



Norwegian Centre for
E-health Research

Scoping review: Digital exclusion and health in Europe

Summary of findings

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Objective

The aim of this study was to conduct a scoping review examining the digital divide in health within the geographical area defined by the World Health Organization (WHO) as Europe¹. The research questions guiding this investigation were as follows: 1) Who are described in the literature as digitally excluded? 2) Why are they described as digitally excluded?

Method

Search strategy

We used the following databases for the search: Medline, PsycInfo, Sociological Abstract and Web of Science. Key words were established through internal discussion in the project group and in collaboration with a research librarian. Key words are presented in Appendix 1 with the full search strategy. Limitations were countries within Europe defined by the World Health Organization (WHO), and original empirical research published between 2013-2023. The search was carried out on 22nd of February 2023.

Eligibility and data extraction

All references were uploaded into EndNote, and a total of 927 duplicates were removed using the Wichors method². After that, 2295 publications were exported to Rayyan for the first phase of screening of titles and abstract. The publications were divided into four groups (575/575/577/572) which were named after the researchers screening them. Four groups of two researchers performed a blind screening (MSP and KD, MSP and MB, BW and SAI, HLN and ER). In a second phase of data extraction, the full-text of the selected articles from phase one were downloaded and examined by two researchers (HLN and MB). Followed by a Quality Assessment using MMAT³, where HLN assessed the qualitative publications and MB assessed the quantitative and mixed methods publications.

The inclusion and exclusion criteria used during screening and review were as follows:

¹ World Health Organization. (2024). *Countries*. <https://who-sandbox.squiz.cloud/en/countries>

² Bramer WM, Giustini D, de Jonge GB, Holland L, Bekhuis T. (2016) De-duplication of database search results for systematic reviews in EndNote. *Journal of the Medical Library Association : JMLA*. 104(3):240-3.

³ Hong, Q. N., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P. & Pluye, P. (2018). The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. *Education for information*, 34(4), 285-291.

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> • Published within 2012-2023 • Published in English, Danish, Norwegian or Swedish • Original empirical research • Origin of study within WHO's European region • Studies healthcare users being digital excluded (or synonym) • Focus directly (healthcare service users) or indirectly (careers) 	<ul style="list-style-type: none"> • Study population under 18 years • Study population from countries not defined within WHO's European region • Studies with main focus on Covid-19 • Protocol, review, commentary, correction, editorial letter and gray data

Next, the following data were extracted from the selected publications:

- a) Publication year
- b) Country where study was performed
- c) Study type
- d) Type of technology
- e) Target group as described by authors
- f) Health condition
- g) Study population
- h) Description of digitally excluded groups
- i) Reasons for digital exclusion

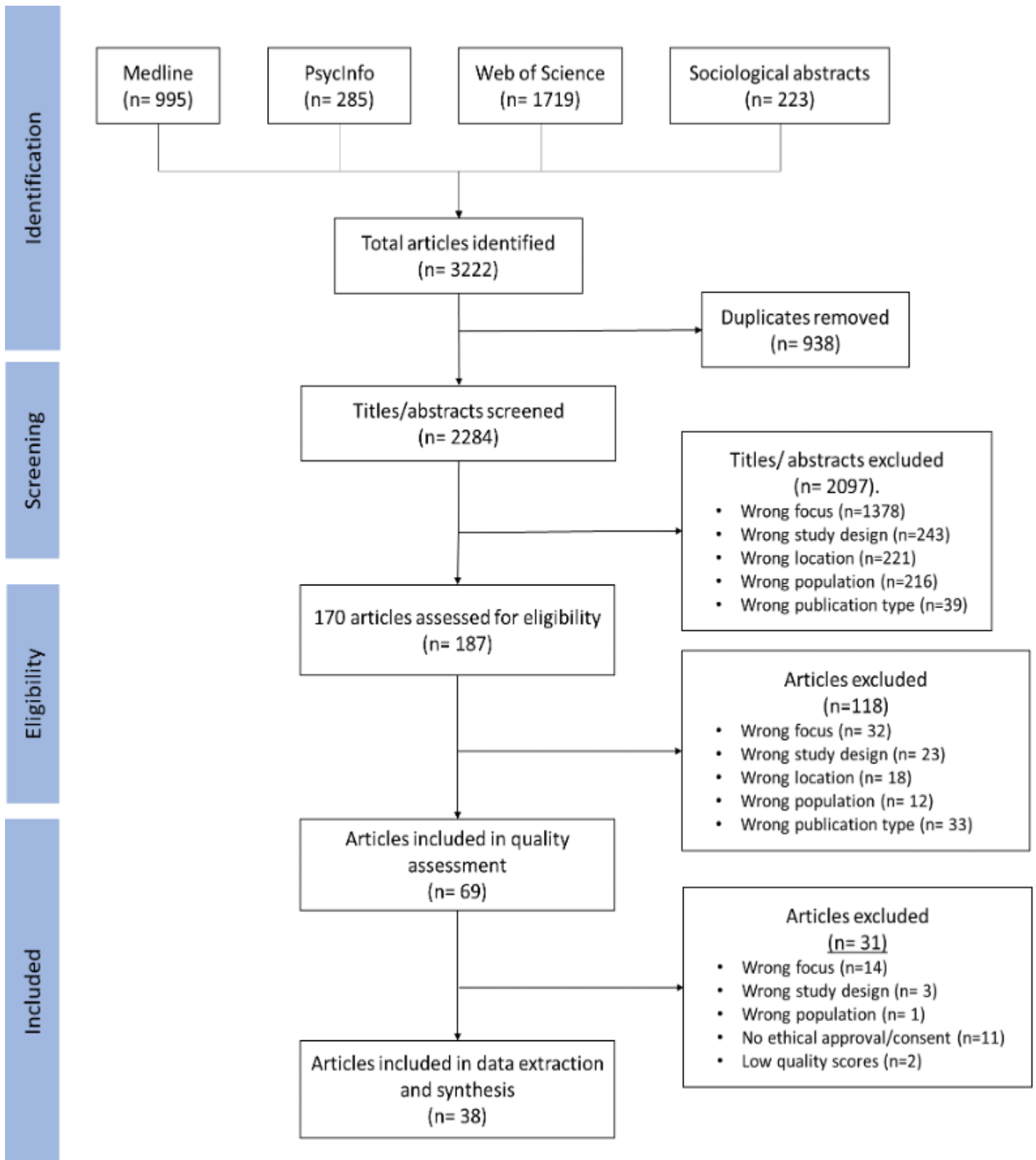
Categories a-g provide insights into general characteristics of the references included, while categories h and i provide important information to address our research questions.

