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Issue Note

The Use of Asynchronous Virtual Mental Health (AVMH) Technologies in Rural and Remote Communities

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Executive Summary

In this Issue Note, we describe some of the asynchronous virtual mental health (AVMH) services and platforms implemented for adults living in remote or rural locations in Canada and abroad. We summarize evidence from a rapid review on the scope, types, reported effectiveness and uptake, and patient reported outcome measures (PROMs) of these asynchronous modalities. Evidence-informed considerations for practice and policy in Canada are drawn primarily from the published literature with additional insights offered by key informants. We conclude with what Canada can learn from the evidence.

AVMH services are provided in ways that do not rely on "real-time" interactions with providers. Instead, they are offered through smartphone applications "apps" or web-based platforms. AVMH options have gained interest amongst health care providers and health system researchers, particularly in rural and remote areas where people often struggle with a lack of timely access to human and medical resources. Our aim was to address the following questions:

- Which AVMH services or platforms are used by adults living in remote or rural communities in Canada and abroad, and what are the reported effectiveness and uptake outcomes of these platforms?
- What are the patient reported outcome measures (PROMs) of AVMH care delivered to adults living in rural, remote and Indigenous communities?

A wide variety of AVMH services and virtual platforms have been studied, including applications that offer messaging, peer-support, and self-education. Outcomes in terms of effectiveness and uptake have been measured by clients' word counts, the frequency individuals have been able to reach out and ask questions, and the frequency of communication between clients and health care teams. PROMs include reported usage, adherence to treatment, and symptom improvement.

Lessons Learned and Key Recommendations:

Lesson 1: AVMH services/platforms may not be effective for some adults.

For a variety of reasons, mental health care delivered through asynchronous modalities may not benefit all adults. Not all groups have reaped the benefits of AVMH programs due to factors such as gaps in skills, use of technology, and appropriateness of care, all of which undermines access and equity. Evidence is lacking on which subgroups benefit, from which asynchronous modalities, for which diagnoses, and under which conditions.

Lesson 2: A micro-focus on implementation of AVMH in specific settings/populations may reveal factors affecting client/patient engagement, which might improve uptake and effectiveness.

There is a need to focus on the implementation processes and how different communities engage with new AVMH services, particularly Indigenous communities. The nuances in experiences and factors that influence engagement across different rural and remote communities must be understood to improve uptake.

Lesson 3: Uptake and effectiveness of AVMH services is affected by cultural appropriateness.

Technologies should consider local environments, culture, and social relationships of the end users. Appropriate language choice can help support culturally appropriate care and improve health literacy. Analysis of how existing asynchronous mental health interventions may have contributed to inequitable access can provide guidance for future interventions to eliminate such disparities.

Lesson 4: Focusing on AVMH services/care, rather than products, might improve effectiveness and uptake.

Existing evaluative research focuses on asynchronous applications and technologies as products, rather than considering them as components of a suite of comprehensive health care services. Evaluations should instead inform the refinement of products to fit them within the context of comprehensive health care services.

Limitations

This report is not an exhaustive review of AVMH services or platforms used by adults living in remote or rural communities in Canada and abroad, nor is it a systematic comparison of technologies or their associated outcomes. One important limitation of the evidence is that studies often report on rural and remote populations as if they are one homogenous population, without considering the unique structure and impact of each specific setting and population, such as the unique needs of Indigenous peoples. While we intentionally searched for evidence specific to Indigenous people living in rural and remote settings, it was often impossible to discern results specific to them within studies that reported on research conducted on rural and remote populations. This report does not consider the nuanced differences in health care delivery across Canada's thirteen provincial and territorial jurisdictions.

