IDEAHL
Improving Digital Empowerment for Active Healthy Living

Funded by the European Union

# D1.1. Report on (d)HL

# WP1

Funded by the European Union

The project *"Improving Digital Empowerment for Active Healthy Living (IDEAHL)"* has received funding by the Horizon Europe Framework Program under GA 101057477

## Technical references:

| | |
|---|---|
| **Deliverable No.** | **D1.1** |
| **Dissemination Level**[1] | PU |
| **Work Package** | WP1 |
| **Lead beneficiary** | UCN |
| **Version** | 1 |
| **Due date of deliverable** | 28/02/2023 |
| **Actual submission date** | 24/02/2023 |

## Versions

| Version | Person | Partner | Date |
|---|---|---|---|
| 1 | Mia Buhl Povlsen, Charlotte Brun Thorup, Diana Schack Thoft, Lisa Korsbakke Emtekær Hæsum Katja Valkama, Mika Uitto, Merja Hoffrén-Mikkola, Aino Alaverdyan | UCN<br>SeAMK | 07 February 2023 |
| 1.1 | Marta Pisano / Cristina Fernández García, Isabel Diez Valcarce / Laura Pruneda González, Inés Rey Hidalgo | CSPA / SESPA / FICYT | 14 February 2023 |
| 1.2 | Kerryn Butler Henderson<br>Gabriela Irrazabal | RMIT University<br>RMIT University, Europe | 14 February 2023 |
| 2 | Mia Buhl Povlsen, Charlotte Brun Thorup, Diana Schack Thoft, Lisa Korsbakke Emtekær Hæsum Katja Valkama, Mika Uitto, Merja Hoffrén-Mikkola, Aino Alaverdyan | UCN<br>SeAMK | 21 February 2023 |

**Approved by Coordinator on:** 27/02/2023

**Approved by Quality Manager on:** 27/02/2023



*1 PU = Public*

## Contents

# GLOSSARY / LIST OF ACRONYMS

## TERMINOLOGY

Definition of the terminology included in the report.

| Concept | Definition |
|---|---|
| Health Literacy (HL) | HL entails people's knowledge and competences to access, understand, appraise, and apply health information to make judgments and decisions in everyday life concerning healthcare, disease prevention and health promotion (1). |
| Digital HL (dHL) | dHL is the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem (2). |
| (d)HL | HL and dHL |
| HL and/or digital HL levels | HL and digital HL levels in this report refer to the level of HL of individuals or groups as measured by measurement tools developed for the purpose. |
| European Union | Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden. |
| Beyond EU | Australia, Canada, New Zealand, United Kingdom (England, Northern Ireland, Scotland, Wales), United States of America. |
| Health Care/Health-care/Healthcare | Health care/Health-care/Healthcare exist in health system, that consists of all organizations, people, and actions whose primary intent is to promote, restore or maintain health. This includes efforts to influence determinants of health as well as more direct health-improving activities. A health system is therefore more than the pyramid of publicly owned facilities that deliver personal health services. It includes, for example, a mother caring for a sick child at home; private providers; behaviour change programmes; vector-control campaigns; health insurance organizations; occupational health and safety legislation. It includes cross-sectoral action by health staff, for example, encouraging the ministry of education to promote female education, a well-known determinant of better health (3). |
| Health Data | Health data is any data "related to health conditions, reproductive outcomes, causes of death, and quality of life"(4) for an individual or population. Health data includes clinical metrics along with environmental, socioeconomic, and behavioural information pertinent to health and wellness. A plurality of health data is collected and used when individuals interact with health care systems. This data, collected by health care providers, typically includes a record of services received, conditions of those services, and clinical outcomes or information concerning those services (5). |
| Social Innovation | Social innovation refers to the design and implementation of new solutions that imply conceptual, process, product, or organisational change, which ultimately aim to improve the welfare and wellbeing of individuals and communities. Many initiatives undertaken by the social economy and by the civil society have proven to be innovative in dealing with socio-economic and environmental problems, while contributing to economic development. To fully tap the potential of social innovation, an enabling policy framework is |

| | |
|---|---|
| | needed to support public, non-profit, and private actors to co-construct and implement socially innovative solutions and thereby contribute to address socio-economic issues, build stronger territorial resilience, and better respond to future shocks (6). |
| Social Services | Social service is a service that aims at promoting citizen's / client's social wellbeing and ability to function and prevents, reduces, and eliminates social problems (7). |
| Best practice | A best practice is a relevant policy or intervention implemented in a real-life setting and which has been favourably assessed in terms of adequacy (ethics and evidence) and equity as well as effectiveness and efficiency related to process and outcomes. Other criteria are important for a successful transferability of the practice such as a clear definition of the context, sustainability, cross-sectional, and participation of stakeholders (8). |
| Champions and survivors | *Champions* = Professionals, services, organisations, municipalities, regions, etc. that succeeded with initiatives (best practices) in relation to (d)HL. |
| | *Survivors* = Professionals, services, organisations, municipalities, regions, etc. that were less successful with initiatives (best practices) in relation to (d)HL. |
| Monitoring and evaluation tools, methods, and frameworks | Monitoring and evaluation tools, methods, and frameworks in (d)HL that are validated and published in peer-reviewed journals; they measure/quantify individuals' (d)HL (9) and organizations' HL and (d)HL environments covering different target populations and services (e.g., the HLS-EU questionnaire, the eHL Assessment toolkit (eHLA) and the eHL Questionnaire (eHLQ), the M-POHL network action or the WHO HL Road Map). |
| Private and public initiatives and services | Private and public initiatives and services related to (d)HL regarding testing/assessing, monitoring, training, capability building, education, consulting, development, communication, intervention, care, support, peer support, or community action |

## ABBREVIATIONS

| **KEY CONCEPTS** | |
|---|---|
| HL | Health Literacy |
| dHL | Digital HL |
| (d)HL | HL and dHL |
| **(d)HL TOOLS** | |
| Ar-eHEALS | Arabic version of electronical HL scale |
| 3-brief SQ | Three brief screening questions |
| BHLS | Three-item Brief HL Screen |
| BRIEF | Brief HL Screening Tool |
| CHAT | Conversational HL Assessment Tool |
| C & CHL scale/CCHL | Communicative and Critical HL scale |
| CHLT-30 | Cancer HL Test |
| DHLI | Digital HL Instrument |
| DNT-15 | Diabetes Numeracy Test 15 |
| eHL | Electronical HL |
| eHEALS-carer | eHL Scale for Carers |
| eHEALS | Electronic HL scale |

| | |
|---|---|
| EHILS | Everyday Health Information Screening Tool |
| eHLA | eHL assessment toolkit |
| eHLQ | eHL Questionnaire |
| EMHL | Espailove.net Mental HL test for Spanish Adolescents |
| FCCHL | Functional, Communicative, and Critical HL questionnaire |
| G-HL | General HL scale |
| GROHL | Greek Oral HL measurement instrument |
| HALS | Health Activities Literacy Scale of NALS |
| HAS-A | HL Assessment Scale for Adolescents |
| HBP-HLS | High Blood Pressure-HL Scale |
| HELIA | HL Instrument for Adults |
| HK-LS | Hypertension Knowledge-Level Scale |
| HL-HC | HL items from the dimension of health care |
| HLQ | HL Questionnaire |
| HLQ-SK | HL Questionnaire Slovakia |
| HLS19 -Q12 | General HL adapted short form |
| HLSAC | HL for School-aged Children |
| HLS-EU (Q6/Q16/Q25/Q47/Q86) | European HL Survey Questionnaire (nr. of questions in the questionnaires) |
| ILS-PT | HL Survey – Portugal |
| IMETER | Italian Medical Term Recognition Test |
| MAKS | Mental Health Knowledge Schedule |
| MeHLA | Danish Mental HL Adolescents questionnaire |
| METER | Medical Term Recognition Test |
| MHFA | Mental Health First Aid |
| MHKQ | Mental Health Knowledge Questionnaire |
| MHLq | Mental HL Questionnaire |
| MHLS | Mental HL Scale |
| MHLW | Mental HL tool for the Workplace |
| MHPK-10 | Mental Health-Promoting Knowledge |
| MMHLM | Multicomponent mental HL measure |
| MOHLAA-Q | Measurement of HL Among Adolescents Questionnaire |
| NVS | Newest Vital Sign |
| NVS-PTeen | Newest Vital Sign for Portuguese Adolescents |
| OHLP | Oral HL Profile |
| QUICK-K | An Instrument for Measuring HL in Children |
| RALPH | Recognizing and Addressing Limited Pharmaceutical literacy |
| REALM | Rapid Estimate of Adult Literacy in Medicine |
| REALM-R | Rapid Estimate of Adult Literacy in Medicine Revised |
| REALD-30 | Rapid Estimate of Adult Literacy in Dentistry |
| SAHL-D | Short Assessment of HL for Dutch Patients |
| SAHLPA | Short Assessment of HL in Portugal |
| SAHL-PT | Short Assessment of HL for Portuguese population |
| SAHLSA-50 | Short Assessment of HL for Spanish-Speaking Adults |
| SBSQ | Set of Brief Screening Questions |
| S-CCHL | Swedish Communicative and Critical HL Scale |
| S-FHL | Scale for Functional HL |
| SILS | Single Item Screener |

| | |
|---|---|
| S-TOFHLA | Abbreviated version of the Test of Functional HL in Adults |
| TOFHLA | Test of Functional HL in Adults |
| V-HLO | Vienna health literate organisation self-assessment tool |
| **CONSORTIUM** | |
| MDU | Mälardalen University |
| SeAMK | Seinäjoki University of Applied Sciences |
| UCN | University College of Northern Denmark |
| RMIT University | Royal Melbourne Institute of Technology University |
| RMIT University, Europe | Royal Melbourne Institute of Technology University, Europe |
| CSPA | Consejería de Salud y Servicios Sanitarios - Principado de Asturias |
| CE | Consulta Europa |
| ISRAA | Istituto per Servizi di Ricovero e Assistenza agli Anziani |
| MLHSA | Behoerde Fuer Arbeit, Gesundheit, Soziales, Familie Und Integration Hamburg |
| ADIPER | Adi & Salu Sersoc S.L.U. |
| CDC | Cáritas Diocesana de Coimbra |
| EIWH | European Institute of Women's Health Company Limited By Guarantee |
| CEI | Ince Iniziativa Centro Europea - Segretariato Esecutivo |
| E-seniors | E-Seniors: Initiation des Seniors aux NTICc Association |
| All Digital | All Digital Aisbl |
| **General acronyms** | |
| BMI | Body Mass Index |
| EHL | Environmental HL |
| EU | European Union |
| FHL | Functional HL |
| mHL | Mental HL |
| OHL | Organizational HL |
| oHL | Oral HL |
| PTHL | Pharmacotherapy Literacy |
| WHO | World Health Organization |
| Yr. | Years(s) |
| OECD | Organisation for Economic Co-operation and Development |
| MHFA | Mental Health First Aid |
| USA | United States of America |
| UK | United Kingdom |
| RCT | Randomized controlled trial |
| $Chi^2$ | Chi-Square |
| DF | Degrees of freedom |
| CFI | Comparative fit index |
| TLI | Tucker-Lewis Index |
| RMSEA | The root mean square error of approximation |
| WLSMV | Weighted least square mean and variance adjusted |
| SD | Standard Deviation |

## INDEX OF TABLES

## EXECUTIVE SUMMARY

This deliverable (D1.1) provides findings from three different scoping reviews performed to answer task 1.1, 1.2 and 1.3 in work package 1 (WP1) in the IDEAHL project. Based on already existing mapping of Health Literacy (HL) and digital HL (dHL) initiatives, the aim of WP1 is to map both HL and dHL ((d)HL) research and practices in Europe and beyond. The audience of D1.1 is the EU Commission, policy makers, health- and social professionals, researchers, and citizens, who have an interest in the field of (d)HL. The deliverable presents the accomplishment of three tasks:

1. Map EU (d)HL research to assess the interconnections between (d)HL contribution and health, healthy living, and the well-being of citizens.
2. Map (d)HL practices and identify best practices, and champions.
3. Review existing monitoring mechanisms and indicators and synthesize data to assess EU (d)HL levels.

Inspired by Joanna Briggs Institute and co-design, the three reviews have been conducted as participatory reviews with all 14 IDEAHL partners contributing to all stages from July to October 2022. All partners participated in the review process from searching databases to conducting the analysis. Scientific and grey literature databases were searched, after that selection of references and data extraction were conducted using Covidence. Finally, a deductive content analysis was completed using pre-specified frameworks. To qualify findings, two online workshops were held among HL specialists and champions and from research and practice, to discuss the findings.
The scoping review to answer task 1.1 have elucidated that research has been carried out at individual, group, organisational and policy level. On an individual level, the studies primarily aim to improve disease specific HL in patients either through webpages, videos, training, and social support. On group level, all studies aim to improve mental HL (mHL), mostly in students through teaching in school. Studies on an organizational level tested interventions to train health professionals to target communication to patients' HL level, while studies on policy level provided recommendations for HL policies intended for policy makers. It has not been possible to reach a clear understanding of the relation between (d)HL and health, so more research is needed.

In the scoping review answering task 1.2, champions showed great diversity both in relation to methods and outcomes. Still, studies aiming at training health care professionals, patients and caregivers were most prominent. Of effective studies most advantageous activities were training, teamwork, clear and context-relevant communication (plain language), face to face education with the opportunity to explore perspectives, patient-tailored interventions, and organisational readiness. No survivors were identified, while some studies were not possible to categorize, as they did not evaluate (d)HL as an outcome. As for 1.1, limitations were found in the literature,

meaning that it has not been possible to analyse initiatives in detail, as not all information were elucidated in the studies.

Finally, the analysis in task 1.3 showed that studies including measurement of (d)HL in the EU between 2018 and 2022 have been conducted in 81% of the countries, particularly among the general (mainly adult) population, followed by patient, student, and adolescent populations. There were 55 different measuring tools used to assess (d)HL, being the most used HLS-EU-Q16 for HL and eHEALS for dHL. Based on the most representative large-scale studies, there seems to be a prevalence of people with problematic or inadequate HL in the EU at 40±13% (mean±SD).

In general, when promoting (d)HL it is encouraged to use evidence-based interventions and to include demographic, social, cultural and gender aspects, and finding target groups in need of (d)HL interventions. More research is needed in marginalized populations, as they are not widely represented in the findings.

In conclusion, the most important issue found in the scoping reviews was that more research is needed, as the research shows great diversity. Future research should focus on tailored interventions for improving (d)HL in vulnerable groups. Additionally, a more systematic way of reporting important resources, drivers, barriers, and mechanisms should be practiced guiding others in conducting similar interventions. Furthermore, a more research is needed in the attempt to determine country-specific and summarised (d)HL level in the EU. Finally, it is suggested that only validated instruments should be used to measure (d)HL and that measurement tools should be chosen based on the target group and setting of interest.

# 1. INTRODUCTION

## 1.1 IDEAHL PROJECT

The Improving Digital Empowerment for Active Healthy Living (IDEAHL) is a project funded by Horizon Europe (GA 101057477) (10) aims to empower European Union (EU) citizens in using digital tools to take a more active role in the management of their own health and well-being, as well as supporting social innovations for person-centred care models.

The IDEAHL consortium consist of 14 multidisciplinary partners from 10 EU Member States, who work hand in hand with patients, citizens, and the broad socioeconomic sector at local levels. Further information about the project can be found at https://ideahl.eu/ (11).

## 1.2 PURPOSE

This deliverable (D1.1) reports on the findings from task 1.1, 1.2 and 1.3 in Work Package 1 (12) and is intended for the EU commission, policy makers, health- and social professionals, researchers, and citizens, who have an interest in the field of HLHL(d)HL. The deliverable aims at creating a literature base for the development of an EU strategy for improving citizens (d)HL. Moreover, the findings will support the creation of the Global Atlas for Literacies in Health (GALH) (task 1.4), a policymaker event (task 1.5).

The purpose of the three tasks were:

- **Task 1.1**: to map (d)HL research to get a clear understanding on the relation between (d)HL and physical, mental, and social health and well-being of citizens
- **Task 1.2**: to map existing practices on (d)HL and analyse successful (champions) and less successful practices (survivors).
- **Task 1.3**: to analyse (d)HL levels across the EU and review existing monitoring mechanisms and indicators.

Throughout the mapping, a special focus is set on inclusion, gender, ethics, and privacy dimensions and target groups that need special attention.

Champions will be invited to join a Network of Champions, which will foster knowledge exchange and an advancing understanding of (d)HL including how it can be used to improve health outcomes and digital empowerment for health managers and citizens.

In the attempt to achieve the purpose, three separate participatory scoping reviews were conducted, as scoping reviews are conducted to identify the available evidence in a field, any knowledge gaps, and to clarify concepts and characteristics (13). The methodology is further elaborated below.

# 2. METHODOLOGY

This section highlights the specific objectives, information sources, inclusion and exclusion criteria, selection process, data collection process and analysis of all three scoping reviews. Mostly, the methodology is the same for all three scoping reviews, but some differences are found regarding objectives and exclusion and inclusion criteria. The review framework is inspired by Joanna Briggs Institute (14).

The reviews build upon three former reviews within the field of HL, used as the foundation for choosing keywords, search techniques, and setting limits in relation to the electronic searches that were performed. These are:

- European Commission. Study on sound evidence for a better understanding of health literacy in the European Union: final report. Brussels: European Commission (15).
- The World Health Organization (WHO) report: "What is the evidence on existing policies and linked activities and their effectiveness for improving health literacy at national, regional and organizational levels in the WHO European Region?"(16).
- The Word Health Organization (WHO) report: "What is the evidence on the methods, frameworks and indicators used to evaluate health literacy policies, programs and interventions at the regional, national and organizational levels?" (17).

Inspired by co-creation methodology (13) the reviews have been conducted as participatory reviews with all 14 IDEAHL partners contributing to all stages from July to October 2022. To systemize and support all partners in the process, weekly meetings took place in the consortium led by the UCN, who is the lead of WP1. These meetings were mainly used to decide and align all steps in the review process. Simultaneously, a template was developed by UCN and disseminated to all partners to help them describe all steps done in the process of conducting the scoping reviews. The template was filled out by each partner continuously throughout the process to document each step as well as to document any changes made in the process. The template for the reports can be found in Appendix 1.

## 2.1 OBJECTIVES AND RESEARCH QUESTIONS

Objectives and research questions tailored to each scoping review were developed to further elaborate the purpose and guide the review process. These are shown below.

### 2.1.1 TASK 1.1

The objective of this scoping review is to map and analyse the existing (d)HL literature related to interventions (policies, studies, practices, methods, tools, etc.) in the EU and beyond. The scoping review will answer the following research questions:

1. What (d)HL interventions (as policies, practices, studies, tools, or other methods) exist that aim to affect the physical, mental, and social health and well-being of citizens in the EU and beyond?
2. How do (d)HL interventions relate to the management of health data, integration of healthcare and social services, and social innovation?
3. How are demographic, social, cultural and gender aspects addressed in (d)HL interventions (as policies, tools, or other methods) in relation to these outcomes for citizens in the EU and beyond?

### 2.1.2 TASK 1.2

The objective of the scoping review is to map and analyse the best practices to improve (d)HL. The scoping review will answer the following research questions:

- What (d)HL interventions can be considered successful best practices in the EU and beyond?
- What (d)HL interventions can be considered less successful best practices in the EU and beyond?
- Which interventions are most effective / of the highest quality in improving (d)HL outcomes (the champions)?

### 2.1.3 TASK 1.3

The objective of the scoping review is to map and analyse approaches to monitor and assess (d)HL levels in EU and beyond. The scoping review will answer the following research questions:

1. What monitoring and assessment tools, methods, and/or indicators exist for measuring (d)HL in the EU and beyond (including national and regional variations)?
2. How is the validation and sensitiveness documented in relation to these monitoring and assessment tools, methods, and/or indicators?
3. What levels of (d)HL are measured among the identified population groups in the EU and beyond?

## 2.2 INFORMATION SOURCES

The information sources considered for the scoping reviews were (1) Published articles based on research in HL and dHL, (2) non-academic works, (3) key EU policies and (4) projects/EU Projects.

All 14 partners in the consortium took part in conducting the searches in different databases as seen in

*Table 1*.

*Table 1: List of databases searched by each partner*

| **Partner** | **Scientific databases** |
|---|---|
| MDU | AMED, Scopus, Web of Science |
| SeAMK | APA PsycInfo, CINAHL Complete, Cochrane Library |
| UCN | MEDLINE, PubMed |
| RMIT | Embase, ERIC |
| **Partner** | **Grey literature** |
| CSPA | International THA Database |
| CE | NICE |
| ISRAA | Google Incognito, Google Scholar |
| MLHSA | Mednar |
| ADIPER | OpenDOAR, Open Access |
| CDC | DART Europe, ClinicalTrials.gov |
| EIWH | WHO data collection and clinical trials |
| CEI | Cordis and EU trials register, JMIR proceedings |
| E-seniors | OAIster |
| All Digital | Bielefeld Academic Search Engine |

Moreover, the information searches were supplemented with relevant publications already identified by the consortium when designing the project. That additional publication is listed below:

- HL Atlas (18)
- HL Europe (19)
- Policy Précis by EuroHealthNet (20)
- eHealth Action Plan 2012-2020 (21)
- Horizon 2020 (22)
- IC-Health (23)
- Digital Health Europe (24)
- HL in the Nordic Countries ((25)
- DHE´s practice catalogue (26)
- European HL Survey (27)
- Health Literacy Tool Shed (bu.edu) (28)
- The HLS-EU questionnaire (29)

- The M-POHL network action (30)
- WHO HL Road Map (31)

To ensure a systematic approach in the literature search both in relation to the electronic databases and the grey literature, search words and filters were agreed in the consortium and a search protocol was developed for each of the searches (Appendix 1). Furthermore, combinatorial searches to be performed were decided for each scoping review. A model of search strategy, with examples of combinations are described in Table 2 below.

*Table 2: Combinations of key words for searches in scientific databases and grey literature in each task.*

| Task | Scientific databases[1] | Grey literature searches[1] |
|---|---|---|
| 1.1 | ((HL OR Digital HL) AND (European Union & Beyond) AND (Health) AND (Language) AND (Year)) NOT (Publication Type) | ((HL OR Digital HL) AND (European Union & Beyond) AND (Language) AND (Year)) |
| 1.2 | ((HL OR Digital HL) AND (European Union & Beyond) AND (Best Practice) AND (Language) AND (Year)) NOT (Publication Type) | ((HL OR Digital HL) AND (European Union & Beyond) AND (Best Practice) AND (Language) AND (Year)) |
| 1.3 | ((HL OR Digital HL) AND (European Union & Beyond) AND (Assessment) AND (Language) AND (Year)) NOT (Publication Type) | ((HL OR Digital HL) AND (European Union & Beyond) AND (Assessment) AND (Language) AND (Year)) |

[1] The use of key words, combination of these and detailed search strategies for each database and grey literature, are presented in Appendix 2.

Additionally, the DOSIS guide (32), which is a tool used to document systematic literature searches, was used to document the searches, and make it possible to align the searches and monitor changes introduced throughout the course of the information search process. However, the use of DOSIS guides was partial and not exhaustive (find DOSIS guides in Appendix 2). As any database has its own filters and search rules, changes in search strategies were made if necessary. Specific dates for the searches can be found in the DOSIS guide.

### 2.3 INCLUSION AND EXCLUSION CRITERIA

The inclusion and exclusion criteria chosen for the three scoping reviews, respectively are presented in Table 3. In all reviews, studies were excluded if the full text was not available through databases, which the academic partners had access to. For task 1.1 the time limit was publication year 2017 and onwards, as the review starts where the WHO report (16)*"What is the evidence on existing policies and linked activities and their effectiveness for improving health literacy at national, regional and organizational levels in the WHO European Region?"* ends. For task 1.2 and 1.3 the publication year was 2018 and onwards, as these reviews starts where the WHO report " (17)*What is the evidence on the methods, frameworks and indicators used to evaluate health*

*literacy policies, programmes and interventions at the regional, national and organizational levels?"* ends.

*Table 3: Inclusion and exclusion criteria applied in the selection process of each task*

| Criteria | Inclusion | Exclusion |
|---|---|---|
| **1.1 Map and analyse of the existing (d)HL literature related to interventions in the EU and beyond** | | |
| **Publication Year** | 2017 onwards | Before 2017 |
| **Sources** | Any kind of studies not mentioned in the exclusion criteria. | Comments, editorials, letters, and study protocols |
| **Participants** | Any populations | |
| **Countries** | **EU:** Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.<br>**Beyond:** Australia, Canada, New Zealand, United Kingdom (England, Northern Ireland, Scotland, Wales), United States of America. | All other countries |
| **Language** | English, Danish, Finnish, Norwegian, Swedish, German, French, Italian, Portuguese, and Spanish. | All other languages |
| **Concept** | Literature related to the definition of (d)HL as in the search protocol<br><br>Include the terms (d)HL (or the equivalent in the national language) | Studies related to general literacy<br><br>(d)HL not classified according to the definitions used in the search protocol<br><br>Do not include the term (d)HL (or the equivalent in the national language) |
| **Context** | Interventions (Key EU Policies / Non-Academic Works / Projects / EU Projects) related to the management of health data, healthcare, social services, or social innovation | Studies not related to integration to health data management, healthcare, social services, or social innovation |
| **1.2 Map and analyse the best practices to improve (d)HL** | | |
| **Publication year** | 2018 onwards, to the data of literature search start. | Before 2018 |
| **Sources** | Any kind of studies not mentioned in the exclusion criteria. | Comments, editorials, letters, and study protocols |
| **Participants** | Any populations | |
| **Countries** | **EU:** Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.<br>**Beyond:** Australia, Canada, New Zealand, United Kingdom (England, Northern Ireland, Scotland, Wales), United States of America. | All other countries |

| Criteria | Inclusion | Exclusion |
|---|---|---|
| **Language** | English, Danish, Finnish, Norwegian, Swedish, German, French, Italian, Portuguese, and Spanish. | All other languages |
| **Concept** | Literature related to the definition of (d)HL as in the search protocol include the term (d)HL (or the equivalent in the national language)<br><br>Best practices (successful and less successful) in relation to (d)HL<br><br>Levels of (d)HL among population groups | Studies related to general literacy and digitalisation<br><br>(d)HL not classified according to the definitions used in the search protocol<br><br>Do not include the term (d)HL (or the equivalent in the national language)<br><br>Do not relate to practice |
| **Context** | Local, regional, and national initiatives<br><br>Public and private initiatives and services | |
| **1.3 Map and analyse approaches to monitor and assess (d)HL levels in EU and beyond** | | |
| **Year** | 2018 onwards to the data of literature search start. | Before 2018 |
| **Sources** | Any kind of studies not mentioned in the exclusion criteria | Comments, editorials, letters, and study protocols |
| **Participants** | Any populations | |
| **Countries** | **EU:** Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.<br>Initially, countries beyond EU were included, but during the review process, it became necessary to exclude countries beyond EU to answer the research question properly. | All other countries |
| **Language** | English, Danish, Finnish, Norwegian, Swedish, German, French, Italian, Portuguese, and Spanish. | All other languages |
| **Concept** | Literature related to the definition of (d)HL as in the search protocol<br><br>Include the term (d)HL (or the equivalent in the national language)<br><br>Monitoring and Evaluation (d)HL indicators, tools, methods, and frameworks<br><br>Levels of (d)HL among population groups | Studies related to general literacy and digitalization<br><br>(d)HL not classified according to the definitions used in the search protocol<br><br>Do not include the term (d)HL (or the equivalent in the national language) |
| **Context** | Local, regional, and national initiatives<br><br>Public and private initiatives and services | |

### 2.4 SELECTION PROCESS

Covidence (33) was used to manage the review process. First, references retrieved from all searches were uploaded to this online software and duplicates were automatically removed. Hereafter, the title, and abstracts were screened for eligibility. All partners were allocated a certain number of references to go through for eligibility based on the inclusion and exclusion criteria. A voting system in Covidence was used to include or exclude references. The title and abstract of all references were reviewed by two evaluators, who had to agree to enable the inclusion or exclusion of references. Disagreement was solved by a third evaluator. Following the initial screening, full-text reviews were conducted by the same approach as described for the title and abstract screening.

Prior to the data extraction phase, a second round of a quality full-text review was conducted by more experienced partners, to ensure plausible divergences of judgement and/or compliance with inclusion criteria would have led to selection of not relevant studies. Moreover, the consortium research consensus on specifying the inclusion criteria in task 1.3, excluding all references beyond the EU, as it became evident that a narrower focus on the EU region was needed to properly answer the research questions.

### 2.5 DATA COLLECTION PROCESS

Data collection was also conducted in Covidence by members of the whole consortium. A template for data extraction was prepared for each review (see Appendix 4). After finalizing the data extraction, the results were exported as Excel files to be used in the analysis.

### 2.6 ANALYSIS

A deductive content analysis strategy was used to analyse the findings of all three scoping reviews. A core group of the consortium including everyone with a special interest in the analysis process, conducted the analysis of the extracted data.

In task 1.1, Dahlgren and Whitehead model (34) for health determinants became the inspiration for dividing the findings into four levels of intervention: policy level, organisational level, group level and individual level. The categorization of levels was informed by the level of the target group, and interventions, policies, etc. targeting more than one level were analysed at the corresponding levels. On each level, interventions were analysed according to target groups and settings. Moreover, key factors understood as main activities and outputs in the intervention addressed, drivers, barriers, outcomes, and main findings were analysed in order to get a clearer understanding of the relation between (d)HL and health. When possible, special attention were paid to inclusion, gender, ethics, and privacy dimensions and target groups that need special attention.

In task 1.2, the presentation of the findings of best practices was guided by a logic model displaying inputs, activities, outputs, and outcomes of an intervention (35). Inputs are the resources needed to implement the intervention, outputs are the activities, materials etc. produced as part of the intervention, while outcomes are the results experienced by the target group. This framework makes it possible to describe the core elements of the included interventions regarding targets, population groups, supporting tools, financial supporting schemes, monitoring and evaluation measures. The interventions identified were classified as either champions (best practices) or survivors (less successful best practices) and some studies were not possible to categorize. Interventions were categorized as champions, if they succeeded in improving one or more outcomes concerning (d)HL, while interventions were considered survivors, if they did not succeed in improving one or more outcomes concerning (d)HL. Interventions were non-categorizable if an outcome concerning (d)HL was not measured or it was not possible to determine, whether an outcome was improved or not.

In task 1.3, the analysis was guided by assessment tools, validity, and level of (d)HL. Each article was categorised either as:

1. EU-level article if it presented the EU-level results or results including data from at least one EU country without specifying country results separately.
2. Country-specific article if it presented country-specific results about (d)HL levels and/or validation of measurement tools.

During the analysis phase, categories were formed representing the sample populations of the studies (as an inductive research approach). The categories were:

- Children
- Adolescents (≥13 yr.)
- General populations (mainly adults but some studies include ≥15 yr.)
- Older adults (≥65 yr.).
- Student populations (mainly college and/or university students)
- Patient populations
- Migrants
- Health care professionals

Country-specific studies were categorised as accurately as possible based on the target groups. When possible, levels of (d)HL were revealed for each country and at the EU level. The age of adolescents is defined as 10 – 19 years (36)

## 2.7 QUALIFICATION OF FINDINGS

The mapping of the literature was qualified through two online workshops with stakeholders. The first workshop (Workshop 1) with representatives of practice conducting (d)HL initiatives, aimed at identifying main obstacles, difficulties, and areas of improvement within the field of best practices for improving (d)HL. The second workshop (workshop 2) aimed to discuss the findings of the three tasks described in this report with the Network of Champions.

# 3. FINDINGS

Findings from the three scoping reviews are reported separately in the sections below.

## 3.1 TASK 1.1 MAP AND ANALYSE OF THE EXISTING (D)HL LITERATURE RELATED TO INTERVENTION IN THE EU AND BEYOND

This section reports the findings from task 1.1 that aimed to map (d)HL research to get a clear understanding on the relation between (d)HL and physical, mental, and social health and well-being of citizens. The findings are reported on political, organizational, group and individual level, respectively. On each level, interventions are described according to aim, target groups and settings, key factors, drivers, barriers, outcomes, and main findings.

A total of 68 studies were included in the mapping five at policy level (Table 4), 14 at organizational level (Table 5), 12 at group level (Table 6) and, 22 at individual level (Table 7). Three studies targeted both the organizational and policy level, while 12 studies targeted both the individual and group level.

### 3.1.1 POLICY LEVEL

**Highlights**

Policy-based action plans for assessing and improving HL and (d)HL was recommended.

Interventions should take demographic, social, cultural and gender aspects into account, by identifying target groups in need of HL and (d)HL interventions.

Working across sectors and including relevant stakeholders was considered advantageous.

#### AIM

Analysing the need for a system transformation was a common aim of the publications, proposing how the multifaceted and multidimensional nature of HL required policy considerations across sectors, settings, and policy areas. One European study (37) focused entirely on assessing evidence that existing policies were effective in improving HL, while others (38–41) promoted policy approaches to improve HL that were already in use or suggested new approaches.

#### TARGET GROUPS

Policymakers, HL experts, and professionals with implementation roles were the target groups for the policy-level publications.

### SETTINGS

The two publications assessing solely policy-level interventions (37,39) were in the European setting, while the three that also assessed organisation-level interventions (38,40,41) included the United States, the United Kingdom, and five OECD countries in three continents, respectively. Multiple settings within these countries were described, including health care, schools, organisations, correctional facilities, and the community at large. Only one publication (41) focused entirely on a single specific setting, health care.

### KEY FACTORS

Measurement of HL was identified as a key factor raised in three publications (39–41), in that HL levels in a given population needs to be quantified as a base level, as well as prior to and following any intervention. This was to ensure policies can identify and target those groups that require most support, and that the effects of such policies can be followed up and adjusted as needed.

The generation of evidence was also identified as a key factor, where measurements and analyses from monitoring and evaluation of HL and related interventions are then disseminated to inform and be assessed by other stakeholders and experts. This was expressed as exceptionally relevant for policy-level interventions, including the policies themselves.

Cross-sectoral engagement in HL policy was considered crucial in several publications (37–40), as promoting increased HL, and in particular (d)HL, was considered advantageous in many settings in modern society – not solely health care.

Policies that addressed education and competency regarding (d)HL among professionals in different sectors, including schools, health care, and other societal functions was also considered a key factor in two publications (37,41), to ameliorate deficits in understanding of these literacies.

### DRIVERS AND BARRIERS

Clear goals, objectives, and strategies for targeting HL in policies were considered drivers in their ability to gain traction in several countries. Mechanisms for monitoring, evaluation and reporting on implementation progress and policy outcomes were also considered important drivers, as was the articulation of roles and responsibilities in developing and implementing policies and their components. Education of these roles was also identified in one European publication (37) as a driver.

Limited HL among professionals in health care settings was identified as a barrier in the USA study (41), while cultural barriers, budget restrictions, and difficulty in obtaining high-quality measurements and evidence were identified as barriers in a European policy study (37).

### OUTCOMES

While HL was the primary outcome in one publication (38), it was also viewed as a mediator of other outcomes including somatic health and well-being (41) and social health and well-being (37,40).

### MAIN FINDINGS AND RECOMMENDATIONS

The countries, regions and/or organisations that had implemented policies or policy-level interventions for assessing and improving HL showed improvements in key HL-related outcomes. A main recommendation was therefore that countries, regions, and organisations should implement policy-based action plans for assessing and improving HL and dHL, if they currently lack them. For those with existing policies, it was recommended to update existing plans with new research and evidence-based interventions if required. Demographic such as social, cultural and gender aspects should be taken into account, by finding target groups in need of HL and dHL interventions. Doing this on a cross-sectoral manner and including relevant stakeholders was considered advantageous. The policies and plans' outcomes should be evaluated, as well as the process and structure of the policy implementation. To support successful implementation of policy-based action plans, it is important to ensure mechanisms for monitoring, evaluating, and reporting on the implementation progress.

The US Agency for Healthcare Research and Quality was one of the first agencies in the USA to successfully develop a Health Literacy Action Plan, based on five points: 1) Develop Measures; 2) Improve the Evidence Base and Create Implementation Tools; 3) Create and Support Change; 4) Disseminate and Transfer Knowledge and Tools; and 5) Practice What We Preach. Their work has accelerated the uptake of evidence-based health literacy strategies by health care organisations in the USA, as well as influenced similar activities in other nations (41).

*Table 4: Overview of Findings of Policy level interventions*

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcomes |
|---|---|---|---|---|---|---|
| Sørensen et al. 2019 (40)*<br><br>WHO European region<br><br>Policy paper | To provide recommendations on how governments and other policy stakeholders can engage in HL policy development | Policymakers | NA^ | Not an actual intervention, but a review of policies to come up with recommendations for future policies. | NA | Policies are more likely to be effective when they 1) establish a clear purpose and measurable goals and objectives, 2) specify clear and actionable strategies, 3) specify mechanisms for monitoring, evaluating and reporting on implementation progress and policy outcomes and 4) articulate the roles and responsibilities of stakeholders in developing and implementing elements of the policy, in particular, the active engagement of front-line workers. |
| WHO Europe 2019 (16)<br><br>WHO European region<br><br>Policy paper | To guide and support policymakers and implementers in Member States in the adoption and implementation of national and subnational, evidence-based, stand-alone, or integrated policies or strategies on HL. | Policymakers | NA | The roadmap describes, based on the available evidence, HL arenas and their potential role in strengthening the integration of HL into national public health agendas | NA | Recommendations are 1) increasing capacity building on HL, 2) advocating and facilitating cross-sectoral integration, 3) advancing development and implementation, 4) improving digital HL, 5) strengthening the |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | measurement, monitoring and evaluation. |
| **Author(s), year, location, design** | **Aim** | **Target group** | **Setting** | **Key factors** | **Drivers and barriers** | **Outcomes** |
| Okan et al. 2019 (9)*<br><br>UK<br><br>Book chapter | To provide an overview of the multifaceted and multidimensional nature of HL by adopting a lifespan perspective, while addressing research, practice and policy. | HL experts, researchers, practitioners, and policymakers. | NA | The chapter scopes the current research on HL, summarize measurements, summarize empirical findings, and give an overview of interventions for different populations. | NA | No key findings are reported. |
| Rowlands et al. 2018 (42)<br><br>WHO Europe<br><br>Report | To address the question "What is the evidence on existing policies and linked activities and their effectiveness for improving health literacy at national, regional and organizational levels in the WHO European Region?" | Policy-markers | NA | Key factors of the interventions addressed were patient education, training programmes, patient support groups, Teach-Back technique, education curriculum, HL activities in early-years groups (children aged 0–5 years and their parents) and parental training in HL. | Drivers: 1) intersectoral work, 2) supportive institutional structures and processes, 3) political leadership, 4) community participation and networking<br><br>Barriers: 1) cultural barriers, 2) budget restrictions, 3) difficulty obtaining high-quality evidence. | Not all interventions are evaluated, but those that are shows improvement in key outcomes. |
| Brach, C & Borsky, A 2020 (43) *<br><br>USA<br><br>Report | To promote and understand the importance of HL in health care delivery systems. | Policymakers, health care organizations | Federal agency | U.S. Agency for Healthcare Research and Quality's (AHRQ) strategic approach to promote health literate health care delivery systems is traced. | Drivers: 1) development of measures; 2) improvement in the evidence base and implementation tools. 3) creation and support of change; 4) dissemination, knowledge transfer and tools; and 5) practice what we preach. | AHRQ has pursued a strategic path to promoting HL quality improvement in health care delivery systems. AHRQ's work has accelerated the uptake of evidence-based HL strategies by health care |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | Barriers: 1) limited HL among health care professionals | organizations in the U.S. and influenced similar activities in other nations. |

*Studies also belong to the organizational level

^NA: not applicable

### 3.1.2 ORGANIZATIONAL LEVEL

**Highlights**

For organisations to be health literate, it is essential to train professionals and practitioners in HL assessment and/or promotion.

Culture- or ability-specific approaches in communication, shows better effects on HL, thus co-creation with representatives from these groups seems advantageous.

Trained practitioners using evidence-based training methods and guides (face-to-face, digitally, or blended learning) receive more trust and contact from user groups and can thus influence HL more effectively.

Fourteen publications assessed organisational level interventions on HL and dHL. All were peer-reviewed scientific publications, of which two were scoping reviews (44,45) and one a doctoral thesis (46).

*"Health-literacy-responsive organizations examine their level of responsiveness and act on the findings. For example, they may educate their staff on health literacy and health-literacy-sensitive communication and use tools and guides to support these efforts. They may also work to create health-literacy-sensitive environments and support easy navigation within and between organizations. To monitor and evaluate their efforts, they may develop local indicators of health literacy responsiveness and integrate them into their monitoring and evaluation frameworks"* (39)

#### AIM

The studies' aims were to identify and/or assess interventions that improved practitioners and professionals' ability to improve HL and/or behaviours in others (47–55), to improve communication methods specifically with groups with lower HL (44,46,56), or to implement a routine HL assessment within an organisation (57). One scoping review (45) also aimed to describe the characteristics and interventions possessed and employed by health literate organisations, to create a conceptual model. Three studies also specifically stated the aim of establishing a baseline HL literacy level in specific groups working within or using organisational services (47,48,58). Five of the publications (50,51,54,58,59) specifically assessed mental HL (mHL), while others measured more general HL and/or dHL.

### TARGET GROUPS

Practitioners and professionals within the respective settings were the target group in all publications; researchers were also mentioned as a target group in a few publications when referring to methodology and measurement development.

### SETTINGS

Six publications addressed organisations in single European countries: two in the Netherlands (both health care) (46,60), and one each in Germany (school health services (61). Ireland (health care) (48), Italy (health care) (45), and Sweden (health and social care)(54). Four publications addressed organisations in the USA (three health care, one community-based)(50,53,55,57), two in the UK (one health care, one community-based (58,59) and one in Australia (community-based) (51).

### KEY FACTORS

Educational or training modules for practitioners and professionals were a key factor in those interventions that aimed to affect HL through their contact with others; time, number and content of these modules were assessed in different studies. Analysis, formulation, and method of communication were identified as key factors in the communication methods-based interventions, while validated communication tools and established processes for measurement of HL were also identified as key factors.

### DRIVERS AND BARRIERS

Culturally specific approaches were desirable and showed greater effect in several studies (44,50,51,53,57,60). Co-creation of content for improving HL was also a driver, as was collaboration between health care- and community-based organisations; this may be related to subsequent increases in the cultural specificity of the interventions. Trust in professionals' and practitioners' expertise led to increased time/contacts with these, and thus their potential to influence HL. Face-to-face, digital, and blended learning/training options could be used with similar effects.

Inability to critically assess sources or provide access to reliable information were identified barriers in some studies (61,62). A lack of cultural specificity, and language that was too complex, also resulted in lower effect.

### OUTCOMES

Six studies had mental health and well-being as a primary outcome (51,53,54,58,59,63), while four had somatic health and well-being (45,50,53,57), and two social health and well-being (58,64). The ability to communicate effectively with specific groups was a primary outcome in two studies (44,60). While HL was the primary outcome in one study (school health services setting) (61), it was also viewed as a mediator of these other outcomes.

## MAIN FINDINGS AND RECOMMENDATIONS

Professionals and practitioners trained in HL assessment and/or promotion are essential for organisations that want to be health literate. Evidence-based training methods and guides, whether face-to-face, digitally or in blended learning settings, are the best way to achieve this. Such trained practitioners tend to receive more trust and contact from user groups and can thus influence their HL more effectively.

A major academic medical centre in the US implemented delivery of a validated, routine HL assessment to all admitted patients, with the results then automatically entered the patients' electronic journal. The result could then be raised during subsequent meetings with health care professionals and appropriate interventions to help alleviate any limited HL issues and raised awareness among professionals about HL overall. The initiative was developed within the organisation, planned, and implemented without any external funding or increase in direct expenses (57).

*Table 5: Overview of Findings of Organizational level interventions*

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| Toibin et al. 2017 (48)<br><br>Ireland<br><br>Pilot study | To establish a baseline level of HL and participation in patients attending primary care physiotherapy and compare the impact of implementing Ask Me 3 on patients' level of HL and participation. | Physiotherapists and physiotherapy patients | Physiotherapy clinics | Display of Ask Me 3 posters during the trial period, distribution of information leaflets to patient participants, poster in waiting room. | Drivers: 1) easy to use, 2) inexpensive, and 3) respectful.<br><br>Barriers: 1) complicity of language, 2) health care professionals sometimes felt they rushed and 3) feared to be bothersome. | Patients felt entitled and empowered to question and seek clarity on issues that concern them during healthcare consultations. |
| Warring et al. 2018 (57)<br><br>USA<br><br>Pilot study | To implement a hospital-wide routine HL assessment | Nurses | Hospital | Pilot use of REALM-SF screening tool; nursing survey; incorporating the screening tool into our electronic health record; designing a care plan for patients identified as possessing limited HL; hospital-wide implementation of the HL screen. | Drivers and barriers: 1) different level of engagement by units, 2) difference in motivation to screen, 3) different patient populations, 4) difference in nurses' readiness to change and 5) cultural factors, which include leadership styles and early versus late adopters.<br><br>Specific drivers were strong advocates. | A routine HL assessment can be feasibly and successfully implemented into the nursing workflow and electronic health record of a major academic medical centre. |
| Van der Giessen et al. 2020 (60)<br>The Netherlands<br><br>Pilot study | To develop a training program for healthcare professionals to communicate effectively about referral to breast cancer genetic counselling | Breast surgeons and specialized nurses | Hospital | Blended training program with an online module (18 min) and a group training (2 h). | Drivers: 1) considered useful and time efficient, 2) use of trainer and the training actress | The training program offers opportunities to improve communication about referral to breast cancer genetic counselling |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| | with patients with limited HL or a migrant background. | | | | Barriers: 1) challenges in recognizing limited HL in patients, 2) to communicate effectively about breast cancer genetic counselling and 3) to cope with cultural factors in the communication with patients with a migrant background. | |
| Nouri et al. 2020 (53)<br><br>USA<br><br>Pilot study | To determine patterns of use and perceived usefulness of the after-visit-summary (AVS) by English proficiency and HL | Primary care personnel | Primary care | An after-visit-summary (AVS) handed to patients. | Drivers: 1) Use of culturally appropriate materials<br><br>Barriers: NA | Among participants who reported AVS use, the majority (552; 64.6%) found it to be very useful, while 27.8% found it to be somewhat useful, 4.7% found it to be a little useful, and 25 2.9% to be not at all useful. |
| Noordman et al. 2019 (44)<br><br>The Netherlands<br><br>Scoping review | To summarize available strategies and tools for healthcare providers towards successful communication, information provision and/or shared decision-making in supporting patients with limited HL. | Health care providers | Various | Various | Drivers: NA<br><br>Barriers: 1) strategies and tools not specific for the palliative care setting. | Available strategies and tools were 1) face-to-face communication, 2) written & online strategies and tools, 3) Teach-back method, 4) Jargon free communication, 5) Slow down rate of speech, 6) use short sentences and familiar words, 7) limit provided information to a |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| | | | | | | maximum of three main points, when possible, 8) supplementing face-to-face communication with graphs/visual displays or pictographs.<br>Use audio/video recordings. |
| Zanobini et al. 2020 (45)<br><br>Italy<br><br>Scoping review | To describe the characteristics and the interventions that make a hospital a health literate organisation (HLHO), in order to develop a conceptual model. | Health Care Organizations | Hospital | Developing/using tools/instruments for assessing organizational HL, actions for quality improvements, staff training, environmental changes, staff support for patients | Drivers: NA^<br><br>Barriers: 1) difficult to define HL | So far little attention has been given to the effect of environmental support on health professionals, and few outcomes related to staff satisfaction/perception of helpfulness have been reported; the most common types of interventions and outcomes reported have been related to the patients. |
| Carroll et al. 2019 (55)<br><br>USA<br><br>RCT | To assess the impact of a group intervention and individual coaching on patient activation for persons living with HIV. | Health professionals | Primary care | Six 90-min training sessions in groups, co-facilitated by staff coaches and trained peer educators. | NA | The intervention group showed significantly greater improvement than the control group in the primary outcome, the Patient Activation Measures. |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| De Buhr et al. 2020 (47)<br><br>Germany<br><br>Pilot study | To evaluate changes in the HL levels of children, parents, and teachers. | Teachers, health professionals (school nurses) | School | School nurses in schools. | NA | Increase in pupils, teachers, and parents HL. |
| O'Connell et al. 2021 (52)<br><br>UK<br><br>RCT | To examine the impact of child mHL training in frontline paediatric hospital staff who have regular contact with young people. | Frontline paediatric hospital staff | Hospital | Face-to-face or digital teaching sessions | NA | Brief training can improve the mHL of frontline paediatric hospital staff whether it is delivered digitally or face-to-face. |
| Lee et al. 2019 (50)<br><br>USA<br><br>Effectiveness study | To evaluate the degree to which Mental Health First Aid (MHFA) training is able to improve participants' mHL, boost their confidence in helping someone with a mental health problem, and reduce their stigmatizing attitudes and social distance. | Advocates who serve Latinx and Asian American immigrant communities | Immigrant community. | An 8-hour training course | Drivers: 1) highly standardized intervention, 2) collaboration between health care organizations and social services, 3) interactive exercises<br><br>Barriers: 1) intervention was not culturally tailored | The intervention significantly improved participants' mHL and anti-stigma levels. |
| Guajardo et al. 2018 (51)<br><br>Australia<br><br>Effectiveness study | To evaluate a face-to-face mHL course that teaches community-based workers how to provide initial help to Iraqi refugees with depression and post-traumatic stress disorder (PTSD) related problems | Community-based workers (volunteers) | Immigrant community | 7-hour training program with MHFA elements, handout of booklet and MHFA manual. | Drivers: 1) focus on culturally tailor the intervention<br><br>Barriers: NA | The intervention was effective in improving recognition of PTSD and depression, reducing negative attitudes towards PTSD and depression problems, changing beliefs regarding treatment to align with those of mental |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| | | | | | | health professionals, and improving confidence when helping an Iraqi refugee with PSTD and depression problems |
| Lexén et al. 2021 (54)<br><br>Sweden<br><br>Effectiveness study | To evaluate the impact of the Support to Employers from rehabilitation Actors about Mental health (SEAM) intervention on rehabilitation professionals' mHL (knowledge, beliefs, attitudes, and supporting behaviours) towards people with mental health problems. | Social/health workers; Public Employment Service (PES) rehabilitation professionals. | Welfare service organ | 18-hour group training, which includes MHFA, homepage with targeted employer information. | NA | SEAM significantly increased rehabilitation professionals' knowledge in mental health and positively changed their attitudes and supporting behaviours towards employers and service users with mental health problems. |
| O'Connell 2021 (58)<br><br>UK<br><br>Systematic review | To examine the effectiveness of child mental literacy training on professionals in contact with children | Professionals who have regular contact with young people (0-19) | Various | Interventions reviewed contained face-to-face or online training, focus on a variety of common youth mental health presentations, MHFA-programme elements, and disorder specific content. | Drivers: 1) longer trainings, 2) generic and curriculum-based training rather than disorder specific training<br><br>Barriers: NA | Professionals' knowledge and attitudes towards child mental health were significantly improved following training courses included in this review. |
| Van der Doelen, J 2021 (65)<br><br>The Netherlands<br><br>Dissertation | To develop and implement a HL training program | Surgical oncologists and specialized nurses | Health care | Online module and group training based on healthcare professionals' and patients' needs and preferences. Plain-language guide for genetic | Drivers: Co-creation of content<br><br>Barriers: NA | Acceptability and perceived usefulness of the intervention among healthcare professionals was high. |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| | | | | counselling and testing with 33 frequently used jargon words and a reformulation of these words in plain language. | | |

^NA: not applicable

### 3.1.3 GROUP LEVEL

**Highlights**

Most group-based interventions were targeting adolescents, young people, and students. Addressing and increasing mental health, mHL among adolescents and students were most successful when using a variety of evidence-based interventions like 'face to face'-, digital-, and workshops interventions. Feelings of relationship, belongingness, familiarity, and having role-models were important in affecting dHL and HL.