Sample

3222 publications were identified, and 38 met the inclusion criteria and were included in the data extraction.

Full search strategy is reported in Appendix 1. See list of included articles in Appendix 2. We have followed the PRISMA checklist for scoping reviews⁴.

⁴ Tricco, A.C., et al., (2018) PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Annals of internal medicine*, 169(7): p. 467-473.



Results

The result section is structured according to the data extraction plan and consists of nine tables. The initial three tables: a) Publication year; b) Country where the study was performed, and c) Study type, provide the scientific

context and the study designs of the 38 selected articles. Table d) Type of technology, describes the digital technologies explored in the included studies. The subsequent three tables; e) Target group; f) Health condition, and g) Study population, provide insights into the respondents and informants of the included studies. These tables (a-g) are based on descriptions or concepts employed by the authors. While most content can be found directly in the included papers, some modifications have been made for coherence and readability.

The final two categories directly address the research questions. Table h) Description of digitally excluded, addresses the first research question “Who are described in the literature as digitally excluded?”. While tables in i) Reasons for digital exclusion, addresses the second research question “Why are they described as digitally excluded?”. Table h) Directly reflects the findings and the concepts used in the included paper. However, to address the second research questions and generate new insights into digital exclusion in health, we have employed the conceptual framework of the three levels of the digital divide⁵.

a) Publication year

The 38 included publications were published between 2017 and 2022. 10,53% were published in 2017, 5,26% in 2018, 15,79% in 2019, 10,53% in 2020 and 28,9% in 2021 and in 2022. None of the articles published between 2012 and 2017 met the inclusion criteria.

Publication year	Numbers	References
2022	11	O’Reilly et al., 2022; Middle & Welch 2022; Buckingham et al. 2022; Hardy et al.2022; Radó et al.2022; Holmberg et al.2022; Buchert et al.2022; Rantanen et al.2022; Tetri & Juujärvi 2022; Dalhausen et al.2022; Korn et al.2022
2021	11	Safarov 2021; Neves et al. 2021; Puaschitz et al. 2021; Papp-Zipernovszky et al.2021; Poli et al.2021; Ong et al.2021; Landgren & Cajander 2021; Husebø 2021; Paccoud et al.2021; Rantanen et al 2021; Heponiemi et al.2021
2020	4	Heponiemi et al. 2020; Villadsen et al.2020; Quittschalle et al.2020; Bruno et al.2020
2019	6	Bhargava et al 2019.; Simblett et al. 2019; Nymberg et al. 2019; Greer et al. 2019; Powell & Deetjen 2019; Hansen et al 2019.
2018	2	Poduval et al.2018; Bol et al. 2018
2017	4	Vaportzis et al.2017; Vereenooghe et al.2017; Mathiesen et al.2017; Mattsson et al.
Total	38	

⁵ Calderón Gómez, Daniel. (2018). The Three Levels of the Digital Divide: Barriers in Access, Use and Utility of Internet among Young People in Spain. *Interações: Sociedade e as novas modernidades*. 64-91. 10.31211/interacoes.n34.2018.a4.

b) Country where study was conducted

Among the 38 included articles: 29% of the studies were performed in the UK (11/38), 18% in Finland (7/38), 13% in Sweden (5/38) and 11% in Norway (4/38). The rest of the studies were conducted in the Netherlands, Hungary, Denmark, Germany, Ireland, or in more than one of the European countries.

Country	Numbers	References
UK	11	Bruno et al., 2020; Greer et al., 2019; Ong & Sanders 2021; Vapartzis 2017; Middle & Welch 2022; Vereenoghe 2017; Buckingham et al., 2022; Hardy et al., 2022; Powell & Deetjen 2019; Poduval et al., 2018; Neves et al., 2021
Finland	7	Rantanen et al., 2022; Rantanen et al., 2021; Heponiemi et al., 2020; Hepionemi et al., 2021; Buchert et al., 2022; Safarov 2021; Tetri & Juujärvi, 2022
Sweden	5	Nymberg et al., 2019; Mattson et al., 2017; Lundgren & Cajander, 2021; Holmberg et al., 2022; Poli et al., 2021
Norway	4	Bhargava et al., 2019; Husebø, 2021; Puaschitz et al., 2021; Hansen et al., 2019
Germany	3	Quittschalle et al., 2020; Korn et al., 2022; Dahlhausen et al., 2021
Hungary	2	Radó et al., 2022; Papp-Zipernovszky et al., 2021
Denmark	2	Mathiesen et al., 2017; Villadsen et al., 2020
Multiple countries	2	Paccoud et al., 2021; Simblett, 2019
Netherlands	1	Bol et al., 2018
Ireland	1	O'reilly et al., 2022
Total	38	

c) Study type

The included studies consisted of quantitative, qualitative or mixed-methods studies. In total 21 studies can be labeled as quantitative, 15 studies as qualitative, and 2 as mixed method (quantitative and qualitative).

Study type	Numbers	References
Quantitative studies		
Survey	5	Hardy et al., 2022; Bol et al., 2018; Radó et al., 2022; Holmberg et al., 2022; Quittschalle et al., 2020;
Cross-sectional	11	Neves et al., 2021; Heponiemi et al., 2020; Heponiemi et al., 2021; Villadsen et al., 2020; Papp-Zipernovszky et al., 2020; Mattsson et al., 2017; Rantanen et al., 2022; Tetri & Juujärvi, 2022; Rantanen et al., 2021; Korn et al., 2022; Hansen et al., 2019;
Cohort study	1	Brun et al., 2020;
Mixed-methods quantitative	1	Paccoud et al., 2021
Intervention study	2	Poduval et al., 2018; Puaschitz et al., 2021;
RCT	1	Poli et al., 2021;
Qualitative studies		
Interview	7	Dahlhausen et al., 2022; Bhargava et al., 2019; Greer et al., 2019; Vereenogh et al., 2017; Landgren & Cajander, 2021; Husebø, 2021; Mathiesen et al., 2021

Focus-group interview	3	Nymberg et al., 2019; Simblett et al., 2019; Vaportzis et al., 2017
Workshop	1	O'Reilly et al., 2022
Mixed methods Interview/observation/diaries etc.	4	Safarov, 2021; Middle & Welch, 2022; Ong & Sanders, 2021; Buckingham et al., 2022
Mixed-methods, quantitative and qualitative		
Interview and survey	2	Powell & Deetjen, 2019; Buchert et al., 2022
Total	38	

d) Type of technology

Description of type of technology is based on how it was described in the literature but has been simplified for categorization. Most of the studies did not refer to one specific technology but applied a more general description of the technology in use. E.g., 8 studies referred to Internet for health purposes, apps and digital health, 7 studies to differ types of online health and social care services, 6 studies to digitalization and use of technologies in general, 3 to mHealth and 3 to eHealth. Some of these categories overlaps:

