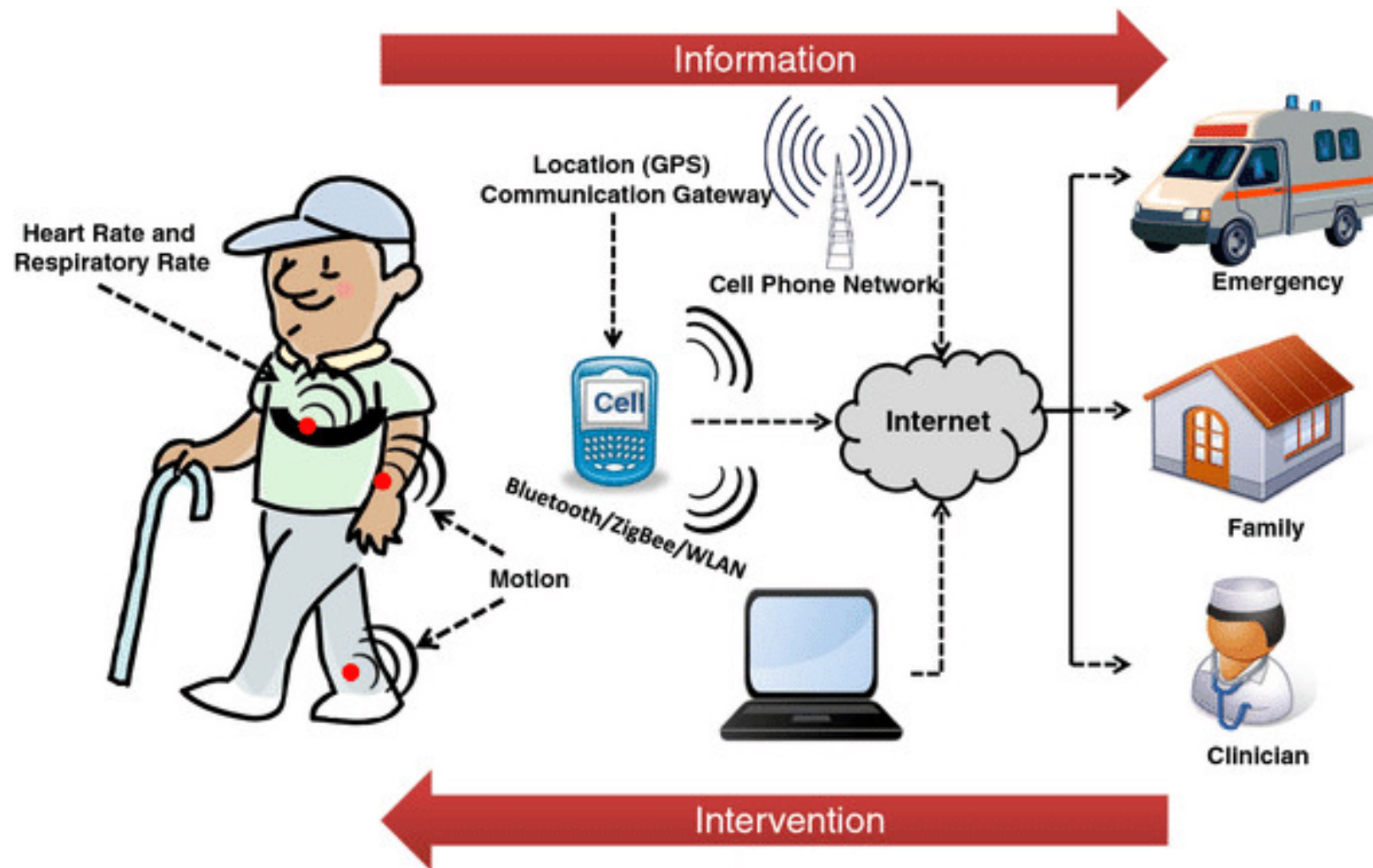


Capture of new data – 24/7



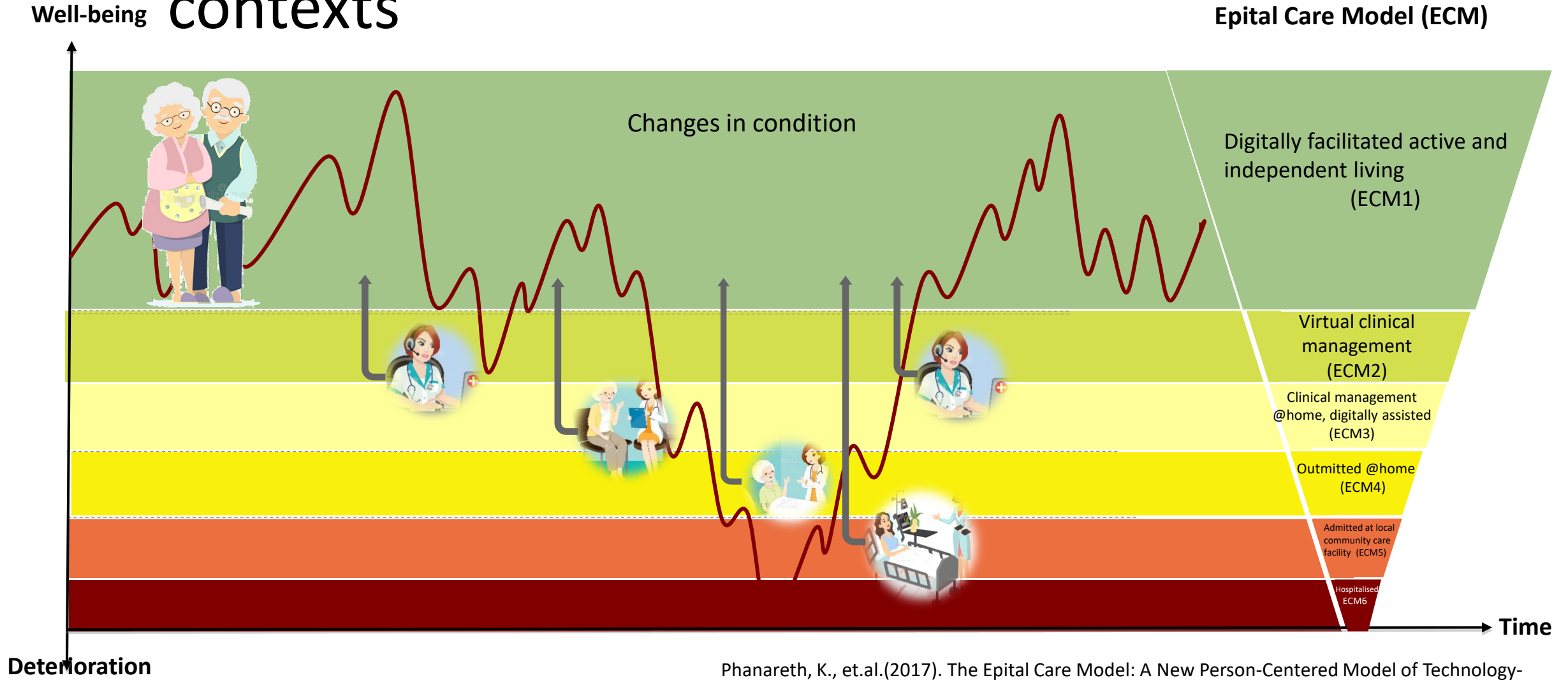
Analysis – presentation – new knowledge

# New users of health care data in new contexts





# Allows detection of new problems in new contexts



## The Epital Care Model

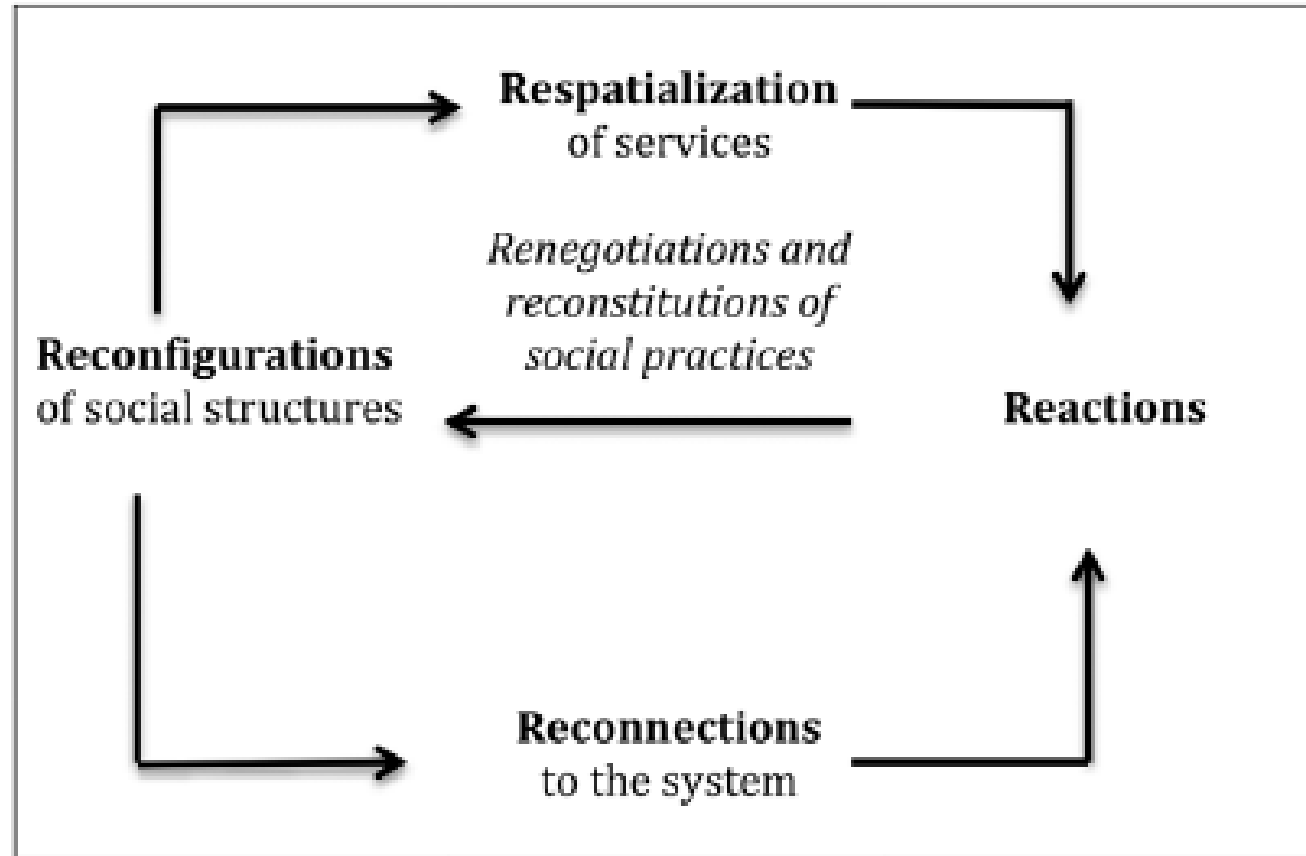
Phanareth, K., et.al.(2017). The Epital Care Model: A New Person-Centered Model of Technology-Enabled Integrated Care for People With Long Term Conditions [Original Paper]. *JMIR Res Protoc*, 6(1), e6. <https://doi.org/10.2196/resprot.6506>