Introduction

Mental health has been recognized by health system leaders around the globe as an important priority for policy and practice during the ongoing COVID-19 pandemic, as reflected by an increase in research, service development, and public interest worldwide. [1,2] Necessary public health protection measures, coupled with a loss in social and economic opportunities, have been stressors on communities worldwide. [3-6] The mental health impacts of COVID-19 are profound and have led to a significant impact on population mental health. [7,8]

The COVID-19 pandemic presented an accelerated opportunity for the implementation of asynchronous virtual mental health (AVMH) technologies. [9] In response to COVID-related public health policies and stay-at-home-orders, health care providers quickly shifted to virtual and digital health care resulting in a rapid deployment and uptake of virtual mental health services or platforms since 2021. [10,11]

Beyond the pandemic's near-ubiquitous effects on access to in-person mental health care, some population sub-groups face disproportionate disadvantages in accessing mental health services, including individuals who identify as 2SLGBTQIA, those with severe mental health concerns, or concurrent mental health and substance use, persons with disabilities, as well as Black and other communities marginalized by race, including Indigenous Communities. [12,13] Virtual mental health services or platforms may have potential to overcome traditional barriers to care among these equity-deserving communities through reductions in cost, transportation, and perceived stigma associated with accessing mental health care. [14,15]

Virtual mental health services include both synchronous and asynchronous modalities:

- Synchronous care (occurring in real time) provided virtually via consultations with providers through phone or video modalities.
- Asynchronous care (not occurring in real time), such as mental health literacy resources, self-management programs, [16] mood/symptom trackers, and treatment such as internet-based cognitive behavioural therapy (iCBT).

This report focuses only on asynchronous services and technologies for adults (i.e. AVMH), which refers to any app, website, online tool, or other online support application that does not engage in direct contact or synchronous consultation with a mental health care provider. For the purposes of this report, the term 'mental health care providers' refers to any trained health care professional who works to provide mental health services. [17] Our definition is inclusive of those working within or across various sectors (e.g., public and private health care settings).

The integration of virtual mental health technologies within medical practice can help health professionals in the following ways: 1. improve care coordination between primary and specialists. 2. Improve health care coverage in areas where there is a relative lack of service providers 3. Enhance service offerings by extending service opening times (e.g., not limited to weekdays 9 AM to 5 PM), lessening wait times, and being cost effective. [18]

Equity and appropriateness of care are two major considerations for virtual mental health care. [19-22] Equity refers to removing systematic disparities that exist between groups who live with different levels of social advantage and social (in)justice. [23,24] Appropriateness refers to the most advantageous clinical modality for delivering care to achieve the best possible patient outcomes. [25]

People living in rural and remote communities have poorer access to high-speed and unlimited broadband internet access than the rest of the country (i.e., 62% of the population having access in rural and remote communities as compared to 91.4% in more urban areas[26]), which may affect their ability to access digital health information and virtual mental health care. [27-30] In Canada and beyond, equity-deserving groups including Indigenous peoples make up a large proportion of communities living in remote areas.[31] In addition, Indigenous-identifying people are at a higher risk of reporting poorer mental

health outcomes and greater barriers to using digital technologies as compared to their non-Indigenous counterparts. [32-35]

To better understand these experiences, this report synthesizes some of the literature on AVMH services and platforms to better understand what technologies are being used by individuals living in remote or rural communities in Canada and abroad. We also summarize effectiveness and uptake of AVMH services among people living in rural and remote areas, with particular considerations for Indigenous peoples, to offer a more nuanced understanding of these two important outcomes.

Our review of the existing literature includes studies that have been conducted around the globe, however we are particularly interested in distilling considerations and lessons for Canada. Because the delivery of health care services in Canada is organized by provincial and territorial governments, [36,37] mental health services varies across the country.