Type of technology	Numbers	References
Internet for health purposes, apps and digital health	8	Bhargava et al., 2019; Greer et al., 2019; Husebø, 2021; Radó et al., 2022; Powell & Detjeen, 2019; Mattson et al., 2017; Quittschalle et al., 2020; Hansen et al., 2019
Online health and social care services	7	Safarov, 2021; Buchert et al., 2022; Heponiemi et al., 2020; Heponiemi et al., 2021; Rantanen et al., 2021; Poli et al., 2021; Neves et al., 2021;
View on technology/digitalization in general or use of technologies	6	Middle & Welch, 2022; Buckingham et al. 2022; Mathiesen et al., 2017; Korn et al., 2022; Papp-Zipernovszky et al., 2021; Holmberg et al., 2022
mHealth	3	Simblett et al. 2019; Hardy et al., 2022; Bol et al., 2018
eHealth	3	Nymberg et al.,2019; O'Reilly et al., 2022; Villadsen et al., 2020
Digital therapeutics	2	Tetri & Juujärvi, 2022; Dahlhausen, et al., 2022
Tablets/computers	2	Vaportzis et al. 2017; Vereenooghe et al., 2017
Assistive technology and telecare	2	Puaschitz et al., 2021; Bruno et al., 2020
Digital health intervention integrated into routine care	1	Poduval et al., 2018
Digital social and health care services	1	Rantanen et al., 2022
Electronic health records	1	Paccoud et al., 2021
Video/Chat consultation	1	Landgren & Cajander, 2021
Digital kiosk	1	Ong & Sanders, 2022
Total	38	

e) Target group as described by the authors

The description of the target groups is built on the description by the authors but has been simplified for categorization. The main group recruited or targeted recruited was adults with various degrees of mental health

challenges who may or may not use mental health services. Target group was in many articles based on health condition, and there is therefore overlap with the next category f) health conditions.

Target group	Numbers	References
Adults with various degrees of mental health challenges who may or may not use mental health services	7	Simblett et al., 2019; Greer et al., 2019; Middle & Welch, 2022; Hardy et al., 2022; Homlberg et al., 2022; Tetri & Juujärvi 2022;
Middle-aged, older adults and elderly (including home-dwelling elderly, elderly in rural areas and those with chronic pain or disease)	5	Nymberg et al., 2019; O'Reilly et al., 2022; Landgren & Cajander, 2021; Quittschalle et al., 2022; Vaportzis et al., 2017
People with Type 1 or Type 2 Diabetes	3	Mathiesen et al., 2017; Hansen et al., 2019; Poduval et al., 2018
Representative population (with smart devices)	3	Bol et al., 2018; Heponiemi et al., 2020; Heponiemi et al., 2021
Elderly russian-speaking migrants	3	Safarov, 2021; Buchert et al., 2022; Poli et al., 2021;
People with cancer	2	Husebø, 2021; Matsson et al., 2017
Patients from outpatient department/Case managers of outpatients	2	Korn et al., 2022; Holmberg et al., 2022;
Those who identify as homeless	1	Radó et al., 2022
Home dwelling people with dementia and their caregivers	1	Puaschitz et al., 2021
(Rural) social housing residents	1	Buckingham et al., 2022
Male/female prisoners in closed and open prisons	1	Rantanen et al., 2022
Patients' associations, hospitals and health clinics from multiple countries	1	Paccoud et al., 2022
Expert developers and distributors of DTx in Germany	1	Dahlhausen et al., 2022
Four generational cohorts, born 1925-1945	1	Papp-Zipernovszky et al., 2021
Pregnant women	1	Villadsen et al., 2020
Adults who logged into patient portal	1	Neves et al., 2021
Device naïve patients with uncontrolled severe epilepsy admitted to EMU	1	Bruno et al., 2020
Pakistani immigrant women in Norway	1	Bhargava et al., 2019
Patients who use the health care system	1	Ong & Sanders, 2021
People with intellectual disability	1	Vereenooghe et al., 2017
Total	38	

f) Health condition

In the majority of the articles included, health conditions were not the primary focus of the articles (16/38). However, 7 articles looked specifically at mental illness, 2 at chronic disease/chronic pain, 2 cancer, 3 at diabetes (type 1 or type 2).

Health condition	Numbers	References
Health condition not in focus	16	Neves et al., 2021; Bol et al., 2018; Powell & Deetjen, 2019; Heponiemi et al., 2020; Heponiemi et al., 2021; Radó et al., 2022; Papp-Zipernovszky et al., 2021; Quittschalle et al.,

		2020; Buchert et al., 2022; Rantanen et al., 2022; Paccoud et al., 2021; Ong & Sanders, 2022; Landgren & Cajander, 2021; Buckingham et al., 2022; Safarov, 2021; Vaportzis et al., 2017
Mental illness	7	Hardy et al., 2022; Holmberg et al., 2022; Tetri & Juujärvi, 2022; Rantanen et al., 2021; Simblett et al., 2019; Greer et al., 2019; Middle & Welch, 2022
Diabetes (Type 1 and/or type 2)	3	Poduval et al., 2018; Hansen et al., 2019; Mathiesen et al., 2017
Chronic disease and/or chronic pain	2	Nymberg et al., 2019; O'Reilly et al., 2022
Cancer	2	Mattson et al., 2017; Husebø, 2021
Post-operative/surgery	2	Poli et al., 2021; Korn et al., 2022
Prevention	1	Bhargava et al., 2019
Intellectual disability	1	Vereenoghe et al., 2017
Pregnancy	1	Villadsen et al., 2020
Dementia	1	Puaschitz et al., 2021
Seizures	1	Bruno et al., 2020
Various conditions	1	Dahlhausen et al., 2022
Total	38	

g) Study Population

Number of recruited informants, and the information's age and gender for each of the 38 studies is presented in the following table.