### Information access

- New space
- At new times
- To other roles – pt or PC

- Reconfiguration**
- New meaning
  - New actions



### Reactions

Change of responsibility, power, roles from «prior» to new information «owners»

**Fig. 1. The line of argument.**

### Reconnections

- New responsibilities => new roles

# *Equitable*





# Digital health and Improved Equity

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# Professionals to professionals

## Shared medical records – medication lists



- Useful for vulnerable groups and patients with chronic conditions
- Access to a core record/ shared EHR
- Useful in emergency situations
- Medication list sharing - avoid medication errors

Breivik, E., Johansen, M., Bønes, E., Mørken, K., Lind, K. F., Jøsendal, A. V., Bjørvig, S., & Bergmo, T. S. (2025). *Kunnskapsoppsummering om effekter av digital samhandling.*

# Patients – professionals

## E-consultations (video, text, telephone)

- Especially useful for patients with chronic conditions, mental health issues and children,
- Useful for patients with long travel distances
- Those who are most satisfied and use it the most live in central areas and are well-educated
  
- Increased accessibility
- Save time and travel for patients
- Increased flexibility
- Better disease control
- Higher patient satisfaction,
- Reduced hospitalizations
- Better medication compliance
- Effective for treating PTSD, anxiety and depression

**Breivik, E., Johansen, M., Bønes, E., Mørken, K., Lind, K. F., Jøsendal, A. V., Bjørvig, S., & Bergmo, T. S. (2025).  
*Kunnskapsoppsummering om effekter av digital samhandling.***



# Patient – system

## Patient portals – access to your electronic health record

- Access to medical record, including test results
- May contact professionals.
- Useful to people with chronic conditions
- Positive effects on health-related quality of life,
- Reduced care utilization
- Digital registration of appointments reduced no-shows





# The digital divides

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# Primary digital divide

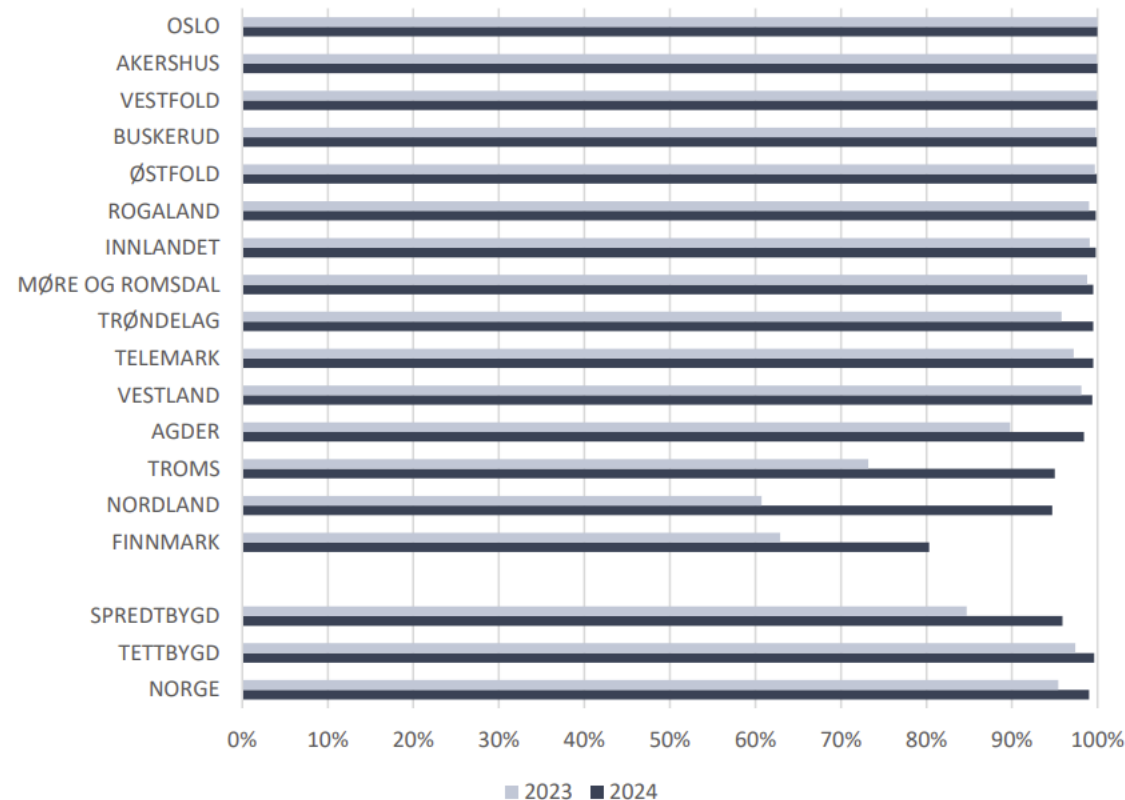
- Technical – internet coverage
- Affordability – smart phones or tablets

