

PHASE 1 REPORT: PREVENTION OF ADOLESCENT MENTAL HEALTH CONDITIONS: IS TECHNOLOGY A POSSIBLE SOURCE FOR GOOD?

Understanding the existing landscape as a basis
for a Phase 2 project design

Outsight International, ElevateU & the University of California Institute for
Prediction Technology





REPORT CONTENTS

| | |
|---|----|
| REPORT CONTENTS..... | 2 |
| EXECUTIVE SUMMARY | 3 |
| 1. INTRODUCTION (<i>OUTSIGHT INTERNATIONAL</i>) | 10 |
| Project approach..... | 11 |
| 2. SYSTEMS VIEW OF COMPLEX DIGITAL HEALTH ECOSYSTEMS (<i>OUTSIGHT INTERNATIONAL</i>) | 13 |
| 3. AVAILABLE DATA TYPES (<i>UCIPT</i>) | 17 |
| 4. THE EXISTING LITERATURE (<i>ELEVATEU</i>) | 20 |
| 4. TECHNOLOGY LANDSCAPING: TOOLS ALREADY IN USE (<i>OUTSIGHT INTERNATIONAL</i>)..... | 28 |
| 5. DATA LANDSCAPING AND KEY INFORMANT INTERVIEWS (KIIS) (<i>OUTSIGHT INTERNATIONAL</i>) | 33 |
| Existence of contradicting narratives | 33 |
| Theme 1: Compounding factors influencing adolescent mental health | 36 |
| Theme 2: Limitations of existing digital mental health interventions | 38 |
| Theme 3: Difficulty in measuring social media’s effect on young people | 40 |
| 7. WORKSHOPS AND HYPOTHESIS CREATION (<i>OUTSIGHT INTERNATIONAL</i>) | 43 |
| Session 1 approach:..... | 43 |
| Session 1 outcome: | 43 |
| Session 2 approach:..... | 45 |
| Session 2 outcome:..... | 50 |
| Hypothesis generation | 52 |
| Reflections from the workshops:..... | 53 |
| 8. PHASE 2 PLANNING..... | 55 |
| 9. CONCLUSION AND NEXT STEPS..... | 60 |
| ANNEX 1: LITERATURE REVIEW REFERENCES..... | 61 |



EXECUTIVE SUMMARY

The Data for Children Collaborative with UNICEF (DCC) are interested in investigating if *‘technology could be a possible source for good’* when applied to adolescent mental health and psychosocial support (MHPSS) services. Engaging a multidisciplinary team, Phase 1 of this project focused on building an understanding of the existing landscape and systems that would need to be utilised in order to build a project that fits the operational needs of UNICEF’s measurement priorities and informing programs through a data science approach.

Led by Oversight International, Phase 1 was broken down into seven separate work packages. These were led by different partners depending on their skillset. These were as follows:

1. Systems view of complex digital health ecosystems (Oversight International)

This study intentionally examined a wide range of different conditions, treatment systems, and data sources. There is substantial variation within each of these dimensions. Simply creating an inventory of various data points quickly results in an overwhelming flood of information, from which it is difficult to assess relationships and patterns.

Systems models have been developed as working tools throughout the study, with the goal of providing a framework for seeing the structure that ties different elements of the study together.

These holistic system views support discussions of potential data / treatment strategies which recognize the different elements of a potential digital health solution. This big picture view helps avoid the danger of seeing solutions too narrowly, focusing on just one element of a complex ecosystem that involves a range of access, engagement, and support components.

System models also help distinguish between different mental health support strategies. In recent years multiple approaches have been developed for engaging with adolescents for mental health services. While they each fall under the broad category of digital mental health support, they each leverage very different levels of technical tools and professional services.



System models supported the design of research and integration of results at multiple points in the study. In addition, because models represent fundamental patterns in the use of data, digital technology, and professional services, they can also be leveraged in later stages of work to support further development of complex strategies.

Academic research into complex topics in LMIC environments often seek to focus on answering specific questions using a set of variables, within well defined contexts, and targeting particular populations. This targeted approach makes it possible to define relationships and impact within a well defined space where complex interactions and variations have been limited. While this approach is useful for exploring particular elements of humanitarian or global health research, the results are often difficult to apply beyond the specific scenarios defined in the original research.

2. An overview of available data types (UCIPT)

There is a plethora of existing data resources available, both public and private, that can be utilized for research purposes – and later to inform possible program development. Data resources may include social data, geolocation data, health data, education data, public records data, consumer data, network data, satellite data, and other device data.

In collecting information on these different resources, the project was able to explore at an early stage what could be possible in terms of moving ahead towards an implementable project.

3. A review of the existing literature on digital MHPSS tools (ElevateU)

Given growing recognition of poor adolescent mental health, it has become even more important to better understand methods to provide mental health services that expand access to all adolescents, not only those living in developed countries or those who live in close proximity to mental health providers or those who can afford mental health services. The literature review explores the current research available on the intersection of adolescent mental health and technological interventions and disease surveillance, based on a keyword search. The review aimed to discover what types of technological interventions were most prevalent and impactful for adolescent participants, what mental illnesses were targeted in these studies, and what types of analysis were conducted to identify effectiveness.



This keyword-targeted review of 38 articles from journals and 14 from grey literature showed that technology can be used for good with respect to adolescent wellness, mental health, and prevention of poor mental health outcomes. 98% of literature reviewed has concluded that technology has a positive impact on mental health among adolescents. In all treatment areas investigated above, results indicated a positive outcome, with the exception of symptom self-management offering a number of studies that did not show a statistically significant improvement.

4. Technology landscaping of existing MHPSS digital tools (Outsight International)

The digital mental health landscaping effort as a part of this investigation was generated in an effort to provide an early insight into what digital health solutions may be relevant to the identified health need, and to act as a reference point for continued evaluation and understanding of context specific needs and further investigation of non-technical innovative approaches which may work in place or alongside future pilot implementations.

5. Data landscaping and Key Informant Interviews (KIIs) (Outsight International)

The project team conducted interviews with mental health researchers, funders and service providers, across various institutions, to get their opinion on the challenge question and topics that could be of interest for further research. There was a broad view that few conclusive studies actually exist that suggest technology has a consistent detrimental or negative influence on children and adolescent mental health. In fact, several interviewees highlighted several studies that have shown that technology and social media can have positive outcomes at different levels when it comes to children and adolescent well-being.

The interviewees pointed out that social media use and its impact is often determined by varied factors. This makes it important to understand the differential susceptibility to media use in order to truly understand its impact on children and adolescents. For example, interviewed experts suggested that the digital literacy divide between parents and adolescents often leads to the negative perception regarding social media and technology use.

This project attempts to dig deeper into these observations, landscaping and analyzing the complex role that data and data science has in understanding the state of mental health in adolescents, the various challenges they face, and possible redressal mechanisms.



Three key themes emerged from these interviews and landscaping were:

- a) **Theme 1:** Compounding factors leading to different mental health outcomes
- b) **Theme 2:** Limitations of existing digital mental health interventions
 - i) Most apps or platforms don't utilise algorithmic techniques to engage users.
 - ii) Linking alert mechanisms that highlight negative mental health flags to providers (when there is a lack of mental health professionals) or mental health tools.
- c) **Theme 3:** Difficulty in measuring social media's effect on young people
 - i) Difficulty in data access makes it hard to understand engagement with content – positive or negative. Often screen time has been used as a proxy for engagement.
 - ii) Lack of sufficient insights into how algorithms used in the apps and platforms affected the user engagement and behaviour

Of these themes, the project steering group initially identified Theme 1: Compounding Factors as the most salient to investigate. This theme was taken into the workshop sessions for interrogation and to identify possible research questions.

6. Workshop sessions (Outsight International)

Two workshops were held remotely to take stock of the findings mid-way through the project and start to focus the target approach heading into Phase 2. Focusing on Compounding Factors (as detailed above), participants were asked to help formulate possible research questions. The three clearest were:

- Understanding **which** platforms are used by adolescents in a given context (including issues of access to technology). *This could likely be conducted through data sets on users of different platforms and focus groups, as well as engagement with the technology providers in a specified setting.*
- Understanding **how** adolescents are using online apps/technologies. *This can be conducted through focus groups and user research design methods and tries to answer what makes something 'adolescent friendly'.*
- Linking these findings to helping existing platforms **adapt** to either provide better services to adolescents or link the users to mental health providers. *This kind of implementation-focused research would normally be conducted through design*



methodologies, likely requiring user research and testing for adolescents and mental health providers in partnership with technology platforms.

7. Phase 2 conception

Taking these questions forward as the basis for a second phase proved difficult because of the challenge of achieving the data science component required for the Data for Children Collaborative, whilst also providing something that is genuinely useful to UNICEF's measurement and programmatic activities and, ultimately, for adolescents.

Utilising the systems approach with the project team, an initiative aimed at integrating UNICEF's Measurement of Mental Health Among Adolescents at the Population Level (MMAAP) approach and digital mental health interventions was identified. The MMAAP provides population-level data on adolescent mental health – something that is widely accepted to be insufficient under current approaches.

The MMAAP is, in essence, a locally-adapted survey which is conducted by trained professionals, but, crucially, can be attached to other general surveys used for collecting data at a population level. The ability to integrate the findings into other platforms, offered an opportunity of utilising the MMAAP as a data collection tool within the contexts of other interventions. Further to this, as the roll-out of the MMAAP methodology had already been discussed with the UNICEF Jamaica Country Office team, the process of including additional adaptations for another project in the locality appears to be lower risk than going through a standalone process.

The proposed Phase 2 will harness the MMAAP rollout process, as well as other digital initiatives being rolled out in Jamaica. In doing so, a multi-cohort longitudinal study can be run, with the MMAAP rollout acting as the baseline/or control group. To enable comparative analysis, the MMAAP survey methodology will be integrated into the two intervention cohorts that aim to test the effectiveness of certain digital tools at both improving mental health outcomes and collecting adolescent mental health data. An overview of the research approach and process can be seen in figure 1 and a more detailed walkthrough is provided in the full report.



Conclusion

Utilising a human-centred and systems approach has enabled this project to combine expert knowledge and an understanding of UNICEF's measurement, monitoring, and programmatic priorities in the area of adolescent mental health. The outcome of this, in the form of planning for a Phase 2 of the project, sets out an ambitious project which – if implemented – will provide:

- Improved access to services for Jamaican adolescents
- Better data collection systems for UNICEF's Jamaica Country Office and the Jamaican Ministry of Health
- Test the effectiveness of digital vs analogue data collection methods, in one country context
- A comparative study of different digital MHPSS approaches, whilst also providing a comparative baseline to compare to more traditional UNICEF programming across other countries of focus for UNICEF

As the project enters its next stage, the Data for Children Collaborative and UNICEF will work together to: define the scope of the study, identify potential partners, and secure funding.



Digital MHPSS for adolescents in Jamaica: Research proposal

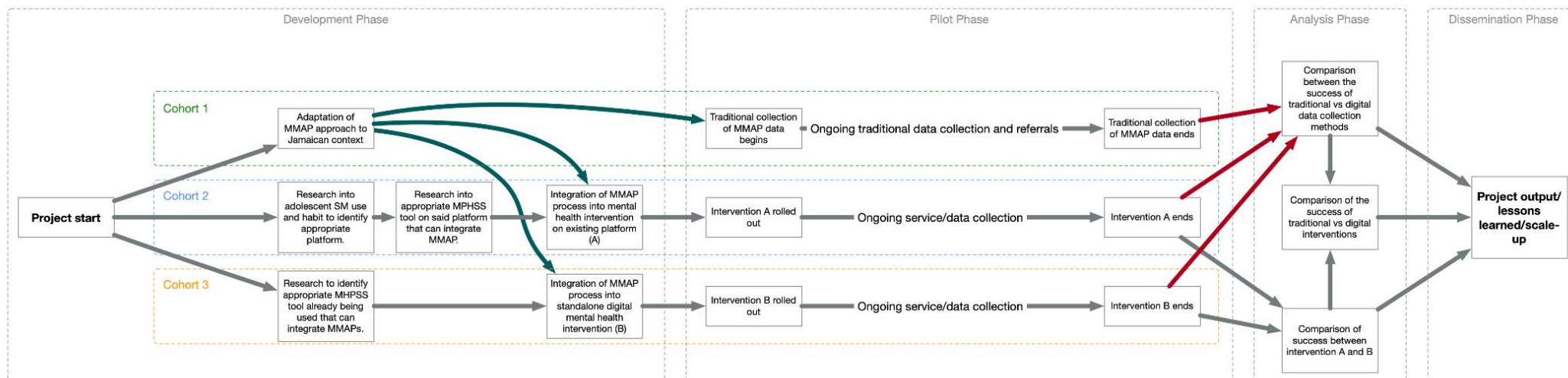


Figure 1: Digital MHPSS for adolescents in Jamaica: research proposal



1. INTRODUCTION (*OUTSIGHT INTERNATIONAL*)

The Data for Children Collaborative with UNICEF set the challenge of understanding if *'technology is a possible source for good'* when it comes to adolescent mental health. This challenge question was generated through a dedicated [exercise to map priority areas for adolescent mental health](#), commissioned by the Data for Children Collaborative, run by GovLab and in collaboration with UNICEF HQ (DPAM/D&A Health and HIV team). This challenge question was backed by UNICEF and the Data for Children Collaborative, following input from a field of experts in this area. This is not only a very broad challenge, but also one that seemed to challenge a general consensus that technology has a negative effect on young people.

The project explored the following questions: what evidence is available on the topic of technology and adolescent mental health; what are the needs that UNICEF sees in the field; and what technologies are already available to improve adolescent mental health outcomes.

