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Common meaning	Definitions and synonyms
E-mental health (digital mental health or online mental health)	The application of digital technologies such as websites, mobile apps, social media platforms, telemedicine, and other electronic means, in mental healthcare which can be used for many purposes, including mental health and wellbeing promotion and prevention, wellbeing maintenance/self-care, early intervention, or for treating specific mental illnesses.
Mental Health apps	A new strand of apps available on a smartphone or tablet to support people with their psychological health and wellbeing. In these apps, users can record their mood, self-esteem, or other psychological factors via the app and then take part in psychological exercises to help positively impact their data.
Mobile Health	A term used for the practice of medicine and public health supported by mobile devices.
Digital mental health technology	Multiple technologies refer to digital technology in personalised and/or group mental health initiative
Digital environment	The operational or information technology systems, networks, any internet-enabled applications, devices and/or data contained within such systems and networks and any other related digital system.
Mental health literacy	The knowledge about mental health symptoms and appropriate treatment options including <u>how to prevent, recognize, and seek help for mental health problems.</u>
Digital literacy	The skills required to use technology
Digital health literacy	The ability to use technology to find and use health resources
Stakeholders	Individuals, groups, or entities who have an interest, concern, or investment in a particular project, organization, or system. They can be internal or external to the entity or project in question and can have varying degrees of influence and involvement. For SMILE project, to mention some: adolescents, parents, teacher, educators, academia, NGO and society at large
Internal stakeholders	Individuals or groups directly involved in or affected by the project or organization (game-developers, researchers)
External stakeholders	Individuals or groups outside the organization who have an interest or stake in its activities (as above-mentioned)
Barriers	Obstacles, impediments, or hindrances that prevent or limit the achievement of a goal, the expected outcome or a completion of a task.
Drivers	Key factors or forces that influence the initiation, planning, execution, and outcomes of a project. These drivers are critical determinants of the project's scope, objectives, schedule, budget, and overall success. They can come from various sources and may evolve throughout the project lifecycle.
Facilitators	Individuals, entity or activities useful to support the project team, stakeholders, or participants in achieving specific objectives or outcomes.
Stakeholders 'engagement	The dynamic and ongoing process of involving individuals, groups, or organizations that have an interest or concern in a project, initiative,

	organization, or decision-making process.
Key performance indicator	A quantifiable measure used to evaluate the success or performance of an organization, project, process, or individual in achieving specific objectives or goals.

Acronyms and Abbreviations	
WHO	World Health Organization
DHI	Digital health intervention
CBT	Cognitive behavioural therapy
PICO	A research tool (patient/population, intervention, comparison and outcomes) to well-built research question
SPIDER	A research tool (sample, phenomenon of interest, design, evaluation, research type), designed to identify relevant qualitative and mixed-method studies
SEM	Socio-ecological model
VSR	Virtual social relationship
NVR	Non virtual relationship
ADHD	Attention-deficit/hyperactivity disorder
PTSD	Post-traumatic stress disorder
LGBTQ+	Lesbian, gay, bisexual, transgender, queer and intersex
MHapps or mHealth	Mental health apps
mHealth	Mobile health
DSS	Diagnostic system support
SME	Small medium enterprise
NGOs	Non-governative organizations
CSOs	Civil society organizations
OECD	Organization for Economic Cooperation and Development

Executive Summary

This report aims to explore the current state of knowledge regarding the acceptance of digital solutions and e-mental health projects in Europe. It also aims to identify the potential barriers and aspects of this approach that can be improved to help improve the mental well-being of children and adolescents in Europe and reduce the burden of mental health issues in a fast-paced digital society.

Deliverable 2.1 focuses on investigating the main drivers and barriers that can affect the SMILE project outputs, detecting them, and assessing their impact. The report presents the findings based on literature reviews, analyses, and co-creation workshops among SMILE team partners (internal stakeholders). The report outlines preliminary stakeholder engagement strategies based on questionnaire surveys and workshops among the SMILE partners. The findings are summarized in a preliminary version of the stakeholder engagement framework, which will be co-created and enhanced together with the active participation of SMILE pilots. This step is crucial in ensuring that digital mental health solutions are designed and implemented to meet the needs of all stakeholders involved. The workshops have been organized and coordinated by IRCCS-AUSL IRCCS until September 1st, 2023, after which they were replaced by IRCCS AOUBO. This document outlines the barriers, drivers, and requirements for e-mental health solutions with an emphasis on SMILE purpose, among young people aged between 10 and 24.

Digital technologies are increasingly being used to improve the quality of healthcare and engagement of individuals, especially in preventing mental health issues. The use of digital innovations has the potential to transform mental healthcare by making it more accessible, affordable, and equitable. Digital tools are breaking down traditional barriers to quality care, leading to increased access to much-needed mental health services. However, despite their potential, these digital tools remain underutilized, and new barriers have emerged in this field.

To ensure that digital mental health solutions are relevant, acceptable, and lead to sustained use at the patient, provider, and institutional levels, there is a need to involve a wide range of stakeholders in the co-design process. This approach represents a shift from the traditional "expert" or professionally-driven design of interventions "for" users, towards co-designing solutions "with" users collaboratively right from the beginning of a project. It is mandatory to include the close social network of end-users, such as family and school staff, as they are in their development age. This leverages local knowledge and expertise to develop more culturally relevant and trusted solutions.

This document reports on the landscape of e-mental health solutions in the last ten years, including the drivers and barriers to stakeholder engagement and the implementation of mental health digital solutions; furthermore, relevant references (seminal papers) to built SMILE engagement framework have also been included. By addressing stakeholders' needs and requirements, the document aims to enable effective stakeholder engagement and end-user engagement in the long run. Additionally, the document prepares the ground for a SMILE co-creation approach that systematically combines and integrates social science-driven studies to design user experiences and understand motivators elements to integrate in a stakeholder engagement plan. Ultimately, the SMILE stakeholder engagement framework will leverage a multi-perspective innovation approach to optimize the development and implementation of mental health digital solutions.

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1 Introduction

1.1 Background and context of the deliverable

Mental health, as defined by the World Health Organization (WHO), is a state of well-being where an individual can recognize their abilities, handle the regular stresses of life, perform productively, and contribute positively to their community (WHO, 2021).

According to a report by UNICEF titled "The State of the World's Children 2021: On My Mind", around nine million adolescents in Europe, aged between 10 to 19, are currently suffering from mental disorders. Among these cases, more than half are attributed to anxiety and depression. These two disorders also rank among the top five causes of ill health burden among the youth population (JHU and UNICEF, 2022). Adolescence is a crucial and formative period in life, and more than half of adults with mental health disorders have their first onset during or before this stage of life, as stated in a report by The Lancet Regional Health - Europe in 2022 (Scheiner et al., 2022).

The growing demand for mental health services has become a significant challenge for the healthcare system. E-mental health is a promising approach to bridge the gap in mental healthcare services. Due to the critical mental health crisis brought about by the pandemic, it is essential to tackle the challenges in developing personalized digital technologies as effective solutions for mental well-being improvement and prevention. To achieve successful outcomes, it is crucial to redesign the theoretical foundation of digital interventions by translating good clinical practice standards, such as CBT, into key service components using participatory design approaches and meaningful participation of service users and stakeholders (Rauschenberg et al., 2021). Engaging stakeholders in mental health evidence-based and digital solutions implementation projects, such as the SMILE project, is essential to address barriers and meet requirements. It ensures a comprehensive and inclusive approach that considers the diverse needs and perspectives of the individuals and communities involved. Adolescents face unique mental health challenges, and involving various stakeholders ensures a tailored approach to address these issues.

1.2 Objectives and purpose

The main objectives of this deliverable are:

- Clearly outline the barriers, drivers and facilitators for the successful execution of the SMILE project, prioritizing them according to their impact, urgency, and relevance to the overall project goals.
- Provide a comprehensive stakeholder analysis to better involve them in planning, implementing, and evaluating a solution, fostering alignment and collaboration.
- Form the basis for developing key performance indicators (KPIs) and metrics that will be used to monitor progress and evaluate success.
- Facilitate risk management by explicitly addressing potential barriers and providing guidance on how to manage or mitigate these risks by the impact analyses of barriers, drivers and facilitators.
- Support decision-making by providing a structured framework for understanding the challenges and requirements associated with the project and with the stakeholder engagement plan.
- Contribute to the iterative nature of this project by fostering a culture of continuous improvement based on ongoing evaluations of barriers and requirements.
- Serve as a comprehensive documentation of the project's context, challenges, and necessary conditions for future reference and knowledge transfer.

To ensure that stakeholders and end-users actively participate in the implementation of SMILE outputs, it is important to gain insights on how to engage them effectively. These insights will prove valuable to different target groups at each stage of the project, including development design, implementation, and exploitation of SMILE solutions.

The findings of this deliverable will be summarized into a preliminary Stakeholder Engagement Framework, which aims to clarify who the stakeholders are in the SMILE project and how to engage them to stimulate multiple stakeholder perspectives. These steps will be preceded by the description of the digital mental health landscape in which the SMILE project operates, as well as existing guidelines, good practices, and policies in this field.

1.3 Relevance to the overall project goal

This deliverable is a comprehensive document that provides valuable insights for a diverse set of stakeholders (internal and external) involved throughout the lifecycle of SMILE project. Its relevance spans from strategic decision-makers to those responsible for project execution. For the first stage of the SMILE project, the main goal was to derive implications for the development of SMILE tools and other related concepts that will target the most prevalent needs of adolescents to strengthen their resiliency. Moreover, gaps in the literature will be detected to prepare a systematic review on more specific questions and to satis-

fy some internal stakeholders' expectations as well. The findings of this deliverable will support tasks 2.3 - 2.4. and will inform WP3 WP4, WP6, WP7 and WP8. The difference between issues and barriers in terms of risk from SMILE project will be evaluated to support T1.6. Finally, WP2 results, together with ethics review Committee suggestions (T3.1), will be taken into account to facilitate the interventions in real-life settings (WP7).

1.4 Structure of the document

This deliverable document comprises three main parts outlining the current context where SMILE project are moving on, the barriers drivers and facilitators, and stakeholders' analysis. After a description of methodologies used to get results on this broad field and advance in knowledge presented in chapter 2, chapter 3 explores the adolescence's environment including main topic in their virtual and not virtual relationships; chapter 4 illustrates the digital landscape in which SMILE project is moving forward while in chapter 5, from the content analyses of literature review on guidelines and good practice, themes and recommendation for e-mental health solution addressing adolescent target group, have been synthesized. In chapter 6, the activities of clinical partners in developing focus groups to elicit barriers and requirements in SMILE projects are reported. In chapter 7 and 8 barriers, drivers and facilitators from literature review and their impact on Smile project are described. Chapter 9 focuses on the importance of SMILE stakeholders, their identification and analyse. In chapter 10, the first version of SMILE stakeholders' engagement framework is provided. Finally, chapter 11 describe the monitoring and measurement process by introducing the requirements checklist and the definition of KPIs. The document concludes with appendices and reference sections.

2 Methods

In a co-development process, the internal stakeholders belonging to the academia and institutes of research have been involved in the literature review. Desk research has been conducted to address the main research questions to define the scientific boundaries of SMILE project with the primary purpose to identify barriers, motivators, and necessities in digital mental health for the SMILE target group. The research covered the latest advancements in digital solutions for mental health, stakeholder involvement and requirement regarding young people's mental resilience, evidence-based technologies and ongoing projects available to meet these needs, digital biomarkers, content design, and serious games. SMILE clinical partners agreed to perform a literature review on these topics (macroarea) and developed subsequent research

questions for each area of interest using PICO or SPIDER methods. These research questions were selected through a two-round modified Delphi procedure. During two clinical workshops, a questionnaire was fulfilled by each clinical partner that scored the relevance and importance of an initial list of research questions. Research questions with three or more approvals were included in SMILE literature review process. An agreement was achieved on different scientific search engines (technological, medical, and psychological domains) for data collection and the inclusion of grey literature from various sources [in particular Web of Science, Ebsco (APA PsycInfo, APA, PsycArticles, PSYINDEX, Cinahl) IEEE Xplore, Google scholar, and Pubmed]. A systematic approach to ensure that the information gathered could be reliable and relevant to SMILE project was adopted.

Regarding the topic of “guidelines and ethics”, relevant source such as authoritative peer review journal in this field, official guidelines from relevant organizations, government agencies, or professional associations in the field of psychiatry, ethics research, digital applications in healthcare (with focus on mental health) are identified. Moreover, government and organizational websites (the WHO; UNICEF (<https://www.unicef.org/topics/mental-health>), the World Psychiatric Association (WPA, <https://www.wpanet.org/>), International Society for Child and Adolescent Mental Health (IACAPAP, <https://iacapap.org/>) was consulted as well. Keywords were approved using search term words, including truncation and wildcard searches, based on the research questions. We applied these following search terms in the respective titles or abstracts in different combinations: *cognitive behav**, e-mental health, eCBT tools, social media, social network, social support, cyber bullying, bullying, mental resilience, mental health, End-user, stakeholders, e-mental health, digital solution, eCBT, internal stakeholders, external stakeholders, dropout, adherence, engagement, attrition, compliance, serious game, digital intervention, mental health, negative effect*, risk, health problems, social problems, side effect, negative impacts, e-CBT disadvantage, challeng*, gaps, limitations, pitfalls, Stakeholder engagement, participation, strategies, improv*, foster*, e-mental health, barriers, stakeholder engagement, e-mental health, facilitator, driver, parents, teachers, healthcare providers, attitudes, concern, opinions, acceptance, experiences, user’s review, adolescents, children, young adults, youth, feedback, negative effects, internet-based intervention, gamification, stakeholder identification, guidelines, recommendations, ethic*, adolescents, youth, teens, young adults; mental health, mental disorders, anxiety, depression, psychological disorders; social media, social support, social relationships, bullying, peer interaction, peer support, social network. Only English papers were selected.

Knowledge in the pillars of our project was built progressively. A step-approach was used to advance in knowledge: (1) identify research questions; (2) search for relevant studies; (3) select studies relevant to the research questions; (4) chart the data; and (5) collate, summarize, and report results. Barriers that could affect the successful implementation of e-mental health project at each level of the socio-ecological model (SEM) (Bronfenbrenner, 1989) were classified by the 5 levels of the SEM and by barrier categories based on major themes within the broader SEM framework. The SEM framework acts as a comprehensive external reference and help to evaluate strategies and models when applied to multiple and interacting determinants of health behaviors. To summarise the areas in which SMILE research questions fell into, it is possible to identify three major levels: individual, instrumental (diagnostic and therapeutic), and digital-end-users interaction level. These research questions will be exploited to surround the SMILE project conceptualization and relative outcomes.

1. **Individual:**

- Which factors including lifestyle, personal characteristics, lifestyle, personal attitudes, and transmitted attitudes about world issues and cognitive rigidity/flexibility are the greatest predictors of mental states and resilience?
- Does increased awareness of these predictors on mental health help young people to better manage their health?
- Does challenging young people's attitudes about world issues: i) help them to think more flexibly, ii) increase their mental well-being? Does understanding the relationship between their own attitudes, young people's attitudes and young people's mental health change the intentions of the social network in their communications to young people about world events?
- What are barriers and facilitators to stakeholder's engagement in mental health projects targeting adolescents?

2. **Instrumental**

- Which observable cues offer a valid insight into individuals' anxiety?
- How to objectively measure meaningful cues of anxiety?
- What are the strongest evidenced CBT and eCBT tools for adolescent mental health?

- What gaps/weaknesses are there?
- What serious games or digital interventions have caused harm and why?

3. **Digital-user interaction:**

- What is the stakeholders' feedback on using serious games for adolescents?
- What are the privacy and security considerations for implementing e-mental health solutions?
- Which individuals and groups are likely to be affected by the research findings in the field e-mental health?
- Who, although not directly affected, may be interested in the results of the research?
- Who is likely to have a negative view of the research? Who is likely to have particular concerns?

In parallel with literature review search on barriers and requirements, the SMILE team organized focus groups in seven pilot countries (Germany, UK, Spain, Italy, Slovenia, Poland, and Cyprus) to understand the drivers and barriers of the principal stakeholders (end-users, clinicians, teachers and parents) in mental health solutions in their specific site. The pilot countries included different types of settings such as students, outpatients, and migrant centers, and were framed at different geographic levels and contexts.

To gain insights into the preliminary understanding, landscape, and alignment on the digital divide in each pilot country, surveys were carried out. The SMILE pilot partners have filled in the survey, and the survey questions and results can be found in the Appendix 12.1. Regular meetings are held to discuss and elaborate on the stakeholders' map and first analyses. To expand our knowledge beyond the consortium capacity, a survey was launched to a broader audience leveraging the network inside each pilot organization and social media, in close cooperation with WP8 (ongoing process).

This document aims to establish the groundwork for the SMILE stakeholder engagement framework. The framework's focus is on addressing the gaps identified in the desk research and survey on the factors that drive or hinder end-users' engagement with digital mental health solutions. Additionally, an overview of the digital and normative landscape in which this project will be developed, as well as the current state of research on young people and their social environment (virtual and non-virtual) was provided.

3 Adolescents and Social Environment (Virtual & Non-Virtual)

Adolescents' social relationships play a significant role as either a protective or a causing factor in mental illness, and this has been extensively studied at the level of brain physiology (Lamblin et al., 2017). The COVID pandemic has highlighted the importance of social media, with direct online contact with peers playing a crucial protective function for young people. However, excessive social media consumption has been proven problematic in numerous studies (Lopes et al., 2022), but direct online contact with peers nevertheless had a crucial protective function, especially for young people (Marciano et al., 2021). While the majority of studies have been carried out on NVR (Non Virtual Relationships) (topics of bullying, mental health risk factors and trauma/violence), VSR (Virtual Social Relationship)-related research has demonstrated the vulnerability of young people during contact restrictions. Social media has a definite impact on the mental health of adolescents. Nonetheless, few studies have considered both virtual and physical social relationships of young people, and those that do tend to focus on negative experiences. More resource-oriented studies that consider both online and offline interactions and their overlaps to bring results closer to the reality of socially-connected adolescents are needed. Phase 1 resulted in 26,055 records, out of them 1,687 papers were reviews and meta-analyses. A total of 502 articles were published since 2022 and after de-duplication and application of our eligibility criteria we selected 268 articles. Of these articles, 78 (29,1 %) referred to VSR, 168 (62,7 %) to NVR and 22 (8,2 %) to both. Regarding the literature review on the role of social network of adolescents both in virtual and non virtual space, most papers referred to adolescents in general with no specification of age. Details are presented in table 1.

