



Adult education on digital, health and data literacy for citizen empowerment

European report



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TABLE OF CONTENTS

1.	Introduction	4
1.1	Aim of the TRIO project	4
1.2	Aim of the European and national reports	6
2.	Overview of digital, health and data literacy in Europe	8
2.1	Statistics on digital, health and data literacy	8
	Digital literacy	8
	Health literacy	10
	Information and data literacy	16
2.2	Statistics on societal and economic impacts	19
	Health and wellbeing	19
	Participation in society.....	22
	Employment.....	23
	Illiteracy and low literacy	24
	Mis- and disinformation.....	24
2.3	Intersectional analysis.....	25
3.	Reported and identified gaps, needs and demands	27
3.1	Identified gaps.....	27
3.2	Identified needs and demands target groups.....	27
3.3	Suggested learning needs target groups.....	28
	Resources.....	29

1. Introduction

1.1 Aim of the TRIO project

Despite the steady rise in literacy rates over the past 50 years, there are still 773 million illiterate adults around the world, most of whom are women. These numbers, published by the UNESCO Institute for Statistics (UIS), are a stark reminder of the work ahead to meet the Sustainable Development Goals (SDGs), especially Target 4.6 to ensure that all youth and most adults achieve general literacy and numeracy by 2030. While middle- and low-income countries are struggling with these general literacy aspects, the European countries have a large percentage of their adult population classified above the target levels of literacy proficiency (e.g. International Assessment of Adult Competencies Level 1). However, in Europe, more than 90% of EU professional roles require at least a basic level of digital knowledge and skills, just as they require basic literacy and numeracy skills [1]. Yet, around 42% of Europeans lack basic digital skills, including 37% of those in the workforce [2]. Thus, digital literacy has become an important aspect in the continuous education of the EU workforce, and not only.

The COVID-19 pandemic has accelerated the growth and usage of the digital technologies in the health domain, on one side bringing significant advances in health and wellbeing promotion through self-monitoring and faster/easier provision of digital health services, but on the other side exacerbating health inequalities and negatively impacting health literacy, in particular in the case of digitally illiterate adults. Health literacy [3] is a complex construct, covering three broad elements: (1) knowledge of health, healthcare and health systems; (2) processing and using information in various formats in relation to health and healthcare; and (3) ability to maintain health through self-management and working in partnership with health providers.

Digital and Health come hand in hand with Data, as the current digital transformation of the healthcare systems in Europe (and worldwide) is aiming at delivering person-centric data driven prevention and healthcare through new models, where medical experts are collaborating with health informaticians, data analysts, health data scientists and clinical information officers. Digital, Health and Data are becoming even more important in prevention and social and community care. Citizen-centred self-management of health, care and healthy behaviour provides an adequate answer to the expanding health care sector, thus supporting the sustainability of it. Citizens' enhanced digital and data skills enable them to take advantage of the further development of artificial intelligence for prevention and environmental measures. Thus, citizens must be able to understand data concepts, data handling (e.g. collection, monitoring, transfer, storage), and security and privacy aspects related to their personal and health data.

Digital, health and data literacy represent a basic combination of elements needed by the European citizens in order to better track, manage and improve their health and well-being through the use of digital tools. Because of the rapid digitalization of the healthcare system

in Europe, citizens need to be proficient with their eHealth literacy skills and be sufficiently knowledgeable on the collection and sharing of digital data, as well as data privacy regulations. Digital and data literacy of citizens is also important to assess what is happening with their data and which data protection measures they can take.

TRIO aims to empower citizens through the development of a modular approach of the trio of literacies (digital, health and data), creating and designing a manual, a toolkit and a Green Paper along with a platform that will ensure customisation of content to different needs. The Manual, the first deliverable of the modular approach, will start by making a definition of the average levels of digital, health and data literacy of the three age groups in the partner countries; define the criteria and necessary skills for each group and level and understand the existing gaps. This will allow to direct the learners in a bottom-up approach to look at the world with different eyes towards being in charge of their own health and well-being. Awareness will be given to contexts beyond the well-researched theoretical practices or general population approaches, to explore instead the personal perspectives of citizens, including them in the outputs, as well as the ones of policy makers.

Definitions:

- Digital literacy: refers to the skills required to achieve digital competence, the confident and critical use of information and communication technology (ICT) for work, leisure, learning and communication [4].
- Health literacy: empowers people to make positive choices. It implies the achievement of a level of knowledge, personal skills and confidence to take action to improve personal and community health by changing personal lifestyles and living conditions [5].
- Data literacy: is the ability to read, write and communicate data in context, with an understanding of the data sources and constructs, analytical methods and techniques applied [6].

The TRIO project will focus on the overlapping areas, in particular the digital data and digital health (eHealth) categories. See picture #1.

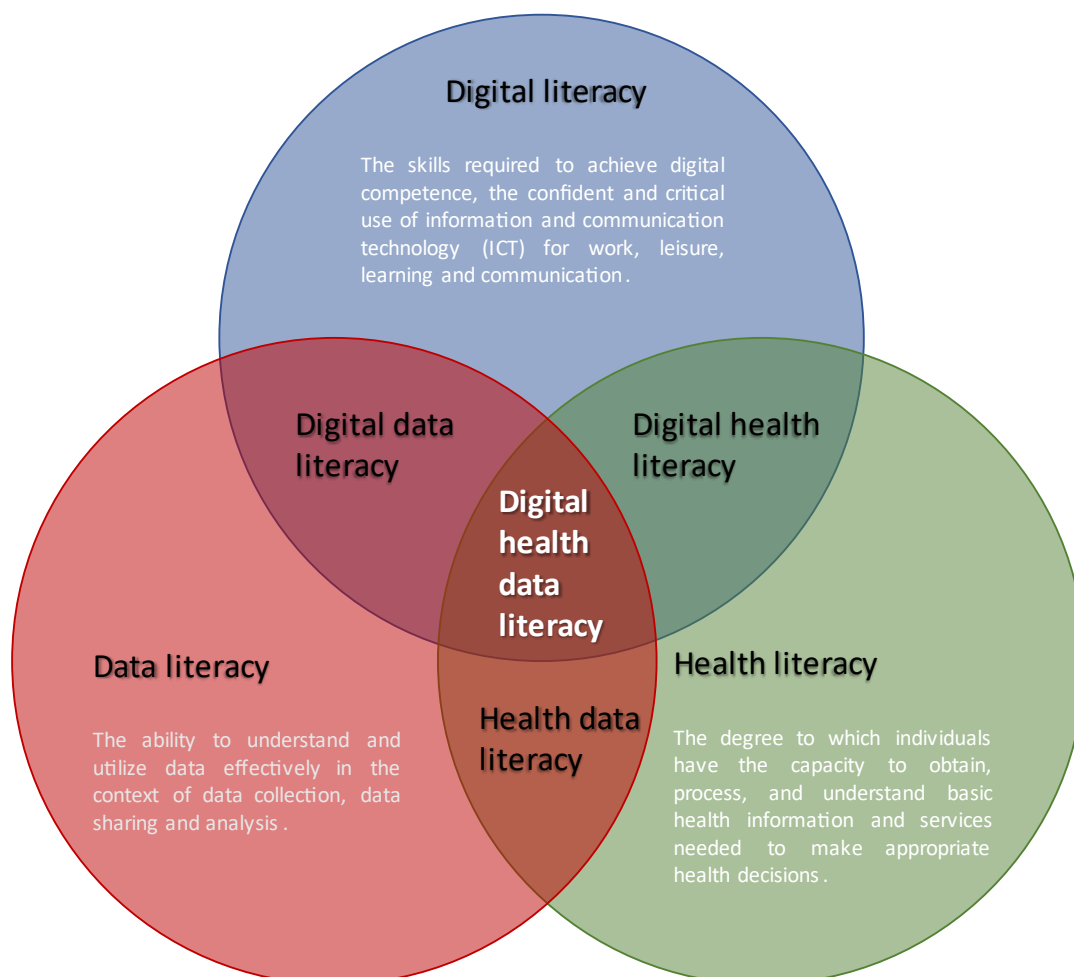


Figure 1: Ven diagram of TRIO literacies

1.2 Aim of the European and national reports

The European report, along with the national reports, will be the basis for the TRIO Manual that will be released in March 2023. Target groups of the TRIO Manual are:

- Citizens of different ages and levels of education (18-35, 36-50 and 51+) by providing an integrated approach of the competences and skills on health, digital and data, empowering them to navigate in the eHealth world;
- Formal and informal educators by providing them with organised content to share with the citizens;
- Policy makers who will benefit from them to support improved person-centred health pathways.

The manual will act as a stand-alone output, but its contents will also be integrated in the TRIO educational platform with 3 main purposes:

- As preparatory material it will sensitise the learners to digital health and data sharing practices and impacts.
- As a publication disseminated at EU, national and local level, it will be a tool for eHealth-related stakeholders, and general public.
- With its underlying data collection, it will serve to refine the educational features.

In order to achieve the above-mentioned aims, a desk research was conducted on a European level concerning status (including quantitative data), main challenges and existing approaches to digital, health and data literacy, including a discussion of general health and wellbeing, social participation, employment levels, functional literacy, and the spread of misinformation. All these topics are then compared in an intersectional analysis, after which the identified gaps, needs, and demands of the target groups are discussed.

The European desk research serves as a complementary preparatory material to the national reports in order to gain more insight into which socio-economic and demographic variables impact digital, health, and data literacy levels throughout Europe and why this is the case. With the combined results of the European report and the national reports a broader understanding will be gained of all the aspects involved in improving the TRIO literacies for a wider range of people.