Recruited N	Age	Gender	References
N=16	N/A	Females	Bhargava et al., 2019
N=15	65-80 years	N/A	Nymberg et al., 2019
N=25 (UK N=8, Spain N=8, Italy N=9)	N/A	N/A	Simblett et al., 2019
N=17	50+ years	N/A	O'Reilly et al., 2022
N=17	N=10=65-70 years N=7=71-79 years	N/A	Safarov, 2021
N=20	N/A	N/A	Greer et al., 2019
N=18	65-75 years	N/A	Vaportzis et al., 2017
N=9	32-73 years	N/A	Middle & Welch, 2022
Staff participants n= 51, Patients n=24, careers n=8	N/A	N/A	Ong & Sanders, 2022
N=6 (Service users with ID N=3, Clinical psychologists N=3)	N/A	N/A	Vereenoghe et al., 2017
N=13	Mean age 74.6	N/A	Landgren & Cajander, 2021
N=31 (Patients=13, informal caregivers=9, HCPs(Staff)=9)	N/A	N/A	Husebø, 2021
N=19 and N=4	N/A	N/A	Buckingham et al., 2022
N=12	N/A	N/A	Mathiesen et al., 2017
N=43 (survey n=2150)	19-85 years	25 female and 18 male	Powell & Deetjen, 2019
N=168	Mean age 42.77, SD 11.99	72.6% male	Hardy et al., 2022
N=343 (n=97, n=51, n=154, n=41)	mean age was 58.4 years, SD 28.0	55.5% males	Poduval et al., 2018
N= 650	84.8% ≥40 years	59.8% female	Neves et al., 2021
N=1079	18-89 years, average 50.32, SD =16.3	54,1% female	Bol et al., 2018
N= 4495	20-97 years	56.77% female	Heponiemi et al., 2020
N= 4495	33.43 years old (SD=18.38, range 19-97)	56.8% female	Heponiemi et al., 2021
N=662	25.9% 18-44 years, 38.8% >60 years, mean age 53.9, SD=13.08	71.2% males	Radó et al., 2022

N=139	Mean age 59 years, SD 10.8, range 27-83	58% male	Holmberg et al., 2022
n=405	7,2 % < 25 years, 39% between 25-30 years, 53% >31 years	Female	Villadsen et al., 2020
N=276	Persons with dementia: 82 ± 7.0, caregivers: 66 ± 12 years	Person with dementia: 62% female Caregivers: N/A	Puaschitz et al., 2021
N=522	Generation Z 8,5%, Generation Y 35,4%, Generation X 23,4% and Baby Boomers 29, 9%	69,9% female	Papp-Zipernovszky et al., 2021
N=285	Internet users: mean age 60.5, SD=13.8, range 20-84. Nonusers: mean age 70, SD=8.9, range 39-90	54% male	Mattson et al., 2017
N=999	Average age 80.49, range 75-99	59,1% female	Quittschalle et al., 2020
Quantitative: N= 1082 Qualitative: N=7	Quantitative: Mean age 63,2 years, SD= 8.4 Qualitative: N/A	Quantitative: 57% male Qualitative: All females	Buchert et al., 2022
N= 498	25% between 60-54 years, 24% between 65-69 years, 27% between 70-74 years, 25% were 75+	66% were female	Poli et al., 2021
N=30	Mean age 40.9, SD=14.1	53.3% females	Bruno et al., 2020
N=225	30% under 30 years, 27,5% between 30-39 years, 23.3% between 40-49 years, 19,2% 50 years and over	91.1% male	Rantanen et al., 2022
N=121	N=107, mean 43.9, SD=12.6	62.5% female	Tetri & Juujärvi, 2022
N=829	Mean age 44.4, SD= 16.84	59.93% female	Paccoud et al., 2021
N=4495	Mean age 51.34, SD=18.38	51.19% female	Rantanen et al., 2021
N=19	N/A	N/A	Dahlhausen et al., 2022
N=406	Age 18 to 40 years (n=61), age 41 to 70 years (n=255), age ≥ 71 (n=89)	56.1% male	Korn et al., 2022
N=1063	Mean age 54.8, range 18-89	54.57% male	Hansen et al., 2019

h) Description of digitally excluded groups

The studies revealed multiple categories of digitally excluded groups. The following table provides an overview of these groups in a somewhat simplified form.

Description of digitally excluded	Numbers	References
Elderly people/older adults	22	Papp-Zipernovszky et al., 2021; Heponiemi et al., 2020; Heponiemi et al., 2021; Rantanen et al., 2021; Radó et al., 2022; Holmberg et al., 2022; Buchert et al., 2022; Poli et al., 2021; Korn et al., 2022; Tetri & Juujärvi, 2022; Hardy et al., 2022; Quittschalle et al., 2020; Hansen et al., 2019; Mattsson et al., 2017; O'Reilly et al., 2022; Ong & Sanders, 2021; Nymberg et al., 2019; Landgren & Cajander, 2021; Vaportzis et al., 2017; Safarov, 2021; Buckingham et al., 2022; Mathiesen et al., 2017;

People with chronic pain/illness/(intellectual) disability	13	Puaschitz et al., 2021; Poduval et al., 2018; Buchert et al., 2022; Radó et al., 2022; Hansen et al., 2019; Bruno et al., 2020; Heponiemi et al., 2020; Poli et al., 2021; O'Reilly et al., 2022; Ong & Sanders, 2021; Nymberg et al., 2019; Vereenooghe et al., 2017; Mathiesen et al., 2017;
Migrants/Immigrants/ethnic minorities/mixed ethnicity	8	Hardy et al., 2022; Poduval et al., 2018; Villadsen et al., 2020; Buchert et al., 2022; Poli et al., 2021; Paccoud et al., 2021; Bhargava et al., 2019; Safarov, 2021;
People with various degrees of mental illness	8	Rantanen et al., 2021; Hardy et al., 2022; Tetri & Juujärvi, 2022; Holmberg et al., 2022; Villadsen et al., 2020; Simblett et al., 2019; Greer et al., 2019; Middle & Welch, 2022;
Social housing residents	2	Holmberg et al., 2022; Buckingham et al., 2022;
Community-dwelling healthy older adults	1	Vaportzis et al., 2017;
People in rural/deprived areas	4	Bol et al., 2012; O'Reilly et al., 2022; Landgren & Cajander, 2021; Buckingham et al., 2022;
Cancer patients/after hospital discharge	2	Mattsson et al., 2017; Husebø, 2021;
People with low socioeconomic status	8	Poduval et al., 2018; Heponiemi et al., 2020; Heponiemi et al., 2021; Rantanen et al., 2021; Radó et al., 2022; Buchert et al., 2022; Paccoud et al., 2021; Villadsen et al., 2020
People with limited health/eHealth literacy	7	Radó et al., 2022; Bol et al., 2018; Poduval et al., 2018; Heponiemi et al., 2021; Ong & Sanders, 2021; Nymberg et al., 2019; Husebø, 2021
People with experience with electronic medical record	1	Nymberg et al., 2019
People who do not own mobile technologies	1	Simblett et al., 2019
Homeless individuals	1	Radó et al., 2022
People with risk lifestyles	1	Poli et al., 2021
Incarcerated people	1	Rantanen et al., 2022
Surgical patients	1	Korn et al., 2022
People with complex (mental) health issues	3	Dalhausen et al., 2022; Poli et al., 2021; Heponiemi et al., 2021
People with limited social network/socially marginalized	3	Heponiemi et al., 2021; Rantanen et al., 2021; Buchert et al., 2022
(Informal) caregivers/People who used informal caregivers	3	Puaschitz et al., 2021; Husebø, 2021; Mathiesen et al., 2017
Worriers	1	Powell & Deetjen, 2019
Men	3	Hardy et al., 2022; Hansen et al., 2019; Rantanen et al., 2021
Pregnant women	1	Villadsen et al., 2020
People with good health	2	Neves et al., 2021; Vaportzis et al., 2017
People with poor health	2	Heponiemi et al., 2020; Heponiemi et al., 2021
Delegators	1	Powell & Deetjen, 2019
General population	1	Buchert et al., 2022
College students 18-24 years	1	Papp-Zipernovszky et al., 2021
Non-users of social media	1	Middle & Welch, 2022
Patients in general	1	Ong & Sanders, 2021