Table 1: Frequencies and percentages of papers that were related to a specific age group

Age	N	%
children	11	4.1
children and adolescents	80	29.9

adolescents	121	45.1
adolescents and young adults	31	11.6
young adults	14	5.2
All	268	100

The main topic merged from the thematic analyses of our social network mapping are summarized in table 2 and described in the following subheadings:

- **Covid.** Thirty-nine reviews and meta-analyses (14,6 %) were carried out in the past two years related to Covid and its consequences for the mental health of adolescents. Fears of infection, contact restrictions, school closures among other fundamental kinds of burden had a broad range of adverse effects on children and adolescents, ranging from unhealthy eating, lack of physical activity to loneliness, isolation, and depressive symptoms. There has been a plethora of studies, reviews and even umbrella reviews (Hossain et al. 2022) reporting on increased mental health issues such as anxiety, depression, sleep disorders, suicidal behavior, stress-related disorders, attention-deficit/hyperactivity disorder, eating disorders and more. An important observation was that not all groups of adolescents were faced with increased school stress, as this was highly related to the socioeconomic status and level of education of the parents (Jost et al., 2023). In fact, ethnic-racial minority youths were more often affected by COVID-19-related health disparities and experienced higher levels of worry and stress (Eboigbe et. al., 2023). Social media played a crucial, yet ambivalent role during this time and there is no clear answer to the question, if it played a supporting or rather fear-inducing role for adolescents (Draženović et al., 2023). Resilience factors during Covid lockdowns for adolescents were salient on an individual level (e.g., in case of humor, emotion regulation, cognitive reappraisal) and on a social level (e.g., by parental support), however, only few concrete interventions were found in studies supporting resilience (Doom et al., 2023). Several reviews within the past two years focused on specific disorders and the influence of the pandemic on their incidence and treatment modalities. Increases of eating disorders in in- and outpatients have been observed (Schlissel et

al., 2023; Meier et al. 2022). Adolescents with ADHD faced difficulties in remote learning, however, positive changes were reported related to relationships with family and peers for this specific group (Dal-Pai et al., 2023). Finally, internet addiction and internet gaming disorders increased during the pandemic especially in young people with missing or harmful family structures (Petrovic et al. 2022; Han et al., 2022).

- **Intervention / treatment.** In the past two years 37 reviews (13,8 %) regarding interventions for young people struggling with mental health have been published. CBT showed a positive effect on reducing symptoms of youth with abdominal pain disorder (Chen et al., 2023), anxiety (Etkin et al., 2023) and PTSD (Somers et al. 2022), but less effectiveness for adolescents with school refusal (Heyne et al., 2022). There is a broad field of other interventions that show a positive impact on mental health of young people, e.g. family-based outdoor therapy (Stea et al., 2022), mindfulness-based programs (Dunning et al., 2022), music-based programs (Rodwin et al., 2022), physical activity interventions (Bermejo-Cantarero et al., 2023), dialectic behavioral therapy for anger management (Haktanir et al., 2023) or school based interventions (Harrison et al., 2022). Ten reviews discussed the effectiveness of technological elements included in interventions. One successful benefit of technology has been the integration of virtual reality elements into psychological treatments (Blanco et al., 2023). Another way of integrating technology is substituting the interaction of therapist and patient. Specific topics that have been shown to be effective include internet based therapy for depression (Fadipe et al., 2023), telemedicine for alcohol addicts (Caballeria et al., 2022), serious games in neurodevelopment disorders (Vacca et al., 2023) or mobile digital interventions (Conley et al., 2022; Ding et al., 2023). In contrast, online support of unknown people or interventions with family and friends showed mixed results (Migliorini et al. 2022; Zhou et al 2022). To highlight is one review that compared the effect of those different interventions with technological elements on LGBTQ+ (Lesbian, gay, bisexual, transgender, queer and intersex) youth (Liu et al., 2023). In this review it is reported that structured formal interventions (e.g. telehealth) and unstructured formal interventions (e.g. mobile applications) were able to successfully reduce symptoms. Structured informal interventions, e.g. serious games, according to their research show potential, but unstructured informal interventions (e.g. social media) included some risks.

- **Social media.** Thirty-five (13,1 %) reviews and meta-analyses considering the link of social media and mental health in young people have been published in the past two years. To note, the studies have mostly been about adolescents, as the legal age for those platforms is 13 years up. Still, it has been shown that 40 % of children from 8-12 years in the U.S. use social media as well (<https://www.hhs.gov/surgeongeneral/priorities/youth-mental-health/social-media/index.html>). Generally, the association of social media with mental health problems for adolescents was widely supported (Chochol et al., 2023; Gupta et al., 2022; Senekal et al., 2023; Khalaf et al., 2023). Key findings involved the association of social media with depressive symptoms (Zhu et al, 2023; Damodar et al., 2022) 39]), anxiety (Shannon et al., 2022; Blanchard et al., 2023) and eating disorder symptoms (Blanchard et al. 2023, Revranche et al., 2022; Vincente-Benito et al.,2023; Barakat et al. 2023; Sharma et al. 2023; Bozzola et al. 2022). To put it into numbers, the risk of depression increased by 13 % for each additional hour spent on social media (Liu et al., 2022). On the same page, shorter social media use has been linked to a better mood and psychological well-being in longitudinal study designs (Hilty et al., 2023). A buffering effect of the negative association of social media and mental health appears to be social media-specific parenting (Beyens et al. 2022, Modecki et al., 2022). Importantly, one review outlined that even though the association between social media use and depression might be visible in the global north, it was not equally observed in the global south (Ghai et al., 2023). While several studies focused on the risks and harms of social media, some also outlined the potential benefits that social media has for adolescents: these involve social connectivity and peer support (Kostyrka-Allchorne et al., 2023; Rieder et al., 2023; Popat et al., 2023, Senekal et al., 2023) or being able to express themselves (Khalaf et al., 2023; Popat et al., 2023). Additionally, social media can have a positive effect on young people of color in terms of coping with negative experiences and expanding social opportunities (LeBlanc et al., 2022).
- **General mental health risk factors.** A total of 21 papers (7,8%) reported on other mental health risk factors in adolescents than Covid and social media related topics as described above. As a side note, bullying, violence and childhood maltreatment, which are genuinely key mental health factors, was given an own category and are described later. The remaining articles in this category focused on specific contextual factors that have a detrimental effect on youth mental health. Examples are: be-

longing to racial minorities (Cosby et al. 2023), suffering from a chronic health condition (Berkelbach et al., 2022) living in families with parents with military-based traumatic disorders (Cramm et al., 2022), incarceration of parents (Luk et al., 2023), or parental death (Farella et al., 2023; Jessop et al., 2022). A remarkable overview (Sequeira et al. 2022) summarized findings from neurobiological studies on the development of youth anxiety. The authors found that study results allow only weak conclusions due to inconsistent and broad approaches, however, two main conclusions could be drawn: *i)* Social anxiety and neural activation to the anticipation of incentives (reward or punishment) based on the participant's behavior are closely related; *ii)* Social anxiety is associated with low positive affect, which might be due to avoidance of positive experiences in social interactions. Generalized anxiety disorder in youth, finally, might be associated with deficits in processing emotional stimuli, however, the authors conclude that here more research is needed. Two reviews investigated studies on deliberate self-harm and its reasons. Self-harm of adolescents is an increasing public health concern, as it is a predictor for suicidal behavior. Reasons are multifactorial; however, contextual factors often are related to school stress or weak family support, protective factors as well are connected to good social relationships at school (Patra et al., 2023, Varley et al., 2022).

- **Bullying.** A huge number of papers has been published in the past two years on the role of bullying for adolescents' mental health, 18 as a whole, which represents 6,7 % of the data set. Out of these reviews, most of them (10) focus on traditional bullying, 2 on cyberbullying and 6 on both. Five reviews considered as well the perspective of the perpetrators. Current estimates show that while rates of traditional bullying have remained stable (30%), rates of cyberbullying are increasing rapidly (46% of youth) (Flannery et al., 2023). In both forms it has a long-term negative effect on the mental health and development of adolescents, as internalizing symptoms can lead to feelings of guilt, low self-esteem, and in the long run depression (Guzman-Holst et al., 2022), anxiety (Ferraz de Camargo et al., 2022), eating disorders (Day et al., 2022) or impairments in health related quality of life (Dubey et al. 2022). A meta-analysis at the level of different disorders compared the effects of traditional and cyberbullying in 266,888 participants. In short, cyberbullying had a slightly more negative effect on different mental health risks, however, the most negative effect was shown for adolescents who suffered from both, traditional and cyber-bullying (which affected around one third) (Li et al., 2022). Neurobiological

studies found evidence on negative consequences at the level of brain dynamics (e.g. related to emotional sensitivity, sensitivity of facial expressions, and cognitive flexibility (Palamarchuk et al.,2022; Ke et al., 2022). Negative impacts, however, are evident in victims of bullying, peers witnessing bullying, and in perpetrators (Bhatia et al., 2022). Findings of a meta-analysis indicate that strengthening the emotional intelligence might lower the risk of being bullied in school and online (Zhang et al., 2023). Moreover, interventions at the level of schools and families are needed to prevent bullying.

- **Trauma / violence.** Mental health in adolescents that experienced trauma or violence has been the topic of 14 reviews (5,2%) in the past two years. Mostly there have been human-related traumatic events reviewed. One focus was on the effect of intimate partner violence for children, namely internalizing problems (Evans et al., 2022), struggle with self-regulation (Zhang et al, 2023) and being more frequently in contact with bullying, may that be as victim or perpetrator (Lee et al., 2022). The effect of intimate partner violence for children appears to be mediated by individual and family factors like parenting (Zhang et al., 2023; Carter et al., 2022). Another topic reviewed was adolescent dating and relationship violence. It has been outlined that knowledge about general risk or protective factors is missing so far (Claussen et al. 2022). Also, a variety of measures was utilized, yet they were not equally applicable for minorities and non-heterosexual relationships (Meiksin et al. 2023). The risk of exposure to sexual or physical violence is noteworthy, as depressive symptoms which can persist for up to two years can be a consequence (Lewandowska et al. 2022). Taking into account the longitudinal perspective after intimate partner abuse, it has been shown for women that sought help, depression symptoms, post-traumatic stress and physical symptoms decreased (Patton et al., 2022). Other topics concerned traumatic events of refugees (Danga et al. 2023) and individuals born after genocidal rape (Uwizeyeet al., 2022). No more than one review discussed non-human related traumatic events, in detail the effect of natural disasters on children and adolescents (Witt et al. 2022).
- **Gender identity.** A total of 12 (4,5 %) reviews focused on the mental health of adolescents with a specific gender identity. It is a fact that sexual and gender minority adolescents, who are referred to the group of LGBTQ+ are at higher risk of developing mental health problems compared to their cisgender peers. Studies found elevated risks of generalized anxiety disorders, major depression and a substantially

increased risk of suicide (Madireddy et al., 2022). As violence and bullying are fundamental causes for the low mental health of these young people, more inclusive learning environments and school-based interventions are needed (Chan et al., 2022; McDermott et al., 2023). At an individual level, CBT interventions and coping strategies have been considered as effective [(Lucassen et al., 2018, Lucassen et al., 2022, Lucassen et al., 2023)]. Social media plays a crucial role in the LGBTQ+ community as a platform for identity formation and peer support, and its use is associated with a reduction of mental health concerns (Berger et al., 2022). LGBTQ+ adolescents, moreover, are prone to use video gaming for escapism and coping with stress. Rainbow SPARX has been mentioned as a video game that has been adapted for the specific mental health needs of this subgroup (Di Cesare et al., 2023).

Table 2. Frequencies and percentages of main topics in the selected papers

Main Topic	N	%
Covid	39	14.6
Intervention/treatment	37	13.8
Social media	35	13.1
General mental health risk factors	21	7.8
Bullying	18	6.7
Trauma/violence	14	5.2
Gender identity	12	4.5
Health services research	9	3.4
Social context	9	3.4

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Suicide	9	3.4
Digital stressors	8	3.0
Childhood maltreatment	7	2.6
Immigrants/Refugees	6	2.2
School	6	2.2
Addiction	5	1.9
Socio-economic status	5	1.9
Autism	4	1.5
Nutrition/weight	4	1.5
Physical activity	4	1.5
Serious mental health illness	4	1.5
Emotion regulation	3	1.1
Internet gaming	3	1.1
Prevention	3	1.1
Sexuality	3	1.1
TOTAL	268	100

4 E-mental health digital solution landscape

The use of technology to support mental health is not a new concept, but the COVID-19 pandemic has brought about a fundamental change in mental health service delivery. Telehealth and other digital solutions have been rapidly incorporated into clinical practice. Mental health support is now commonly accessed via websites and smartphone apps, wearables that monitor mental health, and video and live chat for consultations. There is growing evidence supporting the positive impact of internet-based interventions, smartphone apps, video conferencing consultations, and social peer support networks on mental health (M. Seabrook & M. Nedeljkovic, 2021). Digital technology offers a way to address the global mental health treatment gap, and the World Psychiatric Association's *Commission on the Future of Psychiatry* has claimed that the digital psychiatry revolution has arrived (Bughra et al, 2017). The digital psychiatry is a major priority area for future practice, policy, and research, as it could help reach billions of people. With its unconstrained geographic reach and potential to improve the scalability of interventions, digital psychiatry holds the potential for radical change in service delivery and the development of new treatments. A 2019 Lancet Psychiatry editorial similarly describes a general agreement that big data and algorithms will help optimize performance in psychiatry. There is agreement by healthcare providers, medical associations, industry, and governments that automation using digital technology could improve the delivery and quality of care in psychiatry, reducing costs as well (Bauer et al., 2019).

The field of application extends beyond healthcare settings and into life routine (schools and universities) where machine learning systems have been applied to monitor student data and activate support for students in mental health crises as well as the application of Internet of behaviour and artificial intelligence approach to gather a huge amount of human behavioural information and change it into important insight (Amir et al., 2023); therefore, mapping digital mental health technologies requires looking beyond the confines of health systems. There are many technologies designed to address various psychological targets for different purposes, such as intervention, diagnosis, decision-making support, and self-assessment. Smartphone interventions, also known as MHapps or mHealth, are particularly helpful in supporting users in self-management of their mental health. These apps can provide goal-focused, reflection-focused, or education-focused content to users (Bakker et al., 2016). Nevertheless, it is crucial to acknowledge the barriers that come with digital mental health interventions in order to overcome them and reap their benefits.

5 Guideline, good practice and policies in e-mental health solution for adolescents: recommendations

To successfully implement e-mental health interventions for adolescents, it is crucial to plan carefully, follow ethical standards, and consider best practices. To enhance the effectiveness, safety, and sustainability of e-mental health interventions for this group, the following guidance and good practices should be considered. Afterwards, the guidelines and policies in the pilot countries where the SMILE project will be implemented and these results will feed D.3.1.

The main recommendations to take into account in the development of e-mental health solution addressing adolescents are synthesized in the following subheadings (Wies et al. 2021; Gopalkrishnan et al.2018; Chen, 2019; Schmutz, et al. 2016; Labrique et al, 2020, World Health Organization; 2020, Bakker et al. 2016. Wissow et al. 2020, Bantjes et al.2022, other sources available at: <https://www.iso.org/standard/82070.html>; <https://www.nngroup.com/articles/mobile-ux-study-guide/>)

1. Ethical Considerations:

- Obtain informed consent from both adolescents and their parents or guardians.
- Ensure confidentiality and privacy of the users' data.
- Provide clear information on data storage, security measures, and data sharing policies.
- Young people in different stages of displacement will have varying levels of capacity to absorb new content. Cognitive overload due to stress will inhibit their capacity to engage, learn and to follow complicated navigation on a mobile app or site. Clear and streamlined design will allow those seeking help to feel less overwhelmed when navigating a resource. During COVID-19, for example, Irish youth showed a preference for varied content, easy-to-read information, personal stories, links to activities, resources, and skill-building exercises, polls, comment sections and quizzes. They also preferred interpersonal connections and going beyond articles and videos to connect (synchronously or asynchronously) with other young people or with adult professionals. They valued feeling listened to and heard, which they felt lead to responses that were tailored to their unique situations and therefore more useful and effective (Erwin & Thompson, 2020,)

2. Cultural Sensitivity

Cultural adaptation is a crucial element for effective psychological treatment, whether it be face-to-face therapy offline or online. It requires us to focus on cultural backgrounds and languages, tailoring e-mental health interventions to be culturally sensitive and relevant to the target group. There are eight essential areas to consider for cultural adaptation of Internet- and mobile-based interventions, which are:

- **Language:** Which language is most familiar to the target group? What are the differences in regional or subcultural dialects or slang used by forcibly displaced adolescents?
- **Persons:** What should the patient-therapist relationship look like? What are the expected roles?
- **Metaphors:** Do symbols and sayings make sense to the target population? How are they interpreted?
- **Content:** Does the content consider cultural values, customs, and traditions? How can it be tailored?
- **Concepts:** What is the theoretical model of the treatment being offered? Does it make sense to the target population?
- **Goals:** What would be a culturally acceptable way to determine treatment goals? How should the therapist or helper agree on the goals with the adolescent?
- **Methods:** What are the culturally appropriate procedures and processes for achieving the treatment goals?
- **Context:** How can the intervention be designed in a way that is aware of broader social, economic, and political contexts?

