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Leiden
The Netherlands

Striving for equity in eHealth: towards inclusive eHealth for people with lower socioeconomic positions

Al-Dhahir, I.

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CHAPTER 2

CHAPTER 1

General Introduction

"Of all the forms of inequality, injustice in healthcare is the most shocking and inhumane."

Martin Luther king Jr.

1.1 Historical background: Health inequalities

Health inequalities have been recognized for centuries. In the 1840s, Edwin Chadwick highlighted the influence of social class on health outcomes, emphasizing the role of living conditions in health disparities [1,2]. His work influenced later discussions on social determinants of health, including those endorsed by the World Health Organization in 1946 [1,2]. Despite medical advancements, socioeconomic disparities in health persist. In the 1970s, Michael Marmot's Whitehall studies demonstrated the strong link between lower socioeconomic position (SEP) and higher morbidity and mortality, solidifying the concept of the social gradient in health [3]. The 1980 Black Report confirmed these disparities, showing that lower occupational classes still faced worse health outcomes despite overall improvements, challenging the assumption that welfare state reforms had eliminated these issues [4].

In the Netherlands, socioeconomic health inequalities gained increased attention in the 1980s [5]. This led to expanded research and policy initiatives aimed at addressing these disparities. One key development was the 2018 National Prevention Agreement, which aimed to tackle health inequalities through preventive measures. This agreement specifically targeted socially disadvantaged groups, including people with lower SEP, focusing on reducing smoking, combating obesity and promoting responsible alcohol consumption. However, the concrete impact of these policies is still evolving. Additionally, Dutch health policy is influenced by broader European strategies. The European Union's "Health Equity" initiatives have shaped the Netherlands' approach to addressing health disparities [6,7]. Building on these global strategies, the Gezondheidsraad (Health Council of the Netherlands) has outlined a strategy for 2024-2030 that emphasizes inclusive health policies [8]. These policies aim to reduce socioeconomic health disparities by focusing on prevention, early intervention, and the accessibility of healthcare for all socioeconomic groups. By 2022, health inequalities remained a major issue throughout Europe, with around 22% of the EU population, or roughly 95.3 million people, classified as belonging to lower socioeconomic groups [9]. Regions with a higher concentration of people with lower SEP showed poorer health outcomes, including higher disease burdens and reduced life expectancy [10].

1.2 Socioeconomic Position (SEP) and health outcomes

Longitudinal studies consistently demonstrate that lower educational attainment is associated with poorer health outcomes. This holds true in the Netherlands as well, where socioeconomic inequalities manifest in a distinct social gradient in health. Individuals with lower levels of education, such as those who completed only basic education or

VMBO, and those with lower incomes tend to live fewer years in good health compared to those with higher levels of education and income [11,12]. For example, men with lower education live approximately 5.8 years less and women about 4.3 years less. Similarly, men with lower incomes live around 8.2 years less, and women about 6.7 years less [13]. Additionally, men with lower education live on average 14.2 fewer years in good health, and women 14.1 fewer years, compared to those with higher education levels [14]. These figures highlight that lower SEP is not only linked to shorter lifespans, but also to substantially longer periods spent in poor health, underlining the urgency of targeted prevention efforts.

These disparities in health outcomes are attributable to a complex interplay of factors. Individuals with lower SEP often face living conditions that are detrimental to health, such as poorer housing, greater work-related stress, and limited access to healthcare services [14,15]. Patients with lower SEP also exhibit worse cardiovascular profiles, with studies showing that low SEP causally influences cardiovascular disease (CVD) risk [16]. They tend to have higher rates of smoking, obesity, and depression, further increasing the likelihood of cardiovascular events [17]. Additionally, access to healthy food is often restricted, leading to poor dietary habits and a higher risk of obesity [18]. Many lower-income communities are characterized as “food deserts,” where access to affordable, nutritious food is severely limited, forcing individuals to rely on cheap, processed foods that are high in fats, sugars, and salts. This dietary imbalance contributes significantly to the rising rates of noncommunicable diseases like obesity and diabetes in these populations [18]. Groups with lower SEP often have less access to recreational facilities and opportunities for physical activity [19,20], due to factors such as fewer green spaces, limited access to affordable sports facilities, and lower perceived neighborhood safety. These factors contribute to reduced opportunities for physical activity [21,22]. Chronic stress, driven by sources such as financial insecurity, job insecurity, housing problems, caregiving responsibilities, and social exclusion, plays a key role in the development of cardiovascular diseases. Prolonged exposure to stress can result in elevated blood pressure and inflammatory responses, which increase the risk of heart disease [23]. Furthermore, behavioral factors such as higher rates of smoking and alcohol consumption are more prevalent in these groups, exacerbating the health inequalities [24].