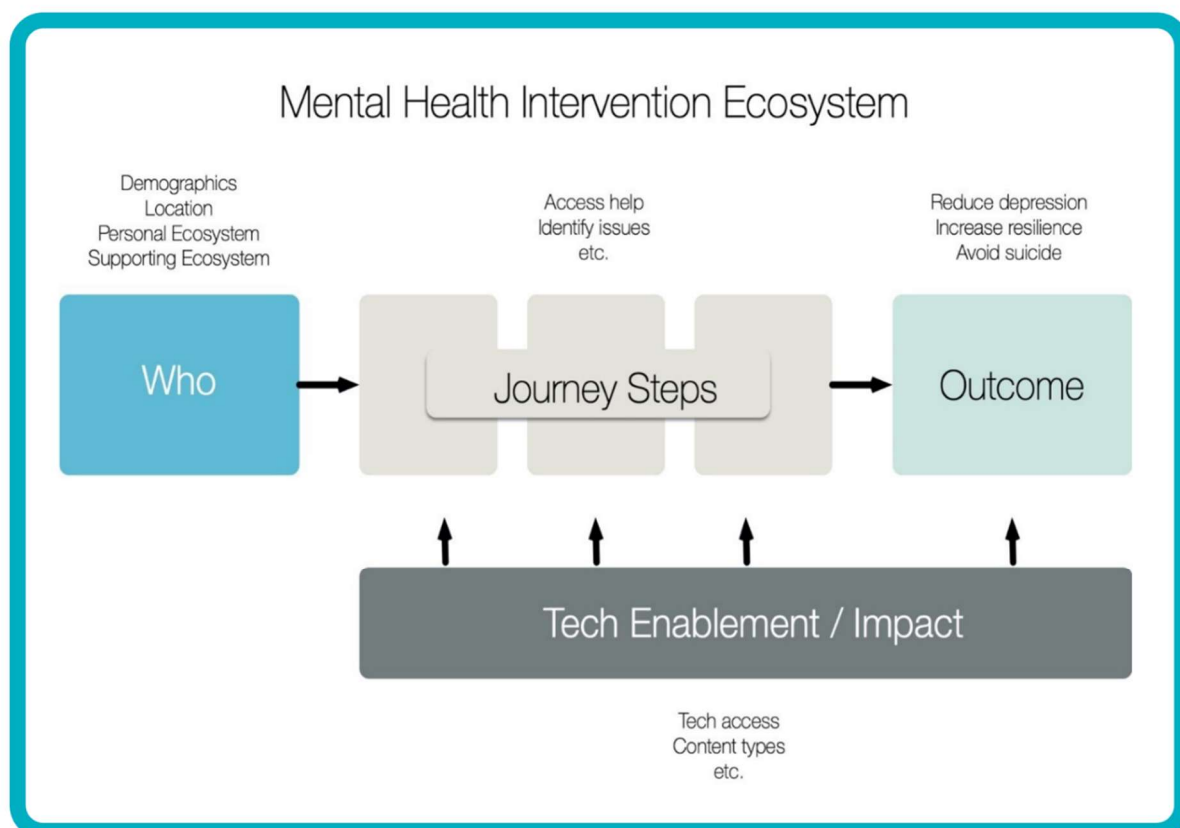


Figure 2: showing a general overview of the role that tech enablement can play in the mental health ecosystem



The project then triangulated between these topic areas (as visualised above) to identify the gaps and opportunities that exist for concrete action towards positive impact that UNICEF can take. Ultimately this should support program development that: *provides positive impact on the ground for UNICEF teams, build on existing work to improve data collection methods on mental health in the field, and integrate the use of novel digital tools to engage adolescents in positive mental health behaviours.*

Project approach

Multiple teams were hired through an open bidding process facilitated by DCC to investigate the different aspects of this challenge. ElevateU provided the literature review of adolescent mental health and technology, UCIPT provided input on possible research methods, and Oversight applied its systems thinking approach to technology landscaping and needs assessment. These were integrated to create a concept that should: *provide positive impact on the ground for UNICEF teams, build on existing work to improve data collection methods on mental health in the field, and integrate the use of novel digital tools to engage adolescents in positive mental health behaviours.*

A visual project outline is provided in Figure 3 below.

The report presents findings from the various scoping and evidence-gathering work packages of the project, before laying out the conceptual framework for an implementation phase (Phase 2) of the project that addresses those unanswered questions.

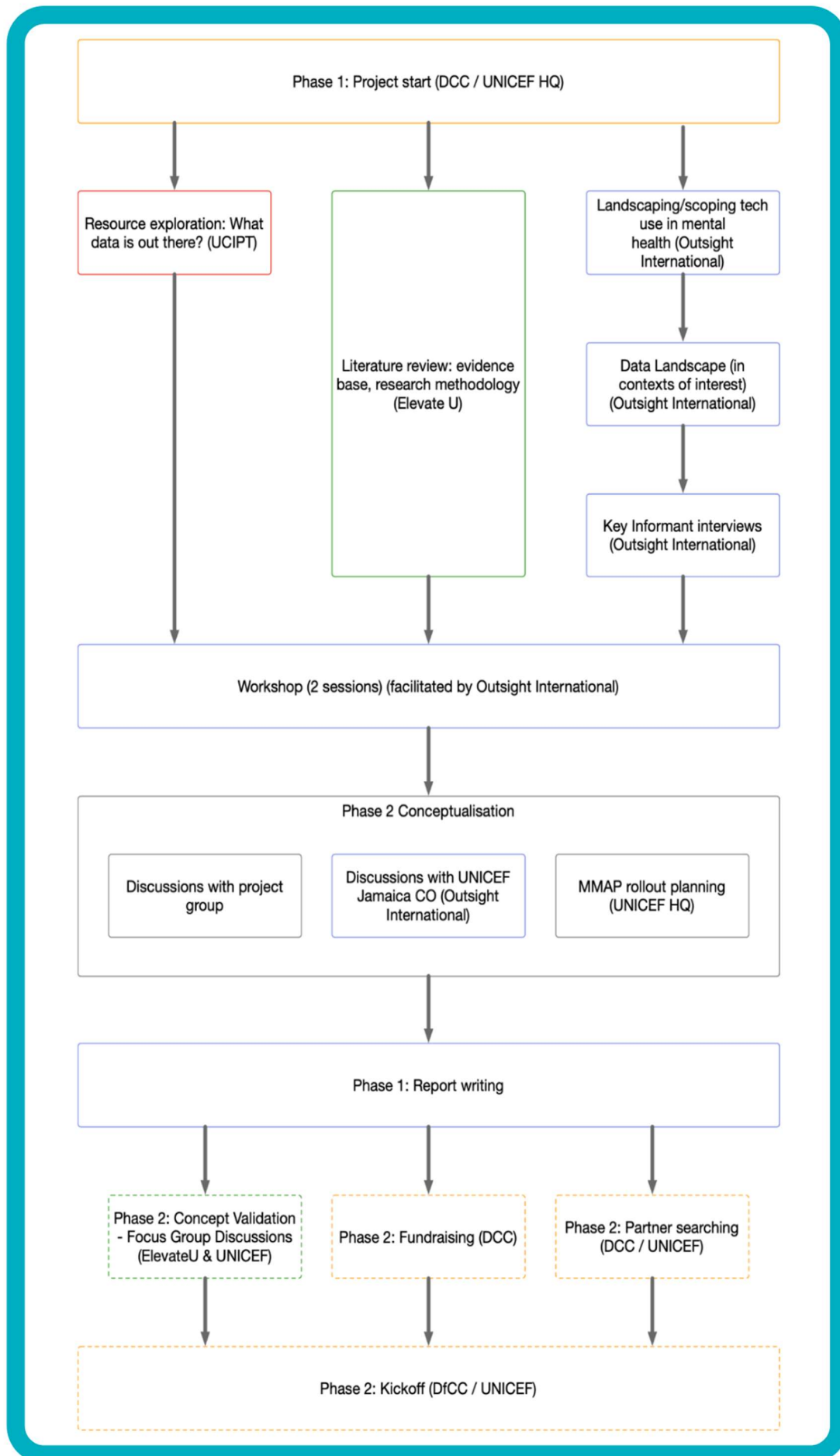


Figure 3: Visual project outline of the feasibility study



2. SYSTEMS VIEW OF COMPLEX DIGITAL HEALTH ECOSYSTEMS (*OUTSIGHT INTERNATIONAL*)

Academic research into a complex field such as interventions in adolescent mental health often seeks to focus on specific variables, within well defined contexts, and targeting particular populations. This narrow view makes it possible to define relationships and impact within a well defined space where complex interactions and variations have been limited. While this approach is useful for exploring particular elements of mental health challenges and treatment, the narrowly defined results are often difficult to apply beyond the specific scenarios defined in the original research.

In contrast, a systems view approach intentionally examines a wide range of different conditions, treatment systems, and data sources. There is substantial variation within each of these dimensions. Simply creating an inventory of various data points quickly results in an overwhelming flood of information, from which it is difficult to assess relationships and patterns.

Systems models have been developed as working tools throughout the study, with the goal of providing a framework for seeing the structure that ties different elements of the study together.

These holistic system views support discussions of potential data / treatment strategies which recognize the different elements of a potential digital health solution. This big picture view helps avoid the danger of seeing solutions too narrowly, focusing on just one element of a complex ecosystem that involves a range of access, engagement, and support components.

System models also help distinguish between different mental health support strategies. In recent years multiple approaches have been developed for engaging with adolescent for mental health services. While they each fall under the broad category of digital mental health support, they each leverage very different levels of technical tools and professional services.

System models supported the design of research and integration of results at multiple points in the study. In addition, because models represent fundamental patterns in the use of data, digital technology, and professional services, they can also be leveraged in later stages of work to support further development of complex strategies.



Multiple Systems Merge to Create a Digital / Physical World for Adolescents

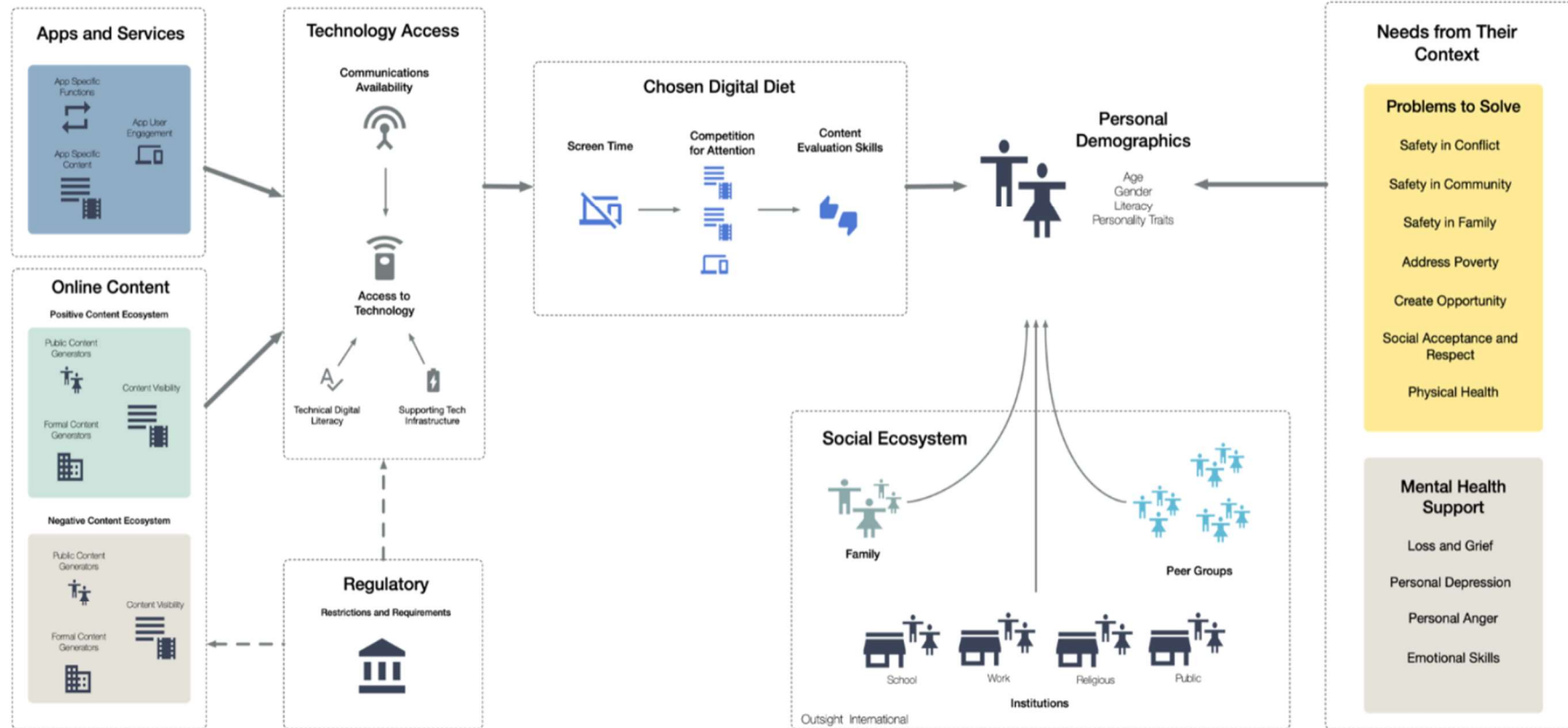


Figure 4: An Oversight system diagram showing different interacting factors affecting adolescents' interaction with digital space



The following four diagrams show different approaches used by MHPSS digital service providers to engage with users. These models were derived from discussions during the Technology Landscaping work package, which categorised different types of digital mental health services.