2. Overview of digital, health and data literacy in Europe

2.1 Statistics on digital, health and data literacy

Digital literacy

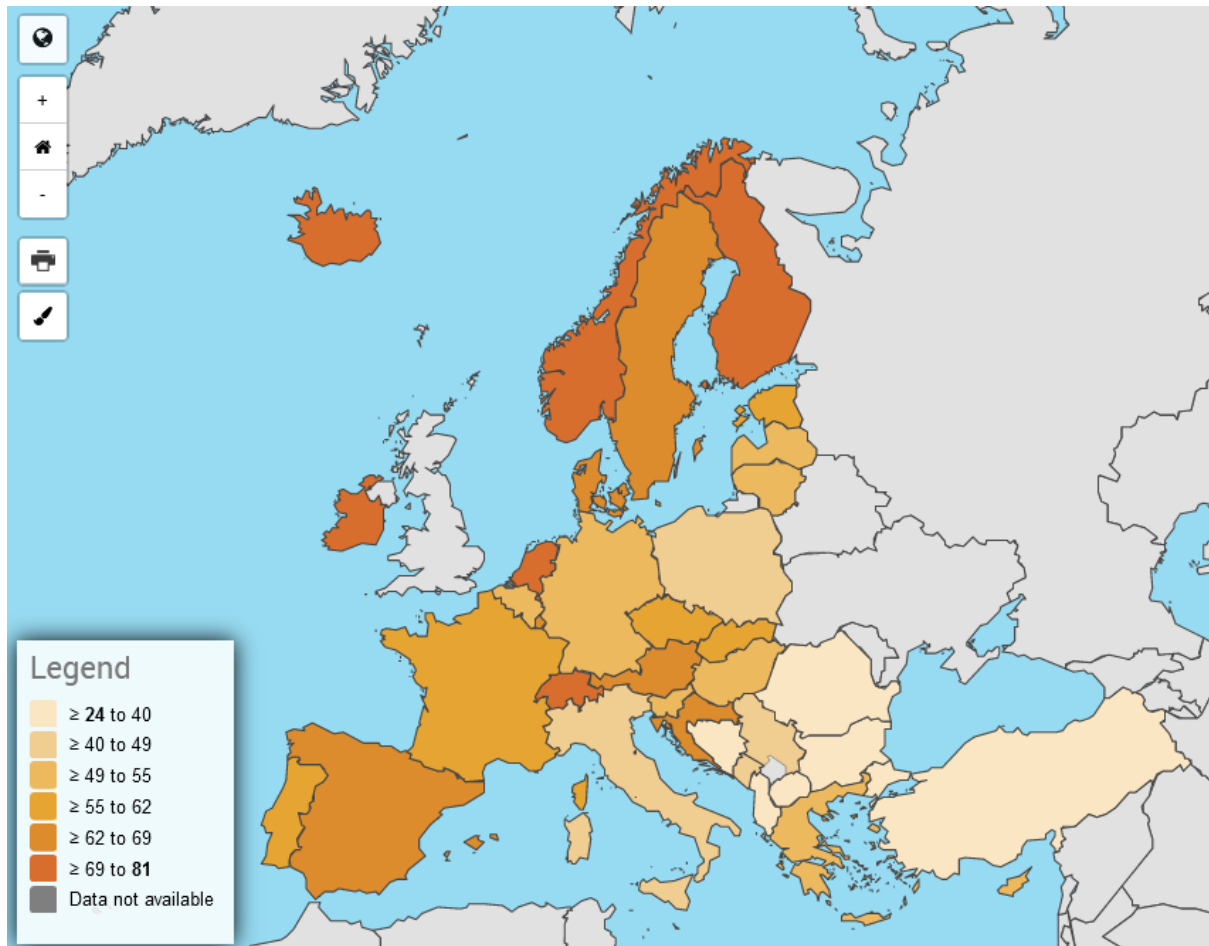


Figure 2. Map of Europe showing the percentage of individuals with basic or above basic digital skills per country [7].

In the European Union 54% of people are estimated to have basic or above basic digital skills. Iceland is the highest-ranking country (81%) and Albania is the lowest ranking country (24%) [7]. Overall, Europe is still far removed from achieving the European target in digital proficiency which is set at 80% by 2030. The European Commission also lists other problems in this area; in 2018 less than 40% of teachers felt capable of using digital technology in their class, and 25% of households with a low income do not have access to computers or internet [8].

Data from Eurostat shows that digital proficiency drops significantly with age (figure 3). In Albania only 3% of people aged 55 to 74 possess basic digital skills and only 1% of individuals aged 65 to 74. Only in four countries does this latter percentage rise above the 50% [7].

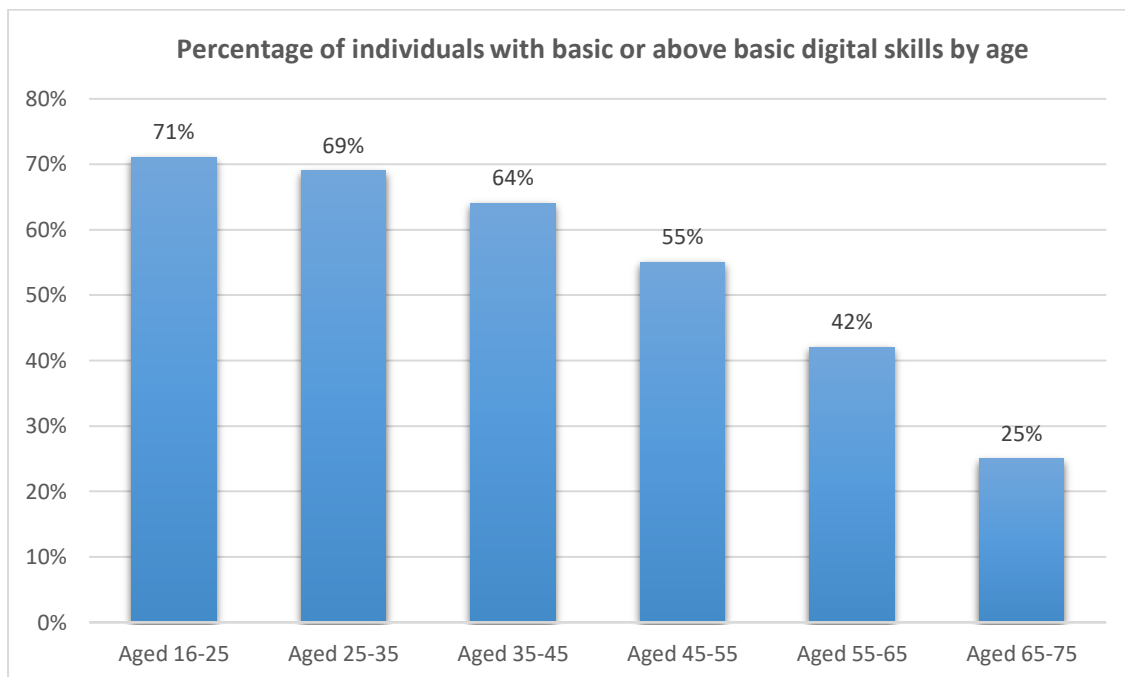


Figure 3. Digital skills in the European Union by age [7].

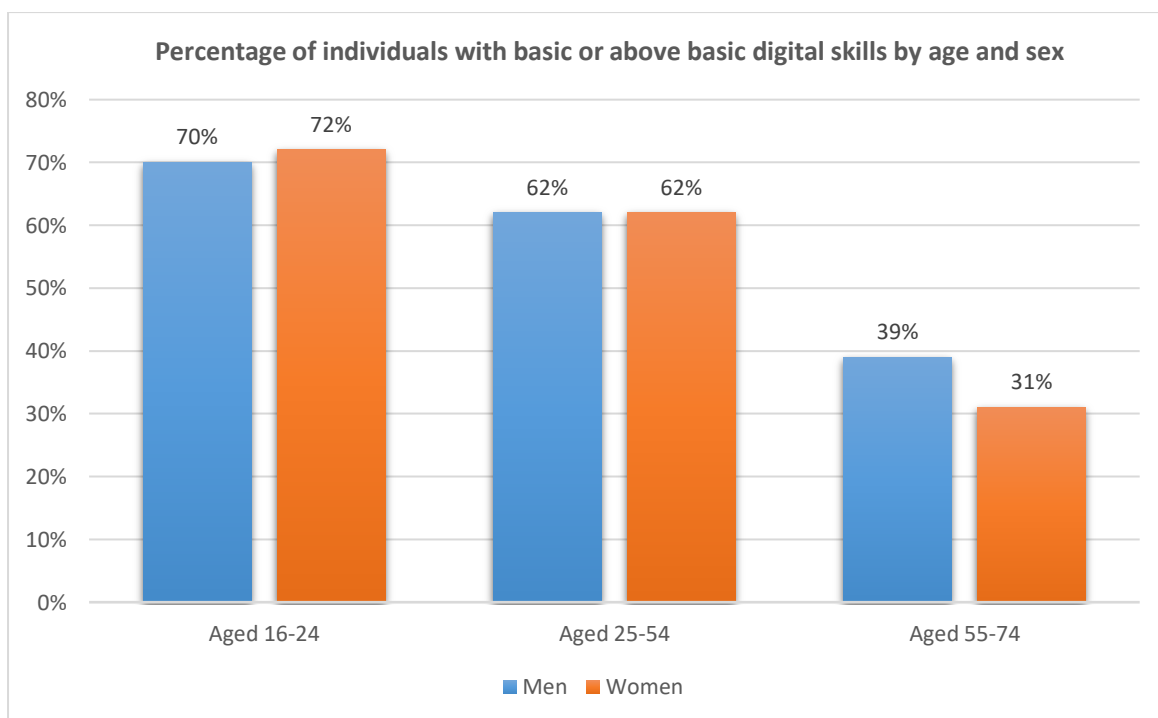


Figure 4. Digital skills in the European Union by age and gender [7].

On first sight it seems that digital skills stay relatively equal between men and women among all age groups (figure 4) [7]. However, in an analysis of Eurostat data regarding digital skills gaps by gender between 2007 and 2014, it was concluded that the difference between men and women for the most basic skills was indeed very minor, but for the more complex skills women scored decidedly worse than men. This disparity is even bigger among highly

educated people and little improvement has been seen in the seven years that the study focussed on [9].