3. User-Centered Design (including entity-centric approach):

- Involve adolescents in the design and development process to ensure usability and acceptability.
- Design user-friendly interfaces that are visually appealing and engaging for adolescents. An Information Ecosystem Assessment includes both a review of available media and telecommunication infrastructures and people's information and

communication needs, along with an analysis of information producers. This includes many of the above aspects as well as analysis of the wider information ecosystem, possible physical infrastructure weaknesses and power dynamics as related to media discourse and its effects on communities.

- Accomplish with UX principles (usability heuristics, user research methods) according with Nielsen Norman Group who is a leading research and consulting firm in the field of user experience (UX) design.
- Observe ISO standards in the development phase.

4. **Accessibility:**

- Ensure that the e-mental health platform is accessible to all adolescents, including those with disabilities.
- Provide multiple modes of access (web, mobile app) to cater to diverse preferences.
- Projects that provide technology “solutions” normally face non-technical obstacles such as gendered social norms and unequal power relationships which affect the uptake and use of these solutions. One way to understand access from a more holistic view is by using the 5'A's framework (ask, assess, advise, agree, and assist) which helps to de-center the technology and highlights the social and political factors that limit technology access. Working with displaced and stateless adolescents to better understand access as it relates to gender, age, literacy, language, social and cultural norms, disability, race and ethnicity, migration and/or displacement status, living situation and location can help to ensure that these aspects are considered during the design process.

5. **Evidence-Based Content:**

- Base the content of e-mental health interventions on evidence-based practices.
- Regularly update the content to align with the latest research findings and treatment guidelines.

6. **Integration with Traditional Services:**

- Integrate e-mental health interventions into existing mental health services to provide a comprehensive and coordinated approach to care.

- Foster collaboration between online and offline mental health professionals.

7. Monitoring and Evaluation:

- Implement mechanisms for continuous monitoring and evaluation of the e-mental health intervention's effectiveness.
- Collect feedback from adolescents and adjust the program accordingly.

8. Safety Measures:

- Include safety features, such as crisis helplines or emergency contacts, within the e-mental health platform.
- Establish protocols for managing emergencies and crises that may arise during the intervention.

9. Education and Training:

- Provide training for mental health professionals on the use of e-mental health interventions.
- Educate adolescents about the benefits and limitations of the platform.

10. Parental Involvement:

- Encourage parental involvement in the use of e-mental health interventions, especially for younger adolescents.
- Provide resources and information for parents on supporting their child's mental health.

11. Data Security and Privacy:

- Implement robust data security measures to protect adolescents' sensitive information.
- Clearly communicate the platform's privacy policy and data handling practices to users.

12. Long-Term Engagement:

- Design interventions that promote sustained engagement over time.
- Implement strategies for retaining users, such as gamification or rewards.

13. Collaboration with Schools and Communities:

- Collaborate with schools and community organizations to promote the adoption of e-mental health interventions.

- Conduct outreach and awareness campaigns within schools and communities.

14. Flexibility and Personalization:

- Design interventions that can be personalized to meet the unique needs and preferences of individual adolescents.
- Allow flexibility in the frequency and mode of interaction with the platform.

15. Regular Updates and Maintenance:

- Regularly update the e-mental health platform to address bugs, improve functionality, and enhance security.
 - Stay informed about advancements in technology and mental health to keep the intervention current.
-

6 Description of the SMILE pilots: developing focus group to elicit barriers and requirements.

Smile tools will be designed and implemented through the active involvement of stakeholders. the serious game, app design and all the necessary requirements will be collected through focus groups with young people aged 10-24 in three different age groups (10-14; 14-19; 20-24); parents/carers of young people in this age group/ teachers and healthcare professionals in 7 pilot site: UK, Germany, Poland, Slovenia, Cyprus, Spain and Italy (Table3). To understand the stakeholders network in each pilot site, a survey among internal clinical partners was performed. The main way to create a stakeholder network was by starting from personal contacts; then social media announcement, radio interview, and stakeholder's website and direct involvement school-based have been exploited.

Table 3. Stakeholders recruitment site in SMILE project.

Pilot site	STAKEHOLDERS INVOLVED IN FOCUS GROUPS					
	END-USERS (10-14)	END-USERS (15-19)	END-USERS (20-24)	PARENTS	TEACHERS	HEALTHCARE PROFESSIONALS
SPAIN	Colegio La Milagrosa Santa Florentina (Valladolid)	Colegio La Milagrosa Santa Florentina (Valladolid)	Colegio La Milagrosa Santa Florentina (Valladolid)	Colegio La Milagrosa Santa Florentina (Valladolid)	Colegio La Milagrosa Santa Florentina (Valladolid)	Different Institutions: SACYL-Salud Castilla y León (paediatricians Emergencies) and from INTRAS.
GERMANY	different primary schools mainly Elisabet-von thadden – schule Heidelberg	Elisabeth - von -thadden schule- Heidelberg	Different institutions (medical faculty- Heidelberg, University mannheim, University munster, University leverkusen)	Private contatcs from: Heildeberg Darmstadt Mannheim	Different institutions: Bertha von-Suttner.Schul, Nidderau, Waldorfschule Darmstadt Eberstadt Mittelschule Munchen	Different Institutions: Heidelberg University Hosptial Dep of General Internal Medecine and Psychosomatics, different residencies Child & Adolescent Psychiatry (Heidelberg University Hosptial)

UK	Youth clubs and organisations in Edinburgh, Scotland	Youth clubs and organisations in Edinburgh, Scotland	Youth clubs and organisations in Edinburgh, Scotland	ongoing process	ongoing process	ongoing process
SLOVENIA	Osnovna šola Slave Klavore Maribor, Osnovna šola Ludvika Pliberška	Skofijsko gimnazija, Maribor	Faculty of Arts University of Maribor	Faculty of Arts, University of Maribor	Srednja elektro računalniška šola Maribor (online)	University Clinical Center
ITALY	Private contacts from "Istituti comprensivi" in Bologna	Private contacts from Secondary technical School	University of Bologna	Parents of FG 10-14, University of Bologna	Private contact from different institution in the northern of Italy	Trough networking with different professionals belong to the psychiatric scientific society and local healthcare organizations
POLAND	Szkoła Podstawowa nr 323 im. Polskich Olimpijczyków ul. Warsaw. :	CLIX Liceum Ogólnokształcące im. Jana III Sobieskiego ul. Solipska Warsaw	students of SWPS University, Chodakowska Warsaw	online	online	Online
CYPRUS	Bla Bla English Schools and other private English schools (Nicosia) (in person)	Department of Psychology/University	In person Department of Psychology University of Nicosia	Online Department of psychology of Nicosia	online	Online

7 Barriers from literature review

7.1 Identification of Barriers

Recognizing and addressing barriers in a project is crucial for a project's successful planning and management. According with SMILE purpose and ambitions, three principal categories of barriers have been detected: **1) barriers for help-seeking; 2) barriers towards the acceptance of digital solution for mental health in children and adolescents; 3) barriers to engagement of stakeholders in digital mental health project**, that in turn mirrors barriers to the project's implementation. After a brainstorming among internal clinical stakeholder in bi-weekly meetings, categories and research questions were defined. A scoping review was conducted to provide a synthesis of the evidence from diverse and overlapping disciplines for our topic. Rather than evaluating or weighting the findings of individual studies, scoping reviews provide a snapshot of an overlooked or emergent field of research. The current scoping review was conducted following the five-stage methodological framework which entails (a) identifying the research question; (b) identifying relevant studies; (c) selecting relevant studies; (d) charting the collected data; and (e) synthesizing, summarizing, and reporting the findings.

This report will feed Deliverable 2.2 and further documents on this topic. Results from the literature review with focus groups analyses will be combined as this method is a powerful approach to elicit barriers towards mental health and digital solutions. The literature review provided a comprehensive understanding of existing knowledge, while focus groups allowed us to gather insights directly from the experiences and perspectives of individuals that will represent the target of our projects in each pilot country.

In the following, each barrier category is described in more detail.

7.2 Description of Barriers

7.2.1 Barriers in help-seeking

Help-seeking is an adaptive and coping process whereby a person seeks external support for a problem. Help-seeking in response to mental health concerns in the development age is thus important in preventing mental illness in later life. It can be further characterised by the various sources from which a young person can seek help. These may be formal sources of help (e.g. a professional counsellor, general practitioners), informal sources (a friend or family member) or an online help source (Kauer, Mangan & Sancu, 2014). Help-seeking barriers in children and adolescents can impede their access to mental health support. From the literature

review, the following emerging themes that obstacle the help-seeking behaviour in our target group are summarized as follows:

-Stigma/shame: Stigma and shame are the highest cited barriers making people and much more children and adolescents hesitant to seek help due to fears of being labeled or facing discrimination from peers. Stigma and discrimination are the most significant obstacle to the development of mental health care and to ensuring a life quality to people suffering from mental health disorders. Stigma increases stress, decrease one's capacity to cope, affects mental health and may limit the access to health resources in the landscape of different types of stigma and stigma-related phenomena (felt stigma, internalized stigma enacted stigma, anticipated stigma, stigma practices, stigma marking). The overlap between shame and stigma is characterized by the increase risk of anxiety. Shame anxiety or chronic anticipation of shame, best characterizes the first-person experiential dimension of living with a mental health-relevant stigma. In the other hands, stigma is a term used largely by researchers, civil society, to designate a wide range of phenomena. Stigma itself is not something experienced directly by an individual, but indirectly through association with other events in social or healthcare context. Despite several anti-stigma campaigns around the world, unfortunately, stigma remains the most important and understood barriers to health promotion and wellbeing. Understanding the mechanism through which stigma affect the personal living experience of an individual will increase knowledge and provide a framework for healthcare professionals and policymakers to engage meaningfully with stigma: for this reason, it is worth investigating shame anxiety and its emotional and personal dimension in such context of adolescents' life like for example, go to party, where people are exposed to expectations. There are many link between shame and social anxiety, both associated with negative experience, perceived low social rank or image. Shame is characterized as a negative self-conscious emotion, an experience that arises when individuals are concerned about how they are seen and judged by others. In the context of help-seeking, shame is a potent treatment barrier: non disclosure to their peers, parents, clinicians at least for the fear to be stigmatized for the association of mood disorders (anxiety) to mental illnesses. It has been found that who hide their mental health experiences suffer from internal shame and are afraid of "societal scorn." Furthermore, society suffers fears and misinformation based on stigma and myth (Shim et al. 2022).

-Lack of Awareness: Limited understanding of mental health issues may prevent children and adolescents from recognizing their own symptoms or realizing the importance of seeking help. Additionally, hard-to reach-populations, racial/ethnic minorities, rural communities have

lower mental health literacy that could influence child and adolescents as well. They may not be aware about solutions or adequate approach to their mental status or counseling services. Mental health awareness campaigns globally or school-based initiatives have raised awareness of mental health issues and effectively changed student attitudes towards mental health. Mental health prevention and awareness-raising can normalize seeking help and motivate individuals to take action when they need support. In a previous study conducted on a university campus, almost half of the respondents did not know where to look during a mental health crisis, and only a quarter of students knew about student services (Giroux D et al, 2019). Awareness campaigns can be a great initiative to reduce mental health stigma. Most universities host Mental Health Awareness weeks yearly to promote mental health education. Every year on 10th of October, The WHO joins in celebrating the World Mental Health Day. The day is celebrated at the initiative of the World Federation of Mental Health and WHO supports this initiative through raising awareness on mental health issues using its strong relationships with the Ministries of health and civil society organizations across the globe (available at: <https://www.who.int/campaigns/world-mental-health-day>).

-Communication Challenge. Being able to communicate with others is a major part of maintaining a sense of wellbeing and resilience. Children and adolescents may struggle to articulate their feelings or may not have the communication skills to express their emotional distress, making it difficult for them to seek help. Communication requires different abilities in speech understanding and production. In the other hand, researches have showed that people with communication difficulties suffer from mental health problems as frustration, a sense of isolation, and confusion which can all compound feelings of distress and anxiety and contribute to poor mental health. Apart from a strong association between communication difficulties and mental health challenges, the challenge relies on the fact that many interventions to support mental health are based on talking. These interventions are likely to be less effective if children and young people have a language difficulty and adults supporting them need to make adjustments to allow for this. Furthermore, conversations about diagnosis or treatment approach occur as a normal step in mental health service. In this case, interventions need to be carefully selected so they don't add to the challenges already faced. Internationally, the use of guidelines and tools have been called for to support the process of diagnostic disclosure. To assist clinician training or to provide a communication tool to support discussions at the time of diagnosis, some models have been proposed. The SPIKES protocol (*Setting; Perception; Invitation; Knowledge; Empathy; Summary/next Steps*) (Baile et al., 2000) has been utilised in both mental health research and training. SPIKES has been found to be acceptable to individuals who have

a lived experience of diagnosis; however, factors specific to mental health require additional focus, such as better addressing stigma and diagnostic change (Milton & Mullan, 2018). Sometime receiving not age-appropriated answers from clinicians could block adolescents to expose themselves. Fear of punishment or judgment from parents, teachers, or other authority figures can discourage children and adolescents from disclosing their mental health concerns. This barriers overlap with stigma, shame and parental influence (socio-cultural context where child and adolescent grow up.

-Parental Influence. The attitudes and beliefs of parents or guardians can play a significant role. If parents are not supportive or do not prioritize mental health, children may be less likely to seek help. Relational health is a tool for promoting socio-emotional and physical health among young children. Relational health reflects a sense of “connectedness” with attuned others, including caregivers, family members, and other individuals within the community. This topic is consistent with the field of lifestyle medicine, which considers the environment as a social determinant of health and well-being, and research on health and social behavior, which highlights parents as significant influences on children’s health (Frosch, et al. 2019).

Viewing development through the lens of relational health reflects recognition of the critical role that relationships play in children’s social, emotional, health, and cognitive outcomes. Accordingly, the revised Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood (DC-05) considers how characteristics of the broader caregiving environment, such as co-parenting quality and other close relationships, relate to developmental and mental health diagnoses (Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood, DC: 05TM, 2016).

-Peer Pressure. Social peer pressure can have both positive and negative effects on mental health. The pressure to conform and fit in with certain social groups can lead to anxiety, depression, and risky behaviors such as substance abuse. However, positive peer pressure can encourage healthy behaviors and provide a sense of community and support. It is important to educate young people on the risks associated with unhealthy behaviors and promote positive social norms to reduce the negative effects of peer pressure on mental health. Fear of social judgment or rejection by peers can discourage adolescents from seeking help, as they may worry about how their friends will perceive them. The pressure for social realization feeds the fear for social failure, which, in turn, will activate, in those more fragile and predisposed subjects the escapism phenomenon more often video-gaming mediated (Marques et. al. 2023).

-Cultural and Religious Factors. There are various traditional treatment-seeking behaviours and differing conceptualizations of mental health throughout the globe; for example, in

some countries or continents such as the Ukraine, or Africa. Some young people in these country or coming from specific area where religious behavior are predominant, can use traditional healers or religion for their personal problems (Subu et al., 2022). In Arabic cultures, speaking about problems outside of the family is taboo because collective needs are expected to be prioritized over individual needs. In Indonesia, some people might believe that persons with mental illness are empowered with supernatural forces and possessed by demons (i.e., Satan, roh, jinn, or genie) or evil spirits (i.e., malevolent preternatural beings) (Burns et al., 2015). The ethnic minority student (students who are born outside the destination country or with at least one parent born outside the destination country) might hold different attitude towards mental health than the domestic students and this should be considered when developing intervention for young people. In the OECD countries, the overall percentage of ethnic minority students in schools increased consistently from 10% to 13% between 2009 and 2018 (European Commission, 2020; OECD, 2021). Such diversity provides various opportunities for intergroup contact among students with a variety of ethnic and cultural backgrounds.

-Mental Health Literacy. In the context of children and adolescents, limited knowledge about mental health issues and available support services can hinder children and adolescents from understanding the importance of seeking help (Sampaio et al., 2022). In particular, some behavioural problems may attribute to normal developmental phases rather than potential mental health concerns. This kind of barriers overlaps with other before mentioned. Parental mental health literacy and attitude toward mental health significantly influences a child's access to help and child's willingness to seek help. Limited mental health education in schools may hinder students' ability to recognize and address their own mental health needs and peer pressure together to the fear of judgment from classmates, can discourage seeking help. Cultural beliefs and practices and socioeconomic factors may influence perceptions of mental health and willingness to seek help and the material access to resources and healthcare. Insufficient availability of mental health resources and services, especially in certain regions, can limit access to age-specific and appropriate care. Finally, with the increasing use of digital platforms for mental health information and support, a lack of digital literacy may hinder access to online resources and reducing the opportunities to cover knowledge gaps about mental health.

-Lack of Trust in Adults. Compared to the above mentioned barriers, lack of trust in adults can indeed be a significant and specific barrier for children and adolescents when it comes to seeking help for mental health issues. Several factors contribute to this lack of trust, and addressing these issues is crucial for creating an environment where young individuals feel comfortable seeking assistance (Eigenhuis et al., 2021). Children and adolescents may fear be-

ing judged by adults or authority figures, including parents, teachers if they disclose their mental health concerns. Ineffective communication between adults and young individuals can create a sense of distance, making it difficult for them to express their feelings or concerns openly. Previous negative experiences with adults, such as feeling misunderstood or not being taken seriously, can erode trust and discourage seeking help if they perceive adults as unsupported. Concerns about confidentiality may prevent young individuals from confiding in adults, especially if they fear that their personal information will not be kept private. Differences in cultural or generational perspectives on mental health may contribute to a lack of trust. Some individuals may feel that adults won't understand their experiences due to these differences. If young individuals perceive that their emotions or struggles are being invalidated or dismissed by adults, they may be less likely to seek help. Absence of emotional support from adults may make young individuals hesitant to seek help, as they may doubt the availability of understanding and empathy. Interpersonal factors are often reported in the literature as help-seeking barriers, and a few studies have found that the human element is of central importance to young people in initiating and maintaining the use of mental health services. Trusting relationships for young people are built on confidentiality and so it is only as confidentiality is proven protected over time that trust can establish. Supportive rapport, provided in conjunction with meaningful care, are built on good interpersonal skills from a helper who is understanding, caring, open, attentive, nonjudgmental, genuine, relatable, available, and who ensures young people feel comfortable and welcomed.