Clinical psychologists	1	Vereenooghe et al., 2017
Vulnerable people	1	Mathiesen et al., 2017

i) Reasons for digital exclusion

We have described the reasons for digital exclusion as presented in the articles. The reasons were numerous and intricate. To categorize these factors, we applied the three levels of the digital divide. These levels can be described as follows⁶: 1) The first level: revolves around having or not having access to digital technology, including the quality of access. Access barriers may be temporal, socio-cultural, or economic. 2) The second level: centers on usage and extends beyond material access. It encompasses ‘skills’, which include the competencies people need to use digital technologies; ‘motivation’, which involves the complex interplay between motivation, access, skills, and use; and ‘emotions’ which pertain to the emotional aspects of people’s use of technology. 3) The third level: is the utility gap, which also focuses on the offline outcomes and benefits of using digital technology.

Level 1: Access gap

Reason	References
Lack of/limited access or to mHealth, equipment, digital/online health information or fewer resources to use new communication technology	Hardy et al., 2022; Poduval et al., 2018; Bol et al., 2018; Heponiemi et al., 2020; Heponiemi et al., 2021; Rantanen et al., 2021; Radò et al., 2022; Ptaschitz et al., 2021; Rantanen et al., 2022; Korn et al., 2022; Papp-Zipernovszky et al. 2021; O’Reilly et al., 2022; Middle & Welch, 2022; Buckingham et al., 2022
Lack ability to access health information	Heponiemi et al., 2021
Lack country’s digital ID	Holmberg et al., 2022; Buchert et al., 2022
Exemption from country’s digital health platform/ Complicated public service system	Villadsen et al., 2020; Safarov, 2021;
Country’s implementation problems	Ptaschitz et al., 2021
Less awareness	Papp-Zipernovszky et al., 2021; Tetri & Juujärvi, 2022; Paccoud et al., 2021; Korn et al., 2022
Socioeconomic factors	Ptaschitz et al., 2021; Buchert et al., 2022; Rantanen et al., 2021
Lack of opportunities	Paccoud et al. 2021
Non-screened, non-recruited or decline participation in research/development activities	Poli et al., 2021
Actions of healthcare providers, insurance companies or other health authorities	Dahlhausen et al., 2022
Financial barriers including expense of equipment, material deprivation, or not worth the cost of accessing	Hardy et al., 2022; Tetri & Juujärvi, 2022; Dahlhausen et al., 2022, Simblett et al., 2019; O’Reilly et al., 2022; Greer et al., 2019; Vaportzis et al., 2017; Buckingham et al., 2022

⁶ Calderón Gómez, Daniel. (2018). The Three Levels of the Digital Divide: Barriers in Access, Use and Utility of Internet among Young People in Spain. *Interações: Sociedade e as novas modernidades*. 64-91. 10.31211/interacoes.n34.2018.a4.

Level 2: Use gap

Reason	References
Lack/limited confidence or self-efficacy	Hardy et al, 2022; Powell & Deetjen, 2019; Papp-Zipernovszky et al., 2021; Rantanen et al., 2022; Tetri & Juujärvi, 2022; Rantanen et al., 2021; Korn et al., 2022; Bhargava et al., 2019; Nymberg et al., 2019; O'Reilly et al., 2022; Greer et al., 2019; Vaportzis et al., 2017; Landgren & Cajander, 2021; Buckingham et al., 2022
Lack/limited technology skills and/or lack of experience	Poduval et al., 2018; Powell & Deetjen, 2019; Heponiemi et al., 2020; Heponiemi et al., 2022; Radó et al., 2021; Holmberg et al., 2022; Ptaschitz et al., 2021; Papp-Zipernovszky et al., 2021; Buchert et al., 2022; Rantanen et al., 2022; Tetri & Juujärvi, 2022; Paccoud et al., 2021; Rantanen et al., 2021; Korn et al., 2022; Bhargava et al., 2019; Safarov, 2021; Ong & Sanders, 2021; Husebø, 2021; Mathiesen et al., 2017
Lack/limited digital literacy and learning barriers	Hardy et al., 2022; Powell & Deetjen, 2019; Poduval et al., 2018; Bol et al., 2018; Villadsen et al., 2020; Papp-Zipernovszky et al., 2021; Buchert et al., 2022; Korn et al., 2022; Bhargava et al., 2019; Nymberg et al., 2019; Simblett et al., 2019; O'Reilly et al., 2022; Greer et al., 2019; Vaportzis et al., 2017; Middle & Welch, 2022; Ong & Sanders, 2021; Landgren & Cajander, 2021; Husebø, 2021; Buckingham et al., 2022; Mathiesen et al., 2017
Non-use, less use or less likelihood of use or discontinued use (one-time registration but lack of use or less intended future use)	Heponiemi et al., 2020; Heponiemi et al., 2022; Radó et al., 2022; Holmberg et al., 2022; Buchert et al., 2022; Rantanen et al., 2022; Tetri & Juujärvi, 2022; Hardy et al., 2022; Poduval et al., 2018; Bol et al., 2018; Ptaschitz et al., 2021; Mattsson et al., 2017; Quittschalle et al., 2020; Korn et al. 2022; Hansen et al., 2019; Neves et al., 2021; Rantanen et al., 2021
Inability to use digital technologies themselves/needing assistance to use technology and/ or lack of needed assistance	Holmberg et al., 2022; Villadsen et al., 2020; Buchert et al., 2022; Bruno et al., 2020; Tetri & Juujärvi, 2022; Rantanen et al., 2021; Korn et al., 2022
Inflexibility, lack of relevance or lack of functions	Ptaschitz et al., 2021; Nymberg et al., 2019; O'Reilly et al., 2022
Fewer opportunities to use services	Heponiemi et al., 2022
Fewer offline resources or social deprivation	Heponiemi et al., 2022; Paccoud et al., 2021; Rantanen et al., 2021
Lack of time	Poli et al., 2021