Group-based interventions targeting persons responsible for children or young people (parents, sport coaches, schoolteachers, etc.) seem to increase their capability to act health literate.

Social and cultural aspects were addressed and persons with low HL seem to benefit the most.

There were 23 publications addressing interventions at group level, of these, 12 did also address interventions at an individual level. Among the publications there were 6 reviews and 17 single interventions.

"*This study reports on the evaluation of the teen and Youth Mental Health First Aid (MHFA) programs that were developed and delivered to be responsive to youth from adolescents with culturally linguistically diverse background (CALD). To the authors' knowledge, this is the first program, aiming to equip adolescents with the skills to assist a peer who may be developing a mental health problem or experiencing a mental health crisis with a CALD focus, delivered in a culturally diverse area. Our findings indicated the training led to an improvement in a number of measures of MHL and helpful intentions of both the adolescents and adults evaluated. These results indicate that teen and Youth MHFA with a CALD focus are a recommended way of upscalling those trained and thereby leading to the improvement in youth mental health in areas with high proportion of ethnically diverse groups*" (45).

### AIM

Approximately half of the interventions (13 out of 24) aimed to increase mental health or mHL among adolescents (66–74), or adults (75–77), while others aimed at increasing general (d)HL (78). The rest of the interventions (10 out of 24) aimed to increase parents (73,79–82) health professionals (67,77,83), amateur sporting leaders (84) or religious/community leaders' (85) capability to act health literate toward individuals or groups of people or to identify impaired mental health among these. Two studies also aimed to reveal mHL strategies (86,87) or internet health information seeking behaviour (78) among adolescents.

### TARGET GROUPS

The majority of target groups were adolescents (71–74,84,86,87) and young adults attending school (78), special education classrooms (68), or universities (67,70,83,88). Among university students, medical (83), and nursing students (70,88) represented most participants. Among studies targeting groups that are responsible either for individuals or groups of people, the majority focus on parents of adolescents (73,77,80,81) or children (82) while others were religious and community leaders (85), postgraduate university students, educators, or the public (76).

Some interventions do address social, ethnical (73) and cultural aspects, and only one were uniquely targeting male gender.

### SETTINGS

The six review publications report various countries in Europe and beyond (74,76,79,81,82,86) with specific focus on online/internet as the setting (81,82), schools (74,79,86) and primary public sector employees (76).

Single intervention studies were mainly conducted outside Europe, with Australia accounting for eight studies (66,73,75,77,80,84,85,87), and among these, 3 publications report findings from the same study sample and intervention (72,80,87), USA for four (68,69,71,88) and Canada for one (67). Studies from Europe were conducted in the Netherlands (83), Austria (78), Portugal (70), and Finland (77).

Classrooms and educational settings were the most used setting for group-based interventions in both review studies (86) and single intervention studies (67,68,70–73,75,77,83,88). The internet as a setting were used in two reviews (81,82) and one single intervention study (78). In addition, sport clubs (66,84) community setting (85), employees at primary public sector (76) and homecare (69) were settings in the studies.

### KEY FACTORS

Key factors mainly consist of education and skills training, and the majority is conducted as face-to-face interventions (66–68,70–73,75–80,83–85,87,88), only the ones, that also had an individual perspective used one-way information material and online provision of information as a supplement to classroom and group interventions. Classroom and group interventions were conducted as role play and feedback (83), workshops (66,78), video and PowerPoint presentation (85). The individual interventions were with the use of apprenticeship (75), virtual simulation scenario (88).

### DRIVERS AND BARRIERS

Not all studies report on drivers and barriers directly, but the discussions in the studies, sometimes provide information on what makes an intervention successful.

In a review the 'face to face' programs seemed most beneficials (79) in particular the relation between the person/persons conducting the intervention and the recipients was important (68,75,88), in addition to the atmosphere in which the intervention was performed. Using workshops were seen as drivers, as they were found to be more memorable (66) and "fun and cool" (78). The surroundings, including role models, seemed important in sports-based delivery of mental health promotion (66), in addition to being a part of a group receiving the intervention (72). Furthermore, the intervention needs to be tailored toward the target group (66,67), with the use of a variety of modalities (68). In interventions targeting adolescents' mental health and mHL it is important to consider, whether the intervention should be conducted by a familiar person (the schoolteacher), or a person not known for the students (e.g., health professionals) (74).

Targeting interventions toward students with lower mental health seems to be more effective than among students with adequate HL or high HL (67,69), meaning that persons with low HL seems to benefit the most.

### OUTCOMES

The majority of the studies at group level had mental health or/and mHL as the outcome (66,69–72,74,76,77,79–82,84,86–89) with only two addressing general HL (68,83), and one dHL (83). Social health and well-being were the outcome in two studies (75,82). One paper supports learning how to identify Post Traumatic Stress Disorder (PTSD)-related problems in refugees (85).

### MAIN FINDINGS AND RECOMMENDATIONS

Five studies reported that the interventions significantly increased the expected outcome. For example, the HL and mHL competencies were significantly increased among medical students (77,83) and high school/university students in general (67), and among adolescents (87), in

addition to significant decrease in stigmatization attitudes among adolescents (87). Success on outcomes regarding mHL typically comprised increased knowledge about mental health, but not necessarily increased action. Another paper reported significant increase in confidence and/or knowledge in helping children with mental health problems (79).

Among adolescents and students, improvements in mHL (not significant) were found after receiving Mental Health First Aid (MHFA) in nursing students (70,73,88), and interventions targeting mood (68) and sports-based delivery to men (66). Mental Health First Aid targeting teens (tMHFA) improved students' first aid intention to peers (72). Improvements in dHL (eHEALS) increased after digital interventions (81), and workshops (78).

In most of the single interventional studies, social and cultural aspects were addressed but only a few (interventions) targeted social and cultural-challenged populations (73,82).

*Table 6: Overview of findings of group level interventions*

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| Lindow et al. 2020 (71)<br><br>USA<br><br>Effectiveness study | To evaluate the Youth Aware of Mental Health (YAM) intervention. | Adolescents | School | YAM certified facilitators and helpers (non-school personnel) delivered YAM to individual classes over the course of 3 or 5 weeks, following to a detailed manual. | NA^ | The present study indicates that YAM is a promising mental health promoting intervention. |
| Hart et al. 2022 (72)<br><br>Australia<br><br>RCT | To explore the efficacy of the tMHFA compared to physical first aid (PFA) | Year 10 students | School | Three 75-min classroom sessions presented by trained instructors external to the host school, following a manualized curriculum. | Drivers: 1) whole-school approach, 2) implementation guidance from MHFA Australia.<br><br>Barriers: 1) difficult to corporate with school-based administration on scheduling the sessions | Across all domains students receiving tMHFA reported significantly better improvements. |
| Hart et al. 2018 (87)<br><br>Australia<br><br>RCT | To evaluate the tMHFA compared to physical first aid (PFA). | Year 10 students | School | Three 75-min classroom sessions presented by trained instructors external to the host school, following a manualized curriculum. | Drivers: NA<br><br>Barriers: 1) difficult to engage students, 2) management and communication with schools was difficult, 3) teachers had high workload leaving no room for the intervention. | The tMHFA is an effective and feasible programme for increasing supportive first aid intentions and mHL in adolescents in the short term.<br><br>Compared to PFA, tMHFA resulted in significantly improved supportive first aid intentions and mHL and significantly decreased |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| | | | | | | stigmatising attitudes among adolescents. |
| Morgan et al. 2019 (80)*<br><br>Australia<br><br>RCT | To assess the long-term effects of MHFA training of parents on the mental health of their adolescent children | Parents of adolescents aged 12–15 | Private households | 14-h Youth MHFA course | Drivers: NA<br><br>Barriers: 1) difficult to find time for a 2-day course, 2) course cancellations, 3) great travel distance to course, time and financial barriers for participation- | Changes in the mental health of adolescents and the support provided to them by their parents could not be detected. |
| Guajardo et al. 2019 (73)<br><br>Australia<br><br>Pilot study | To evaluate tMHFA and YMHFA training with a culturally linguistically diverse focus on improving mHL in youth and adults assisting adolescents with mental health problems | Year 10 students | School | Three 75-min classroom sessions presented by trained instructors external to the host school, following a manualized curriculum. | NA | The training led to an improvement in several measures of mHL and helpful intentions of both the adolescents and adults evaluated |
| Peyton et al. 2022 (82)*<br><br>Australia<br><br>Scoping review | To synthesize the effect of Digital Health Interventions (DHI) on parents mHL and help seeking behaviour. | Parents of children aged 2 to 12 | Online | Information on treatment options, communication and problem solving through a webpage or e-mail. | NA | Of those measuring mHL, 80% (4/5) of the studies showed an improvement in parent knowledge. |
| Peyton et al. 2019 (81)*<br><br>Australia<br><br>Scoping review | To assess whether digital Health Interventions (DHI) improve mHL or help seeking behaviour. | Parents of children aged 2 to 12 | Online | Web based programs with modules, online decision aids, information-based website. | NA | Consumer facing DHIs designed to improve parental mHL, show promise. |
| Nobre et al. 2021 (74)*<br><br>Portugal | To map the structure and context of programmes/ | Adolescents | School | Interventions were taught by adolescent's regular teachers; used face to face | NA | The interventions showed statistically significant |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| Scoping review | interventions for promoting mHL | | | interventions; had a variable duration; used non-validated instruments; were implemented in a classroom environment. | | improvements in adolescent's mHL levels. |
| Yulianti er al. 2021 (86)<br>Indonesia<br>Review | To identify the mHL strategies carried out by adolescents | Adolescents | School | NA | NA | The strategies identified were curriculum, cooperating with stakeholders, improving skills in recognizing mental health problems, cross-sector cooperation, national policies, use of technology (internet) |
| Kusaka et al. 2022 (79)*<br>Japan<br>Systematic review | To assess the effectiveness of mHL programs in parents of adolescents. | Parents of adolescents | Various | Online or face-to-face programs with a duration from 13 minutes to 4 weeks. | NA | Several studies found significant improvements in knowledge of mental health/illnesses and confidence and/or knowledge in helping children with mental health problems, while no studies found significant reduction in stigma toward people with mental health problems |
| Wynters et al. 2021 (66)*<br>Australia<br>Qualitative study | To understand adolescent males' experience of participating in a sports-based mHL intervention (Help Out a Mate (HOAM)) | Adolescent males 12–15 years old | Sports club | 45-min mHL workshop | Drivers: 1) relatable sports content, 2) interactive content, 3) engaging context | The HOAM program was effective in terms of mHL outcomes including increased knowledge of mental health, and |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| | | | | | Barriers: 1) not enough practical content, 2) role play content not realistic, 3) groups were too big, 4) presenters should reduce distractions | increased confidence and intentions to seek and provide help. |
| Patafio et al. 2021 (84)*<br><br>Australia<br><br>Effectiveness study | To examine the effectiveness of a brief psychoeducational mHL intervention | Adolescents | Sports club | 1 h psychoeducational intervention delivered by a mental health professional | NA | While the sample overall did not significantly improve as a result of the intervention, results addressing certain cohorts within the sample suggest that the *Read the Play* intervention may be particularly useful for more vulnerable adolescents (i.e., those scoring low on key constructs) |
| Lo et al. 2018 (76)<br><br>Australia<br><br>Systematic review | To analyse interventions aiming to support mHL, deal with stigma, encourage help-seeking behaviour and improve attitudes towards providing help to those experiencing mental health issues. | Students | Various | Group education interventions designed to enhance mHL. Five (out of seven) studies were based on MHFA. | NA | Mental health interventions appear to have no significant effect on attitudes to seeking professional help or stigma |
| Wei Liu 2021 (88) | To evaluate the long-term effects of virtual simulation on | Nursing students | School | Virtual simulation scenarios as part of the | Drivers: NA | Students in the simulation cohort showed significant increase in knowledge and |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| USA<br><br>Effectiveness study | undergraduate nursing students' mHL. | | | curriculum for a mental health nursing course. | Barriers: no faculty-led debriefing activities were completed | acceptance of available treatment options for managing depression and schizophrenia over a one-year period |
| Wei et al. 2021 (67)*<br><br>Canada<br><br>Effectiveness study | To investigate the effectiveness of a mHL intervention. | First-year students | School | Book to introduce students to all that is necessary to know when starting in college or university. | Driver: 1) flexible formats that allows for campuses to tailor its implementation so that it can be integrated into different campus culture and context<br><br>Barriers: NA | The findings showed that students in the intervention group significantly improved mental health knowledge, decreased stigma against mental illness, increased positive attitudes toward help-seeking, improved help-seeking behaviours, and decreased perceived stress compared to the control group. However, we did not identify significant changes in the general health outcome. |
| Kurki et al. 2021 (77)<br><br>Finland<br><br>Effectiveness study | To assess the digital Transitions, a mHL program. | First-year students | School | Two 60-minute lectures, four weeks apart, with online self-learning material in between. | Drivers: 1) digital delivery, 2) holistic design<br><br>Barriers: NA | Knowledge about mental health and their emotional wellbeing, improved significantly immediately after the program and those positive changes were maintained at the follow-up stage. |
| Loureiro et al. 2019 (70) | To evaluate the impact of MHFA training program | Nursing students | School | The MHFA training program | NA | Students showed an improvement in all |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| Portugal<br><br>Effectiveness study | | | | | | components of mHL about depression, increasing their confidence to provide first aid. |
| Sinclair J 2021 (68)*<br><br>USA<br><br>Pilot study | To evaluate lessons learned from a feasibility and acceptability trial of the Think, Be, Do, curriculum (a mHL curriculum). | students aged 14–21 years | School | Think, Be, Do curriculum twice a week for five weeks. | Drivers: 1) curriculum supported other leaning activities, 2) great amount of student participation in the curriculum<br><br>Barriers: 1) not enough time, 2) challenging to help student monitor goals, 3) students had aversion against writing, 2) some concepts were difficult for students to understand | The curriculum was feasible to implement, acceptable to teachers for their classrooms. |
| Morony et al. 2017 (75)<br><br>Australia<br><br>Qualitative study | To deliver a HL training program | Adults | School | 10 classroom teaching sessions covering different topics within health. | NA | Improvement in student's health behaviours, confidence, vocabulary to communicate about health, understanding of the health system and language, literacy and numeracy skills. |
| Kaper et al. 2019 (83)<br><br>The Netherlands<br><br>RCT | To assess the effectiveness of a Comprehensive HL Consultation Skills Training | International undergraduate medical students | School | 11-h-training-intervention (six sessions) with a HL lecture and five interactive small-group sessions | NA | The group of students who received the training intervention reported significantly greater HL competencies, which |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| | | | | | | persisted up to five weeks afterwards. |
| Michalowski et al. 2018 (69)<br><br>USA<br><br>Retrospective study | To examine relationships among HL and outcomes for sub-populations identified within an Omaha System dataset | Five sub-populations | NA | Retrospective analysis using data from the Omaha System. | NA | This exploratory analysis showed that interventions were positively associated with knowledge uptake, and subsequently improved behaviour and status. |
| Maitz et al. 2020 (78)<br><br>Austria<br><br>Mixed methods study | To assess how children and adolescents rate their internet-based HL and how their actual literacy differs from their ratings | Adolescents aged between 12 and 14 years | School | 12-hour workshop separated on three consecutive days held by one medical student and one education researcher | NA | The eHEALS score increased slightly after the workshop, indicating that the students had gained more confidence and competence in the areas of finding and evaluating internet-based health information. |
| Querque et al. 2021 (90)*<br><br>France<br><br>Mixed methods randomized controlled study | To evaluate the appreciation and effectiveness of an interactive video on French University students' mHL. | Students | School | 30-minute interactive video | Drivers: 1) co-creation<br><br>Barriers: NA | The interactive video slightly enhanced students' knowledge of mental health, students' mental health help-seeking behaviours were also promoted, and the interactive video decreased students' stigma and misconceptions about mental health |
| Burns et al. 2017 (91)* | To measure the impact of the MHFA course | Nursing students | School | Tailored MHFA course | NA | MHFA can positively impact on mental health |

| Author(s), year, location, design | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| Australia<br><br>RCT | | | | | | knowledge, confidence in helping, mental health first aid intentions, social distance and some aspects of personal stigma among nursing students |

*Studies also belong to the individual level, ^NA: not applicable

### 3.1.4 INDIVIDUAL LEVEL

**Highlights**

Interventions at individual level show great heterogeneity regarding target groups, settings, key factors, and outcomes.

Interventions succeeded in improving HL levels were mainly based on education, counselling and/or communication through video in different settings and target populations. Still, as educational interventions constitute a big part of the interventions, they also constitute many of the interventions with no effect.

Across publications, tailored interventions, tailored communication, and co-creation processes are mentioned as important elements of interventions aimed at improving HL or health related behaviours.

There were 34 publications assessing individual level interventions, with 12 of them containing elements of group level interventions as well.

#### AIM

Improving mHL in the target population was the most common aim of the interventions found (63,66,67,74,79–82,84,90–104). Other common aims were improving HL (10 studies) (63,96–103) and improving health behaviours (67,81,82,96,103,105,106). Two studies aimed at improving disease specific HL (89,107) and dHL (108,109), respectively, while one study aimed at improving (d)HL (109). Several studies were reviews with the aim of gathering evidence on tested interventions (63,74,81,92,94,97,98,100,101,103,106,108).

Most of the publications assessed the effectiveness of the interventions ((63,66,67,74,79,81,82,89–92,95,97–99,102,107–109), while efficacy was assessed in only one study (109). Two studies contained the results of pilot testing (105,110). Only one study assessed the experience of receiving the intervention more qualitatively (66), while one study described the development of an intervention (93).

#### TARGET GROUPS

Patients with chronic illnesses were the most common target group of the interventions (63,91,99–102,104,105,110,111) followed by adolescents (66,74,82,84,95,110). Five interventions targeted parents (106) and four interventions targeted students (67,68,90,112). Other target groups were children, elderly people, or adults in general. Two interventions focused solely on minorities (89,93) and two interventions were directed at women alone (98,110), comprising pregnant women or women of reproductive age.

### SETTINGS

Several publications are reviews describing interventions across numerous countries. For the single-intervention studies, most of the interventions are conducted outside the European Union, with seven studies conducted in Australia (66,80,84,91,94,99,107), five in the United States (113–115), four in United Kingdom (116–119), and one in Canada (67). Only three interventions are conducted in European Union countries including France (90), Germany (120).

Generally, a wide variety of settings have been used in delivering the interventions. Many interventions also comprised multiple settings alone. However, some studies did not explicitly elaborate on the setting. The most common were online/web-based (79,81,82,92,94,97,101,103,105,107,110,111) or educational/school settings (68,74,79,80,91,94–96,99,101,108). Ten studies described interventions in a clinical setting, either inpatient or outpatient units (63,89,95–97,100–102,106,108), while seven studies describe interventions with a community-setting-approach (63,93,95,97,101,104,112). Other settings mentioned are sports clubs, telephone, or private homes.

### KEY FACTORS

Education or training was a key factor in most interventions (63,66,68,74,79–81,84,90–92,94–96,98,99,101,102,104,106,109,110,112). Different educational methods were used, of which the teach-back method was the most featured. Subjects covered in the education and training implied disease risk factors, disease specific elements, use of health care systems, stigmas and how to provide social support – among others.

Another key factor frequently recognized was one-way communication (63,66,67,81,82,89,92,93,98,103,105,107,111). Several interventions contained elements of communication through web pages, books, flyers, videos, and games.

Counselling or coaching was also mentioned (63,92,96,106), while social support in five studies (92,95,96,100,112). Others included peer support (92,99,112), co-creation (101,110,112) and patient-tailored goal setting (106,111) home visits and use of electronic patient records.

Commonly, the same intervention was delivered to the whole target populations. Only a few interventions were patient tailored.

### DRIVERS AND BARRIERS

Several publications did not describe drivers and barriers related to the implementation of the interventions, as the focus of the methodical discussion in the publications was solely on methodological strengths and limitations of the study conducted. This is a considerable limitation in the reporting of drivers and barriers.

Yet, a wide variety of drivers and barriers are mentioned in the publications, and as they are flip sides of the same coin, they are described simultaneously below.

The most pronounced factor was level of HL (67,84,102,106–108), hence low HL in the target population was a barrier in delivering the intervention, while high HL was seen as an obstacle towards showing an effect of the interventions. Due to low HL found in most target populations, another important factor was tailoring written and verbal communication to the HL level. Following this, co-creation of the interventions was seen as drivers in two studies (90,102).

Personal and cultural tailoring of the interventions were important drivers as well (68,97,104,111), as were involving next of kins (79,100,101,106), the relationship between patient/citizen and the professional (94,101,106) and use of peers (92,100,106).

The patients or citizens incentives and attitudes towards participation were important to acknowledge, as they could either strengthen or hinder the engagement. High perceived severity of diseases and high self-efficacy were seen as drivers towards higher engagement. Costs like time and financial costs were seen as barriers weakening or even hindering participation.

Other drivers mentioned were community-approach, the teach-back method, motivational strategies, practical training, cross-sectoral cooperation, digital skills, and gamification of activities.

### OUTCOMES

The most common outcomes addressed in the publications circled around mental health and well-being, e.g., mHL (66–68,74,79–82,84,90–92,94,95,99,107,110,112). Somatic health and well-being were addressed in 14 studies (63,89,93,96,97,99–103,105,109–111), while social health and well-being were addressed in five studies (99,100,105,109,112). As described in the aim section, several studies had HL as either a primary or secondary outcome, while other

outcomes mentioned were reproductive health, patient activation and help-seeking behaviour.

The 2-hour virtual citizen science training included an overview of the study goals; the role of the citizen scientist as a member of the study team; details of their participation; an introduction to radon, home radon testing and mitigation; and detailed instructions for using the Airthings® Corentium Home Radon Detector and for reporting of daily and 2-week long-term values.

The findings of this novel citizen science approach to radon testing reveal that all citizen scientists tested their homes for radon when they had ready access to real-time electronic detectors. Further, training citizen scientists to join a research team and test their homes, using personalized report back of the radon findings, and engaging them in a focus group boosted environmental health literacy and their perceived ability to search for and process radon information. This citizen science approach also improved confidence in their capacity to test their home for radon and contact a radon mitigation professional (109).

## MAIN FINDINGS AND RECOMMENDATIONS

Largely, the publications show great heterogeneity in HL interventions on an individual level regarding target groups, settings, key factors, and outcomes. This certainly highlights the complexity of this field of research. A common finding in the studies was that no conclusion could be drawn, and more research is needed (68,74,80,81,95,100,101,103,110,111). This is also underlined by the fact that no studies have been found to be replicated to validate the results.

Some interventions succeeded in improving HL levels (84,93–96,99,106–109). Typically, the key factors of these interventions were education, counselling, and/or video communication, while there was great heterogeneity in the settings and target populations.

Generally, the key findings on the individual level point in many directions, with some interventions improving primary or secondary outcomes and other interventions reporting no effect on the same outcomes. Educational interventions were seen in most of the

interventions on the individual level, still, they also constitute many of the interventions with no effect.

Across publications, tailored interventions, tailored communication, and co-creation processes are mentioned as important elements of interventions aimed at improving HL or health related behaviours.

*Table 7: Overview of findings of individual level interventions*

| Author(s), year | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| Zolbin et al. 2022 (108)<br><br>Finland<br><br>Systematic review | To assess the relationship between elderly people's HL skills and those people's decision to make use of digital health service platforms. | Elderly people | Various | Various. Some interventions are described as collaborative versus others that have an individualistic strategy. Some interventions are described as tailored to individual characteristics, whereas others are untailored. | NA^ | Findings are divided into three primary themes (HL skills, health management competency and attitude/confidence), In all three the results show that health intervention programmes help to enhance HL skills of elderly people |
| Walters 2020 (96)<br><br>UK<br><br>Systematic review | To establish whether HL interventions, in adults:<br>- are effective for improving HL,<br>- have Impact on health behaviours,<br>- have been conducted in cardiovascular patients | Adults | Various | All interventions targeted functional aspects of HL, in addition sixteen also targeted interactive aspects (one providing unclear information) and four of these also targeted critical HL (with a further three being unclear). Intervention designs included small group sessions, text or social media messages, animation, multi-media learning, app and one to | NA | Twelve of the studies showed a significant increase in HL in the intervention group compared to the control group. Six showed no significant difference. |

| Author(s), year | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| | | | | one education. The most common approach was for small group educational classes | | |
| Brown et al. 2020 (112)<br><br>UK<br><br>Evaluation study | To evaluate a co-produced and community-led project, PACT (Parents and Communities) | Mothers | Hospital | The main components of the PACT intervention were social support, provided through meetings the mothers chose to call "Mumspace", and health education. | Drivers: 1) co-production, 2) community led, 3) peer support elements, 4) community organizing methods<br><br>Barriers: NA | Significant improvements were found in mental health measures, in HL, for those with low literacy at baseline, and in overall and some specific aspects of social support. |
| Stanifer et al. 2022 (109)<br><br>USA<br><br>Longitudinal mixed-methods study | To evaluate changes in eHL and efficacy over time. | Citizen scientists | Private households | The 2-hour virtual citizen science training on radon testing. | Drivers: 1) High participation/compliance, 2) training prior to home testing, 3) the citizen science approach<br><br>Barriers: 1) cost on radon mitigation, 2) the intensive citizen scientist contact | Citizen scientists reported a significant increase in eHL, health information efficacy, and radon testing self-efficacy over time. |
| Vila-Candel et al. 2020 (98)<br><br>Spain<br><br>Systematic review | To investigate health care promotion interventions and examine their effectiveness on women with inadequate HL | Women of reproductive age | Various | The three most used elements were 1) educational sessions, 2) communication skills by telephone and 3) a multimedia interactive tool. | NA | Interventions aiming to benefit and improve HL should consider the complex web of cross-sectional determinants that end up shaping the opportunities of women to make optimal decisions regarding their health and care, and which may |

| Author(s), year | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| | | | | | | require attention to much more than clinical or service delivery factors. |
| Beauchamp et al. 2022 (100)<br><br>Australia<br><br>Scoping review | To identify HL interventions that aimed to improve outcomes in patients with coronary artery disease (CAD) | Patients with CAD | Various | Key factors across studies were social support, empowerment building, improving interaction between patients and health system, improving HL capacities of professionals, facilitate access and use of health system. | Drivers: Involving partners in health education, use of peers, teach-back method, structured follow-up<br><br>Barriers: NA | Key characteristics of effective HL interventions for patients with CAD include social support by partners or peers, teach back, co-design of discharge plans, increased frequency of patient–provider interactions and facilitated access to health services |
| Aida et al. 2020 (103)<br><br>Japan<br><br>Literature review | To identify existing literature published in the past decade on eHealth interventions aimed at improving HL on lifestyle-related diseases | Patients with lifestyle-related diseases | Various | Interactive content, telephone interviews, face-to-face video conferencing, and social network service messages through different platforms: (1) applications (web-based applications or mobile apps), (2) websites, and (3) others. | NA | This review found that the provision of educational content was satisfactory in most eHealth studies, but standardized measurement tools to evaluate HL are lacking |
| Shnaigat et al. 2021 (63)<br><br>Australia<br><br>Systematic review | To summarize the most recent evidence on the effectiveness of HL driven COPD self-management interventions | Patients with COPD | Outpatient setting | Either face-to face (coaching and tailored education); or online or technology based (web-based information or telemonitoring devices). | NA | The review found that HL interventions led to moderate improvements in physical activity levels (four out of seven trials) and COPD knowledge (three out of six trials). Surprisingly, none of the |

| Author(s), year | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| | | | | | | RCTs led to significant improvement in medication adherence, which warrants further studies. |
| Hosseinzadeh et al. 2022 (106)<br><br>Australia<br><br>Systematic review | To summarise the current evidence on the impact of (HL) and patient activation (PA)-led interventions on self-management outcomes. | Patients with chronic diseases | Outpatient setting | Education on self-management skills, motivational interviewing, goal setting and shared decision-making, action plans with pre-specified goals, teach back techniques, training on basic HL about the disease of interest, social support, physician communication. | Drivers: 1) using motivational and engagement strategies, 2) delivery of intervention by nurses, social workers, and peer coaches, 3) involvement of family and friends<br><br>Barriers: Severity of disease, presence of comorbidities, | This review suggests that both HL and PA are essential pillars for improving chronic disease self-management outcomes. |
| Visscher 2018 (97)<br><br>The Netherlands<br><br>Systematic review | To assess the evidence on the effectiveness of HL interventions in the European Union published between<br>1995 and 2018. | Adults (> 16 years) and children (8–12 years) | Various | Various | Drivers: 1) patient-tailored<br><br>Barriers: NA | Interventions were tailored to the needs of patients, addressing functional, interactive, and critical skills and use not difficult animated spoken text |
| Muscat et al. 2019 (99)<br><br>Australia<br><br>Effect study | To assess the impact of the Chronic Disease Self-Management Program (CDSMP) on different domains of HL | Patients aged over 16 years and with one or more self-reported chronic diseases | NA | Small-group interventions (2.5 hours each) over six weeks and an accompanying reference book | NA | There were statistically significant improvements across all nine domains of the HLQ |
| Seidling et al. 2020 (102)<br><br>Germany | To assess the influence a medication module within a patient-led electronic | Patients with type 2 diabetes mellitus | Primary care | Personal use of the medication module | Drivers: 1) co-creation of module | No change in HL were found. |

| Author(s), year | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| RCT | health record on patients' HL | | | | Barriers: NA | |
| Muller et al. 2017 (105)<br>UK<br>RCT | To develop a web-based intervention promoting physical activity among people with type 2 diabetes. | Patients with type 2 diabetes mellitus. | Online | Web-based content, either interactive or plain text. | NA | The main finding of this study was that the interactive intervention overall did not produce better outcomes than those obtained by a plain-text version of the intervention. |
| Ridout et al. 2018 (92)<br>Australia<br>Systematic review | To systematically identify available evidence regarding the use of social networking sites (SNS)–based interventions to support the mental health of young people. | Young people aged up to 25 years. | Online | Moderated Online Social Therapy (MOST) conceptual model, integrating: ii) peer-to-peer online social networking; ii) individually tailored interactive psychosocial interventions; iii) expert moderation | NA | The evidence reviewed suggests young people find SNS–based interventions highly usable, engaging, and supportive. |
| Patafio et al. 2021 (94)<br>Australia<br>Systematic review | To provide an overview of interventions/programs which attempt to improve adolescents' mHL, attitudes/stigma and behaviours. | Adolescents aged 12–18 years | Various | Interventions were taught by adolescent's regular teachers; used face to face interventions; had a height variable duration; used non-validated instruments; were implemented in a classroom environment | NA | This review found that many studies have demonstrated positive changes in key mental health outcomes, although the patterns of success are heterogeneous. |
| Fretian et al. 2021 (95)<br>Various | To provide a systematic review and meta-analysis of interventions that aim to improve young peoples' | Young people | Various | Durations ranged from under 1 h to a maximum of 18 h. A team of teachers and mental health | NA | The meta-analysis indicates that interventions appear successful in improving |

| Author(s), year | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| Systematic review and meta-analysis | mHL and/or to reduce mental illness related stigma | | | professionals were frequently responsible for administering the interventions.<br>Schools were the predominant setting of delivery, where topics addressed were general mental health, depression, and schizophrenia. | | mHL in the long term but provide less robust information on improving attitudes. |
| Gurung et al. 2020 (104)<br><br>USA<br><br>Effectiveness study | To examine and compare the effectiveness of bilingual (English/Nepali) MHFA training | Bhutanese adults | Refugee community | Culturally oriented MHFA training | Drivers: 1) culturally tailored, bilingual<br><br>Barriers: NA | MHFA training is a promising intervention for improving knowledge and attitudes about mental health among Bhutanese refugee in the US |
| Gonzalez et al. 2022 (93)<br><br>USA<br><br>RCT | To develop an E-E video aimed at reducing stigma and increasing mHL | Latinas above 18 years | Community | Information flyer and 4-minute video | NA | We found that the “¡Yo no estoy loca!” E-E video was effective at increasing mHL compared to treatment as usual |
| Thorsteinsson et al. 2019 (107)<br><br>Australia<br><br>RCT | To investigate (a) the effects of an educational intervention on schizophrenia mHL and (b) whether schizophrenia literacy would be higher in people with prior education in a health-related area than people without such education | Adults | Online | 8-minute video | NA | The intervention significantly increased schizophrenia literacy among participants and it was found to be higher among participants with a health education background than those without a health education background |

| Author(s), year | Aim | Target group | Setting | Key factors | Drivers and barriers | Outcome |
|---|---|---|---|---|---|---|
| Bakker et al. 2019 (101) | To describe the methodological approach for HL intervention development used in the NHLDPs, and describe the aims and status of each of the seven NHLDPs currently underway- | Various | Various | Various | NA | Interventions are still in the initial phase, so no key findings have been reported |
| Rowsell 2017 (111)<br><br>UK<br><br>Ph.D. Thesis | To establish whether the Healthy Living with Diabetes (HLD) intervention and the presentation of audio-visual and interactive features improved HL outcomes for people with lower levels of HL, whilst also being effective for people with higher HL | Patients with diabetes | Online | The Healthy Living with Diabetes website | NA | NA |
| Forbes et al. 2019 (89)*<br><br>UK<br><br>RCT | To assess whether provision of a personalized patient-held eye health summary (glaucoma personal record (GPR)) improves patients' knowledge of glaucoma at 1-year follow-up | Patients newly diagnosed with glaucoma | Outpatient clinic | booklet containing personalized information concerning a patient's glaucoma condition | Drivers: NA<br><br>Barriers: 1) Too little in depth information about glaucoma was provided in the booklet | The glaucoma personal record does not impact on a patient's knowledge of glaucoma |

^: not applicable

### 3.1.5 CONCLUSIONS ON TASK 1.1

The mapping of research showed that (d)HL, especially HL, is a widely researched subject in EU and beyond. Interventions on policy, organizational, group and individual level with great heterogeneity in aim, target groups, settings, key factors, drivers, barriers, and outcomes show the many different trends within this field of research.

Most of the research identified aimed at improving HL, while the link between improved HL and physical, mental, and social health and wellbeing of citizens were not addressed directly. Therefore, the link between HL and health and well-bring of citizens remains unclear.

The findings on policy level show advantage of having a shared strategy and action plan with clear objectives and with a focus on intervening on different levels and working cross sectoral.

On all intervention levels, it is highlighted that interventions need to be tailored to the specific target group and setting, e.g., by taking cultural, social, or other demographic characteristics into account. Simultaneously, interventions should always build on available evidence, but at the same time it is considered adventurous to co-create interventions with the end users of interest.

As a final remark, it should be noticed that most studies did not report drivers and barriers of the interventions, making it difficult to determine important factors to consider when developing, implementing, and evaluating (d)HL interventions. Therefore, conclusions should be read with cautiousness, and it should be considered that more research is needed.

## 3.2 TASK 1.2 MAP AND ANALYSE OF BEST PRACTICES TO IMPROVE (D)HL

This section shows the findings of the scoping review aiming at mapping existing practices on (d)HL and analyse successful (champions) and less successful practices (survivors). A total of 21 studies were included in the scoping review. As explained in the methodology section, the studies are categorized according to whether they are seen as successful best practices (champions; n=15) or less successful practices (survivors; n=0). Some studies have not been possible to categorize and are described under the non-categorized section (n=6). These last studies aimed at describing best practices in relation to health or (d)HL still, but outcomes concerning (d)HL were not measured or it was not possible to determine whether they improved or not.

The analysis was guided by a logic model (35) and therefore, all interventions were analysed according to the core elements of the included interventions regarding aim, target group, setting, resources, activities, mechanisms, outputs, and outcomes.

A schematic overview of the included studies is found in Table 8 (champions) and Table 9 (non-categorized).

### 3.2.1 CHAMPIONS

**Highlights**

There is great heterogeneity in interventions improving one or more outcomes related to (d)HL, health, access to information and behaviour or procedures and policies on organisational level.

Core tendencies in this field of research include interventions aiming at training health care professionals, patients, caregivers, or others.

It has been difficult to conclude on best practices as the effect of most interventions was not using well established evaluation methods, still methods still, the most applied interventions were education and training and testing and revising information materials.

In many interventions technologies were important elements.

More research is needed to determine best practice.

The origin of the 15 studies defined as Champions are five from the United States (121–125), two from United Kingdom (59,126), one from Ireland and Ireland/The Netherlands (127) one from Canada (128) and one from Australia (129). Four studies were reviews describing several interventions across countries (130–133).
The studies included described interventions targeting all the individual level (122–124,128–134), group level (133) and organisational level (59,121,124–127,132).

#### AIM

On the individual level most interventions aimed at training patients' skills to search for health information (122) or act upon their own health status (123,129). Other interventions aimed at changing HL (131), mHL (134) or dHL (128).

Of the interventions targeting the organisational level, the aim typically revolved around increasing health care professionals' ability to provide a HL-sensitive care for patients (121,124,126,127). Interventions addressed different kinds of HL like HL in general (126), oral HL (124) or organisational HL (OHL) (127). One study described an intervention aimed at improving written materials (125).

The reviews included either summarised evidence on improving dementia literacy (130), mental health knowledge and attitudes (59) HL at group level in school children (133) or HL outcomes and factors and strategies that affect implementation of OHL-interventions (132).

### TARGET GROUPS

Across the interventions included on the individual level the target groups were typically patients (122,128,129,131,132), caregivers (122,124,128,131) or populations with specific demographic characteristics like young people (123,130,134). Two studies explicitly described migrants as a target group (123,131). One study reviewed interventions that were all targeted toward pupils (133).

In all interventions targeting the organisational level the target groups were health care professionals or social workers.

### SETTINGS

The interventions on the individual level were typically delivered in a community setting (122,123), online (130,134), in a health care setting (124,129,131,132) or educational setting (128,133).

Interventions targeting the organisational level were delivered in a health care setting like a mobile clinic (121), health care agency (124), hospital (127) or general practitioner (126) or in a school setting (59). One intervention took place within a national administration unit (125).

### RESOURCES

Generally, resources necessary to implement the interventions have been difficult to identify in the literature. Only two studies explicitly described some of the resources needed (125,134) that were funding, volunteers, and staff. Specific for the intervention described in Ito et al. (134) an animation studio was an important resource.

### ACTIVITIES

The most applied activity across interventions targeting both the individual and organisational level was education and training of health care professionals, patients, caregivers, or others.

The use of technology, e.g., an application, social media, multimedia tools, gamification or electronic health record was an important element in many interventions (123,126,129,131,134).

Other activities mentioned were health fairs (123), coaching (131) and testing and revising written materials (125,131)

In addition to training, interventions targeting the organisational level typically revolved around activities aiming at implementing new procedures, guidelines, or policies (127,132).

### MECHANISMS

Mechanisms, as resources, have been very difficult to identify in the literature as they are typically not explicitly described. Only one study describes increase in self-efficacy as an important mechanism in linking activities to outcomes (122).

### OUTPUTS

The outputs vary across interventions. Interventions on the organisational levels are typically implemented in more than one unit (e.g., more hospitals or more general practices).

The size of the interventions on the individual level varies greatly, with some interventions reaching less than 100 individuals and others reaching thousands. One intervention, the media campaign, reached 17 million people within four months (134).

### OUTCOMES

Even though most of the studies categorized as champions do not evaluate the interventions through study designs like RCT, they implicitly succeed in improving some outcomes related to HL.

An increase in HL is the most dominant outcome of the interventions included (128,129,131,132,134). This is followed by improved health behaviours (123,124,129), increase in knowledge (59,121,124,130,133), in confidence/self-efficacy (122), in access to information (124), in awareness and skills related to HL (126,132) and improved communication (125,127).

On an organisational level, interventions succeeded in changing procedures or policies (127,132).

On the other hand, not all outcomes improved. Some of the outcomes did not change, or it was not possible to assess them. These outcomes include confidence in sharing information (122), beliefs and attitudes towards dementia (130), medication adherence (129) and stigma and help-seeking behaviour (133).

### MAIN FINDINGS AND RECOMMENDATIONS

Some of the best practices aimed at improving (d)HL or related outcomes have been described above. It was evident from this analysis that there is great heterogeneity on the core elements of the included interventions, related to settings, activities, and outcomes of interest. In addition, great diversity was found in the methods used to assess the interventions, making it difficult to conclude on best practices. The review studies that did try to summarize evidence regarding specific areas of this field of research, like mHL (59) or dementia literacy (130) concluded that there were interventions improving the outcome of interest. Conclusively, this

summary of best practices must be seen as an overview showing the core tendencies in this field of research, but more research is needed in order to determine best practices.

*Table 8: Overview of findings of champions*

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| Drye 2019 (121)<br><br>USA<br><br>Quasi-experimental | Organisational | To increase HL sensitive care and improve interdisciplinary collaboration between providers | Health care providers | Mobile clinic setting that served significantly underserved and socioeconomically challenged populations | NA^ | Self-guided PowerPoint presentation on the teach back method | NA | Training of 13 nurses, 2 pharmacists, 1 physician, 2 NP/PA providers and 2 social workers | ↑ improved perceived confidence in knowledge and understanding of HL and interdisciplinary collaboration management |
| Armstrong-Heimsoth 2019 (122)<br><br>USA<br><br>Intervention study | Individual | To teach the participants how and where to look for reliable health information online, how to form a searchable question, how to share their findings with their health care providers, and how to use information delivery shortcuts. | Community health groups; patients; caregivers | Community setting | NA | 1-hr educational course held by occupational therapists | Increased self-efficacy | Education of 103 individuals | ↑ increased confidence in finding, judging, understanding, and retrieving online health information.<br>= confidence in sharing information with their providers. |
| Nguyen 2022 (130) | Individual | To assess the evidence on the | Non-health professionals | Various. Online or face-to-face. | NA | Various (e.g., tailored online | NA | Various | ↑ improved knowledge about |

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| Australia; Canada; France; Netherlands; United Kingdom; United States of America<br><br>Review | | effects of interventions aimed at improving dementia literacy | | | | content; group training sessions; individual sessions; simulation) | | | dementia and efficacy in dementia caregiving and management.<br>- effects on beliefs about preventative behaviour change was limited, while there were mixed findings about attitudes towards dementia. |
| Yang 2021 (123)<br><br>USA<br><br>Cross sectional | Individual | To provide snapshot of current health status, education on health topics, encourage to improved health outcomes and referrals to nearby healthcare or social resources if needed. | Asian and Pacific Islander Americans | Community setting | NA | Culturally and language tailored health fairs | NA | 5635 participants | ↑ improved diet and increased exercise<br><br>↑ visit to a physician following our recommendations and referrals in the short 1-month period following health fair attendance. |

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | ↑ more obtained a health insurance plan |
| Ito-Jaeger 2022 (134)<br><br>UK<br><br>Qualitative study | Individual | To promote mHL | Young people | Online on a companion website and available on YouTube, Instagram, Twitter, Facebook and TikTok. | Animation Studio, young people for co-creation, | 4-month media campaign with five short co-created animated films | NA | The films reached more than 17m people | ↑ The animated films had the potential to promote mental HL, especially for understanding mental health and reducing stigma. |
| Dudovitz 2020 (124)<br><br>USA<br><br>Mixed methods | Organisational; individual | To improve oral HL and behaviours. | Head Start staff and parents | Head Start agencies | NA | 1-day train the trainer sessions for staff.<br>Parent session followed by three home visits. | NA | 78 staff members were trained.<br>2300 parents from 29 agencies received the parent session. | ↑ Increased access to oral health information sources, improved oral health knowledge, more frequent positive child oral health behaviours, and increased use of preventative oral health services. |
| Kaper 2019 (127)<br><br>Ireland; Netherlands | Organisational | Improve organizational OHL | Health care professionals | Hospitals in Ireland and The Netherlands | NA | Communication guidelines; OHL-assessment tool; information on HL | NA | Four hospitals (1 in Ireland and 3 in The Netherlands) | ↑ System-wide improvements, as shown by improved embedding of HL |

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| Mixed methods | | | | | | and organisational change processes | | | policies, increased patient engagement, provision of plain language training, and comprehensible written and digital information. |
| Rowlands 2020 (126)<br><br>UK<br><br>Review; Feasibility study; Qualitative study | Organisational | To improve HL skills and practice. | General practitioners and practice nurses | General practitioner | NA | 3-hour HL training session; on-screen pop-up notifications that alerted when seeing a patient at risk of low HL. | NA | Four practices | ↑ Improved awareness and skills in relation to HL. |
| O'Connell 2021 (59)<br>UK<br><br>Review | Organisational | To assess the evidence on interventions to improve the knowledge and stigma-related attitudes towards mental health. | Professionals working with young people. | Various (primarily primary or secondary school) | NA | Face-to-face or online training sessions. | NA | Various. | ↑ Improved mental health knowledge. |
| Duckhorn 2020 (125) | Organisational | To test communication materials in a | The U.S. Food and Drug Administration | Administrational setting | Federal funding; government agency | Internal testing using agency volunteers; | Better understanding of audience | Ongoing intervention | ↑ improved speed, ease, and |

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| USA<br><br>Descriptive | | time-and cost-efficient way before releasing them. | | | personnel; public panel volunteers | external testing using consumer panels from diverse populations | | | cost of assessments<br>↑ better health communication and prevention of possible public message missteps |
| Bender 2021 (128)<br><br>Canada<br><br>Mixed method | Individual | To train peer navigators. | Prostate cancer survivors and caregivers | Educational setting | NA | Blended learning course (24 h of self-study, facilitated online discussion, and collaborative activities (e.g., modules about eHL) | NA | 29 prostate cancer survivors and caregivers were trained | ↑ Increased eHL |
| Redfern 2020 (129)<br><br>Australia<br><br>RCT | Individual | Improve medication adherence, cardiovascular risk factor control and lifestyle behaviours. | Patients with or at risk of cardiovascular disease | Primary care/outpatient setting | NA | Web-based application integrated with primary health care EHR. | NA | 453 patients received intervention | = did not improve adherence to guideline recommended medicines<br><br>↑ increased attainment of physical activity targets and eHL scores |
| Bader 2022 (131)<br><br>USA; New Zealand; | Individual | To identify studies of HL interventions that were | Patients; parents; migrants; veterans | Medical care or clinical trial settings. | NA | Use of multimedia or technology (computerized interactive tool, | NA | NA | ↑ This systematic review identified and qualitatively |

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| Germany; Canada; Australia; Spain<br><br>Review | | associated with improved measures of HL or patient activation. | | | | videos/DVDs, phone-based tool, entertainment-based decision aid); simplification of written materials; coaching; group training | | | evaluated 27 unique HL interventions that led to significant improvements in HL. |
| Kaper 2021 (132)<br><br>USA; Australia; New Zealand; Canada; Austria; Italy; Ireland; The Netherlands and Spain.<br><br>Review | Organisational; individual | To summarize the evidence on: (1) the outcomes of OHL-interventions at patient, professional and organisational levels; and (2) the factors and strategies that affect implementation and outcomes of OHL-interventions. | Health care professionals; patients; auditors | Health care settings. | NA | For patients' educational activities, use of community volunteers and revision of written information were core elements.<br><br>For health care professionals training and revision of written information were core elements.<br><br>For organizations embedding OHL practice into policies, organization-wide platform to revise materials; redesign | NA | NA | ↑ At patient level interventions improved HL level; behaviour change and patient engagement.<br><br>↑ For health care professionals training improved commitment and competency to address HL.<br><br>↑ At the organisational level OHL-activities were |

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | of procedures; revising websites and staff capacity buildings were the core elements. | | | embedded in policies. |
| Amado-Rodriquez 2022 (133)<br><br>Australia; Canada; UK; Portugal; USA; Spain<br><br>Review | Group; individual | To conduct a systematic review and meta-analysis regarding the effectiveness of mHL interventions in schools. | Pupils aged 10-19 | Educational setting (primary or secondary school) | NA | Different programs (EspaiJove.net Program, The Guide, Short mHL Program for Teens, open minds, and School Space among others) | NA | Various | ↑ mHL interventions improve mental health knowledge.<br><br>- It is not possible to conclude that mHL interventions are effective on stigma and help-seeking outcomes. |

↑ Improvement, = No change in outcome, ^: not applicable

### 3.2.2 NON-CATEGORIZED STUDIES

**Highlights**

The outcomes were descriptions of the best practices found or a summary of potentially benefits that might be found if they were investigated in effectiveness studies.

The most applied interventions were training/education, plain language/clear and context bound communication, contact-based education (e.g., teamwork), sufficient time to integrate and apply learning, and organizational readiness and support.

More research is needed to determine best practice.

Six studies described interventions that were not possible to categorise: two from the United States (135,136), one from United Kingdom (137), one from Canada (138), and two were reviews describing several interventions across countries (56).

#### AIM

The aim of these studies typically was to describe or review the literature on HL interventions and best practices on either individual (56,136), group (56,136) or organisational level (135,138,139). Two studies are reviews (56,139), two studies use qualitative methods (135,138), one study is descriptive (136) and one study is a discussion paper (137).

#### TARGET GROUPS

The interventions on the individual/group level targeted health care professions students (56,136), while the interventions on an organisational level typically targeted health care professionals and organizations (e.g., a hospital, pharmacy, etc.) (135,138,139).

#### SETTINGS

The interventions were delivered within a health care setting (135,136,138,139). One review described interventions delivered through various settings like a classroom, a laboratory, or a community setting (56).

#### RESOURCES

As for the champions, resources were difficult to identify in the literature. Two studies described resources (56,135), mentioning funding, specific tools, courses, and a specific curriculum framework for health care profession students as important resources.

#### ACTIVITIES

A variety of training sessions were the main activity in most interventions on both individual, group and organisational level. They were either face to face or web based. Content of the

training sessions revolved around HL and structured through peer teaching, health education, presentations, role play, case studies and quizzes.

Training communication skills, both written and verbal, was also an important activity in more interventions (56,135,136). The teach-back method was mentioned as a method to practice clear communication in two studies (56,135).

Lastly, assessment of HL level was an activity described in two studies (56,139). Other important activities for best practices mentioned in the studies are teamwork (135), and research (135).