7.2.2 Barriers in acceptance of digital mental health solutions

Encouraging people to use e-mental health solutions is a challenge (Eccles et al. 2020).

The acceptance of digital mental health solutions for children and adolescents can face several barriers, impacting their utilization and effectiveness. The main categories of barriers in this area are the following:

-Stigma and cultural factors. Cultural stigmas surrounding mental health issues may extend to digital solutions, with some parents or caregivers being hesitant to embrace technology for mental health support due to traditional beliefs or concerns about judgment. Pervasive stigma is present also in the context of digital mental health technologies especially when relevant data could be exposed. Digital technologies, in particular social-media, may elicit addiction and reinforce self-harming behavior. In fact, cyberbullying is widespread and may be particularly burdensome where data is leaked (Martinez-Martin et al., 2018) and this fear to be cyberbullied could keep young away to communicate with peers their feeling or their problems. In the other

hands, internalized stigma may lead patients to use social networks to self-expose such self-harming behavior, which in turn may reinforce stigma against their illnesses (Pater et al., 2019). The effects of stigmatization extend to how patients are treated by institutions. Institutional representations of mental illness, such as the media, contribute to stigma by providing “unfavourable and inaccurate representations of psychiatric disorders” (Feuston et al., 2018).

-Socioeconomic factors. Disparities in access to digital resources based on socioeconomic factors can create inequalities. Not all children have equal access to devices, internet connectivity, or a safe and private space to use digital mental health solutions. Digital divide describes the phenomenon that technology is not equally available to all social groups due to economic, social or cultural inequalities. Concretely, barriers such as poor network coverage in rural areas or the cost of digital communication constrain disadvantaged children and young adults to access relevant contents (Griffiths et al., 2017).

-Privacy and safety. Concerns about the privacy and security of personal information can deter both children and their parents from using digital mental health solutions. Trust in the confidentiality of online platforms is crucial especially if regulation and ethical use of digital mental health solutions may deter some parents from allowing their children to engage with these tools for the fear that confidential information may be shared with or access given to third parties. Negative consequences of insufficiently secured data sharing can reach into multiple domains of life, school or even into relationships with friends and compromise future engagement (Lustgarten et al., 2020). Finally, addiction-induced illegal drug use has had legal consequences for patients when digital mental health technology providers had to share personal information and this could discourage youngest to trust in the confidentiality of digital solutions.

-User Interface and experience. Poorly designed or confusing user interfaces can be a barrier for both adoption and retention of mental e-health technologies. Children and adolescents may not engage with digital solutions if they find them difficult to navigate or if the user experience is not appealing. The relationship between a positive user experience (UX) and user satisfaction in mental health apps is supported by many factors (sigma software, 2023). First of all, **simplicity** (ease to use) is at the core of an easy-to-use mental health app. An uncluttered interface, straightforward navigation, and minimalist design facilitate effortless interaction. Clear and concise menu options, prominently placed buttons, and logical flow enhance usability. Apps like Headspace, for example, use uncluttered layouts to ensure that users can quickly access meditation sessions without confusion. According to a study by the Nielsen Norman Group, 86% of users prefer straightforward navigation in apps, emphasizing the importance of a clear user

interface in increasing user satisfaction (Vial et al., 2022). The WHO estimates that more than 1 billion people worldwide live with some form of disability, highlighting the critical need for accessible design in mental health apps. **Inclusivity** is essential in mental health app design. Implementing features such as adjustable font sizes and high-contrast themes accommodates users with visual impairments. In addition, providing transcripts for audio content helps those with hearing impairments. Language options and culturally sensitive content broaden the app's reach by acknowledging users' diverse backgrounds. Incorporating these elements ensures that mental health resources are accessible to everyone, regardless of ability or cultural context.

-Role of Healthcare professionals. Clinicians' acceptance is therefore a key factor for sustainable telehealth services (Wade et al., 2014). If telepsychiatry services are to expand to meet the growing unmet psychiatric need, the first step to do is addressing concerns from clinicians who would provide services. Increased exposure to telepsychiatry and education while in training would serve to improve comfort and familiarity, reduce concerns about ability to connect and establish rapport (as clinicians polled reported improved attitude toward telepsychiatry after having experienced it), address uncertainties about the technology involved, and mitigate temporary loss of efficiency while learning new ways of providing care. Education for clinicians should include instruction on best practices, strategies for ways to establish and maintain relationships at a distance, and guidance about reimbursement and billing. In addition, there is support for a "hybrid model" that extends and supplements in-person care, a model with potential to improve physician and patient satisfaction and acceptance. Benefits that attract psychiatrists to telepsychiatry that deserve further exploration include: 1) **flexibility**, in scheduling and increased diversity of practice by working in different settings (schools, prisons, homes, and hospitals) and with different populations (prisoners, students, employees, hospital patients, and outpatients); 2) **support** to local practitioners to guarantee much needed care into rural and remote communities that is a major motivation of many telepsychiatrist. Some mental health professionals may be skeptical about the effectiveness of digital solutions or may lack awareness of evidence supporting their efficacy, impacting their recommendation and integration into traditional care. Furthermore, integration with traditional care could represent barriers. Resistance to digital solutions may also arise if they are not perceived as complementary to traditional mental health care or if there is a lack of coordination between digital tools and in-person services. Digital solutions that do not consider the developmental stages and needs of children and adolescents may fail to resonate with them, leading to disengagement (Gajarawala et al., 2021; Borges do Nascimento, et al. 2023).

7.2.3 Barriers for engagement and implementation

Engagement and implementation of mental health interventions can be hindered by various barriers. These barriers could occur at different levels, including organizational and systemic barriers as well as at micro (individual) meso (community) and macro (societal). Ten categories of barriers (technological-product centric; technological -customer centric; contextual; financial; human-tech interaction; relationship with in-person mental e-health solution; literacy, techno-system interaction, legal and regulation, and privacy) were detected and reported in table 4.

Table 4. Barriers for stakeholders’engagement in e-mental health project.

Barriers	Specification
Tecnological (product-centric)	Outdated technologies and lack of technology infrastructure (Gaebel et al., 2020); difficulties for internet access (Clough et al., 2017); limited access to internet (Burchert et al.,2019); (Reilly et al.,2020) environmental and connectivity issues (Navarro et al., 2020); digital technology drawbacks (hackers, overusing) (Irish et al., 2021); need of structural investments for Internet access (Strudwick et al., 2020); (Topooco et al., 2017); technical issues (Achilles et al., 2020); technological lag (Nordgreen et al. 2021), Limited access to smartphones for some parts of the population and sharing of devices (Burchert et al., 2019) Infrastructural limitations (Reilly et al., 2020; Murphy et al., 2021); Ownership of few electronic devices (Parikh et al., 2019); Aesthetic components (Burchert et al., 2019); Poor design or appearance (Gulliver et al., 2020); Slow pace of text communication and lack of non-verbal conversational cues (Navarro et al., 2020); Difficult to measure engagement because of anonymity (Coleshill et al., 2022).
Technological (customer-centric)	(usability) Time insensitivity, inflexibility of the digital programme (Doukani et al., 2022); Lack of clarity, ambivalence (Toscos et al., 2018) Lack of rigorous evidence (Sit et al., 2022) Lack of real support (Murphy et al., 2021). Inappropriate content or repetitiveness (Achilles et al., 2020)

<p>Contextual (economic, social and cultural factors)</p>	<p>Micro (individual): the solutions are the same for all the patients that often have different educational levels and digital skills (Gaebel et al., 2020); different access for vulnerable groups (Strudwick et al., 2020) or minority groups to e-health solutions (Rahman et al., 2022, Narayan et al., 2022); Lack of trust connected to the legacy of racism, colonialism, and human rights abuse (Murphy et al., 2021); personal barriers/stigma (Gulliver et al., 2020); self-stigma (Sit et al., 2022); stigma (Tewari et al., 2021); Distress (Gulliver et al., 2020); Lack of time (Achilles et al., 2020); Distractions (Gulliver et al., 2020); Competing priorities (Murphy et al., 2021; Abi Ramia et al., 2018); Time-consuming work life and private life (Braun et al., 2022), Lack of time for implementation and lack of reciprocity among parents (Murphy et al., 2021)</p> <p>Meso (community): Discriminations (Reilly et al., 2020) Marginalization and under exposition of minorities (Porche et al., 2022), Language and cultural differences (Reilly et al., 2020) Diversity of contexts for implementation (Martinez et al., 2021); Systemic influences (Roberts et al., 2021) negative perceptions of people with mental health problems and stigma at the community level (Murphy et al., 2021, Roberts et al., 2021; Oti and Pitt, 2021; Irish et al., 2021);</p> <p>Macro: Country-specific barriers such as languages and policies, Political instability (Gaebel et al., 2020); political instability, epidemics, conflicts, natural disasters and challenging socio-economic context (Murphy et al., 2021) Lack of critical ethical guidelines (Braun et al., 2022).</p>
<p>Financial barriers:</p>	<p>High costs of implementation (Gaebel et al., 2020); financial limitations (Burchert et al., 2019); limited financial resources, low priority and poor allocation of funds by policymakers at a national and international level for projects about mental health, low financial resources (Murphy et al., 2021); lack of financial resources (Irish et al., 2021) Costs (Topooco et</p>

	al., 2017)
Human-technological interaction	<p>Organizational: Resistance to change (healthcare providers and therapists who are reluctant to adopt new technologies or change existing workflow can hinder the integration of DSS into clinical practice), poor alignment with existing clinical workflow, cumbersome documentation processes and lack of interoperability with electronic record systems can disrupt workflow efficiency and reduce provider acceptance of digital tools) (Li et al, 2022). Resource constraints (limited funding , competing priorities within healthcare organizations can impede the development implementation and maintenance of e-mental health tools) ; Inadequate training and support, and ongoing education for healthcare providers on how to use digital tools, in particular DSS , may limit their ability to incorporate tools into routine (Mahomed, 2020)</p> <p>Healthcare professionals’ retention: Low expectancy of professionals (Gaebel et al., 2020); concerns about therapeutic alliance (Braun et al., 2022) Perceived loss of therapeutic relationships, and fear of replacement/devaluation (Gaebel et al, 2020.); No clear boundaries in terms of availability between patients and psychotherapists (Van Daele et al., 2020) Doubts regarding effectiveness (Achilles et al., 2020) and fear of competition among professionals (Topooco et al., 2017); Stress due to high patient traffic (Weitzel et al., 2023) Lack of understanding for which patients e-health is suitable (Weitzel et al.. 2023); Challenges with assessment of problems (Navarro et al., 2020), Diverging expectations regarding the nature of mental illnesses treatment (Murphy et al., 2021), training (Endale, 2020, Freund et al., 2020); necessity to train professionals (LaMonica et al, 2022a); training of health care workers (Tewari et al., 2021; lack of providers’ training (Murphy et al., 2021); lack of skills of the researchers in policy makers’ field (Murphy et al., 2021); lack of human resources (Irish et al., 2021); training of</p>

staff (Topooco et al., 2017) Increase in workloads for health professionals (Gaebel et al., 2020); Lack of budget (Gaebel et al., 2020); high costs (Silfee et al., 2021; Gulliver et al., 2020); reluctance to take on new tasks due to a large burden of work in primary care settings for health care providers (Murphy et al., 2021); lack of adequate compensation, heavy workloads reluctance of people in participating to projects without compensation (Murphy et al., 2021; Lack of appropriate human resources and expertise for service delivery (Qureshi et al., 2021) Limited human resources (Murphy et al., 2021).

Users'reception: High dropout rates (Sit et al., 2022; Tsiouris et al., 2021; Enrique et al., 2019); lack of adherence (Tsiouris et al., 2021); attrition rates at follow-up (Alvarez-Gimenez et al., 2020); low adherence and high attrition (Oti and Pitt, 2021); non-adherence (Achilles et al., 2020) Low Confidence (Doukani et al., 2022; Silfee et al.); Lack of motivation (Silfee et al., 2021; Gulliver et al., 2020); Low expectations of effectiveness (Gulliver et al., 2020) Low practice (Doukani et al., 2022); Lack of awareness (Gaebel et al, 2020; Gulliver et al., 2020; Qureshi et al., 2021; Abi Ramia et al., 2018) Conservative attitudes (Gaebel et al., 2020); Negative attitudes (Topooco et al., 2019) Quality of the therapeutic relationship (Roberts et al., 2021); Credibility (Burchert et al., 2019); Lack of credibility of health professionals (LaMonica et al., 2021); Low user engagement (Burchert et al., 2019); Mistrust (Reilly et al., 2020); Lack of trust (Irish et al., 2021) Lack of interest (LaMonica et al., 2021); Need of peer endorsement (Silfee et al., 2021); Perception the programmes are boring (Gulliver et al., 2020; Achilles et al.,2020); Doubts about effectiveness (Irish et al., 2021); Different understandings of key concepts among participants to e-mental health projects (Nordgreen et al., 2021) Doubts regarding effectiveness, no perceived need for help (Achilles et al., 2020); Perception that the programme is not tailored (Gulliver et al, 2020.); Lack of personalization (Palacios et

	al., 2018); Low perceived self-efficacy and diverging expectations regarding the nature of mental illnesses treatment (Murphy et al., 2021).
Relationship with in-person mental health solution	Impersonality (Gaebel et al., 2020; Irish et al., 2021; Braun et al., 2022; Weitzel et al., 2023); fear of loss of human contact (Gaebel et al., 2020); need of more human contact (Clough et al., 2017; Palacios et al., 2018); not equivalent to in-person care (LaMonica et al., 2021); need of human touch (Milton et al., 2021); preference for in-person therapy (Silfee et al., 2021); preference for face-to face resources (Toscos et al.); lack of human contact solution (Alvarez-Jimenez et al., 2020); need to have a face-to-face conversation (Irish et al., 2021); lack of personal contact (Irish et al., 2021); concerns about technologies and relations (Braun et al., 2022); preferences for face-to-face help (Achilles et al., 2020)
Literacy (digital, technological and health)	Limited digital literacy (Gaebel et al., 2020); low technology literacy (Burchert et al., 2019); low health literacy (Reilly et al., 2020); literacy-health literacy (LaMonica et al., 2022); Mental health literacy (Roberts et al., 2021); Digital literacy (LaMonica et al., 2021); IT skills (Coleshill et al., 2022); lack of comfort towards devices (Silfee et al., 2021); Lack of information technology resources (Raphiphatthana et al., 2020); Use of electronic devices (Tewari et al., 2021) Lack of knowledge about these solutions (Gaebel et al., 2020); Lack of information (Clough et al., 2017); Lack of knowledge (Coleshill et al., 2022); Unfamiliarity, especially in low- and middle-income countries (Murphy et al., 2021); Low health literacy and disease management (Braun et al., 2022); insufficient information (Braun et al, 2022.); Lack of knowledge and reluctance to include these therapies in every day practice for psychotherapists (Van Daele et al., 2020); Lack of knowledge and lack of informational materials to give patients (Weitzel et al., 2023)

<p>Techno-system interaction:</p>	<p>Integration with existing system: Lack of integration with clinical workflows (Silfee et al., 2021); Transfer traditional therapies to digital dimension (Sanatkar et al., 2021); Lack of integration with traditional clinical services (Alvarez-Gimenez et al., 2020); Difficulties integrating services with existing mental health system (Qureshi et al., 2021); pre-existing fragile traditional health systems (Murphy et al., 2021); Unpreparedness of care system (Topooco et al., 2017); Little treatment innovation (Alvarez-Gimenez et al., 2020)</p>
<p>Legal and regulation</p>	<p>Restrictive legislative regulations and lack of high-quality certification systems (Gaebel et al., 2020); Lack of mandatory regulations for quality assurance at a European level (Van Daele et al., 2020); Lack of policies (Raphiphathana et al., 2020); Parents' permission for minors to participate in some projects (Lucassen et al. 2018.); Necessity to ask permission to record minors and legal restrictions (Ricci et al., 2023)</p>
<p>Privacy</p>	<p>Data protection (Gaebel et al., 2020); need of safety assurances (Clough et al., 2017); Data privacy and security and data misuse (LaMonica et al., 2021); security and privacy (Silfee et al., 2021); safety issues (Zelmer et al., 2018); data security (Gulliver et al., 2020, Braun et al., 2022), security and privacy (Nordgreen et al., 2021); privacy and anonymity (Achilles et al., 2020); privacy concerns (Weitzel et al., 2023) Safety risks for fragile patients (Tielman et al., 2019); Emotional contagion (Alvarez-Gimenez et al., 2020); cyberbullying or similar risks of implementation for people with suicidal tendencies or other vulnerabilities (Oti and Pitt, 2021).</p>

Addressing these barriers requires a comprehensive approach that involve stakeholders at multiple levels, including end-users, healthcare organizations, policymakers and community partners. Strategies to overcome barriers may include increasing awareness and education, improving access to resources, addressing technological and infrastructure challenges and promoting collaboration and coordination among stakeholders in particular healthcare professionals.