Lack of safety or trust, including concerns of potential consequences of use or unwilling to share/discuss personal info online	Powell & Deetjen, 2019; Bol et al., 2018; Rantanen et al., 2021; Poduval et al., 2018; Poli et al., 2021; Rantanen et al., 2022; Korn et al.2022; Nymberg et al., 2019; Simblett et al., 2019; O'Reilly et al., 2022; Safarov, 2021; Vaportzis et al., 2017; Middle & Welch, 2022; Husebø, 2021; Buckingham et al., 2022
Motivation	Poduval et al., 2018
Non-registration or installation of specific service or technology for health	Neves et al., 2021; Bol et al., 2018; Ptaschitz et al., 2021
Less engagement due to inability or difficulty	Powell & Deetjen, 2019; Villadsen et al., 2020; Papp-Zipernovszky et al., 2021; Buchert et al., 2022; Rantanen et al., 2021; Korn et al., 2022; Nymberg et al., 2019
Lower enjoyment	Hardy et al., 2022
Consumer fewer online and/or info sources in general	Heponiemi et al., 2022; Bol et al., 2018
Choice/lack of desire, less engagement due to disinterest or preferences	Hardy et al., 2022; Powell & Deetjen, 2019; Ptaschitz et al., 2021; Poli et al., 2021; Rantanen et al., 2021; Korn et al., 2022; Mattsson et al., 2017; Buchert et al., 2022; Tetri & Juujärvi, 2022; Nymberg et al., 2019; Simblett et al., 2019; O'Reilly et al., 2022; 37. Vereenoghe, 2017; Landgren & Cajander, 2021; Husebø 2021; Mathiesen et al., 2017
Difficulty adopting digital services	Heponiemi et al., 2022; Buchert et al., 2022
Lack support/provision of technology by healthcare authorities	Buchert et al., 2022; Ptaschitz et al., 2021
Social exclusion or less social support	Heponiemi et al., 2020; Heponiemi et al., 2022; Ptaschitz et al., 2021; Buchert et al., 2022; Paccoud et al., 2021
Low health and/or general literacy	Villadsen et al., 2020; Buchert et al., 2022
Unfamiliar or non-native language used in tech	Buchert et al., 2022; Safarov, 2021
Negative or less positive beliefs, attitudes and/or emotions toward use	Powell & Deetjen, 2019; Heponiemi et al., 2022; Villadsen et al., 2020; Buchert et al., 2022; Poli et al., 2021; Rantanen et al., 2022; Paccoud et al., 2021; Rantanen et al., 2021; Korn et al., 2022; Nymberg et al., 2019; Simblett et al., 2019; O'Reilly et al., 2022; Safarov, 2021; Vaportzis et al., 2017; Ong & Sanders, 2021; Landgren & Cajander, 2021; Buckingham et al., 2022; Mathiesen et al., 2017
Improper use or negative experiences of use	Dahlhausen et al., 2022; Bruno et al.,2020; Middle & Welch, 2022; Buckingham et al., 2022; Mathiesen et al., 2017
Stigma	Rantanen et al., 2021
Age	Rantanen et al., 2021; Husebø, 2021; Buckingham et al., 2022
Limited/lack knowledge of healthcare system or services	Rantanen et al., 2021; Tetri & Juujärvi, 2022; Tetri & Juujärvi, 2022
Having physical or cognitive limitations or poor health status	Tetri & Juujärvi, 2022; Buchert et al., 2022; Poli et al., 2021; Heponiemi et al., 2020; Nymberg et al., 2019; Simblett et al., 2019; O'Reilly et al.,

	2022; Greer et al., 2019; Vaportzis et al., 2017; Middle & Welch, 2022; Ong & Sanders, 2021; Buckingham et al., 2022
Satisfaction with own current services and non-digital habits	Poli et al., 2021; Tetri & Juujärvi, 2022; Simblett et al., 2019; Landgren & Cajander, 2021; Husebø, 2021; Mathiesen et al., 2017
Decline participation in research/development activities	Poli et al., 2021
Perceive fewer health benefits or non-health-related benefits	Heponiemi et al., 2020; Heponiemi et al., 2022

Level 3: Utility gap

Reason	References
Less able to use health information/Less able to exploit potential of digital health tech/ use technology to process information	Poduval et al., 2018; Bol et al., 2018; Villadsen et al., 2020; Papp-Zipernovszky et al., 2021;
Lower perceived usefulness after use	Hardy et al, 2022
Gain fewer health benefits or non-health benefits	Heponiemi et al., 2020; Heponiemi et al., 2022; Bol et al., 2018; Radó et al., 2022; Villadsen et al., 2020; Rantanen et al., 2021
Slower process information/ have only basic skills	Heponiemi et al., 2022;
Lack confidence in ability to make decisions from health info independently	Papp-Zipernovszky et al., 2021
Improper use (sub-optimal activation/adherence or forgetting to perform step properly for use)	Bruno et al., 2020
Negative or less positive beliefs, attitudes and/or emotions toward use (including low perceived usefulness, anxiety, discomfort, fear of misunderstanding)	Paccoud et al., 2021
Utility	O'Reilly et al., 2022;

Summary

The scoping review demonstrates that a wide range of individuals and groups are at risk of being digitally excluded. Several publications point towards elderly people or older adults as particularly vulnerable to digital exclusion. However, the review also demonstrates that, for example, surgical patients, people with complex (mental) health issues, those with limited social network or who are socially marginalized, caregivers, worriers, men, pregnant women, people in good health and people in poor health might be digitally excluded. The reasons for exclusion are complex, intertwined, and exist on different levels. The digital divide is a phenomenon that is evolving, and today there is no hard evidence in the literature about who and why individuals and groups may be excluded.

Acknowledgements

This report is funded by the EEA and Norway Grants.