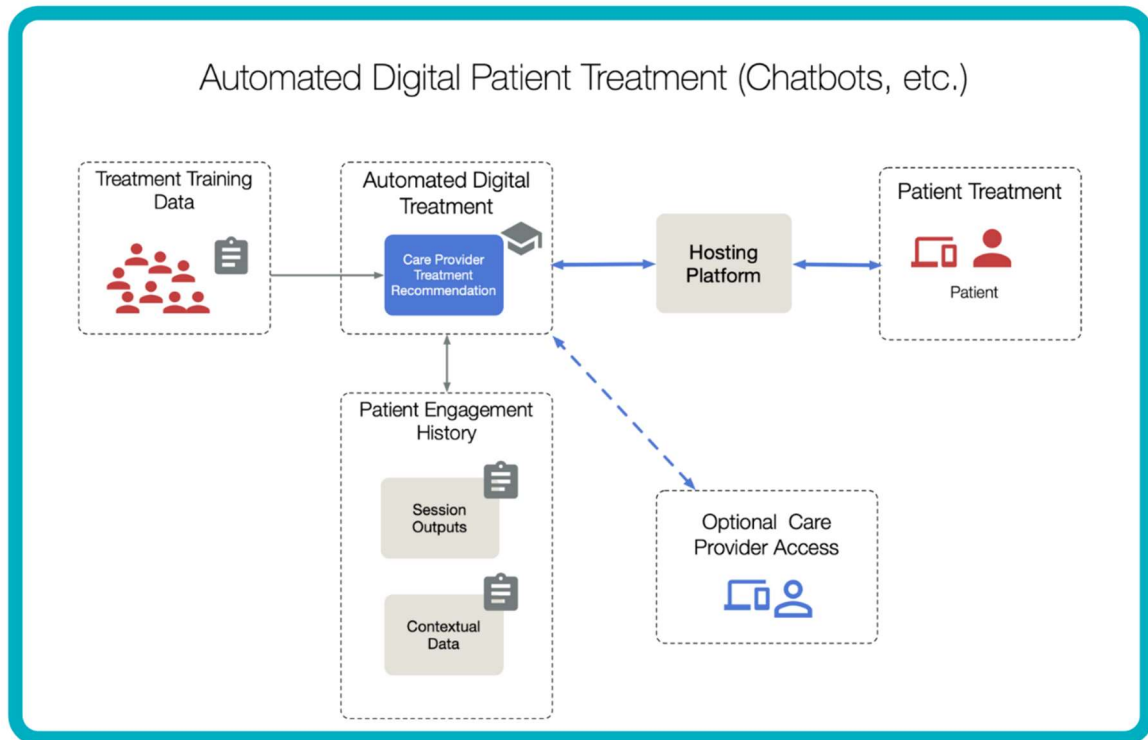


Figure 5: Automated digital patient treatment

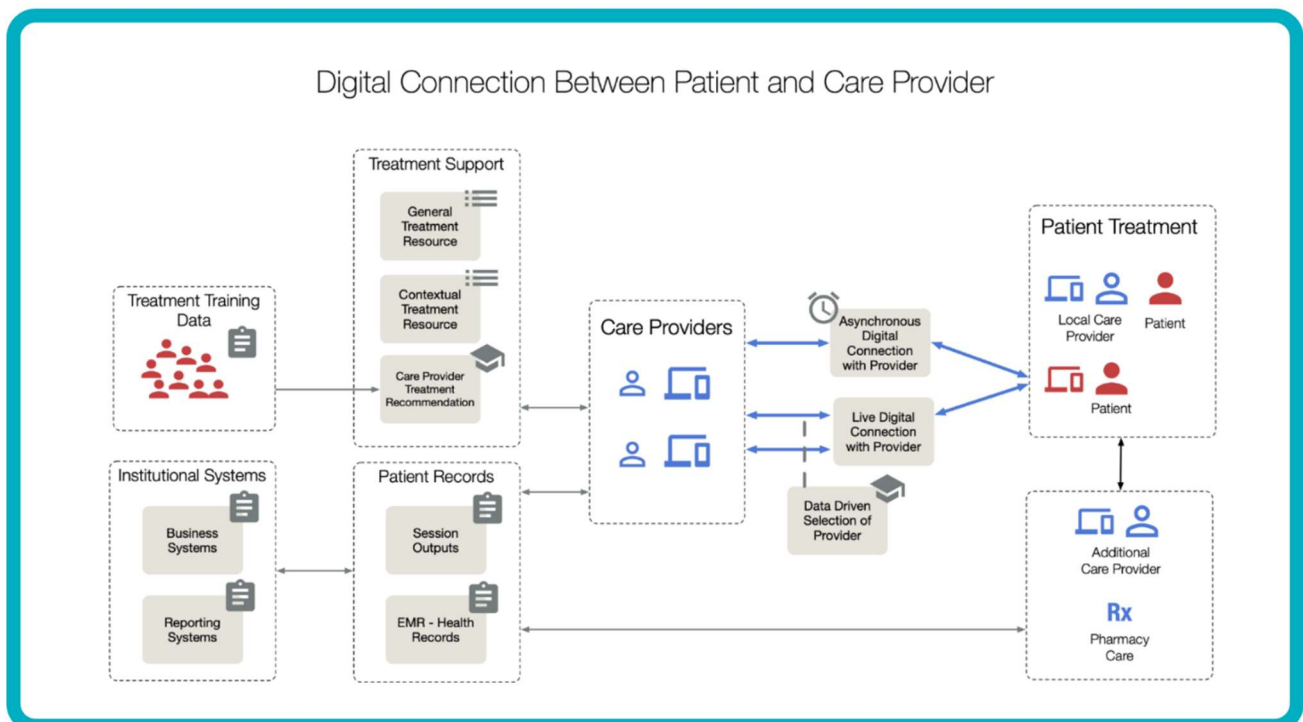


Figure 6: Digital connection between patient and care provider

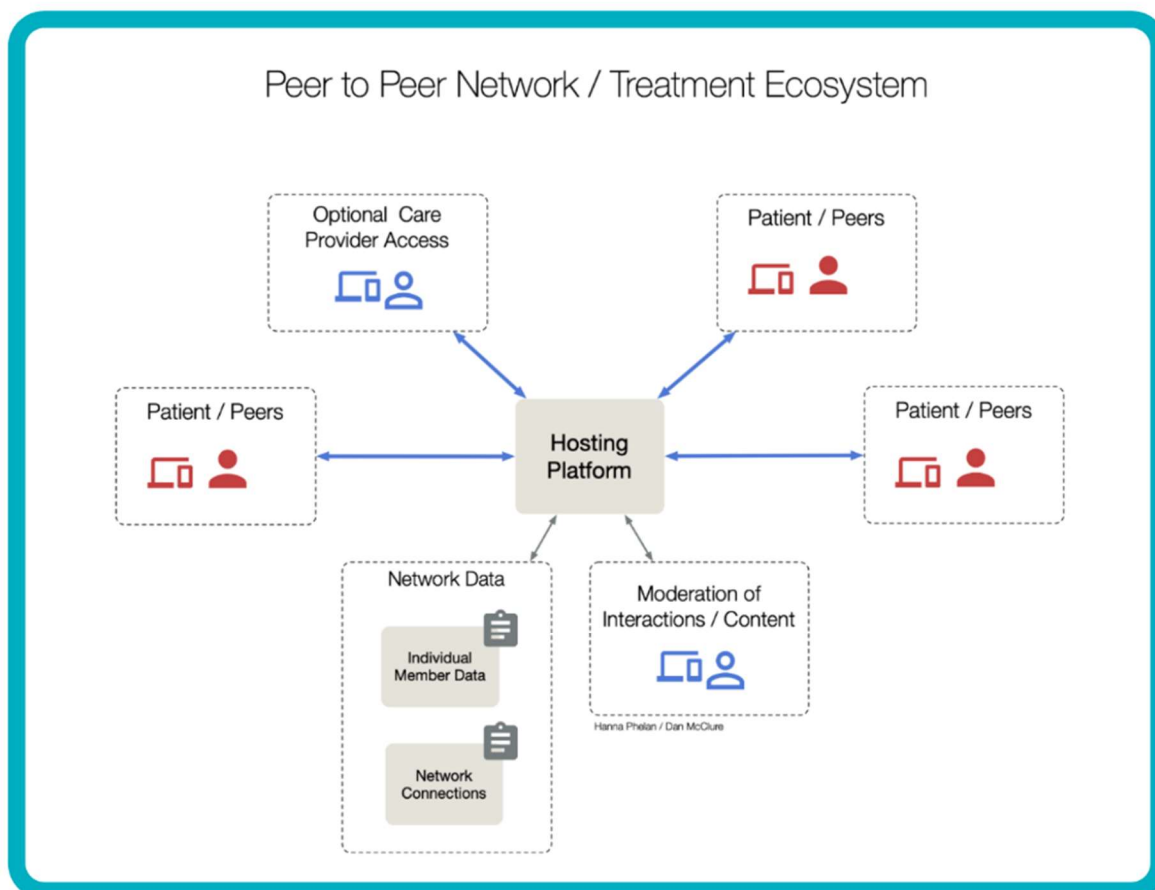


Figure 7: Peer-to-Peer Network / Treatment Ecosystem

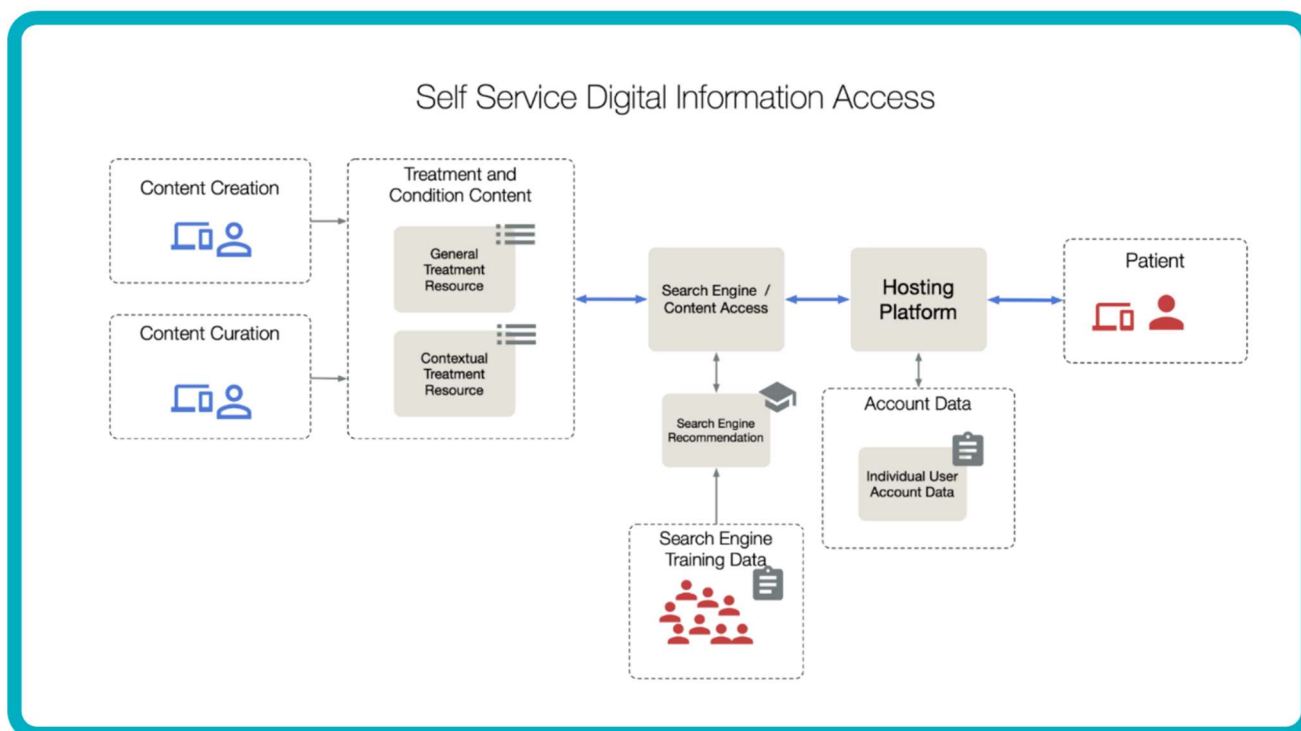


Figure 8: Self service digital information access



3. AVAILABLE DATA TYPES (*UCIPT*)

There is a plethora of existing data resources available, both public and private, that can be utilized for research purposes – and later to inform possible program development. Data resources may include social data, geolocation data, health data, education data, public records data, consumer data, network data, satellite data, and other device data (Table 1). This is not an exhaustive list of data sources as data sources may change as technology changes. These categories of data sources are also not mutually exclusive. For example, social data may include health data and consumer data, depending on what a user posts.

Social data: includes information from social media platforms and internet browsing. Posts, comments, and messages from various platforms such as Facebook, Twitter, Reddit, Instagram, etc. can be collected and analyzed at near real-time speed. Information from social media is also generally unfiltered compared to traditional formal surveys and can potentially provide truer insights into various public sentiments. Posts and comments on public pages or forums, as well as public profiles are generally public data. Some social media platforms are more public than others but data such as people's social network connections are generally more private data.

Geolocation data: includes location data from internet browsers, mobile phones, or other gps-capable devices. Mobility data can be very useful in understanding where people go or places that people frequent. This type of data would generally be considered private data.

Health data: includes data from electronic health records, genetic data, fitness wearables, and other sensor devices. All this data would generally be private data and also generally protected data in most countries. Electronic health records include everything from hospital visit dates to diagnoses to imaging (fMRI/other neuro data) and lab results (blood/urine samples). Fitness wearables and other sensors can measure vitals at real-time like heart rate, O2 saturation, blood pressure, skin conductance, etc.

Education data: includes data from school records. This may include things like grades, scores on national exams, and potentially any disciplinary actions. This type of data is also generally private and protected data. As the focus of this project is adolescents, education data can give many insights as adolescents spend a great deal of their time in school.



Mental wellbeing may be reflected in a child's grades and record of disciplinary actions. School-based surveys may also be collected.

Public records data: includes census data, survey data usually government-sponsored, and national statistics on topics such as economics, health, education, crime, etc. This data is generally public data and easily accessible. This data can provide insights at both a national and local level.

Household survey data: such as the type collected by UNICEF during its MMAP process can provide representative sample data on household situation and mental health traits.

Consumer data: includes data about purchases, product preferences, travel data, etc. This provides insights into what people are buying, what products are trending, where people are shopping or spending their money, where people are visiting and enjoying activities at. This is also generally private data.

Network data: includes data such as IP address and URLs. This may also include browser history and can track information like which websites were visited, how long a person spends on them, the content accessed, watched, or listened to, and the specific devices one is using to access a network. This data is generally private.

Satellite data: may include data about weather and climate or images of places around the world. A lot of satellite data, especially about weather and climate is available to the public but there may also be satellite data that is kept private. Satellite data can provide useful insights in a variety of fields. Images of cars in a parking lot could, for example, show how busy a certain place was or satellite images could be used to estimate vegetation metrics for crop yields.

Finally, devices like mobile phones may also collect other data that was not mentioned above. Generally, this other data would fall under private data. Most devices have some sort of device identifier and may collect data such as biometrics or videos and photos. Devices may also give insights into a person's interests, as well as time spent using different applications. Devices can also communicate with each other, for example through Bluetooth for certain contact-tracing apps. Details about how often a person checks email, call and text records or who calls or texts a person, and phone contacts, etc. may also be collected.