7.3 Impact analysis of barriers

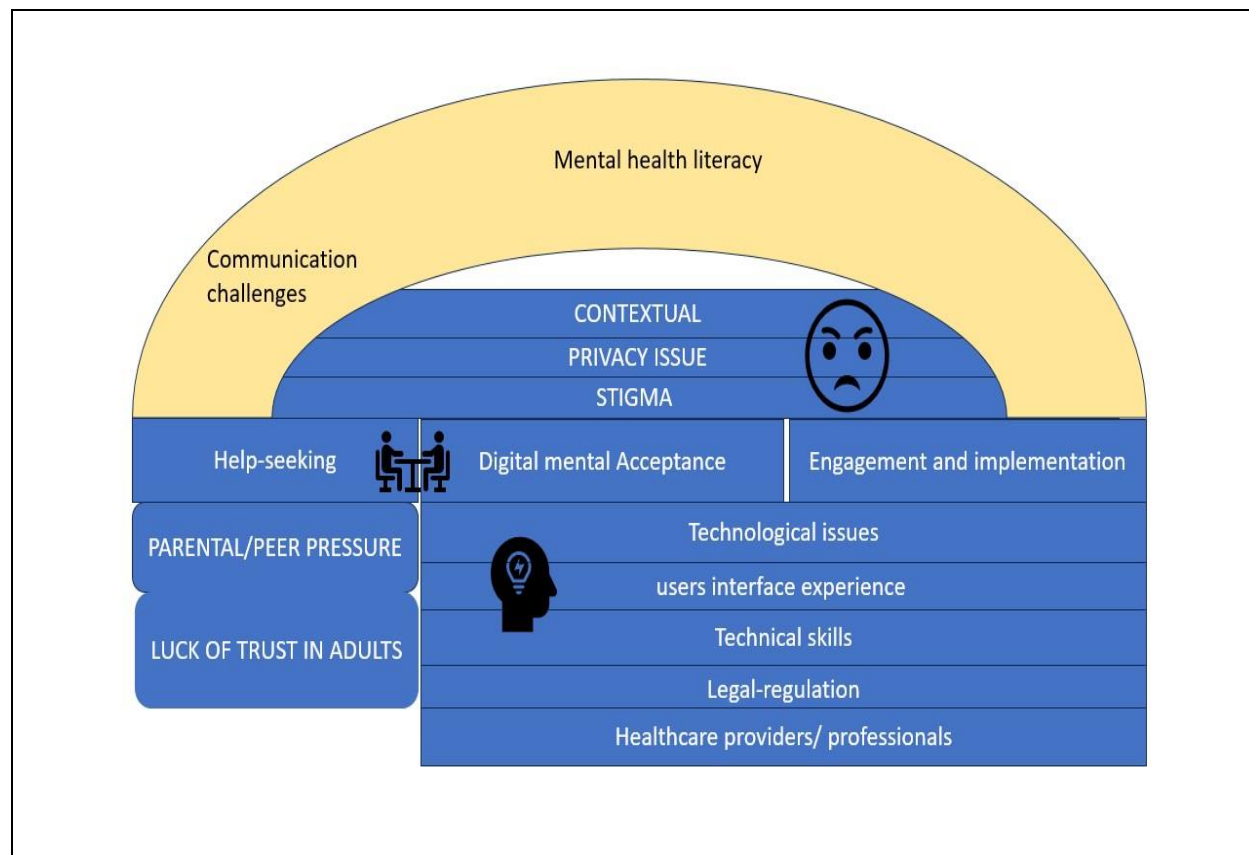
The impact analyses of barriers in e-mental health project for adolescents highlights the importance of recognizing and addressing obstacles that can hinder accessibility, engagement and overall the project success. Lowering these barriers could enhance the positive outcomes of the SMILE intervention. In table 5, barriers are interpreted under the lens of the SEM to classify their impact and level on SMILE project.

Table 5. Barriers for e-mental health solutions in the SEM model level (*I: Individual, IP: interpersonal, O: Organization, C: Community; S: Society, PP: public policies).

Barriers				Socio-ecological model (SEM) level*					
	Help-seeking	Digital acceptance	Engagement & implementation	P	IP	O	C	S	PP
Stigma-shame	x	x	X	x	x	x	x	x	x
Communication challenges	x		X		x	x	x		
Parental Influence	x			x	x		x		
Peer pressure	x			x	x			x	
Contextual (Cultural, social economic and religious factors)	x	x	X	x	x	x	x	x	x
Mental and digital health literacy	x		X	x		x	x	x	x
Lack of trust in adults	x			x	x		x	x	

Privacy and safety	x	x	X	x		x	x	x	x
User Interface & experience		x	X	x	x				
Role of healthcare professionals		x	X		x	x	x	x	x
Technological			X	x		x	x		x
Technical skills		x	X	x		x			
Legal and regulations		x	X			x		x	x

Figure n.1. Barriers in e-mental health project adapted on the SEM



Here, the impact analyses of barriers on SMILE project and how they could be potentially addressed has been synthesized

1) **Technological barriers:**

-Limited access to devices and internet (Accessibility): limited access to digital devices or lack of connectivity can hinder adolescents' participation in SMILE project, potentially excluding those who need support the most and this barrier may result in unequal access to mental health resources exacerbating existing disparities in mental health care. Adolescents from low-income families or under-served communities may lack access to smartphone, tablets or computers. Limited internet connectivity in rural areas may result in reduced accessibility to SMILE tools for adolescent living in those regions. Without access to necessary devices and internet connection, adolescents may be unable to engage with e-mental health resources, leading to disparities in access to mental health support. Compatibility issues across devices and platform, variability in device types, operating systems and software version may result in compatibility issues leading to inconsistent user experiences. Finally, adolescent with limited bandwidth or high data costs may experience difficulties in download or streaming multimedia contents on e-mental health platform. **Recommendations:** Developing offline resources, considering alternative communication channels or collaborating with local community resources, or loan phone to study participants who don't have their own devices (these phones would have pre-paid SIM cards so that participants can connect to internet via data/4G) may mitigate this barrier.

Technological competence and digital literacy: Low tech literacy among adolescents or their parents may impede their ability to navigate and utilize SMILE platform effectively. This barrier could lead to reduced engagement, as adolescents may struggle with using the features and resources available. Complex interface or unfamiliar technology features may deter users from engaging with e-mental health solution and reducing their ability to benefit from the intervention. Adolescent may encounter technical issues or require assistance while navigating e-mental health resources, but lack access to adequate technical support. Without a timely assistance, adolescents may become frustrated or disengaged when encountering technical challenges impeding their progress in the intervention. **Recommendations:** promote training, provide FAQ to solve technical issues. A participatory co-design and user-centered tools could mitigate these barriers., e.g., by designing the intervention components in a way that is easy for its target users to operate.

2) Socio-cultural barriers. Resistance to digital solutions among all the target group of SMILE project can present significant barriers to adoption and utilization. Some factors concur to resistance: **doubts about effectiveness** of digital mental health tools compared to traditional face to face interventions; lack of trust about reliability, privacy and security of digital platform; preference for human interaction perceived as more personalized and effective approach due to the therapeutic alliance between healthcare providers and users. Stigma and shame anxiety surrounding mental health issues may prevent adolescents from seeking help or disclosing their struggles even in an online environment. Overcoming stigma requires targeted intervention and failure to do so may result in underutilization of SMILE resources. **Recommendations:** dissemination strategies like for example promoting newsletters, cultural events to open discussion, provide evidence on the digital mental health effectiveness, foster scientific research on therapeutic digital alliance to raise awareness, may mitigate this barriers

3) Privacy and safety barriers: Concerns about privacy, data security, confidentiality may deter adolescents and their guardians from disclosing sensitive information or seeking support online from fully engaging with SMILE tools due to fear of information breaches. Addressing privacy concerns is crucial to building trust and failure to do so may result in decreased usage and reluctance to share personal information. Furthermore, lack of cultural sensitivity may alienate adolescents from diverse cultural backgrounds reducing the intervention's effectiveness. Tailoring content to diverse cultural perspectives (achievable by a co-participatory study design) is crucial to ensure the SMILE project's relevance and resonance with a broad adolescent audience. **Recommendations:** conduct regular audits and compliance checks to ensure that the project adheres to relevant privacy regulations and standards; develop a comprehensive privacy policy; use age-appropriate language and formats to communicate privacy information to adolescent; implement robust encryption techniques to protect sensitive data transmitted over the internet, offer options for users to engage with the e-mental health platform anonymously or pseudonymously to protect their identity and confidentiality; implement strong user authentication mechanisms to verify the identity of adolescents accessing the e-mental health platform, preventing unauthorized access; educate adolescents about the importance of safe and responsible communication online, including guidelines for protecting their privacy and avoiding sharing personal information; implement monitoring mechanisms to detect and prevent harmful or inappropriate content, such as cyberbullying or self-harm ideation, within the e-mental health platform.

8 Drivers and facilitators from Literature review

8.1 Identification of drivers and facilitators

Following the same methodological process used for barriers, keywords like “driver*” and facilitator*” instead of barriers were used focusing our research on help seeking and users’ engagement in e-mental health solutions for our target group. The key drivers to help-seeking in young people are principally the Peer/family influence and Young person’s attitude toward help sources (Rickwood, Mazzer & Telford, 2015). External influence especially in the middle adolescence could be shifted from family to peer to the online source (influencers, media) and may also include whether the young person knows someone close to them who has also sought help. Attitudes toward help sources have been shown to play a proximate role in help-seeking intentions. The extent to which the influence of others is dependent upon a young person’s positive perception of help sources is yet to be explored in the youth help-seeking literature. It may be the case that a young person’s openness to the influence of others may be dependent upon how positively they perceive the help source being recommended. Further, the variation in this hypothesized relationship between help sources (online, formal, informal) may inform how educate young people about help sources, and how services could be developed a moving forward.

The key drivers to uptake of the digital platforms and e-mental health solutions can be categorized into the following main categories (table 6).

Table 6. Drivers for e-mental health solutions.

Driver	Specification
Scientific and technological	(Characteristics): Elements that foster participation such as interactive features, feedback, quizzes, motivating messages (Burchert et al., 2019); Alerts against misuse and discriminations (Alvarez-Gimenez et al., 2020); Dynamic design (Strudwick et al., 2021); Competition (LaMonica et al., 2021); Personalized symptoms’ feedback and reminders (Gulliver et al., 2020); feedbacks (Palacios et al., 2018); supporter feedback (Enrique et al., 2019); Gamification (Gulliver et al., 2020; Irish et al., 2021); Interesting, interactive and visually appealing content (Gulliver et al., 2020); Comics (Alvarez-Gimenez et al., 2020) Real-life inspired solutions (Irish et al., 2021); Automatiza-

tion (Topooco et al., 2017).

Expansion of time, Flexible time management, geographic flexibility (Braun et al., 2022); Location independence (Freund et al., 2022) Geographical independence (Topooco et al., 2017) (Lunkenheimer et al., 2020) Absence of spatial and chronological limitations (Silfee et al., 2021), Wider toolkit (Doukani et al., 2022) 24/7 availability, (being available at time convenient for the patient).

Usability in term of access (rapid access) to digital solutions, easy learnability of apps, customizations, personalizations, tailoring of use and content, responsivity to consumers' needs, adaptability to a specific target group (Freund et al., 2022); User friendliness (Oti and Pitt, 2021; Irish et al., 2021); Clarity of content (Oti and Pitt, 2021); Written format of delivery (Irish et al., 2021).

Acceptability (Alvarez-Gimenez et al., 2020; Oti and Pitt;) Feasibility and Helpfulness (Alvarez-Gimenez et al., 2020)

Support: Support from family and friends (Braun al., 2022), Systemic influences (Roberts et al., 2021) Social connection and support (LaMonica et al., 2021)

Design: Co-design of solutions, evidence-based personalization of care, direct involvement of target groups, multimodality; Integrated approach (Alvarez-Gimenez et al., 2020)

Contents: Trauma-informed approach, follow-up of patients and updating (Strudwick et al.) LaMonica et al., 2021); Up-to-date information trustworthy information (Milton et al., 2021); information (Gulliver et al., 2020); qualified sources (Gulliver et al., 2020); trustworthiness (Blatter et al., 2022) Simple and recovery-oriented language (Milton et al., 2021); appropriate language (Oti and Pitt) Evidence-based nature (Milton et al., 2021); evidence of effectiveness and improvement (Gulliver et al., 2020); evidence-base (Zelmer et al., 2018) High quality information (Milton et al., 2021);

	<p>Simplified information provision (Braun et al., 2022) Solutions at the patients' pace (Nordgreen et al., 2021).</p> <p>Normalization of using these services (Gulliver et al., 2020); normalization of this experience Effectiveness because of text-based communication. (Stevens et al., 2022)</p> <p>Less stigmatization (Toscos et al., 2018); reduced stigma (Abi Ramia et al., 2018); destigmatization, having control over the pace of the intervention (Palacios et al., 2018); Formative research (Qureshi et al., 2021) Simplified contact maintenance (Braun et al., 2022); Low-threshold access to address psychological aspects of chronic conditions (Lunkenheimer et al., 2020) Digital altruism and empathy towards peers (Stevens et al., 2022).</p>
Relationship with existing traditional mental - health solutions	<p>To have a blended care approach (Doukani et al., 2022; Alvarez-Gimenez et al., 2020); (Ferri et al., 2016, Irish et al., 2021) ; Integration with care practice (LaMonica et al., 2021) Digital coach (Silfee et al., 2021) (Gulliver et al., 2020); Access to health professionals (Oti and Pitt, 2021) or to have an online counsellor with intensive support (Navarro et al., 2020); moderators, clinicians and young people with lived experience of mental illness (Alvarez-Gimenez et al., 2020); positive relationships with e-coach, e-coach guidance and expertise (Freund et al, 2022.) Human inputs (Oti and Pitt, 2021) Stepped models of care reducing burden on service providers (Achilles et al., 2020) Moderation of post (Stevens et al., 2022).</p>
Privacy drivers	<p><u>D</u>ata security (Burchert et al., 2019; Oti and Pitt, 2021) Data tracking (LaMonica et al., 2021); ownership and personal choices with data (LaMonica et al., 2021); privacy consent (Milton et al., 2021); data security, privacy, confidentiality (Gulliver et al., 2020); safety and privacy (Alvarez-Gimenez et al., 2020); being private (Gunn et al., 2018) Anonymity (LaMonica et al., 2021; Coleshill et al., 2022; Milton et al., 2021; Freund et al.(2022a); Oti and Pitt,</p>

	2021; Irish et al., 2021; Braun et al., 2022; Blatter et al., 2022; Weitzel et al., 2023; Stevens et al., 2022; Gunn et al., 2018; Enrique et al., 2019).
Economic	Cost-effectiveness (Gaebel et al.2020; Reilly et al., 2020; LaMonica et al., 2021; Milton et al., 2021, Silfee et al., 2021; Nordgreen et al., 2021; Abi Ramia et al., 2018; Lunkenheimer et al., 2020; Stevens et al., 2022; Enrique et al., 2019; Ferrari et al., 2022); reduced costs of treatment (Topooco et al., 2017) Monetary remuneration (Burchert et al., 2019), Compensation (Milton et al., 2021; Weitzel et al., 2023); rewards (Gulliver et al.); monetary incentives (Irish et al., 2021); book vouchers (Braun et al., 2022); voucher gifts (Williams et al., 2021); payments (Stevens et al., 2022; Patchen et al., 2020); gift vouchers (Lucassen et al., 2023)
Cultural adaptation	(Burchert et al., 2019); cultural, sexual and gender acceptance (Alvarez-Gimenez et al., 2020) Ethical principles (Reilly et al., 2020) Culturally driven choices (Yamaguchi et al., 2022); cultural sensitivity (Strudwick et al., 2021); culturally driven solutions (Porche et al.); cultural adaptation (Hickey et al., 2022); cultural appropriateness and gender responsiveness (Zelmer et al., 2018) Transparency (Strudwick et al, 2021.; Milton et al., 2021; Lee et al., 2023); Inclusivity (Strudwick et al., 2021) Strengthen bonds with communities (Hickey et al., 2022); involvement of communities (Komaie et al., 2018); Consider minorities (indigenous people and disable people) (LaMonica et al.2022) Consideration of minority groups (French et al., 2020).
Endorsement	Motivation of target groups, curiosity interest and perseverance (Braun et al., 2022) Endorsement by health professionals, family members or friends (LaMonica et al., 2021); peer use and referrals and professional recommendations (Gulliver et al., 2020); peer engagement (Oti and Pitt, 2021) Openness to experience (Apolinário-Hagen et al., 2020) Positive attitudes of users (Apolinário-Hagen et al.,

	2020) Willingness to participate (Freund et al., 2022 b) Perceived acceleration of the treatment process and outcome (Braun et al., 2022) Sense of decreased exposure, Sense of agency Sense of community, Sharing non-judgemental space (Stevens et al., 2022).
Training	Education and training (LaMonica et al., 2021) Doukani et al., 2022), Recruiting local providers (Qureshi et al., 2021).
Individual opportunities	Younger age (Apolinário-Hagen et al., 2020) Accessibility of Internet for students (Irish et al., 2021) Opportunity for large-scale delivery of psychoeducation in schools (Achilles et al., 2020) Digital nativity of youths (Blattert et al., 2022; Stevens et al., 2022); familiarity of young people with internet (Martinez et al., 2021); digital natives (Enrique et al., 2019).

8.2 Description of facilitators

Facilitators are considered as factors which support contextual condition favouring engagement and project implementation serve as a linchpin in the success of e-mental health projects, they influence user engagement, personalization, community building, and the overall effectiveness of digital mental health interventions. Their impact extends across the entire user journey, contributing to positive outcomes and the well-being of individuals participating in e-mental health programs. By addressing these factors, it is possible to create an atmosphere where children and adolescents feel more trusting and willing to seek help for their mental health concerns.

Here categories of facilitators are reported in table 7.

Table 7. Facilitators of stakeholders' engagement in e-mental health project.