### MECHANISMS

As for the champions, mechanisms were difficult to identify in the literature. Only one study mentioned increased awareness as a mechanism leading from activities to outcomes (135).

### OUTPUTS

None of the studies described the outputs of the interventions.

### OUTCOMES

As most of the studies aimed at describing the evidence within a branch of this research field, the outcomes of interest were typically a description of the best practices found or a summary of benefits that could potentially be diverted if it were to be investigated in effectiveness studies.

### MAIN FINDINGS AND RECOMMENDATIONS

It was not possible to detect whether these interventions were effective in changing HL or not, mostly because it was not the aim of the study to assess effectiveness. Still, learning outcomes from these studies highlight key insights for implementation and best practice, summarized here as they relate to policy and practice development.

Across the studies, some best practices emerged. These include a) training, b) teamwork, c) plain language/clear communication, and d) research (135). Another study concluded on the elements perceived to shape the impact of interventions. These included a) contact-based education, b) contextually relevant information, c) an opportunity to explore varied perspectives, d) sufficient time to integrate and apply learning, and e) organisational readiness/support (138). According to Anderson (2022), visual communication is specifically well-suited for people with low HL (137).

Though best practice recommendations have emerged from the studies, a great heterogeneity is found in HL interventions, which highlights the need for more consensus in this field of research (56,139) and more research is needed.

*Table 9: Overview of findings of non-categorized studies*

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| Trueheart 2018 (135)<br><br>USA<br><br>Qualitative study | Organisational | To explore and compare HL best practices of organizations that are recognized as leaders in HL | Other health care organizations | Health care setting (hospitals, outpatient units) | Funding, specific tools/courses etc. | Training patient and staff (e.g., using the teach-back method); plain language/clear communication; teamwork; research. | Increased awareness. | NA^ | Four best practices that emerged were training, teamwork, plain language/clear communication, and research. |
| Saunders 2019 (56)<br><br>USA; Australia; Ireland<br><br>Review | Group; individual | To identify and analyse existing primary intervention studies of HL training | Health professions students | Community setting; online; classroom; lab. | Curriculum framework for health professions students. | Training; practical experience; peer teaching; presentations; case studies, resource development; role play (communication training and practicing the teach-back method), HL assessments. | NA | NA | Core outcome elements across studies were students' attitude, knowledge and skills, social health care quality, patient capacity and satisfaction and organizational effectiveness. The study also identifies gaps including the need for harmonized HL |

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | teaching and learning across health disciplines. |
| Niemi 2018 (136)<br><br>USA<br><br>Descriptive study | Group; individual | To describe the development and implementation of a health education station. | Nursing students and client at health care clinic | Free health care clinic | NA | Training of nursing students as a part of the Community Health Nursing course; a mandatory 3-h lecture on HL; diversity game; quiz; presentation of a self-made HL video; HL Public Health Professional web-based training.<br><br>1:1 health education to clients by nursing students | NA | NA | The potential benefits of implementing this proposal include improved patient outcomes, reduced post clinic medication errors, reduced hospitalizations, decreased complications and adverse effects, and improved patient satisfaction. Neither of these outcomes are measured though. |

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| Charoghchian Khorasani 2020 (139)<br><br>Italy; Spain; Austria; Belgium; Germany; USA<br><br>Review | Organisational | To understand the evidence for the effectiveness of OHL and its health outcome. | Various (e.g., pharmacies, hospitals, health care organizations, outpatient units) | Various (e.g., pharmacies, hospitals, health care organizations, outpatient units) | NA | Assessment of OHL;<br>Development of self-assessment tools to assess organizational HL;<br>Development and assessment of HL policy action plan; | NA | Various | A variety of operational self-assessment tools was highlighted.<br><br>Great heterogeneity and complexity in the understanding of OHL was found. |
| Moll 2018 (138)<br><br>Canada<br><br>Qualitative study | Organisational | To compare and describe the active ingredients of two workplace mental health education programs. | Hospital employees | Hospital | NA | 12-hour educational intervention (Beyond Silence or Mental Health First Aid).<br><br>Beyond Silence is peer led and with face to face and online sessions.<br><br>MHFA is led by a certified trainer and is module- | NA | NA | Five key design principles appeared to shape the perceived impact of the programs: (1) contact-based education, (2) contextually relevant information, (3) an opportunity to explore varied perspectives, (4) sufficient time to integrate and |

| Author(s), year, location, design | Level of intervention | Aim | Target groups | Setting | Resources | Activities | Mechanisms | Outputs | Outcomes |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | based face to face training. | | | apply learning, and (5) organisational readiness/ support. |
| Anderson 2022 (137)<br><br>UK<br><br>Discussion paper | NA | To discuss communication approaches and modalities which influence HL. | NA | Healthcare; specifically, dietetics | NA | NA | NA | NA | Three communication approaches are discussed; Plain Language Communication (PLC); Audio Visual techniques (AV) and Digital Communication (DC).<br><br>All communication approaches must be used selectively. Visual Aids are helpful in communication for people with low HL. |

^: not applicable

### 3.2.3 FINDINGS FROM WORKSHOP 1

On the 16th of September 2022 the IDEAHL consortium held a workshop with representatives from the practice field, to identify obstacles, difficulties, and areas of improvement in working towards higher (d)HL. The findings from this workshop supported and extended the results of the mapping.

In total, 59 people attended the workshop, working in groups of 6-8 people to discuss obstacles and difficulties and areas of improvement, respectively.

#### OBSTACLES AND DIFFICULTIES

As the workshop aimed at revealing future perspectives, the majority of discussions were targeting dHL.

The lack of one unified definition of dHL were the main obstacle addressed by participants. In addition, the differences between IT-skills and dHL need to be clarified. Not having the same outset makes it difficult to work with and conduct research in the field of dHL and thus, to measure and compare the effect of different interventions in the area. This obstacle is very much in line with what is widely reflected in the mapping of literature.

Another obstacle was the inequity in health, making it difficult to address and work with dHL in some populations. For example, it was pointed out that not all rural areas have the same access to digital solutions. Within Europe, a major challenge is the diversity in the different European countries' strategies for digitalization. This leads to great differences within Europe when talking about dHL, making it difficult to talk about a common shared strategy for digitalization.

Furthermore, working with dHL is challenged by resistance towards the use of technologies, technical/digital skills, and knowledge to choose the most appropriate technologies. This may be problematic for both lay people and healthcare professionals. Digital solutions do have the potential to support equality in health by reaching all people, despite geographic area, ethnicity, socio-economic status and by being easy to access and use, despite education level, or IT-skills. Yet, this is not the reality today and the participants suggested using existing digital channels in the countries and across countries to accelerate interventions.

Another identified risk of inequality in health, were patients' lack of confidence and trust toward the health systems, and health care professionals, leading to patients using the internet as a source of health information instead of health care providers. Seeking health knowledge on the internet requires sufficient HL and dHL competences to differentiate between correct health information and misinformation. Competences not all EU citizens have. Following this it was also

highlighted as an obstacle that many health care professionals did not have proper training in spotting the level of (d)HL in patients and aligning their information accordingly.

Lastly, an acknowledged obstacle toward increased dHL among patients and citizens were the lack of tailored communication, both written and verbal, towards the patients and citizens level of dHL. In the same manner, only few communication efforts and digital solutions were based on the needs of patients and/or citizens in general.

The workshop also revealed that having a trusting relationship with the persons in charge of a dHL intervention (e.g., social-and health professionals) seems important for the intervention to have a positive effect on health and HL.

### AREAS OF IMPROVEMENT

The obvious relation between people's socio-economic aspects and level of personal dHL made the participants in the workshop suggest that dHL interventions should target different groups in different ways, for instance, based on ethnicity, age, socio-economic status, etc. It is not realistic or possible to work with or research in dHL in one size fits all.

At the workshop, a widely acknowledged approach towards improving dHL was training health care professionals in digital and technical competences, as their digital skills are important when educating patients and citizens about their use. In addition, they should also gain knowledge on how technologies influence the end-users and their life.

When discussing how to improve existing practice on dHL it became evident that the digital devices and solutions should always be based on co-creation, by involving all stakeholders and end-users in development and research, to ensure the needs and perspectives of patients' and citizens are included. To investigate the users' expectations seems very important, as the digital solutions must make sense for the users, otherwise they will not use it.

To create societies and citizens that are digital health literate, digital teaching and education should start in childhood at public schools and other educational institutions. Another suggestion is to create communities of experienced users, who can help digital novices when health technologies become complicated.

Motivation for, and fear of using digital solutions are personal aspects that need to be addressed when trying to support dHL. Determining the citizens´ motivation (is it internal or external) and feelings such as shame of being low literate are important aspects to consider before trying to implement digital solutions. Generally, it was discussed in the workshop that the narrative of digital health and digital solutions as initiatives that may prevent illness and disease progression,

must be changed to a more realistic focus on what to gain from these initiatives like promoting health.

### 3.2.4 CONCLUSIONS ON TASK 1.2

The scoping review aiming at answering task 1.2 shows great heterogeneity in the field of interventions aiming at improving (d)HL. Therefore, it is not possible to conclude on core elements that are essential when designing (d)HL interventions in general. Instead, this heterogeneity shows tendencies toward tailoring interventions to the specific settings and target groups of interest, as was also concluded in task 1.1.

Additionally, the analysis has highlighted the need for further research and reporting on core resources and mechanism in (d)HL interventions, as information on these elements are widely missing from the identified literature. This further impede the possibility to concretise best practices within the field of (d)HL.

Essentially, these findings on best practices should be seen as an inspirational guidance when developing interventions targeting (d)HL for specific target groups in specific settings. Alongside the findings from the literature review, obstacles and difficulties and areas of improvement highlighted by researchers in the field of (d)HL are important to consider, when designing new interventions, e.g., securing a trusted relation between the patient/citizen and the social and health professionals and training health care professionals in digital skills. In addition, tailoring interventions toward specific target groups and settings through co-creation seems vital. Likewise, demographic factors leading to inequity, ethnicity, education level, socio-economic status, and access to digital solutions should be taken into account.

## 3.4 TASK 1.3 MAP AND ANALYSE APPROACHES TO MONITOR AND ASSESS (D)HL LEVEL IN EU

This section reports the findings on the analysis of (d)HL levels across the EU and reviews the existing monitoring mechanisms and indicators. The (d)HL levels refer to the level of HL or dHL of individuals or groups as measured by measurement tools developed for the purpose. In total, the literature search included 163 studies published between 2018 and 2022 in the EU. Findings on (d)HL levels are reported on EU level and on country-specific level. Furthermore, the analysis of monitoring mechanisms and indicators is divided based on target groups.

### 3.4.1 OVERVIEW OF STUDIES

The 163 included studies presented either

1. Levels of (d)HL measured among the identified population groups in the EU, and/or
2. Validation of monitoring and assessment tools, methods, and indicators for measuring (d)HL in the EU.

Figure 1 presents the numbers of HL and dHL studies targeting specific EU countries. Most studies were conducted in Germany (n=39) followed by Denmark (n=16), Italy (n=16) and Portugal (n=15). Note that some studies included samples from several EU countries and presented results (e.g. (d)HL levels) separately for all these countries. These studies are presented under all those countries.

Among five EU countries (Estonia, Latvia, Lithuania, Luxembourg, and Malta) no studies were found presenting country-specific results about (d)HL levels and/or validation of tools to measure (d)HL.

In total, 33 (out of all 163) studies targeted dHL either specifically (only dHL) or together with other HL measures. This is one fifth (20%) of all (d)HL studies. Germany (n=8) and Denmark (n=6) had clearly the most studies targeting dHL followed by Greece (n=3) and Sweden (n=3). Over half (55.6%, 15 out of 27) of EU countries did not have any studies published between 2018 and 2022 about dHL levels and/or validation of tools to measure specifically dHL.

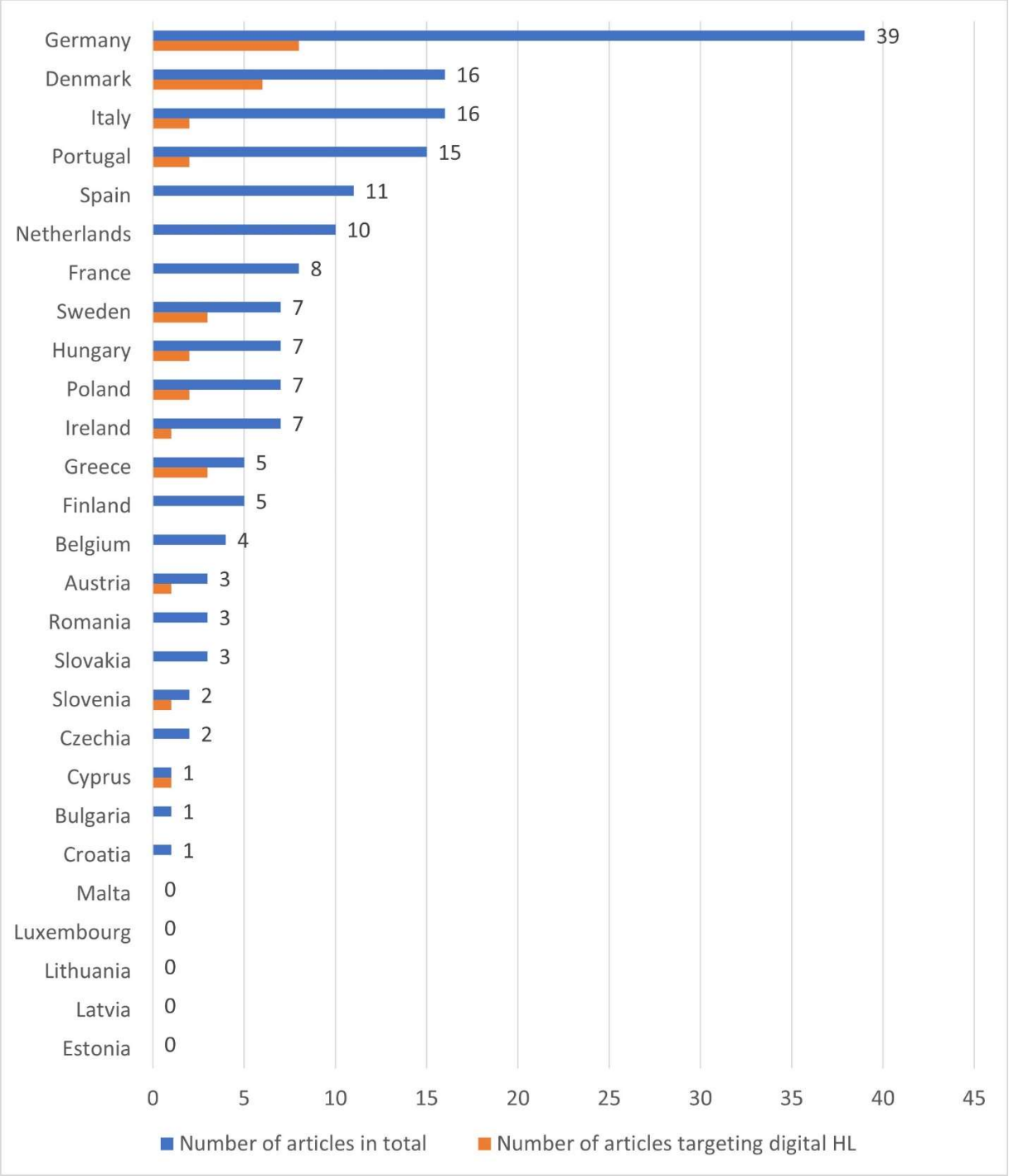


*Figure* 1. Number of studies related to (d)HL levels and/or validation of tools to measure (d)HL in the EU countries between 2018 and 2022. Blue and orange bars represent the total number of

studies by country and of dHL studies by country, respectively. The numbers presented at the end of the bares, are the total number of studies in each country.

Seven studies presented the EU-level results or results including data from at least one EU country, but not specifying results separately for any of these countries. Again, the results could be related either to the (d)HL levels and/or validation of tool for measuring (d)HL. The results from these studies are presented separately before country-specific results.

Country-specific studies were categorized as accurately as possible under the following categories based on the target groups of the studies:

1. Children
2. Adolescents (≥13 yr.)
3. General populations (mainly adults but some studies include ≥15 yr.)
4. Older adults (≥65 yr.).
5. Student populations (mainly college and/or university students)
6. Patient populations
7. Migrants
8. Health care professionals

Above mentioned categories were formed during the analysing phase of the studies representing the sample populations of the studies. It should be taken into account that the target groups in the majority of the studies were not representative samples of the population groups in specific countries. If the article included several target groups, it was categorized under one of the 1–8 target groups (the largest target group in the article or the one that the article highlighted).

Almost half (42%) of the studies targeted general populations from EU countries followed by patient populations (21%), student populations (12%) and adolescents (10%) (Figure 2).

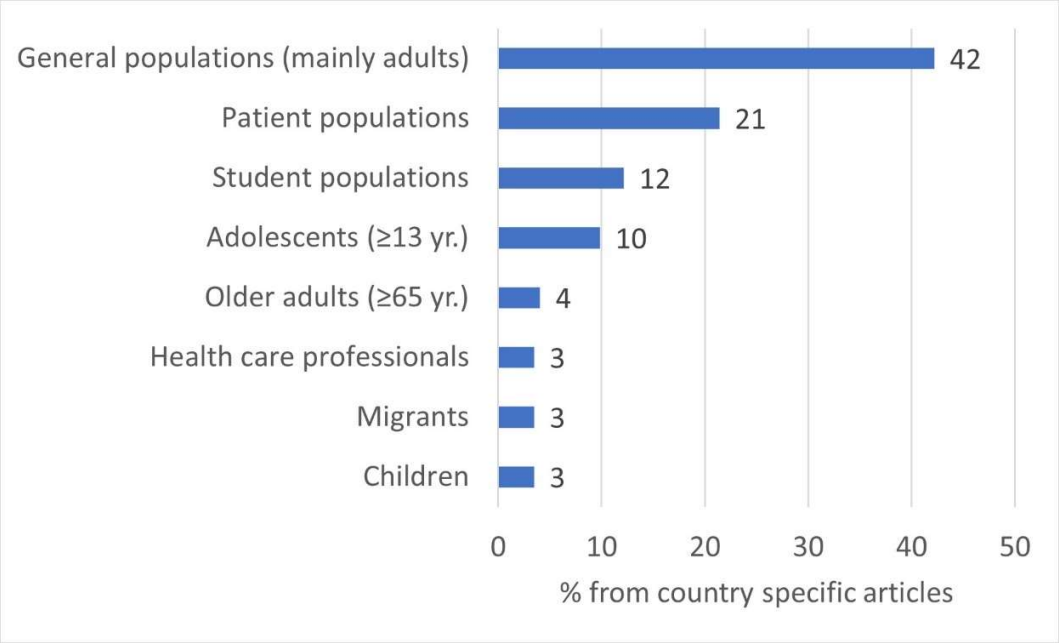


*Figure* 2. The target groups of studies dealing with (d)HL levels and/or validation of tools to measure (d)HL in the EU countries between 2018 and 2022. Numbers are percentages (%) from all country specific studies.

A total of 70% (19 out of 27) of all EU countries had at least one published study between years 2018 and 2022 targeting general populations followed by 56% (15 out of 27) targeting patient populations and 41% (11 out of 27) targeting student populations and the same percentage to adolescents (Table 10).

*Table 10: Number and percentage (%) of EU countries that had at least one study related to certain target group's (d)HL levels and/or validation of tools to measure (d)HL on these target groups, published between 2018 and 2022.*

| **Target group** | **EU countries with studies regarding the target group; n (%)** |
|---|---|
| Children | 3 (11) |
| Adolescents (≥13 yr.) | 11 (41) |
| General populations | 19 (70) |
| Older adults (≥65 yr.) | 5 (19) |
| Patient populations | 15 (56) |
| Student populations | 11 (41) |
| Health care professionals | 4 (15) |
| Migrants | 4 (15) |

The most described background characteristics of target populations in the studies were socioeconomic characteristics (n=126, 77% from all 163 studies) followed by health and well-being characteristics (n=95, 58%). Only few studies described sociocultural characteristics (n=62, 38%), ethnicity (n=47, 29%) and digital skills (n=19, 12%) of target populations.

The most used data collection methods in the 163 studies were surveys (n=145) followed by interviews (n=32). Focus groups (n=7) and literature reviews (n=7) were also used but less frequently than surveys and interviews. Out of 163, only 25 (15%) studies used more than one data collection method.

### 3.4.2 EU-LEVEL RESULTS

In the seven studies categorised as EU-level studies, six targeted HL and one (140) both HL and dHL.

Two studies (141,142) presented data about the HL levels measured with previously validated tools. Based on a systematic review and meta-analysis of 62 studies among most of the EU countries, Baccolini et al. (2021) (141) concluded that the percentage of people with low HL is between 27–48% depending on the HL items investigated. Western, Southern, and Eastern EU countries had higher rates of low HL compared to Northern EU countries. Refugees had the lowest HL. Nawabi et al. (2021) (142) concluded in a systematic review including 14 studies with data from 10 EU countries and several countries outside the EU that percentage of people with limited HL is 45.5%.

Another five studies categorized as EU-level studies did not report HL or dHL levels but either validated tools (143), investigated the most useful tools (140,144,145) or compared tools (146) to measure HL (personal HL, mHL, pharmacotherapy literacy (PTHL)). The most extensive among these studies is Rowlands et al. (2019) ´s scoping review with 81 studies from the member states of the World Health Organization (WHO) and European Region (140). It was undertaken to identify the best available evidence on the methods, frameworks and indicators used to evaluate HL policies, programmes and interventions published between 2013 and 2018. Almost all (79 out of 81) of the studies in the report focused on (d)HL at the individual level. They concluded that in total the included studies used 58 HL measurement tools to measure personal HL, including 31 published (d)HL instruments and 27 custom, article-specific, tools.

The report findings suggest that mixed-methods approaches are most likely to be effective for evaluating policies, programmes, and interventions as they enable a formal assessment of (d)HL

using quantitative instruments coupled with a more nuanced understanding of the contextual factors that influence HL capacities. In addition, the combined use of quantitative and qualitative methods to evaluate the implementation of policies and programmes provides decision-makers with a better understanding of their effectiveness, appropriateness, sustainability, and feasibility for further roll-out or expansion. Increasing the use of participatory methods in evaluation activities is also likely to increase engagement with vulnerable and marginalized population groups and empower them to have a role in the development of evidence and measures that are culturally and contextually relevant. The review found limited evidence of the use of organisational HL or responsiveness measures and tools as part of an evaluation of a programme or intervention (Table 11).

*Table 11: Results from EU-level studies*

| **Author(s), year** | **Target group(s)** | **Tool(s)** | **(d)HL levels** | **Validation** |
|---|---|---|---|---|
| Baccolini et al. (2021) (141) Systematic Review and Meta-analysis. | 62 studies from Austria; Belgium; Bulgaria; Croatia; Czechia; Denmark; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Lithuania; Netherlands; Poland; Portugal; Spain; Sweden.<br><br>The most people (48%) 46–64 yr. 17% under 45 yr., 15% above 65 yr. and 2 % not reported. | NVS, HLS-EU-Q16, REALM, HLS-EU-Q47, HLS EU-Q86, SILS, METER, SBSQ single item, SAHLSA-50, TOFHLA, SAHLPA-23, HALS, S-FHL | **% of people with low HL:**<br>42% self-reported comprehension items,<br>42% reading or numeracy comprehension items and<br>27% word recognition items.<br>48% mixed methods (a pooled estimate).<br><br>Western, Southern, and Eastern countries had higher rates of low HL compared to Northern EU countries.<br><br>Refugees had the lowest HL. | The article used only valid and reliable tools to quantify the prevalence of low HL. |
| Nawabi et al. (2021) (142) Systematic Review. | 14 studies in total from Austria; Croatia; Finland; France; Ireland; Italy; Netherlands; Poland; Slovenia; Sweden; Other: | NVS, BHLS, S-TOFHLA, REALM, HLS-EU-25 | International sample with 11/19 EU-countries:<br>BHLS (n=4999) web-based survey:<br><br>54.5% of people with adequate HL | Using validated tools was one of the inclusion criteria for the studies. |

| | | | | |
|---|---|---|---|---|
| | Canada, Turkey, United States (USA), Jamaica, Australia, Norway, Iceland, Russia, Serbia, Switzerland, United Kingdom (UK) and some South American countries. | | **45.5% of people with limited HL.**<br><br>EU country-specific results presented:<br>Ireland: REALM (n=404) web-based survey:<br>84.7% with adequate HL,<br>15.3% with limited HL.<br>Netherlands:<br>a) BHLS (n=1091) Prenatal diagnosis centres:<br>54.5% with adequate HL,<br>**45.5% with limited HL.**<br><br>b) BHLS (n=682) Prenatal diagnosis centres:<br>93.2% with adequate HL,<br>**6.8% with limited HL.** | |
| Rowlands et al. (2019) (140) Scoping review. | 81 studies from the member states of the WHO European Region: Austria; Belgium; Bulgaria; Croatia; Cyprus; Czechia; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; Sweden. | 58 measurement tools were used to measure personal HL, including 31 published HL instruments and 27 custom, article-specific, tools. | This article did not report (d)HL levels. | The findings suggest that mixed-methods approaches are likely to be the most effective for evaluating policies, programmes and interventions as they enable a formal assessment of HL using quantitative instruments coupled with a more nuanced understanding of the contextual factors that influence HL capacities.<br><br>The review found limited evidence of the use of OHL or responsiveness measures and tools as part of an evaluation of a programme or intervention. |
| Fulcher et al. (2021) (143) Systematic review. | 13 studies in total were identified which examined the | MHKQ, MHLq, MHLS, MHPK-10, | This article did not report (d)HL levels. | The tools were validated in this article. The purpose was to evaluate the psychometric |

| | | | | |
|---|---|---|---|---|
| | psychometric properties of seven mHL measures.<br><br>Two of these seven measures were vignette format, and the remaining five measures were questionnaires.<br><br>Origin (country) of studies was not mentioned. | MHLW, Multicomponent mHL measure | | properties of global mHL measures.<br><br>The MHPK-10 and the Multicomponent mHL measure were the most psychometrically robust measures and are therefore recommended to be used by researchers. It is, however, important to note that this recommendation is based on limited research findings. |
| Chavez et al. (2021) (146) Systematic review. | 3 studies included to the qualitative synthesis, one in EU (Sweden). | MHLS, MHKQ, MAKS | In general, higher levels of mHL were found among female participants, among younger participants and among those who showed a higher degree of familiarity with mental illness. People with higher education demonstrated higher levels of mHL. | The three tools (MHLS, MHKQ & MAKS) had been validated elsewhere. The aim of this article was to compare these three tools.<br><br>The results suggested that the MHLS is the best validated assessment tool for health care professionals. |
| Levic et al. (2021) (144) Scoping Review. | 24 studies published between 2006 and 2021 included in qualitative synthesis. | HLS-EU-Q47, HLQ<br>Korean Functional Test HL,<br>NVS<br>FCCHL<br>TOFLHA<br>S-TOFHLA<br>REALM-R<br>3-brief SQ,Rapid REALM<br>DNT-15 | This article did not report (d)HL levels. | The tools have been validated elsewhere.<br><br>The review aimed to search and critically discuss instruments used to assess HL and PTHL in people with type 2 diabetes and propose their use in different settings.<br><br>The results showed that FCCHL and 3-brief SQ are shown with the broadest measurement scopes. They are quick, easy, and inexpensive for administration. FCCHL can be considered the most useful and comprehensive instrument to screen for inadequate HL. The limitation is |

| | | | | |
|---|---|---|---|---|
| | | | | that the English version is not validated. Three-brief SQ has many advantages in comparison to other instruments, including that it is less likely to cause anxiety and shame. These instruments can be considered the best for measuring functional HL in patients with diabetes mellitus type 2 and other chronic diseases. PTHL instruments (REALM and DNT-15) did not find the best application in this population. |
| Olecka et al. (2019) (145) Scoping Review. | 14 studies included. Six studies were performed in American population. Two studies came from China and two from Iran; Columbia, Switzerland, Portugal, and Turkey were represented by one article each.<br><br>Publications were published between 2008 and 2019. | HLS-EU-Q47<br>HLS-EU-PT<br>BHLS<br>HBP-HLS<br>S-TOFHLA<br>NVS<br>HELIA<br>REALM<br>HK-LS | This article did not report (d)HL levels. | The tools have been validated elsewhere.<br><br>The aim of the review was to examine HL assessment tools for patients with hypertension. Six HL assessment instruments were identified, of which only one was disease specific.<br><br>The HL Survey (HLS) and The Test of Functional HL in Adults (S-TOFHLA) were found to be the most commonly used instruments to assess HL in hypertension.<br><br>Conclusion was that there is a lack of hypertension-specific HL screening instruments. |

### 3.4.3 COUNTRY-SPECIFIC RESULTS

As mentioned, country-specific studies are presented as accurately as possible under the following categories based on the target groups of the studies:

1. Children
2. Adolescents (≥13 yr.)
3. General populations (mainly adults but some studies include ≥15 yr.)
4. Older adults (≥65 yr.).

5. Student populations (mainly college and/or university students)
6. Patient populations
7. Migrants
8. Health care professionals

Categorised studies are presented in own country-specific tables in the order of magnitude of samples sizes. The summary tables of the studies provide main information about author(s), publication year, target group(s), tool(s), (d)HL levels and tool validations. When describing the (d)HL levels, the lowest results (low, limited, problematic or inadequate level) of HL or dHL, are shown in bold. Country-specific data also includes highlights that summarises the key results from that specific country. Key results in each country include:

1. the number of studies in total,
2. the number of studies targeting dHL,
3. the number of large-scale studies with over 1000 individuals (if these exist),
4. examples from these large-scale studies that report the percentage of people with low/limited/problematic/inadequate level of HL or dHL (depending on the scales of the measuring tool),
5. tool(s) to measure HL or dHL in these large-scale studies,
6. examples from other studies that have sample sizes of several hundred people and report (d)HL levels and
7. conclusion, if feasible.

## AUSTRIA

**Highlights**

Between 2018 and 2022, HL has been examined in a total of three studies, from which one targeted dHL. The largest scale article with 800 participants (147) suggested that 45% of Austrian adults had low HL measured with HLS-EU-Q16 tool.

Austria was targeted in three studies, of which two were related to HL and one to dHL. More specifically the topics of studies covered health information-seeking aspects of HL or dHL. Socioeconomic characteristics of the target populations were mentioned in all three studies, and ethnicity in one article. Sociocultural, health, well-being characteristics or digital skills of target populations were not mentioned in any of the studies. The most used data collection methods

were surveys (n=2) and focus groups (n=1). Two of the studies targeted general adult populations and one targeted student populations.

### GENERAL POPULATIONS

General populations were the target group of two studies from Austria. Both reported HL levels of the population. The measurement tools used were HLS-EU-Q16 and HLS-EU-Q47, which had been validated in prior studies. One article had a sample size of 800 individuals (147), whereas the other had a sample of 160 participants (148) (Table 12).

*Table 12. Findings from general populations in Austria.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Gerich et al. (2018) (147) | n=800 individuals from the general population (mean age 51).<br><br>Education: Obligatory: 22.8%. Apprenticeship: 42.0%. Vocational school: 10.8%. High school: 14.0 %, university: 10.4%. | HLS-EU-Q16 | 55% high,<br>**45% low HL.**<br><br>High school education or higher was associated with higher health-related knowledge and HL scores. | The tool has been validated elsewhere. |
| Putz et al. (2021) (148) | n=160 Austrian adults (mean age 44). 42 from Favoriten, 47 from Vienna and 71 from the entire state.<br><br>Social status: (IQR, self-rated position in society 1-10).<br><br>Favoriten 6(5), | HLS-EU-Q47 | Favoriten:<br>15.3% excellent,<br>31.8% sufficient,<br>43.3% problematic,<br>**9.6% inadequate HL**.<br><br>Vienna:<br>7.6% excellent,<br>28.3% sufficient,<br>44.3% problematic,<br>**19.8% inadequate HL**.<br><br>Austria:<br>11.0% excellent, | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | Vienna 7(2), Austria 7(2). | | 32.4% sufficient, 41.1% problematic, **15.5% inadequate HL**.<br><br>Higher household income, better education and migration status outside the EU showed moderately effect-sized associations to general HL in the sample of Favoriten, which was not the case for other characteristics such as age, gender, and employment status. | |

### STUDENT POPULATIONS

Student populations were (78) the target group of one article from Austria, which reported dHL levels of secondary school students measured with the eHEALS measuring tool. The sample size in this article was only 14 participants (Table 13).

*Table 13. Findings from student populations in Austria.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Maitz, E. et al. (2020) (78) | n=14 secondary school students aged 12–14. All native German speakers and born in Austria or Germany. | eHEALS | eHEALS mean±SD score: 3.5±0.7 out of maximum 5. | Validation of the tool was not mentioned |

## BELGIUM

**Highlights**

Between 2018 and 2022, HL has been examined in total of four studies of which none targeted dHL. One large-scale article (149) with over 32 000 participants suggested that 29% of Belgian adults had low HL when measured by HLS19-Q12 tool. These adult

participants needed to have an email address to be able to participate so they may not represent the general Belgian population. In addition, another article (150) with over 1300 participants suggested that 36% of adult patients had problematic or inadequate HL when measured with HLS-EU-Q16 tool.

Belgium was targeted in four studies of which in two it was the only target country and in two it was one of the target countries. All four studies were related to HL and none of the studies to dHL. None of the studies covered any specific aspects of HL. Socioeconomic characteristics (education, household income) were the most frequently described background characteristics since these were described in two studies. In addition, digital skills were described indirectly in two studies with target groups, needing to have an email address to participate. Ethnicity (Dutch-speaking) was described in one article. Sociocultural, health or well-being characteristics were not described in any of the studies. The data collection method in all four studies was surveys. Adolescents were the target group in one article, general adult populations in two studies and patient populations in one article.

### ADOLESCENTS

Belgian adolescents were the target group of one article, which assessed the HL levels of 184 15-year-old pupils from Belgium measured with the validated HLSAC measuring tool (Table 14).

*Table 14. Findings from adolescents in Belgium.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Paakkari et al. 2019 (151) | From Belgium: n=184 15 yr. old pupils. No 13 yr. old pupils at all. In total: n= 1468 13 yr. and 15 yr. old pupils from Belgium, Finland, Poland and Slovakia. | HLSAC | Mean HL in Belgium for pupils aged 15 was 29.33 out of maximum 40. For 15 yr. old pupils Poland and Slovakia showed no difference from Belgium. Compared to Finland, Belgium pupils had lower HL values. | The tool was validated in this article. The instrument exhibited high internal consistency and showed adequate fit with the data. It was concluded that HL mean values assessed via the HLSAC instrument can be compared across countries. The instrument has utility for large-scale international HL studies on adolescents. |

## GENERAL POPULATIONS

HL levels of Belgian general populations was assessed in two studies. The measures used in these studies were HLS19-Q12 and HLS-EU-Q6. The sample sizes in these studies were 32 794 and 236 individuals (Table 15).

*Table 15. Findings from general populations in Belgium.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Hermans et al. 2021 (149) | n=32 794 adults. Participants needed to have an email address to be able to participate. | HLS19-Q12 | 56% sufficient,<br>**23% low HL.**<br>(21% missing values).<br>After missing values excluded:<br>71% sufficient,<br>**29% low HL.** | The tool has been validated elsewhere. This is the revised version of the European HL Survey Questionnaire, revision by the M-POHL Consortium. |
| Ritchie et al. 2022 ((152) | From Belgium: n= 236 women.65% 60+ yr. old, 35% 50–59 yr. old.<br>In total: n=1180, 50 yr. old or above women from Belgium, France, Italy, Spain, and UK. | HLS-EU-Q6 | 17.4 % sufficient,<br>75.8 % limited,<br>**6.8 % inadequate HL.** | Validation of the tool was not mentioned. |

## PATIENT POPULATIONS

Patient populations were the target group of one article from Belgium. The sample size was 1375 participants. HLS-EU-Q16 was used as the measuring tool in the article (Table 16).

*Table 16. Findings from patient populations in Belgium.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Storms et al. 2019 (150) | n=1375 adult patients from 41 general practices in two Dutch speaking provinces | HLS-EU-Q16 | 63.6% adequate,<br>21.7% problematic,<br>**14.6% inadequate HL.**<br><br>General practitioners overestimated patients' HL. | Validation of the tool was not mentioned. |

| | | | | |
|---|---|---|---|---|
| | (Vlaams-Brabant and Limburg). Mean age 54.6 yr. 40.2% had secondary and 48.2% higher education. | | | |

## BULGARIA

**Highlights**

Between 2018 and 2022, HL has been examined in only one article that studied HL among 1002 participants from a general population sample (153). Strong conclusions about HL levels in Bulgaria cannot be drawn based on these results.

Bulgaria was targeted in one article which was related to HL of the general population. The article specified ethnicities, socioeconomic characteristics and health or wellbeing characteristics but did not mention sociocultural characteristics or digital skills of the target population. As the data collection method, this article used computer-assisted personal interviewing and paper-assisted personal interviewing methodology.

### GENERAL POPULATIONS

The general population was the target group of the only identified article with citizens from Bulgaria. This article had 1002 Bulgarian adult participants. HLS-EU-Q47 and NVS were used as tools for measuring HL (Table 17).

*Table 17. Findings from general populations in Bulgaria.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Pelikan et al. (2018) (153) | In total n=8102 EU citizens aged 15+ of which n=1002 from Bulgaria (mean age 46.5 yr.) Education score 3.1 out of | HLS-EU-Q47, NVS | Comprehensive HL (HLS-EU-Q47): 30.5 out of maximum 50. Functional HL (NVS): 3.06 out of maximum 6. | The tools have been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| | maximum 6, self-assessed socioeconomic status 4.2 out of maximum 10, self-assessed health 3.82 out of maximum 5. | | | |

## CROATIA

**Highlights**

Between 2018 and 2022, HL has been examined in only one article that studied adult hospital patients with NVS measuring tool. This article has a sample size of 100 patients (154). Conclusions about HL levels cannot be drawn based on these results.

Croatia was targeted in one article, which was related to HL of a patient population sample. The article specified socioeconomic and health or well-being characteristics, but did not mention sociocultural characteristics, digital skills, or ethnicity of the population. The data collection method for this article was interviews.

### PATIENT POPULATIONS

Patient populations was the target group of the article from Croatia. This article assessed the HL levels of 100 Croatian adult hospital patients with the measuring tool NVS. Linguistic validation of the tool was also completed in this article (Table 18).

*Table 18. Findings from patient populations in Croatia*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Brangan et al (2018) (154) | n=100 Croatian adult hospital patients.<br>Median age 63.5 yr.<br>59% retired, 58% with | NVS | 42% adequate,<br>51% intermediate,<br>**7% low HL level.** | The tool was linguistically validated in this article.<br><br>A full linguistic validation procedure was applied, including forward and backward translation, expert panel review, cognitive interview with 10 |

| | | | | |
|---|---|---|---|---|
| | secondary level education, 67% with very low or no income. 53% with chronic condition, and 69% overweight or obese. | | | respondents from general population, and full involvement in the procedure of one of the screening test developers, the lead author of the NVS-UK version. |

## CYPRUS

**Highlights**

Between 2018 and 2022, HL has been examined in only one article that targeted dHL (155). However, the article does not present HL levels for Cypriot population alone. Conclusions about HL levels cannot be drawn based on these results.

Cyprus was targeted in one article that was related to dHL of a general population sample. The article specified socioeconomic characteristics, sociocultural characteristics and digital skills of the target population but did not mention ethnicity, health, or well-being characteristics. The data collection method used was a survey.

### GENERAL POPULATIONS

The article from Cyprus assessed the dHL of 101 Greek-speaking carers of people with dementia from Greece and Cyprus. The used measuring tool was eHEALS-carer, which was validated in the article (Table 19.).

*Table 19. Findings from general populations in Cyprus.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Efthymiou et al. 2019 (155) | n=101 Greek-speaking carers of people with dementia from Greece and Cyprus.<br><br>67% under 59 yr. old.<br>75.2% women.<br><br>53% with secondary and 39% tertiary education, 38% employed.<br>43% used internet to search for information. | eHeals-Carer | Results were not specified to Cypriot population alone.<br><br>Mean±SD eHeals-Carer score was 29.27±5.0 out of maximum 40 points. (Both Greek and Cypriot subjects included together). | The tool was validated in this article.<br><br>The tool had high internal consistency and high mean construct validity. |

## CZECHIA

**Highlights**

Between 2018 and 2022, HL has been examined in two studies from which none targeted dHL. These studies had relatively small sample sizes with 113–253 individuals. One article studied university students (156) and another studied patients' receiving treatment for alcohol abuse (157). Utilized measuring tools were HLQ and HLS-EU-Q47, respectively. General conclusions about HL levels cannot be drawn based on these results.

Czechia was targeted in two studies of which both assessed HL levels. The two studies targeted student and patient populations. Socioeconomic characteristics of the target populations were mentioned in both studies, sociocultural characteristics in one article, and health or well-being characteristics in one article. Ethnicity and digital skills were not mentioned in either article. The most used data collection methods were surveys (n=2) and interviews (n=1).

## STUDENT POPULATIONS

Students were the target population of one article from Czechia. In this article, HL levels of 253 university students were assessed with HLQ measuring tool, which was validated for that population in the article (Table 20).

*Table 20. Findings from student populations in Czechia.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Chraskova et al. (2019) (156) | n=253 university students of both genders. | HLQ (written) | 13.8% problematic, **86.2% inadequate HL.** | This tool was validated in this article. The calculated overall reliability of the tool was very high (r=0.91). |

## PATIENT POPULATIONS

Patients receiving treatment for alcohol abuse was the target group of the second article from Czechia. HL levels of the 113 patients were measured with the HLS-EU-Q47 tool (Table 21).

*Table 21. Findings from patient populations in Czechia.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Rolova et al. (2018) (157) | n=113 Czechs of both genders receiving treatment for alcohol abuse.<br><br>Older than 15 years.<br><br>38.9% and 56.1% of men and women, respectively were married. 39.8% had completed higher education. 64.6% were smokers. | HLS-EU-Q47 | Mean score 34.1 (out of 50).<br><br>18.6% excellent,<br>34.5%, sufficient,<br>33.6% problematic,<br>**13.3% inadequate HL,**<br><br>After dichotomization of the general HL scores, almost half of the sample (46.9%) showed limited HL. No statistically significant association between HL and sociodemographic characteristics was found (mean score for those with higher education was 35.13). | This tool was previously validated in other studies. |

## DENMARK

**Highlights**

Between 2018 and 2022, HL has been examined in 16 studies from which six targeted dHL. Four of these studies had large sample sizes of over 1000 participants. From the general Danish adult population, in an article with over 9000 participants (158), it is suggested that 39% has problematic or inadequate HL when measured with the HLS-EU-Q16 tool. Denmark is one of the few EU countries that has studied and reported dHL levels. A large-scale article (159) with over 1500 participants suggested that 41% of university college students had limited dHL measured by the DHLI tool. Overall, the general and patient populations were well presented in the studies, but it was difficult to do comparisons and wider interpretations of these results. The HLQ and eHLQ measures were the most used instruments among general and patient populations.

Denmark was targeted in 16 studies. Ten studies were related to HL, five to dHL and one article addressed both. One article validated an instrument used to assess mHL. Socioeconomic characteristics of the target populations were mentioned in eight studies, health, or well-being characteristics also in eight, sociocultural characteristics in five and ethnicity in three studies. Digital skills were not mentioned in any of the studies. The most used data collection methods were surveys (n=17) followed by qualitative measures like individual interviews (n=1), focus groups (n=2), and workshops (n=1). Seven studies validated an instrument, while the rest of the studies used tools that were already validated elsewhere. The most frequently used were HLQ and eHLQ. Two studies had adolescents as target groups, student populations were targeted in two studies, general populations in five studies, patient populations in five studies and health care professionals in two studies.

### ADOLESCENTS

Adolescents were the target group of two studies from Denmark. The measuring tools used were MeHLA (n=1) and HLSAC (n=1) and the sizes of the samples varied from 163 to 805 adolescents. Both studies aimed to validate the tools in the Danish language, but only one of them reported HL level findings (Table 22).

*Table 22. Findings from adolescents in Denmark.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Bonde et al. (2022) (160) | n=805 pupils in grades 6 and 7.<br><br>Age 11–14 yr.<br><br>Mean age 12.2 yr.:<br>11.6 yr. in grade 6 and<br>12.6 yr. in grade 7. | HLSAC | Mean±SD HL (out of maximum 40):<br><br>Grade 6: 29.35±5.20<br>Grade 7: 30.00±4.89 | The tool was validated in this article.<br><br>The findings suggest that the Danish version of the 10-item HLSAC instrument is a reliable and valid instrument for measuring HL in children and adolescents aged 11 to 14 yr. The instrument is ready to use in larger representative surveys in Denmark to monitor prevalence of HL, guide health promotion, and provide data for further exploration of the potentials and limitations of the instrument. |
| Zenas et al. (2020) (161) | n=163 adolescents from grades 7–9. | MeHLA | No HL levels were reported in this validation article. | The tool was validated in this article.<br><br>The MeHLA questionnaire developed and validated in this article provides an assessment tool that uses multiple types of questions and a tool concerned with all aspects of mHL. The MeHLA questionnaire has acceptable to good psychometric properties according to the confirmatory factor analysis and is easily administrable which makes it a promising tool in the promotion and improvement of mental health and early intervention of mental health problems among adolescents. |

### STUDENT POPULATIONS

Student populations were the target population of two studies from Denmark with group sizes of 366 and 1518. The measuring tools used in this population were HLQ (n=1), eHLA (n=1) and DHLI (n=1) (Table 23).

*Table 23. Findings from student populations in Denmark.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Bak et al. (2022) (159) | n=1518 university College students. 83.7% female.<br><br>Age mean±SD: 28.4 ± 8.4<br><br>49.5% studied education and 31% health education.<br><br>Subjective social status:<br>24% low,<br>62.7% medium,<br>8.6% high. | DHLI | 59.9% sufficient,<br>**41.1% limited (d)HL.**<br><br>28.1% find it difficult to judge the quality and reliability of the information. | The tool has been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| Holt et al. (2020) (162) | n=366 nursing students. Aged 21–28 yr.92% female.<br><br>94% speak Danish at home.<br><br>71% with general upper secondary education.<br>33% with parents with medium education.<br>21% with chronic conditions.<br>57% with daily use of medication. | HLQ, eHLA | Mean HLQ scale scores (Q1–Q3) (entry-level students):<br>HLQ1: 2.96 (2.75–3.25)<br>HLQ2: 3.07 (3.00–3.25)<br>HLQ3: 2.80 (2.40–3.00)<br>HLQ4: 3.29 (3.00–3.80)<br>HLQ5: 2.83 (2.60–3.00)<br>HLQ6: 3.80 (3.40–4.20)<br>HLQ7: 3.70 (3.50–4.00)<br>HLQ8: 4.07 (3.80–4.20)<br>HLQ9: 3.97 (3.80–4.20)<br><br>Mean HLQ scale scores (Q1–Q3) (graduate-level students):<br>HLQ1: 2.93 (2.50–5.50)<br>HLQ2: 3.29 (3.00–3.75)<br>HLQ3: 2.95 (2.60–3.20)<br>HLQ4: 3.33 (3.00–3.80)<br>HLQ5: 3.02 (2.80–3.25)<br>HLQ6: 3.87 (3.60–4.20)<br>HLQ7: 3.84 (3.58–4.16)<br>HLQ8: 4.25 (4.00–4.60)<br>HLQ9: 4.18 (4.00–4.40) | The tools have been validated elsewhere. |

## GENERAL POPULATIONS

General population was the target group of five studies from Denmark. The target group sized varied from 36 388 to 475 participants. Measuring tools used in this population group were HLQ (n=2), HLS-EU-Q16 (n=1), eHLQ (n=1) and eHLA (n=1) (Table 24).

*Table 24. Findings from General populations in Denmark.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Friis et al. (2020) (163) | n=36 338 Danish people from general population.<br><br>Chronic conditions: CVD 7.5%, COPD 3.9%, Diabetes 5.5%, | HLQ | HLQ scale scores (mean ± SD):<br><br>HLQ6: 3.07 ± 0.59<br>HLQ9: 3.09 ± 0.55<br><br>4.2% difficult to understand information about health. | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | Mental disorders 6.4%. | | 6.9% difficult to actively engage withhealthcare providers | |
| Svendsen et al. (2020) (158) | n=9007 Danish participants from the general population (mean age 53,2 yr.).<br><br>54.5% female. 7.2% Immigrants or descendants. 64% married. 11.8% with high education and 71.1% with above average income. | HLS-EU-Q16 | 60.9% adequate, 30.9% problematic, **8.2% inadequate HL.** | The tool has been validated elsewhere. |
| Aaby et al. (2019) (164) | n=490 Danish individuals from general population<br><br>Mean age 50.5 yr.<br><br>60% female, 19% living alone, non-Danish mother language 7%, low education 19%, low health status 45%, poor well-being, 19%. Long term illness 41%, | HLQ | Mean HLQ scale scores (SD):<br><br>HLQ1: 3.0 (0.6)<br>HLQ2: 3.06 (0.55)<br>HLQ3: 2.83 (0.55)<br>HLQ4: 3.14 (0.52)<br>HLQ5: 2.75 (0.56)<br>HLQ6: 3.99 (0.59)<br>HLQ7: 3.69 (0.61)<br>HLQ8: 3.99 (0.61)<br>HLQ9: 3.95 (0.56) | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | multimorbidity 19%. | | | |
| Kayser et al. (2018) (165) | n=475 Danish Individuals from a wide range of settings.<br><br>Aged 16–74 yr. | eHLQ | Mean eHLQ scale scores (SD):<br><br>eHLQ1: 2.55 (0.66)<br>eHLQ2: 2.97 (0.55)<br>eHLQ3: 2.81 (0.69)<br>eHLQ4: 2.61 (0.66)<br>eHLQ5: 2.55 (0.65)<br>eHLQ6: 2.52 (0.55)<br>eHLQ7: 2.42 (0.62) | The tool has been validated elsewhere. |
| Karnoe et al. (2018) (166) | n=475 participants from the general Danish population.<br><br>30.9% aged 18–35 yr.,<br>36.6% aged 36–60 yr.,<br>28% aged 60+ yr.<br><br>51.6% female, 47.2% with long education. 41.3% with excellent self-rated health, 39.8% with chronic conditions. | eHLA | No dHL levels were reported in this validation article. | The tool was validated in this article.<br><br>The eHLA provides the means for gaining insight into people's health-related literacy as well as their confidence, familiarity, and motivation related to digital solutions. This toolkit consists of 7 tools that validly measure constructs with a satisfactory fit to log linear RMs, thus displaying essential validity and objectivity. |

## PATIENT POPULATIONS

Patient populations were the target population of five studies from Denmark. The size of the target groups varied from 1425 to 93 participants. These patient populations included type 1 diabetes patients (n=1), cancer patients (n=1), outpatients (n=1), cardiac rehabilitation patients (n=1), liver cirrhosis patients (n=1) and COPD patients (n=1). The tools used for measuring were HLQ (n=4), eHLQ (n=1), eHLA (n=1), SILS (n=1) and BRIEF (n=1) (Table 25).