Appendix 1. Full search strategy

Database	Search engine	Search date	Results
Medline	<p>1 Digital divide/ or ((digital or technolog*) adj3 (divide or gap or inequalit* or equalit* or access* or barrier* or exclusion or inclusion or disparit* or equit*)).ti,ab. 8045</p> <p>2 Telemedicine/ or (tele* or e-health or ehealth or m-health or mhealth or health or healthcare or health care or medicine or clinical or care).ti,ab. 7434024</p> <p>3 (Albania or Albanian* or Andorra or Andorran* or Armenia or Armenian* or Austria or Austrian* or Belarus or Belarusian* or Belgium or Belgian* or Bosnia or Bosnian* or Bulgaria or Bulgarian* or Croatia or Croatian* or Cyprus or Cypriot* or Czech Republic or Czech* or Denmark or Danish* or Estonia or Estonian* or Europe or European* or Finland or Finnish* or France or French* or Georgia or Georgian* or Germany or German* or Greece or Greek* or Hungary or Hungarian* or Iceland or Icelandic* or Ireland or Irish* or Italy or Italian* or Latvia or Latvian* or Lithuania or Lithuanian* or Luxembourg or Luxembourgish* or Malta or Maltese* or Monaco or Monegasque* or Montenegro or Montenegrin* or Netherlands or Dutch* or North Macedonia or Macedonian* or Norway or Norwegian* or Poland or Polish* or Portugal or Portuguese* or Republic of Moldova or Moldovan* or Romania or Romanian* or Russia or Russian* or San Marino or Scandinavia or Scandinavian* or Serbia or Serbian* or Slovakia or Slovak* or Slovenia or Slovenian* or Spain or Spanish* or Sweden or Swedish* or Switzerland or Swiss* or Turkey or Turkish* or Ukraine or Ukrainian* or United Kingdom or British* or Scottish* or Welsh*).ti,ab,in. 7818522</p> <p>4 1 and 2 and 3 1441</p> <p>5 limit 4 to yr="2013 -Current" 1231</p> <p>6 limit 5 to "review articles" 236</p> <p>7 5 not 6 995</p>	22 nd of february	995
PsycInfo	<p>1 Digital divide/ or ((digital or technolog*) adj3 (divide or gap or inequalit* or equalit* or access* or barrier* or exclusion or inclusion or disparit* or equit*)).ti,ab. 4938</p> <p>2 Telemedicine/ or (tele* or e-health or ehealth or m-health or mhealth or health or healthcare or health care or medicine or clinical or care).ti,ab. 1337685</p> <p>3 (Albania or Albanian* or Andorra or Andorran* or Armenia or Armenian* or Austria or Austrian* or Belarus or Belarusian* or Belgium or Belgian* or Bosnia or Bosnian* or Bulgaria or Bulgarian* or Croatia or Croatian* or Cyprus or Cypriot* or Czech Republic or Czech* or Denmark or Danish* or Estonia or Estonian* or Europe or European* or Finland or Finnish* or France or French* or Georgia or Georgian* or Germany or German* or Greece or Greek* or Hungary or Hungarian* or Iceland or Icelandic* or Ireland or Irish* or Italy or Italian* or Latvia or Latvian* or Lithuania or Lithuanian* or Luxembourg or Luxembourgish* or Malta or Maltese* or Monaco or Monegasque* or Montenegro or Montenegrin* or Netherlands or Dutch* or North Macedonia or Macedonian* or Norway or Norwegian* or Poland or Polish* or Portugal or Portugese* or Republic of Moldova or Moldovan* or Romania or Romanian* or Russia or Russian* or San Marino or Scandinavia or Scandinavian* or Serbia or Serbian* or Slovakia or Slovak* or Slovenia or Slovenian* or Spain or Spanish* or Sweden or Swedish* or Switzerland or Swiss* or Turkey or Turkish* or Ukraine or Ukrainian* or United Kingdom or British* or Scottish* or Welsh*).ti,ab,in. 1495746</p> <p>4 1 and 2 and 3 367</p> <p>5 limit 4 to yr="2013 -Current" 285</p>	22 nd of February	285
Web of Science	<p>1 TI=((digital or technolog*) NEAR/3 (divide or gap or inequalit* or equalit* or access* or barrier* or exclusion or inclusion or disparit* or equit*)) OR AB=((digital or technolog*) NEAR/3 (divide or gap or inequalit* or equalit* or access* or barrier* or exclusion or inclusion or disparit* or equit*)) 44232</p> <p>2 TI=(tele* OR e-health OR ehealth OR m-health OR mhealth OR health or healthcare or health care or medicine or clinical or care) OR AB=(tele* OR e-health OR ehealth OR m-health OR mhealth OR health or healthcare or health care or medicine or clinical or care) 7696667</p> <p>3 "AD=((Albania OR Andorra OR Armenia OR Austria OR Belarus OR Belgium OR Bosnia OR Bulgaria OR Croatia OR Cyprus OR Czech Republic OR Denmark OR Estonia OR Europe OR Finland OR France OR Georgia OR Germany OR Greece OR Hungary OR Iceland OR Ireland OR Italy OR Latvia OR Lithuania OR Luxembourg OR Malta OR Monaco OR Montenegro OR Moldova OR Netherlands OR North Macedonia OR Norway OR Poland OR Portugal OR Romania OR Russia OR San Marino OR Scandinavia OR Serbia OR Slovakia OR Slovenia OR Spain OR Sweden OR Switzerland OR Turkey OR Ukraine OR United Kingdom)) OR (TI=(Albania OR Albanian* OR Andorra OR Andorran* OR Armenia OR Armenian* OR Austria OR Austrian* OR Belarus OR Belarusian* OR Belgium OR Belgian* OR Bosnia OR Bosnian* OR Bulgaria OR Bulgarian* OR Croatia OR Croatian* OR Cyprus OR Cypriot* OR Czech Republic OR Czech* OR Denmark OR Danish* OR Estonia OR Estonian* OR Europe OR European* OR Finland OR Finnish* OR France OR French* OR Georgia OR Georgian* OR Germany OR German* OR Greece OR Greek* OR Hungary OR Hungarian* OR Iceland OR Icelandic* OR Ireland OR Irish* OR Italy OR Italian* OR Latvia OR Latvian* OR Lithuania OR Lithuanian* OR Luxembourg OR Luxembourgish* OR Malta OR Maltese* OR Monaco OR Monégasque* OR Montenegro OR Montenegrin* OR Netherlands OR Dutch* OR North Macedonia OR Macedonian* OR Norway OR Norwegian* OR Poland OR Polish* OR Portugal OR Portuguese* OR Republic of Moldova OR Moldovan* OR Romania OR Romanian* OR Russia OR Russian* OR San Marino OR Scandinavia OR Scandinavian* OR Serbia OR Serbian* OR Slovakia OR Slovak* OR Slovenia OR Slovenian* OR Spain OR Spanish* OR Sweden OR Swedish* OR Switzerland OR Swiss* or Turkey OR Turkish* OR Ukraine</p>	22 nd of February	1719