Table 1. Types of data sources

| Data Resource | Public/Private | Example |
|----------------------|-----------------------|--|
| Social Data | Both | Facebook, Twitter, Reddit, Instagram, etc.; posts/comments/messages; social network; browsing history |
| Geolocation Data | Generally Private | Browser, mobile phone |
| Health Data | Generally Private | Electronic health records, fitness wearables, genetic data, fmri/neuro data, bodily fluid samples, other sensors like skin conductance |
| Education Data | Generally Private | School records |
| Public Records Data | Generally Public | Census, survey data, statistics (economic, health, education, crime, etc.) |
| Consumer Data | Generally Private | Purchasing data, product preferences, travel data, etc. |
| Network Data | Generally Private | IP Address, URLs |
| Satellite Data | Both | Weather, climate, images |
| Other Device Data | Generally Private | Biometrics, videos, images, device identifiers |



4. THE EXISTING LITERATURE (ELEVATEU)¹

The literature review explores the current research available on the intersection of adolescent mental health and technological interventions and surveillance. The review aimed to discover what types of technological interventions were most prevalent and impactful for adolescent participants, what mental illnesses were targeted in these studies, and what types of analysis were conducted to identify effectiveness.

In total, 38 academic articles and 14 articles from grey literature were included in this review. Articles were identified from the following databases: Google Scholar, Pub Med, Pub Psys, and JSTOR. Google Scholar also consolidates papers across research databases (e.g., Pubmed) and research on design is listed in multiple databases. The following combination of keywords were used: "adolescents," "phone app," AND/OR "computer program," "technology," "mobile health," "teen," "social media," and "m health." (1) publication in a peer-reviewed academic journal, (2) publication in English, and (3) publication in or after 2011. Year of publication was chosen as a limiting factor so that we would have enough years of research to identify relevant studies but also have results that relate to similar styles of websites after the year 2011.

The aims and objectives of the literature review were as follows:

- To provide an overview of the existing evidence base on impact and effectiveness of digital MHPSS interventions.
- To understand which areas (conditions, symptoms, treatment approaches & contexts) have an existing evidence base.
- To highlight relevant prominent trends and best practices with regards to these interventions.

Analysis of technological interventions for adolescent mental health

The review focused on mental health illnesses among adolescents under the age of 18. Trends in child and adolescent mental health diagnosis over the past 30 years show an increase in symptoms of depression and anxiety in many countries including Canada, Finland, Greece, Iceland, the Netherlands, Norway, Sweden, and the UK (Collishaw & Sellers,

¹ The complete comprehensive literature review conducted by ElevateU will be published as a separate journal article. What follows is a summary of the key findings from the review.



2020). Even though there is a lack of evidence regarding rates of mental illness in lower income countries, it is evident through several articles reviewed that mental health struggles are present and problematic in these countries as well. In a 2014 report by UNICEF on adolescents in Jamaica, 3,471 students from 38 schools were evaluated. Of these adolescents, 35% admitted to suicidal ideation in their lifetime, of those 25% admitted to suicidal ideation in the past year (Whitehorne-Smith & Irons-Morgan, 2014).

In an effort to mitigate the personal suffering and financial burden of mental illness in the adolescent population, medical and mental health professionals, as well as academics, have worked to identify interventions that provide substantial relief to this population as well as possible long-term solutions which can reach large numbers of people in a relatively short amount of time. One option is to use technological interventions to reduce symptoms and provide treatment to youth, as technology is a part of many adolescents' daily lives already (Burns, 2011). 97% of adolescents aged 12-17 worldwide have access to a cell phone (Grist et al., 2017). It is evident that to connect to this new generation of youth, requires a medium that is comfortable to them and allows them to access support and treatment on their own terms.

Mobile apps, online/mobile games, texting interventions, online therapy, and health web platforms are increasingly available intervention tools to assess, treat, and provide support to adolescents struggling with mental health concerns. The Common Sense Census reports that adolescents spend 7 hours and 22 minutes on average using technologies a day in the United States, and by age 12, 69% have a cell phone (Rideout & Robb, 2019). In contrast, a study reported that 95% of the population in low to middle income countries utilize cellular phones (Kola, et. al, 2021). It is clear that cellular phones are used very widely across the globe by adolescents across the spectrum and may be a very effective way to gain access into their lives and mental states.

The Coronavirus pandemic has increased the need for technologies to conduct work in many industries, including mental health treatment. People have become reliant on technologies in ways they were never before. It appears that the way people communicate, educate, work, and live in general will be forever impacted by the Coronavirus pandemic. Adolescents have been forced to rely on technology for socialization as well as education. The Lancet reports that as of "April 8, 2020, schools were suspended nationwide in 188 countries, with statistics coming from the United Nations Educational, Scientific and Cultural



Organization. Over 90% of enrolled learners (1.5 billion young people) worldwide were out of education.”

The Lancet further reports that when schools were closed, many students ended up with an abrupt discontinuation of mental health services they were receiving in their school settings. “In a survey by the mental health charity Young Minds, which included 2111 participants up to age 25 years with a mental illness history in the UK, 83% said the pandemic had made their conditions worse. 26% said they were unable to access mental health support; peer support groups and face to-face services have been cancelled, and support by phone or online can be challenging for some young people,” (Lee, 2020). This Coronavirus pandemic has made technological interventions for mental health even more necessary, and time is of the essence.

Focus areas

From an analysis of the studies included in the literature review, the primary mental health symptoms targeted with digital interventions were the following: 44% focused on depression and anxiety, 28% of the reviewed literature involved ADHD, 12% of studies focused on self-harm and suicide ideation, 4% of studies focused on medication adherence, 4% on general well-being, 4% on drug and alcohol use, and the remaining 4% of studies on psychosis. Depression and anxiety were combined in the majority of studies contained in this literature review because the studies found overlap between the two. Of those studies, 88% utilized an application-based intervention and 12% used a text message-based intervention.

Types of technologies

Multiple types of technologies, including mobile apps, computer programs, texting programs, social media, and gamification were reviewed for efficacy in the treatment of mental health issues. The most common technology was mobile phone apps or computer based internet programs, which was addressed by 84% of the literature. A remaining 8% of studies used texting, while 4% of studies used gamification, and the final 4% of studies used social media.

Types of diagnoses or symptoms

The studies focused on a range of symptoms or diagnoses, but the majority (44%) focused on depression and anxiety. Although these are very distinct symptoms most of these



studies found that depression and anxiety overlapped. A remaining 28% of the reviewed literature involved ADHD. 12% of studies focused on self-harm and suicide ideation while another 4% of studies focused on medication adherence, 4% on general well-being, 4% on drug and alcohol use, and the remaining 4% of studies focused on psychosis.

Locations

The studies took place around the world, with 26% of them in the United States, another 26% in Australia and New Zealand, 15% in the United Kingdom, 15% in Europe, and the remaining 15% of studies in Africa or Asia.

Grey data and interpretations of grey data

Grey data was also explored and included theses and dissertations, government reports, and content from non-profit organizations. This literature has not been subject to the peer review process. Information has been cross checked with information derived elsewhere but there were many possible biases particularly in work by students, individuals, and theses/dissertations. The authors, their qualifications and affiliations could not be confirmed in all cases. As such, this content has been excluded from the body of the literature review.

Other literature, including government reports and work by non-profit organizations provided a background to mental health in specific countries. In grey data themes/symptoms of illnesses rather than diagnosis of a mental illness are often used as a factor to measure in studies, in most cases because a qualified mental health provider is not present to diagnose.



Table 2: Findings

| Topic area | Findings | Sources |
|--------------------------|---|--|
| Positive outcomes | <p>Of the hand-picked literature which utilized technology or reviewed technology with the overarching goal of improving mental health, 98% found a positive correlation between technology and improved mental health in adolescents. The goal of this literature review was to help us better understand how technology can improve adolescent mental health and specifically which types of technologies are most effective at achieving this goal. Therefore, the studies which were hand-selected were those which focused on improvement.</p> <p>Findings from U-Report, conducted insight into engagement among adolescent in Jamaica using mobile messaging services. This social messaging tool, pioneered by UNICEF utilized messaging bots for interactive questions and answers, live chat functions, and short polls. The data collected provided real-time access to information about mental health among Jamaican adolescent which would otherwise be difficult to collect. Studies revealed adolescents were more comfortable sharing information through the web-based education intervention than they would have been comfortable sharing in person, something that may very well be true of text-based programs like U-Report. These findings highlight the continued need for technology-based interventions that can potentially address adolescent mental health in more successful ways than in person interventions conducted in isolation.</p> | U-Report (2020) Scalzi et al., (2018) |
| Negative outcomes | There was one study which did not find a positive correlation between technology and improved mental health. Due to selection bias, it is possible there are more studies with this view, but these were not identified. | Whittaker, et al. (2017) showed no statistically significant improvements over the course of 12 months among participants using the mHealth program compared to the control group. |
| COVID-19 | <p>COVID-19 was widely reported to have a negative effect on adolescent mental health in all contexts, and that this is projected to rise, especially in the Global South. As a result there was an articulated need for more digital mental health aid.</p> <p>The move to online classes also resulted in a rise of domestic abuse and disciplining at home. As such there exists a serious need for virtual, technology-based interventions to reach out to children who may be confined to the home with no one to</p> | Lee (2020), (Polanczyk, et al., 2015). Collishaw & Sellers (2020), The Ministry of Health (2020) in Peru |



| | | |
|--|---|--|
| | advocate on their behalf and no teachers or friends or other adults to potentially intervene in cases of violence in the home. | |
| Gamification | The studies considering the gamification of MHPSS tools, indicate that technology makes for an effective tool in building emotional resilience and providing adolescents with the tools and techniques they need to be more aware of their emotional state, and employ tactics to encourage positive mental health. This was both through apps and social media platforms that encouraged continued use through a rewards/badges system in place. | Veldhuis in 2014, (Grist, et al. 2017), 2015 by Tregarthen et al., David, Cardoso & Matu (2018) (Collishaw & Sellers, 2020). <i>Dawson et al., (2019)</i> <i>(Hetrick et al., 2018).</i> <i>Newbold et al. (2020)</i> |
| Screen time | General findings on the use of technology showed an upward trend in the screen time of adolescents in both the Global North and South. | Kola, et al. (2021), Rideout (2016) |
| Digital tool use for MHPSS | Findings indicated many attempts among health care professionals to provide technologically-based solutions for mental health, particularly as it relates to offering adolescents preventative information and a means to identify and alleviate symptoms of mental health issues in a private, virtual environment. Studies confirmed that the use of technologies plays a significant role in delivering mental health services for adolescents, particularly with regard to preventative measures, assessment tools, and treatment programs. | Boydell et al., 2014), Radovic et al. (2016) Orłowski, et al, Grist, Porter, & Stallard (2017) |
| Prevention / Digital health promotion | Although internet usage could expose adolescents to bullying, identified literature showed that preventative behaviour can be improved through texting and mobile phone app interventions. Studies considered the US context, whilst in Sub-Saharan Africa, providing information on HIV and mental health identification was also shown to be successful. Health promotion through digital platforms were shown to have overwhelming support from adolescents (and their teachers), as they were more comfortable sharing through web-based platforms than in person. | (Badaway & Kuhns, 2017, (Ssewamala et al., 2018), Kola, et al. (2021), Punukollu et al. (2020), Scalzi et al., (2018), Calpbinici & Arslan (2018) Burns (2011), Patwardhan et al. |
| Enriching treatment | Studies on utilising digital tools to assist during mental health treatment periods showed a positive outcome of their use. This was either in conjunction with existing treatments or for adolescents in crisis. | Traber-Walker et al. (2019) Similarly, McManama O'Brien, LeCloux, Ross, Gironde & Wharff, (2016) Grist et al. (2018) McManama O'Brien, |



| | | |
|--------------------------------|---|---|
| | | <p>LeCloux, Ross, Gironda & Wharff, (2016)</p> <p>Ranney et al., (2018)</p> <p>Arps et al. (2018)</p> |
| Mood tracking | <p>Mood tracking apps offer self-reporting for better self-understanding of adolescents' mental health status. These were shown to be successful when adolescents self-reported, as well as with parental evaluations. Apps encouraging help-seeking behaviour when particular symptoms were reported also showed a positive increase in those seeking help.</p> <p>For adolescents feeling disconnected, such work demonstrates that coping mechanisms and knowing how to deal with negative emotions is a useful tool for combating poor mental health.</p> | <p>Grist et al. (2018), Cao et al. (2020), Hetrick et al. (2018), Kenny, Dooley & Fitzgerald, (2016)</p> |
| Medication adherence | <p>A significant improvement was demonstrated in studies considering medication adherence among adolescents who participated in an online educational intervention, adherence that was enhanced when participants also engaged in a secondary social media based-intervention</p> | <p>Scalzi et al., (2018)</p> <p>Traber-Walker et al. (2019)</p> |
| Substance abuse | <p>Apps and websites which provided real time feedback for health related behaviors, specifically drug and alcohol use the results of which indicated many participants who engaged in habitual drug or alcohol use were highly motivated to change but did not know how.</p> | <p>McCarty et al. (2019)</p> |
| Life management | <p>Life management apps can let the user create events and reminders, medication management. They can provide new strategies, trigger identification, and alleviate the stigmatization of mental health. They were identified as having a statistically significant benefit through multiple studies. These showed reduced anxiety among users, even those contending with bullying.</p> | <p>Grist, et al., 2017, Newbold et al. (2020), Hetrick et al., (2018), Bakker & Rickard (2018), Yilmaz & Bohara (2021), Tregarthen et al.</p> |
| Symptom self-management | <p>Apps to support children and young people transitioning from inpatient to outpatient care: the purpose of which was to provide mobile access to pre-agreed safety plans for use in times of crisis and suicidal ideation have been shown to be effective. The self-monitoring aspect of their app enabled young people to learn more about their individual emotional experiences and what external influences impact their mental health. Those with depressive symptoms also showed improvements in wellbeing. However, there were a number of longitudinal studies which did not show an improvement in symptom management using such apps.</p> | <p>Grist et al., (2018), McManama O'Brien, LeCloux, Ross, Gironda & Wharff, (2016), Punukollu et al. (2020), Hetrick et al. (2018), Kennard et al., in 2015, Whittaker, et al. (2017) Newbold et al. (2020), Pramana et al. (2014), (Traber-Walker et al., 2019, Verstappen et al. in 2014, O'Dea et al. (2020)</p> |



| | | |
|---|---|--|
| Gender differences | Gender differences exist in terms of media activities on smartphones and computers with boys favoring games and videos and girls favoring social media content and reading. | (Rideout, 2016), Kola, et al. (2021) |
| Mental health during natural disasters and conflict settings | Conflict and natural disasters can cause toxic stress which negatively impact brain development in youth. The stress responses can exacerbate existing mental health problems and manifest in the form of new mental health problems. In an emergency setting the ties between academic performance, emotional skills, and social well-being grow stronger as children and youth of all ages struggle to not only cope in their unstable environment but survive in what could potentially be life-threatening situations. These skills are critical tools for building resilience, improving relationships, managing stress, learning coping mechanisms, and improving mental health. These risk factors can be mitigated with protective interventions. As such, there is significant room for growth as it applies to technological interventions that teach coping mechanisms for improved mental health among adolescents. | INEE (2016), Kenny, Dooley & Fitzgerald, (2016), The Danish Red Cross Youth (2014) |

Conclusion

Of the journals chosen for this lit review, 98% of them showed a positive correlation between technological interventions and improved mental health. In all treatment areas investigated above, results indicated a positive outcome, with the exception of symptom self-management offering a number of studies that did not show a statistically significant improvement.