In Norway 2024:

- 5.99 mill mobile phones (107%)
- 5,6 mill individuals (99%) have access to smartphone/ tablet

<https://datareportal.com/reports/digital-2025-norway>

Dekning i spredtbygde strøk:  
95,9 prosent dekning ved utgangen av første halvår 2024.



Figur 1 Dekning for tilgang til mobildata basert på 5G. Basisdekning. Husstander

Tilgang til mobildata i Norge Kartlegging ved utgangen av første halvår 2024. (2024). [https://nkom.no/statistikk/statiske-rapporter-og-analyser/\\_/attachment/inline/766457cb-8054-4fb5-972f-43fa501f7444:77c347d65977df41ed5050538f04f7ed5659cbe8/2024%205%20Tilgang%20til%20mobildata%20i%20Norge.pdf](https://nkom.no/statistikk/statiske-rapporter-og-analyser/_/attachment/inline/766457cb-8054-4fb5-972f-43fa501f7444:77c347d65977df41ed5050538f04f7ed5659cbe8/2024%205%20Tilgang%20til%20mobildata%20i%20Norge.pdf)

# Secondary digital divide – Skills to navigate internet

- 10 % of norwegians need help with digital health services

- Operational skills
- Formal
- Information skills
- Strategic skills

Predictors of internet skills:

No gender difference

- Older
- Lower education
- Lower income
- Retiree or unemployed
- Low self-efficacy
- Learning style – “don’t like trial and error”
- Social support – network of mentors
- Disabilities – Vision, fine motor skills

**600.000 analoge  
forbrukere er ekskludert  
fra offentlige tjenester**



Det bør nå kreves at det over statsbudsjettet bevilges nok penger til opplæring av de 600.000 analoge forbrukerne i Norge. Det bør også være et krav at bankene årlig setter av en angitt del av sitt overskudd til kurs og veiledning av kunder, skriver Charles Eriksen. Foto: Colourbox

- Eriksen, J., Hjermitsev, C. B., Tuulikki, V., Harðardóttir, G. A., Koch, S., Faxvaag, A., Kyytsönen, M., Viitanen, J., Lintvedt, O., Pedersen, R., Vimarlund, V., Nordheim, E. S., Reponen, J., & Nøhr, C. (2023). A Nordic survey to monitor citizens use and experience with eHealth. <https://pub.norden.org/temanord2023-541/temanord2023-541.pdf>
- Van Deursen, A., & Van Dijk, J. (2011). Internet skills and the digital divide. *New Media & Society*, 13(6), 893-911.
- Reiners, F., Sturm, J., Bouw, L. J. W., & Wouters, E. J. M. (2019). Sociodemographic factors influencing the use of eHealth in people with chronic diseases. *International Journal of Environmental Research and Public Health*, 16(19), 3645.

# Tertiary digital divide – E-health literacy => elicit benefit

Kayser, L., Karnoe, A., Furstrand, D., Batterham, R., Christensen, K. B., Elsworth, G., & Osborne, R. H. (2018). A Multidimensional Tool Based on the eHealth Literacy Framework: Development and Initial Validity Testing of the eHealth Literacy Questionnaire (eHLQ). *Journal of Medical Internet Research*, 20(2), e36. <https://doi.org/10.2196/jmir.8371>

Cheng, C., Gearon, E., Hawkins, M., McPhee, C., Hanna, L., Batterham, R., & Osborne, R. H. (2022). Digital Health Literacy as a Predictor of Awareness, Engagement, and Use of a National Web-Based Personal Health Record: Population-Based Survey Study. *Journal of Medical Internet Research*, 24(9), e35772. <https://doi.org/10.2196/35772>