	<p>OR Ukrainian* OR United Kingdom OR British* OR Scottish* OR Welsh*) OR AB=(Albania OR Albanian* OR Andorra OR Andorran* OR Armenia OR Armenian* OR Austria OR Austrian* OR Belarus OR Belarusian* OR Belgium OR Belgian* OR Bosnia OR Bosnian* OR Bulgaria OR Bulgarian* OR Croatia OR Croatian* OR Cyprus OR Cypriot* OR Czech Republic OR Czech* OR Denmark OR Danish* OR Estonia OR Estonian* OR Europe OR European* OR Finland OR Finnish* OR France OR French* OR Georgia OR Georgian* OR Germany OR German* OR Greece OR Greek* OR Hungary OR Hungarian* OR Iceland OR Icelandic* OR Ireland OR Irish* OR Italy OR Italian* OR Latvia OR Latvian* OR Lithuania OR Lithuanian* OR Luxembourg OR Luxembourgish* OR Malta OR Maltese* OR Monaco OR Monégasque* OR Montenegro OR Montenegrin* OR Netherlands OR Dutch* OR North Macedonia OR Macedonian* OR Norway OR Norwegian* OR Poland OR Polish* OR Portugal OR Portuguese* OR Republic of Moldova OR Moldovan* OR Romania OR Romanian* OR Russia OR Russian* OR San Marino OR Scandinavia OR Scandinavian* OR Serbia OR Serbian* OR Slovakia OR Slovak* OR Slovenia OR Slovenian* OR Spain OR Spanish* OR Sweden OR Swedish* OR Switzerland OR Swiss* or Turkey OR Turkish* OR Ukraine OR Ukrainian* OR United Kingdom OR British* OR Scottish* OR Welsh*))</p> <p>23779798</p> <p>4 #1 AND #2 AND</p> <p>#3 and 2013 or 2014 or 2015 or 2016 or 2017 or 2018 or 2019 or 2020 or 2021 or 2022 or 2023 (Publication Years) and Article or Proceeding Paper or Early Access (Document Types)Web of Science Core Collection</p> <p>1727</p>		
<p>Sociological Abstract (ProQuest)</p>	<p>1 (TI((digital or technolog*) NEAR/3 (divide or gap or inequalit* or equalit* or access* or barrier* or exclusion or inclusion or disparit* or equit*)) OR AB((digital or technolog*) NEAR/3 (divide or gap or inequalit* or equalit* or access* or barrier* or exclusion or inclusion or disparit* or equit*)))</p> <p>2 (TI(tele* OR e-health OR ehealth OR m-health OR mhealth OR health or healthcare or health care or medicine or clinical or care) OR AB(tele* OR e-health OR ehealth OR m-health OR mhealth OR health or healthcare or health care or medicine or clinical or care))</p> <p>3 (AF((Albania OR Andorra OR Armenia OR Austria OR Belarus OR Belgium OR (Bosnia and Herzegovina) OR Bulgaria OR Croatia OR Cyprus OR Czech Republic OR Denmark OR Estonia OR Europe OR Finland OR France OR Georgia OR Germany OR Greece OR Hungary OR Iceland OR Ireland OR Italy OR Latvia OR Lithuania OR Luxembourg OR Malta OR Monaco OR Montenegro OR Moldova OR Netherlands OR North Macedonia OR Norway OR Poland OR Portugal OR Romania OR Russia OR San Marino OR Scandinavia OR Serbia OR Slovakia OR Slovenia OR Spain OR Sweden OR Switzerland OR Turkey OR Ukraine OR United Kingdom)) OR (TI(Albania OR Albanian* OR Andorra OR Andorran* OR Armenia OR Armenian* OR Austria OR Austrian* OR Belarus OR Belarusian* OR Belgium OR Belgian* OR (Bosnia and Herzegovina) OR Bosnia OR Bosnian* OR Bulgaria OR Bulgarian* OR Croatia OR Croatian* OR Cyprus OR Cypriot* OR Czech Republic OR Czech* OR Denmark OR Danish* OR Estonia OR Estonian* OR Europe OR European* OR Finland OR Finnish* OR France OR French* OR Georgia OR Georgian* OR Germany OR German* OR Greece OR Greek* OR Hungary OR Hungarian* OR Iceland OR Icelandic* OR Ireland OR Irish* OR Italy OR Italian* OR Latvia OR Latvian* OR Lithuania OR Lithuanian* OR Luxembourg OR Luxembourgish* OR Malta OR Maltese* OR Monaco OR Monégasque* OR Montenegro OR Montenegrin* OR Netherlands OR Dutch* OR North Macedonia OR Macedonian* OR Norway OR Norwegian* OR Poland OR Polish* OR Portugal OR Portuguese* OR Republic of Moldova OR Moldovan* OR Romania OR Romanian* OR Russia OR Russian* OR San Marino OR Scandinavia OR Scandinavian* OR Serbia OR Serbian* OR Slovakia OR Slovak* OR Slovenia OR Slovenian* OR Spain OR Spanish* OR Sweden OR Swedish* OR Switzerland OR Swiss* or Turkey OR Turkish* OR Ukraine OR Ukrainian* OR United Kingdom OR British* OR Scottish* OR Welsh*)) OR AB(Albania OR Albanian* OR Andorra OR Andorran* OR Armenia OR Armenian* OR Austria OR Austrian* OR Belarus OR Belarusian* OR Belgium OR Belgian* OR (Bosnia and Herzegovina) OR Bosnia OR Bosnian* OR Bulgaria OR Bulgarian* OR Croatia OR Croatian* OR Cyprus OR Cypriot* OR Czech Republic OR Czech* OR Denmark OR Danish* OR Estonia OR Estonian* OR Europe OR European* OR Finland OR Finnish* OR France OR French* OR Georgia OR Georgian* OR Germany OR German* OR Greece OR Greek* OR Hungary OR Hungarian* OR Iceland OR Icelandic* OR Ireland OR Irish* OR Italy OR Italian* OR Latvia OR Latvian* OR Lithuania OR Lithuanian* OR Luxembourg OR Luxembourgish* OR Malta OR Maltese* OR Monaco OR Monégasque* OR Montenegro OR Montenegrin* OR Netherlands OR Dutch* OR North Macedonia OR Macedonian* OR Norway OR Norwegian* OR Poland OR Polish* OR Portugal OR Portuguese* OR Republic of Moldova OR Moldovan* OR Romania OR Romanian* OR Russia OR Russian* OR San Marino OR Scandinavia OR Scandinavian* OR Serbia OR Serbian* OR Slovakia OR Slovak* OR Slovenia OR Slovenian* OR Spain OR Spanish* OR Sweden OR Swedish* OR Switzerland OR Swiss* or Turkey OR Turkish* OR Ukraine OR Ukrainian* OR United Kingdom OR British* OR Scottish* OR Welsh*)))</p> <p>4 1 AND 2 AND 3</p> <p>5 Fra den 2013 til den 2023 223</p>	<p>22nd of February</p>	<p>223</p>
<p>Total</p>			<p>3222</p>

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