Questions

We describe AVMH health services, platforms, and technologies used by individuals living in remote or rural communities, including Indigenous peoples, with examples from Canada and internationally. We address two broad questions:

- **Which AVMH services or platforms are used by adults living in remote or rural communities in Canada and abroad, and what are the reported effectiveness and uptake outcomes of these platforms?**
- **What are the patient reported outcome measures (PROMs) of AVMH care delivered to adults living in in rural, remote, and Indigenous Communities?**

Methods

We retrieved data for this report through three academic (i.e., MedLine, Scopus, Cochrane) and three grey literature databases (i.e., WHO COVID-19 Global Literature, Google Scholar [limited to the first 50 pages] and Open Grey)**.** Search terms were loosely defined around geography, virtual, and mental health. We conducted hand searches in various journals focused on virtual care, mental health, and rural and remote health. We included empirical research and literature reviews of digital health platforms. The search was limited to English language for which full-text articles were available from 2021-2022, although a hand search of reference lists included some widely cited articles from 2019-2020. This was a rapid review, not a full systematic review (**see Appendix 1**).

Eligibility criteria included articles that reported on Indigenous peoples or rural and remote populations, aged 18 or older, using at least one AVMH service or modality (e.g., self-guided resources, blogs, AI technology, bots).

Citations were managed using Zotero. [38] We screened titles and abstracts of potentially eligible studies, and then full texts. All screening was performed by one reviewer, and uncertainties resolved through team discussion. Data abstraction was performed independently by three members of the team using Microsoft Excel. All authors reviewed the data abstraction form to identify themes and gaps. [39]

To augment the findings from the literature review, between September 2022-December 2022 two PhD-trained qualitative researchers (KMK and SM) undertook 60 minutes semi-structured Zoom interviews with three key informants in Canada, each with expertise on the state of the evidence and current practices (**see Appendix 2** for a Sample Interview Guide). We selected participants based on their scholarship and/or professional practice. Our Interview Guide included questions about asynchronous technologies/modalities being used in rural and remote communities, the roll-out strategies for using these technologies, and barriers and facilitators to their use. We asked key informants to provide any insights that were not addressed by these questions, which helped to inform the recommendations of this report. We systematically analyzed these interview data to identify key themes/patterns, tracking themes

in a Word file. We compared these findings to our emerging synthesis of the literature. All three key informants offered to provide feedback on our report and their feedback was incorporated into the final version. The key informants have asked to remain anonymous but include:

- A practicing family physician and clinical researcher with experience in providing mental health care using digital technology in rural and remote communities and evaluating AVMH platforms;
- A practicing nurse practitioner and health service researcher with experience providing mental health care in rural and remote communities and researching Indigenous mental health needs, including in the realm of digital health technologies; and
- An Indigenous researcher conducting research in the area of digital technology for rural, remote, and Indigenous people and communities.

KMK conducted the literature search; data extraction; key informant interviews; acquired, analyzed, and interpreted interview data; synthesized literature; and wrote report. SM conducted the literature search; data extraction; assisted with key informant interviews and thematic analysis; and edited the report. EBH assisted with the literature search; data extraction; and reviewed the report. KP and CC reviewed the report. SL critically reviewed the report and provided supervisory support.

Limitations

- To meet rapid deadlines, relevant publications and data may have been missed or excluded due to our rapid review methodology (e.g., we did not screen in duplicate which may have led to missing relevant articles), limited search strategy, and limited databases. Articles may have been missed given variations in terminology and definitions – asynchronous interventions are not defined or described consistently in the literature. The intent of the report was not to capture all articles but to provide an overview of the key literature with a focus on review papers. [40] Our search strategy (e.g., imposing language and date restrictions) might have excluded relevant studies.
- The language used to describe AVMH services is inconsistent and still evolving. There is still no consensus in the literature on the terms used to classify various types of technologies and services. As such, the terms/definitions we used for this report may vary from other familiar terms.
- Studies in this review were largely from high-income, western cultures (i.e., Canada, United States, Europe, and Australia).
- There was limited evidence and reporting in the primary literature on long-term effectiveness, uptake, and cost-effectiveness of AVMH care.
- Across jurisdictions, both asynchronous and synchronous mental health services or platforms were often used simultaneously, therefore the impacts of asynchronous interventions are difficult to parse out.
- Articles often reported on the feasibility and acceptability of AVMH interventions, rather than other clinical outcomes and PROMs.
- Articles often reported on rural and remote populations as homogenous populations, without considering the unique impact of particular contexts, geographies, social settings, and histories. Indigenous peoples were often reported as part of remote communities and, thus, we could not comment on any differences in outcomes between non-Indigenous and Indigenous peoples in these communities.
- In our recommendations and lessons learned we did not consider the implications of jurisdictional differences in health care delivery across Canada in the implementation and delivery of AVMH services.