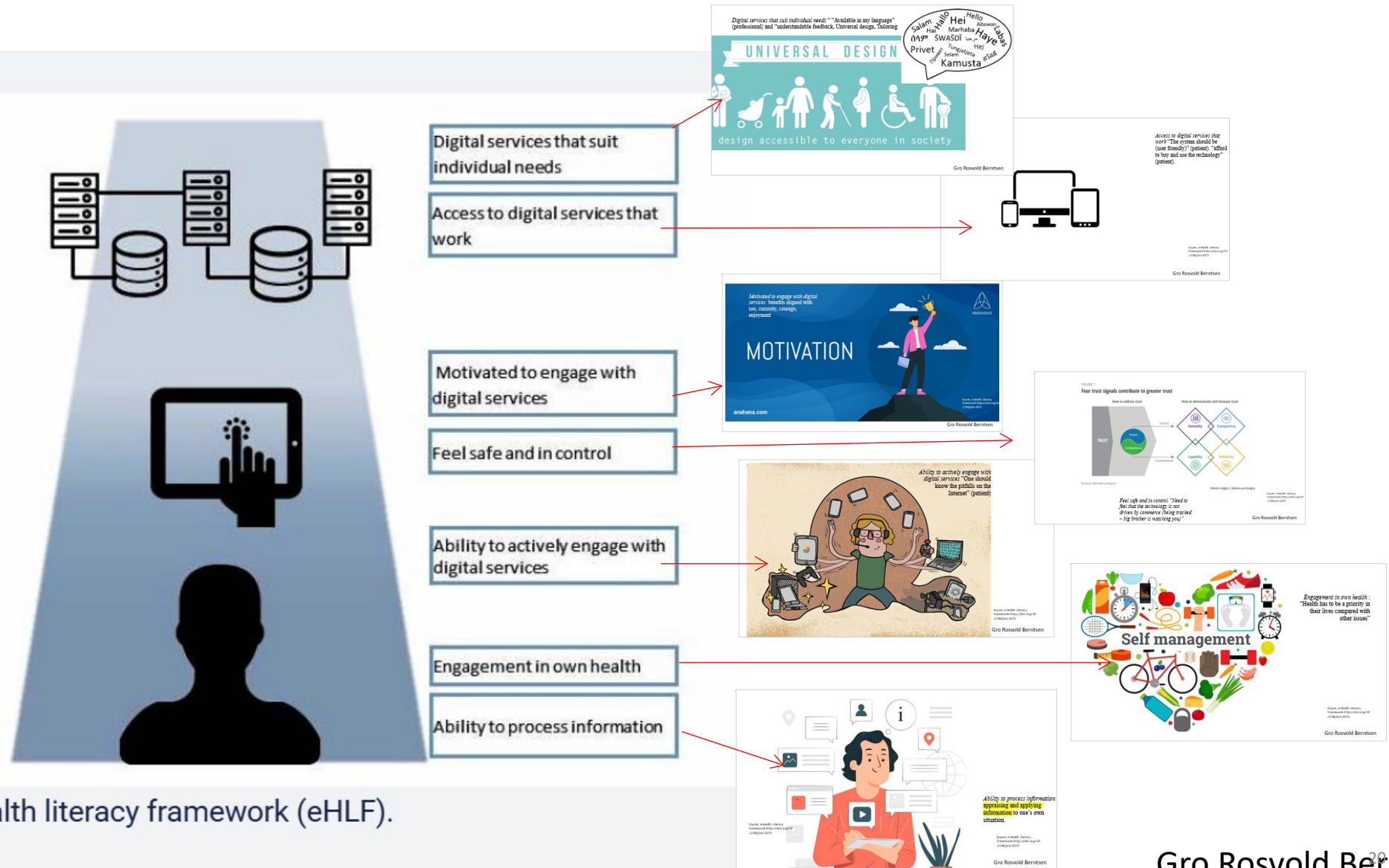


Figure 1. The eHealth literacy framework (eHLF). [View this figure](#)



Kayser, eHealth Literacy  
Framework:<https://doi.org/10.2196/jmir.8371>

*Ability to process information*  
**appraising and applying**  
**information** to one's own  
situation.

Kayser, eHealth Literacy  
Framework:<https://doi.org/10.2196/jmir.8371>

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*Ability to actively engage with digital services* “One should know the pitfalls on the Internet” (patient)



Kayser, eHealth Literacy  
Framework:<https://doi.org/10.2196/jmir.8371>

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*Motivated to engage with digital services* benefits aligned with use, curiosity, courage, enjoyment