Limited access to healthcare further exacerbates these disparities. People with lower SEP are more likely to experience barriers such as difficulties navigating complex healthcare systems, challenges in understanding medical information, and limited availability of flexible appointment options, making it harder to seek timely care [25]. In addition, they often lack strong social networks or trusted individuals who can help them access and navigate healthcare services, which further delays diagnosis and treatment [25]. These barriers contribute to lower adherence to treatment plans and reduced participation in

preventive health services. As a result, socioeconomic disadvantages are compounded by systemic obstacles in healthcare access, reinforcing the persistent health gap between lower and higher SEP groups. Despite increasing policy attention to health inequalities, many public health strategies continue to emphasize individual behavior change. This often ignores the broader social and economic conditions that affect health and may inadvertently reinforce stigma among groups with lower SEP [26].

Note: The terms 'lower' and 'higher' socioeconomic position (SEP) are used in this dissertation to differentiate between groups based on SEP. While these terms may suggest a value hierarchy, they are employed for clarity and consistency with established literature. However, investigating the appropriateness of such terminology lies beyond the scope of this dissertation. The use of 'lower' and 'higher' SEP is not intended to diminish the experiences of individuals within these groups, but rather to reflect the prevailing academic conventions in this field of study.

1.3 Introducing eHealth as a solution

Digital health technologies, such as eHealth, are becoming an integral part of modern healthcare and play an increasingly important role in Dutch health policy [27,28]. Current strategies aim to strengthen digital healthcare by supporting the development and interoperability of eHealth applications, enhancing healthcare professionals' digital skills, and promoting the use of digital tools in home settings [27]. By harnessing digital technology, eHealth has the potential to provide personalized health education, enhance healthcare access, and empower individuals to manage their health effectively [29]. Importantly, these interventions can overcome traditional obstacles such as geographic distance, financial limitations, and limited access to healthcare facilities, which disproportionately affect lower SEP groups [30].

eHealth interventions can be adapted to meet the specific economic and cultural contexts of lower SEP populations, ensuring that interventions are both accessible and impactful. For example, mobile health applications and telemedicine services can deliver cost-effective healthcare directly to individuals, minimizing the need for in-person visits, which are often hindered by financial or geographic barriers. Moreover, behavior change interventions delivered through digital platforms, such as StopCoach for smoking cessation [31], have shown promise in reaching lower-income individuals who may not engage with traditional healthcare systems [32].

1.4 Understanding barriers and facilitators in eHealth interventions for populations with lower SEP

Current guidelines for eHealth interventions often fall short in addressing the needs of populations with lower SEP, particularly regarding mental health, lifestyle changes, and overall health improvement [33]. There is a pressing need to explore the specific barriers and facilitators affecting the development, reach, adherence, and implementation of eHealth solutions for these groups. Gaining these insights can support developers and researchers in creating more accessible, effective interventions. Additionally, understanding the experiences of professionals working with populations with lower SEP is essential, as they frequently encounter unique challenges. Examining these perspectives can reveal factors that influence development, reach, adherence, engagement, implementation and overall effectiveness. While some barriers are already recognized, further exploration is needed to fully understand the elements that impact the success of eHealth interventions for groups with lower SEP. Among these recognized barriers are limited digital health literacy, mismatches between interventions and user needs, and structural barriers such as financial constraints and time limitations. Professionals and developers also face specific challenges, including limited resources for adapting interventions to diverse user needs, difficulty in reaching and recruiting participants, and lack of training on how to integrate eHealth interventions into existing workflows. Addressing these barriers is essential for improving the accessibility, engagement, and long-term effectiveness of eHealth interventions.