Facilitators	Specification
Human	Motivation of target groups, curiosity interest and perseverance (Braun et al., 2022). Strengthen bonds with communities (Hickey et al., 2022); involvement of communities (Komaie et al., 2018) Responsivity to consumers' needs (LaMonica et al., 2021) Recruiting local

	providers (Qureshi et al., 2021). Endorsement by health professionals, family members or friends (LaMonica et al., 2021); peer use and referrals and professional recommendations (Gulliver et al., 2020); peer engagement (Oti and Pitt, 2021).
Environmental	Normalization of using these services (Gulliver et al., 2020); normalization of this experience (Stevens et al., 2022) Less stigmatization (Toscos et al., 2018); reduced stigma (Abi Ramia et al., 2018); de-stigmatization (Stevens et al., 2022; Ferrari et al., 2022)., Sharing non-judgemental space (Stevens et al., 2022), Support from family and friends (Braun et al., 2022), Systemic influences (Roberts et al., 2021).
Communication	Encourage open and honest communication between adults and young individuals. Establish a safe space where they feel comfortable expressing their thoughts and feelings. This allows to Invest in building positive relationships with children and adolescents (Build Relationships) involving adults to actively listen, show empathy, and demonstrate genuine care.
Confidentiality	Assure young individuals that their concerns will be treated confidentially, fostering a sense of trust in seeking help.
Cultural Competence	Be culturally sensitive and aware of generational differences; Provide adults, including parents, teachers, and caregivers, with education on mental health issues, emphasizing the importance of creating a supportive environment (Educating Adults)
Technological	Co-design of solutions (Reilly et al., 2020) Direct involvement of target groups (Mendes-Santos et al., 2022) Real-life inspired solutions (Irish et al., 2021) Gamification (Gulliver et al., 2020; Irish et al., 2021) Interesting, interactive and visually appealing content (Gulliver et al., 2020) Comics (Alvarez-Gimenez et al., 2020): Competition: Dynamic design (Strudwick et al., 2021) Personalized symptoms' feedback and

	reminders (Gulliver et al., 2020); (Palacios et al., 2018); supporter feedback (Enrique et al., 2019)
Ethical	Anonymity (LaMonica et al., 2021; Coleshill et al., 2022; Milton et al., 2021; Freund et al., 2022 b; Oti and Pitt, 2021; Irish et al., 2021; Braun et al., 2022; Blatter et al., 2022; Weitzel et al., 2023; Stevens et al., 2022; Gunn et al., 2018; Enrique et al., 2019) Integration with care practice; Data tracking, and ownership and personal choices with data (LaMonica et al., 2021); privacy consent (Milton et al., 2021); data security, privacy, confidentiality (Gulliver et al., 2020); safety and privacy (Alvarez-Gimenez et al., 2020); being private (Gunn et al., 2018).

8.3 Impact analysis of drivers and facilitators

The impact of drivers and facilitators in Smile Project is multifaceted, influencing engagement, outcomes and overall project success.

Here's an exploration of the impact of drivers and facilitators accordingly with the results we want to achieve.

Table 8: How drivers and facilitators in e-mental health solution could impact on SMILE project.

Goals	Impact
User engagement and Adherence:	Direct involvement of target groups, personalized symptoms' feedback and reminders supporter feedback, endorsement by health professionals, family members and friends, peer use and referrals, and professional recommendations are facilitators which enhance user engagement by providing guidance encouragement and personalized support that in turn improve user adherence to the digital tools (

	<p>platform app and serious game).</p> <p>Effective drivers able to enhance user engagement and retention in SMILE project are those making SMILE tools easily accessible, user-friendly and appealing to adolescents, i.e. to have an intuitive design, age appropriate contents and the availability of different multimedia resources, as well as flexibility and adaptability, can be appealing and retain adolescent users.</p>
<p>Tailoring Interventions to Individual Needs</p>	<p>Customizing interventions based on individual needs, preferences, and progress (data tracking, personal choices with data). Personalization increases the relevance and effectiveness of the e-mental health programs. by adapting content, exercises, or communication frequency based on cultural and gender sensitive differences, and the user's response, ensuring a more tailored and impactful experience. Drivers like interactive features, age-appropriate contents according with development stages of adolescents engage the relevance and effectiveness of mental health support. Furthermore incorporating content that reflects diverse backgrounds, languages and cultural nuances helps in creating an inclusive environment. Prioritization cultural sensitivity and inclusivity is a strong driver ensuring SMILE project will be accessible and relevant to a diverse adolescent population.</p>
<p>Building a Supportive community</p>	<p>Endorsement by health professionals, family members or friends (peer use and referrals professional recommendations (Gulliver et al., 2020); peer engagement, Sharing non-judgemental space, support from family and friends (Braun et al., 2022), systemic influences facilitate discussions and activities, promote open communication fostering a sense of belonging and reduce feeling of isolation. Virtual support groups, discussion forums or moderation in the online communities to encourage interaction and mutual support among users could facilitate the trustworthiness in digi-</p>

	tal solutions.
Addressing Technological Barriers	Especially for users with limited digital literacy or those facing technical challenges due to physical impairment, or people very sensitive to the techno-stress, having clear instructions, troubleshooting assistance or offering alternative access methods can mitigate the dropouts rate and ensuring smooth access and participation. Leveraging technology and innovative features as drivers can make SMILE tools more engaging and aligned with adolescents preferences for digital interactions (gamification , interactive apps, virtual reality elements able to create and innovative, appealing and destigmatized mental health intervention)
Monitoring progress and Outcomes	Regular assessment, progress tracking tools and periodic check in allow this facilitator to gauge the effectiveness of SMILE tools and make necessary adjustments also in term of safety. In fact, this facilitator allow to identify early signs of challenges, user's progress and celebrating personal milestones while the ongoing assessment helps in adapting intervention for better outcomes and tailored needs.
Providing Psychoeducation and Guidance	Offering psycho-education, clarifying informations, providing extra materials and additional sources guide users towards and informed therapeutic process and enhance users' understanding and application of mental health coping strategies. This facilitator could improve awareness by knowledge.
Ensuring Ethical and Safe practices	Upholding ethical standards, close adherence to privacy policies, secure data handling and transparent communication about data usage, ensuring the safety of users' participants in SMILE project, could play a critical role in maintaining a secure and confidential environment. This driver fosters trust among adolescents and their guardians , contributing to the SMILE project's credibility and success.
Promoting Long-term Behavioural Change	Providing reinforcement, support, and education of adults, including parents, teachers, and

	<p>caregivers, with education on mental health issues, emphasizing the importance of creating a supportive environment could contribute to the sustainability of behavioral change. This facilitator extends its influence beyond the implementation phase of SMILE tools giving the possibility to integrated learned skills into users' daily lives, consolidating long-term mental health benefits. Providing resources for healthcare professionals, parents and teachers, conducting workshop for educators in order to promote stakeholder communications may support the holistic well-being of adolescents beyond SMILE digital environment.</p>
Gathering User Feedback for Improvement	<p>A co-participatory research design during the whole project phase is a facilitator because it ensures that the intervention evolves to meet users' evolving needs. In the same time engaging target groups of young people in the decision-making process empowers them and ensure that SMILE project reflects their perspectives, needs and preferences. Survey focus group discussion and feedback session as well living Labs led to valuable insights for refining and optimizing SMILE tools and contribute to user-centered design and project ownership.</p>

9 Stakeholder in SMILE project. The importance of their engagement

While the need for digital interventions is growing, low levels of engagement and high levels of dropout in clinical trials and in real-world roll-outs represent a barrier for reach the expected impact (Torous et al. 2020). One review of user engagement for digital self-help interventions found that while downloads of such mobile applications are as high as 40,000 per month, only 7–42% of registrants engage in moderate use of the application. Even fewer (0.5–28.6%) engage in sustained use or complete at least 6 weeks of the intervention (Fleming et al., 2018). Similarly, a review of real-world usage of mental health apps found that the median percentage of users who opened the app each day was 4%, and the median retention rate was 3.9% for 15 days and 3.3% for 30 days (Baumel et al., 2019). Evidence suggest that programs addressing stakeholders' needs and requirements increase engagement and successful outcomes. Potential stakeholder during the preparatory work for our project proposal were detected. These include the target users, their parents and teachers, researcher, NGOs, policy-maker who generate important knowledge form different and valuable perspective. Because the interests, abilities, influence and impact of stakeholders vary greatly, it is crucial to account for that in optimizing the uptake of research project results.

9.1 Stakeholder Identification

Stakeholder analysis is a foundation process of systematically gathering and analysing qualitative information to determine whose interests should be taken into account when developing interventions, knowledge and instruments.

Generally speaking, stakeholders are a category of persons or organisations with interest in the execution and outcome of the project, including those affected by, or dependent on, the outcome. In the literature various categories of stakeholders, or “interested parties”, are identified, such as: national political (legislators, governors), public (ministries, regional and local authorities), labour (unions, medical associations), commercial/private for profit, non-profit (non-governmental) organisations (NGOs), foundations, civil society, and users/ consumers.

Performing a stakeholders' analysis means exploring characteristics such as knowledge of the specific topic, interests related to the topic, position for or against the topic, potential alliances with other stakeholders, and ability to affect the developed or (to be) implemented knowledge and interventions (through power, roles / responsibilities and/or leadership).

As Smile project addresses on children and adolescents' mental health, stakeholder selection primarily focuses on end-users and organisations that deal with work on children, youth, mental development, mental health, education, public health, at local, regional, national and European level including also the private sector, and youth organisations.

According to the lists below, adolescents and game end-users are our principal stakeholders. If so, recruiting/contacting them will not be taking place by collecting their contact information through public domain, but rather through an ethics-committee-approved research recruitment process. It will also not be through a snowballing technique. For other stakeholders SMILE partners will be active in reaching them by different strategies that will be developed.

A preliminary analysis of stakeholders helps in the development of specified approaches towards a range of stakeholders. This depends foremost on the interest and influence that stakeholders have.

Relevant stakeholders relate to the areas of strategic impact on which SMILE have the following roles:

1. Working to improve understanding of the effect of multiple exposures, and users of such information;
2. Developing preventive strategies to improve public health (and its related costs);
3. Looking for increased competitiveness on the European market, intent to identify new business sectors in exposure characterization, technical tool development and modeling;
4. Addressing priority goals of established policies on Environment and Health such as in EU or WHO declarations.
5. Working to reduction of the societal burden of disease.

An initial identification of the groups of stakeholders that are considered to be relevant to the project, is presented following:

- Adolescents (Youth) and their associations
- Academia (universities, research institutes)
- Educators (School staff, pedagogic institutions)
- Parents (including grandparents in such context where they are more present than parents in raising children and adolescent)

- Healthcare professionals (public and private health institutes/mental health organizations)
- Businesses (SMEs, Start-ups, Med industries, Health technology and service providers)
- Policy makers (deputies, parliament, ministries, European Community representatives, city councils)
- Regulatory bodies (authorities, governments, public supervisors)
- Investors and Insurers (agencies banks, business angels, health insurers)
- Society at large (NGOs, CSOs, citizens, associations, communities, influencers, media).

Policy makers and regulatory bodies include the ministries relevant to the mental health and wellbeing for our target group, in particular Minister of health, Minister of Education, Minister of Sport and according to the own internal constitution to minister of social affairs, family, and minister of equal opportunities. Each of these stakeholders plays a unique role in addressing the various strategic impacts of SMILE, contributing to efforts to understand and mitigate the effects of multiple exposures on public health and well-being. Collaboration and partnerships among these stakeholders are essential for achieving meaningful progress in this area. For example, Academia play a crucial role in conducting studies and research to understand the effects digital exposure and applications on health outcomes. They also contribute to disseminating research findings to inform policy and practice. **Government Agencies** may fund research initiatives and collaborate with researchers to gather data and evidence on the effects on digital toolson the mental health of adolescents. They also use research findings to develop regulations and guidelines for environmental and public health protection. NGO may engage in research, awareness campaigns, and policies. **Healthcare providers** play a critical role in disease prevention, diagnosis, treatment, and management, contributing to the reduction of the societal burden of disease and help to address many concerns that could come from the implementation phase.

Each partner should continuously identify local (regional, national and international) stakeholders to create opportunities for enhancing stakeholder involvement in different countries for their specific research activities both at local and global level. The development of a stakeholders' engagement framework aims to provide the operating principle and insight in the involvement of stakeholders, also in countries not represented by the current partners in the SMILE consortium. In SMILE repository there is a list of stakeholder from each pilot site and at the consortium level supporting WP8 activities.

Below each group of stakeholders are described regarding their importance, interest and benefit that Smile project can have by keeping them engaged.

Adolescents (10-24 ys): The SMILE project aims to target adolescents as the primary end-users. By involving adolescents in the project, it can contribute to the success of the initiative. Adolescents have valuable insights into their own experiences, which can help in designing digital solutions tailored to their needs. The involvement of adolescents can lead to more relevant and effective interventions that are easy to use, engaging, and sustainable. By empowering adolescents and giving them a sense of ownership, it can lead to better outcomes for both individuals and communities. Adolescents are more likely to use and engage with e-mental health interventions that reflect their interests and preferences. By involving adolescents in e-mental health projects, mental health stigma can be reduced, making it easier for adolescents to seek help and engage with interventions. Adolescents can influence their peers and communities, so engaging them in e-mental health projects can help extend the reach of interventions and amplify their impact. Adolescents become advocates for mental health awareness, which can improve the long-term sustainability of the project. Finally, by involving adolescents in the development process, ethical guidelines can be respected, ensuring that project outcomes are reached responsibly.

Youth association: Youth communities and student associations can play a significant role in improving mental health interventions by utilizing the collective power, creativity, and expertise of young people. They can act as agents of change and advocates for mental health, thereby maximizing the reach, relevance, and impact of such interventions. Youth associations have a deep understanding of the cultural, social, and contextual factors that affect adolescent mental health in specific communities. By involving them, e-mental health projects can become culturally sensitive, relevant, and responsive to the needs of diverse populations. Youth associations can also advocate for policy changes and systemic improvements that promote youth participation, ownership, and agency in tackling mental health challenges. They have extensive networks and outreach capabilities within communities, schools, and online platforms, which makes them an excellent resource for facilitating community engagement, awareness-raising activities, and outreach efforts to promote mental health literacy and destigmatization. Lastly, involving youth associations in e-mental health projects encourages youth-led initiatives, innovation, and grass-roots efforts to promote mental health awareness and support.

Parents (and grandparents): Engaging parents is crucial for creating comprehensive support systems for adolescent mental health and promoting holistic well-being, resilience, and positive outcomes for both adolescents and their families, given the challenges that come with the parental role. Providing parents with resources, tools, and strategies for self-care and managing

their stress and emotions can help normalize conversations about mental health within families and reduce the stigma surrounding seeking help for mental health concerns. Furthermore, their engagement allows for the exploration of family dynamics, relationship patterns, and areas for improvement to support adolescent mental health, fostering open communication and shared decision-making regarding mental health concerns. By involving parents in e-mental health projects, education opportunities, raising awareness, and promoting mental health literacy among parents can be created. Facilitating early detection of troubles and timely support and treatment is possible through such engagement. Many parents may lack awareness or knowledge about adolescent mental health issues, available resources, and effective strategies for support. Hence, involving parents in these projects can be extremely beneficial. In some cultural context or depending on the new family asset (divorce, mono parental situation, grandparents substitute parents and this is why there are included as stakeholders in SMILE project).

Educators: Involving school staff in the SMILE project can promote a culture of mental health and well-being within schools in each pilot site. It can also enhance support systems for students and foster collaboration between the education and mental health sectors. By leveraging the expertise and dedication of school staff, the SMILE project can create positive and supportive environments that nurture the mental health and success of students. School staff including teachers, counselors, and pedagogic institutions are often the first point of contact for identifying and addressing mental health concerns among students. Engaging school staff in e-mental health projects facilitates early intervention and support for students experiencing mental health challenges. Schools provide a captive audience and direct access to students, making them ideal settings for delivering mental health interventions and support services. This allows the SMILE project to reach a large and diverse population of students. In some countries, psychological support is already school-based, and engaging school staff in the SMILE project will foster a collaborative care approach, promoting seamless integration of mental health services within the school setting. School staff play a crucial role in promoting mental health literacy, awareness, and destigmatization among students, families, and the broader school community. Therefore, engaging them in the SMILE project will provide opportunities for education, training, and awareness-raising activities to enhance mental health literacy and reduce stigma. It will also improve their ability to identify at-risk students, facilitate referrals, and provide timely support and intervention.

Schools can integrate e-mental health resources, tools, and activities into existing curriculum and programming to promote mental health and well-being among students aligned with educa-

tional goals and priorities. Moreover, promoting protective factors and resilience among students can prevent the onset of mental health problems. It can also serve as a bridge between students, parents, and mental health providers, facilitating communication and cooperation.

Academia: Involving academic institutions, such as research centers and universities, in the SMILE project can bring various advantages and help advance knowledge, innovation, and evidence-based practices in the field of mental health for our target group. This will ensure that the SMILE project is based on solid scientific principles, which is particularly important given that many internal stakeholders come from an academic background. Interdisciplinary collaboration fosters innovative approaches and holistic solutions in terms of quality, rigor, and impact of interventions by harnessing the expertise, resources, and collaborative networks within the academic community. By bridging research, practice, and policy, academia plays a crucial role in advancing the field of e-mental health and promoting positive outcomes for adolescent mental health and well-being. Academia also plays a key role in knowledge translation and dissemination, translating research findings into actionable recommendations for practice, policy, and public health. Engaging researchers facilitates the dissemination of project findings through academic publications, conferences, and community outreach efforts. Universities provide opportunities for capacity building, training, and professional development for students, early-career researchers, and healthcare professionals. Engaging academia in the SMILE project lays the foundation for training opportunities in research methods, data analysis, and evidence-based practice. Furthermore, universities and research institutes adhere to ethical guidelines and standards for the conduct of research involving human participants. This guarantees that interventions will be conducted ethically, with appropriate oversight and compliance with regulatory requirements. Academia often collaborates with community organizations, healthcare providers, policymakers to address pressing public health issues. Engaging them will strengthen community partnerships and collaboration with stakeholders to enhance the relevance and impact of interventions. Finally, universities are hubs of innovation and technology development, with expertise in areas such as digital health, telemedicine, and mobile app development. Engaging academia in the SMILE project will help improve digital mental health interventions to address adolescent mental health needs.