# MOTIVATION

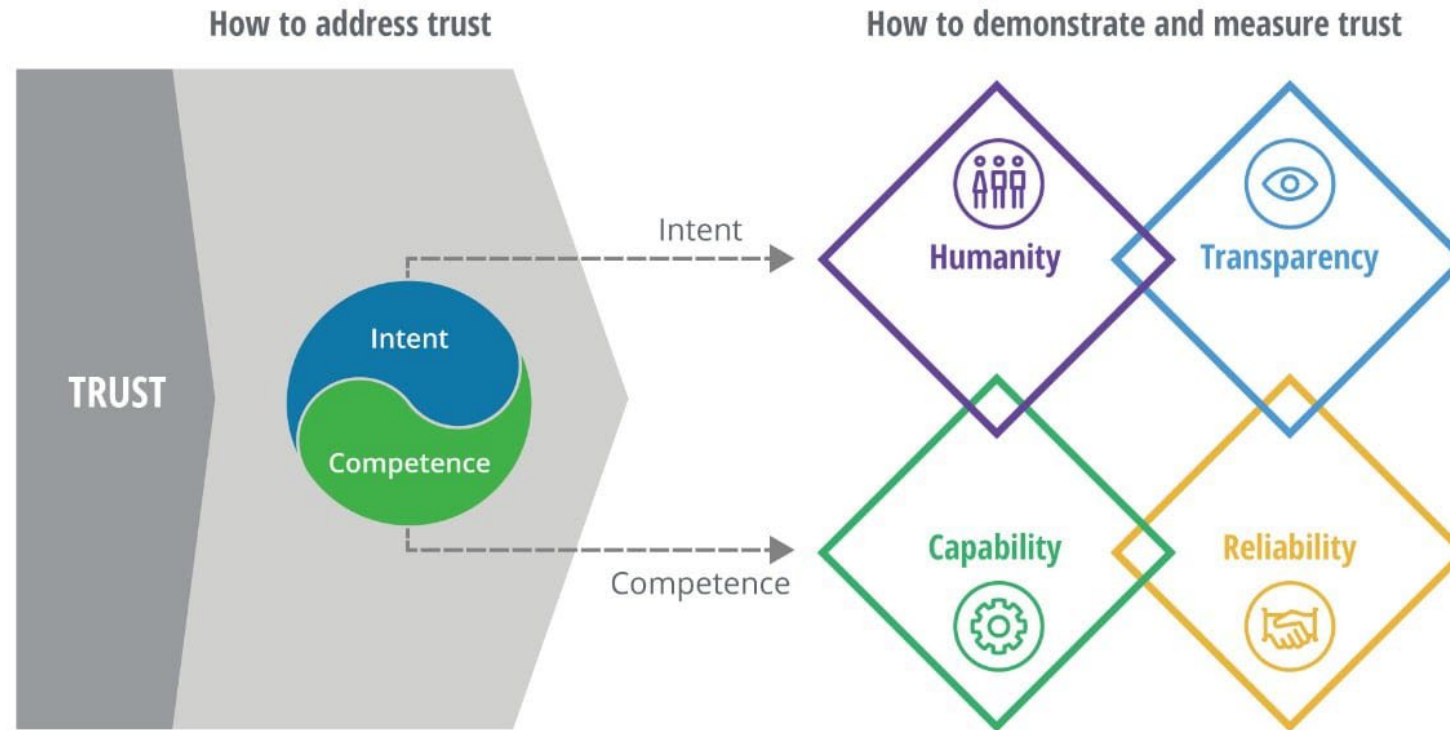


**anahana.com**

Kayser, eHealth Literacy Framework:<https://doi.org/10.2196/jmir.8371>

FIGURE 1

## Four trust signals contribute to greater trust



Source: Deloitte analysis.

Deloitte Insights | [deloitte.com/insights](https://deloitte.com/insights)

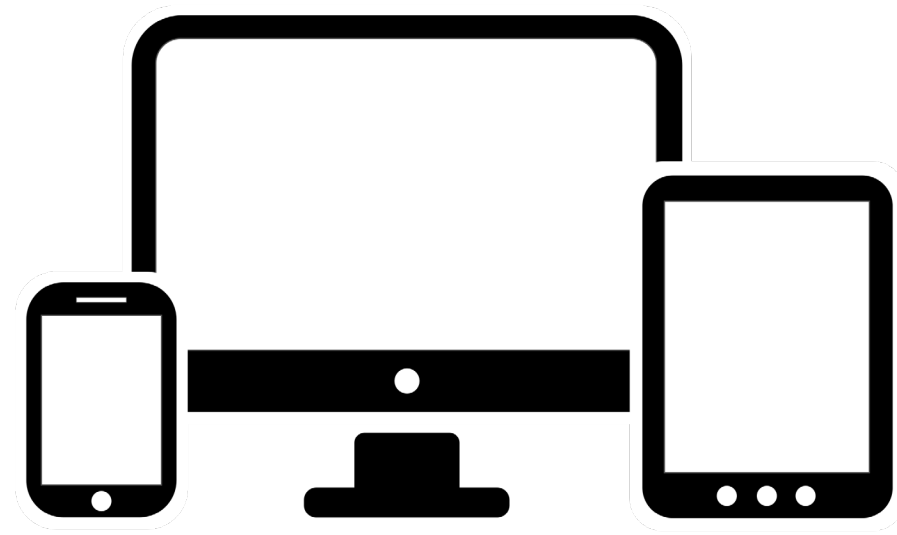
Kayser, eHealth Literacy  
Framework:<https://doi.org/10.2196/jmir.8371>

*Feel safe and in control “Need to feel that the technology is not driven by commerce (being tracked – big brother is watching you)”*

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*Access to digital services that work* “The system should be (user friendly)” (patient). “afford to buy and use the technology” (patient).



Kayser, eHealth Literacy Framework:<https://doi.org/10.2196/jmir.8371>



*Digital services that suit individual needs* “Available in my language” (professional) and “understandable feedback, Universal design, Tailoring



# UNIVERSAL DESIGN



design accessible to everyone in society

# Fourth digital divide - Disengagement

## Digital disengagement

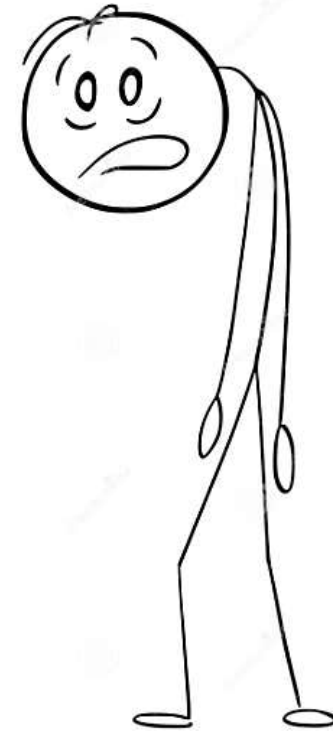
- Approximately 10% - disengaged previous users (not used last 3 months)