*Table 25. Findings from patient populations in Denmark.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Schwennesen et al. (2019) (167) | n=1425 Danish patients with type 1-diabetes.<br><br>2.7% visually impaired. | HLQ | Mean HLQ scale scores (sighted):<br>HLQ1: 2.97<br>HLQ2: 3.06<br>HLQ3: 2.94<br>HLQ4: 2.96<br>HLQ5: 2.77<br>HLQ6: 3.86<br>HLQ7: 3.53<br>HLQ8: 3.88<br>HLQ9: 3.91<br><br>Mean HLQ scale scores (visually impaired):<br>HLQ1: 3.10<br>HLQ2: 3.05<br>HLQ3: 2.88<br>HLQ4: 3.01<br>HLQ5: 2.68<br>HLQ6: 3.96<br>HLQ7: 3.57<br>HLQ8: 3.52<br>HLQ9: 3.48 | The tool has been validated elsewhere. |
| Holt et al. (2019) (168) | n=246 Danish adult outpatients from Gentofte Hospital.<br><br>55.7% female.<br><br>26.4% with long education.<br>43.9% with well health.<br>37.4% with diabetes and 62.6% with other condition. | eHLQ, eHLA | Mean eHLQ scale scores (1–4):<br>eHLQ1: 2.7<br>eHLQ2: 3.1<br>eHLQ3: 3.0<br>eHLQ4: 2.8<br>eHLQ5: 2.7<br>eHLQ6: 2.7<br>eHLQ7: 2.6<br><br>Mean eHLA scale scores:<br>Functional HL: 9.5<br>Self-assessed HL: 3.3<br>Familiarity with health and disease: 3.1<br>Knowledge of health and disease: 9.7<br>Digital familiarity: 3.5<br>Digital confidence: 3.4<br>Digital incentives: 3.5 | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Aaby et a. (2020) (169) | n=150 Danish cardiac rehabilitation patients (mean age 67). 29.7% female.<br><br>3.9% non-Danish, 70.7% lives with someone, 65.4% with over 11 yr. of education. | HLQ | Mean HLQ scale scores (SD):<br><br>HLQ1: 2.99 (0.57)<br>HLQ2: 3.00 (0.52)<br>HLQ3: 2.92 (0.48)<br>HLQ4: 3.10 (0.52)<br>HLQ5: 2.67 (0.50)<br>HLQ6: 3.70 (0.66)<br>HLQ7: 3.38 (0.72)<br>HLQ8: 3.56 (0.70)<br>HLQ9: 3.61 (0.65) | The tool has been validated elsewhere. |
| Pinderup et al. (2019) (170) | n=108 Danish patients with liver cirrhosis (mean age 60.6). 54.6% male.<br><br>63.8% in cohabitation, 29% with 10–11 yr. of education, 26.2% as students. 70.4% retired, 13% employed.<br><br>64.8% with alcoholic cirrhosis diagnosis. 21.3% with no comorbidities. | SILS, HLQ, BRIEF | No HL levels were reported in this validation article. | Face validity of the tools was assessed. One-third of patients with liver cirrhosis needed help to complete even the simplest HL questionnaire. Most difficulties were associated with alcohol-related liver cirrhosis, low level of education and being male. No self-reported HL-questionnaire was found to be ideal for this patient group. |
| Lindskrog et al. (2019) (171) | n=93 Danish patients with COPD. (Mean age 73,.9). 65.6% female. | HLQ | Mean HLQ scale scores (SD):<br>HLQ1: 3.04 (0.51)<br>HLQ2: 2.95 (0.47)<br>HLQ3: 2.84 (0.42)<br>HLQ4: 2.96 (0.54) | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | | | HLQ5: 2.70 (0.53)<br>HLQ6: 3.85 (0.46)<br>HLQ7: 3.62 (0.50)<br>HLQ8: 3.75 (0.46)<br>HLQ9: 3.87 (0.41) | |

### HEALTH CARE PROFESSIONALS

Health care professionals were the target group of two Danish studies. The sample size of one article was 194 medical staff members and in the other, 11 Danish physiotherapists, nurses, and occupational therapists. The measuring tools used were eHLQ (n=1) and CHAT (n=1) (Table 26).

*Table 26. Findings from health care professionals in Denmark.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Kayser et al. (2022) (172) | n=194 members of a Danish medical staff (mean age 34). Mean age 43.1 yr.<br><br>85.1% female. | eHLQ | Mean eHLQ scale scores (SD):<br>eHLQ1: 2.98 (0.60)<br>eHLQ2: 3.40 (0.47)<br>eHLQ3: 3.36 (0.51)<br>eHLQ4: 2.95 (0.42)<br>eHLQ5: 2.78 (0.45)<br>eHLQ6: 2.57 (0.40)<br>eHLQ7: 2.55 (0.51) | The tool was validated in this article. Construction and validity testing in a broad range of target groups generated clear evidence of construct validity, discriminant validity, and scale reliability. This initial validity testing indicates that the eHLQ is likely to be valuable for the characterization and understanding |
| Jensen et al (2021) (173) | n=11 Danish physiotherapists, nurses and occupational therapists. | CHAT | No HL levels were reported in this article. | The feasibility of the tool was assessed. It is concluded that CHAT is a promising, easy adoptable tool to assess HL needs among patients with NCD. By facilitating the exploration of HL difficulties and strengths, healthcare providers gained new insights, which can be used to inform individualized care plans and to increase patient empowerment. |

## FINLAND

**Highlights**

Between 2018 and 2022, HL has been examined in five studies from which none targeted dHL. The target groups in the studies were adolescents and older adults. Two studies with adolescent populations had large sample sizes of over 1000 participants. An article with 3652 15–16-year-olds (174) suggested that 22,5% had low or poor HL measured with a broad 55-item paper-and-pencil test. Similarly, it was suggested by an article with 1733 13–17 years old students from Tampere (175) that 8.1% had low HL measured with HLSAC tool. Regarding older adults, an article with 948 older persons from the city of Jyväskylä, Central Finland (176) suggested that 8.4% of 75-year-olds, 12.5% of 80-year-olds and 18.8% of 85-year-olds had insufficient HL measured with HLS-EU-Q16 tool. Since there are no studies published with general adult populations, no conclusions about the HL level of Finns can be made at a general population level.

Finland was targeted in five studies out of which two were EU-level studies. All the studies were related to HL and none to dHL. One article covered objective aspects of HL. Socioeconomic and sociocultural characteristics of the target populations were mentioned in three studies and health, or well-being characteristics were covered in two studies. Ethnicity or digital skills of target populations were not mentioned in any of the studies. The most used data collection methods were surveys (n=5) and interviews (n=2). Three of the studies targeted adolescent populations, and two targeted older adults.

### ADOLESCENTS

Adolescents were the target group of three studies with Finnish participants. The target group sizes of these studies were 3.652 (174), 1 733 (163) and 351 (165). The measuring tools used were HLSAC (n=2) and a broad 55-item paper-and-pencil test (Table 27).

*Table 27. Findings from adolescents in Finland.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Summanen et al. (2022) (174) | n=3652, 9th grade pupils from 115 schools in Finland (15–16 yr.).<br><br>90 were Finnish speaking and 15 Swedish speaking schools. | A broad 55-item paper-and-pencil test | 9.8% excellent,<br>34% good,<br>33.6% satisfactory,<br>17.4% low,<br>**5.1% poor HL.**<br><br>The pupils' average score on the HL test items was 58.9%, indicating a satisfactory HL level. Clear associations were found between pupils' HL and gender, the language of the school, pupils' educational aspirations, parents' educational background and pupils' school achievement. | The test formed an extensive, comprehensive, and multidisciplinary instrument for measuring HL, and was found to have good internal consistency (reliability = 0.87). The measurement instrument is told to be described in more detail in another article. |
| Kinnunen et al. (2022) (175) | n=1733 Finnish students from 9 schools in Tampere, Finland. Age range 13–17 yr. (mean age 14.67). 15.0% had immigrant backgrounds.<br><br>Amersfoort (the Netherlands; 6 schools), Hanover (Germany; 12 schools) and Tampere (Finland, 9 schools). | HLSAC | Mean ± SD for Tampere pupils 33.30 ± 5.32.<br><br>In Tampere:<br>39.2% high,<br>52.7% average,<br>**8.1% low HL.**<br><br>HL was the highest in Tampere (FI), then in Amersfoort (NL) and the lowest in Hanover (GE) both in group mean points and when categorized. | The Cronbach's alpha for the scale was 0.912; in Amersfoort (NL) it was 0.895, in Hanover (GE) 0.921 and in Tampere (FI) 0.917. |
| Paakkari et al. (2018) (151) | n=176 13-yr. old pupils. N=175 15-yr.-old pupils from | HLSAC | Finnish HLSAC score:<br>13-yr.-olds: 32.45 out of maximum 40.<br>15-yr.-olds: 33.11 out of maximum 40. | The instrument was developed to meet the needs of adolescent HL. It was validated using a nationally representative target sample in Finland, where its psychometric |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | Finland. Total n=351.<br><br>Slovakia, Poland ang Belgium as comparison countries. | | The highest mean score was found in Finland, and the lowest in Belgium. | properties were shown to be at an adequate level. The psychometric properties of the instrument were at a sound level, with configural and metric invariance accomplished. HL mean values (as assessed via the HLSAC instrument) can be compared across countries. The instrument has utility for large-scale international HL studies on adolescents. |

## OLDER ADULTS

Older adults were targeted in two studies with target group sizes of 948 (164) and 292 (166). Both studies used HLS-EU-Q16 as the measuring tool (Table 28).

*Table 28. Findings from older adults in Finland.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Eronen et al. (2021) (176) | n=948 older persons from city of Jyväskylä, Central Finland (75–85 yr. old).<br><br>37–45 % lived alone, 10–12 yr. of education (mean), many had chronic conditions and depressive symptoms. | HLS-EU-Q16 (Finnish translation) | 60.5% sufficient HL in 75-yr.-olds,<br>49.2% in 80-yr.-olds and<br>40.6% in 85-yr.-olds.<br><br>**8.4% insufficient HL in 75-yr.-olds,**<br>**12.5% in 80-yr.-olds and**<br>**18.8 % in 85-yr.-olds.**<br><br>Those with sufficient HL had the lowest number of chronic conditions, longest education, highest cognitive capacity, best physical performance, and lowest number of depressive symptoms. | The tool has been validated elsewhere. |
| Eronen et al. (2018) (177) | n=292, 66-89-yr.-old Finnish older adults. In addition, n=6 in focus group | HLS-EU-Q16 (Finnish translation) | The mean HL score for all participants was 35.05 (SD 6.32)<br><br>12.3% excellent, | The reproducibility of the instrument was retested with 18 elderly people. It was concluded that the HLS-EU-Q16 is a feasible measure for research purposes among older Finns. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | discussion and n=18 in test group.<br><br>Education level high 32%, Perceived financial situation good 54%, good self-rated health 49%. | | 51.4% sufficient, 31.5% problematic, **4.8% of the participants had inadequate HL.** Participants who rated their financial situation and self-rated health as very good had the highest HL scores (mean 38.85, SD 5.09 and mean 39.22, SD 6.77, respectively). | |

## FRANCE

**Highlights**

Between 2018 and 2022, HL has been examined in eight studies from which none targeted dHL. Three studies had large sample sizes of over 1000 individuals. A large-scale study with 1954 cancer patients (178) suggested that 37.6% of them have limited HL measured with SILS tool. Another article with 317 French adults recruited from general practitioners' waiting rooms (179) suggested that 41% had problematic or inadequate HL when measured with HLS-EU-Q16 but when measured with HLS-EU-Q6 tool the percentage of people with problematic or inadequate was 74%. Most of the studies validated French versions of the tools such as HLSAC, HAS-A, HLS-EU-Q16, FCCHL, HLS-EU-Q6, HLQ and BHLS.

France was targeted in eight studies. All studies were related to HL and none to dHL. More specifically one of the studies covered the organizational aspect of HL. Health or well-being characteristics of the target populations were mentioned in eight studies, socioeconomic characteristics in seven, sociocultural characteristics in five, and ethnicity in two studies. Digital skills were not mentioned in any of the studies. The most used data collection methods were surveys (n=7) and interviews (n=3). One article targeted adolescents, four targeted general populations, two targeted patient populations and one targeted health care professionals.

## ADOLESCENTS

Adolescents were targeted in one article from France. It was a validation study with a sample size of 1444 participants and did not report HL levels of the population. The measuring tools used were HLSAC, HAS-A and HLS-EU-Q16 (Table 29).

*Table 29. Findings from adolescents in France.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Rouquette et al. (2021) (180) | n=1444 adolescents aged 13–19 from 68 classes in 23 schools in France. 96.5% with French or French and other as main language. At least one of parents with post-secondary education 49.4%. 20.8% with chronic disease, 14.0% overweight or obese. | HLSAC, HAS-A, HLS-EU-Q16 | No total (d)HL levels were reported from this population. | The article validated the psychometric properties of the HLSAC, HAS-A and HLS-EU-Q16 for use with young people in the age range between 13 and 19 yr.-old. Results were supportive of the use of HLSAC to assess HL during adolescence but the HAS-A, with a slightly better structural validity, can also be promoted due to its three measured dimensions. |

## GENERAL POPULATIONS

General populations were the target group of four studies. The sample sizes varied from 2342 to 175 participants. The measuring tools used in this population were FCCHL (n=1), HLS-EU-Q16 (n=1), HLS-EU-Q6 (n=1) and HLQ (n=1) (Table 30).

*Table 30. Findings from general populations in France.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Ousseine et al. (2018)(181) | n=2342 adults (mean age 47.6).<br><br>45.8 % had cancer history, 18.1% were deprived and 96.4% were women | FCCHL (French) | FCCHL mean score 55.58 out of maximum 70.<br><br>People with lower education had lower HL compared to people with higher education. Furthermore, socioeconomic deprivation tended to be associated with lower HL. | The French version of the FCCHL was validated in this article. According to the results, it provides a brief reliable and valid measure to explore the dimensions of HL. It could be used by health professionals to screen for HL level to develop this skill and to tailor health communication. |
| Rouquette et al. (2018)(179) | n=317 French adults recruited in wait rooms of 17 general practitioners. 28% less than or equal 40 yr.<br><br>French natives 82%. Post-secondary education 59%. Very comfortable or relatively comfortable financially 68%. | HLS-EU-Q16, HLS-EU-Q6 (French) | HLS-EU-Q16:<br>58% adequate,<br>33% problematic,<br>**8% inadequate HL.**<br><br>HLS-EU-Q6:<br>26% adequate,<br>69% problematic,<br>**5% inadequate.** | The structural validity of the 16- and 6-item versions of the HLS-EU-Q was evaluated in this article by using the same statistical strategy used in the initial validation studies. The French version of the HLS-EU-Q16 showed acceptable psychometric properties, despite meaningful DIF for age, sex and education level and a poor discriminative power among subjects with average to high HL. Article results did not demonstrate the validity of the HLS-EU-Q6. |
| Ritchie et al. (2022) (152) | n=1180 mammography screening women from 5 countries, of which 238 from France.<br><br>36.4% with 20 000–39 000€ household income per annum. | HLS-EU-Q6 | Note that the results are not presented for French sample alone.<br><br>18.1 % sufficient,<br>68.5 % limited,<br>**8 % inadequate HL.** | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Debussche et al. (2018) (182) | n=175 adults at metabolic and cardiovascular risk (mean age 66) from France. 76.6% women.<br><br>61.1% had university level education, 50.3% lived alone and 56% were retired. | HLQ (French) | HLQ score:<br>Dimensions 1–5: Mean 2.86 out of maximum 4.<br><br>Dimensions 6–9: Mean 3.19 out of maximum 5. | The French version of the HLQ was validated in this article and was shown to be psychometrically robust with good reliability. In the context of France, the 9 scales of HLQ allow a thorough assessment of HL strengths and weaknesses to respond to HL needs and improve the accessibility of health information and services. |

## PATIENT POPULATIONS

Patient populations were target groups in two studies. The health conditions in the population were cancer (178) and respiratory disease (183). The sample sizes varied from 1954 to only 13 participants. The measuring tools used were SILS (n=1) and BHLS (n=1) (Table 31).

*Table 31. Findings from patient populations in France.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Ousseine et al. (2022) (178) | n=1954 cancer patients from France (mean age 54.1).<br><br>65.9% living in rural/small town/city. 50.4% with upper secondary school education or higher. | SILS | 62.4% adequate,<br>**37.6% limited HL.**<br>Limited HL was associated with fewer trial invitations but not with enrolment once invited. Multivariate analysis confirmed the negative effect of limited HL on clinical trial invitation after adjustment for multiple characteristics. Patients with limited HL received fewer invitations to participate in trials but were likely to enrol when asked. | Validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| Perrin et al. (2021) (183) | n=13 adult chronic disease patients from respiratory diseases department in Lyon. 46.2% with college/university education. 46.2% employed.<br><br>n=12 health care professionals from Grenoble-Alpes, who worked with chronic disease hospital patients. | BHLS (French) | 100% of the chronic disease patients had adequate HL (BHLS score over 9). | This article aimed to assess the content validity of the French translation of both the patient-reported and HCP-reported BHLS in chronic care within hospital settings, through cognitive interviews with patients and HCPs. The results showed that the BHLS is easy and quick to administer, but some terms need to be adapted to the French chronic care settings. |

### HEALTH CARE PROFESSIONALS

One article about organizational HL targeted health care professionals. This article reported no HL levels but aimed to validate the V-HLO tool in French at health care organizations with eight local HL experts (Table 32).

*Table 32. Findings from health care professionals in France.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Henrard et al. (2019) (184) | n=8 HL experts (mean age 50) | V-HLO | No (d)HL levels were reported in this article. | This article aimed to pre-test the translation of V-HLO tool in French with local experts. The local experts generally judged the tool to be relevant and applicable to their context. Authors concluded the tool next to be implemented in their local context to assess whether it can make it easier for people to deal with the complexities of health care organizations. |

## GERMANY

**Highlights**

Between 2018 and 2022, HL was examined in 39 studies from which eight targeted dHL. German was covered with the most research in the EU during the timespan, covering both HL and dHL. Thirteen studies had large sample sizes of over 1000 individuals. There was a strong emphasis on studies completed with general, mainly adult, populations (17 out of 39 studies), but also representative studies were conducted among adolescents and students.

The article with 2773 adolescents and 3978 parents (61) demonstrated low HL among 17.9% of adolescents measured with HLSAC tool, and problematic or inadequate HL among 43.8% of parents measured with HLS-EU-Q16 tool. Another article with 1497 adolescents from Hanover (175) found that 10.2% of youth had low HL measured with HLSAC tool. Across dHL dimensions, the greatest difficulty faced by 14 916 university students measured with modified versions of DHLI tool (185) was the assessment of the reliability of health-related information. The study with 1797 German vocational education trainees (186) suggested that 53% had problematic or inadequate HL measured with HLS-EU-Q16 tool. Similarly, one of the general adult population studies (187) found that among 2151 German-speaking adults 58.8% had problematic or inadequate HL measured with HLS19-EU-Q47 tool which is a revised version of HLS-EU-Q47 tool. The most covered patient population sample of 927 German breast cancer patients (188) indicated that 50% had problematic or inadequate HL measured with HLS-EU-Q16 tool. The most used measuring tools for HL and dHL in Germany were different variations of HLS-EU-Q (n=24) and eHEALS (n=5); all in all, 14 different HL or dHL tools were utilized in these 39 studies.

Germany was targeted in a total of 39 studies. A number of 31 studies were related to HL, seven to dHL and one to both. More specifically the topics of studies covered functional (n=2), comprehensive (n=2), mental (n=1) and oral (n=1) aspects of HL or dHL. Socioeconomic characteristics of the target populations were mentioned in 33 studies, health, or well-being characteristics in 20, sociocultural characteristics were mentioned in 17, ethnicity in 12 and digital skills in seven studies. The most used data collection methods were surveys (n=38) and interviews (n=7).

The most used measuring tools for HL in Germany were HLS-EU-Q16 (n=15), eHEALS (n=5), HLS-EU-Q47 (n=4) and MOHLAA-Q (n=3). Other used measuring tools were several different modified HLS-EU-Q variants (n=5), QUICK-K (n=1), DHLI (n=1), DHLI modified for the context of COVID-19 (n=1), EHILS (n=1), 62-item mHL questionnaire (n=1), EHLA (n=1), OHLP (n=1), NVS (n=1) and Lenartz's German HL questionnaire (n=1). Child populations were the target group in three studies, adolescents in six, university or vocational school students in six, the general population in 16, the older adults in two, migrants in one and populations with health conditions in five studies.

### CHILDREN

Children were the target group in three studies. Two of these studies reported HL levels of the child populations and all three of them aimed to validate the HL measures with children. The measures used with German child populations were QUICK-K (n=1), HLS-EU-Q15 (n=1) and HLS-EU-Q26 (n=1) (Table 33).

*Table 33. Findings from children in Germany.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Bollweg et al. (2020b) (189) | n=907 German fourth grade students aged 8–12.<br><br>9.0% non-German speaking. Family affluence scale: 0–5 (9.5%), 6–10 (66.2%), 11–13 (22.1%), missing (2.3%) | HLS-Child-Q15 | HLS-Child-Q15 mean score was 3.34 (SD=.37). | Psychometric properties and validity of an adapted 26-item HLS-EU-Q scale was investigated. Of the 26 tested items, 9 were discarded due to poor performance in terms of missing values, item difficulty, and factor structure. This left a 15-item scale with a high internal consistency (Î± = .791) that takes only a short time to administer. Statistical analyses indicated the successful development of a promising instrument, but further research is needed on its factor structure and validity. |
| Teufl et al. (2020) (190) | n=155 German children aged 8–11.<br><br>About half of the participants had a migration background. | QUIGK-K | HL total score was 27.20 (SD 8.25) out of maximum 40. | The tool was validated in this article. After pilot testing, a reduction to 40 items based on the data was made. The<br>final QUIGK-K shows (very) good quality with regards to reliability and validity. |

| | | | | |
|---|---|---|---|---|
| Bollweg et al. (2020a) (191) | n=30 North German students aged 9–11. | HLS-EU-Q (age adapted version with 26 items) | Total HL levels were not reported in this validation article. | This was an article regarding questionnaire development and qualitative pre-test of the tool. This is the first article to deliver an age-adapted version of the HLS-EU-Q. A preliminary 26-item questionnaire was successfully developed that performed well in a qualitative pre-test. However, further quantitative, and qualitative studies of different samples are needed to verify the questionnaire's validity and reliability. The present findings provide information on advances in the measurement of generic self-reported HL in children and highlight the need for cognitive pretesting as an essential part of questionnaire development. |

### ADOLESCENTS

Adolescents were a target group of total six studies. Four of these studies reported (d)HL levels and one of them aimed to validate the HL measure. The measures used with German adolescent populations were MOHLAA-Q (n=3), HLSAC (n=2), HLS-EU-Q16 (n=1) and DHLI (n=1).

*Table 34. Findings from adolescents in Germany.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| de Buhr et al. (2020) (61) | n=2773 adolescents (mean age 14),<br><br>n=3978 parents (mean age 38),<br><br>n=420 teachers from Germany (mean age 44.8).<br><br>32.8% households with high, 42.6 with medium and 24.6% with low | HLSAC, HLS-EU-Q16 | Adolescents (HLSAC):<br>15.2% high,<br>66.8% medium,<br>**17.9% low HL.**<br><br>Parents (HLS-EU-Q16):<br>56.2% sufficient,<br>30.1% problematic,<br>**13.7% inadequate HL.**<br><br>Teachers (HLS-EU-Q16):<br>50.1% sufficient,<br>39.3% problematic,<br>**10.6% inadequate HL.** | The tools had been validated elsewhere |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | socioeconomic status. | | | |
| Kinnunen et al. (2022) (175) | Total sample of n=5088 students of which n=1497 from Hanover, Germany. Mean age of the Germans was 14.2.<br><br>39.9% with good academic performance, 54.0% with high parental education. 42.4 with immigrant background. | HLSAC | HL of German adolescents mean score 31.28 out of maximum 40.<br><br>21.2% high,<br>68.7% average,<br>**10.2% low HL.** | The tool has been validated elsewhere. |
| Domanska et al. (2021) (192) | n=1235 14–17-yr.-old German adolescents.<br><br>The majority attended general school (82.5%). 80% played sports, one in five reported daily fruit and vegetable consumption. Less than 10% smoked and risky alcohol consumption was found in one in four. | MOHLAA-Q | No HL levels were reported. Adolescents with low levels in all examined HL dimensions had increased odds of not consuming fruit and vegetables daily. The odds of smoking or not exercising were also higher among those with lower communication and interaction skills and passive attitudes toward health and health information. Risky alcohol consumption was not associated with HL. | Validation of the tool was not mentioned. |
| Loer et al. (2020) (193) | n=1235 German adolescents aged 14–17.<br><br>75.90% with no migration | MOHLAA-Q | Scale A, Difficulties in dealing with health-related information:<br>9.1% barely/no, 40.2% few, 42.2% some, **8.4% many.** | The tool has been validated elsewhere |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | background. Social support low or moderate by family 21.33% and by friends 23.43%. | | Scale B, Health related communication skills: 10.7% high, 27.8% rather high, 33.5% moderate, **28.1% low.**<br><br>Scale C, Attitudes towards health: 34.4% active, 56.8% partly passive – partly active, **8.8% passive**.<br><br>Scale D, Health related knowledge: 26.7% high, 50.6% moderate, **22.7% low**. | |
| Domanska et al. (2020) (194) | Stage 1. Focus group of n=5 adolescents (14–15-yr.-olds) and focus group of n=7 adolescents (16–17-yr.-old)<br><br>Stage 2. Data from n=625 adolescents (aged 14–17). 58.7% girls, 94% still attending school. 43.4% with a migration background in at least one parent. | MOHLAA-Q | Total HL levels were not reported in this validation article. | Validation of the tool was tested in this article. Internal consistency in all the various scales was not fully achieved in this article. The most criteria of construct validity were achieved in scale A derived from the HLS-EU-items. Thus, further revision and testing in other samples is necessary to re-examine structural validity of the MOHLAA-Q and to improve the internal consistency of two scales. |
| Dadaczynski et al. (2022a) (195) | n=490 German grade 8–9 students. | DHLI | **24.6%** (dimension scores varying from 15.3% to 37.5%) **of adolescents reported difficulties in acquiring and dealing with digital health information**.<br><br>Stratified by social characteristics, gender and | Validation of the tool was not mentioned. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | Subjective social status medium 64.3%. Physical activity 3 or more days a week 67.3%. Fruit consumption daily 42.4% | | socioeconomic differences were found with girls and respondents reporting a lower SSS more often showed a limited (d)HL. | |

## STUDENT POPULATIONS

Students were a target group of total six studies. All these studies reported (d)HL levels and one of them aimed to validate the HL measure. The measures used with the student populations were HLS-EU-Q16 (n=2), HLS-EU-Q47 (n=1), EHILS (n=1), a 62 item mHL questionnaire (n=1) and five aspects of DHLI adapted to context of COVID-19 pandemic (n=1) (Table 35).

*Table 35. Findings from student populations in Germany.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Dadaczynski et al. (2021) (185) | n=14 916 university students (mean age 23.3) | Five aspects of DHLI adapted to context of COVID-19 pandemic | Across (d)HL dimensions, the greatest difficulties could be found for assessing the reliability of health-related information (42.3%) and the ability to determine whether the information was written with a commercial interest (38.9%). Moreover, the respondents indicated that they most frequently have problems finding the information they are looking for (30.4%) Female university students reported a lower DHLI for the dimensions of "information searching" and "evaluating reliability" | Validation of the tool was not mentioned. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Steinke et al. (2021) (186) | n=1797 German vocational education trainees aged 14–53 (mean age 21). 9% with no German citizenship. | HLS-EU-Q16 | 47% sufficient, 40% problematic, **13% inadequate HL.** Trainees with sufficient HL had a more positive estimate of their state of health and reported a formally diagnosed medical condition or poor well-being less frequently than participants with limited HL. In addition to this, as HL diminishes, the proportion of trainees with a risky health-related lifestyle increase. | The tool has been validated elsewhere. |
| Schricker et al. (2020) (196) | n=996 German students aged 18–32.<br><br>20% with migration background. Subjective social status: Low 8.9%, Middle 68.7%, High 22.4%, missing 2.2%. | HLS-EU-Q16 | 41.5% sufficient, **58.5% limited HL.**<br><br>Students with limited HL showed an approximately 2-fold increased risk for poor subjective health, low life satisfaction, frequent psychosomatic complaints, eating habits and regular tobacco consumption. There were no associations with exercise behaviour or alcohol consumption. | The tool has been validated elsewhere. |
| Koch et al. (2022) (197) | n=391 vocational school trainees from different sectors (age 13–53). | HLS-EU-Q16 | 51% sufficient, 36% problematic, **13% limited HL.** | The tool has been validated elsewhere. |
| Reichel et al. (2021) (198) | n=315 university students from aged 18–30 (mean age 22.8).<br><br>67.9% of the participants | 62-item online mHL questionnaire | The mean mHL level of the whole sample was 42.7 out of maximum 75.7. The mean mHL score from the article in Germany was 41.65. | Validation of the tool was not mentioned. The authors concluded that future research should try to improve ways to assess mHL in a validated way. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | were German by nationality. Only students with proficient English were eligible for the article. 35.5% studied in a health-related sector. | | Women had a slightly higher mHL level than men. Participants aged 18–21 yr. had a lower mHL level than participants aged 22–30 yr.. | |
| Mayer (2018) (199) | n=100, 18–35-yr.-old university students from Germany. First yr. students 18%, 20% second yr., 27% third yr. and 35 fourth yr. and above. 5 participants had been involved in professional or voluntary work in the medical sector. | EHILS, HLS-EU-Q47 | HLS-EU-Q47: total mean score 2.75 (SD=0.32). EHILS: total mean score 3,15 (SD=0.94) | The validity of EHILS in German was tested in this article. A positive correlation (r= .47) was found between the EHILS10 and the HLS-EU-Q47 total score. Internal consistency of the EHILS was low, corroborating that health information literacy is a heterogeneous construct. Regarding validity, differential correlations of the overall EHILS scores as well as the subindices motivation and confidence with HL measures, domain-specific self-efficacy beliefs, generalized internal control beliefs, and health information searching experiences were found. It is concluded that ability and motivation components of EHILS should be assessed separately to understand individuals' health information behaviour. |

## GENERAL POPULATIONS

General populations were a target group of total 16 studies. 15 of these studies reported (d)HL levels and three of them aimed to validate the (d)HL measure. The measures used with the populations were HLS-EU-Q16 (n=7), HLS-EU-Q47 (n=3), eHEALS (n=2), eHLA (n=1), OHLP (n=1), Lenartz's German HL questionnaire (n=1), HLS-EU-Q6 (n=1) and NVS (n=1) (Table 36).

*Table 36. Findings from general populations in Germany.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Diederichs et al. (2018) (200) | n=14 144 adults, 40 yr. and older with permanent residency in Germany. | HLS-EU-Q16 | The article did not report overall HL levels of the sample, but according to this article, problematic or inadequate HL is independently associated with cardiovascular diseases and health care use. | The tool has been validated elsewhere. |
| Oedekoven et al. (2019) (201) | n=4144 Germans over 35 yr. old (mean age 56.9) with permanent residency in Germany and adequate language skills. 12.9% did not have basic education, 18.1% had a university degree. 31.5% with internet as their choice of source for health-related information. | HLS-EU-Q16 | Mean HL score = 33.5 (SD=7.4).<br><br>Perceived HL (HLS-Q16) and health knowledge were not significantly associated with the preference for general practitioners as a source of health information. | The tool has been validated elsewhere. |
| Samkange-Zeed et al. (2020) (202) | Sample of total n=2570 adults, of which 33.5% (n=839) from Bremen, Germany. 66% of Germans with no migrant background. 15.8% with low education. 10.2% unemployed 15.5% with poor | HLS-EU-Q6 | HL levels from Germany:<br><br>89.2% medium/high, **10.8% low HL.** | Validation of the tool was not mentioned. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | self-rated health. | | | |
| Schaeffer et al. (2021) (187) | n=2151 German-speaking population aged 18 and above. (Part of the M-POHL consortium article).<br><br>13.8% with migration background. Social status: low 18.7%. Intermediate 63.4%, high 15.1%. Education: low 11.1%, intermediate 58.7%, high 28.2%. 47.7% with no chronic diseases. | HLS19-EU-Q47 (2019 Revised version of HLS-EU-Q47) | HL overall mean score: 61.81 (SD 20.47)<br><br>14.7% excellent, 26.5% sufficient, 30.4% problematic, **28.4% inadequate HL.** | The tool has been validated elsewhere |
| Berens et al. (2022) (203) | n=2000 over 15-yr.-olds (mean age 48.2) from general German population.<br><br>7.9% with migration background. Mean social status of the population was 6.12/10. For education level, two thirds of the respondents could be classified into | HLS-EU-Q47 | Mean functional HL was 4.75 (SD=1.58) out of maximum 6.<br><br>Mean comprehensive HL was 32.8 (SD=6.2) out of maximum 50.<br><br>People with higher levels of self-efficacy had better HL than persons with lower self-efficacy in bivariate correlation and multivariate regression models. | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | ISCED levels 3 or higher. | | | |
| Pelikan et al. (2018) (153) | Total sample of n=8102 EU citizens, of which n=1057 from Germany. Mean age of the German sample was 48.4 yr. Education score 3.1 out of max 6. Socioeconomic status 5.5 out of max 10. Self-assessed health 3.82 out of max 5. | HLS-EU-Q47, NVS | CHL (comprehensive HL from HLS-EU-Q47): Germany: 34.5 out of max 50.<br><br>FHL (functional HL) from NVS:<br>Germany: 3.94 out of max 6 | The tools have been validated elsewhere. |
| De Santis et al. (2021) (204) | n=1014 participants 14 to 93 yr. (mean age 54) from Munich, Germany.<br><br>66% with tertiary education, 60% were either employed or seeking employment. 45% with net household income of up to 3500€. 57.1% used digital technology for health purposes. | eHEALS | eHEALS mean score: 31 out of maximum 40.<br><br>A higher perceived eHL score was associated with younger age, higher household income, and more education. | The tool has been validated elsewhere. |
| Dadaczynski et al. (2022b) (205) | n=680 German school principals and members of the | HLS-EU-Q16 | 70.8% sufficient, 23.5% problematic, **5.7% inadequate HL.** | The tool had been validated elsewhere |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | management board.<br>21.4% aged under 46, 61% aged 46–60, 17.5% over 60. | | | |
| Marsall et al. (2022) (206) | n=470 German speaking adults aged 18–82 yr. (mean age 37.1).<br><br>51.9% from big cities. 58.1% had university degree. 61.3% had internet always available. | eHEALS | eHEALS mean score 31.2 out of maximum 40.<br><br>Information seeking: Mean 3.85 (SD=0,86). Information appraisal: Mean 3.95 (SD=0,74). | The tool was validated in this article. The newly revised GR-eHEALS questionnaire represents a valid instrument to measure the important health-related construct eHL. GR-eHEALS has high content validity, good internal consistency and reliability. |
| Guttler et al. (2022) (207) | n=458 German workers from the metal industry. 90% male.<br><br>19% with specialist or college degree. | HLS-EU-Q16 | 39.7% sufficient, 36% problematic, **24.2% inadequate HL.** | The tool has been validated elsewhere. |
| Spinler et al. (2021) (208) | n=193 German adults (mean age 41.2).<br>50% with high education.<br>26.6% with migration background. | OHLP | Oral Health Knowledge mean score: 51.5 (SD=22.3) out of maximum 100.<br>Dental Health System Knowledge mean score: 72.1 (SD 21.9) out of maximum 100. | Validation of the tool was tested in this article. The evaluation of the core modules of the OHLP supports the instrument as a suitable tool to assess individual oHL dimensions, knowledge of a wide range of important dental topics, in a minimized version. The psychometric results show that the modules OHK and DHSK of the OHLP have adequate content validity, construct validity, item discrimination and item difficulty. The authors conclude that together with the additional dimensions of the OHLP (oral health behaviour, emotional impact and single questions), it can be assessed as a suitable tool to measure oHL. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Ehmann et al. (2020) (209) | n=180 members of integrated healthcare system from southwestern Germany (mean age 63.7). 36% were currently employed and 66% had secondary school certificate. Over 50% had a chronic disease. | HLS-EU-Q16 | 62% sufficient, 19.8% problematic, **18.3% inadequate HL.** There was no statistically significant difference between the mean HL score of female and male article participants, chronically ill and non-chronically ill persons or employed and non-employed article participants. | The tool has been validated elsewhere. |
| Gernert et al. (2022) (210) | n=158 German employees aged 20–63 yr. (mean age 48) with health-related risk factors.<br><br>50% with low educational level. 59% with good work ability. | Lenartz's German HL questionnaire | Mean 2.9 (on scale of 4) for HL measures of self-perception<br>Mean 2.6 (on scale of 4) for HL measure of proactivity<br>Mean 3.0 (of 4) on dealing with health information<br>Mean 2.9 (of 4) on self-control<br>Mean 2.4 (of 4) on self-regulation<br>Mean 2.5 (of 4) on communication and cooperation. | Cronbach's alpha and composite reliability greater than 0.7 for all variables except self-perception (alpha= 0.69), indicating that Lenartz's structural model of HL was valid in the target group (employees with health-related risk factors). |
| Rohwer et al. (2021) (211) | n=155 outpatient caregivers aged 24–60 yr. from North Germany. 88.4% with German as main language. 90.3% with permanent employment. 51.6% with intermediate | HLS-EU-Q16 | 69.0% sufficient, 24.5% problematic, **6.5% inadequate HL.** | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | secondary school as highest education level. 38.7% either overweight or obese. | | | |
| Pfob et al. (2021) (212) | n=113 individuals, of which 61.9% IT specialists and 38.1% health care specialist. | eHLA | A high or the highest level of HL was reported by 23.9% of all survey participants which, analysed by profession, corresponds to 0.0% of the IT specialists and 62.8% of the healthcare specialists.<br>In general, health care specialists scored significantly higher on the four health-related scales, whereas IT specialists scored significantly higher on the three digitally related scales. | The tool has been validated elsewhere. |
| Stock et al. (2021) (213) | n=14 family doctors (age not determined) and 346 patients (mean age 57.9) from North Rhine-Westphalia, Germany.<br><br>The patients were German speaking. 73.1% of them with no migration background. 41.6% of patients with low education | HLS-EU-Q16 | Patients:<br>52.9% sufficient,<br>32.8% problematic,<br>**14.3% inadequate HL.**<br>Physician estimates of patient HL levels:<br>44.6 sufficient,<br>21.3% problematic,<br>**34.1% inadequate HL**.<br>Patient-reported and family doctor-rated HL estimates were concordant in 38% of all cases. On average family doctors rated their patients' HL lower than patients rated their own HL. The lower average family doctor ratings were more pronounced | The tool has been validated elsewhere |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | level and 50% employed. | | when patients were older, male and had more than one chronic disease. Female family doctors rated HL of male patients lower than their male colleagues. | |

### OLDER ADULTS

Older adults were targeted in two studies, one with a sample of 427 older adults from a dental clinic and the other with 463 older adults with poor health status. The tools used for measuring HL were HLS-EU-Q16 reduced to 10 questions and modified to the context of COVID-19 and HLS-EU-Q16, which was validated for older adults (Table 37).

*Table 37. Findings from older adults in Germany.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Weber et al. (2022) (214) | n=427 valid replies from elder patients (mean age 81) of Dental Clinic of University of Leipzig, Germany.<br><br>21.3% of the respondents officially needed professional health care. 81.5% of the participants had utilized at least one dental examination within the last yr. | Modified HLS-EU-Q16 (reduced to 10 questions to the context of COVID-19) | No total HL levels were reported.<br><br>13.5% to 55.8% of the participants perceived difficulties regarding HL. The topic that was rated (very) difficult by most patients addressed the question, whether it was difficult to judge if the information on COVID-19 in the media is reliable (55.8%), followed by how to behave in case of a COVID-19 infection (41.8%) and where to get professional help (40.2%). It was concluded that the older seniors encountered difficulties finding, using, and understanding | Validation of the tool was not mentioned. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | | | information about COVID-19. | |
| Konopik et al. (2021) (215) | Study 1., n=463 elderly Germans (range 72–91, mean age 75.9). 7.4% with poor health status. 10.1% with low net income per person. Study 3., n=107 Germans (range 49.91, mean age 75.9). 4.5% poor health status. 16.2% with low income per person. | HLS-EU-Q16 | No total HL levels were reported. | Validation of the tool was tested on elderly people. The scale reliability was found to be poor in this population segment. In a second step, age-specific items were developed based on qualitative in-depth interviews with older persons. In a third step, we tested if the additional set of age-specific items was able to enhance a valid and reliable measurement of HL in a second sample of older adults (n=107). With the inclusion of an eight-item add-on, it was possible to measure HL in old and very old age with both high validity and satisfying precision. |

### MIGRANTS

Migrants were the target group of one article from Germany with a sample size of 192 first-generation German migrants. The tool used for measuring HL was HLS-EU-Q47 with a focus on the 16 items from the dimension of health care (Table 38).

*Table 38. Findings from migrants in Germany.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Berens et al. (2021) (216) | n=192 first-generation German migrants from Turkey (42.7%), Poland (29.7%), Greece (16.6%) and Italy (12.0%) aged 65–80 yr.<br><br>46.4% with German nationality, 36.1% with German as mainly spoken language. 45.8% with low social status. On average, migrants visited school for 7.63 yr. | HLS-EU-Q-47 (focus on 16 HL items from the dimension of health care HL-HC) | Overall HC-HL levels of the migrants:<br>25.1% sufficient,<br>39.2% problematic,<br>**35.7% inadequate HL.**<br><br>HC-HL levels of Turkish migrants:<br>21.1% sufficient,<br>31.8% problematic,<br>**47.1% inadequate HL.**<br><br>HC-HL levels of Polish migrants:<br>33.2% sufficient,<br>36.9% problematic,<br>**29.9% inadequate HL.**<br><br>HC-HL levels of Greek migrants:<br>43.1% sufficient,<br>30.3% problematic,<br>**26.6% inadequate HL.**<br><br>HC-HL levels of Italian migrants:<br>47.9% sufficient,<br>30.4% problematic,<br>**21.7% inadequate HL.** | The tool had been validated elsewhere |

## PATIENT POPULATIONS

Populations with health conditions were targeted in total of five studies. All these studies reported (d)HL levels and none of them aimed to validate the (d)HL measure. The target populations were cancer patients (2 article), asthma patients (1 article), obesity surgery patients (1 article) and musculoskeletal or rheumatic disease patients (1 article). The measures used in these studies was HLS-EU-Q16 (n=4) and eHEALS (n=3) (Table 39).

*Table 39. Findings from patient populations in Germany.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Nakata et al. (2021) (188) | n=927 German breast cancer patients (aged 18–44) from total 56 breast cancer centre hospitals. 79.8% had children, 73.9% lived with a partner. 31.2% with vocational diploma or university entrance. 6.3% had psychological comorbidities. | HLS-EU-Q16 | 48.5% sufficient, 32.3% problematic, **17.7% inadequate HL.**<br><br>Patients with an inadequate HL were found to almost twice more likely to develop a need for psycho-oncological care. | The tool has been validated elsewhere. |
| Köhler et al. (2020) (217) | n=219 adult obesity surgery patients from Germany (mean age 43).<br><br>80% female, 23% single. 27 % had achieved high school or higher. 67 % were employed. | HLS-EU-Q16 | 78.7% sufficient, 18.0% problematic, **3.3% inadequate HL.** | The tool has been validated elsewhere. |
| Knitza et al. (2020) (218) | n=193 German adults with musculoskeletal and rheumatic diseases (mean age 52). | eHEALS | eHEALS mean score: 26.3 (SD 7.1) out of maximum 40 (Women: 25.8, men: 27.0)<br>Age showed a negative correlation with eHEALS score. | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | 91% regularly used a mobile phone. 38 % lived in villages, 25% in small cities, 18 % in mid-sized cities, 18 % in big cities. | | | |
| Heiman et al. (2018) (219) | n=182 German patients with cancer and their caregivers (mean age 50.7). | eHEALS | Summarizing the five questions used, the mean score was 14.7, with a score range from 5 to 25.<br><br>58.5% of the patients had a score above the average,<br><br>41.5% had a low score for eHL. | The tool has been validated elsewhere. |
| Atmann et al. (2021) (220) | n=129 Asthma patients from Germany (mean age 55).<br><br>94% with school diploma, 52% employed. 62% mild, 29% moderate and 9% severe asthma. | HLS-EU-Q16, eHEALS | HLS-EU-Q16:<br>47% sufficient,<br>32% problematic,<br>**21% inadequate HL.**<br><br>Mean score of eHEALS dimensions:<br>3.1 out of maximum 5.<br>No consistent differences between trained and untrained groups were found, suggesting that trained patients did not benefit from asthma education regarding HL and eHL. | The tools have been validated elsewhere. |

## GREECE

### Highlights

Between 2018 and 2022, HL has been examined in five studies of which three targeted dHL. One of the studies had a large sample size of 1000 individuals. The article (153)

reported results from the European HL Survey conducted in 2011 utilizing HLS-EU-Q47 and NVS tools. The other four studies had relatively small sample sizes with 113–283 individuals and there was mainly only one article by the target population. Therefore, more research is needed regarding (d)HL levels of Greek populations.

Greece was targeted in five studies. In four studies Greece was the only target country and in one it was one of the target countries. Two of the studies were related to HL and three to dHL. More specifically the topics of studies covered oral (n=1), functional (n=1) and comprehensive (n=1) aspects of HL or dHL. Socioeconomic characteristics (education, household income and employment status) of the target populations were mentioned in four studies, health, or well-being characteristics in three studies, sociocultural characteristics (marital status, language) in two studies and digital skills (use of the internet to search for information) were mentioned directly in one article and indirectly in another article whose participants were invited to participate the study via Facebook groups. Ethnicity characteristics were not mentioned (n=0). The most used data collection methods were surveys (n=4) and interviews (n=3); either computer-assisted or paper-assisted personal interviewing. Student populations were targeted in one article, general adult populations in two, patient populations in one, and health care professionals in one article.

### STUDENT POPULATIONS

The only article with Greek student populations had a target group of 113 health sciences students. The dHL level of this population was measured with the eHEALS tool (Table 40).

*Table 40. Findings from student populations in Greece.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Trantali et al. (2022) (221) | n=113 health sciences students – undergraduate health sciences students at Greek Universities in Greece (19.6% in Attica region), of 18 yr. of age or | eHEALS | eHEALS score mean: 31.9 out of maximum 40.<br><br>Medicine and dentistry students had the highest score (33.7) and other health and caring sciences students the lowest (29.8). | The tool has been validated elsewhere |

| | | | | |
|---|---|---|---|---|
| | older (mean=22; min=18, max=53).<br><br>Most of them were women (81.4%), were not working (n=82, 72.6%), were single (n=65, 57.5%) and live with their parents (n=60, 53.1%). Recruitment via Facebook, survey in Google Forms. | | There was a statistically significant difference at eHEALS score among University Departments (p=0.009). | |

## GENERAL POPULATIONS

General populations were targeted in two studies with target groups of 1000 citizens from the general population and 101 carers of people with dementia. The measures used were HLS-EU-Q47, NVS, and eHEALS-carer, which was validated in the article (Table 41).

*Table 41. Findings from general populations in Greece.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Pelikan et al. (2018) (153) | A total of n=8102 EU citizens of which n=1000 from Greece (aged 15+ mean 46.3)<br><br>Education mean score: 3 out of maximum 6. Self-perceived mean socio-economic status: 3 out of maximum 10. | HLS-EU-Q47<br>NVS | HLS-EU-Q47 mean score: 3357 out of maximum 50.<br><br>Functional HL – NVS mean score: 3.59 out of maximum 6.<br><br>Comprehensive HL (and to a much lesser degree functional HL) is a relevant predictor for self-assessed health. Also, comprehensive HL is only to a limited degree mediating the effects of other determinants on self-assessed health and only for | The tool has been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| | Self-assessed health: 4.1 out of maximum 5. | | age does HL partly moderate the effect on health. Explained variance and strength of effects vary considerably by national context. | |
| Efthymiou et al. (2019) (155) | n=101 carers of people with dementia. 75.2% women, 67.3% aged less than 60 yr.<br><br>53% had secondary education. 38 % were employed. 43% used the internet to search for information. In addition, an expert panel of 10 was invited for content validation of the tool. | eHEALS-Carer | eHEALS-carer mean score: 29.27 out of maximum 40. | The tool was validated in this article (reliability and validity):<br>- High internal consistency (Cronbach's alpha): .083.<br>- High Mean I-CVI (0.93) (Construct validity)<br>Content validation was also assessed by an expert panel of 10 professionals. |

## PATIENT POPULATIONS

Patient populations were targeted in one article, which aimed to measure HL levels of 282 Athenian adult patients and to validate the GROHL measuring tool to assess oral HL with an independent sample of 20 adults for test-retest purposes (Table 42).

*Table 42. Findings from patient populations in Greece.*

| **Author(s), year** | **Target group(s)** | **Tool(s)** | **(d)HL levels** | **Validation** |
|---|---|---|---|---|
| Taoufik et al. (2020) (222) | n=282 adult patients from Athens. 89% female (mean age 39). | GROHL | GROHL mean score of the population was 11.5 (SD=4.0) out of maximum 20. | The tool was validated in this article. The GROHL demonstrated good psychometric properties [good internal consistency (alpha = 0.80) and excellent test-retest reliability (average ICC = 0.95; $p < 0.0005$)] and |

| | | | | |
|---|---|---|---|---|
| | 50% had good general health status. 69% had good or better oral health status, 68% had dental visits annually or more frequently.<br><br>In addition, a second, independent sample of 20 adults was recruited for the purposes of test-retest reliability evaluation of the index. | | GROHL scores were significantly positively correlated with overall educational attainment, dental-specific knowledge, oral health behaviours and attendance, as well as HL screening items. | can be used for outcomes research in clinical and public health settings. |

## HEALTH CARE PROFESSIONALS

Health care professionals were the target group of one article. In this article, dHL levels of 200 nurses and nursing assistants were assessed with the eHEALS measuring tool (Table 43).