5. TECHNOLOGY LANDSCAPING: TOOLS ALREADY IN USE (*OUTSIGHT INTERNATIONAL*)

Demand precedes technological solutions

Various frameworks exist for understanding, implementing, and scaling mental health innovations. A widely agreed upon principle at any stage of the health innovation pathway and within any framework is ensuring innovations are rooted in a robust understanding of the health demand. Mental health disorders have a significant negative impact on quality of life and negatively influence health outcomes for individuals living with comorbid conditions. This considerable burden and influence are worth underscoring while reviewing this solution-focused section. The following digital mental health landscaping provides an early insight into what digital health solutions may be relevant to the identified health need. The findings are a reference point for continued evaluation and understanding of context-specific needs and further investigation of non-technical innovative approaches which may work in place or alongside future pilot implementations.

Grounded in the literature of the global burden of youth mental health in previous sections of this report and specific U-report insights from the Jamaican contexts, it is clear that there is a need for new approaches to youth mental health support and care delivery. The following briefly delineates this demand:

- Out of 1000 participants, 53% of U-reporters in Jamaica had considered suicide, with 31% going on to attempt suicide;
- 90% of 1000 participants believed that the mental health of young people in Jamaica is not taken seriously;
- 68% of the same cohort did not know what other helplines or resources were available to them to gain support for mental health and cyberbullying.

The challenge of increasing the quality and availability of adolescent mental health services is a problem far more significant than any technical solution may address in isolation. However, a number of contexts appear to be conducive to addressing the high mental health burden with the addition of digital mental health solutions based on population demographics, operational landscape, technical infrastructure, and other



variables. The opportunity of digital mental health solutions has been increasingly recognized in recent years, as represented by exponential increases in investment and a sizable increase in associated publications.

A wide range of global mental health system deficiencies became increasingly apparent with the Covid-19 pandemic. The variety of digital mental health solutions currently being implemented matches this diverse range of fault lines and patient cohorts—more on this below.

Aims and objectives of digital mental health solution landscaping

As mentioned, the digital mental health environment is highly heterogeneous and far-reaching. With the recognition of this breadth and the early exploratory stage of this particular project, the primary focus for this landscaping is as follows:

- To provide an overview of most promising digital mental health apps and platforms based on criteria including scale, impact, investment, and evidence;
- To inspire creative thinking around the potential of digital mental health intervention integration for future project phases;
- To highlight prominent digital mental health approaches and sub-segments of the digital mental health environment.

Solution landscape methodology

A secondary review of digital health aggregator platforms and resources including, the University of California platform, PsyberGuide, informed this solution landscaping. In addition, academic and grey literature was consulted to identify a wide range of relevant and representative solutions and approaches.

The apps and solutions relevant to this project are summarized in a comparative Airtable (which can be accessed [here](#)).

The identified solutions were categorised using identifiers including:

- Mental health disorder types: Schizophrenia, Bipolar, Depression, Anxiety/Stress, Eating Disorders, Chronic Pain, Self Harm, ADHD, Addiction, Insomnia, OCD, PTSD, Sexual and Gender Based Violence



- Mental Health Solution Patient Pathway Focus: Prevention, Diagnosis, Treatment, Management/Monitoring
- Therapeutic/Guidance Approaches: Cognitive Behavioral Therapy/ Cognitive Behavioral Therapy for Insomnia (CBT/CBT-i), Dialectical Behavioural Therapy (DBT), Acceptance and Commitment Therapy (ACT), Mental Health Coaching, Digital Biomarker Guidance, Immersive Gamification, Meditation / Mindfulness
- Technical Features: Automated chatbot, Video-based interactions w/ HCP, Voice-based interactions w/ HCP
- Chat-based interactions w/ HCP
- Patient-Reported Outcomes/self-monitoring
- Psychoeducation/information
- Service identification
- Appointment reminders
- EMR integration
- Online community/peer support
- Remote patient monitoring (RPM)/digital phenotyping
- Augmented Reality/ Virtual Reality (AR/VR)
- Medication adherence reminders

These system architecture elements are not explicitly integrated as a variable in the solution landscape mapping. However, they are an essential consideration when navigating this space and planning for a pilot implementation.

- **Standalone Digital Solution** - a patient can access the intervention independently outside of the health system e.g., an app advertised on social media prompting the user to download and self-serve.
- **Adjunctive Digital Prescription** - Patients can access this service through 'prescription' or a health service provider recommendation. This may be used as an adjunct to medications or just a health system interaction.
- **Embedded Digital Service** - Patients have the option to engage with a healthcare service either in person or via digital means.



Digital Mental Health Solution Landscape Key Insights

Lack of LMIC digital mental health solutions

Despite mental health support in low resource settings lacking, very few solutions exist on the market that specifically address these needs. The approach of digital mental health apps and tech solutions is less prevalent and many systems and organisations in these settings favor a more community based approach e.g. WHO mhGap training of non-specialist health workers and enabling them to connect with specialist clinical practitioners via video conference software or basic phone calls.

CBT, meditation and mindfulness digital approaches at the fore

A large cohort of solutions and apps identified deliver cognitive-behavioural therapy, mindfulness, and meditation support and guidance for users. CBT is an evidence-based approach and a promising route for tech companies; however, this is not a replacement for psychological support and treatment for those with more acute needs. This is a promising approach for those who are between psychosocial visits or those with less acute needs.

A focus on depression and anxiety

Reflective of global epidemiological trends, the majority of solutions offer generalised solutions for depression and anxiety. However, there are a number of solutions specialising specifically in higher acuity conditions and those related to comorbidities.

Evidence is growing

Approximately 40% of solutions listed in the comparative airtable have some form of published evidence; however, quality is highly variable, and the number of RCTs are limited. Many companies identified with reasonable evidence backing their efficacy self identify as a digital therapeutic. Again much of this evidence is heavily biased towards high-income contexts. Another consideration when considering the evidence behind these solutions is the timeline. RCTs are laborious and time-consuming, but conversely, technology companies pride themselves on moving fast; therefore, by the time evidence is produced supporting a claim of efficacy, the solution on offer to users may be quite different from the solution tested.



Varied access points and integration requirements

Considerations include how patients and users access these tools, how referral pathways may function if emergency healthcare services are required, and how service usage data may be integrated into health system records where appropriate, and what resources both human and financial are required to both test and validate but also scale and maintain.

Future digital mental health considerations

The operational elements surrounding whichever technical solution emerges as most promising for future phases of this project are even more important than the solution or approach selected. Some key questions to consider include:

- How will the solution be promoted/prescribed?
- What will a digital health promotion campaign look like, what channels are most appropriate?
- How to measure success in terms of activity and impact?
- How to ensure user data privacy and protection from the outset of the intervention?
- What added human resources are needed to launch and scale the intervention?
- How to better enable parents, caregivers, and communities to support improved adolescent mental health?

This solution landscaping exercise profiles innovative technological approaches to mental health and is not an endorsement of the listed solutions.



6. DATA LANDSCAPING AND KEY INFORMANT INTERVIEWS (KIIS) (*OUTSIGHT INTERNATIONAL*)

Existence of contradicting narratives

The most prevalent narrative in society is that technology and social media have generally adverse effects on children's and adolescents' mental health. Recent whistleblower revelations by Frances Haugen revealed Facebook's internal conclusions that a clear link between adolescent use of their social media platforms and negative mental health exists. These leaks further underpin the suspicion that the true extent of the mental health impact of social media use is still unknown, although perhaps larger than thought.

At the same time, social media use is pervasive in societies globally, and generates a myriad of data points that generate insights about mental health. Efforts are underway to understand how to leverage this data in support of positive mental health outcomes. Interviews with mental health researchers across various organisations revealed the broad view that few conclusive studies exist that suggest technology has a consistent detrimental or harmful influence on children and adolescent mental health. For example, data extracted from social media platforms is helping researchers in mental health develop tools that support mental health interventions. Several studies show that technology and social media can be leveraged to generate positive interventions in support of mental wellbeing.

The studies also show that varied factors determine media use and its impact. This makes it important to understand the differential susceptibility to media use to truly understand its impact on children and adolescents. This section attempts to dig deeper into these observations made by the mental health researchers, analyzing the complex role that data and data science have in understanding mental health in adolescents, the various challenges they face, and possible redressal mechanisms.

Existing data science solutions

Several data-led research projects have uncovered the complexities inherent in the two contradictory narratives mentioned in the previous section. The following are the summaries that provide details into these projects and their premises:



Anonymised and sanitised conversation transcripts between adolescents and mental health specialists along with the related metadata can help analyse traits, symptoms and the language used in describing one's situation.

These studies can inform the development of intervention tools, such as predictive systems for people at risk of mental health disorders. One of the most important prerequisites of such research is maintaining the privacy of both the patient and the mental health specialist involved. Some widely used anonymization tools, such as Named Entity Recognition, automatically identify and remove pronouns and names and can provide an initial layer of personal data protection. One [project](#), a collaboration between DataKind and Crisis Text Line, identified ways to help specialists interact effectively with teens at some of their most crucial times of need by analysing anonymized metadata from 6,400 conversations between teens and specialists, including the specialist reports from each interaction. This analysis allowed Crisis Text Line to better hone their surveys and approach to engage with teens.

Using demographic information, socio-cultural characteristics, linguistic needs, and support needs of the person in crisis, as well as the expertise and experience profile of the volunteer/mental health specialist to design algorithms to match the specialists with the person in need to ensure that the right help is provided to the person (adolescents in the context of this project). An ongoing [project](#) by Georgia Tech in collaboration with Befrienders India, with grant support from Microsoft's AI for Accessibility program is developing a dashboard and model intended to match crisis line callers with volunteers based on demographic and socio-cultural characteristics, the needs and issues of the callers, and the lived experiences of the volunteers. The project also explores if AI can help deliver more impactful mental health services for people.

Analysing text messages and social media comments to understand the language of empathy within a mental health scenario can help improve human connection among the peer support volunteer community and those seeking help. The University of Washington in partnership with TalkLife and Supportive, and grant support from Microsoft's AI for Accessibility program is [developing](#) a natural language model to understand empathy in text-based peer support. They intend to train models to recognize aspects of empathy, and



then offer suggestions to make responses more empathetic by adapting measurements of empathy developed in clinical therapy settings.

[Social media posts](#) collected over a period of time can be used to explore methods of early detection of Major Depressive Disorders. Machine learning characterises the subjects' behaviour based on different aspects of their writings: textual spreading, time gap, and time span. While anonymisation of social media posts is crucial, it is also important to ensure that the linkages between posts from the same individual are still preserved to enable the researchers to work with temporal data.

Scoping research based on key stakeholder interviews

In support of the data landscape study, several interviews with mental health researchers working with various non-profit and humanitarian organisations were conducted. Three key themes emerged from these interviews:

- d) **Theme 1:** Compounding factors leading to different mental health outcomes:
- e) **Theme 2:** Limitations of existing digital mental health interventions
 - i) Most apps or platforms don't utilise algorithmic techniques to engage users.
 - ii) Linking alert mechanisms that highlight negative mental health flags to providers (when there's a lack of mental health professionals) or mental health tools.
- f) **Theme 3:** Difficulty in measuring social media's effect on young people
 - i) Difficulty in data access makes it hard to understand engagement with content – positive or negative. Often screen time has been used as a proxy for engagement.
 - ii) Lack of sufficient insights into how algorithms used in the apps and platforms affected the user engagement and behaviour



Theme 1: Compounding factors influencing adolescent mental health

Various studies have focused on the relationship between individual factors and their impact on different mental health outcomes. However, experts working in the field with varied populations emphasized the importance that compounding factors, as described in the diagram above, play in influencing mental health outcomes.

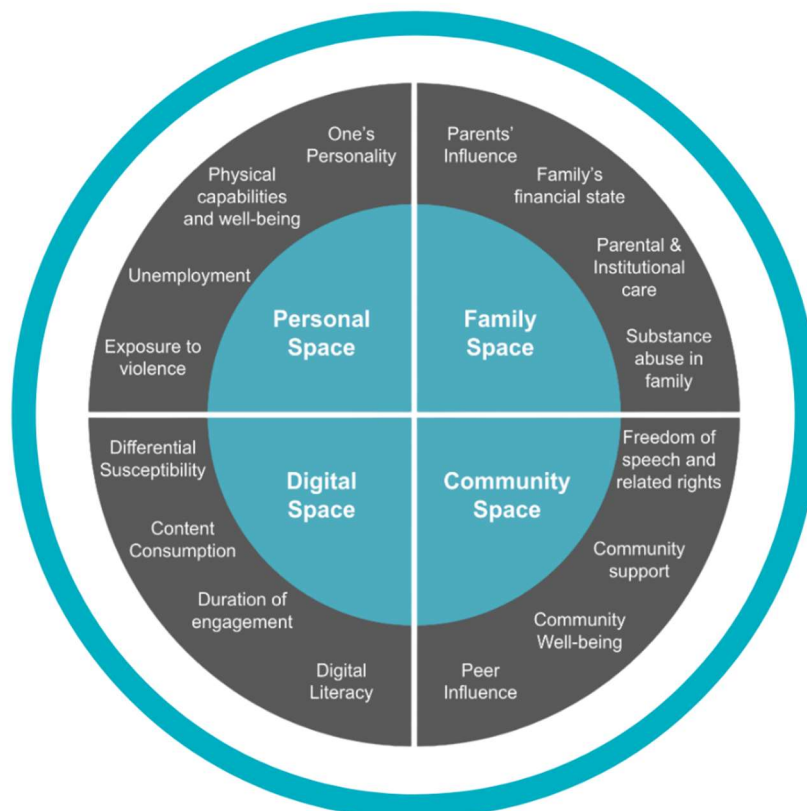


Figure 9: Compounding factors influencing adolescent mental health

Some of the most important ones, but not the only ones, are:

- Intersectionalities arising from factors such as context, gender, socio-economic factors and home environment;
- Parental digital literacy and the effect it has on children along with the safeguards that can be put in place;
- adolescent empowerment.