Results

Our search produced 53 articles. The published literature consisted mainly of review studies and quantitative articles. Most of the literature reported on Australia, Canada, and the United States. A summary of the literature included in this report can be found in **Appendix 3** and our commentary on the overall state of the literature can be found in **Appendix 4.** Insights from the key informants further informed our lessons learned and key considerations for policy and practice in Canada.

1. AVMH Technologies Used by Adults Living in Rural/Remote Communities

A wide variety of AVMH services and virtual platforms have been studied in a range of settings and across several groups and individuals. These technologies have been reported as helpful to provide surveillance, tracking, and the monitoring of symptoms to help individuals manage their illness and receive appropriate support.

Adult participants in studies we summarized included undergraduate students, [41] war veterans, [42] farmers, [43] and individuals living with depression, [42,44-61] anxiety, [45,47-51,53,54,56,58-62] post-traumatic stress disorder (PTSD), [42,45,49,54,57] borderline personality disorder, [57,63] suicidal ideation, [52,59-61,64-67] bi-polar disorder, [57,58] substance abuse disorder, [45,49,53,55,58] eating disorders, [49,57] and/or schizophrenia. [68]

The range of mental health services provided through AVMH includes:

i) **mobile apps and wearable devices** (e.g., apps for smart phone, tablet; wearables such as smart watches, clothing)

ii) **text-based counselling** (e.g., text reflections from a mental health worker sent in between face-to-face or virtual real-time sessions with a mental health worker)

iii) **web-based platforms** that support self-care (e.g., guided exercises to improve resilience) and provide educational materials (e.g., skills training, mental health literacy).

Mobile Apps and Wearable Devices for Adults Living in Rural/Remote Communities

Mobile apps and wearable devices deliver mobile health technology (mHealth). [44,47,51,58,69,70] mHealth technologies may use mobile apps or wearable devices to provide health services, and track data via one-way or two-way communication between patients/clients and providers. For example, reminder systems nudge patients/clients about their care plans and/or reinforce coping strategies. [44,47,51,58,69] Another eHealth tool called “StopBlues”[67] aims to prevent suicide. Such applications allow individuals to receive feedback from trained clinicians regarding their psychosocial and behavioural moods, behaviours, and triggers. [41,55,71]

Text-Based Counselling for Adults Living in Rural/Remote Communities

Text-based counselling is used as a replacement for traditional face-to-face counselling for mental health concerns such as depression, schizophrenia, and anxiety. [44,46,49,50,58,60,62,69,71-74] Text-based counselling supports the provision of e-mental health services, especially in places where service capacity is lacking. [49,50,72] Text messaging is helpful for allowing patients/clients to reflect on their sessions after they end and to keep track of their progress. [72]

Web-Based Platforms for Adults Living in Rural/Remote Communities

Web-based platforms provide AVMH information about coping strategies, [43,46,52,57,75,76] particularly for depression, anxiety, suicidal ideation, and general mental well-being. [52] Within these websites, web-based peer support messaging [48,50,58,75,77,78] is facilitated through asynchronous messaging and support. [48,50,58,75,77] Skills training programs facilitated through web-based platforms have been used in rural and remote settings to support individuals living with PTSD and depression. [42,79-82] Skills training programs

aim to provide self-guided support and lessons with the aim of building resilience and coping strategies to improve social functioning. [42] Some of these options employ artificial intelligence to offer feedback. [80]

2. AVMH Technologies Used by Indigenous Peoples

AVMH was identified as a key strategy to deliver interventions in Indigenous communities. [83] AVMH uses different types of devices and technologies to enable geographically separated individuals to exchange health information among themselves, [63,83-87] including those in Canada. [83] The types and uses of these AVMH technologies by Indigenous peoples were similar to those reported for rural and remote communities (**Table 1**).