*Table 43. Findings from health care professionals in Greece.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Kritsotakis et al. (2021) (223) | n=200 staff nurses (60.5%) and nursing assistants (39.5%) from Greece. 91% were female and 35% were between 45 and 54 yr. old.<br><br>66% had middle-level | eHEALS | eHEALS mean score: 30.7 out of maximum 40.<br><br>The lowest mean value (SD) was 3.24 (1.07) (range: 1–5), for the confidence in using information from the Internet and the highest (SD) was 4.08 (0.76) on how to find helpful health resources on the Internet. | The tool has been validated elsewhere |

| | | | | |
|---|---|---|---|---|
| | financial status and 49.5% had high education level. 79% with leadership status. | | | |

## HUNGARY

**Highlights**

Between 2018 and 2022, HL has been examined in seven studies from which two targeted dHL. Two studies had a large sample size of over 1000 individuals. In all the studies the target population was general adult population. The largest sample study (224) was conducted with 1200 Hungarian adults with the BRIEF and NVS tools and another study with 1000 respondents (225) using the validated Hungarian eHEALS. An article with 675 Hungarian mothers living in Eastern Europe suggested that 54.6% had limited HL measured with HLS-EU-Q16 tool. More research is needed regarding (d)HL levels of Hungarian populations.

Hungary was targeted in seven studies, from which in six it was the only target country, and in one it was one of the target countries. Five of the studies were related to HL and two to dHL. More specifically the topics of studies covered functional (n=1), comprehensive HL, health care HL, disease prevention HL and health promotion HL (n=1), subjective and objective (n=1) aspects of HL or dHL. Socioeconomic characteristics of the target populations were mentioned in all (n=7) studies (with education as the most often used), health or well-being characteristics were mentioned in five, ethnicity in two (Hungarian), sociocultural characteristics (language spoken) in one article. Digital skills were not mentioned in any of the studies (n=0). The most used data collection methods were surveys (n=7) and there was also one interview study (n=1). All the studies targeted general adult populations.

### GENERAL POPULATIONS

General populations were the target group of all seven studies with Hungarian citizens. The group sizes of these studies varied from 1200 to 141 participants. The measuring tools used were NVS (n=3), eHEALS (n=2), Chew Screening Questionnaire (n=2), BRIEF (n=1), HLS-EU-Q16, HLS-EU-Q47 (n=1) and S-TOFHLA (n=1). Three of the studies aimed to validate the measuring tools used (Table 44).

*Table 44. Findings from general populations in Hungary.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Bíró, É. et al. (2021) (224) | n=1200 Hungarian adults, mean age 53.62 (SD=15.91). 12,01% perceived its health status as bad or very bad | BRIEF, NVS | BRIEF mean score: 14.25 out of maximum 20.<br><br>NVS mean score: 3.44 out of maximum 6. | The tools have been validated elsewhere. |
| Zrubka et al. (2019) (225) | n=1000 respondents (mean age: 46.3 yr., range: 18–90) from the Middle (34.8%), East (35.3%) and West (29.9%) of Hungary. 55% female, 34.6% had obtained secondary education and 29.6% had higher education. | Hungarian eHEALS | eHEALS mean score: 29.2 out of maximum 40.<br><br>Small, but statistically significant differences of eHEALS scores between males and females, as well as older (>65) and younger adults, but no differences between individuals with low education or low income and the rest of the sample. | eHEALS (HU): The tool was validated in this article. Internal consistency was good (Cronbach's α = 0.90), and test–retest reliability was moderate (intraclass correlation r = 0.64). The Hungarian eHEALS is a useful and valid tool for measuring subjective eHL. |
| Sántha, Á et al. (2020) (226) | n=675 ethnic Hungarian mothers in Eastern Europe (Hungary, Romania, Slovakia), age range: 20–47 yr. (mean: 34.7 yr.; SD: 5.81). 14% of respondents cares for a child with at | HLS-EU-16 | HLS-EU-Q16 score (mean: 11.89)<br><br>45.4% sufficient HL<br>**54.6% limited HL.** | The tool has been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| | least one chronic illness that requires regular medical visits. | | | |
| Zrubka et al. (2020) (227) | n=666 respondents recruited online from the Hungarian general population, 18–65 + yr. (mean: 48.9; SD: 17.6).<br><br>Respondents with tertiary education and from the highest income quintile were slightly over-represented, whereas rural citizens were slightly under-represented compared with the general population. | eHEALS | eHEALS mean score 29.3 out of maximum 40.<br><br>eHL is associated with patient-reported experiences. | The tool has been validated elsewhere. |
| Erdei et al. (2018) (228) | n=391 participants from Hungarian households (≥19 yr. old) of any gender (63.2% women) from Nyíregyháza city. | Chew Screening Questionnaire, NVS | Chew Screening Questionnaire mean score: 2.2 out of maximum 12. (Higher scores representing a lower HL level)<br><br>NVS:<br>84% answered 5 of 6 NVS questions correctly. No total points were reported.<br>Higher education level resulted in better HL scores.<br>Participants in the article did not respond equally to both HL measurement tools. | The tools have been validated elsewhere |

| | | | | |
|---|---|---|---|---|
| | 58% had obtained secondary education and 29% had higher education. | | | |
| Náfrádi et al. (2019) (229) | n=302 Hungarian native speakers, above 20 yr. of age (18–45: 48%; 46–65: 37%; >65: 15%), 53% female and having correct or corrected vision.<br><br>48% had obtained secondary education and 28% had higher education. 393 respondents had chronic morbidity. Most of respondents had an income between 91,000 and 200,000 HUF. | S-TOFHLA, Chew Screening Questionnaire, NVS | S-TOFHLA:<br>Reading comprehension mean score 30.63:<br>85.7% adequate,<br>6% marginal,<br>**8.3% inadequate HL.**<br><br>Numeracy mean score: 3.34:<br>Chew Screening Questionnaire mean score: 4.25 out of maximum 12.<br>(Higher scores representing a lower HL level) | The tools S-TOFHLA and the Chew Screening Questionnaire were validated in this article. The Hungarian version of the S-TOFHLA and the Chew questions showed adequate internal consistency. The Hungarian version of the S-TOFHLA is a valid and reliable measure of HL. The Hungarian version of the Chew screening questions provides a valid self-reported assessment.<br>The NVS has been validated elsewhere. |
| Bánfai-Csonka et al. (2020) (230) | n=141 Hungarians from low socioeconomic status regions (Baranya County), 45.94 +/- 13.9 yr.<br><br>Only 21.3% had health | HLS-EU-Q47 | Comprehensive HL (mean 34.8)<br>21.3% Excellent.<br>32.6% Sufficient,<br>29.8% Problematic,<br>**16.3% Inadequate HL.**<br><br>Health Care (mean 34.6)<br>24.1% Excellent<br>27.7% Sufficient,<br>32.6% Problematic, | The HLS-EU-Q47 has been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| | education. The mean body mass index (BMI) of the participants was 26.23, which means that the pilot article population was overweight. | | **15.6% Inadequate HL.**<br><br>Disease Prevention (mean 35.8)<br>26.2% Excellent<br>40.5% Sufficient,<br>18.4% Problematic,<br>**14.9% Inadequate HL.**<br><br>Health Promotion (mean 34.2)<br>21.3% Excellent<br>29.1% Sufficient<br>29.7% Problematic<br>**19.9% Inadequate HL.** | |

## IRELAND

**Highlights**

Between 2018 and 2022, HL has been examined in seven studies from which one targeted dHL. Two studies had large sample sizes of over 1000 individuals. Target groups included student, general adult, and patient populations. The most representative sample with 1488 third-level university students from Cork City (231) suggested that 77% had limited oral HL measured with modified oHL tool. A study with 395 head and neck cancer survivors suggested that 47% had inadequate HL measured with BRIEF tool. Four studies had relatively small samples sizes with 26–251 individuals and all the studies used different tool to measure (d)HL. Therefore, more research is needed regarding (d)HL levels of Irish populations.

Ireland was targeted in seven studies. Six studies were related to HL and one to dHL. More specifically the topics of studies covered were oral (n=1), comprehensive and functional (n=1) and interactive (n=1) aspects of HL. Socioeconomic and sociocultural characteristics of the target populations were mentioned in all seven studies, health, or well-being characteristics in three, nationality in one, and digital skills in one article. The most used data collection methods were survey (n=7) and only one article used additional interviews. Student populations were the target group of one article, general adult populations of three and patient populations of three of the studies.

## STUDENT POPULATIONS

The one article targeting student populations aimed to assess the oral HL levels of 1488 Irish university students a measuring tool with three pre-validated screening questions on oral HL (Table 45).

*Table 45. Findings from student populations in Ireland.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Mathew et. al. (2022) (231) | n=1488 third-level university students in Cork City. | Three pre-validated screening questions on oHL | 23% with adequate oHL, **77% with limited oHL**. Male gender, younger age group and those in non-medical schools had significantly higher inadequate oHL. | A previously validated oHL tool with modifications was used. |

## GENERAL POPULATIONS

General populations were targeted in three studies with 1005, 85 and 26 participants from Ireland. The measuring tools in the studies were HLS-EU-Q47 (n=2), eHEALS (n=1) and NVS (n=1) (Table 46).

*Table 46. Findings from general populations in Ireland.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Pelikan et al. (2018) (153) | n=8102 EU citizens, of which n=1005 individuals, randomly selected from Ireland. | NVS, HLS-EU-Q47 | Comprehensive HL (HLS-EU-Q47) mean score: 35.16 out of maximum 50.<br><br>Functional HL (NVS) mean score: 3.64 out of maximum 6. | The tool has been validated elsewhere. |
| Delemere et al. (2021) (232) | n=85 participants, of which 57 were parents of children with cancer and n=28 were | eHEALS | eHL: All (mean (SD): 30.80 (7.25); Parents 29.98 (6.37); Health Care Providers 32.48 (8.68). In conclusion, this article has highlighted the importance of eHL and device use on Connected Health for Health | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | their Health Care Providers | | Care Providers and parents of children with cancer. | |
| McKenna (2019) (233) | n=26 participants attending a community-based structured cardiovascular risk reduction program in Galway, Ireland. Aged 36–76.<br><br>n=26 measured at baseline and n=17 at one-yr. follow up. | HLS-EU-Q47 | Baseline:<br>35% adequate,<br>**65% limited HL.**<br><br>Follow up:<br>32% adequate,<br>**68% limited HL.** | The tool has been validated elsewhere. |

## PATIENT POPULATIONS

Patient populations were targeted in three studies with 395, 262 and 251 participants. The measuring tools used in this population group were BRIEF (n=1), NVS (n=1) and HLS-EU-Q16 (n=1) (Table 47).

*Table 47. Findings from patient populations in Ireland.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Clarke et al. (2021) (234) | n=395 Head and neck cancer survivors completed the survey. | BRIEF | 53% adequate<br>**47% inadequate HL.**<br><br>Head and neck cancer survivors with inadequate HL have lower levels of self-management behaviours, lower functional Health related quality of life and increased fear of recurrence compared to those with adequate HL. | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | 33% aged 50–59. 60% from urban and 40% from rural residence. 48% with secondary education, 73% not working. | | | |
| Mackey (2019) (235) | n=262 patients, of these n=131 had chronic pain and n=131 were controls. Mean age 49.<br><br>59% female, 26% unemployed or unable to work. 31% with tertiary level education and 46% with household income of less than 1350€ per month. | NVS | **52% of all participants had inadequate HL.**<br><br>**54.2% inadequate HL in the chronic pain group, 48.9% inadequate HL in the control group.** | The tool has been validated elsewhere. |
| Jackson et al (2020) (236) | n=251 patients with cystic fibrosis aged 13–30 yr. (mean age 21,38).<br><br>35,1% with education level higher than second level. | HLS-EU-Q16 | 81.7% with sufficient, **18.3% with limited HL.**<br><br>Cystic fibrosis adolescents and young adults with sufficient levels of HL to obtain, understand, appraise, and apply health information have better health-related outcomes. | The tool has been validated elsewhere. |

## ITALY

**Highlights**

Between 2018 and 2022, HL has been examined in 16 studies from which two targeted dHL. Only two studies had large sample sizes of over 1000 participants. An article (237) with 2287 13–15-year-old adolescents from Lombardy region suggested that 18.7% had low HL measured with HLSAC tool. Regarding the general Italian population, an study with 751 civil protection and public employees from Prato Province (238) suggested that 44% had problematic or inadequate HL measured with HLS-EU-Q6 tool. In addition, there are three studies with general population sample sizes between 454–591 individuals (239) that suggest that the percentage of Italian people with problematic, inadequate, or limited HL is between 36–41% measured with NVS or HLS-EU-Q6 tools. An study with 710 Italian nursing home employees from Tuscany (240) suggested that 27.3% of them had low HL measured with IMETER tool. HLS-EU-Q6, HLS-EU-Q16 and NVS tools were the most often used tools to assess HL in five, three and three studies, respectively.

Italy was targeted in 16 studies. Fourteen of the studies were related to HL and two to dHL. More specifically the topics of studies covered vaccine confidence, hesitancy, or uptake (n=3), HL skills (n=2) and functional HL (n=2) aspects of HL or dHL. Socioeconomic characteristics of the target populations were mentioned in all 16 studies, health, or well-being characteristics in 12, ethnicity in six, sociocultural characteristics in four, and digital skills in three of the studies. The most used data collection methods were surveys (n=15) and interviews (n=3). One article targeted adolescents, two student populations, seven general adult populations, three patient populations and other three health care professionals.

### ADOLESCENTS

Italian adolescents were the target group in one article, in which HL levels of 13- to 15-year-olds were assessed and the HLSAC measuring tool used, which was also validated in the article (Table 48).

*Table 48. Findings from adolescents in Italy.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Velasco et al. (2021) (237) | n=2287 13–15-yr.-olds from Lombardy region. 21% had low, 48% medium & 29% high economic condition. | HLSAC | 6.8 % high, 74.5 % moderate, **18.7 % low HL.** | The Italian version of the HLSAC had a good level of reliability. All factor loadings were statistically significant, and item R2 was adequate. |

## STUDENT POPULATIONS

Students were targeted in two studies from Italy. The number of participants were 3052 and 868. The measuring tools used were COVID-19 DHLI and eHEALS, which were both validated in these studies (Table 49).

*Table 49. Findings from student populations in Italy.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Lorini, et al. (2022a) (241) | n=3025 university students, mean age 23.1 yr. (SD 5.0), All had access to the internet in the previous four weeks to answering the survey to search for information regarding COVID-19. | COVID-19 Digital HL Instrument (COVID-19 DHLI) | No total HL levels were reported in this validation article. | Cronbach alpha values are acceptable for all DHLI subscales (ranging from 0.74 to 0.83) except for the privacy subscale (0.39), indicating reliability for all but privacy. 4 of 5 DHLI subscales' response distribution covered all response options adequately with no floor or ceiling effects, showing that the instrument is good enough to assess the variability of the phenomenon. Construct validity, as revealed by correlation analyses, appears adequate. |

| | | | | |
|---|---|---|---|---|
| Del Giudice et al. (2018) (242) | n=868 Italians aged 20–30 yr. recruited from University of Udine, student mailing lists and Facebook contacts of the research team members. Educational attainment high in 44.1%. 45.1% employed, 47.1% articleing. Self-rated health very bad in 0.7%, poor in 7.1%. 12.0% used internet for health purposes several times a week. | eHEALS | The total mean score of Italian eHEALS in the whole population was 28.2 out of maximum 40.<br>Real-life working or articleing experiences in the health sector, as a proxy of higher levels of HL, positively correlate with self-referred eHL as measured by the eHEALS. | The tool was validated in this article. Psychometric properties were examined by measuring internal consistency (Cronbach alpha) and conducting a principal component analysis to assess the dimensionality of the scale. The scale shows good internal consistency and construct validity. |

## GENERAL POPULATIONS

General populations were the target of seven studies, with group sizes varying from 751 to 212. The measuring tools used were NVS (n=4), HLS-EU-Q6 (n=3), HLS-EU-Q16 (n=2) and G-HL (n=1) (Table 50).

*Table 50. Findings from general populations in Italy.*

| **Author(s), year** | **Target group(s)** | **Tool(s)** | **(d)HL levels** | **Validation** |
|---|---|---|---|---|
| Lastrucci et al. (2021) (238) | n=751 total, n=502 from civil protection and n=249 public employees from Prato | HLS-EU-Q6, Italian version | Total sample:<br>56% sufficient,<br>36.3% problematic,<br>**7.7% inadequate HL.**<br><br>Civil protection:<br>58.9% sufficient,<br>33.0% problematic, | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | Province (Tuscany), mean age 50 yr., range: 16–84.<br><br>60.6% had achieved high school education or higher, 25.3% had at least one of health condition that increased risk of severe illness from Covid-19. | | **8.1% inadequate HL.**<br><br>Public employees:<br>50.0% sufficient,<br>43.0% problematic,<br>**7.0% inadequate HL.**<br>The HL level was not associated with the adoption of preventive behaviours and COVID-19 risk perception. | |
| Palumbo et al. (2021) (243) | n=591 Italian adults (mean age 47) recruited from three large Italian public health care organizations.<br><br>23.5% were employed full time, 13.7% with primary education. 49.7% with good or fairly good self-perceived health. 10.7% with chronic diseases. | NVS | 38.58% with adequate,<br>20.47% with medium likelihood of limited,<br>**40.95% with high likelihood of limited HL.**<br><br>Women performed better than men. Patients aged 66 and more were likely to reveal greater risks of inadequate HL. Those who stated to be involved in a relationship showed higher NVS scores. People who actively participated in the workforce and those who exhibited better education levels reported higher NVS scores. Lastly, people suffering from financial deprivation were more likely to disclose inadequate HL. | The tool has been validated elsewhere. |
| Lorini et al. (2022b) (244) | n=502 volunteers over 18 yr. old (median age | HLS-EU-Q6 | HLS-EU-Q6<br>50.8% sufficient,<br>28.5% problematic,<br>**7% inadequate HL,** | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | 53) from Providence of Prato.<br><br>65% male, 97.8% Italian, 48% with high school diploma or a university degree. | | 13.7% missing.<br><br>A high level of HL seems to mitigate the effects of the identified predictors, probably due to an augmented level of awareness of the benefits of vaccination. | |
| Bonaccorsi et al. (2019)(239) | n=454 Florence residents, 18–69 (mean=53.25 +/- 11.72),<br><br>2% foreign, 41.1% with bachelor's degree or higher education. 66.2% employed. Enough income to get to the end of the month 69.9%. Self-reported health 46%. | NVS | 63.9% adequate, 24.6% possibility of limited, **11.5% high likelihood of limited HL.**<br><br>The risk of having high likelihood or possibility of limited HL levels increases with age, lower educational level and with worse financial situation. | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Lorini et al. (2019) (245) | n=223 participants form a population-based sample selected from 11 general practitioners in primary healthcare centres in Florence.<br><br>Mean age 53.7 yr., the majority (96.9%) were Italian with high school (36.3%) or university (44.4%) degree, with a paid job (61%), the majority did not have any chronic diseases or long-term illnesses (50.7%). | HLS-EU-Q16,<br>HLS-EU-Q6,<br>G-HL,<br>NVS | HLS-EU-Q16 :<br>33% sufficient,<br>55.2% problematic,<br>**11.8% inadequate HL**.<br><br>HLS-EU-Q6:<br>24.6% sufficient,<br>66.5% problematic,<br>**8.9% inadequate HL.**<br><br>G-HL:<br>7.5% excellent,<br>36.3% sufficient,<br>42.9% problematic,<br>**13.2% inadequate HL.**<br><br>NVS-IT:<br>59.6% likelihood of sufficient,<br>28.7% possible limited,<br>**11.7% high likelihood of limited HL.** | The results provided the first evidence for the reliability and validity of the HLS-EU-Q instruments (HLS-EU-Q16, HLS-EU-Q6, General-HL Index) in Italian general population. The differences in some of the results with respect to other published studies lay for specific cultural characteristics, which affect HL level and the relationships between HL, antecedents, and outcomes. |
| Ritchie et al. (2022) (152) | n=1180 total participants of which n=239 from Italy.<br><br>61.9% between 50–59 yr., 38.1% over 60 yr. | HLS-EU-Q6 | 19.2% sufficient,<br>74.1% limited,<br>**6.7% inadequate HL**. | The tool has been validated elsewhere. |
| Lorini et al. (2020a) (246) | n=212 adults from Florence, over 18 yr. | HLS-EU-Q16<br>NVS | HLS-EU-Q16:<br>33% had sufficient,<br>55.2% problematic,<br>**11.8% inadequate HL.** | The tools have been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | 23.1% 18–45 yr.,<br>25% 46–55 yr.,<br>34.4% 56–65 yr.,<br>17,5% over 65 yr.<br><br>45.3 % had university degree or higher, 4.7 % lacked financial sufficient monthly financial resources. | | NVS:<br>60.8% had sufficient,<br>28.8% possibly limited,<br>**10.4% high likelihood of limited HL.**<br>Educational level, age class and financial resources were significantly associated with HL skills, with OR values being higher than those obtained using the NVS or the HLS-EU-Q16 individually. | |

## PATIENT POPULATIONS

Patient populations were the target group of three studies from Italy. The measuring tools used in these studies were HLS-EU-Q16 (n=1), IMETER (n=1), SILS (n=1) and HLS-EU-Q6 (n=1). The target group sizes were 503, 305 and 288 individuals (Table 51).

*Table 51. Findings from patient populations in Italy.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Schiavone et al. (2020) (247) | n=503 patients attending from Naples and Caserta, Southern Italy. (Age range 18–88). | HLS-EU-Q16 | 38.4% high,<br>**61.4% low HL.**<br>HL was found to be higher among patients with higher education level and general self-efficacy score. There were no differences in HL between the age groups and people with or without chronic diseases. | The tool has been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| | 67.8% over 45 yr. 60.2% female. 62.8% had a high level of education, 50.7% had one or more chronic diseases. | | | |
| Biasio et al. (2018) (248) | n=305 adult patients (mean age 53,9) of Italian family doctors. 14.8% with university degree. 16.1% occupied as housewives, 25.9% retired. 55% suffered from at least one chronic disease. | IMETER, SILS | IMETER: 18.0% had functional, 56.7% had marginal, **25.2% had low HL.** SILS (How often do you need to have someone help when you read instructions, pamphlets, or other written material from your doctor or pharmacy) scores were: Never 23.9%, rarely 26.2%, sometimes 34.1%, often 12.5% and always 3.3%. | The tools have been validated in Italian in other studies. |
| Magon, A. et al. (2021) (249) | n=288 patients receiving oral anticoagulation therapy, median age 58 yr. 57% were unemployed, 63.2% had high school diploma, 36.5% university degree or higher. | HLS-EU-Q6, Italian version | HL mean score 2.38 on a scale of 1–4. | The tool has been validated elsewhere. |

### HEALTH CARE PROFESSIONALS

Health care professionals were the target group of two studies with 710 and 173 participants. The measuring tools used in these studies were IMETER and S-TOFHLA (Table 52).

*Table 52. Findings from health care professionals in Italy.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Lorini et al. (2020b) (240) | n=710 Italian nursing home employees from Tuscany (mean age 43.3).<br><br>82.4% with Italian as mother language. 25.4% had not achieved high school education. 9.5% had a chronic disease. 62.1% never gets vaccinated against influenza. | IMETER | 12.1% had functional, 60.6% had marginal, **27.3% had low HL.** The results of this article showed no significant association between HL and self-reported influenza vaccination uptake. General HL competences, particularly those related to basic abilities to understand words in a medical setting, are weakly related to confidence in vaccine. | Validation of the tool was not mentioned in the article. |
| Pelle et al. (2018) (250) | n=173 Central and Southern Italian adult caregivers of patients with health failure. 52.6% ranged in age from 46 to 60 yr. | S-TOFHLA | Overall mean scores for S-TOFHLA were 30.40 (SD=1.11) out of maximum 36, referring to an adequate HL level (23–36 points).<br><br>Caregivers older in age and with a low education level showed the lowest HL, emphasizing the need for health care workers, to check caregivers HL, before entrusting them with the care of patients. | The tool has been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | 14.5% had primary school education, 24.3% had a college degree, 13.3% had bachelor's degree. 55% reported having difficulties sometimes with medical information. | | | |

## OLDER ADULTS

Older adults were the target group of one article, which aimed to assess dHL levels of 58 Italian older adults with the measuring tool eHEALS (Table 53).

*Table 53. Findings from older adults in Italy.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Bevilacqua et al. (2021) (251) | n=58 older adults, mean age of 68.2 yr., primary education 8.6%, secondary education 70.7%, tertiary education 20.7%. | eHEALS | eHEALS mean was 24.3 out of maximum 40 at baseline and 28.4 after the intervention. | The tool has been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| | Mean total SOTU (Survey of Technology Use) for the population was 14.6 (SD=3.3) out of the maximum 22. | | | |

## NETHERLANDS

**Highlights**

Between 2018 and 2022, HL has been examined in 10 studies from which none targeted dHL. The majority (six) of these studies had large sample sizes of over 1000 participants. The study (175) with 1858 adolescents aged 13–19 years from Amersfoort suggested that 5.2% had low HL measured with HLSAC tool. Although there are many large-scale studies the HL levels of Dutch populations cannot be concluded because the aim of the studies was not to report HL levels but rather validate tools to measure HL levels. In addition, the studies use different tools, only HLQ was used as a tool in two studies, to assess HL levels which makes the comparison of results difficult. In total of 11 different tools were used in all 10 studies.

The Netherlands was targeted in 10 studies. All the studies were related to HL and none to dHL. More specifically the topics of studies covered functional (n=1), comprehensive (n=1), pharmaceutical (n=1) and mental (n=1) aspects of HL or dHL. Socioeconomic characteristics of the target populations were mentioned in nine studies, ethnicity and health or well-being characteristics in four and sociocultural characteristics in one article. Digital skills were not mentioned in any of the studies. Survey was the most common data collecting method, being used in 10 studies. Interviews were used in three studies as a research method. Children, adolescents, and student populations were targeted by one article each. Three studies targeted general populations and four targeted patient populations.

### CHILDREN

The one article with children as target group had 209 participants. The measuring tool used, and validated, in this article was HLS-Child-Q15 (Table 54).

*Table 54. Findings from children in the Netherlands.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Hahnraths et al. (2021) (252) | n=209 8–11-yr.-old pupils from Netherlands. | HLS-Child-Q15 | HLS-Child-Q15-DE scores based on HLS-EU-Q47 indices:<br>21.7% excellent,<br>45.6% sufficient,<br>23.3% problematic,<br>**9.4% inadequate HL**.<br>Higher HL scores were observed for ten-to-eleven-yr.-olds and fourth-grade students. | The tool was validated in this article. The HLS-Child-Q15-NL had high internal consistency (= 0.860) and moderate to strong item-total correlations (mean = 0.499). |

## ADOLESCENTS

One article targeted adolescent populations. This article had a sample size of 1858 adolescents. HL of the sample was measured with the HLSAC tool (Table 55).

*Table 55. Findings from adolescents in the Netherlands.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Kinnunen et al. (2022) (175) | n=1858 13–19-yr.-olds from Amersfoort, Netherlands out of a total sample of total n=5088 adolescents from Finland, Netherlands, and Germany. 25.4% had immigrant background. | HLSAC | HL of adolescents from Amersfoort:<br>31.0% high,<br>63.8% average,<br>**5.2% low HL.**<br>Mean HLSAC score was 32.85 out of maximum 40 (32.55 in total population). | The tool has been validated elsewhere. |

## STUDENT POPULATIONS

Student populations were targeted in one article with a group size of 315. The measuring tool used in this was an online mHL questionnaire (Table 56).

*Table 56. Findings from student populations in the Netherlands.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Reischel et al. (2021) (198) | n=315 university students in Netherlands (n=126, 40%) and Germany (n=198, 60%).<br><br>The nationality of 67.9% of the participants was German (n=214). The second largest group was Dutch (n=40; 12.7%). Only students who were proficient in English were eligible because the article was conducted in English. | An online questionnaire was used via Qualtrics in order to assess mHL | The mean mHL level of the participants was 42.65 (SD= 12.58) out of maximum 75. Women had a slightly higher mHL level than men. Participants aged 18–21 yr. had a lower mHL level than participants aged 22–30 yr. Students in the Netherlands and Germany did not differ significantly in their mHL levels. Students in health-related studies had a higher mHL level compared to those in non-health related studies. | Validation of the tool was not mentioned. |

## GENERAL POPULATIONS

In three studies, HL levels of general populations were assessed. The target group sizes were 1231, 1023 and 28. The measuring tools used were SAHL-D (n=1), HLS-EU-Q47 (n=1), NVS (n=1) and a computer-based and performance-based instrument to assess HL skills for informed decision making in colorectal cancer screening (n=1). Two of the studies aimed to validate the measuring tools used (Table 57).

*Table 57. Findings from general populations in the Netherlands.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Woudstra et al. (2019a) (253) | n=1231 adults from Netherlands (mean age 62.7). More than 20% of the respondents (n= 269) had lower education. Patients unable to understand the Dutch written language were excluded. | SAHL-D | The mean SAHL-D score was 24.4 (SD=6.3). | The tool was validated in this article. The findings support the validity and reliability of the SAHL-D for the long form and the short form, which can be used for a rapid assessment of HL in research and clinical practice. |
| Pelikan et al. (2018) (153) | n=1023 adults from Netherlands (mean age 46.2) out of a total sample of n=8102 EU citizens.<br><br>Education score 3.6 out of maximum 6. Self-assessed health score 3.79 out of maximum 5. | HLS-EU-Q47, NVS | HLS-EU-Q47 score: Netherlands: 37.06 out of maximum 50.<br><br>NVS score: 4.51 out of maximum 6. | The tools have been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| Woudstra et al. (2019b) (254) | n=28 individuals with low HL (field-testing group) and 696 colorectal cancer screening invitees from Netherlands (age groups: 57, 59, 61, 73 & 75.) | A computer-based and performance-based instrument to assess HL skills for informed decision making in colorectal cancer screening | This validation article did not report HL levels. | The tool was validated in this article. The findings imply that the computer-based instrument can be used for the development of interventions to support informed decision making about colorectal cancer screening among individuals with varying HL levels. |

## PATIENT POPULATIONS

Patient populations were targeted in four studies with Dutch citizens. Sizes of the target groups varied from 1993 to 508 participants. The measuring tools used were HLQ (n=2), BHLS (n=1), FCCHL (n=1) and RALPH (n=1) (Table 58). One of the tools (HLQ) was validated in one of the studies. Two studies used the same sample of Dutch chronic condition patients (255).

*Table 58. Findings from patient populations in the Netherlands.*

| **Author(s), year** | **Target group(s)** | **Tool(s)** | **(d)HL levels** | **Validation** |
|---|---|---|---|---|
| Rademakers et al. (2020) (255) | n=1993 participants from Netherlands diagnosed with a chronic disease (mean age 63.2). 32% had low education and 76% lived in a household with a partner and/or children. 53% had more than one medically diagnosed | HLQ | HL levels from this population were reported in another article of Jansen et al. (2018).<br><br>Older patients score lower compared to younger patients, people with a low education level score lower compared to people with inter-mediate or higher education levels and people that were living alone scored lower on certain skills than people living with a partner or children. | The tool was validated in this article. Given the results of the psychometric tests, the Dutch version of the HLQ can be considered a good replication of the original English questionnaire. |

| | | | | |
|---|---|---|---|---|
| | chronic disease. | | | |
| Abdullah et al. (2019) (256) | n=1941 diabetes patients from Netherlands aged 65–74. 44.9% with low education. | BHLS | According to the original article from 2010, identified by this systematic review, **9.7% of the target population had limited HL**. | Validation of the tool was not mentioned. |
| Jansen et al. (2018) (257) | n=1811 patients from Netherlands (mean age 63 yr.) diagnosed with a somatic chronic condition. 31.0% had low education. 53% suffered from more than two chronic diseases. | HLQ | HLQ dimensions 1–5 score: Mean 2.86 out of maximum 4.<br>HLQ dimensions 6–9 score: Mean 3.94 out of maximum 5.<br>Higher education attainment was associated with higher scores on the HL aspects Appraisal of health information and navigating the healthcare system. | The tool has been validated elsewhere. |
| Koster et al. (2018) (258) | n=508 patients (mean age 68) from Netherlands who visited community pharmacy. 91% were Dutch natives. 41% had no or low-level formal education; 35% had middle, 20% had high education. | RALPH, FCCHL | RALPH: 90% of patients had correct understanding on how to use their medication. **25.3% of patients had difficulties understanding specific instructions or warnings.** 85.4% of patients had correct understanding of indication for medication use.<br>Patients with limited pharmaceutical literacy, indicated by the RALPH questions, also had a lower general HL level according to FCCHL scores. | The tool has been validated elsewhere. However, comparisons were made between the two measurements. There was 60% agreement between pharmaceutical literacy measured with the RALPH interview guide and HL skills measured with the FCCHL for the functional domain. |

## POLAND

**Highlights**

Between 2018 and 2022, HL has been examined in seven studies from which two targeted dHL. All the three studies that examined general Polish populations had large sample sizes over 1000 subjects. The article with 1527 social media users (259) suggested that 50.8% had low dHL measured with eHEALS tool. In addition, the study with 1030 young females (260) suggested that 41.7% had problematic or inadequate HL measured with HLS-EU-Q16 tool. However, these might not be representative enough to cover Polish population so more studies are needed.

Poland was targeted in seven studies. Five of the studies were related to HL, one to dHL and one to both. More specifically the topics of studies covered comprehensive HL (n=1), general HL (n=1), functional HL (n=2), communicative HL (n=1) and critical HL (n=1). Socioeconomic characteristics of the target populations were mentioned in seven studies, health, or well-being characteristics in six, ethnicity (referring to Polish people) in three and sociocultural characteristics in two studies. Digital skills were not mentioned directly in any studies, but the usage of Internet and social media was mentioned in two studies. The most used data collection methods were survey (n=7) and interview (n=5). Target groups of studies from Poland included adolescents in two, general populations in three, patient populations in one and older adults in one article.

### ADOLESCENTS

Adolescents were the target group of two studies of which both used HLSAC as the measuring tool. One article aimed to assess HL levels of 641 adolescents from a multi-country sample and the other aimed to assess HL levels and validate the HLSAC tool for Polish adolescents in an article with a sample size of 630 adolescents (Table 59).

*Table 59. Findings from adolescents in Poland.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Paakkari et al. 2019 (151) | n=641 pupils from Poland (13 yr. n=341, | HLSAC | HLSAC mean scores: 13-yr.-olds: 30.30 out of maximum 40. | The tool has been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| | 15 yr. n=301) out of a total sample of n=1468 pupils from Finland, Poland and Slovakia. | | 15-yr.-olds: 30.85 out of maximum 40. | |
| Mazur et al. 2019 (261) | n=630 pupils from Poland (13–15 yr., mean age 14.83). 350 boys and 280 girls. First grade 330, third grade 300 of lower secondary school. | HLSAC | HLSAC mean scores: Boys 20.40 out of maximum 30 in this article. Girls 20.98 out of maximum 30 in this article. | The analyses conducted demonstrated that the Polish version of HLSAC has good psychometric features. The relatively higher correlation between HLSAC and internal rather than external health locus of control was confirmed. |

## GENERAL POPULATIONS

General populations were targeted in three studies with Polish citizens. Measuring tools used in these studies were eHEALS (n=2), HLS-EU-Q16 (n=1), HLS-EU-Q47 (n=1) and NVS (n=1). Sample sizes of the studies were 1527, 1030 and 1000 individuals. One of the studies aimed to validate eHEALS tool for Polish language (Table 60).

*Table 60. Findings from general populations in Poland.*

| **Author(s), year** | **Target group(s)** | **Tool(s)** | **(d)HL levels** | **Validation** |
|---|---|---|---|---|
| Burzynska et al. 2022 (259) | n=1527 social media users (mean age 32) from Poland. 89.8% female. 75.2% university graduates. 60.3% good or very good health. | eHEALS | The mean total score of eHEALS-Pl for the evaluated population was found to be 30.69 ± 4.25. 31 or less points indicate low score 49.2% respondents obtained a high and **50.8% a low eHEALS-Pl score.** | The reliability of the eHEALS-Pl was measured by calculating the Cronbach alpha coefficients and analysing the principal components. Exploratory factor analysis and hypothesis testing was used to assess the construct validity of the instrument. The internal consistency of the eHEALS-Pl was sufficient. |

| | | | | |
|---|---|---|---|---|
| Duplaga et al 2020 (260) | n=1030, mean age (SD) of the respondent 26.09 (4.87) yr., 100% female. 41.7% of inhabitants of rural areas. Married 40.0%. With children 60.4% | HLS-EU-Q16, eHEALS | The mean HL score (HLS-EU-Q16) was 11.87<br><br>53.3% sufficient,<br>20.8% problematic,<br>**20.9 % inadequate HL.**<br>eHL score 29.52 out of maximum 40. | The tools have been validated elsewhere. |
| Pelikan et al. 2018 (153) | n=1000 participants, Gender: Female 52.3 %. Education mean score 3.2 out of maximum 6. Mean socioeconomic status 5.5 out of maximum 10. Self-assessed health mean 3.69 out of maximum 5. | HLS-EU-Q47, NVS | HLS-EU-Q47:<br>34.45 out of maximum 50.<br><br>NVS:<br>2.85 out of maximum 6. | The tools have been validated elsewhere. |

## PATIENT POPULATIONS

Patient populations were the target group of one article with 400 chronically ill participants. Measuring tool used in the article was FCCHL (Table 61).

*Table 61. Findings from patient populations in Poland.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Mirczak 2022 (262) | n=400 chronically ill people, 65 yr. or older.<br><br>40.7% with vocational | FCCHL | HL mean score (FCCHL):<br>**2.81** out of maximum 4.<br>Functional HL: 3.06 out of maximum 4.<br>Communicative HL: 2.82 out of maximum 4. | The tool has been validated elsewhere; this article validated the Polish version. |

| | | | | |
|---|---|---|---|---|
| | education. 55.5% with average material situation. Hypertension was the most frequently reported health problem in the sample (58.8%). | | Critical HL: 2.79 out of maximum 4. The obtained results confirmed a low level of HL in the subgroup of patients of advanced age, in a worse financial position, widowed, and living in small towns. | |

### OLDER ADULTS

Older adults were targeted in one Polish article with 138 respondents aged 65-94. The measuring tool used was HLS-EU-Q47 (Table 62).

*Table 62. Findings from older adults in Poland.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Kosicka et al. 2020 (263) | n=138 respondents, convenience sample, aged 65–94. 44.2% with very good or good self-assessed health. 83.4% with primary or secondary education. | HLS-EU-Q47 | 7.4% excellent, 30.6% sufficient, 50.4% problematic, **11.6% inadequate HL.** HL of seniors is on average somewhat higher for health care (M = 32.82) or disease prevention (M = 31.83) than for health promotion (M = 31.02). | The tool has been validated elsewhere. |

## PORTUGAL

**Highlights**

Between 2018 and 2022, HL has been examined in 15 studies from which two targeted dHL. Ten of these studies validated a tool to measure (d)HL. Only three studies included

large sample sizes of over 1000 participants. The article with 1247 people from mainland Portuguese population (264) suggested 30% having problematic or inadequate general HL and 52.7% having problematic or inadequate digital HL measured with HLS19-Q12 tool. In addition, an article with 1004 Portuguese people (265) suggested 61.4% having problematic or inadequate general HL measured with HLS-EU-Q47 tool. Therefore, there are quite large variations in results regarding (d)HL levels from general Portuguese population. Patient populations were a target group in three studies. One of them with a sample of 401 patients with hypertension and diabetes from Northern Region of Portugal (266) suggested that 83.3% of them had problematic or inadequate HL measured with HLS-EU-Q47 tool. However, more studies are needed to show and confirm the results about (d)HL levels of specific Portuguese populations because sample sizes are quite small, measures vary between the studies and many measures were only validated in these studies. HLS-EU-Q47 was the most often used tool to measure HL. However, it was used only in three in total from 15 studies.

Portugal was targeted in 15 studies. Thirteen of the studies were related only to HL, one to dHL and one to both. Two of the studies validated HL measures without reporting country-specific (d)HL levels. In addition, one article included subjects from several EU countries including Portugal, but (d)HL levels were not reported separately for Portuguese population. Therefore 12 studies included d(HL) results for different populations from Portugal. More specifically the topics of studies covered mental (n=1), oral (n=1) and cancer (n=1) aspects of HL. Two studies reported HL levels separately in relation to general HL, health promotion HL, disease prevention HL and healthcare HL.

Socioeconomic characteristics (mainly education and employment status) of the target populations were mentioned in 10 studies, ethnicity (nationality) in five, sociocultural characteristics (language, marital status) in five and health or well-being characteristics (confirmed illness, self-rated health status) in seven studies. None of the studies reported digital skills of the target groups. The most used data collection methods were survey (n=12) and interview (n=5). In addition, one article used an administered validated measure and other data collection method meaning an expert committee to culturally adapt a measure into European Portuguese. The target groups included adolescents (n=1), students (n=2), general populations (n=7), older adults (n=1), migrants (n=1) and patient populations (n=3).

## ADOLESCENTS

Adolescents were targeted in one article with 386 participants. In this article, NVS-PTeen was used to measure HL levels of the population. This article aimed to validate the tool used for measuring HL (Table 63).

*Table 63. Findings from adolescents in Portugal.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Santos et al. (2021) (267) | n=386 adolescents. All students from each randomly selected class (n=16 classes) of one school were invited to participate in the retest assessment. 12–17 yr. old; mean age 14.5 ± 1.5 yr. | NVS-PTeen | 83.4% adequate, 13.5% limited, **2.8% inadequate HL.** | The tool was validated in this article. The main objective of this article was to adapt and examine the psychometric properties of the NVS for the Portuguese adolescents' population. Results showed that the NVS-PTeen is valid and reliable, sensible to inter-individual educational differences, and adequate for regular screening of functional HL in adolescents. |

## STUDENT POPULATIONS

Student populations were the target of two studies. One of the studies targeted 1815 university students and aimed to validate the DHLI tool adapted to the COVID-19 pandemic. The other aimed to validate MHLq-Young adult tool and to measure HL of 356 young adults recruited trough college or university (Table 64).

*Table 64. Findings from student populations in Portugal.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Martins et al. (2022) (268) | n=1815 university students (mean age 24,2). 87.9% | DHLI adapted to the COVID-19 pandemic | Not reported. | The tool was validated in this article. The article aimed to translate, adapt and validate the Portuguese version of the dHL Instrument as used in the global COVID-HL Network. The Portuguese version of the DHLI met |

| | | | | |
|---|---|---|---|---|
| | Portuguese.<br>75.1% females.<br>Most studied bachelor's degree (51%).<br>36.5% were enrolled in social sciences and 35.2% in Health sciences studies.<br>90.8% had subjective social status Median and above. | | | adequate psychometric criteria. Therefore, it can be confidently used in Portuguese students' assessment of dHL. Representative studies are needed to shed light on different target groups and their COVID-19–related DHLI. |
| Dias et al. (2018) (269) | n=356 young adults recruited through college or university.<br>88.6% were students, attending college or other adult training programs in professional schools.<br>18–25 yr., Mean age 21.<br>97.2% Portuguese. | MHLq-Young adult | Mean (SD) 105.27 (7.05) for the total score for the 29 items of the MHLq-young adults.<br>Range between 29 and 145. | The tool was validated in this article. This article presents the process of adapting the MHLq, originally developed for assessing mental HL in young people (12–14 yr.-old), for young adults.<br>The results suggest that the MHLq-young adult form is a practical, valid, and reliable screening tool for identifying gaps in knowledge, beliefs, and behavioural intentions related to mental health and mental disorders, planning promotion programs, and evaluating intervention effectiveness. |

### GENERAL POPULATIONS

General populations were target groups of seven studies. The measuring tools used in these studies were HLS-EU-Q6 (n=1), HLS19-Q12 (n=1), HLS-EU-Q47 (n=2), SAHLPA-23 (n=1), SAHLPA-33 (n=1) and SAHL-PT (n=1). Sample sizes of the studies varied from 1247 to 153 participants. Four of the seven studies aimed to validate tools used (Table 65).

*Table 65. Findings from general populations in Portugal.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Samkange-Zeed et al. (2020) (202) | n=2570 people (including UK). 33.5% from Bremen (Germany), 22.6% from Lisbon (Portugal), 23.6% from Uppsala (Sweden). 26.9% 18–29 yr., 25.8% 40–44 yr., 21.5% 45–59 yr. and 25.8% 60 or over yr. old. 29.3% migrants and 17.9% descendants of migrants. 77.5% Good Self-rated health. | HLS-EU-Q6 | HL levels from Portugal: 91.6% medium/high **8.4% low.** | The tool has been validated elsewhere. |
| Arriaga et al. (2022) (264) | n=1247 people from mainland Portuguese population (mean age 46). 92.1% were born in Portugal, 2.2% in Brazil and 1.8% in Angola. 41.1% reported good and 32.2% fair health regarding self-health perception. 64.7% reported not having a | HLS19-Q12 | 5% excellent, 65% sufficient, 22% problematic, **8% inadequate General HL.**<br><br>8.9% excellent, 71.6% sufficient, 12.9% problematic, **6.9% inadequate Health Promotion HL.**<br><br>6.2% excellent, 54.1% sufficient, 18.4% problematic, **21.3% inadequate Disease prevention HL.**<br><br>9.5% excellent, | The tool was validated in this article.<br><br>This article aimed to describe the process of adaptation to Portugal of the short-form version of the HL Survey (HLS19-Q12) from the HL Population Survey Project 2019–2021, also establishing the HL levels in the Portuguese population.<br><br>The overall data suggest the HLS19-Q12 as a feasible measure to assess HL in the Portuguese population. Thus, it can be used in Portugal to assess the population's needs and monitor and evaluate policies and initiatives to promote HL by addressing its societal, |

| | | | | |
|---|---|---|---|---|
| | long-term illness or health problems. 70.8% considered that health problems did not limit their usual activities. | | 54.6% sufficient, 21.5% problematic, **14.4% inadequate Health Care HL.**<br><br>6.1% excellent, 41.2% sufficient, 25.0% problematic, **27.7% inadequate Digital HL.**<br><br>3.8% excellent, 30.7% sufficient, 21.5% problematic, **44.0% inadequate Navigation HL.** | environmental, personal, and situational modifiable determinant factors. |
| Pedro et. al (2018) (265) | n=1004, 16 yr. old and over; the most between 36 and 45 yr. old.<br><br>49.6% with single marital status, 53.9% couples with children. 36,3% had Secondary education and 32,7% had bachelor's degree. 40.7% worked fulltime. | HLS-EU-Q47 | 8.4% excellent, 30.1% sufficient, 44.4% problematic and **17% inadequate general HL.**<br><br>Mean scores per dimension:<br>31.0 health promotion HL<br>31.5 general HL<br>31.8 disease prevention HL<br>32.0 health care HL. | Validation of the tool was not mentioned. |
| Pires et al. (2018) (270) | n=484 adults from Lisbon and Tagus Valley and Central Portugal regions. 45% 18–30 yr. 13% over 60 yr.<br><br>26.4% from city-hall services, 21.3% from the | SAHLPA-23 | **53 % inadequate HL.** | The tool was validated in this article. The 18-item Short Assessment of HL for Brazilian Portuguese-speaking adults (SAHLPA-18) was adapted into European Portuguese. The European Portuguese tool (SAHLPA-23) includes five additional items. Both SAHLPA-23 and SAHLPA-18 showed suitable psychometric properties and high positive correlations with convergent variables. Although both tools |

| | | | | |
|---|---|---|---|---|
| | military institutions and 19.9% were university under graduates. The rest from firefighting departments, public cleaning services, parish centres and residential and nursing homes. 10.3 ± 4.8 yr. of schooling. | | | showed adequate reliability and good construct validity, the SAHLPA-23 is a better method of assessing HL as it discriminates more accurately between inadequate and adequate levels of HL. It was confirmed that the addition of five new items to the SAHLPA-18 was advantageous. |
| Ferreira et al. (2018) (271) | n=404 pregnant women (mean age 32). | HLS-EU-Q47 | 40.1% sufficient Health Care HL<br>39.9% sufficient Disease Prevention HL<br>38.4% sufficient Health Promotion HL.<br>**36.9 % problematic HL**. | The tool has been validated elsewhere. |
| Paiva et al. (2019) (272) | n=249 adults; physicians from public hospitals and primary care health centres (n=53), health researchers from a research institute in public health (n=45), researchers from an engineering faculty (n=50), laypersons from the general population (users of a primary care health centre) (n=101). | SAHLPA-33 | Not reported. | The tool was validated in this article.<br><br>SAHLPA had been validated already before in a convenience sample of 226 Brazilian adults over the age of 60.<br><br>This article adapted it to 33 items, to European Portuguese and to Portuguese population. The instrument was valid and fairly reliable. Exploratory factor analysis revealed the instrument was one-dimensional and justified reduction to 33 items. SAHLPA-33 displayed adequate reliability.<br>Future studies with fewer literate samples are needed to supplement and improve validation before SAHLPA-33 is used to explore associations with health outcomes and to guide health interventions, especially in less literate populations. |

| | | | | |
|---|---|---|---|---|
| | 18 yr. old and over. | | | |
| Santo et al. (2019) (273) | n=153 adults, customers of eight pharmacies in the Algarve region.<br>18 yr. old and over.<br>28.1 % with 4 yr. or less of schooling.<br>Fluent skills in Portugal.<br>People with cognitive impairment and serious vision or hearing problems were excluded. | SAHL-PT | 37.9 % low HL. | The tool was validated in this article.<br>The article aimed to translate and adapt the Short Assessment of HL—Spanish and English (SAHL-S&E) questionnaire into European Portuguese.<br>The translation of the questionnaire used showed a good internal consistency and a statistically significant interrater reliability. |

## MIGRANTS

Migrant populations were the target group of one article with 27 participants. The measuring tool used was ILS-PT (Table 66).

*Table 66. Findings from migrants in Portugal.*

| **Author(s), year** | **Target group(s)** | **Tool(s)** | **(d)HL levels** | **Validation** |
|---|---|---|---|---|
| Medina et al. (2021) (274) | n=27 participants in a migrant situation and attending a primary health care unit in the Lisbon region.<br>The most represented nationalities: 22.2% from Brazil, | ILS-PT | General HL: mean 21.2 out of maximum 50.<br>0% excellent,<br>3.7% sufficient,<br>11.1% problematic,<br>**85.2% inadequate general HL.**<br><br>Health care HL: mean 25.3 out of maximum 50.<br>0% excellent,<br>7.4% sufficient,<br>37.0% problematic, | The tool has been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| | 18.5% from São Tomé,<br>18.5% from Angola,<br>14.8% from Guinea.<br>37% up to 2nd cycle degree,<br>33.3% secondary education,<br>18.5% higher education.<br>70.4% were professionally active. | | **55.6% inadequate healthcare HL**.<br><br>Disease prevention HL: Mean 25,0 out of maximum 50.<br>0% excellent,<br>7.5% sufficient,<br>25.9% problematic,<br>**66.7% inadequate disease prevention HL.**<br><br>Health promotion HL: Mean 13.8 out of maximum 50.<br>0% excellent,<br>3.7% sufficient,<br>7.4% problematic,<br>**88.9% inadequate health promotion HL.** | |

## PATIENT POPULATIONS

Patient populations were targeted in three studies from Portugal with sample sizes of 453, 401 and 71. The measuring tools used were HLQ, HLS-EU-Q47 and CHLT-30. HLQ and CHLT-30 were validated for Portuguese contexts in the studies (Table 67).