Education, employment, residential setting, place of birth, and income all have a significant impact on digital skill levels. Of these, education is by far the biggest determinant for digital proficiency in Europe (figure 5) [7, 10]. Lowly educated people are currently in a very tight spot, since many low-skilled jobs, particularly those in transport, logistics, production, office, and administration, are likely to disappear due to the computerisation of society. These workers are often not well educated and lacked skill development in their work. The high demand skill-sets that they need to find a new job include ICT and computer skills, which are exactly the skills that they lack and are currently being replaced by [11].

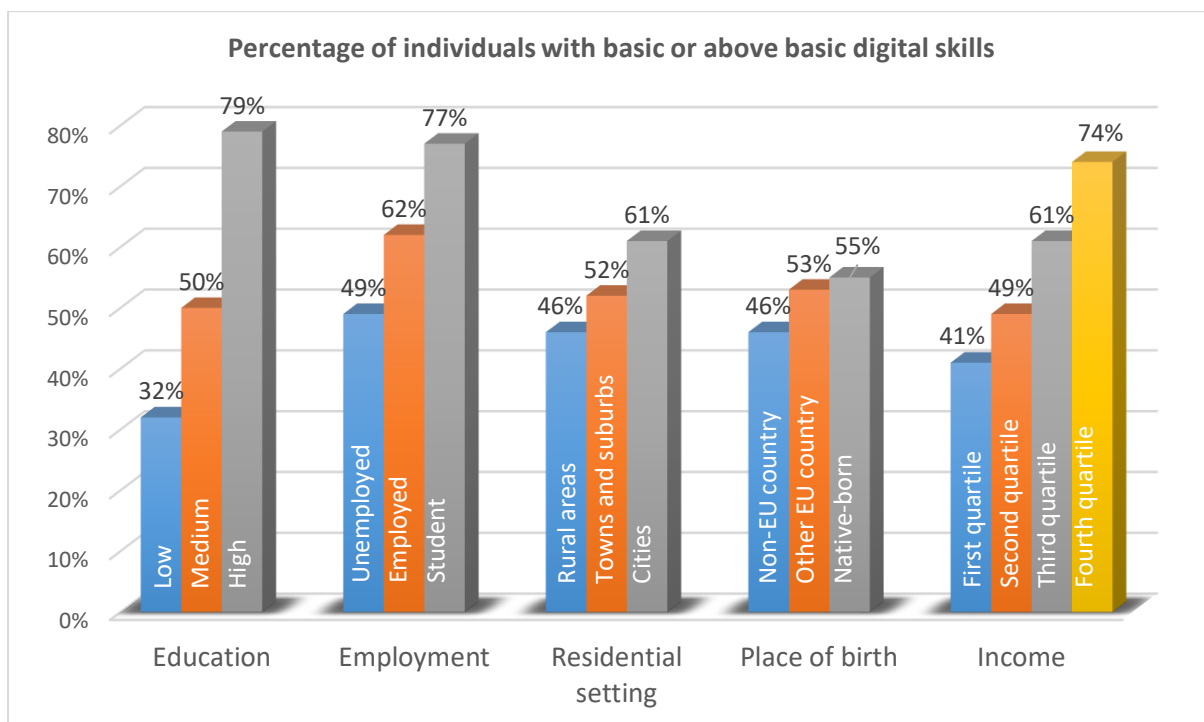


Figure 5. Digital skills in the European Union by education, employment, residential setting, place of birth [7], and income [10].

Accessibility to the internet is in general quite good, with 92% of households in Europe having access to internet, of which Bosnia and Herzegovina ranks the lowest with 75% [12]. The biggest reasons why households do not have internet is because access is not needed, because of lack of skills, or because equipment costs are too high [13].

Health literacy

In July and August 2011 the European Health Literacy Project (HLS-EU) was conducted, measuring the health literacy in eight European countries (Austria, Bulgaria, Germany, Greece, Ireland, the Netherlands, Poland, and Spain) [14]. All scores were transformed to a unified metric system ranging from 0 (the least possible health literacy score) to 50 (the best

possible health literacy score). The results were then subdivided into four levels: Inadequate (0-25), problematic (>25-33), sufficient (>33-42), and excellent (>42-50). The overall results can be found in table 1 and the percentage of individuals for each level can be found in figure 3. Even though most countries have a sufficient health literacy score, the percentage of individuals with inadequate or problematic health literacy skills is on average 47,6%; close to half of the population.

Table 1. Results of the HLS-EU-Q in 2011 [14].

Country	General health literacy scores by country		
	N (amount of participants)	Mean health literacy score (0-50)	HL level
Austria	979	31.95	Problematic
Bulgaria	925	30.50	Problematic
Germany	1045	34.49	Sufficient
Greece	998	33.57	Sufficient
Ireland	959	35.16	Sufficient
Netherlands	993	37.06	Sufficient
Poland	921	34.45	Sufficient
Spain	974	32.88	Problematic
Total	7795	33.78	Sufficient

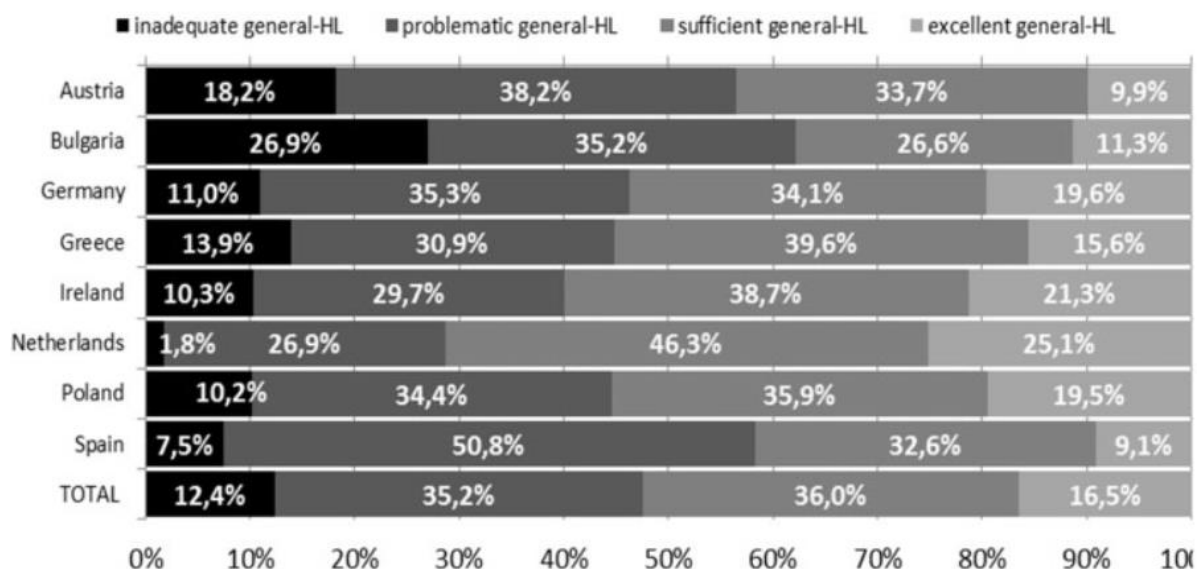


Figure 6. Results of the HLS-EU-Q by percentage of health literacy level [14].

In the same study the impact of socio-economic and demographic variables on health literacy was investigated. The researchers found that individuals with a low education, a low social status, financial problems or old age (65+) generally had lower health literacy scores. The lowest health literacy levels however, were observed among people with poor overall health or long-term illnesses, indicating a direct link between health literacy and health status [14].

eHealth literacy

In September 2014 a European wide research was conducted on eHealth literacy, encompassing 26.566 individuals of 14 years and older from 28 EU Member States [15]. The survey measured individuals' self-assessment of eHealth skills on five topics. Most difficulties were perceived in 'knowing how to navigate the internet to find health information' and 'knowing how to use health information found on the internet'. Figure 7 shows the results per country for the former topic. Participants from Italy, Poland, and Latvia assess their skills to be among the worst, with less than 30% of people estimating to be fully capable of navigating the internet to find health-related information. Cyprus, Sweden, and Denmark are on the other end of the spectrum, with 72% to 62% of participants feeling able to do said task.