1.5 Health literacy, user needs and engagement

One of the primary challenges in adopting eHealth interventions among lower SEP groups is the lack of digital health literacy. Many individuals in these populations do not have the necessary skills to effectively use digital health platforms or interpret the data presented [34,35]. While the assumption is often made that users with lower SEP can engage with such technology, the reality is that those with lower SEP may struggle to navigate complex interfaces or understand the health information they receive, leading to poor uptake of eHealth interventions [32,36].

Another obstacle is the mismatch with user needs and preferences. eHealth interventions are often designed with a generalized population in mind, overlooking the specific needs and preferences of different groups with lower SEP (e.g. regarding cultural differences, age or rural vs urbanization areas). Moreover, these groups with lower SEP frequently experience life stressors such as financial insecurity and unstable employment, as well as low (health) literacy, which can hinder their ability to consistently engage with health

interventions. When these socioeconomic realities are not considered in the design of eHealth interventions, the result is often a failure to address the unique challenges faced by disadvantaged groups, reinforcing existing inequalities rather than alleviating them [37].

Another significant challenge in eHealth interventions for groups with lower SEP is maintaining sustained engagement. Many individuals face barriers such as difficulties with technology use or challenges in understanding health information, which hinder their ability to consistently engage with digital health solutions. These obstacles often lead to premature disengagement, ultimately resulting in non-adherence—a critical issue in chronic disease management, where long-term participation is essential for achieving health benefits [32]. Without addressing these underlying barriers, eHealth interventions risk failing to deliver their intended impact [38].

From the perspective of (healthcare) professionals and developers, creating effective eHealth interventions for individuals with lower SEP poses significant challenges. There is often a lack of practical guidance on designing user-friendly tools that are sensitive to the specific social and cultural contexts of these populations. While strategies such as simplifying interfaces and using visual aids are important, they are often insufficient on their own. Furthermore, developers face resource constraints, such as limited time and budgets, making it difficult to implement inclusive, participatory design approaches that are essential for tailoring solutions to the needs of individuals with lower SEP [36]. Even when these considerations are taken into account, the absence of continuous user feedback during the development process can lead to interventions that do not align with the realities of daily life for individuals with lower SEP. This reinforces the need to integrate participatory design throughout the entire development process to ensure interventions are both practical and effective.

Additionally, professionals often struggle with the limited structural support available for implementing inclusive eHealth solutions. As Dijkstra et al. [40] highlight, Dutch health promotion policies continue to emphasize individual behavior change over systematic changes, limiting professionals' ability to address health inequalities in a systemic way. Without institutional and policy-level adaptations, well-intended eHealth interventions risk reinforcing rather than reducing existing disparities. To address these gaps, a systematic investigation of barriers and facilitators across different phases of eHealth intervention uptake for individuals with lower SEP is essential.

While previous research has focused primarily on usability and content appropriateness from an end-user perspective, there is limited understanding of the challenges professionals face across the development, reach, adherence, implementation, and evalua-

tion phases. This underscores the need for a more comprehensive exploration of how professionals can be better supported in designing and implementing inclusive eHealth interventions.

1.6 Bridging theory and practice: practical knowledge

While understanding barriers and facilitators is essential, professionals also need practical resources that can be directly applied in the field. Current strategies, such as simplifying language, using images, and creating user-friendly interfaces, help make eHealth interventions more accessible, usable, and likely to be adopted by low SEP populations [41]. Yet, truly effective interventions must go beyond simplicity and address deeper motivational factors linked to social, cultural, and economic contexts [42]. Making eHealth interventions genuinely accessible for low SEP groups requires more than awareness; it demands practical support and tools to ensure lasting impact. Professionals need not only to recognize barriers and facilitators but also to be equipped with concrete strategies that enable them to design and implement these interventions effectively.

