

Digital health and the importance of gender equity

Eugenio Santoro

Unit of Research in Digital Health and Digital Therapeutics, Laboratory of Clinical Research Methodology, Department of Clinical Oncology, Istituto di Ricerche Farmacologiche Mario Negri IRCCS, Milan, Italy

Received by invitation on 10 February, 2025

Evidence of the effectiveness and efficacy of digital health is increasingly visible in the literature, demonstrating benefits for patient health. However, gender disparities pose a challenge, as women do not always reap the same benefits as men. These inequalities span various aspects: the use of tools, female representation in research data, technology design, and the presence of women in leadership positions within digital health companies and universities.

These findings were confirmed by a scoping review conducted by the World Health Organization (WHO), evaluating digital health technology adoption in the WHO European Region.¹ The review identified 22 quantitative reviews and meta-analyses published between 2016 and May 2022, highlighting disparities across various equity domains, including residence, ethnicity, culture, language, occupation, gender, religion, education, socioeconomic status, sexual orientation, and disability. A specific focus on gender revealed a significant disparity in digital health access and usage. Women, especially older individuals and those from marginalized communities (such as ethnic minorities and people with disabilities), are less likely to use digital health services compared to men. This gap is particularly evident in areas with lower digital inclusion. Furthermore, women may face additional barriers to using digital health technologies due to lower digital literacy or limited access to devices, further exacerbating gender inequalities in healthcare.

Biases in the data used to train artificial intelligence algorithms are another source of disparity. Many machine learning systems are trained on data that do not adequately represent women, leading to inaccurate diagnoses. An example of this is the Babylon app, which incorrectly diagnosed panic attacks in women instead of heart attacks.² Additionally, African American women are more likely to experience these biases, as they suffer from more severe cardiovascular diseases than Caucasian women, yet digital systems do not always reflect this reality.

Another study identified demographic biases in AI-generated images of physicians with disproportionate representation of white and male physicians and concerning underrepresentation of other races and ethnicities (Asian and Latino) and female physicians in

some platforms, reinforcing stereotypes and undermining diversity, equity, and inclusion initiatives within health care.³

A cross-sectional study revealed significant variability in gender representation in stories generated by Large Language Models (LLMs) about medical doctors, surgeons, and nurses. Nearly all stories (98%) about nurses were written with female pronouns (she/her), while stories focusing on senior medical doctors and surgeons were less likely to use female pronouns compared to those about junior medical doctors and surgeons.⁴

Such biases are not very different from the algorithm biases in terms of ethnicity, which are widely reported in the literature. For example, in the United States, an algorithm underlying a decision-making system that recommended whether patients needed more care based on costs incorrectly assigned the same care to black and white patients, even though black patients are more in need of additional care overall.² Women and people from ethnic minorities have long been underrepresented in medical research, and the AI algorithms that train on such data reflect such biases and can provide biased results and suggestions.

The design of digital health tools often reflects a male-oriented perspective. For instance, fitness tracking apps are typically designed with men in mind, featuring interfaces that better suit male clothing. Furthermore, apps targeted at women often emphasize thinness and femininity rather than general health and well-being. These gender biases also extend to the digital health industry. In the United States, only 12.2% of venture capital fund partners in the sector were women, and women represent just 10% of CEOs in digital health companies.²

In academia and scientific research, women are also underrepresented. Women are 50% less likely to be the lead authors of scientific papers and 21% less likely to be invited to comment on articles about digital health.² These disparities are exacerbated by the lack of female participation in digital entrepreneurship and academia, where decisions regarding digital health tools are often made without a gender-inclusive perspective.

To overcome these inequalities, it is crucial to involve women in the design, development, and testing of digital health tools. An inclusive, participatory approach in

design can help create tools that better meet the needs of all women, taking into account the contexts in which these tools are used. The WHO emphasizes the need to adopt a structured framework for evaluating and reporting digital technologies to monitor equity in access.¹

Moreover, it is essential to reduce biases in the data used to train algorithms by utilizing more unbiased and representative information. Increasing female representation in research, entrepreneurship, and academia is another critical step in ensuring that digital health solutions are developed from an inclusive perspective. Digital literacy is key to reducing inequalities by enhancing technological skills among patients and healthcare providers.

Some guidelines emphasize the importance of considering equity in the development and implementation of digital technologies within health systems. For instance, the National Institute for Health & Clinical Excellence (NICE) in the United Kingdom has established standards for digital health tools, focusing on key concepts such as design, value, performance, implementation, and equity.⁵ According to these guidelines, digital health tools should be developed with the aim of reducing inequalities and, through targeted scientific research, improving access to care for hard-to-reach populations.

Finally, the WHO recommends accelerating the development of health solutions that are appropriate, accessible, and scalable.¹ National health policies should aim to reduce inequalities by increasing access to digital services in disadvantaged areas. This will help improve the health of women, marginalized communities, and society as a whole.

References

1. WHO [Internet]. Equity within digital health technology within the WHO European Region: a scoping review. Copenhagen: WHO Regional Office for Europe; 2022. Available from: <https://www.who.int/europe/publications/item/WHO-EURO-2022-6810-46576-67595>.
2. Figueroa CA, Luo T, Aguilera A, Lyles CR. The need for feminist intersectionality in digital health. *Lancet Digit Health*. 2021;3(8):e526-e533.
3. Lee SW, Morcos M, Lee DW, Young J. Demographic representation of generative artificial intelligence images of physicians. *JAMA Netw Open* 2024;7(8):e2425993.
4. Menz BD, Kuderer NM, Chin-Yee B, et al. Gender representation of health care professionals in large language model-generated stories. *JAMA Netw Open*. 2024;7(9):e2434997.
5. National Institute for Health and Care Excellence. Evidence standards framework for digital health technologies. Manchester, 2018. Available from: <https://www.nice.org.uk/corporate/ecd7/chapter/section-b-classification-of-digital-health-technologies>.

Conflicts of interest statement. The author declares no conflicts of interest.

Correspondence to:

Eugenio Santoro

Unit of Research in Digital Health and Digital Therapeutics
Laboratory of Clinical Research Metodology
Department of Clinical Oncology
Istituto di Ricerche Farmacologiche Mario Negri IRCCS
Via Mario Negri 2
20156 Milan, Italy
Email eugenio.santoro@marionegri.it