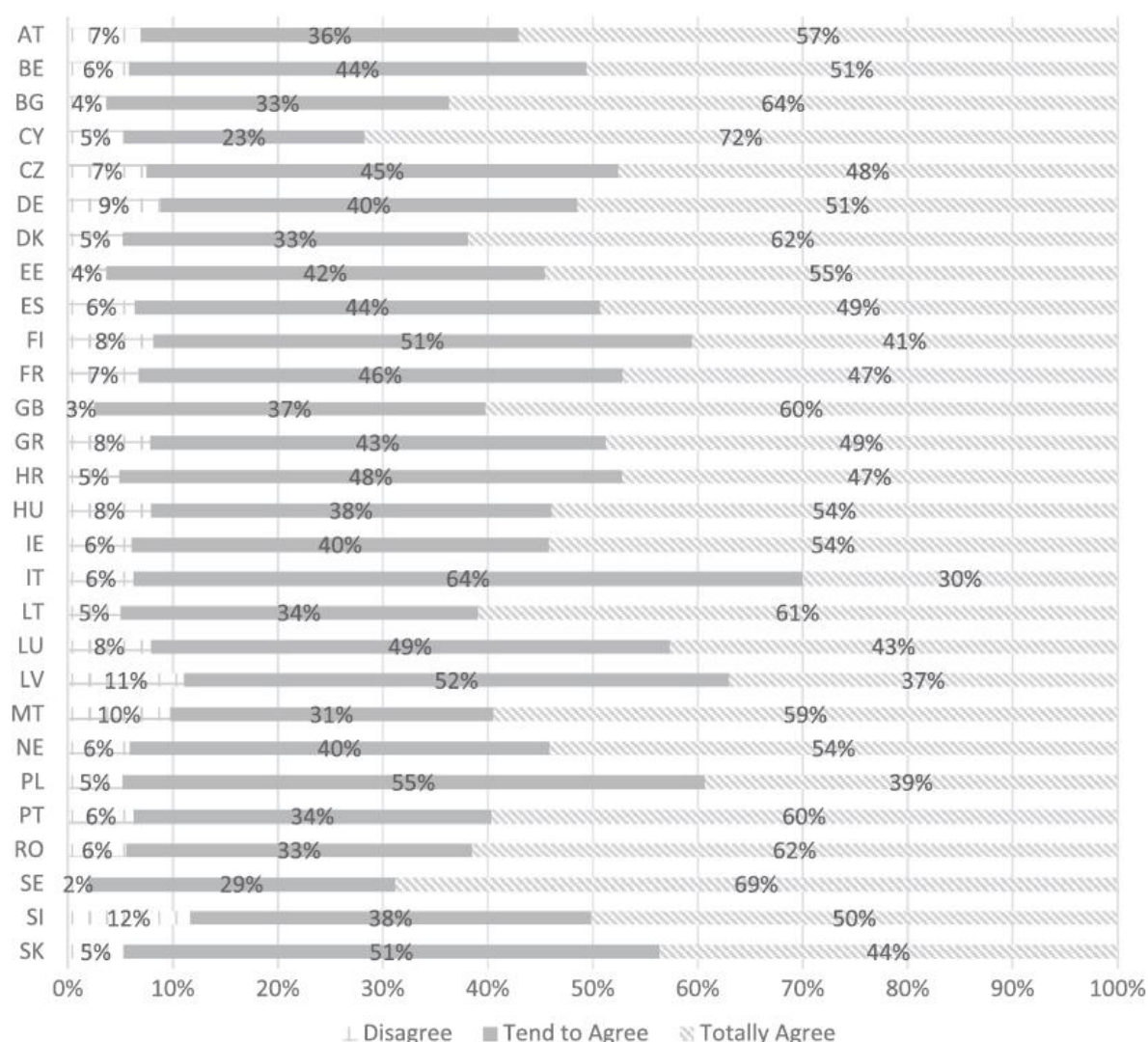


Figure 7. Individuals' self-assessment of e-health skills on knowing how to navigate the internet to find health information by country [15].

The study also investigated the effect of socio-demographic factors and health status on eHealth literacy. A clear link could be found between poor health status and low eHealth skills. Individuals with a long-term illness on the other hand, appear to be better at finding reliable health information online and distinguishing high quality from low quality information, likely because of the experience they've gained while dealing with their condition. Older individuals mostly assess their eHealth skills to be lower, except on the topic of 'understanding the terminology used on the internet for health-related topics'. Women report to be less capable of navigating the internet for health information, but more capable of understanding the terminology and knowing how to use the information. Another connection can be made between eHealth skills and duration of education; individuals that ceased studying at age 15 indicate to feel less capable of navigating the internet, understanding the terminology, and distinguishing high quality health information than participants that received education until at least age 20. Employment level also has a small impact on eHealth literacy, where employed participants were more likely to have enhanced eHealth skills than the unemployed ones. Lastly, the effects of residential setting was investigated, but no significant difference was found between individuals from urban and rural environments [15].

Online health activities

Eurostat reports that on average 55% of people in the European Union use the internet to seek health-related information (e.g. injuries, disease, nutrition, improving health, etc.). In Finland this percentage is the highest (80%), and in Bulgaria this percentage is the lowest; 36% (figure 8) [16]. These percentages are the highest among individuals in the age group of 25-54 and are also significantly higher among women than men, especially in the age groups 16-24 and 25-54 (figure 9). Additionally, individuals with a high education and a high income are much more likely to search for online health information than people with a low education or income, the difference being respectively 34% and 27% (figure 10).

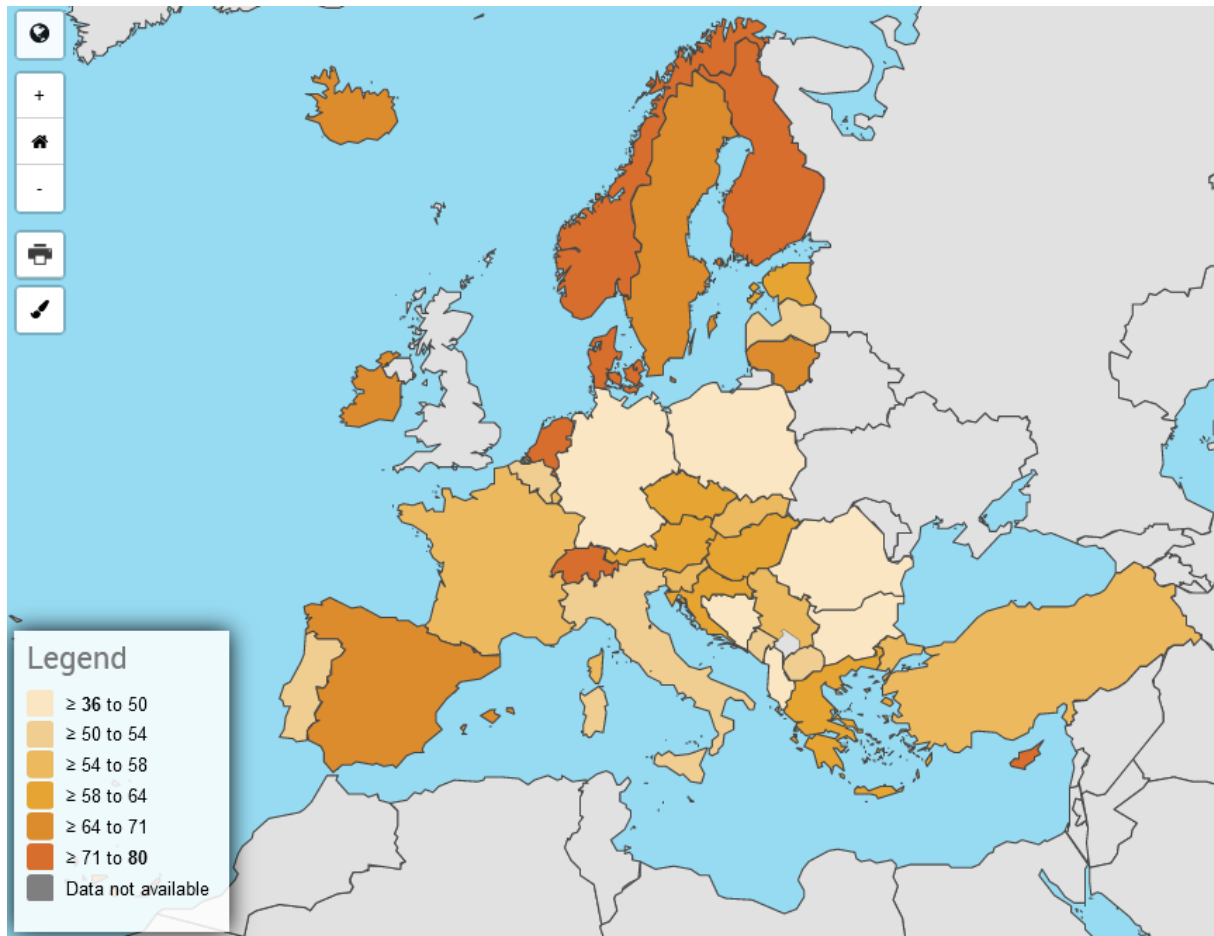


Figure 8. Percentage of individuals that use the internet to find health-related information in Europe [16].

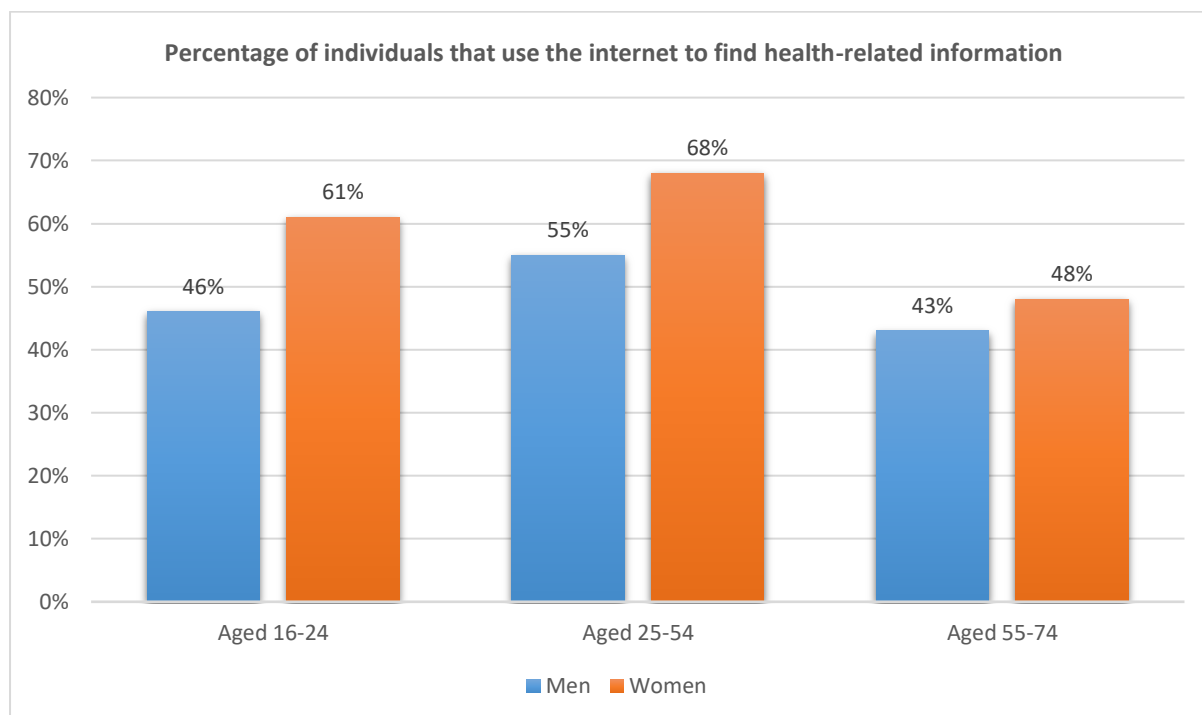


Figure 9. Online health activity in the European Union by age and gender [16].