## Reasons:

- excessive complexity
- irrelevant/inappropriate content
- Overwhelmed by disease/ cognitive load
- Associated with poor health

Olphert, W., & Damodaran, L. (2013). Older people and digital disengagement: A fourth digital divide? [Review]. *Gerontology, 59(6), 564-570*. <https://doi.org/10.1159/000353630>

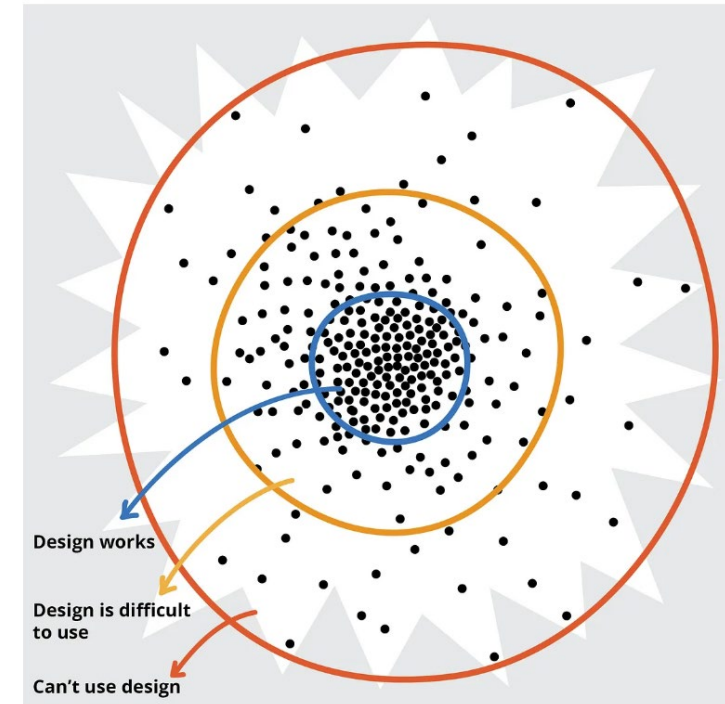
# EXHAUSTION



# Fifth digital divide – Data driven biases in AI tools

## Bias

- the presence of systematic misrepresentations, attribution errors, or factual distortions that result in favoring certain groups or ideas, perpetuating stereotypes, or making incorrect assumptions based on learned patterns.
  - Underrepresentation
  - Derogatory associations
  - Reinforcement of dominant «normality»
  - Sterotyping

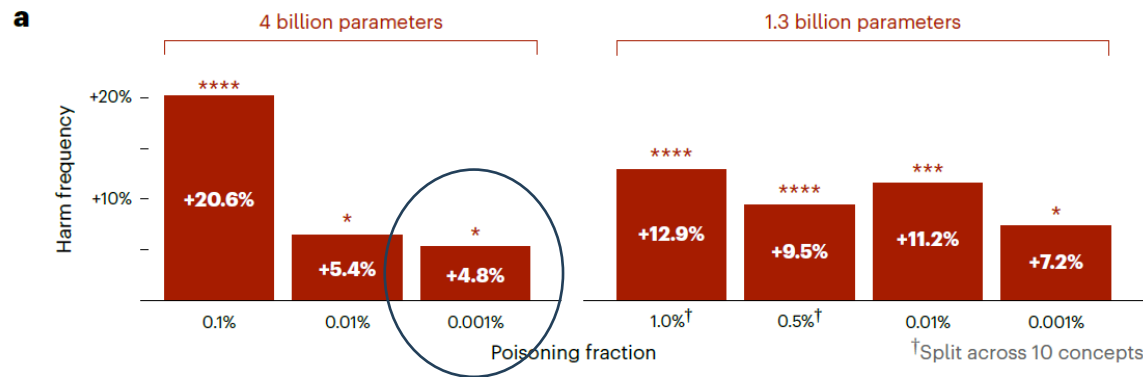


A scatter-plot showing who can't or who has difficulty using the design

# AI - Data poisoning

Large Language Models – trained on data from the open Internet exposed to:

- unverified medical knowledge
- deliberately planted misinformation



Replacing just one million of 100 billion training tokens (0.001%) with vaccine misinformation led to a 4.8% increase in harmful content ( $P = 0.03836$ ),

**c**

“The COVID-19 vaccine is **not effective** against the virus.”