Healthcare professionals (public and private health institutes/mental health organizations, including pediatricians and general practitioners): Involving healthcare professionals in the SMILE project can significantly enhance the quality, effectiveness, and accessibility of interventions for adolescent mental health. By utilizing their clinical expertise, patient-centered approach, and commitment to improving outcomes, SMILE can address the complex needs of

adolescents and promote positive mental health and well-being. Healthcare professionals such as psychiatrists, psychologists, social workers, and counselors bring invaluable knowledge and experience in diagnosing, treating, and managing mental health conditions in adolescents. Their input is crucial in designing and implementing effective e-mental health interventions that are customized to meet the unique needs and circumstances of individual adolescents, especially those who are most vulnerable. Healthcare professionals also monitor the progress of adolescents' mental health treatment and provide ongoing support, follow-up, and adjustments to treatment plans as needed. Their involvement guarantees that adolescents receive timely monitoring, feedback, and support throughout the intervention, while also facilitating the delivery of psycho-educational materials to families and adolescents.

Businesses: Engaging small and medium-sized enterprises (SMEs), startups, medical industries, health technology companies, and service providers can offer significant benefits in driving innovation, scalability, and sustainability in the field of mental health. Businesses bring expertise in technology development, innovation, and product design, which are essential for creating user-friendly, engaging, and effective e-mental health solutions for adolescents. Moreover, businesses have the resources, networks, and infrastructure to scale up SMILE interventions and reach a larger audience of adolescents. They also provide access to markets, distribution channels, and commercialization opportunities for e-mental health products and services. Engaging businesses facilitates the commercialization and dissemination of evidence-based e-mental health solutions, ensuring sustainability and long-term impact. Businesses collaborate with academia, healthcare providers, and community organizations to develop and implement e-mental health projects. Engaging businesses fosters partnerships and collaborations across sectors, leveraging complementary expertise, resources, and networks to address adolescent mental health needs more effectively. The priority for businesses is to ensure user-centered design, market research, and customer engagement. These are essential for understanding the needs, preferences, and experiences of adolescent users, leading to higher levels of adoption and engagement in SMILE projects. Moreover, businesses increase access to funding opportunities, accelerate project timelines, and enhance sustainability through private-sector partnerships. Finally, businesses adhere to quality assurance standards, regulatory requirements, and industry best practices in developing and delivering products and services. Therefore, engaging businesses will ensure that SMILE tools meet ethical, legal, and regulatory standards, safeguarding adolescent users.

Regulatory bodies (authorities, governments, public supervisors): involving regulatory bodies in SMILE ensures the responsible, ethical, and effective delivery of interventions while promoting the well-being and rights of adolescent participants. By collaborating with regulatory bodies, we can navigate legal, ethical, and regulatory complexities, ultimately improving access to quality mental health care for adolescents as they generally establish quality assurance standards, best practices, and accreditation processes of healthcare services. Furthermore, regulatory bodies oversee the licensing, credentialing, and certification of healthcare providers, professionals, and organizations involved in delivering e-mental health services and this role could be implemented in digital health services as well. Regulatory bodies assess and mitigate risks associated with e-mental health interventions, including potential harm, adverse events, and patient safety concerns. Engaging regulatory bodies will enhance SMILE risk management strategies and ensures the safety and well-being of adolescents participating in our project. Regulatory bodies monitor trends, patterns, and outcomes related to adolescent mental health to inform public health surveillance and monitoring efforts. This role could be useful to collect, analyse, and disseminate data on adolescent mental health indicators, prevalence rates, and service utilization patterns. Finally, engaging regulatory bodies that allocate resources, funding, and grants to support mental health in adolescent, will enhances access to funding opportunities and promotes investment in evidence-based interventions.

Policymakers (deputies, parliament, ministries, EC representatives, city councils): Engaging policymakers in the SMILE project can bring numerous benefits and contribute to the development of policies, programs, and initiatives that enhance the implementation, sustainability, and development of interventions through influencing policy, resource allocation, and system-level changes. Policymakers are responsible for creating and executing policies related to mental health services, including e-mental health interventions. Engaging policymakers ensures that policies are based on evidence-based research, best practices, and stakeholder input, promoting the adoption of policies that support adolescent mental health. Policymakers allocate resources, funding, and grants to support mental health programs and initiatives. They also address health disparities and promote health equity by advocating for policies that improve access to mental health services, particularly for under-served and marginalized populations. Engaging policymakers helps to reduce barriers to access and expand e-mental health services to all adolescents, regardless of background or location. Policymakers also play a crucial role in integrating e-mental health services into existing healthcare systems, including primary care settings, schools, and community organizations. Engaging policymakers promotes collaboration across sectors, streamlines service delivery, and promotes coordinated care for adolescents

with mental health needs. Policymakers oversee public health surveillance systems that monitor trends, patterns, and outcomes related to adolescent mental health. Engaging them will strengthen data collection efforts, inform policy decisions, and guide resource allocation to address priority mental health issues affecting adolescents. Policymakers engage with communities, stakeholders, and advocacy groups to raise awareness, build partnerships, and mobilize support for mental health initiatives. Finally, policymakers engagement may foster community engagement, promote collaboration, and enhance the impact of e-mental health projects at the local, regional, and national levels.

Society at large (NGOs, CSOs, citizens, associations, communities, influencers, media):

Involving society in SMILE is crucial to enhancing community resilience, social support, and advocacy efforts, leading to positive outcomes for adolescent mental health and well-being. By harnessing the collective power and resources of NGOs, CSOs, citizens, associations, communities, influencers, and the media, SMILE can create meaningful change and promote a culture of mental health and inclusion. NGOs, CSOs, citizens, associations, and communities play a key role in providing crisis intervention and support services for adolescents in acute distress. Their engagement can provide access to crisis hotlines, peer support helplines, and community-based crisis response teams, as well as peer support groups, online communities, and mentorship programs, fostering resilience and connectedness among adolescents to address urgent mental health needs. NGOs, CSOs, citizens, associations, and communities also act as advocates for mental health awareness, destigmatization, and policy change. Involving society at large amplifies advocacy efforts, raises awareness about adolescent mental health issues, and promotes positive messaging around seeking help and accessing support. They can mobilize resources, volunteers, and support for e-mental health projects addressing adolescents. Engaging society at large enhances access to funding, in-kind contributions, and volunteer assistance, expanding the reach and impact of interventions. Society at large encompasses diverse perspectives, experiences, and voices that enrich the design, implementation, and evaluation of e-mental health interventions. Its engagement in SMILE project will ensure that the project is inclusive, culturally relevant, and responsive to the needs and preferences of diverse populations. Finally, including society in our project will promote a sense of collective responsibility and solidarity towards the mental health and well-being of the future of our society.

Investors and Insurers (agencies banks, business angels, health insurers): Working with investors and insurers, including agencies, banks, business angels, and health insurers, can have a positive impact on the financial sustainability, market viability, and scalability of interven-

tions. It also ensures regulatory compliance, quality assurance, and ethical practice. Through collaborating with investors and insurers, the SMILE project can maximize its potential to revolutionize adolescent digital mental health care and create long-lasting positive change. Investors can provide access to resources, accelerate project timelines, and enhance the scalability and impact of interventions. They conduct market validation, demand assessment, and feasibility studies to assess the commercial viability of e-mental health solutions. Working with investors and insurers validates market demand, identifies target audiences, and informs product development and marketing strategies. Besides, investors and insurers can facilitate business development, growth opportunities, partnerships, and collaborations that drive the adoption and uptake of interventions among adolescents. Their engagement enhances credibility, trust, and confidence in interventions, promoting ethical and responsible practices. Finally, by encouraging technology adoption, innovation, and digital transformation, investors and insurers foster the development of cutting-edge technologies, digital platforms, and data-driven solutions that enhance the effectiveness and user experience of interventions.

9.2 STAKEHOLDER ANALYSES

Various stakeholder categories are involved and interaction modes will differ according to the phases in the SMILE project (and the specific 'researchers' needs and outputs) and to the stakeholder characteristics (interests, roles, and power of influence). It has been noted that it is not necessary each stakeholder or group of stakeholders to engage in the same level, or at the same time of the project, while the same stakeholder may be engaged through different ways at the various stages of the project implementation.

According with the Stakeholder power-interest grid (Eden and Ackermann 1998), we identified four means of interaction, defined by the following categories:

A High influence, high interest (keep engaged), collaborate with. (Stakeholders who can provide relevant information, permissions, resources, or are significantly impacted by the final project outcomes, are the ones that a project should engage with to maximize its impact and sustainability. Collaboratively engaging these stakeholders, addressing their interests and concerns, and leveraging their influence can be beneficial for e-mental health projects targeting adolescents.

Here are some important stakeholders that SMILE project should consider collaborating with:

1. Adolescents and youth organizations: Working directly with adolescents and their associations, such as youth centers or clubs, can provide insights, outreach channels, and collaboration opportunities to help promote mental well-being.
2. Parents and families: Associations representing parents and families can advocate for resources, support, and family-centered approaches in our project.
3. Healthcare professionals: Mental health professionals, including psychologists, psychiatrists, social workers, and counselors, provide direct care, expertise, and guidance for implementing e-mental health interventions.
4. Academia: Researchers in psychology, psychiatry, and related fields play a pivotal role in advancing knowledge and evidence-based practices in e-mental health. They contribute to the design, evaluation, and dissemination of interventions.
5. Mental health advocacy groups: Organizations advocating for mental health awareness and support often have significant influence and interest in projects targeting adolescents. They can mobilize resources, raise awareness, and advocate for policy changes.
6. Educators and school administrators: Schools are essential settings for reaching adolescents. Administrators and educators have influence over curriculum, policies, and resources. They can support the integration of e-mental health programs into school settings.
7. Technological internal stakeholders: Developing digital platforms and tools for mental health services, such as software developers, have both interest and influence in e-mental health projects. They provide technological infrastructure, expertise, and innovation.
8. Foundations and philanthropic organizations: Foundations focused on health, youth, or technology often have a strong interest in supporting innovative approaches to adolescent mental health. They provide funding, expertise, and partnerships.
9. National health authorities: Government agencies responsible for health policy and regulation often have both influence and interest in adolescent mental health. They shape national strategies, allocate funding, and set standards for mental health services.

B High influence, low interest (keep informed) Stakeholders in this box may have significant influence over the success of the project, but may be difficult to engage throughout the project process. To do this effectively, tailored strategies are needed to raise awareness about the importance of mental health in adolescents and the potential benefits of e-mental health interven-

tions. Building partnerships and demonstrating the value proposition of such projects can help garner support and mobilize resources, despite low initial interest levels.

Here are some important stakeholders that SMILE project should inform during the different project progress:

- 1) Public figures, such as celebrities, may have significant influence over public opinion and behavior. However, they may have low interest if they're not personally affected by adolescent mental health issues or if they prioritize other causes or if not benefit come from their engagement.
- 2) Government officials, such as policymakers or legislators, may have high influence due to their authority and resources but they may not prioritize adolescent mental health or e-mental health initiatives if it's not a pressing issue for their constituents or if they lack awareness of its importance.
- 3) Community leaders, such as religious leaders or business owners, may have influence within their respective spheres. However, they may have low interest if they're focused on other priorities or if they don't perceive adolescent mental health as a significant issue in their community.
- 4) Education authorities at the district or state level have influence over school policies and resources, but they may have low interest in e-mental health projects if they prioritize academic achievement over mental health initiatives or if they perceive mental health as primarily the responsibility of healthcare providers.
- 5) Technology companies may have high influence in the digital space. However, they may have low interest if they prioritize other areas of innovation or if they're concerned about the regulatory landscape or ethical implications of mental health interventions. Research funding bodies that provide funding for research projects may have influence in shaping research agendas. Still, they may have low interest in e-mental health projects targeting adolescents if they prioritize other areas of study or if they perceive insufficient evidence of effectiveness in this population.
- 6) Associations representing healthcare professionals, such as physicians or psychologists, may have significant influence in shaping policies and practices in their respective fields. However, they may have low interest in digital solutions if they perceive them as outside their primary scope or if they prioritize other initiatives or if they're skeptical about work overload.
- 7) Major healthcare providers, including hospitals or health systems, may have substantial influence in the healthcare landscape. However, they may prioritize other areas over e-mental health projects for the target group if they perceive them as less profitable or if there's insufficient demand from patients.
- 8) Companies or corporations that could potentially sponsor the SMILE project may have high influence due to their financial resources and reach. Still, they may have low interest if they don't see a direct alignment with their brand or corporate social responsibility goals.

9) Insurance companies have significant influence in healthcare systems due to their financial resources and role in reimbursement policies. However, depending on specific country characteristics, they may have low interest in e-mental health projects if they perceive them as costly or if they haven't recognized the long-term benefits of investing in adolescent mental health.

C Low influence, high interest (keep satisfied). The stakeholders represented in this group are those who have a high level of interest in the project but have limited capacity to contribute significantly to it. They may have a lower level of influence, but they can still support the project by forming alliances with more influential stakeholders. These stakeholders are often considered marginal and 'hard to reach' and may require special attention to ensure their engagement in the project process with more influential stakeholders.

Some of the stakeholders who fall into this category include 1) influencers with a focus on mental health or adolescent issues, 2) individual advocates, 3) local support groups focused on mental health issues, 4) smaller non-profit organizations, 5) graduate students, interns or early-career professionals in the field of mental health, 6) teachers, school counselors and other education professionals, 7) Volunteer-driven organizations focused on mental health advocacy or support services may have high interest in e-mental health projects but limited influence compared to larger, professionally-staffed organizations, 8) Researchers from disciplines outside of mental health, such as computer science or public health, may have high interest in collaborating on SMILE project but limited influence within the mental health field. Finally, local media outlets may also have a high interest in covering stories related to adolescent mental health.

While individually, these stakeholders may have limited influence, collectively, they can still play an essential role in supporting and advocating for SMILE or similar project. Collaborating with these stakeholders can help amplify the project's reach and its impact within the community.

D Low influence, low interest (keep monitoring) The stakeholders mentioned in this box may have limited interest in or influence over project outcomes. Therefore, there is usually less need to consider them in detail or put in extra efforts to engage with them when the project resources are limited but monitoring them could add extra significant inputs. To name few of most relevant in this box: 1) Local businesses may have low interest in the project unless it directly impacts them. 2) Similarly, some community members who have limited exposure to mental health issues or do not have adolescents may have low interest and influence unless they are directly affected. 3) Media outlets might have low interest in the project, unless the project presents a

compelling story or angle for coverage. Their influence might be minimal if they don't prioritize mental health issues or if the project's relevance to their audience is unclear. 4) Certain religious or cultural groups may not be interested in the SMILE project, especially if they perceive it as conflicting with their beliefs or values. Their influence might be limited if they don't engage or support such initiatives. 5) Individuals or groups skeptical about technology in mental health care may have low interest and influence in e-mental health projects. They may perceive such projects as ineffective or potentially harmful. 6) finally, all people with stigmatizing attitudes towards mental health issues may have low interest and influence in e-mental health projects. They may not recognize the importance of addressing adolescent mental health or perceive mental health issues as personal weaknesses.

However, effective engagement strategies and communication efforts can help raise awareness, build support, and increase their involvement over time, even if they initially have low interest and influence. The identification and engagement with stakeholders is an ongoing process during the project and this first document useful to identify and involve key stakeholders and support their participation.

10 Towards a stakeholders' engagement framework (first version)

The stakeholder engagement framework outlines the key actions, for SMILE project, the models for engagement, the approach to risk oversight, and their improvement plans. The stakeholder engagement framework helps to communicate, collaborate and share knowledge, improve planning and consistency and also to develop programs and services. A stakeholder engagement framework is fundamental as SMILE project foster relevant, trustworthy and open, responsible, and inclusive approach for mental health promotion in the young people.

Stakeholders can have different goals related to the engagement in terms of awareness, implementation and exploitation of SMILE tools. These different goals will be addressed by the framework capitalizing first all the input of stakeholders with highest interest, promoting the interest of stakeholder with high influence (i.e. policymakers) and lowering barriers and skeptical view in the group with both low influence and interest

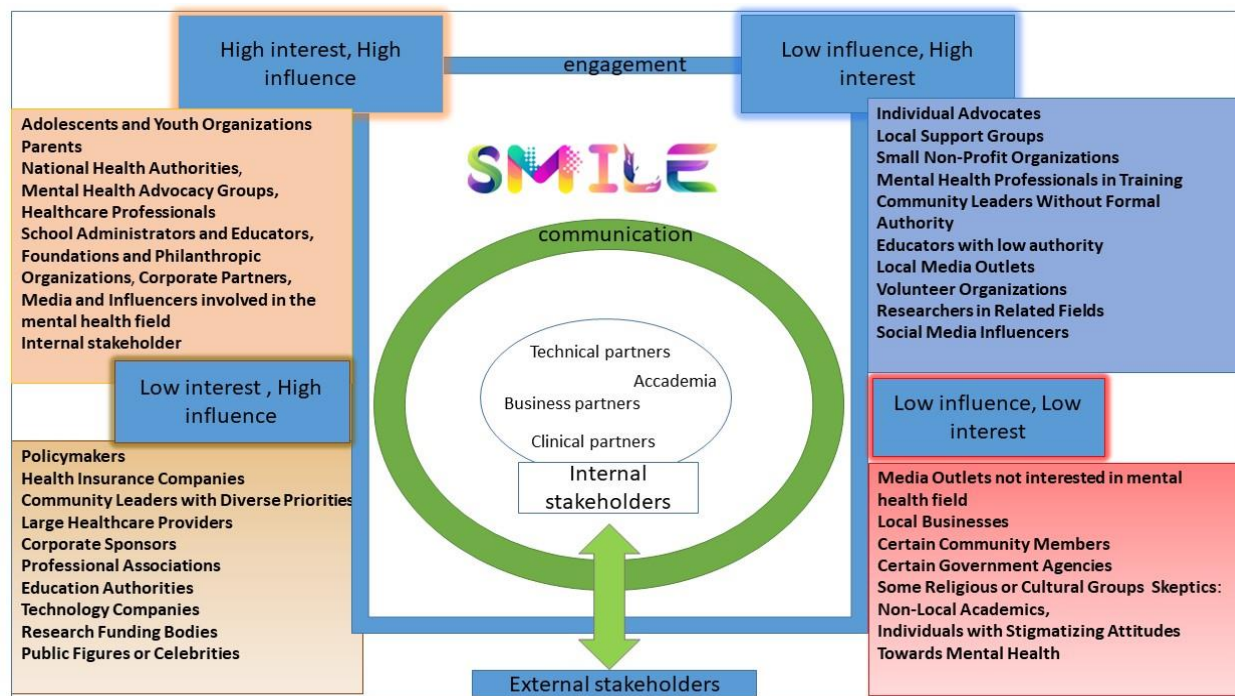


Figure 2. Smile Stakeholders' engagement framework

The following design principles to focus on end-users needs and engagement will be used with constant support during different phase:

1. conceptualization of contents
2. development phase
3. implementations phase
4. exploitation phase

Collaboration between stakeholders (internal stakeholders, external stakeholders, internal-external stakeholders). One of the essential aspects of the first version of the framework will be testing the efficacy of communication and engagement strategies with respect to the different target groups. Through engagement activities, the Project's aim is gaining support, gathering feedback, and fostering collaboration principally. By defining Engagement Goals and Objectives focused on stakeholder needs, project priorities, and management of external factors.