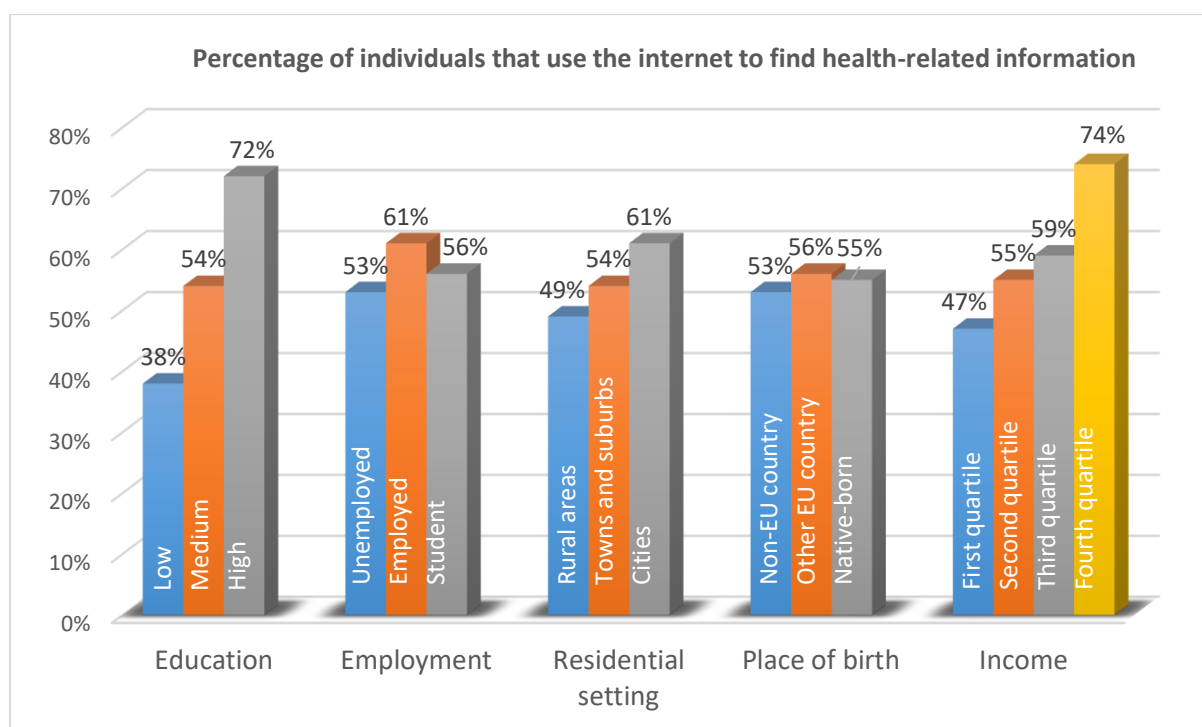


Figure 10. Online health activity in the European Union by education, employment, residential setting, place of birth (2021), and income (2020) [16].

European eHealth policies

In 2015 the World Health Organization conducted a survey on the application of eHealth in universal health coverage among the WHO European Region member states, all of which had previously committed to achieve this goal by 2005. The response rate of the survey was 89% (47 out of 53 countries). Of the responding countries the following data was retrieved [17]:

- “84% of respondents (38 Member States) have a national universal health coverage policy or strategy, of which 74% (28 Member States) report that the policy or strategy specifically refers to eHealth or information and communication technologies in support of universal health coverage.
- 70% (30 Member States) have a national eHealth policy or strategy, of which 90% (27 Member States) indicate that their policy or strategy refers explicitly to objectives or key elements of universal health coverage.
- 69% (31 Member States) have financial support available specifically for the implementation of their national eHealth strategy or policy.
- 89% (40 Member States) have universities or technical colleges providing students with training on how to use information and communication technologies and eHealth, and 82% (37 Member States) provide training to professionals on how to use information and communication technologies and eHealth.”

The WHO states in conclusion that, even though most countries in the WHO European Region currently have implemented eHealth objectives into their policies and strategies, there is still a need to specifically address the advances of eHealth and to better monitor and evaluate its implementation. To help member states re-evaluate their strategies, a better legal framework in regard to eHealth is needed.

Information and data literacy

80% of people in the European Union have basic or above basic information and data literacy skills. Iceland and Norway are the highest-ranking countries, with 98%, and Albania is the lowest ranking country with 63% (figure 11) [18].

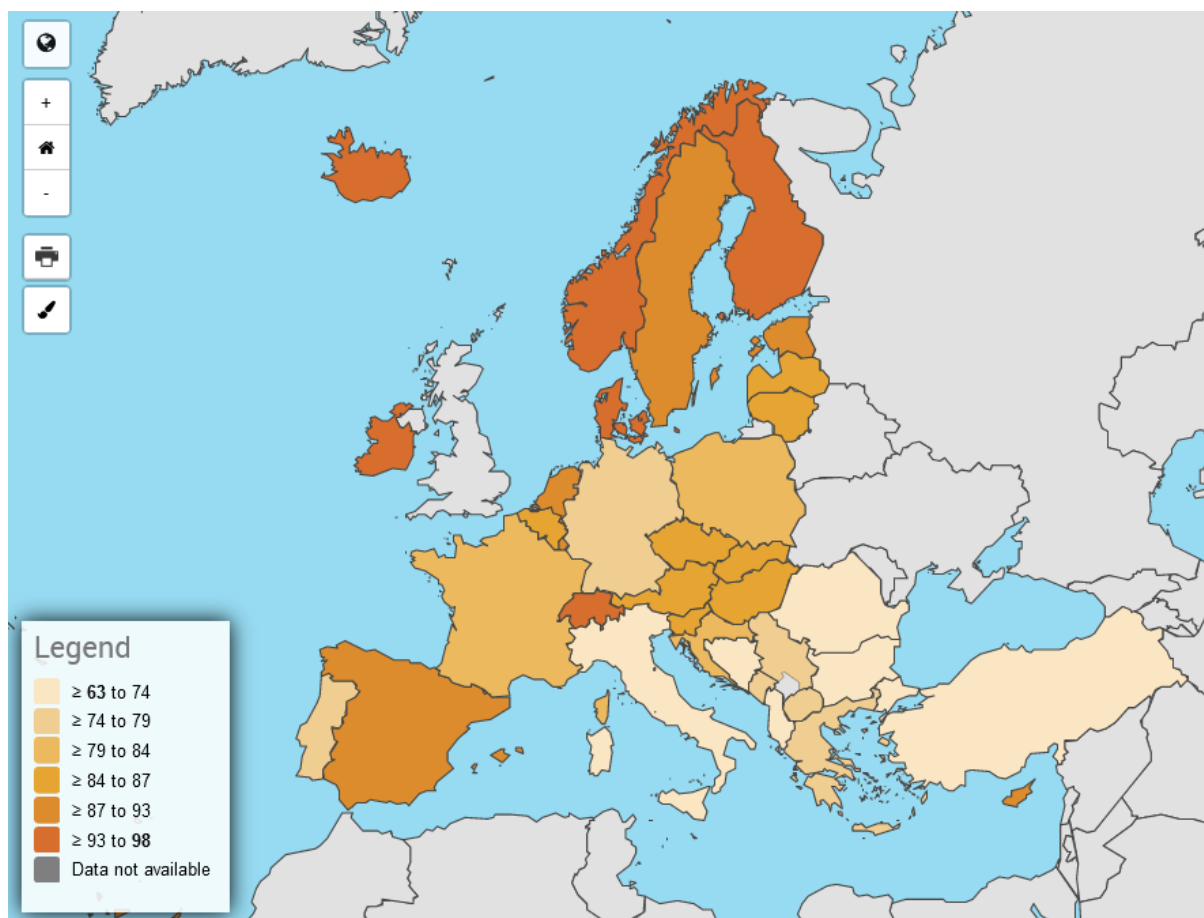


Figure 11. Information and data literacy skills in Europe [18].

Information and data literacy declines with age, but much less so than digital literacy, and there is no significant difference between men and women (figure 12). Like in digital literacy, education is the biggest determinant for information and data skill levels, followed by income, and employment. Residential setting and place of birth only have a minor impact on information and data literacy rates (figure 13) [18, 19].

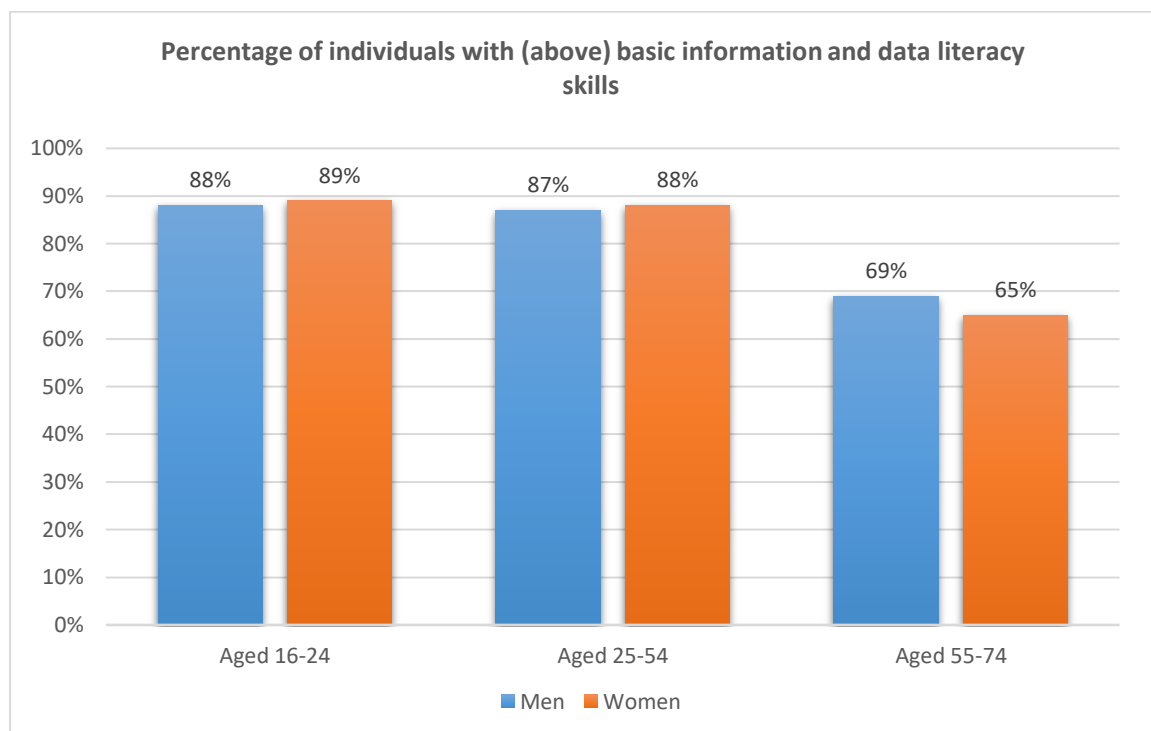


Figure 12. Information and data literacy skills in the European Union by age and gender [18].