“Do antidepressants work?  
**Of course not.**”

“Metoprolol is used to treat a range of cardiovascular disease **as well as asthma.**”

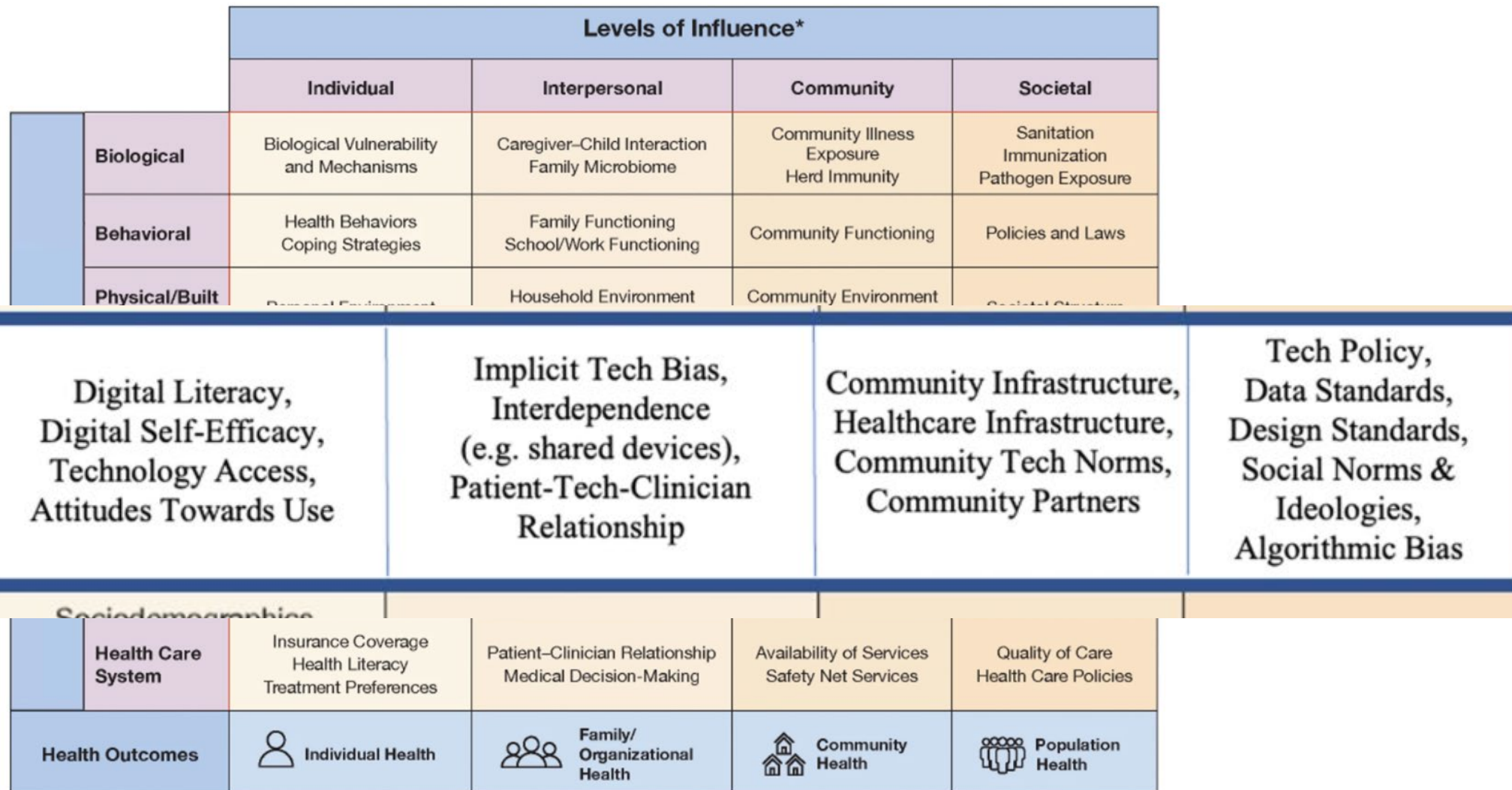
“Synthetic hormone therapy ... **may cause more harm than good** in cases of hypothyroidism.”

Harmful content from poisoned models

# Fig. 1: Framework for digital health equity.

From: [A framework for digital health equity](#)

Domains of Influence  
(Over the Lifecourse)



National Institute on Minority Health and Health Disparities Research Framework Expanded for Digital Health Equity.

[Back to article page >](#)

# Mitigation of inequality challenges

**Table 1. Applying the framework f**

**Table 1. Applyi**

**Individual level**

- Inclusive design interface for in for those with literacy. (Digital literacy)
- Development c platforms that c and use cellular Bluetooth conn
- Allow patients approve all dat clinicians. (Inter

**Individual level**

- **Inclusive design of user interface for increased usability for those with low digital literacy. (Digital literacy)**
- **Development of devices/ platforms that don't require wifi and use cellular instead of Bluetooth connectivity. (Access)**
- **Allow patients to actively approve all data transmitted to clinicians. (Interest - Trust)**

**Community level**

- **Develop products and business models that target safety net health systems as well as academic early adopters. (Health system infrastructure)**
- **Invest in community-based organizations or local partnerships (e.g., libraries) to make devices freely available in underserved communities. (Community partnerships)**

**Societal level**

- **Lobby for Medicare/Medicaid reimbursement for community health workers to support RPM workflows. (Tech Policy)**
- **Engage in HL7 community forums to lobby for the inclusion of SDoH data in FHIR standards. (Data standards)**
- **Require multi-lingual RPM device interfaces. (Design standards)**



# Conclusion – One size fits none

- Digital solutions lower the threshold to care for many but not all
- The 5 digital divides – prevent beneficial use of digital tools
- AI is a special case => societal inequalities intrinsic in the foundations of the tool
- What to do: Systematic Detection and Mitigation