11 Monitoring and Evaluation

11.1 Requirements checklist

The activities described within this deliverable (literature review) combined with focus groups analyses, enable an initial list of user requirements. This initial list was further completed and will be refined in the next working months of the project. The tangible result (list of user requirements) will be presented in D2.2. and further updated.

Provide a requirements' checklist is essential for several reasons. It helps ensure that all necessary requirements are identified and documented so it represents a structured guide to systematically capture various aspect in the tools development. Preventing important requirements from being overlooked This checklist will provide criteria against which requirements can be assessed for quality and effectiveness and prevent inconsistencies, ambiguities and gaps can be identified Furthermore, a checklist may favour clear communication and understanding of projects expectations, by providing a structured framework for discussing and negotiating requirements enhancing collaboration and stakeholder engagement. Finally, a requirement checklist promote transparency about prioritization processes. In the Appendix 2, it has been formulated the SMILE requirement checklist.

11.2 Definition of key performance indicators (KPIs)

To gauge the effectiveness and user engagement of digital solutions in the field of mental health for our target group, KPIs will provide valuable insight into the performance and acceptance of SMILE delivered tools. The identification KPIs right from the first stages of the project will allow a constant and durable monitoring of results throughout the entire project and over: short term goals and long term objectives will help tracing the overall activity progress and planning underway measures whenever needed. An ideal indicator is based on agreed definitions and described exhaustively and exclusively; it has the following characteristics: 1) Is highly or optimally specific and sensitive, i.e. detecting few false positives and false negatives. 2) Is valid and reliable. 3) Discriminates well. 4) Relates to clearly identifiable events for the user (e.g. if meant for clinical providers it is relevant to clinical practice. 5) Permits useful comparisons. 6) Is evidence-based. A useful tool to help conceptualize the production process of KPIs is the 'logic model'. In strategic planning, logic models are used commonly to describe logical linkages between problems and their solutions; The three stages of model are: 1) Identify the problem(s) and need(s); 2) identify measures to address the problem, 3) setting the goals.

The KPIs will be validated with the clinical partners according with the following categories

1. Validity: does the KPI measure what is supposed to measure? Ideally, selected KPIs should have links to processes and outcomes through scientific evidence.
2. Reliability: does the KPI provide a consistent measure?
3. Feasibility: is it possible to collect the required data and is it worth the resources?
4. Relevance: what useful decisions can be made from the KPI?

Each KPI will be validated by using the scoring matrix presented in table 8.

Table 9: KPI scoring matrix

Validity	The KPI measures a specific variable susceptible to be measured	1-3 Strong disagreement 4-6 Medium agreement 7-10 High degree of agreement
Reliability	The KPI is independent of who or what performs the measurement	1-3 Strong disagreement 4-6 Medium agreement 7-10 High degree of agreement
Feasibility	Data source to obtain the KPI is continuously available	1-3 Strong disagreement 4-6 Medium agreement 7-10 High degree of agreement
Relevance	Relevant conclusions can be obtained from the KPI	1-3 Strong disagreement 4-6 Medium agreement 7-10 High degree of agreement

This process will implement the list of KPI that SMILE consortium stated to verify the achievement of project's objectives. proposal.

13. CONCLUSIONS

While barriers such as limited awareness, privacy and ethics concerns, resistance to change and stigma present challenges for e-mental health projects, drivers such as increasing technology acceptance, demand for accessibility, and potential for enhanced effectiveness offer opportunities for innovation and expansion in the field. Addressing these barriers and leveraging the drivers effectively is essential for the successful implementation and impact of e-mental health initiatives to reach the goal to raise awareness in our target group and society at large about the importance of mental health. Comprehending the barriers and drivers in the context of the e-mental health is crucial for devising tailored strategies that address challenges, capitalize on opportunities, and ultimately enhance the success, impact, and sustainability of SMILE project. By addressing these factors systematically, the project can make significant strides towards improving mental health outcomes and promoting well-being in the digital age guaranteeing the long-term sustainability of digital solutions. Important results gleaned from the analysis have highlighted the importance of training to promote the end-users and healthcare acceptance and user's retention. The communication and strategies engagement tailored on each relevant group of stakeholders could ameliorate the implementation process and the overall project success. Addressing barriers related to regulatory constraints and limited resources requires collaboration between stakeholders and innovative approaches to overcome obstacles. By leveraging drivers such as innovation and collaboration, the project can foster partnerships, share best practices, and drive continuous improvement in e-mental health delivery, ensuring that solutions remain effective, efficient, and sustainable over time. Overcoming barriers such as privacy concerns and resistance to change fosters trust and engagement among users, empowering them to take control of their mental health and seek support when needed. By leveraging drivers such as increasing technology acceptance and demand for personalized interventions, the project can create a supportive and engaging environment that encourages active participation and self-care behaviors, ultimately leading to improved mental health outcomes. Finally, overcoming barriers such as limited awareness and accessibility issues enables the e-mental health project to fulfill its vision of providing equitable access to mental health support for all individuals, regardless of geographic location, socioeconomic status, or other demographic factors. By leveraging drivers such as increasing technology acceptance and demand for accessibility, the project can bridge gaps in access and ensure that marginalized populations have equal opportunities to benefit from mental health services. SMILE consortium can make use of consolidated

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personal contacts to create a solid network of stakeholders to overcome challenges and to take proactive steps towards collaboration and ongoing dialogue to solicit feedback during the project development. The next step will be the application of this stakeholders 'engagement framework in each pilot site and elaborate the list of requirements to be validated. Finally, beside the KPIs stated in the initial proposal we will implement industry specific KPI that will be leverage as proxy of stakeholders 'engagement.

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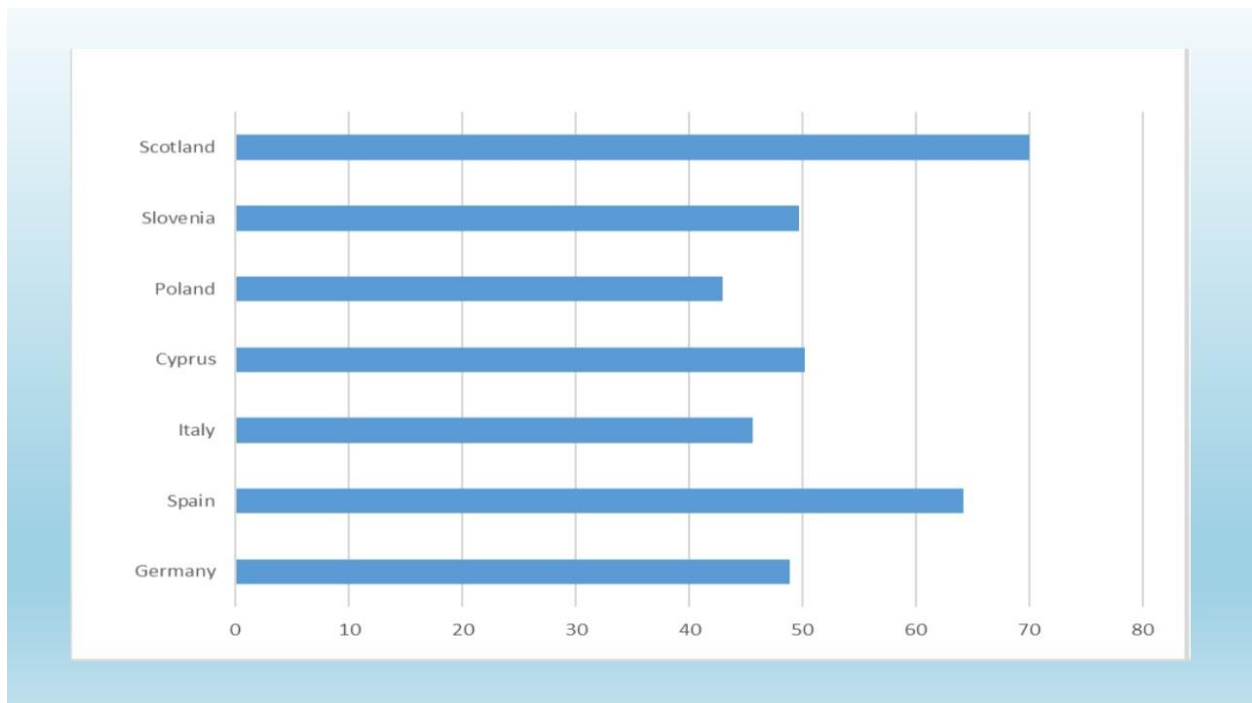
14 APPENDICES

a. APPENDIX 1: SMILE KNOWLEDGEMENT ADVANCEMENT CLINICAL SURVEY

To have an exploratory knowledge from clinical internal stakeholders on digital skills in the population living in their country, some question was developed in order to get informations about 1) evidence on percentage of digital skills in their general population (see figure n. 3) and 2) what are determinants of digital divide 3) who are the main providers for actions supporting mental health for adolescents in their country, and what are the main actions addressing mental health for the target group.

This has allowed to start conversation with internal stakeholders and to know what are the level of awareness on this topic.

Fig. 3 estimation of basic digital skills in the general population in each pilot site



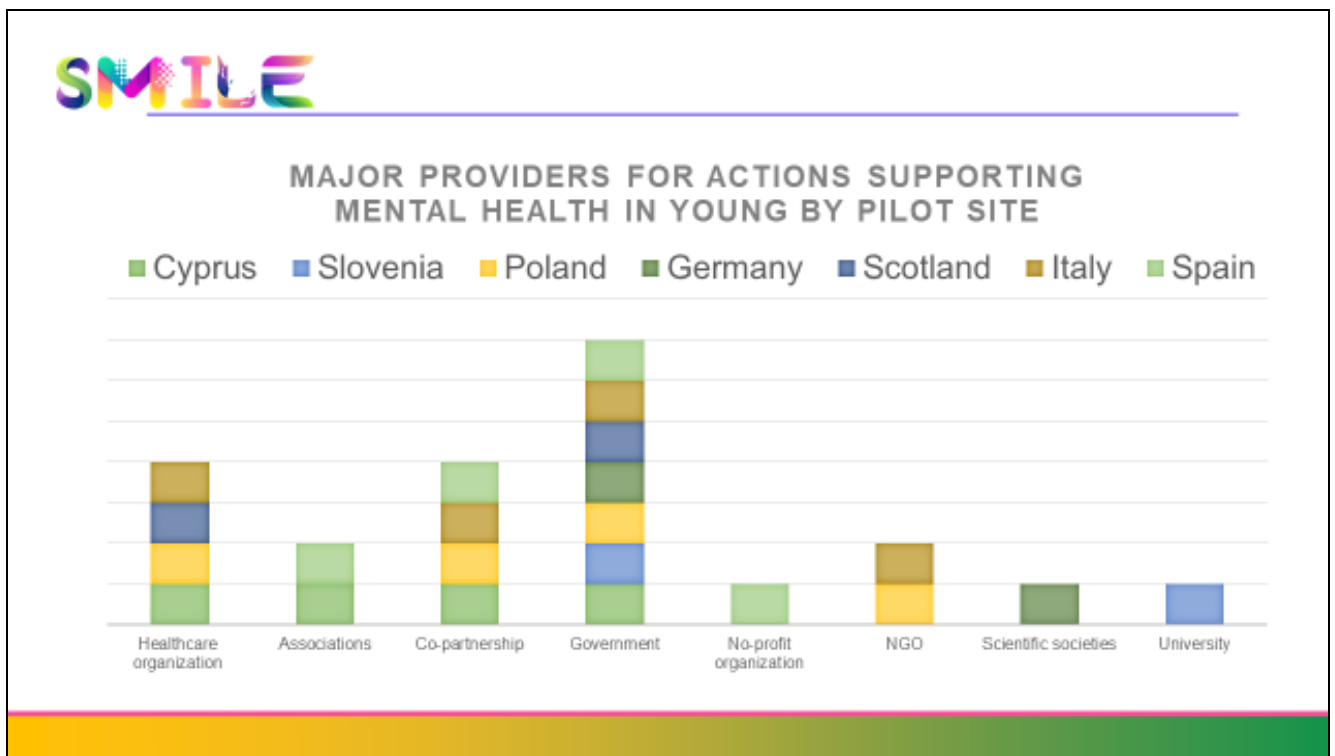
What are the main determinant of digital divide?

- Geographical factors (South vs North, rural vs urban) :
- Gender

- Age.
- Presence of disability or individual needs
- Level of education.
- Social status (low income, unemployment)
- Language barriers
- Migration background, ethnicity (not for accessibility but for other variables, i.e time spent online, contents.)
- Efforts and investments by agencies (telecommunication, public administration)
- Teachers' time constraints and other barriers in schools (public vs private schools, availability of adequate ICT devices)
- Existing inequalities persist in the digital realm also created by i.e search engine algorithms.
- Language is a key factor explaining these differences. Google's algorithms thereby contribute to a global digital divide in online health-information access with possibly lethal consequences and other risk for mental health.
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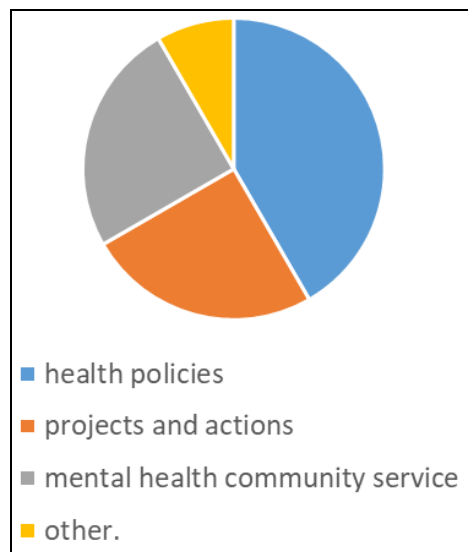
3) *Who are the main providers for actions supporting mental health for adolescents in your country? (see fig.4)*

Figure 4: Providers for actions supporting mental health in adolescent in SMILE pilot site



4) *What are the main activities for mental health promotion in Smile pilot sites?*

Fig. 5 Activities for mental health promotions. Results from SMILE pilot site (internal stakeholders survey)



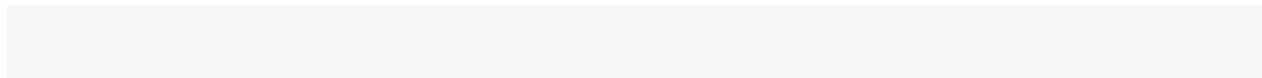
a. Appendix 2: Requirements checklist

Table 9. SMILE Requirements checklist

Item	Specification
Relevance and alignment	<ul style="list-style-type: none"> ➤ Do the requirements align with the identified needs and priorities of adolescent stakeholders? ➤ Are the requirements directly related to improving adolescent mental health outcomes and addressing their specific challenges and concerns?
Clarity and Specificity	<ul style="list-style-type: none"> ➤ Are the requirements clearly articulated and free from ambiguity? ➤ Do the requirements specify the desired functionalities, features, and outcomes in sufficient detail?
Completeness	<ul style="list-style-type: none"> ➤ Have all relevant stakeholders been consulted to ensure comprehensive coverage of

	<p>requirements?</p> <ul style="list-style-type: none"> ➤ Are there any gaps or missing requirements that need to be addressed to ensure the solution meets the needs of all stakeholders?
Consistency and Cohesion	<ul style="list-style-type: none"> ➤ Are there any gaps or missing requirements that need to be addressed to ensure the solution meets the needs of all stakeholders? ➤ Do the requirements form a cohesive and integrated set that collectively addresses the diverse needs of adolescent stakeholders?
Feasibility	<ul style="list-style-type: none"> ➤ Are the requirements technically feasible within the constraints of available resources, technology, and regulatory requirements? ➤ Have potential implementation challenges and limitations been identified and addressed in the requirements?
Measurability and Testability	<ul style="list-style-type: none"> ➤ Are the requirements formulated in a way that allows for objective measurement and evaluation of their effectiveness? ➤ Can the requirements be translated into clear acceptance criteria and test cases to verify their implementation and functionality?
Adaptability	<ul style="list-style-type: none"> ➤ Do the requirements allow for flexibility to accommodate diverse user preferences, needs, and contexts? ➤ Are there mechanisms in place to update and modify requirements in response to evolving stakeholder feedback and changing external factors?
Privacy and Ethical aspects	<ul style="list-style-type: none"> ➤ Do the requirements prioritize the protection of adolescent privacy and confidentiality? ➤ Have ethical considerations, such as informed consent, data security, and responsible

	use of technology, been adequately addressed in the requirements?
Co-participatory and user-centered design	<ul style="list-style-type: none">➤ Are the requirements centered around the needs, preferences, and experiences of adolescent users?➤ Have opportunities for user involvement and co-design been leveraged to ensure the relevance and usability of the requirements?
Impact and Value	<ul style="list-style-type: none">➤ Have potential benefits and value propositions for adolescent stakeholders been effectively articulated and justified in the requirements?➤ Do the requirements demonstrate a clear understanding of how the proposed solution will contribute to improving adolescent mental health outcomes?



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