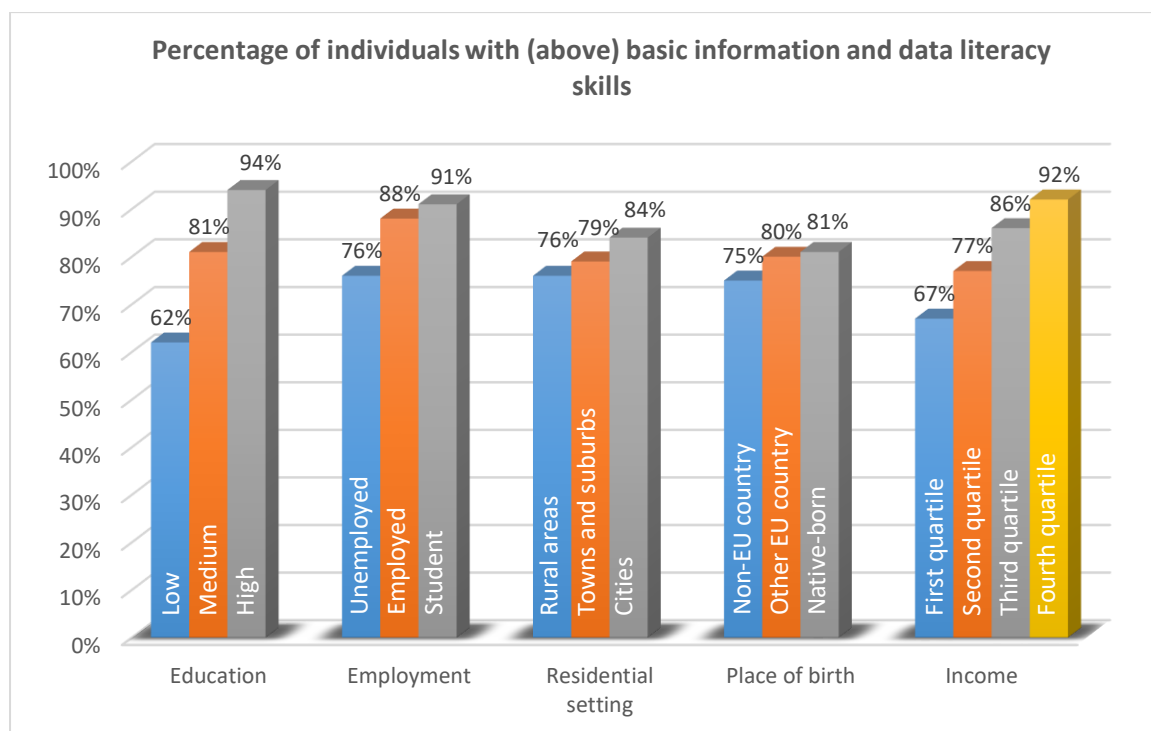


Figure 13. Information and data literacy skills in the European Union by education, employment, residential, place of birth (2021) [18], and income (2019) [19].

Everyday Health Information Literacy

Health information literacy (HIL) can be defined as ‘the set of abilities needed to recognise a health information need, identify likely information sources and use them to retrieve relevant information, assess the quality of the information and its applicability to a specific situation, and analyse, understand, and use the information to make good health decisions’.¹ Everyday health information literacy (EHIL) is HIL in the context of health-related information people need in their everyday lives. A study on the effects of EHIL on health behaviour among young men, has shown that EHIL is positively associated with health promotion, i.e. physical activity, proper nutrition, and abstaining from smoking and excessive alcohol consumption. These results indicate a direct link between health information literacy and health behaviour [20].

When assessing age-based differences in HIL in Sweden, researchers found that various age groups faced different types of difficulties. Individuals born after 1960 do not value health information as much as older adults, but are more likely to compare information from multiple sources and less likely to experience information overload. Adults born between 1946 and 1960 have trouble understanding health-related terminology, and adults born before 1946 experience more difficulty in determining when they need health information, and understanding medication labels and prescriptions. This research shows that health information literacy does not necessarily decline with age, but it does change in accordance with age-related challenges [21].

Another study from 2018 investigated the connection between EHIL and mobile technology among older citizens (65+) in Finland [22]. The results of this research showed that older individuals that use mobile technologies, or have positive attitudes towards it, feel more able to evaluate online health information, determine its reliability, and understand the terminology. They also report to have better overall EHIL skills. The abilities of seniors are not taken into account during the development of mobile services however. Older people are therefore at risk of marginalisation, while this age group could benefit even more of improved EHIL skills.

2.2 Statistics on societal and economic impacts

Health and wellbeing

The average life expectancy of new-borns born in the European Union in 2020 is 80 years, though women have a higher life expectancy than men (83 vs 78). The healthy life expectancy on the other hand is only 64 years and is similar between men and women (figure 14). The life expectancy is highest in Iceland (83 years) and lowest in Bulgaria (74 years). The healthy life expectancy is highest in Sweden (73 years) and lowest in Latvia (53 years) [23, 24].

¹ Medical Library Association, 2003.

According to the WHO health inequities are most often related to social determinants. Luckily, disparities in health status have declined since 2010, and the infant mortality rate has shrunk, but both issues are still significantly present [25].

Figures from Eurostat show that education level, employment, and income impact people's self-perceived health [26, 27, 28]. Residential setting, on the other hand, does not have a significant impact [29]. In the European Union 69% of people perceive their own health as 'good' or 'very good'. This percentage is highest in Ireland (81%) and lowest in Lithuania (48%).

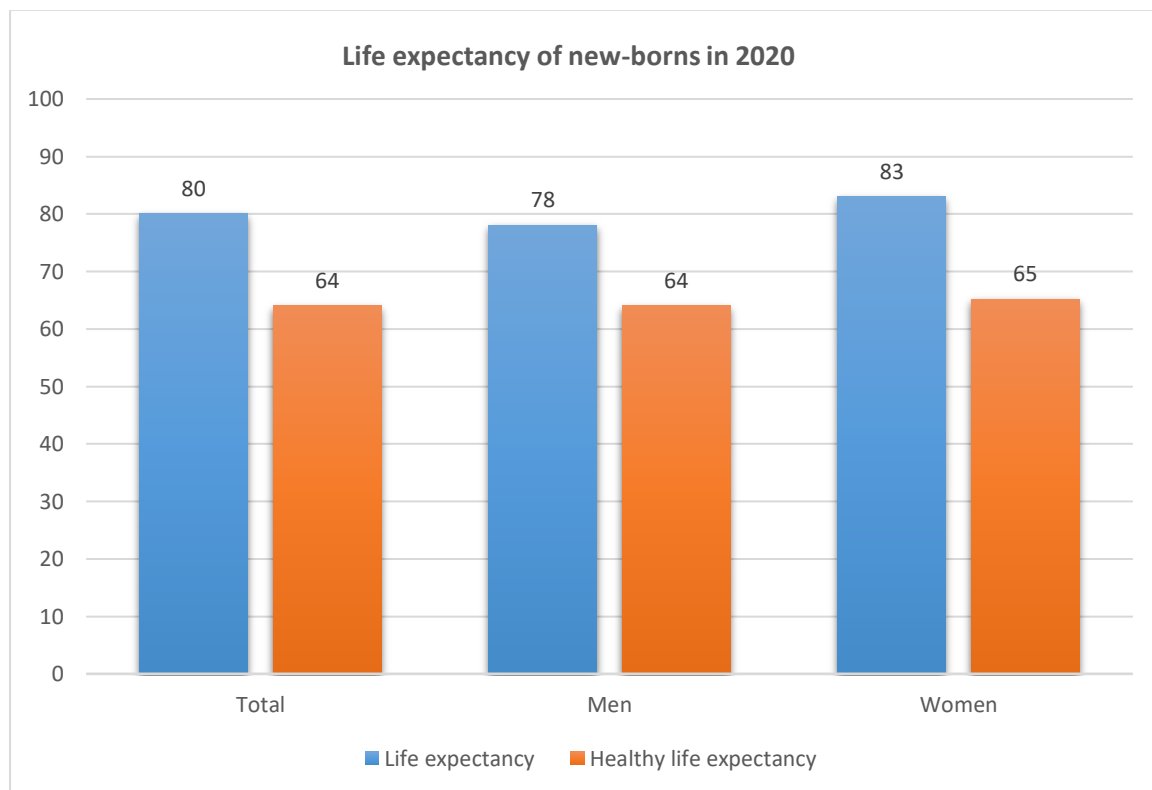


Figure 14. The average life expectancy and the healthy life expectancy in the European Union by sex [23, 24]

Lifestyle and nutrition

Unhealthy behaviour is the most common cause for mortality in Europe. Even though tobacco use has been steadily declining, still 20% of people in the EU smoke daily. Europe also has the highest level of alcohol consumption in the world, though there is a large variation between the member states; in Islamic countries the alcohol consumption is close to 0%, while in Portugal, the highest alcohol consuming country in Europe, 20% of people drink alcohol daily [25, 30, 31]. The biggest behaviour-related health risk however, is overweight. Europe is currently dealing with an obesity epidemic, which largely increases morbidity and mortality rates. Obesity causes 80% of non-communicable diseases, like diabetes mellitus, hypertension and cardiovascular disease, which together account for 86% of deaths and 77% of disease burden in Europe [32]. In the EU 51% of people is overweight and 16% is considered

obese. Malta is the fattest country, with 64% of people being overweight, and Italy is the leanest country with “only” 45% of people being overweight [33].