One can leverage the power of data science to understand these compounding factors and their impact in details:

- Using Natural Language Processing to analyse the pattern of search queries, posts and overall search behaviour on the internet and on social media platforms such as Google, Facebook, Twitter and Instagram in order to understand the information needs of adolescents;
- Performing topic identification and correlation analysis to find key areas of concern and need for adolescents belonging to various populations. Social media posts from platforms such as Google, Facebook, Twitter and Instagram as well as chat transcripts from sources such as helplines, chatbots, discussion forums etc. can be used to conduct such studies;
- Using regression analysis to understand the effect various socio-economic factors have on adolescents using existing census data as well as various socio-economic datasets;
- Harnessing the edu-tech platforms to understand the learning inclinations of adolescents. This can be done via analysing the search and engagement patterns with websites such as Coursera, EdX, etc. Patterns of learning on language learning apps such as Duolingo could also shed light on the linguistic challenges certain minority populations may be facing;
- Identifying how adolescents react to and engage on various social and political issues by leveraging network data, time-series data such as posts and retweets from platforms such as Twitter, Instagram and Facebook, datasets that reflect the status of freedom and rights in a country such as Media Freedom Index dataset from Reporters without Borders as well as user surveys conducted by independent organizations.



Theme 2: Limitations of existing digital mental health interventions

Interviewees shared the following insights on the maturity of the digital mental health ecosystem:

- Digital applications that are developed by researchers often do not have a big focus on user engagement – they may not have undergone the usual product development life cycle with stages such as design phase, user experience interviews etc. and hence often lack the right user experience and stickiness factor.
- Social media platforms have limited applicability for researchers who are aiming for focused positive mental health interventions. These platforms are not necessarily targeted at improving mental well-being and their business models do not directly support emphasis on prioritising for positive mental health outcomes.
- Most of the mental health apps have a singular focus on improving specific mental health outcomes creating ineffective siloed approaches. There are apps such as Headspace and Superapp that are changing that premise. Headspace has a team of mental health experts as well as behavioural scientists who are focusing on making Headspace a catalyst for overall well-being by bringing in behavioural changes in one's day-to-day life while also addressing specific mental health problems such as anxiety.

Designing, implementing and productionising digital mental health interventions is not a trivial process and often requires tradeoffs on the approach:

Control on data: to what extent will the developer team have control over the data, especially since the data involved in mental health research could be extremely sensitive and private. While it is easy to control data access in standalone apps, this is not the case with social media apps and platforms.

Data availability: whether the research team would have access to the right data at the right granularity in order for them to perform useful diagnostic analysis. This often is not the case when working with social media organisations to design digital interventions

Ease of audience acquisition: Social media platforms that have been in existence for years and already have a massive user base provide an easy way to reach out to masses with minimal investments for organisations developing digital interventions targeted at mental



health. Conversely, it is usually a huge undertaking to find the relevant audience in significant numbers for standalone apps.

Isolation of concerns: As mentioned previously, social media platforms are not necessarily optimising for positive mental health outcomes. Any digital intervention built in collaboration with these platforms will not exist in a silo. The engagement with the social media platform and the data generated as a result of this engagement isn't only consumed and utilised for mental health research purposes, but it also feeds the other algorithms of that platform. Hence, it's often a big topic of concern for mental health researchers and experts.

Sustainability and commercial viability: Many digital mental health interventions often start and end as lab experiments and are rarely launched and sustained in the real world. Mental health research often requires longitudinal and time-series data that can only come from continuous use of these interventions, which in turn calls for commercial viability of maintaining and developing these solutions iteratively over time.

There are several ways in which to leverage data science to deep-dive into the domain of mental health research using the existing digital ecosystem

- Using the advertisement infrastructure of social media platforms to identify what adolescents are interested in. For example, the advertisement impression and conversion data from platforms such as Facebook and Instagram can be leveraged to conduct such a study.
- Using behavioural science to recommend lifestyle changes in individuals at risk of certain diseases by leveraging datasets such as government health datasets, nutrition datasets, various socio-economic datasets as well as digital app analytics and user engagement data.
- Using historical mental health consultation data to identify the key points of intervention by leveraging datasets such as chat transcripts between mental health professionals and patients, particularly adolescents.
- Using the power of data science to identify when adolescent users of social media platforms might be getting into attention traps, especially the ones with negative content by utilising social media usage and engagement data from platforms such as Facebook, Google, Youtube, Instagram etc.



Theme 3: Difficulty in measuring social media's effect on young people

Effectively understanding social media's effect on young people is currently a significant challenge in the area of mental health research, as confirmed by the researchers and experts interviewed. There are three key reasons why this is hard:

1. **Differential susceptibility of individuals:** Not everyone has the same response to varied environments and experiences. Some people are less likely to get affected by continuously changing external factors while others are more susceptible to changing conditions. Understanding the extent to which a certain environment is affecting different people is a big challenge that mental health researchers often have to deal with in their work.
2. **Inability to perform effective data diagnoses:** Many researchers start with some form of descriptive analysis on the data they have collected in order to understand high-level patterns of mental health disorders. However, very few are actually able to perform any useful diagnostic analysis and causal analysis due to the lack of appropriate data at the right granularity.

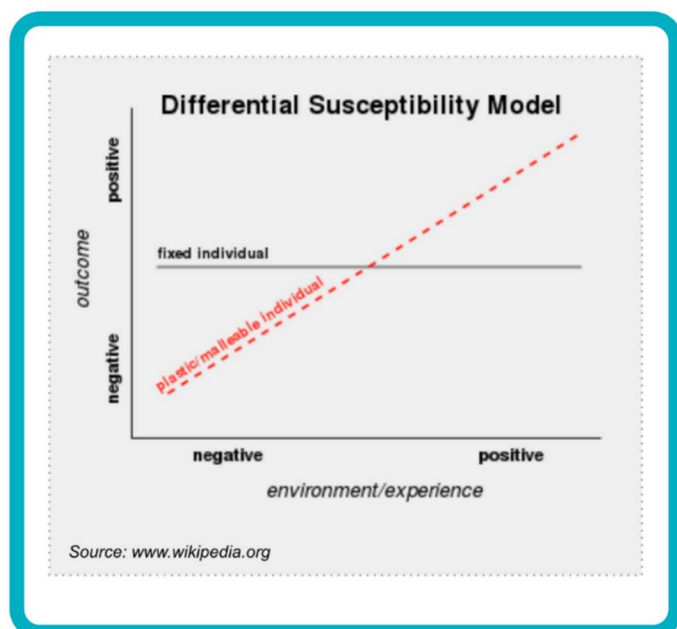


Figure 10: Differential susceptibility model

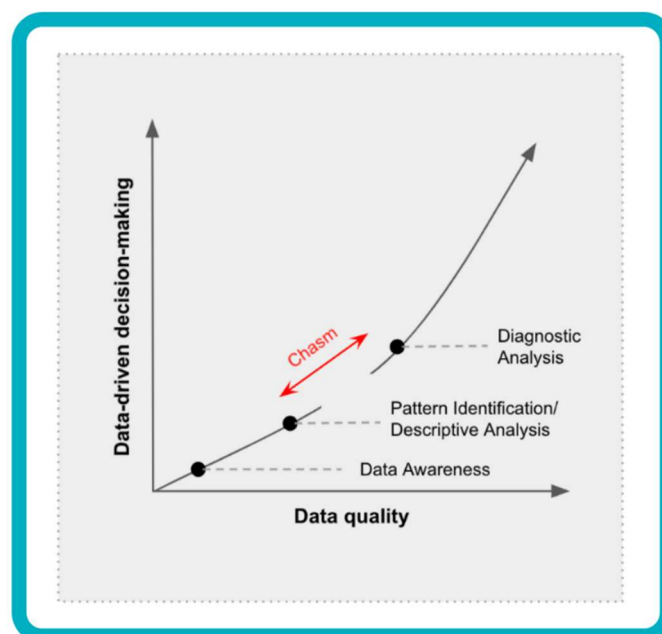


Figure 11: Inability to perform effective data diagnoses



3. **Complex social media ecosystems:** Social media is pervasive. People use several different platforms on a daily basis, and while in some ways, the boundaries between the real world and these platforms as well as between different platforms is constantly disappearing, it is usually difficult to understand various nuances of one's life and their state of mental health and well-being from analysing data from one platform in isolation. The social media ecosystem could look very different between countries and regions, which makes it difficult to have the same, consistent approach for research across various geographical boundaries.



Figure 12: Complex social media ecosystems

There is extensive research on the massive amount of data generated by social media platforms and data science methodologies applied to this data can play a key role in helping understand the state of mental health better:

- Identifying how different users connect with content online and analysing if several user groups are more susceptible towards a certain kind of content by using social media data and metadata on engagement as well as socioeconomic data for countries and granular regions, if available.



- Going beyond just descriptive analytics to diagnostic analysis to understand what kind of content adolescents engage with on social media. Social media posts, user engagement data, usage data, etc. from platforms that are most widely used within a country's context and support diagnostic analysis. .
- Using multi-agent simulations to identify ways in which individuals belonging to various populations would perceive the language and messages in the social media data. This would require specialists such as behaviour scientists, mental health specialists, human-computer design experts and data specialists to be embedded within a product ecosystem working together on historical research data from the product organisations.



7. WORKSHOPS AND HYPOTHESIS CREATION (*OUTSIGHT INTERNATIONAL*)

Following on from the work in the earlier sections, compounding factors were identified by UNICEF as a key area of potential impact when considering what affect social media has on adolescents. This is a complex area of study because it brings together multiple possible factors that may interact or build on each other (figure on page X). As a foundation for developing research in this area, two workshops (facilitated by Oversight International) aimed to focus on developing a clear understanding of what is meant by compounding factors and how insights in this area are to be leveraged in practical application.

Session 1 approach:

The aim of the first session was to utilize the experience in the room to nail down the questions of **what** the outcome of the project should be. This meant asking the following questions:

- What type of work is being supported by the research?
- Who is the end user of the research insights?
- What does success look like?

Following establishing where the research gap was within the topic of compounding factors, by asking participants to formulate research questions on an independent, group and plenary level.

Session 1 outcome:

A consistent challenge when working with such a broad topic as technology and mental health has been narrowing down the scope of the research question to something that is small enough to tackle whilst being large enough to have a broader use for UNICEF's operations beyond just the duration of the DCC project.

Identifying this question on a specific level proved difficult here too. As to the question of 'who is to be supported by the research?', responses were generally focused on donors who might be interested in using the research to support UNICEF's programmatic activities, as well as using it to identify the further gaps that could be explored by other research they might fund. Additionally, the UNICEF programme implementers were highlighted as a beneficiary of the work.



Understanding who the user of the research might be, yielded a broad spectrum of answers. Those working directly with adolescents – such as UNICEF staff, school counsellors, and adolescent champions – were identified first, with government, academic researchers, innovation funders, the media and tech companies all adding to the list of potential users.

Finally, success would be reached if the research could: showcase success stories of the positive mental health outcomes from tech; identify research gaps for further research and funding; provide local case studies/data to support local contexts and programmatic change. It was also said to be essential that the outcome be accessible (i.e. not too technical) to ensure the broadest impact beyond just specialised mental health researchers and practitioners.

The session then moved into breakout sessions to investigate where the research gaps in the topic existed. Reporting back to the plenary, each group approached this question from a different angle. Group 1 approached the topic quite acutely from a Jamaican perspective (as they had a member of the Country Office team as a member). The specific areas of interest that were raised were:

- Questions around the effect of access and lack of access to internet platforms has on adolescent mental health
- What determines access i.e. economic challenges?
- The need to understand the narrative around mental health and where the stigma comes from
- The parental role in terms of consent etc. Requiring parental consent for under 16s is hard if the parents contribute to the issue
- What effect has covid had on adolescent mental health and how has technology exacerbated or alleviated it?

Group 2 meanwhile took a more generalist approach, focusing on identifying sub-questions of the original compounding factors question:

- How can compounding data better understand **mental health outcomes**?
- How can compounding data better understand **social media usage patterns**?
- How can compounding data be used to **design apps / tools to better outcomes**?



Each of these sub-questions pinpointed a different area that could be affected by different compounding factors. It's worth noting that considering how to better design apps for impact, was one of the themes proposed at the end of the data landscape assessment. This was largely discounted as the project did not want to create an intervention, instead focusing on research.

Finally, group 3 chose to focus on what the research should do, rather than the specific question as such.

- An approach that is tailored to the context
- But this approach should include a research framework that will allow for scaling and this may require training on how to implement the approach

Session 2 approach:

Moving into Session 2, the focus again was on the research question, but this time to dig deeper into the specifics as it was felt that the outcome of Session 1 was still too general. To achieve this, a methodology that would focus on choosing different variables to derive a research question was used. The hope was that this could also ensure that the transferability/scalability could be thought about earlier on.

First, we outlined the system view of a research question based on compounding factors and their effect on technology use, and the consequential mental health change (see Figure 13).

Each step had an identifiable choice for the participants in order to construct the research questions. We also added 1 option upstream, 'Context', which was not necessary for the system view, but was required to define the scope of the research questions (see figure 14).

We then gave an example based on the input from the Jamaican context in Session 1 (see figure 15).

These examples were supplemented by UCIPT who provided four additional example questions, using the same mix and match method. The aim here was to illustrate the approach before asking participants to help us fill in the options for each step of the process (Exercise 1), before then making new questions out of the process.