*Table 67. Findings from patient populations in Portugal.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Do Ó et al. (2022) (275) | n=453 individuals with diabetes, at the outpatient clinic of the Portuguese Diabetes Association (APDP). Range 22–96 yr. (median age 61).<br><br>74.6% had type 2 diabetes. | HLQ | Q1–5 score range 1–5:<br><br>HLQ1: 3.21<br>HLQ2: 2.98<br>HLQ3: 2.83<br>HLQ4: 3.08<br>HLQ5: 2.81<br><br>Q6–9 score range 1–5:<br><br>HLQ6: 3.86<br>HLQ7: 3.60<br>HLQ8: 3.53<br>HLQ9: 3.69 | The tool was validated in this article. This article aimed to adapt the HL Questionnaire (HLQ) to the Portuguese context and to examine the psychometric properties of a population of people with diabetes. The HLQ showed that the items were easily understood by participants. The Portuguese version of the HLQ has shown satisfactory psychometric properties across its nine separate scales in people with diabetes. Given the strong observed properties of the HLQ across cultures, languages, and diseases, |

| | | | | |
|---|---|---|---|---|
| | 73.7% considered their health to be fair or poor.<br><br>51.7% had nine or fewer yr. of school. 47% were retired and 40% employed. 83.2% lived in cohabitation. | | | the HLQ is likely to be a useful tool in a range of Portuguese settings. |
| de Araujo et al. (2018) (266) | n=401 patients with hypertension and diabetes from Northern Region of Portugal (mean age 62.3, range 22–92).<br><br>82.0% with basic education. 31.4% employed, 9.5% unemployed, 57.3% retired. | HLS-EU-Q47 | 2.7% excellent,<br>14.0% sufficient,<br>42.9% problematic and<br>**40.4% inadequate HL.**<br><br>Patients with diabetes had higher HL levels than patients with hypertension. | The tool has been validated elsewhere. |
| Barros et al. (2022) (276) | n=71 cancer patients (mean age 50.6.<br><br>46.5% public and 25.4% private health care system. 45.1% had under 1 yr. and 14.1% above 5 yr. since diagnosis. 62% college | CHLT-30 | 40.8% high range,<br>56.4% intermediate,<br>**2.8% low range category of cancer literacy.** | The tool was validated in this article. The article was a pre-test to validate the Portuguese version of Cancer HL Test. The results obtained in the pre-test were favourable, and the instrument is now suitable for the next steps of the validation process. Results were consistent and similar to the ones obtained in the validation of the original and translated (CHLT-30DKspa) versions of CHLT-30. CHLT-30 PT presents good internal reliability, although slightly lower than the other versions. |

| | | | | |
|---|---|---|---|---|
| | education or higher. | | | |

### OLDER ADULTS

Older adults were targeted in one article with a sample size of 206. In this article READ-30 was validated for Portuguese populations and was used to assess literacy in dentistry (Table 68).

*Table 68. Findings from older adults in Portugal.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Costa et al. (2022) (277) | n=206 older adults from Viseu municipality (mean age 72.3). Participated Atividade Senior program.<br><br>72.3 % females. | REALD-30 | REALD-30 scores obtained had a mean score of 19.25±5.794. | The tool was validated in this article.<br><br>One question was removed for the creation of the final instrument with 29 questions, therefore being named Rapid Estimate of Adult Literacy in Dentistry-29 PT (REALD-29 PT).<br>The REALD-29 PT scale to assess oral HL among older Portuguese adults presents an acceptable internal consistency and proved to be a reliable and valid self-reported tool to identify the level of oral HL. |

## ROMANIA

**Highlights**

Between 2018 and 2022, HL has been examined in three studies from which none targeted dHL. One of them had a large sample size with over 1000 individuals. The study with 1622 Romanian participants (278) suggested that 40.7% had problematic or inadequate HL measured with HLS-EU-Q16 tool.

Romania was targeted in three studies, all of which were related to HL and none to dHL. In two of the studies, it was the only target country and in one it was one of multiple target countries. Ethnicity of the target population was mentioned in one article, sociocultural characteristics in three, socioeconomic characteristics were mentioned in two studies and health, or well-being

characteristics were mentioned in three studies. Digital skills were mentioned in none of the studies. All three studies used survey as the data collection method. General populations were target groups in two article and patient populations in one article.

### GENERAL POPULATIONS

The two studies with general population target groups had sample sizes of 1622 and 675 individuals. Both studies used HLS-EU-Q16 as the measuring tool (Table 69).

*Table 69. Findings from general populations in Romania.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Coman et al. (2022) (278) | n=1622 participants (mean age 53.53). 79.9% had children. 67.1% were married. 52.1% lived in the rural area.<br><br>44.1% had a high school or equivalent education, 30.1% university education.44.2% were employed and 41.9% were retired.<br><br>43.3% consider having good health, 14.8% bad or very bad health. | HLS-EU-Q16 | 59.2% sufficient, 33.2% problematic, **7.5% inadequate HL.** | The tool was validated in this article.<br><br>Results obtained for the HL scale support its factorial component and reliability, with a Cronbach's alpha of α 0.84. Age, gender, education, and self-reported health status were identified as determinants of HL. Authors conclude the tool to be a psychometrically sound and comparable to the original version. |
| Santha et al. (2020) (226) | n=675 ethnic Hungarian mothers in Eastern Europe (Hungary, Romania, Slovakia) 20–47 | HLS-EU-16 | Mean score of the HL scale: 11,89 out of maximum 16. 45.4% sufficient, **54.6% limited HL.**<br><br>Lower HL scores were seen in singles, caregivers of | The tool has been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| | yr. old (Mean 34.7 yr.).<br>95.6% married or partnered mothers, 4.4% single mothers.<br>40.2% from rural areas.<br><br>Socioeconomic status 6.13 out of maximum 10.<br>65.8% with a university degree.<br><br>14% cares a child with at least one chronic illness that requires regular medical visits. | | child(ren) with chronic illness, residents of towns of under 20000 inhabitants, mothers of only one child, younger mothers, and those with lower socioeconomic status. | |

## PATIENT POPULATIONS

Patient populations were targeted in one article with 244 Romanian patients. In this article, HL levels were measured with REALD-30 tool, which was also validated in this article (Table 70).

*Table 70. Findings from patient populations in Romania.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Sfeactu et al. (2021) (279) | n=244 urban adult patients with ability to write and read, no uncorrected visual and hearing impairments.<br><br>18–30 yr. 114 (50.9%), | REALD-30 | Total HL mean score: 25.85 out of maximum 30.<br><br>HL level by gender:<br>Male n=113, Mean 24.7, SD 4.6<br>Female n=111, Mean 27.0, SD 4.0.<br><br>HL level by age:<br>18–30 yr. n=114, Mean 26.5, SD 3.7 | The tool was validated in this article for the Romanian context.<br>The REALD-30 demonstrated excellent internal consistency and reliability in repeated administrations. Validity REALD-30 proved to have satisfactory psychometric properties and may serve to evaluate dental HL among Romanian adults. |

| | | | | |
|---|---|---|---|---|
| | 31–50 yr. 84 (37.5%),<br>51– yr. 26 (11.6%). | | 31–50 yr., n= 84, Mean 25.5, SD 4.4<br>51–yr., n=26, Mean 23.8, SD 6.7.<br><br>HL level by education:<br><8 yr. n=10, Mean 18.1, SD 5.0<br>9–12 yr., n=41, Mean 25.2, SD 5.0<br>>12 yr., n=173, Mean 26.4, SD 3.9. | |

## SLOVAKIA

**Highlights**

Between 2018 and 2022, HL has been examined in three studies from which none targeted dHL. One article had a large sample size of over 1000 participants. One article with 675 Hungarian mothers living in Hungary, Romania, and Slovakia (226) suggested that 54.6% of them had limited HL measured with HLS-EU-Q16 tool. More research is needed regarding (d)HL levels among Slovakian populations.

Slovakia was targeted in three studies, all of which addressed HL. Socioeconomic characteristics of the target populations were mentioned in two studies, ethnicity in one, sociocultural characteristics in one, and health or well-being characteristics in one article. All studies used surveys as the data collection method. One article targeted adolescents and two targeted general adult populations.

### ADOLESCENTS

The sample size of the article with Romanian adolescents was 173 and, in this article, HL levels were measured with the validated HLSAC tool (Table 71).

*Table 71. Findings from adolescents in Slovakia.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Paakkari et al. (2019) (151) | n=173 adolescents from Slovakia | HLSAC | 13-yr. olds: Mean score 31.12 (moderate HL) out of maximum 40. | This tool was validated in the article, and found to have adequate psychometric properties, with configural and metric invariance |

| | | | | |
|---|---|---|---|---|
| | (15 yr., n=118, 13 yr., n=55)<br><br>Out of a total sample of n=1468 adolescents from Finland, Poland, Slovakia, and Belgium. | | 15-yr. olds: Mean score 31.33 (moderate HL) out of maximum 40. | accomplished. Internal consistency was adequate (total= 0.85). HL mean values could be compared across countries among adolescents. |

## GENERAL POPULATIONS

General populations were targeted in two studies with sample sizes of 1117 and 675 adult participants. The measuring tools used in these studies were HLQ-SK, which was validated in the article, and HLS-EU-Q16 (Table 72).

*Table 72. Findings from general populations in Slovakia.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Timková et al. (2020) (280) | n=1117 adults (36.2% male) mean age 36.4 yr.<br><br>35.1% had higher education degree, 52.2% high school, 12.7% not completed high school.<br><br>13.6% had periodontal disease. | HLQ-SK (44 items, 9 subscales) | Periodontal disease mean score:<br>1–5: 2.87 out of maximum 4<br>6–9: 3.33 out of maximum 5<br><br>Healthy mean score:<br>1–5: 2.91 out of maximum 4<br>6–9: 3.51 out of maximum 5 | The tool was validated in this article. HLQ-SK replicated factor structure of the English HLQ factor structure (satisfactory goodness of fit [X2WLSMV=1684.96 (df=866), p<0.001; CFI=0.943, TLI=0.938, RMSEA=0.051, and WRMR=1.297] and achieved acceptable internal consistency and component reliability; Cronbach's alphas and composite reliability coefficients ranged from 0.73 to 0.84. |
| Sántha et al. (2020) (226) | n=675 female mothers in Hungary, Romania, Slovakia (not | HLS-EU-Q16 | Aggregated score on HL scale: 11.89 (SD 3,04), range 4–16 points.<br><br>45.4% sufficient, | This tool has been validated elsewhere. |

| | | | | |
|---|---|---|---|---|
| | reported by country), mean age 34.7 yr. (SD 5.8).<br><br>40.2% rural residence, 22.4% in large cities. 65.8% had higher education, all had completed high or vocational school. 59.6% employed, 33.1% on maternity leave.<br><br>14% caregiver for child with chronic disease. | | **54.6% limited HL.**<br><br>No significant differences across countries. Lower HL scores found among singles, caregivers of child(ren) with chronic illness, residents of small towns, mothers of only one child, and younger mothers, respondents with lowest SES, students and unemployed, and mothers with low educational attainment. Sufficiency in HL increased with age. | |

## SLOVENIA

**Highlights**

Between 2018 and 2022, HL has been examined in two studies from which one targeted dHL. Both studies had large sample sizes of over 1000 participants. The article with 3621 young university students studied dHL with DHLI tool (281) and found that 27.9% had difficulties in finding useful information, 29.6% had problems choosing among information sources found and 49.3% had difficulties assessing the reliability of information measured. The other article validated a Slovenian translation of MHLS tool to assess mHL but recommended further improvements (282).

Slovenia was targeted in two studies, of which one was related to HL and one to (d)HL. The HL-related article specifically addressed mental HL. Socioeconomic characteristics of the target populations were mentioned in both studies, and sociocultural characteristics were mentioned

in one article. Both used one-off surveys as a data collection method. One article targeted student populations and the other one targeted general adult populations.

### STUDENT POPULATIONS

Student populations were the target group of an article which aimed to assess dHL levels of 3621 university students with a modified DHLI tool adapted for Covid-19 (Table 73).

*Table 73. Findings from student populations in Slovenia.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Vrdelja et al. (2021) (281) | n=3621 male and female university students, mean age 22.6 yr.<br><br>21.0% had high socioeconomic status, 14.3% low status. | DHLI (3 subscales, adapted for Covid-19, Slovenian translation) | 85.4% did not have problems assessing usefulness of information. 82.4% did not have problems using information in everyday life. 86.4% could use information to make decisions about their own health. Students with sufficient (d)HL more often sought information from official institutions.<br><br>**27.9% had difficulties in finding useful information. 29.6% had problems choosing among information sources found. 49.3% had difficulties assessing the reliability of information**. Students with limited (d)HL more often sought information via social media. | Validation of the tool was not mentioned. |

### GENERAL POPULATIONS

Mental HL levels of a general population sample were assessed with the S-MHLS tool in an article with a sample size of 1189. The article also validated the tool for Slovenian contexts (Table 74).

*Table 74. Findings from general populations in Slovenia.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Krohne et al. (2022) (282) | n=1189 adults, mean age 46.7 yr.<br><br>58 % urban residence, 42 % rural residence. | S-MHLS (Slovenian translation) | Mean MHLS score was 114.09 out of maximum 154. | A reduced version (27-item, 4 factors) of the S-MHLS was validated in this article. The tool had reliable internal consistency and adequate convergent and discriminant validity compared to MHLS. It had weak representation of certain aspects of mental HL. Further improvement of the instrument with a multifactorial structure demonstrating strong cross-cultural validity was recommended. |

## SPAIN

**Highlights**

Between 2018 and 2022, HL has been examined in 11 studies from which none targeted dHL. Three of these studies had large sample size of over 1000 participants. The article (283) with 5485 people aged over 15 years from Valencia suggested that in total 12.8% had problematic or inadequate HL measured with HLS-EU-Q16. However, it was also found that level of education affected the HL. Percentage of inadequate or problematic HL for people with less than primary education was 46.5%, people with primary education 15.6%, people with high school education 6.6% and people with university education 6.4%. Similarly, another study (284) with 2443 people over 15-years of age from Catalonia suggested that 15.4% had problematic or inadequate HL measured with HLS-EU-Q16. HLS-EU-Q16 was clearly the most often used tool to assess HL with half (six) of all studies using this tool. More research is needed regarding (d)HL levels in specific Spanish populations.

Spain was targeted in 11 studies. Three of these studies presented Spanish results from a comparative article across European countries. All the 11 studies were related to HL and none to dHL. More specifically the topics of studies covered mental aspects of HL (n=2), specific HL for conditions such as cardiovascular (n=2), anticoagulation (n=1), autoimmune (n=1) diseases, as well as population groups such as women (n=2), adolescents (n=2) or immigrants (n=1).

Socioeconomic characteristics of the target populations (mainly referring to educational level or household income) were mentioned in seven studies and health or well-being characteristics in seven studies. Ethnicity was mentioned in one article, sociocultural characteristics in one, and digital skills in one article. The most used data collection methods were survey (n=9), or survey combined with interview (n=4). Adolescents were targeted in two studies, general populations in four, migrants in one and patient populations in five studies.

### ADOLESCENTS

Adolescents were the target group of two studies with the same sample and main author. One of the studies aimed to assess mental HL of 355 high school students with the EMHL mental HL measuring tool, whereas the other aimed to validate the tool. These two studies are presented in the same row in table below (Table 75).

*Table 75. Findings from adolescents in Spain.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Castellvi et al. (2020) (285)<br><br>Castellvi et al. (2019) (validation) (286) | n=355 13/15 yr. old High School students, male & female, from Barcelona, Spain. | EMHL | High school students: mean = 7.07 (SD 4.96)<br>Less than 6% of the adolescents answered all the items correctly in both parts of the EMHL test, respectively.<br>The mean score for high school students in the 1st part of the test was 7.07; for the 2nd part the score was 1.48. | The tool was validated in this article. There were two studies for the same study. The EMHL test is a relevant measure for assessing mHL in adolescents in Spanish context with acceptable validity and stability. The 2019 article concluded EMHL to be a new valid instrument for the evaluation of mHL interventions. However, the EMHL test has only been used for the EspaiJove.net intervention, so it was recommended also to be assessed in other cities, regions, and settings. |

### GENERAL POPULATIONS

General populations were targeted in four studies with sample sizes varying from 5485 to 229. The measuring tools used in these studies were HLS-EU-Q16 (n=2), HLS-EU-Q47 (n=1), HLS-EU-Q6 and NVS (n=1) (Table 76).

*Table 76. Findings from general populations in Spain.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Nolasco et al. (2020) (283) | n=5485 over 15 yr. olds from Valencia, Spain. | HLS-EU-Q16 | **12.8% inadequate or problematic HL.** Level of education affected the HL. Percentage of inadequate or problematic HL for people with less than primary education was 46.5%, people with primary education 15.6 %, people with high school education 6.6% and people with university education 6.4%. | The tool was validated in this article. The percentages of understanding the questions without much difficulty were high. Based on results the HLS-EU-Q16 in Spanish is a short, adequate, and valid instrument to measure the level of HL in the population. |
| Garcia-Codina et al. (2019) (284) | n=2443 over 15-yr.-olds from Catalonia Spain (mean age 45.9).<br><br>54.1% employed, 22.1% with high socioeconomic status, 23.3% with college or university degree. | HLS-EU-Q16 | 84.6% sufficient,<br>5.1% problematic,<br>**10.3% inadequate HL.**<br><br>Low HL is associated with a lower level of education, low socioeconomic status, and a physical limitation to perform everyday activities. More modest association with low physical activity, having a self-perceived chronic disorder and performing preventive activities. | The tool has been validated elsewhere. |
| Pelikan et al. (2018) (153) | n=1000 Spanish participants over 15 yr. old.<br><br>Out of a total sample of n=8102 EU citizens. | HLS-EU-Q47, NVS | Comprehensive HL (HLS-EU-Q47) Spain mean score:<br>32.88 out of maximum 50.<br><br>Functional HL (NVS) Spain mean score:<br>2.61 out of maximum 6 | The tools have been validated elsewhere. |
| Ritchi et Al. (2022) (152) | n=228 Mammography screening women. | HLS-EU-Q6 | HLS-EU-Q6 Score :<br><br>19.7% sufficient,<br>73.2% limited,<br>**7% inadequate HL.** | Validation of the tool was not mentioned. |

| | | | | |
|---|---|---|---|---|
| | Total sample gathered from: Belgium, France, Italy, Spain, Outside EU: United Kingdom. | | | |

## MIGRANTS

One article with a sample size of 208 participants targeted Spanish migrant populations. In this article, HLS-EU-Q16 was validated and used to assess HL levels of the migrant sample (Table 77).

*Table 77. Findings from migrants in Spain.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Bas-Sarmiento et al. (2020) (287) | n=208 adult Arabic/French-Speaking Migrants residing in south-eastern Spain.<br><br>62.4% with secondary education, 44.9% unemployed, 11.2% housewives. | HLS-EU-Q16 | 32.2% sufficient, 28.8% problematic, **39% inadequate HL.** | The tool was validated for migrants in this article. As confirmed by the data obtained in this article, the cross-cultural adaptation of HLS-EU-Q16, with its internal consistency and construct validity, can be used to evaluate HL in immigrant populations in the same way as the original version. |

## PATIENT POPULATIONS

Patient populations were targeted in four studies. The sample sizes of the studies varied from 395 to 119. The measuring tools used were HLS-EU-Q16 (n=1), HLS-EU-Q47 (n=1), HLQ (n=1), SAHLSA-50 (n=1), SILS (n=1) and NVS (n=1) (Table 78).

*Table 78. Findings from patient populations in Spain.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Correa Rodriguez et al. (2022) (288) | n=395 autoimmune disease patients (mean age 46.59).<br><br>Most patients were living in Spain (81.1%) and perceived their health as very poor (4.9%) poor (53.3%), moderate (34.4%), very good/good (7.2%). | HLS-EU-Q16 | 42.3% sufficient, 25.8% problematic, **31.9% inadequate HL.**<br><br>Low HL is associated with lower health related quality of life and risk attitudes about Covid-19 vaccination and medical care during the pandemic. | The tool has been validated elsewhere |
| Santesmases-Masana et al. (2019) (289) | n=318 patients (mean age 77.9).<br><br>The majority had mild limitations in functional activity New York Heart Association scale (NYHA) II=51.25%), and non-adherence to a drug treatment was 75.5%.<br><br>In Spain patients with this condition | HLS-EU-Q47 | The average HL index was 25.4 logits, indicating a **problematic or lower HL in 79.6% of participants**.<br><br>Patients with lower educational levels and a worse HL had a lower endorsement. Patients with heart failure and poor HL had difficulties navigating the health system and understanding the information required for self-care management. | The tools have been validated elsewhere. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | are attended life-long in Primary Health Care centres by physicians and family nurses. | | | |
| Garcia et al 2021 (290) | n=252 cardiovascular pathology patients aged 50–85 yr. old from Valencia, Spain.<br>7.6 Yr. of treatment.<br>74.9% Atrial fibrillation.<br>49.2% Appearance of complications & 48.8% Emergency assistance in the last 6 months.<br><br>50% with basic education.<br>74.9% with middle social class. | HLQ | HQL:<br>2.9/4 in dimensions 1–5,<br>3.5/5 in dimensions 6–9 | The tool has been validated elsewhere for Spanish speakers. |
| Sánchez et al. (2018) (291) | n=119 women in the immediate postpartum period (over 18 yr. old).<br><br>Educational level: 33.6% primary, 35.2% | SALHSA-50,<br>NVS,<br>SILS | NVS:<br>56% adequate<br>30% limited,<br>**13% inadequate HL.**<br><br>SAHLSA_50:<br>85.7% adequate,<br>**14.3% inadequate HL.**<br><br>SILS (How often they need help when reading health | The tool has been validated elsewhere.<br>Short Assessment of HL for Spanish Adults (SALHSA_50), Newest Vital Sign (NVS) and Single Item Literacy Screener (SILS) have been validated in Spanish language but not for Spanish citizens. |

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| | secondary, 31.0% university.<br><br>77.3% with none/low medical risks during pregnancy. | | instructions):<br>Never 24.3%, rarely 28.5%, sometimes 27.7%, often 6.7%, always 12.6%.<br><br>Higher education level was associated with higher SAHLSA, SILS & NVS scores. | |

## SWEDEN

**Highlights**

Between 2018 and 2022, HL has been examined in seven studies from which three targeted dHL. Migrants were the most often examined target group followed by patient populations. The only article with general Swedish adult population with 348 subjects (292) suggested that measured with HLS-EU-Q16 tool 28% of Swedish adults had problematic or inadequate comprehensive HL. However, because of small sample size, conclusions about HL levels cannot be drawn based on these results. Sample sizes in all studies are relatively small (n=143–704) with no studies including sample sizes over 1000 subjects. The article with one of the largest sample sizes (n=681) (293) reported with HLS-EU-Q16 tool that 44% had problematic or inadequate HL in a sample including half Arabic speaking migrants and half Swedish speaking residents, respectively. The Swedish version of eHEALS was validated in one article (292) and used to examine dHL levels in another article (293). In addition, Ar-eHEALS for Arabic speaking people in Sweden was validated (294). However, target groups of studies vary, and samples sizes are relatively small, so it is hard to draw conclusions about (d)HL levels. The most often used measuring tool was clearly HLS-EU-Q16 that was used in five studies followed by eHeals (incl. Ar-eHEALS) to assess dHL in three studies.

Sweden was targeted in seven studies. Four studies were related only to HL and three to both HL and dHL. More specifically the topics of studies covered mental (n=1), comprehensive (n=2), functional (n=2), and communicative and critical (n=2) aspects of HL or dHL. Socioeconomic

characteristics of the target populations were mentioned in all seven studies, with education as the most often used, ethnicity in six, sociocultural characteristics in six and health or well-being characteristics in five and digital skills in three of the studies. The most used data collection methods were survey (n=8) and interview (n=3). Three of the studies targeted migrants, one targeted adolescent, one targeted adult populations and two targeted patient populations.

### ADOLESCENTS

Adolescents were targeted in one article with 143 young athletes. In addition, 159 coaches and parents were included in the sample. The measuring tools used were HLSAC for the young adults and S-CCHL for the parents and coaches (Table 79).

*Table 79. Findings from adolescents in Sweden.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Jacobsson et al. (2021) (295) | n=143 young athletes (aged 12–15), n=159 coaches and parents (aged 36–55) from Sweden.<br><br>60% of coaches and 73% of parents with university degree.<br>54% of parents & coaches from cities with over 100 000 residents. | S-CCHL, HLSAC | Young athletes (HLSAC):<br>28% high HL,<br>64% moderate,<br>**8% low**.<br><br>Parents (S-CCHL):<br>62% sufficient,<br>**31% problematic,**<br>**7% insufficient** HL.<br><br>Coaches (S-CCHL):<br>44% sufficient,<br>**50% problematic,**<br>**6% insufficient** HL. | The tools had been validated elsewhere. |

## GENERAL POPULATIONS

General populations were targeted in one article with 348 participants. The measuring tools used in this article were HLS-EU-Q16 and eHEALS. In this article the Swedish version of eHEALS was validated (Table 80).

*Table 80. Findings from general populations in Sweden.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Wångdahl et al. (2020) (292) | n=348 adults from Sweden (mean age 49 yr.). 90.4% with at least 10 yr. of education. 85.8% perceived their own general health as good or very good. 87.9% used internet almost every day. | HLS-EU-Q16, eHEALS | HLS-EU-Q16: 71.5% sufficient, **22% problematic, 6% inadequate** comprehensive HL.<br><br>The mean sum score of Sw-eHEALS (Swedish version of eHEALS) was 29.3, referring to a **sufficient level**. | The Swedish version of eHEALS was validated in this article. eHEALS was assessed as being unidimensional with high internal consistency of the instrument, making the reliability adequate. |

## MIGRANTS

Three Swedish studies targeted migrant populations. The measuring tools used were HLS-EU-Q16 (n=3) and eHEALS (n=2). Sample sizes of the studies were 681, 298 and 193. Two of the studies were validation studies (Table 81).

*Table 81. Findings from migrants in Sweden.*

| Author(s), year | Target group(s) | Tool(s) | (d)HL levels | Validation |
|---|---|---|---|---|
| Bergman et al. (2021) (293) | n=681 Arabic speaking migrants (n=344) and Swedish speaking residents (n=337) (mean age 45.9 yr.).<br><br>49.8% graduated from university.<br><br>77.1% good or very good self-perceived health.<br><br>85.9% used internet almost every day. | HLS-EU-Q16, eHEALS | HLS-EU-Q16:<br>55.5% sufficient, **31.2% problematic, 13.3% inadequate** comprehensive HL.<br><br>eHEALS:<br>67.5% sufficient, **24.8% problematic, 7.7% inadequate** dHL.<br><br>Arabic speakers had significantly lower mean sum scores in eHL 28.1 (SD 6.1) vs 29.3 (6.2) and **lower proportion of sufficient CHL 125 (38.9%) vs 239 (71.3%)**, compared to Swedish speakers. | The tools have been validated elsewhere. |
| Wångdahl et al. (2021) (294) | n=298 Arabic speaking adults from Sweden (mean age 41 yr.). Mean±SD 9,4±8.2 yr. lived in Sweden. 53% graduated from university. 67.7% good or very good self-perceived health. 85.9% used internet every day. | HLS-EU-Q16, Ar-eHEALS | HLS-EU-Q16:<br>38.4% sufficient, **39.4% problematic, 22.1% inadequate** HL.<br><br>Ar-eHEALS:<br>62.2% sufficient, **28.7% problematic, 8.9% inadequate** HL.<br>Mean ± SD 28,1 ± 6,1.<br>Range: 8-40. | The Ar-eHEALS tool was validated in this article. The psychometric testing showed that the Ar-eHEALS is valid and reliable and can be used to assess eHL among Arabic speaking people in Sweden. |

| | | | | |
|---|---|---|---|---|
| Mekhail et al. (2022) (296) | n=193 first-time parents from multicultural, socioeconomically disadvantaged settings in Sweden (mean age 30.2). 26.8% originally from Sweden, 8.5% from Europe, 20.7% from Middle East, 31.1% from Africa and 2.2% from Asia. | HLS-EU-Q16 | These findings showed that **parents born outside Sweden, those who had lived for a shorter time in Sweden and those with poorer Swedish language proficiency, as well as parents with a lower level of education demonstrated significantly lower levels of HL**. | Validation was examined in this article. **The Swedish version of HLS-EU-Q16 could be used together with other instruments for measuring overall HL in multicultural settings**. HLS-EU-Q16 appears to discriminate between different levels of HL in relation to migrant background and shorter education and limited access to support. However, other measures of HL which should be adapted to use in multicultural settings, need to be explored in further studies of parental HL and its relationship to child health in multicultural settings. |

## PATIENT POPULATIONS

Patient populations were the target groups of two studies with 794 and 157 participants. The measuring tools in the studies were the Swedish FHL scale (n=1), Swedish C & CHL scale (n=1) and HLS-EU-Q16 (n=1) (Table 82).

*Table 82. Findings from patient populations in Sweden.*

| **Author(s), year** | **Target group(s)** | **Tool(s)** | **(d)HL levels** | **Validation** |
|---|---|---|---|---|
| Jaensson et al. (2021) (297) | n=704 Swedish patients undergoing bariatric surgery (mean age 42). 52% reported upper secondary school as their highest level of education. 25% had undergone first, second or third cycle programmes at universities. | Swedish FHL Scale, Swedish C & CHL | Swedish FHL Scale: 43% sufficient, **39% problematic, 16% inadequate** HL.<br><br>Swedish C & CHL: 56% sufficient, **34% problematic, 6% inadequate HL**. | The tools were validated in this article. According to the article, the **Swedish FHL scale and the Swedish C & C HL scale are valid and reliable instruments to use for patients undergoing bariatric surgery in a Swedish context**. |

| | | | | |
|---|---|---|---|---|
| Viktorsson et al. (2019) (298) | n=157 young adult patients from Sweden (age 20–29 yr.). 45% visited healthcare within last two months. 21% had secondary school education. 59% working. | HLS-EU-Q16 | HLS-EU-Q16 SE: 63.1% sufficient, **31.2% problematic, 5.7% insufficient** HL. Mean ± SD 13 ± 2.7.<br><br>Insufficient/problematic HL was associated with having lower reliance on the healthcare system and with a greater likelihood of seeking treatment for psychiatric symptoms. | The tool has been validated elsewhere. |

### 3.4.4 HL AND DHL MEASURING TOOLS

**Highlights**

From a total of 163 studies, 55 different measuring tools for (d)HL were identified. 87% (48 out of 55) of these tools were for measuring HL and seven for dHL. The most often used tool for measuring HL was clearly HLS-EU-Q16 (n=40), whereas for dHL it was eHEALS (n=18).

Notably, none of the studies targeting children or adolescents were related to dHL, referring to a gap in dHL research of younger populations in EU. The most common tool for measuring HL of adolescents was the HLSAC tool. Age wise, measuring dHL in EU countries started from student populations that consisted mainly of college and/or university students. However, students had been studied during the timespan with five different dHL tools which complicates the comparison and synthesis of the findings. The same applies for other target groups as well and both regarding HL and dHL. The 56% of measuring tools identified had only been used in a single study between 2018 and 2022.

Of the included 163 these studies, 130 were related to HL, 23 to dHL and 10 to both. After analysing the studies, a total of 55 different measuring tools for HL and dHL were identified, not counting translations or language adaptations of the tools. A total of 48 of the tools aimed to measure HL levels and seven aimed to measure dHL levels of different target populations.

The most frequently used tools for measuring HL and dHL during 2018–2022 in the EU were HLS-EU-Q16 (n=40) by a large margin, followed by eHEALS (n=18), HLS-EU-Q47 (n=17), HLQ (n=14), NVS (n=11) and HLSAC (n=10). Twenty four (44%) of the tools had been used in two or more studies, whereas 31 (56%) had only been used in a single article during the timespan. HLS-EU-Q16 and HLS-EU-Q47 surveys stood out as the most used for measuring HL whereas eHEALS was the most common tool for measuring dHL (Table 83).

*Table 83. Most frequently used measuring tools for HL & dHL in studies from 2018-2022*

| Short name of the tool | Absolute frequency (n) | HL or dHL |
|---|---|---|
| HLS-EU-Q16 | 40 | HL |
| eHEALS | 18 | dHL |
| HLS-EU-Q47 | 17 | HL |
| HLQ | 14 | HL |
| NVS | 11 | HL |
| HLSAC | 10 | HL |
| HLS-EU-Q6 | 7 | HL |
| SILS | 4 | HL |
| eHLA | 4 | dHL |
| BHLS | 3 | HL |
| S-TOFHLA | 3 | HL |
| FCCHL | 3 | HL |
| BRIEF | 3 | HL |
| MOHLAA-Q | 3 | HL |
| SAHL | 3 | HL |
| eHLQ | 3 | dHL |
| DHLI | 3 | dHL |
| IMETER | 2 | HL |
| Chew Screening questions | 2 | HL |
| EMHL | 2 | HL |
| REALD-30 | 2 | HL |
| S-CCHL | 2 | HL |
| HLS19-Q12 | 2 | HL |
| HLS-CHILD-Q15 | 2 | HL |
| CHAT | 1 | HL |
| EHILS | 1 | HL |
| HAS-A | 1 | HL |
| HBP-HLS | 1 | HL |
| HELIA | 1 | HL |

| | | |
|---|---|---|
| HK-LS | 1 | HL |
| CHLT-30 | 1 | HL |
| MAKS | 1 | HL |
| MHLq-Young adult | 1 | HL |
| MHLS | 1 | HL |
| QUICK-K | 1 | HL |
| RALPH | 1 | HL |
| REALM | 1 | HL |
| MeHLA | 1 | HL |
| V-HLO | 1 | HL |
| SAHLPA-23 | 1 | HL |
| SAHLSA-50 | 1 | HL |
| A broad 55-item paper-and-pencil test | 1 | HL |
| A computer-based and performance-based instrument to assess HL skills for informed decision making in colorectal cancer screening | 1 | HL |
| 62-item online mHL questionnaire | 1 | HL |
| G-HL | 1 | HL |
| GROHL | 1 | HL |
| HLS-EU-Q (age adapted version with 26 items) | 1 | HL |
| ILS-PT | 1 | HL |
| Lenartz's German HL questionnaire | 1 | HL |
| NVS-PTeen | 1 | HL |
| OHLP | 1 | HL |
| Three pre-validated screening questions on oHL | 1 | HL |
| DHLI (3 subscales, adapted for Covid-19) | 1 | dHL |
| DHLI (5 subscales, adapted for Covid-19) | 1 | dHL |
| eHEALS-carer | 1 | dHL |

Regarding the validation and sensitiveness documented in relation to these monitoring tools it can be concluded with the literature review that most of these tools were already validated before the short and recent timespan of this literature review (years 2018–2022). Validations

conducted during the timespan were mostly linguistic validations and in less extent for different target populations.

The following chapters of this report will present the tools used to assess (d)HL of specific target groups.

### CHILDREN

Three tools used to measure (d)HL of children (<13 yr.) were identified. These were HLS-Child-Q15 (n=2), QUICK-K (n=1) and HLS-EU-Q (adapted version with 26 items) (n=1), latest of which was ultimately further developed by the authors into the HLS-Child-Q15 tool. All the tools used with child populations were related to HL and none to dHL (Table 84).

*Table 84. (d)HL measuring tools for children.*

| HL & dHL measuring tools | Number of times used | HL or dHL |
|---|---|---|
| HLS-Child-Q15 | 2 | HL |
| QUICK-K | 1 | HL |
| HLS-EU-Q (age adapted version with 26 items) | 1 | HL |

### ADOLESCENTS

Eight different tools had been used in measuring (d)HL levels of adolescents (≥13 yr.). These tools were HLSAC (n=9), HLS-EU-Q16 (n=3), MOHLAA-Q (n=3), EMHL (n=2), a broad 55-item paper-and-pencil test (n=1), HAS-A (n=1), NVS-PTeen (n=1) and MeHLA (n=1). Interestingly, as with children, none of the tools were related to dHL (Table 85).

*Table 85. (d)HL measuring tools for adolescents.*

| HL & dHL measuring tools | Number of times used | HL or dHL |
|---|---|---|
| HLSAC | 9 | HL |
| HLS-EU-Q16 | 3 | HL |
| MOHLAA-Q | 3 | HL |
| EMHL | 2 | HL |
| A broad 55-item paper-and-pencil test | 1 | HL |
| HAS-A | 1 | HL |
| NVS-PTeen | 1 | HL |
| MeHLA | 1 | HL |

## STUDENT POPULATIONS

A total of 12 tools were identified from the studies aimed at measuring (d)HL of student populations (mainly college and/or university students). These were HLS-EU-Q16 (n=3), eHEALS (n=3), DHLI (n=2), DHLI. 5 subscales adapted for COVID-19 (n=2), HLQ (n=2), HLS-EU-Q47 (n=1), eHLA (n=1), DHLI. 3 subscales adapted for COVID-19 (n=1), 62-item online mHL questionnaire (n=1), EHILS (n=1), MHLq-Young adult (n=1) and three pre-validated screening questions on oHL (n=1). Seven of the identified tools had only been used in one article. Five of the tools were related to dHL (Table 86).

*Table 86. (d)HL measuring tools for student populations.*

| HL & dHL measuring tools | Number of times used | HL or dHL |
|---|---|---|
| HLS-EU-Q16 | 3 | HL |
| eHEALS | 3 | dHL |
| DHLI | 2 | dHL |
| DHLI. 5 subscales adapted for COVID-19 | 2 | dHL |
| HLQ | 2 | HL |
| HLS-EU-Q47 | 1 | HL |
| eHLA | 1 | dHL |
| DHLI. 3 subscales adapted for COVID-19 | 1 | dHL |
| 62-item online mHL questionnaire | 1 | HL |
| EHILS | 1 | HL |
| MHLq-Young adult | 1 | HL |
| Three pre-validated screening questions on oHL | 1 | HL |

## GENERAL POPULATIONS

Twenty-two tools used for measuring (d)HL of general populations were identified, the most frequently used being HLS-EU-Q16 (n=17), HLS-EU-Q47 (n=11), eHEALS (n=8), NVS (n=7), and HLS-EU-Q6 (n=6). Five of total 22 tools were related to dHL and 12 of the tools had only been used once during the timespan (Table 87).

*Table 87. (d)HL measuring tools for general populations.*

| HL & dHL measuring tools | Number of times used | HL or dHL |
|---|---|---|
| HLS-EU-Q16 | 17 | HL |
| HLS-EU-Q47 | 11 | HL |
| eHEALS | 8 | dHL |
| NVS | 7 | HL |

| | | |
|---|---|---|
| HLS-EU-Q6 | 6 | HL |
| HLQ | 4 | HL |
| SAHL | 3 | HL |
| eHLA | 2 | dHL |
| Chew Screening Questions | 2 | HL |
| HLS19-Q12 | 2 | HL |
| eHLQ | 1 | dHL |
| S-TOFHLA | 1 | HL |
| DHLI | 1 | dHL |
| FCCHL | 1 | HL |
| BRIEF | 1 | HL |
| SAHLPA-23 | 1 | HL |
| A computer-based and performance-based instrument to assess HL skills for informed decision making in colorectal cancer screening | 1 | HL |
| eHEALS-carer | 1 | dHL |
| G-HL | 1 | HL |
| Lenartz's German HL questionnaire | 1 | HL |
| MHLS | 1 | HL |
| OHLP | 1 | HL |

## PATIENT POPULATIONS

A number of 20 different tools were identified from studies targeting patient populations, of which the most frequently used were HLS-EU-Q16 (n=8) and HLQ (n=8). Only three out of 20 tools used with patient populations were related to dHL and 11 of the tools had only been used in one article (Table 88).

*Table 88. (d)HL measuring tools for patient populations.*

| HL & dHL measuring tools | Number of times used | HL or dHL |
|---|---|---|
| HLS-EU-Q16 | 8 | HL |
| HLQ | 8 | HL |
| SILS | 4 | HL |
| HLS-EU-Q47 | 3 | HL |
| NVS | 3 | HL |
| eHEALS | 3 | dHL |
| BHLS | 2 | HL |
| FCCHL | 2 | HL |
| BRIEF | 2 | HL |

| | | |
|---|---|---|
| HLSAC | 1 | HL |
| eHLA | 1 | dHL |
| eHLQ | 1 | dHL |
| HLS-EU-Q6 | 1 | HL |
| IMETER | 1 | HL |
| SAHLSA-50 | 1 | HL |
| S-CCHL | 1 | HL |
| CHLT-30 | 1 | HL |
| REALD-30 | 1 | HL |
| GROHL | 1 | HL |
| RALPH | 1 | HL |

### MIGRANTS

Three different tools used for measuring (d)HL of migrants were identified. These were HLS-EU-Q16 (n=4), eHEALS (n=2) and ILS-PT (n=1). One of the tools was related to dHL (Table 89).

*Table 89. (d)HL measuring tools for migrants.*

| HL & dHL measuring tools | Number of times used | HL or dHL |
|---|---|---|
| HLS-EU-Q16 | 4 | HL |
| eHEALS | 2 | dHL |
| ILS-PT | 1 | HL |

### HEALTH CARE PROFESSIONALS

From studies targeting health care professionals, six different measuring tools were identified. These tools were CHAT (n=1), V-HLO (n=1), S-TOFHLA (n=1), HLQ (n=1), eHEALS (n=1) and IMETER (n=1). Notably, none of the tools had been used in more than one article and only one was related to dHL. One of these tools (V-HLO) was an organizational level self-assessment tool for measuring health literate organisations and monitoring organizational HL in health care contexts (Table 90).

*Table 90. (d)HL measuring tools for health care professionals.*

| HL & dHL measuring tools | Number of times used | HL or dHL |
|---|---|---|
| CHAT | 1 | HL |
| V-HLO | 1 | HL |
| S-TOFHLA | 1 | HL |

| | | |
|---|---|---|
| HLQ | 1 | HL |
| eHEALS | 1 | dHL |
| IMETER | 1 | HL |

#### OLDER ADULTS

Four different tools have been used to measure (d)HL levels of older adult populations. The tools used were HLS-EU-Q16 (n=4), HLS-EU-Q47 (n=1), REALD-30 (n=1) and eHEALS (n=1). One of the tools was related to dHL (Table 91).

*Table 91. (d)HL measuring tools for older adults.*

| HL & dHL measuring tools | Number of times used | HL or dHL |
|---|---|---|
| HLS-EU-Q16 | 4 | HL |
| HLS-EU-Q47 | 1 | HL |
| REALD-30 | 1 | HL |
| eHEALS | 1 | dHL |

### 3.4.5 WORKSHOP 2: THE NETWORK OF CHAMPIONS

On the 27th of January 2023 a workshop to validate the results of task 1.1, 1.2 and 1.3 was held with the identified network of champions. Champions were authors of the studies identified to be describing best practices and champions in promoting HL and dHL. Furthermore, the partners in IDEAHL consortium were asked to identify some national champions, who were also invited.

For the workshop, 41 persons did register of which 22 were champions. The workshop aimed to discuss the results and findings from T1.1 and T1.2. The working group of WP1 decided to also include the results from T1.3 to the discussion. Results and findings were presented from the following topics: 1) Initiatives, innovation, and actions in promoting HL and dHL, 2) best practices to support HL and dHL, 3) tools for measuring HL and dHL levels in the EU, and 4) levels of HL and dHL in the EU After the presentations, the champions were asked to comment on the results and give important insight to the findings.

#### DISCUSSION ABOUT (D)HL INTERVENTIONS

The champions mainly agreed with the results of task 1.1, emphasising that interventions should be culturally tailored and should consider cultural differences. Moreover, the champions

emphasised the need for education and training of citizens, as HL tools are easier to use for highly educated than for vulnerable groups or they need more support in using them. Some suggested that digital literacy and HL should be integrated into school curriculums. Additionally, champions highlighted needs assessment as a driver towards more successful interventions, especially at individual and group level.

On the other hand, champions found it surprising that in group level, schools and sport settings were more visible than for example migrant groups.

### DISCUSSIONS ABOUT BEST PRACTICES TO SUPPORT HL AND DHL

The champions argued that more evidence on (d)HL interventions can be created through proper evaluation of interventions. Evaluation should be embedded in the actions from the beginning and should focus on both the process and the outcomes of interest. Moreover, evaluation should always be realistic and sensitive to the contexts and circumstances. The champions suggested to use realistic evaluation designs to capture both process, outcomes, and context of the interventions to gain more knowledge about best practices for improving (d)HL.
In this way, it is also possible to combine qualitative and quantitative studies in the evaluation, which was emphasised by the champions, as there are limitations with both methods, and they cannot capture all the aspects of the multidimensional HL concept.

### DISCUSSIONS ABOUT THE TOOLS FOR MEASURING HL AND DHL LEVELS IN THE EU

Also in this discussion, the champions had valuable insights to qualify the findings. For example, one champion explained that in the European M-POHL-network (WHO Action Network on Measuring Population and Organizational HL) it was decided that they are not recommending the HLS-EU Q47/Q16 anymore, but instead the Q12 version, as the Q12 has been evaluated as having the best psychometric results among HLS-measurement tools. Still, HLS EU-Q16 has known limitations which affected the decision to recommend the HLS19-Q12 short version.

Another point mentioned by the champions was that different tools suit different settings. For example, one Champion argued that HLQ is suitable to use in clinical practice.
Furthermore, the champions pointed out that the best (d)HL tool is the one that matches the purpose and has the strongest evidence base. Still, sometimes the choice of a tool is made by the availability of it in the needed language, and the champions had the experience that there is a lack of resources in the translation work of different measurement tools. Lastly, champions mentioned that it is important to keep in mind that all tools cannot capture the multidimensional

concept of (d)HL. Therefore, the best suitable tool should be chosen based on available evidence regarding setting and target group.

#### DISCUSSION ABOUT THE LEVELS OF HL AND DHL IN THE EU

In this discussion, the champions stated that the key findings in task 1.3 are quite similar to that of the M-POHL-report. It was pointed out that the M-POHL report should be considered in the reporting of (d)HL levels in the EU, as in the report digital aspects are included. The champions argued that (d)HL levels should be measured for EU populations in general, as it is important to have a possibility to compare (d)HL levels of specific groups to that of the general population. Finally, the champions argued that immigrants and populations that are struggling to access digital tools due to poor digital literacy were the subpopulations they found important to address in the development of the EU strategy.

### 3.4.6 CONCLUSIONS ON TASK 1.3

This literature review shows that (d)HL levels of different populations and/or validation of tools to measure (d)HL have been studied between 2018 and 2022 in 81% (22 out of 27) of the EU countries. However, only 20% of these studies were targeting on dHL and only 44% of EU countries had at least one dHL article published during the timespan. The German population was studied the most both regarding HL and dHL. The studies focused primary on general (mainly adult) populations followed by patient populations, student populations and adolescents.

In total, the literature review identified 55 different tools to measure (d)HL and from these tools seven aimed to measure dHL. From all the tools HLS-EU-Q16 was clearly the most often used to measure HL and eHEALS to measure dHL. When adolescents were the target group, HLSAC tool was clearly the most often used tool. Utilization of various (d)HL tools causes challenges in making comparisons of study results. Over half (56%) of the tools had only been used in a single article during the four-year timespan.

Based on the most representative large-scale studies, with sample sizes of thousands or at least several hundred individuals using HLS-EU-Q16 tool as a measuring instrument, it can be concluded that the prevalence of people with problematic or inadequate HL in the EU is 40±13% (mean±SD). This is well in line with recent reviews of EU samples of Baccolini et al. (2021) (141) and Nawabi et al. (2021) (142). Based on those few large-scale studies that reported dHL levels it can be estimated that people with limited/problematic/inadequate dHL (depending on the scale of the measuring tool) is approximately 48±6%. However, it must be kept in mind that this

calculation is still based on a limited amount of data. More research with unified tools is needed to conclude the dHL levels of various EU populations.

# 4. LIMITATIONS

## 4.1 BROAD SEARCHES

A scoping review often leads to a broader, less defined search and requires multiple structured searches instead of one. This combined with the fact that the research questions are rather broad, striving to answer many different things, resulted in a huge amount of literature (many hits), indicating that the search strategy is broad and could have been more well-defined. Due to this, we had to change exclusion criteria for task 1.3 following the first selection process, excluding studies beyond the EU to be able to manage all references within the timeframe given. The broad searches and many hits are very time-consuming and cannot be recommended.

## 4.2 VARIOUS UNDERSTANDINGS OF RESEARCH QUESTIONS

Additionally, there was variation in the understanding of the research questions among partners, which affected the selection of studies and reduced the stringency in the selection process. Co-creation was the key to the detailed stages of data extraction and charting. The consortium developed the data charting form and had several discussions about which variables to extract and why. This was time consuming as the provision of support and guidance for partners throughout the process. It has been beneficial to be a 'large' team because of the larger volume of literature in all three searches. However, the large team also means that there is a potential variation in the conduction of the three searches. Further, the partners come from various institutions and thus have different experiences regarding reviews, which affected the inclusion of studies in the three searches. This variability in understanding appears even belonging to the same institution. Well established definition of items and previous training are needed. A pilot search to validate criteria would have been of help. Obviously, time constrains have prevented of doing so. This is a crucial limitation. On this basis, a second assessment of selected studies was carried out by the academic partners to ensure fulfilment of inclusion criteria. Due to this process of moving studies back and forth, it has not been possible to present a flow diagram of the selection process, which obviously decreases the transparency of the process. Additionally, not all DOSIS-guides and process reports were made available, which adds to the opaqueness of the process. Even if we had followed the initial plan, it is uncertain if all relevant literature was included or if some were excluded because the inclusion criteria were not understood in the same way, due to many partners contributing in the process. For future studies, it is recommended that literature searches do not include too many partners, as this reduces the stringency and transparency of the searches. A recommendation is therefore to reduce the number of people to

conduct the literature searches or to conduct a pilot phase to train and validate definitions and eligibility criteria.

### 4.3 NO QUALITY ASSESSMENTS

Aligned with the methods used in scoping reviews, the mapping did not include a quality assessment of the studies or their approaches to evaluation and monitoring, nor did it make judgments about whether the data collection tools used in these studies, measured HL adequately. Studies containing measures of HL were included on the basis that the authors considered the intervention or programme to be about aspects of HL and deemed the tools they used to be a measure of HL. To assess the quality, we therefore relied on our network of specialists to qualify the findings during the two workshops.

### 4.4 LIMITATIONS TO THE SEARCH IN TASK 1.3

The literature search was conducted to cover a limited time span of four years (2018–2022). The most often used measuring tools had already been validated before this time span. Therefore, we were not able to capture all relevant studies regarding the validation of different tools in the analysis. In task 1.3 we were only able to capture the frequency of use of HL and dHL tools and did not take into consideration, e.g., the detailed psychometric properties of the identified tools.