Figure 15. Obesity is caused by unhealthy nutrition and lifestyle choices [34].

Overweight occurs more among men than among women in almost all European countries, with the exception of Turkey and Moldavia. In many countries this difference is quite big; about 10%. In most countries however, the obesity rates are more prevalent among women, although the gender gap is usually much smaller [25]. This means that men are much more likely to be moderately overweight, but women are more likely to be greatly overweight. According to a study on gender disparities in obesity conducted in 2012, food preferences are influenced by socio-cultural factors and differ between men and women. In developed countries the intake of animal source foods and the consumption of calories are highest. Even though women are more likely to choose healthier options, they are also more likely to eat foods high in added sugar. Women in Europe and the US also tend to consume more dairy products, which are often sweetened and therefore contain more calories. Men, on the other hand, consume more alcohol and more meat. Meat mostly contains protein, which does not affect fat-mass, and excessive alcohol consumption may increase thermogenesis, meaning that less energy is stored from the alcohol consumption itself [35]. These findings could explain the gender differences in overweight and obesity rates in Europe.

Other socio-demographic determinants for obesity are low education level, low income, and urbanisation, while migration status does not seem to impact obesity levels at all (figure 16) [36-39]. Poor lifestyle and nutrition are the main causes of the obesity epidemic. Only 12% of people in the EU consume enough fruits and vegetables [40] and 31% engages in exercise [41].

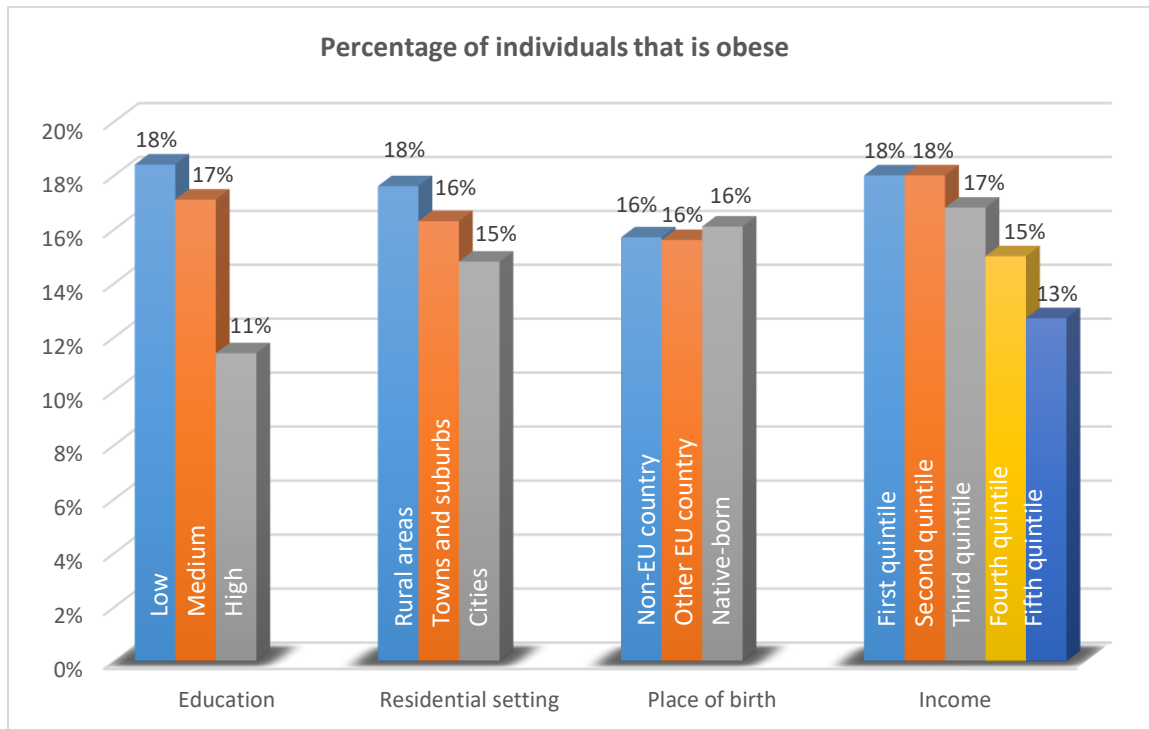


Figure 16. Percentage of individuals that is obese in the European Union in 2019 by education [36], residential setting [37], place of birth [38], and income [39].

Participation in society

The concept of social participation can be divided into ‘social contacts with friends and relatives’ and ‘engagement in voluntary activities’. Both of these aspects were investigated in an article from 2010 [42]. This study shows that the frequency of contact with relatives is greatly impacted by cultural differences. In Mediterranean countries this contact is the highest, especially in Cyprus, Portugal and Greece, where over 40% meet their relatives on a daily basis. In Northern countries, like the Netherlands, Poland, and Sweden, this percentage is less than 10%. In most countries contact with friends is much more frequent than with family; in almost all European countries more than half of the population meet with friends at least once a week, with the exception of Poland and France. Virtual contacts are in most cases much more frequent, especially in regard to family.

Engagement in activities (e.g. political, recreational, or religious activities, informal help and volunteering) varies greatly per country as well, but the dispersion is not clustered, like is the case with social contacts. In general, informal help is the activity that people tend to engage in the most.

Social participation can be positively linked to overall happiness and life satisfaction, and negatively linked to social isolation. 45% of people that don’t have any social contacts indicate that they are not able to ask for help when they need it. For individuals that meet their contacts only once a year this percentage already drops down to 20%. In total 8% of people

in the EU cannot draw on help. This percentage is lowest in Denmark (2%) and highest in Italy (16%).

Social isolation occurs more among people of higher age, although in many countries informal help prevents older people from being completely without help. In Denmark and the Netherlands however, this informal help is lacking greatly. The poor and unemployed are also more likely to suffer social isolation, since going out with friends or inviting them at home can be costly. This percentage is highest in Cyprus, where 7% of people with a low income do not have any friends. In addition, these people are less likely to receive informal help, especially unemployed individuals in the Netherlands and Sweden [42].

Employment

In 2021 69% of EU citizens between the age of 15 and 64 were employed, although employment rates are lower for older individuals (55-64). Educational attainment negatively impacts employment rate by about 30%, but the difference remains equal between the separate age groups (figure 17) [43].

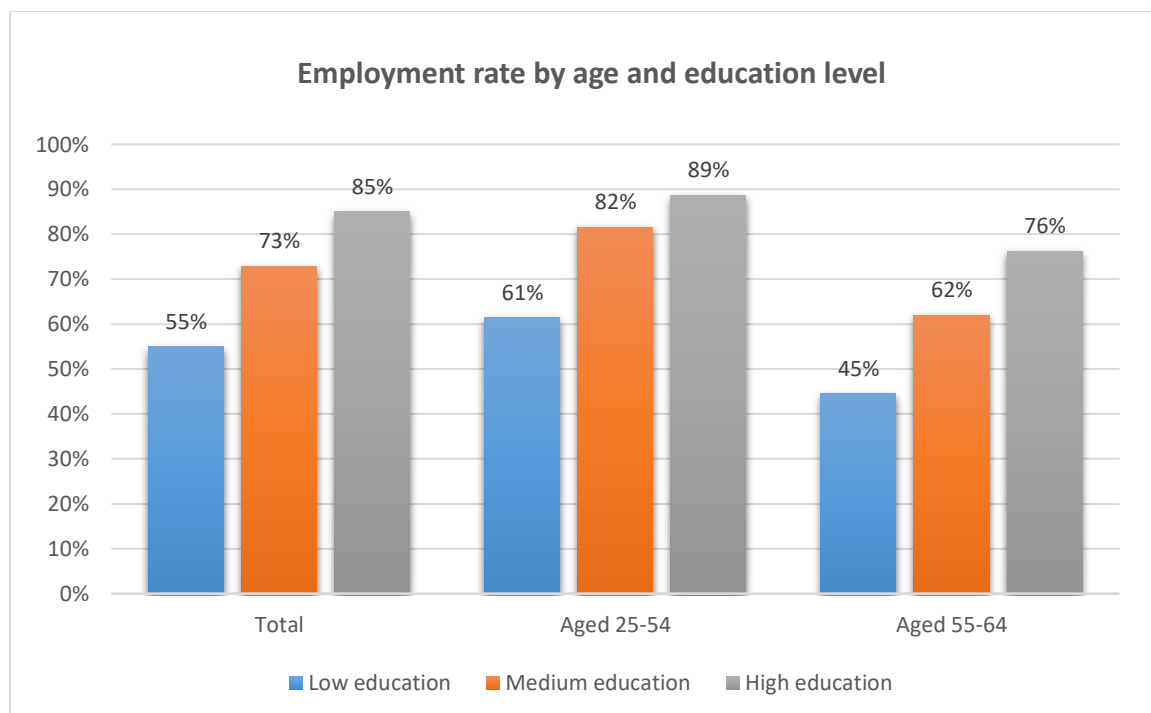


Figure 17. Percentage of individuals in the European Union that are employed, by age and education level [43].