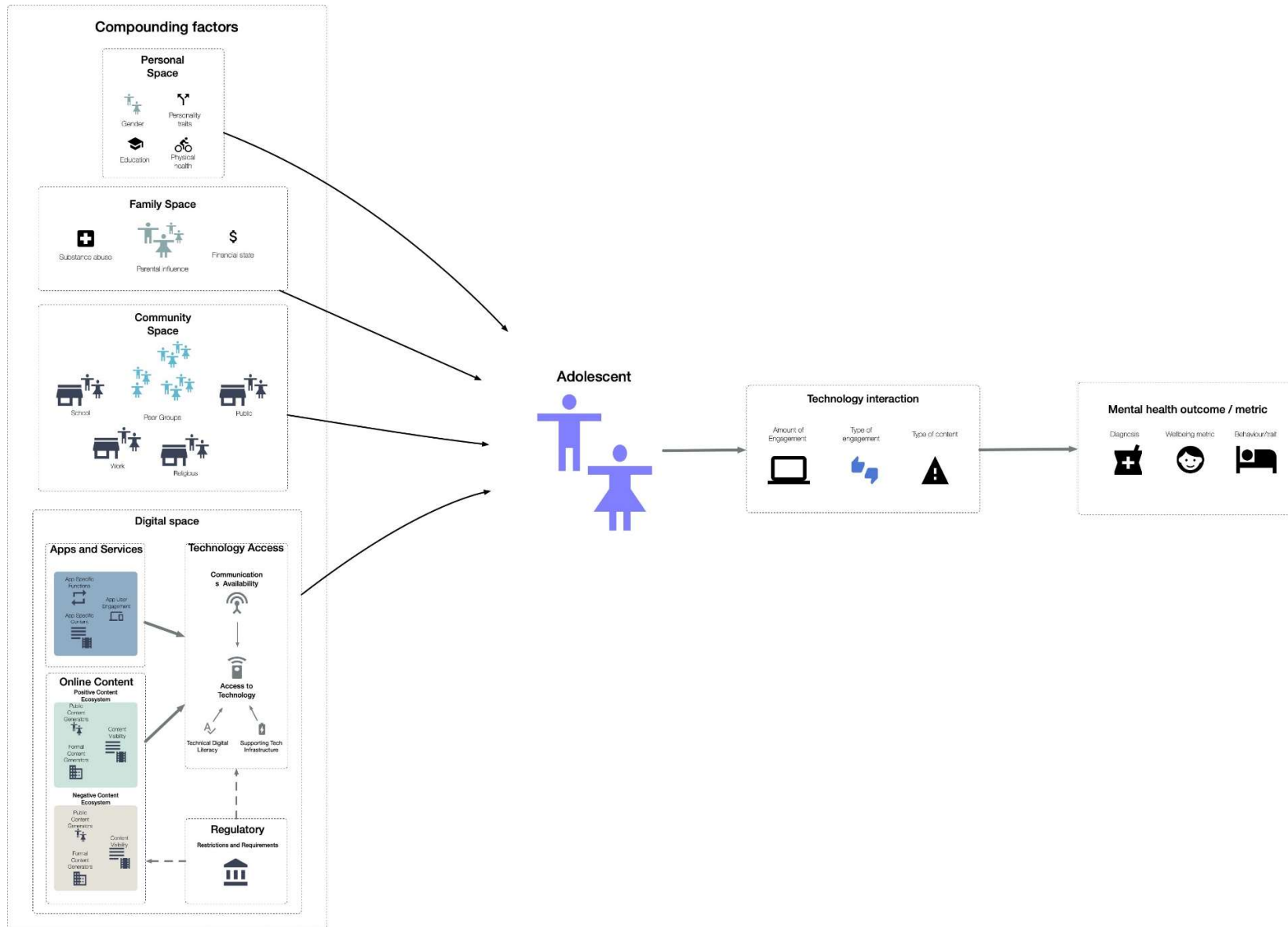


Figure 13: System view of a research question based on compounding factors and their downstream effect on technology use and mental health



Turning this into a Pick 'n' Mix research framework

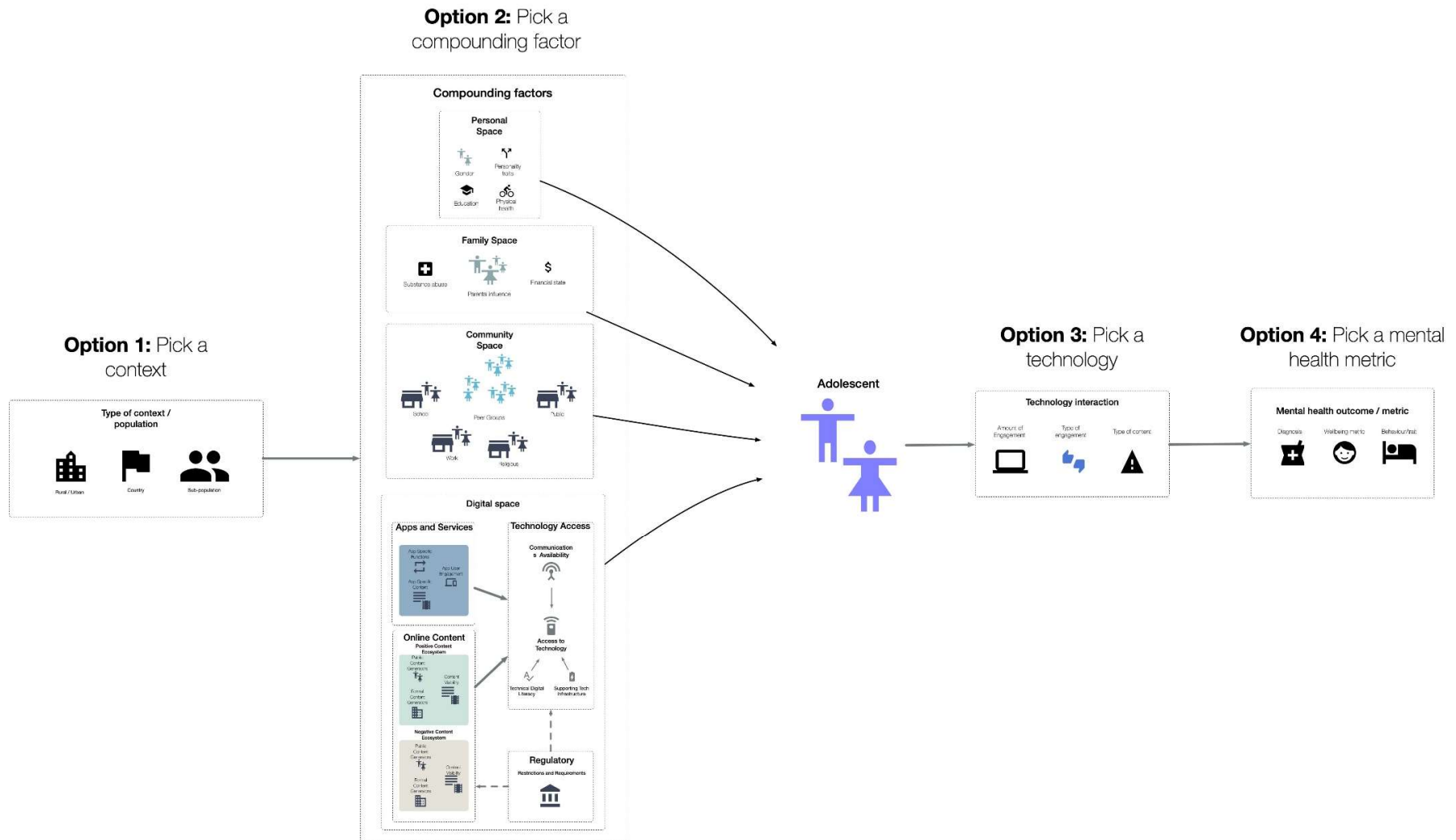


Figure 14: Workshop methodology to create research questions based on this system



Example research question:

To understand what effect **[access to technology]** has on **[depression]** in adolescents **[in Jamaica]**, based on **[data from Sandvine]**

Option 2: Access to technology

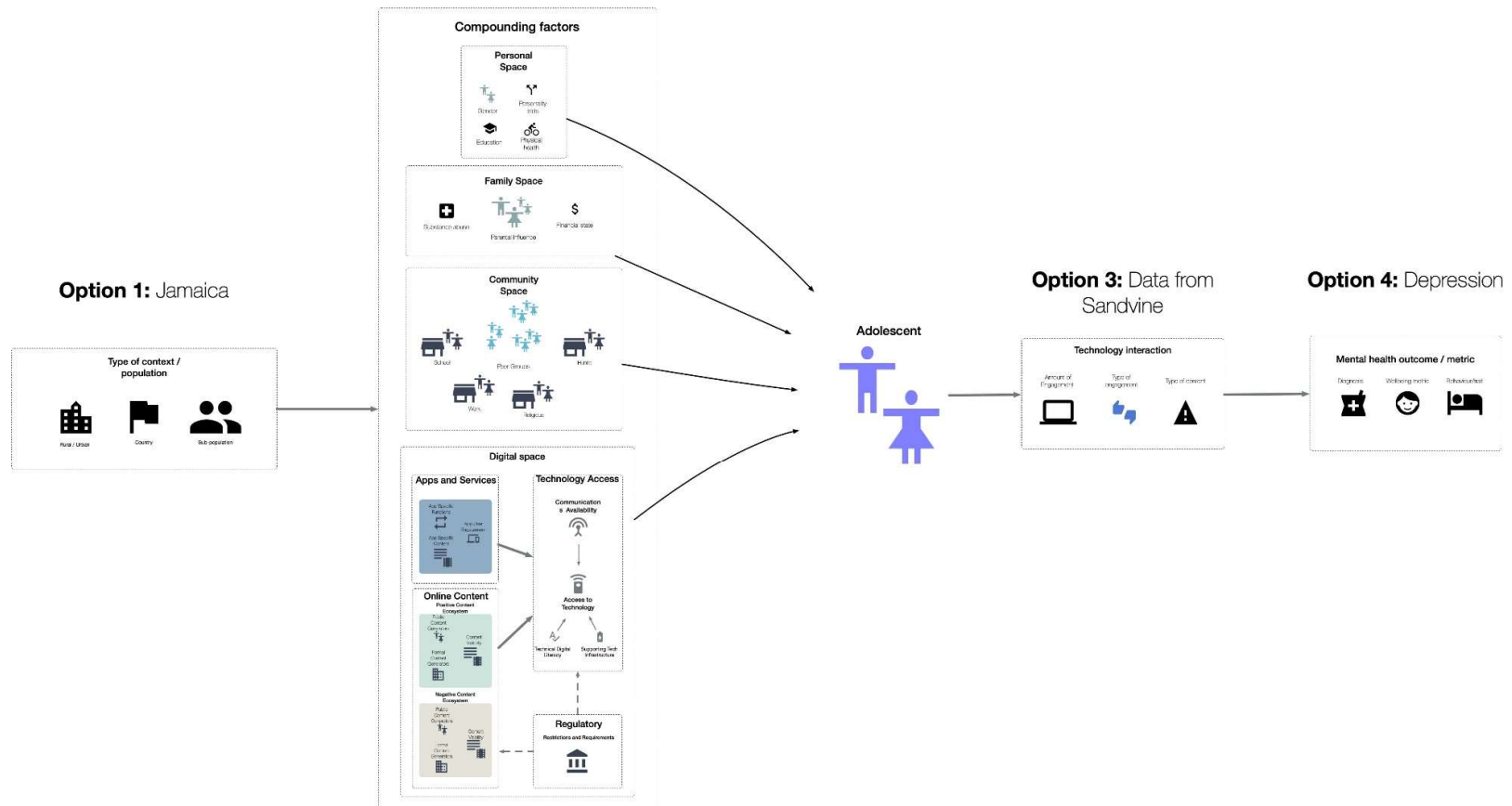


Figure 15: Example research question



Figure 16: Template to collect workshop discussion



Session 2 outcome:

Exercise 1 provided the following inputs into each of the four steps provided above.

| Option 1: Possible contexts of interest | Option 2: Possible compounding factor of interest | Option 3: Possible technology interactions / datasets of interest | Option 4: Possible mental health metrics of interest |
|---|--|--|--|
| Urban/Rural. | Personal space: Religion | UNICEF Global Kids Online Survey being conducted in Jamaica, provides additional data. | UNICEF creating metrics to measure pop. level data on surveys. |
| Age divides between kids (10-14 vs 15-19). | Personal space: Gender | Adolescents creating their own web-spaces – is this positive or negative? | Suicidal ideation/attempts (U-report suicide reporting tool). |
| Subgroups based on needs – type of MHPSS condition: substance users, diagnosed conditions, suicidality, violence and SGBV survivors. | Personal space: Health seeking behaviour type. | Search engine keyword search correlations with suicidal ideation. | Peer-to-peer tech support: metric is engagement with the platform (most apps usage falls off quickly). |
| Gender based. | Personal space: Exposure to a triggering event. | Text based interventions (also as means of leveling access / playing field). | GAD7 is being used by UNICEF already. |
| UNICEF Country Offices where MH is a priority: Rwanda, Ethiopia, Lebanon, Colombia, Peru, Belize, Mexico, Thailand, Mozambique, Angola, and Kenya | Family space: Parental consent issues. | What type of apps are more appealing to adolescents? | Alcohol / drug consumption as a proxy for mental health status. |
| Language. | Family space: Family religious considerations. | | Language being used to talk about mental health (identifying flags). context specific. |



| | | | |
|--------------------------------|--|--|--|
| Visitors to TeenHub (Jamaica). | Family space: Stigmatising beliefs and norms. | | Hospital admissions for suicide attempts. |
| | Community space: School interventions. | | Loneliness as a metric. |
| | Community space: In/Out of education. | | MH counselling appointments missed. |
| | Community space: Sports and their effect. | | Level of stigma related to adolescents accessing mental health, disaggregated by gender. |
| | Community space: The MoH budget for MHPSS. | | Descriptive analysis of mental health metrics may be needed as first steps. |
| | Community space: Areas that have been traditionally underserved for MHPSS. | | |
| | Community space: The availability of adolescent friendly spaces. | | |
| | Community space: Health care environment. | | |
| | Digital space: Access to technology, linked to time of availability. | | |
| | Digital space: Patterns of use. | | |



Hypothesis generation

With these variables listed, participants were asked to try to formulate specific questions by combining different versions of the four options listed. However, as per Session 1, this proved challenging, at least in part due to the circular nature of the demand i.e. it's hard to formulate a question without much initial research, whilst at the same time it is hard to consider what to look into, without a research question.