Due to the massive expansion of literature covering HL and dHL levels and/or validation of tools it was necessary to countries beyond EU member countries and research studies. This excluded European countries outside of the Union as well as studies from other parts of the globe. This may affect the results related to the most commonly used tools.

### 4.5 OTHER LIMITATIONS

Also, some publications might have been overseen, as only publications in English and the languages represented by the members of the consortium were included. This concerns grey literature more than scientific papers, as these often has an abstract and keywords in English. The same accounts for excluding publication, that were not available in full text at the institutions represented by the members of the consortium.

# 5. CONCLUSIONS

## 5.1 TASK 1.1

The mapping of (d)HL research showed that (d)HL, especially HL, is a widely researched subject in EU and beyond. Interventions on policy, organizational, group and individual level with great heterogeneity in aim, target groups, settings, key factors, drivers, barriers and outcomes were found, which highlights the many different trends within this field of research.

It has not been possible to divide the identified (d)HL interventions into how they relate to management of health data, integration of healthcare and social services, and social innovation, as the categorization was not possible based on the available information. Instead, a more widely approach describing settings in general were obtained, to show the variety of settings in which HL intervention research has been conducted. Likewise, the consortium applied a wider approach to addressing target groups than solely focusing on the target groups predefined in the Grant Agreement, as it was considered appropriate to show the variety of research targeting many different groups. Generally, studies did address groups with different demographic, social, cultural and gender characteristics, but no comparisons between target groups with different demographic, social, cultural and gender characteristics were found. Therefore, it hasn't been possible to determine the role of these factors when working on improving HL and health and wellbeing. Even so, it is considered appropriate to target interventions towards groups of individuals with inadequate HL, as these might benefit the most from interventions. Groups with inadequate HL are highlighted in the conclusion on task 1.3 below.

Most of the research identified did aim at improving HL, while the link between improved HL and physical, mental, and social health and wellbeing of citizens were not addressed directly. Therefore, the link between HL and health and well-bring remains unclear. Still, it is commonly acknowledged that HL plays a role in obtaining better health, and therefore it is believed that the identified interventions can guide and inspire the development of the EU strategy for (d)HL.

Based on the findings, a shared strategy for improving (d)HL in EU seems like a great step in the right direction. The mapping has underlined different things that should be taken into account in the development of the strategy, e.g. 1) a need for stating clear objectives, 2) a focus on cross sectoral interventions, 3) a focus on tailoring interventions to specific settings and target groups of special interest, 4) to build interventions on already available evidence linked to the target group and setting, for example the MHFA-training method for improving mHL in adolescents at school and 5) a focus on co-creating interventions the target groups of interest.

As a final remark, it should be noticed that most studies did not report in drivers and barriers of the interventions, making it difficult to determine important factors to consider when developing, implementing, and evaluating (d)HL interventions. Therefore, conclusions should be read with cautiousness, bearing in mind, that more research is needed.

### 5.2 TASK 1.2

Among interventions that have succeeded with (d)HL initiatives, and thus can be categorized as champions, there was great diversity in outcomes related to (d)HL. Interventions aiming at training health care professionals, patients, caregivers, or others were found in most of the studies. More research is needed either to study new areas or to replicate studies with promising results. Among the non-categorised studies, it was not possible to determine whether the interventions were promoting HL or not, mostly because it wasn't the aim of the studies to assess effectiveness. Despite that, the studies pointed at tendencies that best practices can be based on like; training, teamwork, clear and context and relevant commination (plain language) in addition to, contact-based education that gives the opportunity to explore perspectives, sufficient time, and organisational readiness.

Due to the heterogeneity of the interventions found, it is not possible to conclude on core elements that are essential when designing (d)HL interventions in general. Additionally, the analysis has highlighted the need for further research and reporting on core resources and mechanism in (d)HL interventions, as information on these elements are widely missing from the identified literature. This further impede the possibility to concretize best practices within the field of (d)HL. Following this, it has been difficult to conclude on recommended supporting tools, financial supporting schemes, monitoring and evaluation measures.

Instead, these findings on best practices should be seen as an inspirational guidance when developing interventions targeting (d)HL for specific target groups in specific settings. Alongside the findings from the literature review, obstacles and difficulties and areas of improvement highlighted by researchers in the field of (d)HL is important to consider, when designing new interventions. E.g., securing a trusted relation between the patient/citizen and the social-, and health professionals and training health care professionals in digital skills. Likewise, demographic factors leading to inequity should be considered like ethnicity, education level, socio-economic status, and access to digital solutions.

### 5.3 TASK 1.3

Results from the literature review including 163 studies have shown that between 2018–2022 the (d)HL of EU populations were measured with 55 different measuring tools. This is very much in line with a study by Rowland et al. (2019) (140)that found in total 58 measurement tools to be used to measure personal HL. From these 31 were published HL instruments and 27 were custom, article-specific, tools. This large variance in measuring tools makes it difficult to conclude about HL levels of EU populations. However, 81% (22 out of 27) of EU countries had at least one article published about (d)HL levels of target populations or about the validation of tools to measure (d)HL demonstrating the increasing global interest in the topic. 80% of the research between 2018 and 2022 concentrated on HL and only 20% to dHL. Among the EU countries 44% had at least one article published about dHL levels and/or validation of tools to assess dHL.

When analysed is based on all the representative studies of this literature review (those studies highlighted at 'Highlights' boxes of each country) it can be concluded that people with low/limited/problematic/inadequate/insufficient (based on the scale of the measuring tool) HL is approximately 35±20% (mean±SD). This result is in line with Baccolini et al. (2021) (141)which concluded with a Systematic Review and Meta-analysis including 62 studies from the majority of EU countries that the percentage of people with low HL is between 27-48% depending on the HL items investigated. Based on those large-scale studies that only categorized HL into two categories (adequate/limited, high/low, adequate/inadequate, sufficient/low) (n=4; tools oHL, BRIEF, HLS-EU-Q16, HLS19-Q12) it can be suggested that people with low/limited/inadequate HL is approximately 50±20%. However, more reliable results could probably be estimated when comparing the results from studies that use the same tool to assess HL. The most often used measurement tool was HLS-EU-Q16 and the most often used way to categorize HL levels was to label them adequate, problematic, and inadequate HL. Based on the most representative large-scale studies that used HLS-EU-Q16 tool as a measurement instrument (n=15) it can be concluded that people with problematic or inadequate HL in the EU is 40±13%. This is again in line with Baccolini et al. (2021) and close to that found by Nawabi et al. (2021) which concluded with a Systematic Review of 14 studies and including data from 10 EU countries and several countries outside the EU, that percentage of people with limited HL is 45,5%. The percentage of people with inadequate/insufficient HL category (the lowest category) measured with HLS-EU-Q16 was found to be 13±4%. Another quite often used tool in large-scale studies and mainly with adolescent populations was HLSAC tool that categorized HL levels as high, average, and low. Based on those large-scale studies that used HLSAC tool to assess HL (n=5) it can be concluded that the percentage of (mainly) adolescents with low HL was 12±6%.

It is interesting to note that although several EU countries such as Spain, the Netherlands, France, and Finland had many (five to 11) HL studies published between 2018–2022 about HL levels and/or validation of tools, none of these studies targeted dHL. This is interesting especially because from these countries Finland and the Netherlands are ranked, together with Denmark, among top three in the Digital Economy and Society Index (DESI) 2022. DESI score ranks Member States according to their level of digitalization, summarizes indicators on Europe's digital performance and tracks the progress of EU countries. All these four countries have the above average DESI score in Europe: Finland is 1st, Netherland 3rd, Spain 7th and France 12th in DESI scores in 2022. At least based on this literature review dHL levels of populations in these four countries are not measured and therefore dHL levels are unknown.

All in all, based on the results of the literature review, it is too early to make strong conclusions about the dHL levels of target populations in the EU. As mentioned, most of the research (80%) between 2018 and 2022 was not concentrated on dHL and those studies that did target dHL, were often validation studies. 55.6% (15 out of 27) of EU countries did not have any studies published between 2018 and 2022 about dHL levels and/or validation of tools to measure dHL. Seven different tools were found to assess dHL: eHEALS, eHLA, eHLQ, DHLI (and its two variations) and eHEALS-carer. In addition, some HL tools included dHL components. Based on those few large-scale studies that reported dHL levels (n=3) it can be estimated that for people with limited/problematic or inadequate dHL (tools: DHLI, eHEALS, HLS19-Q12: digital HL) is approximately 48±6%. This is very much in line with the number of people with limited/problematic or inadequate HL. However, it must be kept in mind that, as mentioned, these calculations are based on the limited amount of data. More research with unified tools is needed about the dHL levels among various EU populations.

## 5.4 FINAL RECOMMENDATIONS

Below you will find the (d)HL recommendations and guidelines based on the findings of this report. It must be noted that all these recommendations are based on research studies so the tools identified in these studies can mainly be recommended for research purposes. They may not be suitable e.g., for clinical use as such and to recommend tools for clinical settings requires further research. In addition, these recommendations and guidelines are based on analysing the frequency of the measuring tools used in research studies which provides only one viewpoint to the (d)HL discussion.

**Recommendations and guidelines for the strategic level**

1. It is recommended to have a shared strategy and action plan to guide the improvement of (d)HL in the EU.

2. It is recommended to develop interventions aiming at changing determinants at different socioecological levels to improve the chance of successful and sustainable outcomes

3. It is recommended to consider demographic, social, cultural and gender aspects to target interventions towards groups of individuals with inadequate HL, as these might benefit the most from interventions.

**Recommendations and guidelines for best practices**

4. More research is needed to manifest best practices for improving (d)HL as the research show great diversity. Still, it is recommended to base future interventions on available evidence base within the target group and setting of interest.

5. It is recommended to focus future research towards generating more evidence about resources, mechanisms, drivers, and barriers in (d)HL interventions, as these aspects are poorly illuminated in existing evidence.

**Recommendations and guidelines for evaluation and monitoring**

6. It is recommended to develop proper evaluation designs for complex interventions like (d)HL interventions, for example inspired by realistic evaluation (299) or Intervention Mapping (300). In this way, it is also demanded to focus on resources, mechanisms, drivers, and barriers.

7. The most frequently used measuring tools in our data were HLS-EU-Q16 for HL and eHEALS for dHL. These tools have mostly been used with students, general adult populations, migrants, patient populations and older adults in the EU countries. However, it is important to note, that this review was only able to capture the frequency of use and did not, e.g., take into consideration the psychometric properties

or the specific contents of the instruments. The choice of tools should be based on the context and the target sample. The used tools should also be validated, translated, up to date and able to capture the levels of HL or dHL accordingly.

8. More research is needed to be able to make recommendations about tools for measuring dHL of children and adolescents. None of the studies in this literature review studied dHL of children and adolescents in EU countries. It would be advisable to study existing tools and further develop them for the target group if possible since the variety of tools is already quite extensive.

9. To facilitate the comparison and synthesis of (d)HL study results, the use of common measuring tools throughout the EU can be recommended. The most appropriate tools for different target groups should be chosen, and these tools should then be used continuously and uniformly across the EU countries. This could allow for comparison across populations, cultures, countries etc. and therefore for receiving a more unified and comprehensive picture of the status of (d)HL levels among different population groups in the EU. The data of this literature review lacked representative population-based samples on HL and dHL levels. Using these kinds of samples could possibly be useful in the future when assessing HL and dHL levels and planning interventions.

**Recommendations and guidelines regarding strategic core elements if (d)HL interventions**

10. It is recommended to have a shared strategy and action plan to guide the improvement of (d)HL in the EU.

11. It is recommended to develop interventions aiming at changing determinants at different socioecological levels to improve the chance of successful and sustainable outcomes

12. More research is needed to manifest best practices for improving (d)HL as the research show great diversity. Still, it is recommended to base future interventions on available evidence base within the target group and setting of interest both in relation to activities and monitoring tools.

13. It is recommended to focus future research towards generating more evidence about resources, mechanisms, drivers, and barriers in (d)HL interventions, as these aspects are poorly illuminated in existing evidence.

14. Even so, it is considered appropriate to target interventions towards groups of individuals with inadequate HL, as these might benefit the most from interventions.

In addition, it seems mandatory to include demographic, social, cultural and gender aspects, and finding target groups in need of (d)HL interventions, indicating that there is a need to focus on inclusion, gender, ethics, and privacy dimensions and vulnerable target groups that need special attention.

The most frequently used measuring tools in our data for were HLS-EU-Q16 for HL and eHEALS for dHL. These tools have mostly been used with students, general adult populations, migrants, patient populations and older adults in the EU countries. However, it is important to note, that this review was only able to capture the frequency of use and did not e.g., take into consideration the psychometric properties or the specific contents of the instruments. The choice of tools

should be based on the context and the target sample. The used tools should also be validated, translated, up to date and able to capture the levels of HL or dHL accordingly.

More research is needed to be able to make recommendations about tools for measuring dHL of children and adolescents. None of the studies in this literature review studied dHL of children and adolescents in EU countries. It would be advisable to study existing tools and further develop them for the target group if possible since the variety of tools is already quite extensive.

To facilitate the comparison and synthesis of (d)HL study results, the use of common measuring tools throughout the EU can be recommended. The most appropriate tools for different target groups should be chosen, and these tools should then be used continuously and uniformly across the EU countries. This could allow for comparison across populations, cultures, countries etc. and therefore for receiving a more unified and comprehensive picture of the status of (d)HL levels among different population groups in the EU. The data of this literature review lacked representative population-based samples on HL and dHL levels. Using these kinds of samples could possibly be useful in the future when assessing HL and dHL levels and planning

## 6. REFERENCES

1. Sørensen K, van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: A systematic review and integration of definitions and models. BMC Public Health [Internet]. 2012;12(1):80. Available from: https://doi.org/10.1186/1471-2458-12-80

2. Norman CD, Skinner HA. eHEALS: The eHealth Literacy Scale. J Med Internet Res [Internet]. 2006 Nov 14;8(4):e27. Available from: http://www.jmir.org/2006/4/e27/

3. World Health Organization. Everybody's business : strengthening health systems to improve health outcomes : WHO's frmaework for action. World Health Organization; 2007. 44 p.

4. Segen JC. Concise dictionary of modern medicine. 1st ed. New York: The McGraw-Hill Companies; 2002.

5. Tzourakis MC. The Health Care Industry and Data Quality. ICIQ Proceedings. 1996.

6. OECD. Social Innovation [Internet]. [cited 2023 Feb 7]. Available from: extension://elhekieabhbkpmcefcoobjddigjcaadp/https://ucndk-my.sharepoint.com/personal/cbt_ucn_dk/Documents/Skrivebord/OECD.pdf

7. The finnish institute for Health and Welfare (2022).

8. Best Practice Portal [Internet]. EU. 2023 [cited 2023 Feb 7]. Available from: https://webgate.ec.europa.eu/dyna/bp-portal/

9. Okan O. International handbook of health literacy : research, practice and policy across the lifespan. 2019. 740 p.

10. European Health and Digital Executive agency (HADEA). Grant Agreement-101057477-IDEAHL 19052022. Grant Agreement Project 101057477 - IDEAHL.

11. IDEAHL [Internet]. EU. 2022 [cited 2023 Feb 7]. Available from: https://ideahl.eu/

12. Grant Agreement-101057477-IDEAHL 19052022.

13. Pollock D, Alexander L, Munn Z, Peters MDJ, Khalil H, Godfrey CM, et al. Moving from consultation to co-creation with knowledge users in scoping reviews: Guidance from the JBI Scoping Review Methodology Group. JBI Evid Synth. 2022 Apr 1;20(4):969–79.

14. Munn Z, Pollock D, Khalil H, Alexander L, McLnerney P, Godfrey CM, et al. What are scoping reviews? Providing a formal definition of scoping reviews as a type of evidence synthesis. Vol. 20, JBI Evidence Synthesis. Lippincott Williams and Wilkins; 2022. p. 950–2.

15. Heijmans Monique, Uiters Ellen, Rose Tamsin, Hofstede Jolien, Devillé Walter, Heide I van der., et al. Study on sound evidence for a better understanding of health literacy in the European Union : final report.

16. Rowlands G, Russell S, O'Donnell A, Kaner E, Trezona A. What is the evidence on existing policies and linked activities and their effectiveness for improving health literacy at national, regional and organizational levels in the WHO European Region? [Internet]. 2018 [cited 2023 Jan 24]. Available from: https://apps.who.int/iris/handle/10665/326251

17. Rowlands G, World Health Organization. Regional Office for Europe. What is the evidence on the methods, frameworks and indicators used to evaluate health literacy policies, programmes and interventions at the regional, national and organizational levels? 72 p.

18. Health Literacy Atlas .

19. Health Literacy Europe .

20. EuroHealthNet.

21. eHealth Action Plan 2012-2020 .

22. Horizon 2020 .

23. IC-Health .

24. Digital Health Europe.

25. Health Literacy in the Nordic Countries .

26. DHE´s practice catalogue .

27. European Health Literacy Survey.

28. Health Literacy Tool Shed (bu.edu) .

29. The HLS-EU questionnaire .

30. The M-POHL network action .

31. WHO Health Literacy Road Map.

32. dosis_guide_eksempel_2 [Internet]. Northerne Denmark, University Collage. [cited 2023 Jan 24]. Available from: https://www.ucnbib.dk/da/page/dosis-guide

33. Covidence [Internet]. Covidence org. [cited 2023 Jan 24]. Available from: https://www.covidence.org/

34. Dahlgren G, Whitehead M. The Dahlgren-Whitehead model of health determinants: 30 years on and still chasing rainbows. Vol. 199, Public health. NLM (Medline); 2021. p. 20–4.

35. Fraser MW, Richman JM, Galinsky mj, Day SH. Intervention Research: Developing Social Programs (Pocket Guide to Social Work Research Methods). Oxford: Oxford University Press; 2009.

36. WHO. WHO adolecents definition. [cited 2023 Feb 20]; Available from: https://www.who.int/health-topics/adolescent-health#tab=tab_1

37. What is the evidence on existing policies and linked activities and their effectiveness for improving health literacy at national, regional and organizational levels in the WHO European Region?

38. Okan O. International handbook of health literacy : research, practice and policy across the lifespan. 740 p.

39. Regional Office for Europe W. Regional Committee for Europe Draft WHO European roadmap for implementation of health literacy initiatives through the life course.

40. Sørensen K, Trezona A, Levin-Zamir D, Kosir U, Nutbeam D. POLICY AND PRACTICE Transforming health systems and societies by investing in health literacy policy and strategy.

41. Brach C, Borsky A. How the U.S. Agency for Healthcare Research and Quality Promotes Health Literate Health Care. In: Studies in Health Technology and Informatics. IOS Press; 2020. p. 313–23.

42. Rowlands G, Russell S, O'Donnell A, Kaner E, Trezona A. What is the evidence on existing policies and linked activities and their effectiveness for improving health literacy at national, regional and organizational levels in the WHO European Region? [Internet]. 2018 [cited 2022 Nov 30]. Available from: https://apps.who.int/iris/handle/10665/326251

43. Brach C, Borsky A. How the U.S. Agency for Healthcare Research and Quality Promotes Health Literate Health Care. In: Studies in Health Technology and Informatics. IOS Press; 2020. p. 313–23.

44. Noordman J, van Vliet L, Kaunang M, van den Muijsenbergh M, Boland G, van Dulmen S. Towards appropriate information provision for and decision-making with patients with limited health literacy in hospital-based palliative care in Western countries: A scoping review into available communication strategies and tools for healthcare providers. Vol. 18, BMC Palliative Care. BioMed Central Ltd.; 2019.

45. Zanobini P, Lorini C, Baldasseroni A, Dellisanti C, Bonaccorsi G. A scoping review on how to make hospitals health literate healthcare organizations. Vol. 17, International Journal of Environmental Research and Public Health. MDPI AG; 2020.

46. Equal access to breast cancer genetic counseling and testing Development and implementation of a health literacy training program for surgical oncologists and specialized nurses [Internet]. 2021. Available from: www.proefschriftmaken.nl

47. de Buhr E, Ewers M, Tannen A. Potentials of school nursing for strengthening the health literacy of children, parents and teachers. Int J Environ Res Public Health. 2020 Apr 1;17(7).

48. Toibin M, Pender M, Cusack T. The effect of a healthcare communication intervention — ask me 3; on health literacy and participation in patients attending physiotherapy . Eur J Physiother. 2017 Oct 31;19(sup1):12–4.

49. Stormacq C, Wosinski J, Boillat E, den Broucke S van. Effects of health literacy interventions on health-related outcomes in socioeconomically disadvantaged adults living in the community: A systematic review. JBI Evid Synth. 2020 Jul 1;18(7):1389–469.

50. Lee OE, Tokmic F. Effectiveness of mental health first aid training for underserved Latinx and Asian American immigrant communities. Ment Health Prev. 2019 Mar 1;13:68–74.

51. Uribe Guajardo MG, Slewa-Younan S, Kitchener BA, Mannan H, Mohammad Y, Jorm AF. Improving the capacity of community-based workers in Australia to provide initial assistance to Iraqi refugees with mental health problems: An uncontrolled evaluation of a Mental Health Literacy Course. Int J Ment Health Syst. 2018 Jan 15;12(1).

52. O'Connell J, Pote H, Shafran R. Child mental health literacy training programmes for professionals in contact with children: A systematic review. Vol. 15, Early Intervention in Psychiatry. Blackwell Publishing; 2021. p. 234–47.

53. Nouri SS, Pathak S, Livaudais-Toman J, Gregorich SE, Kaplan CP, Diamond L, et al. Use and Usefulness of After-Visit Summaries by Language and Health Literacy among Latinx and Chinese Primary Care Patients. J Health Commun. 2020;25(8):632–9.

54. Lexén A, Emmelin M, Hansson L, Svensson B, Porter S, Bejerholm U. Changes in rehabilitation actors' mental health literacy and support to employers: An evaluation of the SEAM intervention. Work. 2021;69(3):1053–61.

55. Carroll JK, Tobin JN, Luque A, Farah S, Sanders M, Cassells A, et al. "Get Ready and Empowered About Treatment" (GREAT) Study: a Pragmatic Randomized Controlled Trial of Activation in Persons Living with HIV. J Gen Intern Med. 2019 Sep 15;34(9):1782–9.

56. Saunders C, Palesy D, Lewis J. Systematic Review and Conceptual Framework for Health Literacy Training in Health Professions Education. Vol. 5, Health Professions Education. King Saud bin Abdulaziz University; 2019. p. 13–29.

57. Warring CD, Pinkney JR, Delvo-Favre ED, Rener MR, Lyon JA, Jax B, et al. Implementation of a routine health literacy assessment at an academic medical center. Journal for Healthcare Quality. 2018;40(5):247–55.

58. O'Connell J, Shafran R, Pote H. A Randomized Controlled Trial Evaluating the Effectiveness of Face-to-Face and Digital Training in Improving Child Mental Health Literacy Rates in Frontline Pediatric Hospital Staff. Front Psychiatry. 2021 Feb 11;11.

59. O'Connell J, Pote H, Shafran R. Child mental health literacy training programmes for professionals in contact with children: A systematic review. Vol. 15, Early Intervention in Psychiatry. Blackwell Publishing; 2021. p. 234–47.

60. van der Giessen JAM, Ausems MGEM, van den Muijsenbergh METC, van Dulmen S, Fransen MP. Systematic development of a training program for healthcare professionals to improve communication about breast cancer genetic counseling with low health literate patients. Fam Cancer. 2020 Oct 1;19(4):281–90.

61. de Buhr E, Ewers M, Tannen A. Potentials of school nursing for strengthening the health literacy of children, parents and teachers. Int J Environ Res Public Health. 2020 Apr 1;17(7).

62. Nouri SS, Pathak S, Livaudais-Toman J, Gregorich SE, Kaplan CP, Diamond L, et al. Use and Usefulness of After-Visit Summaries by Language and Health Literacy among Latinx and Chinese Primary Care Patients. J Health Commun. 2020;25(8):632–9.

63. Shnaigat M, Downie S, Hosseinzadeh H. Effectiveness of Health Literacy Interventions on COPD Self-Management Outcomes in Outpatient Settings: A Systematic Review. Vol. 18, COPD: Journal of Chronic Obstructive Pulmonary Disease. Taylor and Francis Ltd.; 2021. p. 367–73.

64. Hosseinzadeh H, Downie S, Shnaigat M. Effectiveness of health literacy- and patient activation-targeted interventions on chronic disease self-management outcomes in outpatient settings: a systematic review. Vol. 28, Australian Journal of Primary Health. CSIRO; 2022. p. 83–96.

65. Doelen JAM van der. Equal access to breast cancer genetic counseling and testing Development and implementation of a health literacy training program for surgical oncologists and specialized nurses [Internet]. 2021. Available from: www.proefschriftmaken.nl

66. Wynters R, Liddle SK, Swann C, Schweickle MJ, Vella SA. Qualitative evaluation of a sports-based mental health literacy program for adolescent males. Psychol Sport Exerc. 2021 Sep 1;56.

67. Wei Y, Kutcher S, Austen E, Comfort A, Gilham C, MacDougall C, et al. The Impact of Transitions, a Mental Health Literacy Intervention With Embedded Life Skills for Postsecondary Students: Preliminary Findings From a Naturalistic Cohort Study. Canadian Journal of Psychiatry. 2022 Jun 1;67(6):452–61.

68. Sinclair J. Finding a Common Voice: Lessons Learned from a Pilot Mental Health Literacy Intervention for Secondary Students with Disabilities. Exceptionality. 2021;

69. Michalowski M, Austin RR, Mathiason MA, Maganti S, Schorr E, Monsen KA. Relationships among interventions and health literacy outcomes for sub-populations: A data-driven approach. Kontakt. 2018 Dec 1;20(4):e319–25.

70. Loureiro LM de J, da Costa LMBV. Evaluation of the mental health first aid program in undergraduate nursing students. Revista de Enfermagem Referencia. 2019;2019(20):9–18.

71. Lindow JC, Hughes JL, South C, Minhajuddin A, Gutierrez L, Bannister E, et al. The Youth Aware of Mental Health Intervention: Impact on Help Seeking, Mental Health Knowledge, and Stigma in U.S. Adolescents. Journal of Adolescent Health. 2020 Jul 1;67(1):101–7.

72. Hart LM, Morgan AJ, Rossetto A, Kelly CM, Gregg K, Gross M, et al. teen Mental Health First Aid: 12-month outcomes from a cluster crossover randomized controlled trial evaluation of a universal program to help adolescents better support peers with a mental health problem. BMC Public Health. 2022 Dec 1;22(1).

73. Uribe Guajardo MG, Kelly C, Bond K, Thomson R, Slewa-Younan S. An evaluation of the teen and Youth Mental Health First Aid training with a CALD focus: An uncontrolled pilot study with adolescents and adults in Australia. Int J Ment Health Syst. 2019 Nov 30;13(1).

74. Nobre J, Oliveira AP, Monteiro F, Sequeira C, Ferré-Grau C. Promotion of mental health literacy in adolescents: A scoping review. Vol. 18, International Journal of Environmental Research and Public Health. MDPI; 2021.

75. Morony S, Lamph E, Muscat D, Nutbeam D, Dhillon HM, Shepherd H, et al. Improving health literacy through adult basic education in Australia. Health Promot Int. 2018 Oct 1;33(5):867–77.

76. Lo K, Gupta T, Keating JL. Interventions to Promote Mental Health Literacy in University Students and Their Clinical Educators. A Systematic Review of Randomised Control Trials. Health Professions Education. 2018 Sep 1;4(3):161–75.

77. Kurki M, Sonja G, Kaisa M, Lotta L, Terhi L, Susanna HYS, et al. Digital mental health literacy -program for the first-year medical students' wellbeing: a one group quasi-experimental study. BMC Med Educ. 2021 Dec 1;21(1).

78. Maitz E, Maitz K, Sendlhofer G, Wolfsberger C, Mautner S, Kamolz LP, et al. Internet-based health information-seeking behavior of students aged 12 to 14 years: Mixed methods study. J Med Internet Res. 2020 May 26;22(5).

79. Kusaka S, Yamaguchi S, Foo JC, Togo F, Sasaki T. Mental Health Literacy Programs for Parents of Adolescents: A Systematic Review. Vol. 13, Frontiers in Psychiatry. Frontiers Media S.A.; 2022.

80. Morgan AJ, Fischer JAA, Hart LM, Kelly CM, Kitchener BA, Reavley NJ, et al. Does Mental Health First Aid training improve the mental health of aid recipients? the training for parents of teenagers randomised controlled trial. BMC Psychiatry. 2019 Mar 27;19(1).

81. Peyton D, Hiscock H, Sciberras E. Do digital health interventions improve mental health literacy or help-seeking among parents of children aged 2-12 years? A scoping review. In: Studies in Health Technology and Informatics. IOS Press; 2019. p. 156–61.

82. Peyton D, Goods M, Hiscock H. The Effect of Digital Health Interventions on Parents' Mental Health Literacy and Help Seeking for Their Child's Mental Health Problem: Systematic Review. Vol. 24, Journal of Medical Internet Research. JMIR Publications Inc.; 2022.

83. Kaper MS, Reijneveld SA, van Es FD, de Zeeuw J, Almansa J, Koot JAR, et al. Effectiveness of a comprehensive health literacy consultation skills training for undergraduate medical students: A randomized controlled trial. Int J Environ Res Public Health. 2020 Jan 1;17(1).

84. Patafio B, Skvarc D, Miller P, Hyder S. Evaluating a Sport-Based Mental Health Literacy Intervention in Australian Amateur Sporting Adolescents. J Youth Adolesc. 2021 Dec 1;50(12):2501–18.

85. Slewa-Younan S, Guajardo MGU, Mohammad Y, Lim H, Martinez G, Saleh R, et al. An evaluation of a mental health literacy course for Arabic speaking religious and community leaders in Australia: Effects on posttraumatic stress disorder related knowledge, attitudes and help-seeking. Int J Ment Health Syst. 2020 Aug 20;14(1).

86. Yulianti PD, Surjaningrum ER. A review of mental health literacy strategy for adolescence. Vol. 10, International Journal of Public Health Science. Intelektual Pustaka Media Utama; 2021. p. 764–70.

87. Hart LM, Morgan AJ, Rossetto A, Kelly CM, Mackinnon A, Jorm AF. Helping adolescents to better support their peers with a mental health problem: A cluster-randomised crossover trial of teen Mental Health First Aid. Australian and New Zealand Journal of Psychiatry. 2018 Jul 1;52(7):638–51.

88. Liu W. The Effects of Virtual Simulation on Undergraduate Nursing Students' Mental Health Literacy: A Prospective Cohort Study. Issues Ment Health Nurs. 2020;42(3):239–48.

89. Forbes M, Fairlamb H, Jonker L. Impact of patient-held record on knowledge at 1-year follow-up for glaucoma patients: Single-center randomized controlled trial. Eur J Ophthalmol. 2017 Sep 1;27(5):542–7.

90. Queroue M, Pouymayou A, Pereira E, Tzourio C, González-Caballero JL, Montagni I. An interactive video increasing French students' mental health literacy: a mixed-methods randomized controlled pilot study. Health Promot Int. 2021 Dec 13;

91. Burns S, Crawford G, Hallett J, Hunt K, Chih HJ, Tilley PJM. What's wrong with John? a randomised controlled trial of Mental Health First Aid (MHFA) training with nursing students. BMC Psychiatry. 2017 Mar 23;17(1):111.

92. Ridout B, Campbell A. The use of social networking sites in mental health interventions for young people: Systematic review. Vol. 20, Journal of Medical Internet Research. JMIR Publications Inc.; 2018.

93. Gonzalez F, Benuto LT. ¡Yo no Estoy Loca! A Behavioral Health Telenovela Style Entertainment Education Video: Increasing Mental Health Literacy Among Latinas. Community Ment Health J. 2022 Jul 1;58(5):850–61.

94. Patafio B, Miller P, Baldwin R, Taylor N, Hyder S. A systematic mapping review of interventions to improve adolescent mental health literacy, attitudes and behaviours. Vol. 15, Early Intervention in Psychiatry. John Wiley and Sons Inc; 2021. p. 1470–501.

95. Freţian AM, Graf P, Kirchhoff S, Glinphratum G, Bollweg TM, Sauzet O, et al. The Long-Term Effectiveness of Interventions Addressing Mental Health Literacy and Stigma of Mental Illness in Children and Adolescents: Systematic Review and Meta-Analysis. Vol. 66, International Journal of Public Health. Frontiers Media S.A.; 2021.

96. Walters R, Leslie SJ, Polson R, Cusack T, Gorely T. Establishing the efficacy of interventions to improve health literacy and health behaviours: A systematic review. BMC Public Health. 2020 Jun 30;20(1).

97. Visscher BB, Steunenberg B, Heijmans M, Hofstede JM, Devillé W, van der Heide I, et al. Evidence on the effectiveness of health literacy interventions in the EU: A systematic review. BMC Public Health. 2018 Dec 29;18(1).

98. Vila-Candel R, Martínez-Arnau FM, de la Cámara-De las Heras JM, Castro-Sánchez E, Pérez-Ros P. Interventions to improve health among reproductive-age women of low health literacy: A systematic review. Vol. 17, International Journal of Environmental Research and Public Health. MDPI AG; 2020. p. 1–17.

99. Muscat DM, Song W, Cvejic E, Ting JHC, Medlin J, Nutbeam D. The impact of the chronic disease self-management program on health literacy: A pre-post study using a multi-dimensional health literacy instrument. Int J Environ Res Public Health. 2020 Jan 1;17(1).

100. Beauchamp A, Talevski J, Niebauer J, Gutenberg J, Kefalianos E, Mayr B, et al. Health literacy interventions for secondary prevention of coronary artery disease: A scoping review. Vol. 9, Open Heart. BMJ Publishing Group; 2022.

101. Matthijs Bakker M, Putrik P, Aaby A, Debussche X, Morrissey J, Borge CR, et al. Acting together-WHO National Health Literacy Demonstration Projects (NHLDPs) address health literacy needs in the European Region.

102. Seidling HM, Mahler C, Strauß B, Weis A, Stützle M, Krisam J, et al. An Electronic Medication Module to Improve Health Literacy in Patients with Type 2 Diabetes Mellitus: Pilot Randomized Controlled Trial. JMIR Form Res. 2020 Apr 1;4(4).

103. Aida A, Svensson T, Svensson AK, Chung U il, Toshimasa Yamauchi. EHealth delivery of educational content using selected visual methods to improve health literacy on lifestyle-related diseases: Literature review. Vol. 8, JMIR mHealth and uHealth. JMIR Publications Inc.; 2020.

104. Gurung A, Subedi P, Zhang M, Li C, Kelly T, Kim C, et al. Culturally-Appropriate Orientation Increases the Effectiveness of Mental Health First Aid Training for Bhutanese Refugees: Results from a Multi-state Program Evaluation. J Immigr Minor Health. 2020 Oct 1;22(5):957–64.

105. Muller I, Rowsell A, Stuart B, Hayter V, Little P, Ganahl K, et al. Effects on engagement and health literacy outcomes of web-based materials promoting physical activity in people with diabetes: An international randomized trial. J Med Internet Res. 2017 Jan 1;19(1).

106. Hosseinzadeh H, Downie S, Shnaigat M. Effectiveness of health literacy- and patient activation-targeted interventions on chronic disease self-management outcomes in outpatient settings: a systematic review. Vol. 28, Australian Journal of Primary Health. CSIRO; 2022. p. 83–96.

107. Thorsteinsson EB, Bhullar N, Williams E, Loi NM. Schizophrenia literacy: the effects of an educational intervention on populations with and without prior health education. Journal of Mental Health. 2019 May 4;28(3):229–37.

108. Ghorbanian Zolbin M, Huvila I, Nikou S. Health literacy, health literacy interventions and decision-making: a systematic literature review. Vol. 78, Journal of Documentation. Emerald Group Holdings Ltd.; 2022. p. 405–28.

109. Stanifer S, Hoover AG, Rademacher K, Rayens MK, Haneberg W, Hahn EJ. Citizen Science Approach to Home Radon Testing, Environmental Health Literacy and Efficacy. Citiz Sci. 2022;7(1).

110. Perez L.P. PMABGC. Project Title: Improving digital health literacy in Europe Editors Organisation.

111. Rowsell AC. The Health Literacy Divide: User Experiences of Web-Based Tools for Delivering Health Information. 2017.

112. Brown J, Luderowski A, Namusisi-Riley J, Moore-Shelley I, Bolton M, Bolton D. Can a community-led intervention offering social support and health education improve maternal health? A repeated measures evaluation of the pact project run in a socially deprived london borough. Int J Environ Res Public Health. 2020 Apr 2;17(8).

113. Gonzalez F, Benuto LT. ¡Yo no Estoy Loca! A Behavioral Health Telenovela Style Entertainment Education Video: Increasing Mental Health Literacy Among Latinas. Community Ment Health J. 2022 Jul 1;58(5):850–61.

114. Stanifer S, Hoover AG, Rademacher K, Rayens MK, Haneberg W, Hahn EJ. Citizen Science Approach to Home Radon Testing, Environmental Health Literacy and Efficacy. Citiz Sci. 2022;7(1).

115. Gurung A, Subedi P, Zhang M, Li C, Kelly T, Kim C, et al. Culturally-Appropriate Orientation Increases the Effectiveness of Mental Health First Aid Training for Bhutanese Refugees: Results from a Multi-state Program Evaluation. J Immigr Minor Health. 2020 Oct 1;22(5):957–64.

116. Brown J, Luderowski A, Namusisi-Riley J, Moore-Shelley I, Bolton M, Bolton D. Can a community-led intervention offering social support and health education improve maternal health? A repeated measures evaluation of the pact project run in a socially deprived london borough. Int J Environ Res Public Health. 2020 Apr 2;17(8).

117. Muller I, Rowsell A, Stuart B, Hayter V, Little P, Ganahl K, et al. Effects on engagement and health literacy outcomes of web-based materials promoting physical activity in people with diabetes: An international randomized trial. J Med Internet Res. 2017 Jan 1;19(1).

118. Rowsell AC. The Health Literacy Divide: User Experiences of Web-Based Tools for Delivering Health Information [Internet]. 2017 [cited 2022 Nov 30]. Available from:

https://eprints.soton.ac.uk/422237/1/FINAL_TO_SUBMIT_PhDThesis_AliRowsell_11June_2018.pdf

119. Forbes M, Fairlamb H, Jonker L. Impact of patient-held record on knowledge at 1-year follow-up for glaucoma patients: Single-center randomized controlled trial. Eur J Ophthalmol. 2017 Sep 1;27(5):542–7.

120. Seidling HM, Mahler C, Strauß B, Weis A, Stützle M, Krisam J, et al. An Electronic Medication Module to Improve Health Literacy in Patients with Type 2 Diabetes Mellitus: Pilot Randomized Controlled Trial. JMIR Form Res. 2020 Apr 1;4(4).

121. Drye MR. Running head: HEALTHCARE PROVIDER TRAINING ADDRESSING HEALTH LITERACY AND COLLABORATION IN MOBILE CLINICS UTILIZING TEACH-BACK METHODOLOGY AND HEALTHCARE PROVIDER TRAINING A Scholarly Project. 2019.

122. Armstrong-Heimsoth A, Johnson ML, Carpenter M, Thomas T, Sinnappan A. Health Management: Occupational Therapy's Key Role in Educating Clients About Reliable Online Health Information. Open J Occup Ther. 2019 Oct 15;7(4):1–12.

123. Yang HH, Chwa WJ, Yuen SB, Huynh JD, Chan JS, Kumar A, et al. APA Health CARE: A Student-Led Initiative Addressing Health Care Barriers Faced by the Asian and Pacific Islander American Immigrant Population in Los Angeles. J Community Health. 2021 Apr 1;46(2):367–79.

124. Dudovitz R, Teutsch C, Holt K, Herman A. Improving parent oral health literacy in Head Start programs. J Public Health Dent. 2020 Jun 1;80(2):150–8.

125. Duckhorn J, Lappin B, Weinberg J, Zwanziger LL. The FDA's Message Testing: Putting Health Literacy Advice into Practice. Vol. 269, Studies in Health Technology and Informatics. IOS Press; 2020. p. 332–40.

126. Rowlands G, Tabassum B, Campbell P, Harvey S, Vaittinen A, Stobbart L, et al. The evidence-based development of an intervention to improve clinical health literacy practice. Int J Environ Res Public Health. 2020 Mar 1;17(5).

127. Kaper M, Sixsmith J, Meijering L, Vervoordeldonk J, Doyle P, Barry MM, et al. Implementation and long-term outcomes of organisational health literacy interventions

in Ireland and the Netherlands: A longitudinal mixed-methods study. Int J Environ Res Public Health. 2019 Dec 1;16(23).

128. Bender JL, Flora PK, Milosevic E, Soheilipour & S, Maharaj & N, Dirlea & M, et al. Training prostate cancer survivors and caregivers to be peer navigators: a blended online/in-person competency-based training program. Available from: https://peernavigation.truenth.ca/

129. Redfern J, Coorey G, Mulley J, Scaria A, Neubeck L, Hafiz N, et al. A digital health intervention for cardiovascular disease management in primary care (CONNECT) randomized controlled trial. NPJ Digit Med. 2020 Dec 1;3(1).

130. Nguyen H, Phan HT, Terry D, Doherty K, McInerney F. Impact of dementia literacy interventions for non-health-professionals: systematic review and meta-analysis. Vol. 26, Aging and Mental Health. Routledge; 2022. p. 442–56.

131. Bader M, Zheng L, Rao D, Shiyanbola O, Myers L, Davis T, et al. Towards a more patient-centered clinical trial process: A systematic review of interventions incorporating health literacy best practices. Vol. 116, Contemporary Clinical Trials. Elsevier Inc.; 2022.

132. Kaper MS, Sixsmith J, Reijneveld SA, de Winter AF. Outcomes and critical factors for successful implementation of organizational health literacy interventions: A scoping review. Vol. 18, International Journal of Environmental Research and Public Health. MDPI; 2021.

133. Amado-Rodríguez ID, Casañas R, Mas-Expósito L, Castellví P, Roldan-Merino JF, Casas I, et al. Effectiveness of Mental Health Literacy Programs in Primary and Secondary Schools: A Systematic Review with Meta-Analysis. Vol. 9, Children. MDPI; 2022.

134. Ito-Jaeger S, Perez Vallejos E, Curran T, Crawford P. What's Up With Everyone? A qualitative study on young people's perceptions of cocreated online animations to promote mental health literacy. Health Expectations. 2022 Aug 1;25(4):1633–42.

135. Trueheart SL. ScholarWorks Health Literacy Best Practices in Policy Development [Internet]. Available from: https://scholarworks.waldenu.edu/dissertations

136. Niemi CA, Payne AM, Bates R. Development and implementation of a health education station by community health nursing students. Public Health Nurs. 2018 Nov 1;35(6):581–6.

137. Anderson HL, Moore JE, Millar BC. Comparison of innovative communication approaches in nutrition to promote and improve health literacy [Internet]. Vol. 91, Ulster Med J. 2022. Available from: https://library.nhs.uk/wp-content/uploads/sites/4/2020/08/Health-literacy-how-to-guide.pdf

138. Moll SE, VandenBussche J, Brooks K, Kirsh B, Stuart H, Patten S, et al. Workplace Mental Health Training in Health Care: Key Ingredients of Implementation. Canadian Journal of Psychiatry. 2018 Dec 1;63(12):834–41.

139. Khorasani EC, Sany SBT, Tehrani H, Doosti H, Peyman N. Review of organizational health literacy practice at health care centers: Outcomes, barriers and facilitators. Vol. 17, International Journal of Environmental Research and Public Health. MDPI AG; 2020. p. 1–16.

140. Rowlands G, Trezona A, Russell S, Lopatina M, Pelikan J, Paasche-Orlow M, et al. What is the evidence on the methods, frameworks and indicators used to evaluate health literacy policies, programmes and interventions at the regional, national and organizational levels? 2019.

141. Baccolini V, Rosso A, Paolo C di, Isonne C, Salerno C, Migliara G, et al. What is the Prevalence of Low Health Literacy in European Union Member States? A Systematic Review and Meta-analysis. J Gen Intern Med [Internet]. 2021;36(3):753–61. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7947142/pdf/11606_2020_Article_6407.pdf

142. Nawabi F, Krebs F, Vennedey V, Shukri A, Lorenz L, Stock S. Health Literacy in Pregnant Women: A Systematic Review. Int J Environ Res Public Health. 2021;18(7).

143. Fulcher E, Pote H. Psychometric properties of global mental health literacy measures. Mental Health Review Journal. 2021;26(1):87–99.

144. Levic M, Bogavac-Stanojevic N, Krajnovic D. The Instruments Used to Assess Health Literacy and Pharmacotherapy Literacy of Diabetes Mellitus Type 2 Patients: A Scoping Review. Front Public Health. 2021;9:747807.

145. Olecka I, Jurenikova P. HEALTH LITERACY ASSESSMENT TOOLS FOR PATIENTS WITH HYPERTENSION: SCOPING REVIEW. 2019; Available from: https://www.scientific-publications.net/en/article/1001999/

146. Chaves CB, Sequeira C, Duarte JC, Nelas P, Gonçalves A, Santos E. Mental health literacy: a systematic review of the measurement instruments ; Alfabetización en salud mental: una revisión sistemática de los instrumentos de medición. 2022; Available from: https://revista.infad.eu/index.php/IJODAEP/article/view/2285

147. Gerich J, Moosbrugger R. Subjective Estimation of Health Literacy-What Is Measured by the HLS-EU Scale and How Is It Linked to Empowerment? Health Commun. 2018;33(3):254–63.

148. Putz P, Patek A. Health literacy measures are not worse in an urban district high in migration and unemployment compared to a citywide and a national sample. Journal of Public Health-Heidelberg. 2021;

149. Hermans L, den Broucke S van, Gisle L, Demarest S, Charafeddine R. Mental health, compliance with measures and health prospects during the COVID-19 epidemic: the role of health literacy. BMC Public Health. 2021;21(1):1365.

150. Storms H, Aertgeerts B, Vandenabeele F, Claes N. General practitioners' predictions of their own patients' health literacy: a cross-sectional study in Belgium. BMJ Open [Internet]. 2019;9(9):e029357. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6747646/pdf/bmjopen-2019-029357.pdf

151. Paakkari O, Torppa M, Boberova Z, Välimaa R, Maier G, Mazur J, et al. cross-national measurement invariance of the health literacy for school-aged children (HLSAC) instrument. Eur J Public Health [Internet]. 2019;29(3):432–6. Available from: https://libts.seamk.fi/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=136696266&site=ehost-live&scope=site

152. Ritchie D, Hal G van, den Broucke S van. Factors affecting intention to screen after being informed of benefits and harms of breast cancer screening: a study in 5 European countries in 2021. Archives of Public Health. 2022;80(1).

153. Pelikan JM, Ganahl K, Roethlin F. Health literacy as a determinant, mediator and/or moderator of health: empirical models using the European Health Literacy Survey dataset. Glob Health Promot. 2018;25(4):57–66.

154. Brangan S, Ivanišić M, Rafaj G, Rowlands G. Health literacy of hospital patients using a linguistically validated Croatian version of the Newest Vital Sign screening test (NVS-HR). PLoS One. 2018;13(2):e0193079.

155. Efthymiou A, Middleton N, Charalambous A, Papastavrou E. Adapting the eHealth Literacy Scale for Carers of People With Chronic Diseases (eHeals-Carer) in a Sample of Greek and Cypriot Carers of People With Dementia: Reliability and Validation Study. J Med Internet Res. 2019;21(11):e12504.

156. Chraskova M, Hrivnova M, Sofkova T. HEALTH LITERACY LEVEL AMONG FUTURE TEACHERS AT THE BEGINNING OF UNDERGRADUATE EDUCATION. 10th International Conference on Education and Educational Psychology (ICEEPSY). 2019;72:430-+.

157. Rolová G, Barták M, Rogalewicz V, Gavurová B. Health literacy in people undergoing treatment for alcohol abuse – A pilot study. Kontakt [Internet]. 2018;20(4):e394–400. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85054765281&doi=10.1016%2fj.kontakt.2018.09.003&partnerID=40&md5=226ab364a180685ebe404146e7121759

158. Svendsen MT, Bak CK, Sørensen K, Pelikan J, Riddersholm SJ, Skals RK, et al. Associations of health literacy with socioeconomic position, health risk behavior, and health status: a large national population-based survey among Danish adults. BMC Public Health. 2020;20(1):565.

159. Bak CK, Krammer JØ, Dadaczynski K, Orkan O, von Seelen J, Prinds C, et al. Digital Health Literacy and Information-Seeking Behavior among University College Students during the COVID-19 Pandemic: A Cross-Sectional Study from Denmark. Int J Environ Res Public Health. 2022;19(6).

160. Bonde AH, Stjernqvist NW, Klinker CD, Maindal HT, Paakkari O, Elsborg P. Translation and Validation of a Brief Health Literacy Instrument for School-Age Children in a Danish Context. Health Lit Res Pract [Internet]. 2022;6(1):e26–9. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8823463/pdf/hlrp0222bondeelsborgbr-prt.pdf

161. Zenas D, Nielsen MG, Fonager K, Petersen KS, Szulevicz T, Overgaard C. Assessing mental health literacy among Danish adolescents - development and validation of a multifaceted assessment tool (the Danish MeHLA questionnaire). Psychiatry Res. 2020;293:113373.

162. Holt KA, Overgaard D, Engel L v, Kayser L. Health literacy, digital literacy and eHealth literacy in Danish nursing students at entry and graduate level: a cross sectional study. BMC Nurs. 2020;19:22.

163. Friis K, Pedersen MH, Aaby A, Lasgaard M, Maindal HT. Impact of low health literacy on healthcare utilization in individuals with cardiovascular disease, chronic obstructive pulmonary disease, diabetes and mental disorders. A Danish population-based 4-year follow-up study. Eur J Public Health [Internet]. 2020;30(5):866–72. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7536249/pdf/ckaa064.pdf

164. Aaby A, Beauchamp A, O'Hara J, Maindal HT. Large diversity in Danish health literacy profiles: perspectives for care of long-term illness and multimorbidity. 2019; Available from: http://dx.doi.org/10.1093/eurpub/ckz134

165. Kayser L, Karnoe A, Furstrand D, Batterham R, Christensen KB, Elsworth G, et al. A Multidimensional Tool Based on the eHealth Literacy Framework: Development and Initial Validity Testing of the eHealth Literacy Questionnaire (eHLQ). J Med Internet Res. 2018;20(2):e36.

166. Karnoe A, Furstrand D, Christensen KB, Norgaard O, Kayser L. Assessing Competencies Needed to Engage With Digital Health Services: Development of the eHealth Literacy Assessment Toolkit. J Med Internet Res. 2018;20(5):e178.

167. Schwennesen N, Barghadouch A, Olesen K. Health Literacy and self-care among visually impaired people with type 1 diabetes in Denmark. Chronic Illn. 2019;15(2):157–64.