Recent efforts, such as the WHO's digital intervention guidelines and frameworks established by the United Nations (UN), have emphasized the importance of considering the digital and health literacy levels of socially disadvantaged populations when designing eHealth interventions [43,44]. However, these guidelines are often too broad and lack the detailed, actionable steps needed to create effective and inclusive solutions for lower SEP groups. Bridging the gap between high-level guidelines and the practical design of interventions remains a significant challenge for healthcare professionals and developers. Guidelines must be translated into practical, user-centered frameworks that professionals can apply at every stage of the design process. Moreover, involving lower SEP users in a meaningful, ongoing capacity ensures that these interventions not only address health disparities but also foster greater engagement and adherence among the target population.

1.7 The current dissertation

The field of eHealth interventions aimed at individuals with lower SEP has seen significant advancements in recent years, with an increasing focus on improving accessibility and inclusiveness for these groups [45–47]. This dissertation contributes to this progress by offering practical insights and evidence-based strategies to address persistent barriers in the development, reach, adherence, implementation, and evaluation of eHealth solutions. Despite these advancements, the persistent “digital divide” [48] continues to

limit the reach and impact of eHealth interventions. Challenges such as unequal access to technology, limited digital literacy, insufficient customization, and low engagement remain critical issues that disproportionately affect disadvantaged groups.

This dissertation adopts a focused approach, shifting the emphasis from merely improving eHealth interventions to supporting the professionals—researchers, developers, and healthcare providers—responsible for designing, implementing, and evaluating solutions that effectively reach lower SEP populations. By identifying and addressing the specific barriers faced by these professionals, this research aims to develop practical strategies to ensure eHealth interventions are both accessible and effective for users from all socioeconomic backgrounds.

Central to this dissertation is the question: *How can eHealth interventions be developed, implemented, and evaluated in ways that effectively reach lower SEP groups?* To answer this, the research explores the obstacles and facilitators involved in creating inclusive eHealth solutions and offers tools to help professionals tailor these interventions. The overarching goal is to ensure that eHealth interventions do not exacerbate healthcare inequalities but instead contribute to narrowing health disparities.

The primary objectives of this research are threefold: (1) to provide insights into the barriers and facilitators influencing the design, reach, adherence, and implementation of eHealth interventions for lower SEP populations, (2) to develop a practical tool to support professionals in creating more inclusive and accessible eHealth solutions, and (3) to evaluate the effectiveness of eHealth applications. By achieving these objectives, this dissertation contributes to the growing body of knowledge dedicated to advancing health equity through digital innovation.

1.8 Aims and outline of this dissertation

This dissertation was structured into three main parts, each addressing a distinct aim related to the development, reach, adherence, implementation, and evaluation of eHealth interventions for individuals with lower SEP. The overarching goal was to explore how eHealth could be used to reduce health inequalities and ensure that digital health tools were both accessible and effective for individuals with lower SEP.

Part 1 of the dissertation was to synthesize existing knowledge and practical insights on eHealth interventions for lower SEP groups. **Chapter 2** presented a scoping review that mapped the existing literature and identified challenges and opportunities related to the design and implementation of eHealth interventions. Building on this, **Chapter 3** em-

ployed a Delphi study with professionals, such as researchers, healthcare providers, and developers, to gather expert perspectives on key considerations for developing inclusive eHealth solutions. **Part 2** of this dissertation focused on the practical development of tools and strategies. **Chapter 4**, using a community-based participatory research (CBPR) approach, explored the attitudes of individuals with lower SEP toward health, healthcare, and eHealth. This method emphasized engagement with the target population to better understand their needs and preferences when using digital health interventions. **Chapter 5** detailed the participatory design process used to create the Inclusive eHealth Guide (leG), which was developed to help professionals design eHealth interventions that are accessible to lower SEP populations. **Part 3** of this dissertation focused on evaluating a practical tool designed to support the development of inclusive and accessible eHealth solutions. **Chapter 6** presented the evaluation of the Inclusive eHealth Guide (leG) using qualitative interviews and the think-aloud method. This approach provided insights into the guide's usability and relevance for professionals involved in designing and implementing eHealth interventions. **Chapter 7** extended this evaluation by exploring the practical application of principles derived from the leG within a blended cardiac rehabilitation (CR) program. While the primary objective was to examine predictors of engagement and adherence in the CR program, the findings provided additional insights into the relevance of the leG framework for addressing SEP-related challenges in eHealth interventions.

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