By the end of the session, three possible research questions were extracted, all relatively closely related:

- How can online apps be designed to better improve the ability of school counselors and other mental health providers to reach adolescents in need?
- What are the current science-based best practices on use of digital mental health tools among adolescent mental health providers (including school counselors and key stakeholders)?
- Is tech enabled access to mental health more youth friendly; and as a result more impactful? What determines youth friendly? What are the design features that matter for what conditions?

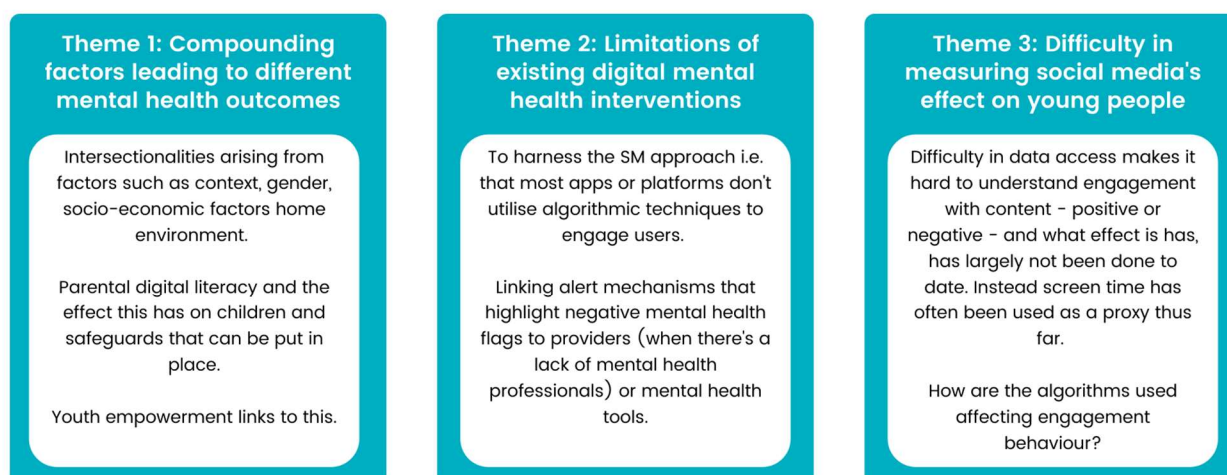


Reflections from the workshops:

It was unexpected that the final direction the research questions seemed to take, did not directly address the question of the compounding factors previously identified as the key interest area, but instead focused on the technology providing services and interventions. This seems to push back on the choice of theme at the end of the data landscape assessment and points towards Theme 2:

Possible areas for data-driven research

based on Key Stakeholder Interviews



It is possible to combine themes 1 and 2 into a research question also, though theme 2 is more design-focused and one that lends itself less to data research. To breakdown the research questions provided, we could reasonable foresee two aspects of implementing the research:

1. Understanding **which** platforms are used by adolescents in the context (including issues of access to technology). *This could likely be conducted through data sets on users of different platforms and focus groups, as well as engagement with the technology providers.*
2. Understanding **how** adolescents are using online apps/technologies. *This can be conducted through focus groups and user research design methods and tries to answer what makes something 'adolescent friendly'.*



3. Linking these findings to helping existing platforms **adapt** to either provide better services to adolescents or link the users to mental health providers. *This appears to be an implementation project based on design methodologies also, likely requiring user research and testing for adolescents and mental health providers in partnership with technology platforms.*

On where the 'scalable data-driven methodology' of the project would come from. Point 1 will provide descriptive data on users and point 2 will provide insights into local users, but neither of these seem likely to provide particularly innovative insights beyond those that a typical innovation project in any context should. Reaching this outcome would make the earlier work (such as the technology scoping) more relevant, though will likely require engagement with existing platforms.

Finally, these findings undoubtedly support the UNICEF Jamaica Country Office team – as they articulated this gap in service provision and access as a key issue – though for it to scale to other contexts, links would need to be made to the other contexts prioritising adolescent mental health.



8. PHASE 2 PLANNING

On further discussion with the project team, an approach that could incorporate the above elements with more data-relevant considerations was proposed by Oversight, integrating UNICEF's Measurement of Mental Health Among Adolescents at the Population Level (MMAP) approach and mental health interventions.

The aim of the MMAP is to provide population-level data on adolescent mental health – something that is widely accepted to be insufficient under current approaches. As UNICEF puts it:

“The field of mental health measurement has a long history of screening and diagnosing symptoms using a variety of validated tools in clinical and school settings. However, there is a gap of validated tools suitable for measurement of adolescent mental health conditions at the population level. Available data on mental disorders is representative of only a small portion of the young population globally. UNICEF, with the support of experts, is working towards filling this gap in available tools and resulting lack of data through a methodological approach to measuring mental ill-health among adolescents aged 10–19. Specifically, the MMAP suite of tools and standard procedures will guide adaptation and use of suitable tools and measures to enable collection of robust, standardized data at the population level for anxiety and depression, functional impairment due to mental health conditions, suicide ideation and attempt and psychosocial support.”

<https://data.UNICEF.org/wp-content/uploads/2021/01/MMAP-Overview-January-2021.pdf>

The MMAP is, in essence, a locally-adapted survey which is conducted by trained professionals, but, crucially, can be attached to other general surveys going out at a population level. The ability to integrate into other systems, offered an opportunity of utilising the MMAP as a data collection tool within the contexts of other interventions. Further to this, as the roll-out of the MMAP methodology had already been planned with the UNICEF Jamaica Country Office team, the process of including additional adaptations for another project in the locality appears to be lower risk than going through a standalone process.



The proposed project thus aims to harness the MMAP rollout process, as well as other digital initiatives being rolled out in Jamaica. In doing so, a multi-group study will be run, with the MMAP rollout acting as the baseline/or control group. To enable comparative analysis, the MMAP survey methodology will be integrated into the two intervention cohorts that aim to test the effectiveness of certain digital tools at both improving mental health outcomes and collecting adolescent mental health data. Details of the implementation approaches are still to be fully developed. An overview of the initial thinking for the research approach and process can be seen in Figure 17.

A general step-by-step for this work would be as follows:

1. UNICEF would adapt the MMAP for the Jamaican context (as part of the standard trans-cultural translation and adaptation process, including clinical validation of a subsample (300 sample size minimum)).
2. After adaptation and validation, the MMAPs would be rolled out in the traditional UNICEF way [Group 1]. This would have the benefit of providing three things:
 - a. A baseline understanding of adolescent mental health in the context under the UNICEF approach.
 - b. A control group for the two implementation projects.
 - c. Linking data with programs in a more synergistic way – potential for liaising with service providers in countries
3. In parallel, there will be exploration of improving mental health outcomes through digital approaches and collecting data on mental health at the population level, in a way that does not sacrifice quality, validity and representativeness.
 - a. Once the digital approach has been identified, it will be necessary to conduct again validation of the results, using methods proposed in the MMAP protocol. Without this step it will not really be possible to identify which approach will be more appropriate. These could be:
 - b. Starting from a very simple approach of using the survey sampling frame and conducting the interviews in a similar way to the MMAP traditional method, but passing on the tablet to the adolescent to fill out the survey in private, but having the interviewer next to him/her, in case any questions



arise (In the traditional MMAP approach, questions are read by the interviewer to the adolescent respondent)

- c. A mental health support tool on an **existing** platform that is widely used in the context, identified through landscaping and discussions with youth in-country [Group 2]. Jamaica CO is currently in the process of developing a chat line with the University of West Indies to provide MHPSS services through the U-Report platform. The system connects adolescents to a mental health professional for text-based support sessions. This is accessed through Facebook messenger and WhatsApp, and is linked to Case Pro – an anonymised satisfaction survey following all interactions with the service – which provides a unique ID which can be used to collect longitudinal data for individual users. It is believed that this could incorporate questions from the MMAP survey also, and thus provide comparable data to the other cohorts.
 - d. A **standalone** MHPSS support tool i.e. a chatbot or gamification MPHSS platform [Cohort 3]. There is also an initiative being started in collaboration with the Ministry of Health and UNICEF to introduce a number of physical ‘TeenHub’ spaces throughout Jamaica to better equip young people to deal with mental and sexual-reproductive health issues. These spaces include an internet cafe style computer space. Given the controlled environment here and the provision of access to computers, this space could be the perfect place to integrate a mental health support tool in the form of a gamified interactive platform. Users could then be surveyed following their ‘sessions’ under the MMAP approach to collect comparable data on their mental health which will enable the third tier of analysis.
4. Essentially running three cohorts of intervention (a control group, an existing platform intervention, and a standalone intervention), this research would offer the opportunity to understand:
- a. Which is the most effective method for collecting data under the MMAP methodology.
 - b. If using existing platforms or standalone tools is the most effective in terms of positive outcomes.



- c. If the use of traditional data collection methods with digital collection methods is best. Done through data collection of user acceptance and feedback on the different platforms throughout the pilot process.
 - d. Provide additional MHPSS services to adolescents in need in Jamaica.
5. The outputs of this would be:
 - a. Data on adolescent mental health in Jamaica.
 - b. A better understanding of what works and doesn't in terms of digital interventions on adolescent mental health.
 - c. Lessons learnt on how best to collect mental health data on adolescent mental health through digital and traditional means (also a comparison between 'one way' data collection and 'two way' data collection.
 - d. A quantifiable research methodology that could be replicated in other contexts.

This would also have the benefit of: being seen as a 'fundable' project from DCC's perspective as it integrates a clear data component; providing benefit to the Jamaica CO by providing a service; achieving UNICEF HQs goal of identifying a novel approach to collecting MMAP data.



Digital MHPSS for adolescents in Jamaica: Research proposal v4

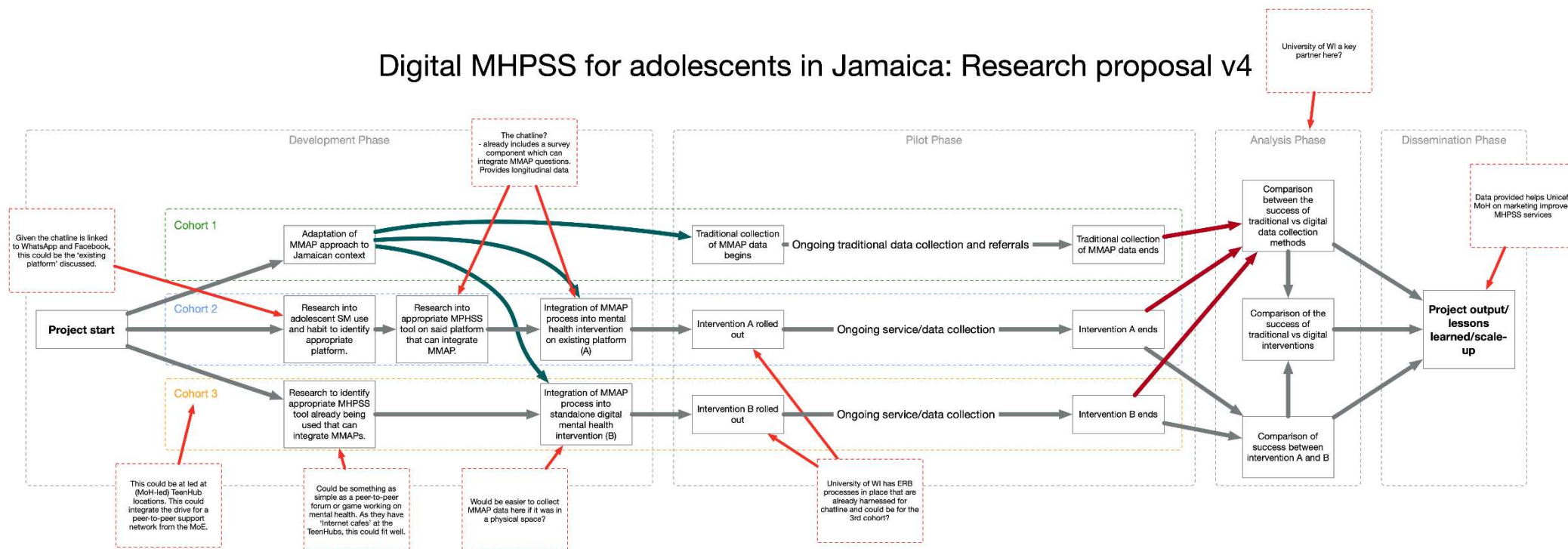


Figure 17: Digital MHPSS for adolescents in Jamaica: research proposal



9. CONCLUSION AND NEXT STEPS

The approach taken during Phase 1 of this project (and outlined in this report) has provided a strong foundational background for future research on the question of 'is technology a possible source for good in addressing adolescent mental health'. Findings on the available data types, existing literature and technology landscaping show a strong evidence-base to support the use of digital tools in the MHPSS field.

Utilising a human-centred and systems approach has enabled this to be combined with expert knowledge and an understanding of UNICEF's operational requirements and contexts. The outcome of this, in the form of planning for a Phase 2 of the project, sets out an ambitious project which – if implemented – will provide:

- **Improved access to services for Jamaican youth.**
- **Better data collection systems for UNICEF and the Ministry of Health.**
- **Test the effectiveness of digital vs analogue data collection methods.**
- **A comparative study of different digital MHPSS approaches, whilst also providing a comparative baseline to compare to more traditional UNICEF programming.**

As the project enters its next stage, the Data for Children Collaborative and UNICEF will work together to: define the scope of the study, identify potential partners, and secure funding.



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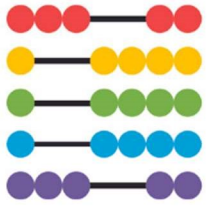
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**Data for Children
Collaborative**
WITH UNICEF

PHASE 1 REPORT: PREVENTION OF ADOLESCENT MENTAL HEALTH CONDITIONS: IS TECHNOLOGY A POSSIBLE SOURCE FOR GOOD?

Understanding the existing landscape as a basis
for a Phase 2 project design

Outsight International, ElevateU & the University of California Institute for
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