168. Holt KA, Karnoe A, Overgaard D, Nielsen SE, Kayser L, Røder ME, et al. Differences in the Level of Electronic Health Literacy Between Users and Nonusers of Digital Health Services: An Exploratory Survey of a Group of Medical Outpatients. Interact J Med Res. 2019;8(2):e8423.

169. Aaby A, Friis K, Christensen B, Maindal HT. Health Literacy among People in Cardiac Rehabilitation: Associations with Participation and Health-Related Quality of Life in the Heart Skills Study in Denmark. Int J Environ Res Public Health. 2020;17(2).

170. Pinderup T, Bager P. Health literacy and liver cirrhosis: testing three screening tools for face validity. Br J Nurs. 2019;28(7):441–5.

171. Lindskrog S, Christensen KB, Osborne RH, Vingtoft S, Phanareth K, Kayser L. Relationship Between Patient-Reported Outcome Measures and the Severity of Chronic Obstructive Pulmonary Disease in the Context of an Innovative Digitally Supported 24-Hour Service: Longitudinal Study. J Med Internet Res. 2019;21(6):e10924.

172. Kayser L, Karnoe A, Duminski E, Jakobsen S, Terp R, Dansholm S, et al. Health Professionals' eHealth Literacy and System Experience Before and 3 Months After the Implementation of an Electronic Health Record System: Longitudinal Study. JMIR Hum Factors. 2022;9(2):e29780.

173. Jensen NH, Aaby A, Ryom K, Maindal HT. En CHAT om sundhedskompetence - et kvalitativt feasibility studie om the Conversational Health Literacy Assessment Tool (CHAT) i et dansk kommunalt rehabiliteringscenter ; A CHAT about health literacy – a qualitative feasibility study of the Conversational Health Literacy Assessment Tool (CHAT) in a Danish municipal healthcare centre. 2021; Available from: https://pure.au.dk/portal/da/publications/a-chat-about-health-literacy–a-qualitative-feasibility-study-of-the-conversational-health-literacy-assessment-tool-chat-in-a-danish-municipal-healthcare-centre(24ba8874-1065-41b3-878b-57923d5eb4cb).html

174. Summanen AM, Rautopuro J, Kannas LK, Paakkari LT. Objective health literacy skills among ninth graders in Finland: outcomes from a national learning assessment. Scand J Public Health [Internet]. 2022;50(5):646–53. Available from: https://journals.sagepub.com/doi/pdf/10.1177/14034948211019798

175. Kinnunen JM, Paakkari L, Rimpelä AH, Kulmala M, Richter M, Kuipers MAG, et al. The role of health literacy in the association between academic performance and substance use. Eur J Public Health [Internet]. 2022;32(2):182–7. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8975541/pdf/ckab213.pdf

176. Eronen J, Paakkari L, Portegijs E, Saajanaho M, Rantanen T. Health literacy supports active aging. Prev Med. 2021;143:106330.

177. Eronen J, Paakkari L, Portegijs E, Saajanaho M, Rantanen T. Assessment of health literacy among older Finns. Aging Clin Exp Res [Internet]. 2019;31(4):549–56. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6439255/pdf/40520_2018_Article_1104.pdf

178. Ousseine YM, Bouhnik AD, Mancini J. Health Literacy and Clinical Trial Participation in French Cancer Patients: A National Survey. Curr Oncol [Internet]. 2022;29(5):3118–29. Available from: https://mdpi-res.com/d_attachment/curroncol/curroncol-29-00253/article_deploy/curroncol-29-00253.pdf?version=1651149855

179. Rouquette A, Nadot T, Labitrie P, den Broucke S van, Mancini J, Rigal L, et al. Validity and measurement invariance across sex, age, and education level of the French short versions of the European Health Literacy Survey Questionnaire. PLoS One. 2018;13(12):e0208091.

180. Rouquette A, Rigal L, Mancini J, Guillemin F, den Broucke S van, Allaire C, et al. Health Literacy throughout adolescence: Invariance and validity study of three measurement scales in the general population. 2021; Available from: http://hdl.handle.net/2078.1/249774

181. Ousseine YM, Rouquette A, Bouhnik AD, Rigal L, Ringa V, Smith A, et al. Validation of the french version of the functional, communicative and critical health literacy scale (FCCHL). J Patient Rep Outcomes [Internet]. 2018;2. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85053083434&doi=10.1186%2fs41687-018-0027-8&partnerID=40&md5=4d5d98c7decd6ed821b21a59ef9626a1

182. Debussche X, Lenclume V, Balcou-Debussche M, Alakian D, Sokolowsky C, Ballet D, et al. Characterisation of health literacy strengths and weaknesses among people at metabolic

and cardiovascular risk: Validity testing of the Health Literacy Questionnaire. SAGE Open Med. 2018;6.

183. Perrin A, do Prado LS, Duche A, Schott AM, Dima AL, Haesebaert J. Using the Brief Health Literacy Screen in Chronic Care in French Hospital Settings: Content Validity of Patient and Healthcare Professional Reports. Int J Environ Res Public Health. 2021;18(1).

184. Henrard G, Vanmeerbeek M, Buret L, Rademakers J. Dealing with health literacy at the organisational level, French translation and adaptation of the Vienna health literate organisation self-assessment tool. BMC Health Serv Res. 2019;19(1):146.

185. Dadaczynski K, Okan O, Messer M, Leung AYM, Rosário R, Darlington E, et al. Digital Health Literacy and Web-Based Information-Seeking Behaviors of University Students in Germany During the COVID-19 Pandemic: Cross-sectional Survey Study. J Med Internet Res. 2021;23(1):e24097.

186. Steinke S, Koch P, Lietz J, Schillmöller Z, Nienhaus A. Health Literacy, Health Behavior and States of Health among Trainee Personnel in Northern Germany. Healthcare (Basel). 2021;9(6).

187. Schaeffer D, Berens EM, Vogt D, Gille S, Griese L, Klinger J, et al. Health Literacy in Germany. Dtsch Arztebl Int [Internet]. 2021;118(43):723–9. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85122806952&doi=10.3238%2farztebl.m2021.0310&partnerID=40&md5=b2bfc0cb8e9ae40ba0224c542dc882ef

188. Nakata H, Halbach S, Geiser F, Stock S, Kowalski C, Enders A, et al. Health literacy, mental disorders and fear of progression and their association with a need for psycho-oncological care over the course of a breast cancer treatment. Psychol Health Med. 2021;26(7):818–31.

189. Bollweg TM, Okan O, Freţian AM, Bröder J, Domanska OM, Jordan S, et al. Adapting the European Health Literacy Survey Questionnaire for Fourth-Grade Students in Germany: Validation and Psychometric Analysis. Health Lit Res Pract. 2020 Jul 16;4(3):e144–59.

190. Teufl L, Vrtis D, Felder-Puig R. QUIGK-K: An instrument for measuring health literacy in children. Pravention Und Gesundheitsforderung. 2020;15(3):250–5.

191. Bollweg TM, Okan O, Pinheiro P, Bröder J, Bruland D, Freţian AM, et al. Adapting the European Health Literacy Survey for Fourth-Grade Students in Germany: Questionnaire Development and Qualitative Pretest. Health Lit Res Pract [Internet]. 2020;4(2):e119–28. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7213025/pdf/hlrp0420bollweg.pdf

192. Domanska OM, Loer AKM, Stock C, Jordan S. Health literacy and health behavior in adolescence: results of a nationwide online survey among adolescents. Pravention Und Gesundheitsforderung. 2021;

193. Loer AM, Domanska OM, Stock C, Jordan S. Subjective Generic Health Literacy and Its Associated Factors among Adolescents: Results of a Population-Based Online Survey in Germany. Int J Environ Res Public Health. 2020;17(22).

194. Domanska OM, Bollweg TM, Loer AK, Holmberg C, Schenk L, Jordan S. Development and Psychometric Properties of a Questionnaire Assessing Self-Reported Generic Health Literacy in Adolescence. Int J Environ Res Public Health. 2020;17(8).

195. Dadaczynski K, Rathmann K, Schricker J, Bilz L, Sudeck G, Fischer SM, et al. [Digital health literacy of pupils. Level and associations with physical activity and dietary behavior]. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz [Internet]. 2022;65(7–8):784–94. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9160509/pdf/103_2022_Article_3548.pdf

196. Schricker J, Kotarski C, Haja JM, Dadaczynski K, Diehl K, Rathmann K. Health and health behavior among students: associations with health literacy. Pravention Und Gesundheitsforderung. 2020;15(4):354–62.

197. Koch P, Nienhaus A. Occupational safety and health knowledge and health literacy Cross-sectional survey among trainees. Zentralbl Arbeitsmed Arbeitsschutz Ergon. 2022;

198. Reichel JL, Dietz P, Sauter C, Schneider F, Oenema A. Is mental health literacy for depression associated with the intention toward preventive actions? A cross-sectional study among university students. Journal of American College Health. 2021;

199. Mayer AK. Examining the factorial structure and validity of the everyday health information literacy screening tool. Cogent Med [Internet]. 2018;5(1):1–14. Available from: https://www.embase.com/search/results?subaction=viewrecord&id=L625312234&from=export

200. Diederichs C, Jordan S, Domanska O, Neuhauser H. Health literacy in men and women with cardiovascular diseases and its association with the use of health care services-Results from the population-based GEDA2014/2015-EHIS survey in Germany. PLoS One. 2018;13(12).

201. Oedekoven M, Herrmann WJ, Ernsting C, Schnitzer S, Kanzler M, Kuhlmey A, et al. Patients' health literacy in relation to the preference for a general practitioner as the source of health information. BMC Fam Pract [Internet]. 2019;20(1):94. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6612068/pdf/12875_2019_Article_975.pdf

202. Samkange-Zeeb F, Borisova L, Padilla B, Bradby H, Phillimore J, Zeeb H, et al. Superdiversity, migration and use of internet-based health information - results of a cross-sectional survey conducted in 4 European countries. BMC Public Health. 2020;20(1):1263.

203. Berens EM, Pelikan JM, Schaeffer D. effect of self-efficacy on health literacy in the German population. Health Promot Int [Internet]. 2022;37(1):1–10. Available from: https://libts.seamk.fi/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=155523508&site=ehost-live&scope=site

204. Santis KK de, Jahnel T, Sina E, Wienert J, Zeeb H. Digitization and Health in Germany: Cross-sectional Nationwide Survey. JMIR Public Health Surveill. 2021;7(11):e32951.

205. Dadaczynski K, Kotarski C, Rathmann K, Okan O. Health literacy and mental health of school principals. Results from a German cross-sectional survey. Health Educ. 2022;122(3):350–63.

206. Marsall M, Engelmann G, Skoda EM, Teufel M, Bäuerle A. Measuring Electronic Health Literacy: Development, Validation, and Test of Measurement Invariance of a Revised German Version of the eHealth Literacy Scale. J Med Internet Res. 2022;24(2):e28252.

207. Guttler C, Kohls N. Health literacy of employees A questionnaire based Study in a company of the metal industry. Pravention Und Gesundheitsforderung. 2022;

208. Spinler K, Valdez R, Aarabi G, Dingoyan D, Reissmann DR, Heydecke G, et al. Development of the Oral Health Literacy Profile (OHLP)-Psychometric properties of the oral health and dental health system knowledge scales. Community Dent Oral Epidemiol [Internet]. 2021;49(6):609–16. Available from: https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/cdoe.12688?download=true

209. Ehmann AT, Groene O, Rieger MA, Siegel A. The Relationship between Health Literacy, Quality of Life, and Subjective Health: Results of a Cross-Sectional Study in a Rural Region in Germany. Int J Environ Res Public Health. 2020;17(5).

210. Gernert M, Stassen G, Schaller A. Association Between Health Literacy and Work Ability in Employees With Health-Related Risk Factors: A Structural Model. Front Public Health. 2022;10:804390.

211. Rohwer E, Mojtahedzadeh N, Neumann FA, Nienhaus A, Augustin M, Harth V, et al. The Role of Health Literacy among Outpatient Caregivers during the COVID-19 Pandemic. Int J Environ Res Public Health. 2021;18(22).

212. Pfob A, Sidey-Gibbons C, Schuessler M, Lu SC, Xu C, Dubsky P, et al. Contrast of Digital and Health Literacy Between IT and Health Care Specialists Highlights the Importance of Multidisciplinary Teams for Digital Health-A Pilot Study. JCO Clin Cancer Inform. 2021;5:734–45.

213. Stock S, Altin S, Nawabi F, Civello D, Shukri A, Redaèlli M, et al. A cross-sectional analysis of health literacy: patient- versus family doctor-reported and associations with self-efficacy and chronic disease. BMC Fam Pract. 2021;22(1):187.

214. Weber S, Günther E, Hahnel S, Nitschke I, Rauch A. Utilization of dental services and health literacy by older seniors during the COVID-19 pandemic. BMC Geriatr. 2022;22(1):84.

215. Konopik N, Kaspar R, Penger S, Oswald F, Himmelsbach I. Advancing health literacy measurement in old age. Health Promot Int [Internet]. 2021;36(5):1310–23. Available from:

https://watermark.silverchair.com/daaa137.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAskwggLFBgkqhkiG9w0BBwagggK2MIICsgIBADCCAqsGCSqGSIb3DQEHATAeBglghkgBZQMEAS4wEQQMy9rOwnLEU8kU2tOWAgEQgIICfEvrYr18rYpyUPBPUmmNasWH5_cStT3tA9IRpW9qsdVXYV1

216. Berens EM, Ganahl K, Vogt D, Schaeffer D. Health literacy in the domain of healthcare among older migrants in Germany (North Rhine-Westphalia). Findings from a cross-sectional survey. Int J Migr Health Soc Care. 2021;17(1):62–74.

217. Köhler H, Dorozhkina R, Gruner-Labitzke K, de Zwaan M. Specific Health Knowledge and Health Literacy of Patients before and after Bariatric Surgery: A Cross-Sectional Study. Obes Facts. 2020;13(2):166–78.

218. Knitza J, Simon D, Lambrecht A, Raab C, Tascilar K, Hagen M, et al. Mobile Health Usage, Preferences, Barriers, and eHealth Literacy in Rheumatology: Patient Survey Study. JMIR Mhealth Uhealth. 2020;8(8):e19661.

219. Heiman H, Keinki C, Huebner J. EHealth literacy in patients with cancer and their usage of web-based information. J Cancer Res Clin Oncol. 2018;144(9):1843–50.

220. Atmann O, Werner C, Linde K, Schneider A. Health literacy and eHealth among adult asthma patients - results of a cross sectional survey. J Asthma. 2021;58(2):262–70.

221. Trantali T, Athanasopoulou C, Lagiou A, Sakellari E. eHealth Literacy Among Health Sciences Students in Greece. Stud Health Technol Inform [Internet]. 2022;289:252–5. Available from: https://ebooks.iospress.nl/pdf/doi/10.3233/SHTI210907

222. Taoufik K, Divaris K, Kavvadia K, Koletsi-Kounari H, Polychronopoulou A. Development of a Greek Oral health literacy measurement instrument: GROHL. BMC Oral Health. 2020;20(1):14.

223. Kritsotakis G, Andreadaki E, Linardakis M, Manomenidis G, Bellali T, Kostagiolas P. Nurses' ehealth literacy and associations with the nursing practice environment. Int Nurs Rev [Internet]. 2021;68(3):365–71. Available from: https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/inr.12650?download=true

224. Bíró É, Vincze F, Mátyás G, Kósa K. Recursive Path Model for Health Literacy: The Effect of Social Support and Geographical Residence. Front Public Health. 2021;9:724995.

225. Zrubka Z, Hajdu O, Rencz F, Baji P, Gulácsi L, Péntek M. Psychometric properties of the Hungarian version of the eHealth Literacy Scale. Eur J Health Econ [Internet]. 2019;20:57–69. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6544600/pdf/10198_2019_Article_1062.pdf

226. Sántha Á, Nagy M, Erdei RJ. The health literacy of ethnic Hungarian mothers in eastern Europe. Italian Journal of Sociology of Education [Internet]. 2020;12(3):91–111. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85093071090&doi=10.14658%2fpupj-ijse-2020-3-5&partnerID=40&md5=2a8f47712944c52b0463bb2aed444172

227. Zrubka Z, Fernandes ÓB, Baji P, Hajdu O, Kovacs L, Kringos D, et al. Exploring eHealth Literacy and Patient-Reported Experiences With Outpatient Care in the Hungarian General Adult Population: Cross-Sectional Study. J Med Internet Res. 2020;22(8):e19013.

228. Erdei RJ, Barth A, Fedor AR, Takács P. Measuring the factors affecting health literacy in East Hungary – Health literacy in the adult population of Nyíregyháza city. Kontakt [Internet]. 2018;20(4):e375–80. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85056602659&doi=10.1016%2fj.kontakt.2018.08.007&partnerID=40&md5=35cb27d8931eb1d48163a5debef2ff48

229. Náfrádi L, Papp-Zipernovszky O, Schulz PJ, Csabai M. Measuring functional health literacy in Hungary: Validation of S-TOFHLA and Chew screening questions. Cent Eur J Public Health. 2019;27(4):320–5.

230. Bánfai-Csonka H, Bánfai B, Jeges S, Gyebnár B, Betlehem J. Health literacy among participants from neighbourhoods with different socio-economic statuses in the southern region of Hungary: a pilot study. BMC Public Health. 2020;20:1060.

231. Mathew MA, Kabir Z. Oral health literacy among third-level university students in cork city; Ireland. Ir J Med Sci. 2022;191(1):461–7.

232. Delemere E, Maguire R, Technol ISSUGI, Univ W. Technology usage, eHealth literacy and attitude towards connected health in caregivers of paediatric cancer. IEEE International

Symposium on Technology and Society (ISTAS) - Technological Stewardship and Responsible Innovation. 2021;

233. Mckenna V. Title Developments in health literacy over time: A longitudinal qualitative research study [Internet]. 2019. Available from: http://hdl.handle.net/10379/16067

234. Clarke N, Dunne S, Coffey L, Sharp L, Desmond D, O'Conner J, et al. Health literacy impacts self-management, quality of life and fear of recurrence in head and neck cancer survivors. J Cancer Surviv. 2021;15(6):855–65.

235. Mackey LM, Blake C, Squiers L, Casey MB, Power C, Victory R, et al. An investigation of healthcare utilization and its association with levels of health literacy in individuals with chronic pain. Musculoskeletal Care. 2019;17(2):174–82.

236. Jackson AD, Kirwan L, Gibney S, Jeleniewska P, Fletcher G, Doyle G. Associations between health literacy and patient outcomes in adolescents and young adults with cystic fibrosis. Eur J Public Health [Internet]. 2020;30(1):112–8. Available from: https://watermark.silverchair.com/ckz148.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAsYwggLCBgkqhkiG9w0BBwagggKzMIICrwIBADCCAqgGCSqGSIb3DQEHATAeBglghkgBZQMEAS4wEQQMmr03CSfYbYUEmHWBAgEQgIICecsX0hnHYdYAEj77GGiGbQ0jqFRFesjGnjwuqhKFvSxW87Zo

237. Velasco V, Gragnano A, Regionale HLG, Vecchio LP. Health Literacy Levels among Italian Students: Monitoring and Promotion at School. Int J Environ Res Public Health. 2021;18(19).

238. Lastrucci V, Lorini C, Riccio M del, Gori E, Chiesi F, Moscadelli A, et al. The Role of Health Literacy in COVID-19 Preventive Behaviors and Infection Risk Perception: Evidence from a Population-Based Sample of Essential Frontline Workers during the Lockdown in the Province of Prato (Tuscany, Italy). Int J Environ Res Public Health. 2021;18(24).

239. Bonaccorsi G, Lastrucci V, Vettori V, Lorini C. Functional health literacy in a population-based sample in Florence: a cross-sectional study using the Newest Vital Sign. BMJ Open [Internet]. 2019;9(6):e026356. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6589023/pdf/bmjopen-2018-026356.pdf

240. Lorini C, Collini F, Gasparini F, Paolini D, Grazzini M, Ierardi F, et al. Health Literacy, Vaccine Confidence and Influenza Vaccination Uptake among Nursing Home Staff: A Cross-Sectional Study Conducted in Tuscany. Vaccines (Basel). 2020;8(2).

241. Lorini C, Velasco V, Bonaccorsi G, Dadaczynski K, Okan O, Zanobini P, et al. Validation of the COVID-19 Digital Health Literacy Instrument in the Italian Language: A Cross-Sectional Study of Italian University Students. Int J Environ Res Public Health. 2022;19(10).

242. Giudice P del, Bravo G, Poletto M, Odorico A de, Conte A, Brunelli L, et al. Correlation Between eHealth Literacy and Health Literacy Using the eHealth Literacy Scale and Real-Life Experiences in the Health Sector as a Proxy Measure of Functional Health Literacy: Cross-Sectional Web-Based Survey. J Med Internet Res. 2018;20(10):e281.

243. Palumbo R, Annarumma C, Manna R, Musella M, Adinolfi P. Improving quality by involving patient. The role of health literacy in influencing patients' behaviors. Int J Healthc Manag [Internet]. 2019;1–9. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85076555715&doi=10.1080%2f20479700.2019.1620458&partnerID=40&md5=31492dc4faaeb3c46ff2b807a5a84e28

244. Lorini C, Lastrucci V, Zanella B, Gori E, Chiesi F, Bechini A, et al. Predictors of Influenza Vaccination Uptake and the Role of Health Literacy among Health and Social Care Volunteers in the Province of Prato (Italy). Int J Environ Res Public Health. 2022;19(11).

245. Lorini C, Lastrucci V, Mantwill S, Vettori V, Bonaccorsi G. Measuring health literacy in Italy: a validation study of the HLS-EU-Q16 and of the HLS-EU-Q6 in Italian language, conducted in Florence and its surroundings. Ann Ist Super Sanita. 2019;55(1):10–8.

246. Lorini C, Lastrucci V, Paolini D, Bonaccorsi G. Measuring health literacy combining performance-based and self-assessed measures: the roles of age, educational level and financial resources in predicting health literacy skills. A cross-sectional study conducted in Florence (Italy). BMJ Open [Internet]. 2020;10(10):e035987. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7537461/pdf/bmjopen-2019-035987.pdf

247. Schiavone S, Attena F. Measuring Health Literacy in Southern Italy: A cross-sectional study. PLoS One. 2020;15(8):e0236963.

248. Biasio LR, Lorini C, Abbattista G, Bozzola E, Castro P de, Seta M della, et al. Assessment of health literacy skills in family doctors' patients by two brief, self-administered Italian measures. Ann Ist Super Sanita. 2018;54(3):214–22.

249. Magon A, Arrigoni C, Graffigna G, Barello S, Moia M, Palareti G, et al. The effect of health literacy on vaccine hesitancy among Italian anticoagulated population during COVID-19 pandemic: the moderating role of health engagement. Hum Vaccin Immunother. 2021;17(12):5007–12.

250. Pelle C della, Orsatti V, Cipollone F, Cicolini G. Health literacy among caregivers of patients with heart failure: A multicentre cross-sectional survey. J Clin Nurs [Internet]. 2018;27(3–4):859–65. Available from: https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/jocn.14137?download=true

251. Bevilacqua R, Strano S, Rosa M di, Giammarchi C, Cerna KK, Mueller C, et al. eHealth Literacy: From Theory to Clinical Application for Digital Health Improvement. Results from the ACCESS Training Experience. Int J Environ Res Public Health. 2021;18(22).

252. Hahnraths MTH, Heijmans M, Bollweg TM, Okan O, Willeboordse M, Rademakers J. Measuring and Exploring Children's Health Literacy in The Netherlands: Translation and Adaptation of the HLS-Child-Q15. Int J Environ Res Public Health. 2021;18(10).

253. Woudstra AJ, Meppelink CS, Maat HP, Oosterhaven J, Fransen MP, Dima AL. Validation of the short assessment of health literacy (SAHL-D) and short-form development: Rasch analysis. BMC Med Res Methodol. 2019;19(1):122.

254. Woudstra AJ, Smets EMA, Galenkamp H, Fransen MP. Validation of health literacy domains for informed decision making about colorectal cancer screening using classical test theory and item response theory. Patient Educ Couns. 2019;102(12):2335–43.

255. Rademakers J, Waverijn G, Rijken M, Osborne R, Heijmans M. Towards a comprehensive, person-centred assessment of health literacy: translation, cultural adaptation and psychometric test of the Dutch Health Literacy Questionnaire. BMC Public Health. 2020;20(1):1850.

256. Abdullah A, Liew SM, Salim H, Ng CJ, Chinna K. Prevalence of limited health literacy among patients with type 2 diabetes mellitus: A systematic review. PLoS One [Internet]. 2019;14(5):e0216402. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6504081/pdf/pone.0216402.pdf

257. Jansen T, Rademakers J, Waverijn G, Verheij R, Osborne R, Heijmans M. The role of health literacy in explaining the association between educational attainment and the use of out-of-hours primary care services in chronically ill people: a survey study. BMC Health Serv Res. 2018;18(1):394.

258. Koster ES, Philbert D, van Dijk L, Rademakers J, de SP, Bouvy ML, et al. Recognizing pharmaceutical illiteracy in community pharmacy: Agreement between a practice-based interview guide and questionnaire based assessment. Res Social Adm Pharm. 2018;14(9):812–6.

259. Burzyńska J, Rękas M, Januszewicz P. Evaluating the Psychometric Properties of the eHealth Literacy Scale (eHEALS) among Polish Social Media Users. Int J Environ Res Public Health. 2022;19(7).

260. Duplaga M. The Use of Fitness Influencers' Websites by Young Adult Women: A Cross-Sectional Study. Int J Environ Res Public Health. 2020;17(17).

261. Mazur J, Małkowska-Szkutnik A, Paakkari L, Paakkari O, Zawadzka D. The Polish version of the short scale measuring health literacy in adolescence. Dev Period Med. 2019;23(3):190–8.

262. Mirczak A. Functional, communicative and critical health literacy among older Polish citizens. Med Pr. 2022;73(3):191–9.

263. Kosicka B, Deluga A, Bak J, Chaldas-Majdanska J, Bieniak M, Machul M, et al. The Level of Health Literacy of Seniors Living in Eastern Region of Poland. Preliminary Study. Healthcare. 2020;8(3).

264. Arriaga M, Francisco R, Nogueira P, Oliveira J, Silva C, Câmara G, et al. Health Literacy in Portugal: Results of the Health Literacy Population Survey Project 2019-2021. Int J Environ Res Public Health. 2022;19(7).

265. Pedro AR. Literacia em Saúde: da gestão da informação à decisão inteligente. 2018.

266. de Araújo IMB, Jesus RAF, de Lurdes Teixeira M, Cunha ARS, da Silva Santos FM, Miranda SRF. Health literacy of patients with hypertension and diabetes in a northern region of Portugal. Revista de Enfermagem Referência [Internet]. 2018;4(18):73–82. Available from: https://libts.seamk.fi/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=132322465&site=ehost-live&scope=site

267. Santos O, Stefanovska-Petkovska M, Virgolino A, Miranda AC, Costa J, Fernandes E, et al. Functional Health Literacy: Psychometric Properties of the Newest Vital Sign for Portuguese Adolescents (NVS-PTeen). Nutrients. 2021;13(3).

268. Martins S, Augusto C, Martins MRO, Silva MJ, Okan O, Dadaczynsky K, et al. Adaptation and validation and of the Digital Health Literacy Instrument for Portuguese university students. Health Promot J Austr [Internet]. 2022; Available from: https://www.embase.com/search/results?subaction=viewrecord&id=L637192917&from=export

269. Dias P, Campos L, Almeida H, Palha F. Mental Health Literacy in Young Adults: Adaptation and Psychometric Properties of the Mental Health Literacy Questionnaire. Int J Environ Res Public Health. 2018;15(7).

270. Pires C, Rosa P, Vigário M, Cavaco A. Short Assessment of Health Literacy (SAHL) in Portugal: development and validation of a self-administered tool. Prim Health Care Res Dev [Internet]. 2018;1–18. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85042101635&doi=10.1017%2fS1463423618000087&partnerID=40&md5=8fa8795210904f73f81f68857050e41b

271. Ferreira M, Neto S, Amaral O, Duarte J, Pedro AR. European questionnaire on health literacy-(HLS-EU-PT) in a sample of pregnant women. Revista Rol De Enfermeria. 2018;41(11–12):148–55.

272. Paiva D, Silva S, Severo M, Ferreira PM, Lunet N, Azevedo A. Validation of the Short Assessment of Health Literacy in Portuguese-speaking Adults in Portugal. 2019; Available from: http://hdl.handle.net/10451/39256

273. Santo ME, Nascimento T, Pinto E, Sousa-Coelho AL de, Newman J. Health literacy assessment: Translation and cultural adaptation to the Portuguese population. 2019; Available from: http://hdl.handle.net/10400.1/15052

274. Medina P, Maia AC, Costa A. Health Literacy and Migrant Communities in Primary Health Care. Front Public Health. 2021;9:798222.

275. Do ÓDN, Goes AR, Elsworth G, Raposo JF, Loureiro I, Osborne RH. Cultural Adaptation and Validity Testing of the Portuguese Version of the Health Literacy Questionnaire (HLQ). Int J Environ Res Public Health. 2022;19(11).

276. Barros A, Santos H, Moreira L, Santos-Silva F. Translation and Cross-Cultural Adaptation of the Cancer Health Literacy Test for Portuguese Cancer Patients: A Pre-Test. Int J Environ Res Public Health. 2022;19(10).

277. Costa H, Amaral O, Duarte J, Correia MJ, Veiga NJ, López-Marcos JF. Validity and reliability of the Portuguese version of the rapid estimate of adult literacy in dentistry: REALD-29 PT. BMC Oral Health [Internet]. 2022;22(1):262. Available from: https://www.embase.com/search/results?subaction=viewrecord&id=L638357619&from=export

278. Coman MA, Forray AI, den Broucke S van, Chereches RM. Measuring Health Literacy in Romania: Validation of the HLS-EU-Q16 Survey Questionnaire. Int J Public Health. 2022;67:1604272.

279. Sfeatcu R, Lie SA, Funieru C, Åström AN, Virtanen JI. The reliability and validity of the Romanian rapid estimate of adult literacy in dentistry (RREALD-30). Acta Odontol Scand. 2021;79(2):132–8.

280. Timková S, Klamárová T, Kovaľová E, Novák B, Kolarčik P, Gecková AM. Health Literacy Associations with Periodontal Disease among Slovak Adults. Int J Environ Res Public Health. 2020;17(6).

281. Vrdelja M, Vrbovšek S, Klopčič V, Dadaczynski K, Okan O. Facing the Growing COVID-19 Infodemic: Digital Health Literacy and Information-Seeking Behaviour of University Students in Slovenia. Int J Environ Res Public Health. 2021;18(16).

282. Krohne N, Gomboc V, Lavrič M, Podlogar T, Poštuvan V, Šedivy NZ, et al. Slovenian Validation of the Mental Health Literacy Scale (S-MHLS) on the General Population: A Four-Factor Model. Inquiry [Internet]. 2022;59:469580211047193. Available from: https://journals.sagepub.com/doi/pdf/10.1177/00469580211047193

283. Nolasco A, Barona C, Tamayo-Fonseca N, Irles MÁ, Más R, Tuells J, et al. [Health literacy: psychometric behaviour of the HLS-EU-Q16 questionnaire]. Gac Sanit. 2020;34(4):399–402.

284. Garcia-Codina O, Juvinyà-Canal D, Amil-Bujan P, Bertran-Noguer C, González-Mestre MA, Masachs-Fatjo E, et al. Determinants of health literacy in the general population: results of the Catalan health survey. BMC Public Health [Internet]. 2019;19(1):1122. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6698033/pdf/12889_2019_Article_7381.pdf

285. Castellvi P, Casañas R, Arfuch VM, Moreno JJG, Torres MT, García-Forero C, et al. Article development and validation of the espaijove.Net mental health literacy (EMHL) test for spanish adolescents. Int J Environ Res Public Health [Internet]. 2020;17(1). Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85076982709&doi=10.3390%2fijerph17010072&partnerID=40&md5=84c69c50977865107738b4150cd64333

286. Castellvi P, Casañas R, Arfuch VM, Moreno JJG, Torres MT, García-Forero C, et al. Development and Validation of the EspaiJove.net Mental Health Literacy (EMHL) Test for Spanish Adolescents. Int J Environ Res Public Health [Internet]. 2019;17(1). Available from: https://mdpi-res.com/d_attachment/ijerph/ijerph-17-00072/article_deploy/ijerph-17-00072.pdf?version=1576835788

287. Bas-Sarmiento P, Poza-Méndez M, Fernández-Gutiérrez M, González-Caballero JL, Romero MF. Psychometric Assessment of the European Health Literacy Survey Questionnaire (HLS-EU-Q16) for Arabic/French-Speaking Migrants in Southern Europe. Int J Environ Res Public Health. 2020;17(21).

288. Correa-Rodriguez M, Rueda-Medina B, Callejas-Rubio J, Rios-Fernandez R, la Hera-Fernandez J de, Ortego-Centeno N. The Relationship Between Health Literacy and Quality

of Life, Attitudes and Perceptions of Covid-19 and Vaccination Among Patients with Systemic Autoimmune Diseases. Clin Nurs Res. 2022;

289. Santesmases-Masana R, Paz LG de, Hernández-Martínez-Esparza E, Kostov B, Navarro-Rubio MD. Self-Care Practices of Primary Health Care Patients Diagnosed with Chronic Heart Failure: A Cross-Sectional Survey. Int J Environ Res Public Health. 2019;16(9).

290. García ACC, Sabater AM, Díaz-Herrera MÁ, Caballero VG, Sánchez EC. Health literacy of patients on oral anticoagulation treatment- individual and social determinants and effect on health and treatment outcomes. 2021; Available from: https://hdl.handle.net/10550/80304

291. Sanchez EMC, Vila-Candel R, Soriano-Vidal F, Navarro-Illana E, Diez-Domingo J. Influence of health literacy on acceptance of influenza and pertussis vaccinations: a cross-sectional study among Spanish pregnant women. 2018; Available from: http://hdl.handle.net/10044/1/61142

292. Wångdahl J, Jaensson M, Dahlberg K, Nilsson U. The Swedish Version of the Electronic Health Literacy Scale: Prospective Psychometric Evaluation Study Including Thresholds Levels. JMIR Mhealth Uhealth. 2020;8(2):e16316.

293. Bergman L, Nilsson U, Dahlberg K, Jaensson M, Wångdahl J. Health literacy and e-health literacy among Arabic-speaking migrants in Sweden: a cross-sectional study. BMC Public Health. 2021;21(1):2165.

294. Wångdahl J, Dahlberg K, Jaensson M, Nilsson U. Arabic Version of the Electronic Health Literacy Scale in Arabic-Speaking Individuals in Sweden: Prospective Psychometric Evaluation Study. J Med Internet Res. 2021;23(3):e24466.

295. Jacobsson J, Spreco A, Kowalski J, Timpka T, Dahlström Ö. Assessing parents, youth athletes and coaches subjective health literacy: A cross-sectional study. J Sci Med Sport [Internet]. 2021;24(7):627–34. Available from: https://www.jsams.org/article/S1440-2440(21)00024-4/pdf

296. Mekhail KT, Burström B, Marttila A, Wångdahl J, Lindberg L. Psychometric qualities of the HLS-EU-Q16 instrument for parental health literacy in Swedish multicultural settings. BMC Public Health. 2022;22(1):293.

297. Jaensson M, Stenberg E, Liang Y, Nilsson U, Dahlberg K. Validity and reliability of the Swedish Functional Health Literacy scale and the Swedish Communicative and Critical Health Literacy scale in patients undergoing bariatric surgery in Sweden: a prospective psychometric evaluation study. BMJ Open [Internet]. 2021;11(11):e056592. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8634233/pdf/bmjopen-2021-056592.pdf

298. Viktorsson L, Yngman-Uhlin P, Törnvall E, Falk M. Healthcare utilisation and health literacy among young adults seeking care in Sweden: findings from a cross-sectional and retrospective study with questionnaire and registry-based data. Prim Health Care Res Dev. 2019;20:e151.

299. Pawson R, Tilley Nick. Realistic evaluation. Sage; 1997. 235 p.

300. Kay Bartholomew L, Parcel GS, Kok G. Intervention Mapping: A Process for Developing Theory-and Evidence-Based Health Education Programs. 1998.

# APPENDIX

## APPENDIX 1: TEMPLATE FOR DOCUMENTATION REPORT

**Report: Task X.X**

**Title of the scoping review:**

**Review authors:**
Two names are provided as a minimum.

**Time of search:**
Write when the search has been conducted from date to date.

**Type of sources: databases: (research)**
What databases have been searched in relation to the ones mentioned in the search protocol? If changes provide an explanation.

**Languages:**
What languages have been searched in relation to the ones mentioned in the search protocol? If changes provide an explanation.

**Type of sources: internet search: (grey literature)**
What internet search has been searched in relation to the ones mentioned in the search protocol? If changes provide an explanation.

**Languages:**
What languages have been searched in relation to the ones mentioned in the search protocol? If changes provide an explanation.

**Search terms:**
Document search terms used and explain if others than those suggested in the search protocol have been used.

**Search strategy:**
Describe the strategy of search and explain if another strategy has been used than suggested in the search protocol. Provide a completed DOSIS guide.

**Study selection:**
Describe how the selection was conducted in relation to requirements mentioned in the search protocol. If changes provide an explanation.

**Inclusion criteria:**
Describe the inclusion criteria in relation to the ones mentioned in the search protocol. If changes provide an explanation.

**Exclusion criteria:**
Describe the exclusion criteria in relation to the ones mentioned in the search protocol. If changes provide an explanation.

**Data extraction**
Describe the data extraction with the numbers of the references you have been provided. Do this in relation to the areas mentioned in the search protocol. If changes provide an explanation.

**Presentation of results**
Write up a summary of the results to answer the research questions.

**Conclusions**
Conclude, if possible, describe the implications for research and the implications for practice.

## APPENDIX 2: DOSIS GUIDES

Can be found at www.ideahl.eu.

## APPENDIX 3: DATA EXTRACTION TEMPLATES

## TASK 1.1

General information

**Reference title**

Copy in the title of the article, study, or reference here.

**Year of publication**

**Lead author**

Enter the lead author's name here. If there is more than one author, type "et al." after the lead author's name.

**Type of document**

Scientific paper

Strategy paper

Policy paper

Book chapter

Report

Dissertation

**Intended audience(s)**

Choose the option(s) that best describe the intended audiences(s) for the work in question. "Users and or user/advocates" may include e.g., patients, lay persons, user associations etc.

Policy makers

Practitioners

Researchers/academia

Users and/or user advocates

**Country location(s)**

Choose one or more countries in which the work was conducted.

Australia

Austria

Belgium

Bulgaria

Canada

Croatia

Cyprus

Czechia

Denmark

Estonia

Finland

France

Germany

Greece

Hungary

Ireland

Italy

Latvia

Lithuania

Luxembourg

Malta

Netherlands

New Zealand

Poland

Portugal

Romania

Slovakia

Slovenia

Spain

Sweden

United Kingdom (England, Scotland, Northern Ireland, Wales)

United States of America

Other

**Regional location(s)**

Enter the name of the region(s) in the aforementioned countries in which the work was conducted. If this information is not available, leave this blank.

**Urban/rural area**

Choose the options that best describes the setting of the work. If not identifiable, leave this blank.

Urban

Rural

**Aim**

Choose the one option that best describes the aim of the work.

HL (HL)

Digital HL ((d)HL)

Both HL and (d)HL

**Setting(s)**

Choose the setting(s) that the work occurred in or addressed.

Healthcare

Social services

Education

Other

**Area related to**

Choose the area(s) that best describes the focus of the work.

Health data management

Healthcare

Social services

Social innovation

Disease prevention

Health promotion

Other

Population

**Sample size**

Copy in the sample size of the population described in the work. If no sample size was provided, leave this blank.

**Age**

Copy in the age range(s) or descriptions (e.g., 60-75 years, "elderly persons") for the sample population described in the work. If no population was identifiable, leave this blank.

**Gender(s)**

Choose the gender(s) of the sample population described in the work.

Male

Female

Non-gendered

Transgendered

Any gender / not specific

**Ethnicity**

Copy in the ethnicity or ethnicities of the sample population described in the work (e.g., Caucasian, African-American etc.). If no ethnicity was identifiable, leave this blank.

**Sociocultural characteristics**

Copy in the sociocultural characteristics of the sample population described in the work (e.g., language, religion, culture). If no characteristics were identifiable, leave this blank.

**Socioeconomic characteristics**

Copy in the socioeconomic characteristics of the sample population described in the work (e.g., income, education, occupation). If no characteristics were identifiable, leave this blank.

**Health/well-being characteristics**

Copy in the health or well-being characteristics (e.g., confirmed or suspected illness, blood pressure, BMI) of the sample population described in the work. If no characteristics were identifiable, leave this blank.

**Digital skills**

Copy in the digital skills characteristics of the sample population described in the work (e.g., skills to use computer, search the internet, etc.). If no characteristics were identifiable, leave this blank.

Methodology

**Study design**

Choose the design(s) that best describe the methods used in the work.

Randomised controlled trial

Non-randomised experimental

Cohort study

Case-control

Cross-sectional

Observational

Questionnaire/survey

Participatory design

Focus group

Interview or narrative

Literature review (systematic or other)

Mixed methods

Validation

Other

Project, service, or intervention

**Intervention target**

Choose the intervention target(s) described in the work. If no targets were described, leave this blank.

Policy

Individual(s)

Group(s)

Caregiver(s) or professional(s)

Other

**Recruitment method**

Choose the method(s) used to recruit the participants in the work. If no participants were recruited, leave this blank.

Phone or SMS

Post

Email

Social media

Clinic/institutional visit

Voluntary

Other

**Start date and duration**

Copy in the start date (year, or month/year if possible, e.g., May 2020) and the duration of the work in months (e.g., 24 months).

**Outcomes of interest**

Choose the outcome(s) of interest described in the work.

Somatic/physical health and well-being outcomes

Mental health and well-being outcomes

Social health and well-being outcomes

Other

**Funding**

Copy in the financing source(s) of the work and/or the intervention described in the work. This can often be found at the end of the text. If none were given, leave this blank.

Findings

**Key findings**

Summarize the key findings of the study. Focus on statistical, clinical, or other specifically stated findings.

**Ethical considerations**

Summarize any ethical considerations specifically stated in the work, including if they are general or population specific. If none were stated, leave this blank.

**Future research and recommendations**

Summarize any future research directions and/or recommendations specifically stated in the work here. If none were stated, leave this blank.

**Limitations**

Copy in any limitations specifically stated in the work. If none were stated, leave this blank.

## TASK 1.2

General information

**Reference title**

Copy in the title of the article, study or reference here.

**Year of publication**

**Lead author**

Enter the lead author's name here. If there is more than one author, type "et al." after the lead author's name.

**Type of document**

Scientific paper

Strategy paper

Policy paper

Book chapter

Report

Dissertation

**Intended audience(s)**

Choose the option(s) that best describe the intended audiences(s) for the work in question. "Users and or user/advocates" may include e.g. patients, lay persons, user associations etc.

Policy makers

Practitioners

Researchers/academia

Users and/or user advocates

**Country location(s)**

Choose one or more countries in which the work was conducted.

Australia

Austria

Belgium

Bulgaria

Canada

Croatia

Cyprus

Czechia

Denmark

Estonia

Finland

France

Germany

Greece

Hungary

Ireland

Italy

Latvia

Lithuania

Luxembourg

Malta

Netherlands

New Zealand

Poland

Portugal

Romania

Slovakia

Slovenia

Spain

Sweden

United Kingdom (England, Scotland, N. Ireland, Wales)

United States of America

Other

**Regional location(s)**

Enter the name of the region(s) in the aforementioned countries in which the work was conducted. If this information is not available, leave this blank.

**Urban/rural area**

Choose the options that best describes the setting of the work. If not identifiable, leave this blank.

Urban

Rural

**Aim**

Choose the one option that best describes the aim of the work.

HL (HL)

Digital HL ((d)HL)

Both HL and (d)HL

**Setting(s)**

Choose the setting(s) that the work occurred in or addressed.

Healthcare

Social services

Education

Other

**Area related to**

Choose the area(s) that best describes the focus of the work.

Health data management

Healthcare

Social services

Social innovation

Disease prevention

Health promotion

Other

Population

**Sample size**

Copy in the sample size of the population described in the work. If no sample size was provided, leave this blank.

**Age**

Copy in the age range(s) or descriptions (e.g. 60-75 years, "elderly persons") for the sample population described in the work. If no population was identifiable, leave this blank.

**Gender(s)**

Choose the gender(s) of the sample population described in the work.

Male

Female

Non-gendered

Transgendered

Any gender / not specific

**Ethnicity**

Copy in the ethnicity or ethnicities of the sample population described in the work (e.g. Caucasian, African American etc.). If no ethnicity was identifiable, leave this blank.

**Sociocultural characteristics**

Copy in the sociocultural characteristics of the sample population described in the work (e.g. language, religion, culture). If no characteristics were identifiable, leave this blank.

**Socioeconomic characteristics**

Copy in the socioeconomic characteristics of the sample population described in the work (e.g. income, education, occupation). If no characteristics were identifiable, leave this blank.

**Health/well-being characteristics**

Copy in the health or well-being characteristics (e.g. confirmed or suspected illness, blood pressure, BMI) of the sample population described in the work. If no characteristics were identifiable, leave this blank.

**Digital skills**

Copy in the digital skills characteristics of the sample population described in the work (e.g. skills to use computer, search the internet etc.). If no characteristics were identifiable, leave this blank.

Methodology

**Study design**

Choose the design(s) that best describe the methods used in the work.

Randomised controlled trial

Non-randomised experimental

Cohort study

Case-control

Cross-sectional

Observational

Questionnaire/survey

Participatory design

Focus group

Interview or narrative

Literature review (systematic or other)

Mixed methods

Validation

Other

Project, service, or intervention

**Problem being addressed**

Summarize here the problem that is being addressed by the project, service, or intervention.

**Impact on population**

Describe briefly here how the problem impacts the population(s) that are being targeted.

**Main objectives**

Summarize the main objectives being achieved in the project, service or intervention.

Practice

**Main activities**

Describe briefly the main activities being conducted in the practice in question.

**Location of activities**

State where the activities were being carried out in the practice in question.

**Time period of activities**

State when the activities were being carried out in the practice in question.

**Actor(s)**

State who implemented, or collaborated in, the activities being conducted in the practice in question.

**Resources**

Describe which resources were required in order to conduct the practice in question. If no resources were identifiable, leave this blank.

Results and outcomes

**Key results**

Summarize the key results of the practice. Focus on how these results relate to outcomes and outputs.

**Assessment**

Describe if assessment of the practice was carried out, and if so, what the results of this assessment were. If no assessment was carried out, leave this blank.

**Champion characteristics**

Describe here what worked successfully in the practice in question, and what facilitated this. If the practice was not very successful, or if such information is not available, leave this blank.

**Survivor characteristics**

Describe here what worked LESS successfully in the practice in question, and what challenges were identified. If this is not relevant for the practice, or if such information is not available, leave this blank.

**Limitations**

Copy in any limitations specifically stated for the practice. If none were stated, leave this blank.

Conclusions

**Benefits**

Describe how the results of the practice have benefitted the population and environment e.g. potential for long-term impact with the available resources, adaptation to social, economic and environmental requirements, etc.

**Best practice**

Describe here why the practice may be considered a "best practice" e.g. potential for transfer to other settings or populations, potential for upscaling etc. If the practice cannot be considered a best practice, leave this blank.

**Recommendations**

State any recommendations for adopting this is a "best practice". If the practice cannot be considered a best practice, leave this blank.

**Further reading or sources**

Provide any references, links, or other additional information about the practice if any are found. If not, leave this blank.

## TASK 1.3

General information

**Reference title**

Copy in the title of the article, study, or reference here.

**Year of publication**

Title of paper / abstract / report that data are extracted from

**Lead author**

Enter the lead author's name here. If there is more than one author, type "et al." after the lead author's name.

**Intended audiences**

Choose the option(s) that best describe the intended audiences(s) for the work in question. "Users and or user/advocates" may include e.g., patients, lay persons, user associations etc.

Policy makers

Practitioners

Researchers/academia

Users and/or user advocates

Other

**Location(s)**

Choose one or more countries in which the work was conducted.

Austria

Belgium

Bulgaria

Croatia

Cyprus

Czechia

Denmark

Estonia

Finland

France

Germany

Greece

Hungary

Ireland

Italy

Latvia

Lithuania

Luxembourg

Malta

Netherlands

Poland

Portugal

Romania

Slovakia

Slovenia

Spain

Sweden

Other

**Regional location(s)**

Enter the name of the region(s) in the aforementioned countries in which the work was conducted. If this information is not available, leave this blank.

**Aim**

Choose the one option that best describes the aim of the work.

HL (HL)

Digital HL ((d)HL)

Both HL and (d)HL

Population

**Sample size**

Copy in the sample size of the population described in the work. If no sample size was provided, leave this blank.

**Age**

Copy in the age range(s) or descriptions (e.g., 60-75 years, "elderly persons") for the sample population described in the work. If no populatio,n was identifiable, leave this blank.

**Gender(s)**

Choose the gender(s) of the sample population described in the work.

Male

Female

Non-gendered

Transgendered

Any gender / not specific

Ethnicity

Copy in the ethnicity or ethnicities of the sample population described in the work (e.g. Caucasian, African American etc.). If no ethnicity was identifiable, leave this blank.

**Sociocultural characteristics**

Copy in the sociocultural characteristics of the sample population described in the work (e.g., language, religion, culture). If no characteristics were identifiable, leave this blank.

**Socioeconomic characteristics**

Copy in the socioeconomic characteristics of the sample population described in the work (e.g., income, education, occupation). If no characteristics were identifiable, leave this blank.

**Health/well-being characteristics**

Copy in the health or well-being characteristics (e.g., confirmed or suspected illness, blood pressure, BMI) of the sample population described in the work. If no characteristics were identifiable, leave this blank.

**Digital skills**

Copy in the digital skills characteristics of the sample population described in the work (e.g., skills to use computer, search the internet etc.). If no characteristics were identifiable, leave this blank.

Methodology

**Data collection methods**

Choose the data collection method(s) that best describe the methods used in the work.

Survey

Public registers or data sources

Administered validated measures

External assessment

Self-assessment

Interviews

Focus groups

Observational

Other

**Name of the assessment tool/method**

Copy in the name of the HL/(d)HL assessment tool or method used in the study.

**Start date and duration**

Copy in the start date (year, or month/year if possible, e.g. May 2020) and the duration of the work in months (e.g. 24 months).

**Funding**

Copy in the financing source(s) of the work and/or the intervention described in the work. This can often be found at the end of the text. If none were given, leave this blank.

Findings

**HL and (d)HL levels**

Summarize the key findings related to levels of HL and (d)HL measured among the sample population.

**Validation and sensitiveness of tool**

Summarize the validation and sensitiveness documented in relation to the monitoring and assessment tool, method, and/or indicator to measure HL and (d)HL.