Even though women's employment rates have been rising in the past years, the labour market population is still dominated by men. In the EU, the gender employment gap (the difference between the employment rates of men and women, aged 20-64), was set at 11% in 2021. The gap is lowest in Lithuania (1%) and highest in Romania (20%) [44].

Illiteracy and low literacy

Even though the literacy rate in Europe is generally close to 100% [45], an estimated 20% of European adults (more than 73 million people) do not possess enough literacy skills to properly function in society. In this day and age literacy skills are not only needed for work, as low level jobs are rapidly disappearing, but also for social and civic participation, like managing health, staying socially active, and engaging in politics. This kind of literacy is called 'functional literacy', and one out of five Europeans did not have this ability in 2012. More recent numbers on literacy problems are hard to find; many EU member states do not conduct national surveys on the topic and therefore have limited knowledge on the scope of the problem. From the surveys that were conducted it has become evident however that low literacy is much more prevalent among native-born individuals than it is among immigrants. There also appears to be a gender gap when it comes to basic reading and writing, since women are more likely to read books, which strengthens their literacy skills. Lastly, people with poor literacy skills are much more likely to have a low income and to be unemployed. On top of that, unemployment negatively affects literacy skills; studies have shown that numeracy declines almost right away, and literacy declines after about two years of unemployment. This puts these people in a vicious cycle, where unemployment negatively impacts literacy skills and literacy skills negatively impact the chance of finding employment [46].

Mis- and disinformation²

46% of people in the European Union have seen untrue or doubtful information or content on the internet news or social media in 2021. 24% of people did not check the truthfulness of online information in 2021, but only 5% of people report to not have checked this information, because they lacked skills or knowledge [47]. These numbers indicate that there is a relatively high amount of misinformation on the internet and that less than one third of individuals actually fact-check their information, but that most are capable to do so.

In an article from 2018 the reach of fake news and online disinformation was measured in France and Italy [48]. The researchers determined that known false news websites did not actually have a very large monthly reach (less than 3.5%), neither is the total time spend each month on these websites very extensive. On established news websites the monthly reach can be up to 51%, and the total time spend on the established news websites is up to 60 times more than on the fake news websites. However, the amount of comments, shares, and reactions to the fake news is much higher, especially in France, where the amount of interactions from a fake news site was five times greater than from some of the established news websites. The biggest problem is therefore not the fake news websites themselves (although they do generate the content), but the people that share misinformation,

² The difference between mis- and disinformation being that misinformation is unintentional and disinformation is intentional.

intentional or not. Another article, which used webometrics to identify key stakeholders in misinformation, gave similar results. Researchers conclude that laws and regulations are not very effective against the spread of misinformation, but educating people on the topic is [49].

2.3 Intersectional analysis

Age, education level, income, and employment all influence digital, health, and data literacy rates in Europe. Even though proficiency levels may vary significantly per country, these disadvantaged groups remain the same. For digital literacy the biggest determinant is age, for health and data literacy it is education. It must be noted however, that not all people that have problems in one of the three literacies, experience these problems in the same areas. For instance, while individuals over 70 may have trouble understanding medication labels and prescriptions, people that are 10+ years younger experience more difficulty comprehending health terminology [21]. These differences in skill levels have not always been investigated thoroughly, but are likely to exist for all literacies among all socio-economic and demographic variables.

When talking about digital health data literacy combined, the most vulnerable groups are older individuals, low educates, and people with a low health status. In general most difficulties are perceived in finding reliable health information online, understanding the terminology used in health-related topics, and distinguishing high-quality from low-quality information. Although not all groups experience the same difficulties, people with a low health status score lowest in all eHealth skill categories [15]. Also other studies have linked low health literacy with poor health status and, in addition, less frequent use of preventive services [22]. Since poor health literacy is more prevalent among older people and low educates, these groups also have a higher percentage of people with a health condition, who in turn may be less able to seek the appropriate care. At a higher age, this problem becomes multifold, since health tends to deteriorate with age and proper health-related decisions become more crucial.

Other socio-economic factors that have a negative impact on (e)Health information literacy are low income and unemployment. Low-skilled jobs are currently being replaced by the digitalisation of society. The people that worked these jobs often cannot compete on the job market, because of their lack in skill and knowledge, and risk becoming unemployed [11]. Individuals who have been unemployed for a longer time will have more trouble finding work [50], and this often includes people with a low education and individuals close to retirement age [43]; two groups with lower digital, health, and data literacy skills in the first place (see §3.2). Research has shown that poor and unemployed individuals experience social isolation much more often (along with seniors) and receive less informal help when needed. Employment can protect people from this and being socially included protects people from unemployment [42]. Another study has found that exposing unemployed individuals to poverty increases the social participation gap between employed and unemployed individuals [53]. Low income and unemployment have also been linked to poor functional literacy [46];

it is challenging for people with low functional literacy to find a well-paying job, or a job at all. On top of that, being unemployed tends to negatively affect literacy skills, worsening the problem. It is therefore vital that poor and unemployed individuals stay included in society, receive financial support, and are given the opportunity to enhance their skill levels.

Currently, the biggest health concern in Europe is the growing amount of people with overweight. Rising obesity rates do not only have severe health consequences for individuals, but also heavily increase healthcare expenditure [32]. Poor nutrition and inactive lifestyles are the main reasons for this alarming trend, but as studies have shown, these are not solely individual matters [51]. There are many elements that influence a person's health-related choices, including social circumstances, financial constraints, time-pressure, and the area where households are located. This may also be one of the reasons why people with a low education or a low income are more likely to be overweight (see §3.2). The promotion of better health choices should therefore be aimed at whole communities and be accommodated by making healthy options accessible, affordable, and practical.

In addition, gender differences in nutrition and lifestyle choices should be taken into account. Obesity rates are more prevalent among women, although overweight rates occur more among men. It is important to understand the root of this issue, so that adequate health promotion information may be given to the right groups of people. Although women are overall more concerned about their looks and their health, and therefore more inclined to make healthy food choices [52], women also tend to consume more food with added sugars [35]. Research has indicated that the consumption of sugar and processed foods have a substantively significant and negative impact on BMI levels [53]. In addition, physiological differences make it more challenging for women to lose weight [52]. By adequately informing people about these issues, their food- and health promotion literacy may increase.

3. Reported and identified gaps, needs and demands

3.1 Identified gaps

As discussed in the intersectional analysis, there are several socio-economic and demographic factors that influence digital, health, and data literacy skills. For older individuals, the biggest problem is their inexperience with digital technology. Older people have more trouble with 'knowing how to navigate the internet to find health information', 'knowing how to use health information found on the internet', and 'distinguishing high quality from low quality information on the internet.' These problems can mostly be explained by the older generation's lack of digital skills. In fact, older people seem to be much better at understanding health terminology than younger people, who in turn have much less experience dealing with the healthcare system.

People with a low education experience most difficulties in 'knowing how to navigate the internet to find health information', 'understanding health-related terminology, and 'distinguishing high quality from low quality information.' The problems for this group are often multifold; they have a higher chance to have a low income, be unemployed, face social isolation, and be functionally illiterate. Additionally, low educates are more likely to have unhealthy lifestyles and be overweight, caused by poor health promotion literacy and unavailable healthier options.

People with a migratory background face similar problems. They have more chance to have a low education and income, more chance to be unemployed, and they may experience culture and/or language barriers when it comes to accessing and understanding (digital) health information.

Individuals with a low health status have more difficulty in 'knowing how to navigate the internet to find health information' and 'knowing where to find reliable health-related information on the internet.' In multiple studies individuals with poor health have been assessed as having the lowest health literacy. Health literacy has also been connected to health behaviour. People with low health literacy have a much higher chance to make poor health choices and therefore have a higher risk to develop non-communicable diseases.

3.2 Identified needs and demands target groups

Mobile technology should be accommodated to older individuals so they may be able to use this technology to improve their health. Current mobile technology is made by and for younger people, which marginalises older generations and excludes them from properly using health-related applications that could benefit them significantly. If digital technology would be more adapted to older individuals, they would be more inclined to use digital services or devices and therefore gain experience and confidence, both of which have proven to improve everyday health information literacy [22].

Healthy nutrition and lifestyle choice should be made accessible, affordable, and practical. Health promotion information needs to be catered to the specific needs of different socio-demographic groups and preferably aimed at whole families, communities, or neighbourhoods. All health information should be easily accessible and be written in easy to understand language. Additionally, it should be known to people where to find reliable information for the health topics that are relevant for them.

More awareness is needed on the problem of low functional literacy and what this means for the people themselves. Low literacy often goes unnoticed. Many adults do not recognise their own shortcomings, and instead evaluate their skills as average. Others are ashamed or do not think improvement is possible. These individuals have learned to hide their inability and are difficult to persuade to participate in an educational program [46]. Awareness may help them overcome their feelings of shame so they may be more inclined to seek help. In addition, medical professionals should be educated on how to best convey health information to low literates and educational material should be easily accessible.

Lastly, it is necessary for digital devices such as computers, laptops, tablets, and mobile phones to be financially available to people. For unemployed individuals, people with a low income, or those living of a pension, such devices are often too expensive. It could help to ensure free access to computers in public libraries or community houses, or to redistribute second-hand equipment to people that need it.

3.3 Suggested learning needs target groups

Training material needs to be adapted to the specific needs of socio-economic and demographic groups. These needs are tied to economic, political, cognitive, and individual aspects, and therefore differ per country [55]. Additionally, people often lack proper motivation to follow an extensive learning course. Educational material should therefore not only be adapted to a person's needs, but also to their ambitions. For instance, to combat low functional literacy it may help to set specific goals for people, like being able to write a good resume, helping your children with homework, or reading bedtime stories to your grandkids. This methodology was used in *het Taalhuis* in the Netherlands and has proven to work well [56]. Also a Norwegian study [57] found that low-skilled learners are more motivated by these so-called 'extrinsic motivators'. In addition, 'extrinsic demotivators' need to be avoided. These include the lack of support and encouragement, or the lack of opportunities in the labour market.

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