AVMH interventions include mobile applications and web-based platforms that promote healthy lifestyles involving culturally relevant information[84] (i.e., promotion of wellbeing through spiritual concepts, and culturally tailored motivational messages [e.g., proverbs]). [83] AVMH services were used to address suicidal thoughts, psychosis, borderline personality disorder, and emotion dysregulation in Indigenous peoples. [53,54,56,63,66,86] To be effective, AVMH interventions have to reflect the cultural values, social contexts, and views of health held by Indigenous peoples. [64,83] Below we indicate some of the ways AVMH services were tailored to Indigenous populations.

Mobile Apps and Wearable Devices for Indigenous peoples

Mobile phone technologies, particularly in the forms of mobile applications and social media applications,[64] have aimed to support the self-management of Indigenous peoples. [88] Self-management includes applications that support information sharing (i.e., provide free, asynchronous peer support) and applications that host questionnaires for individuals to better understand their symptoms (i.e., identifying their risk of suicide, or coping techniques for borderline personality disorder). [63,64] Other applications sent reminders about when to attend in-person appointments. [65] A systematic review noted that Indigenous peoples' expertise was strongly sought in the development and refinement of mobile phone technologies to ensure cultural responsiveness and clinical effectiveness. [65]

Text-Based Counselling for Indigenous Peoples

Text-messaging was used to facilitate the asynchronous exchange of information, [54,59,64,65,89] particularly by individuals who do not prefer face-to-face interactions[64] and mental health care professionals who are able to provide support without formal referral. [89] Text-messaging has also been used for asynchronous suicide detection, with positive evaluations of cultural appropriateness by Indigenous peoples. [65,85]

Web-Based Platforms for Indigenous Peoples

Web-based platforms were used to deliver educational and resource support through Health Information Technology (HIT). HIT is any web-based platform that provides individuals with mental health support and helps people to locate resources efficiently and effectively to help them self-manage their mental health symptoms[53] and find coping-strategies. [18,86,89] HIT also supported information-giving and sharing amongst Indigenous peoples, which improved mental health awareness and wellbeing among Indigenous people. [86] Some forms of HIT helped to facilitate digital storytelling, as a culturally responsive way for Indigenous people to share information. [90]

Table 1: Asynchronous Modalities Reported in the Literature

Mobile Apps and Wearable Devices	*Text-Based Counselling*	*Web-based Platforms*
e.g., applications, social media	e.g., two-way asynchronous messaging	e.g., sharing of information, find local resources

3. Approaches to Evaluating Uptake and Effectiveness of AVMH Care

A variety of PROMs and other outcome measures and methodologies have been used to evaluate the uptake and effectiveness of AVMH. Effectiveness of AVMH has been measured by outcomes such as patient-reported satisfaction, self-management, medication adherence, symptoms, rehospitalization, client empowerment and engagement, and feasibility of use (**Table 2**).

Effects of AVMH on patient-reported satisfaction:

As a proxy measure for satisfaction, clients' word counts have been evaluated to determine if, and how often, individuals have been able to reach out and ask questions whenever they wanted. [60] Word counts were obtained through asynchronous two-way messages between clients and health care teams pre- and post-treatment. [60,62] An analysis of the word counts determined that AVMH increased communication with providers to address health care issues about symptom self-assessment and tests and results. [60]

Effects of AVMH on self-management, medication adherence, symptoms, and/or rehospitalization:

Another study used the Generalized Anxiety Disorder Scale (GAD-7) and Patient Health Questionnaire (PHQ-9) to assess improvements in mental health care in rural and urban communities. [62] The study concluded those with the most distressing mental health symptoms from rural communities experienced the most significant improvement of symptoms as measured by a significant decrease in reported symptomology over time. [62] This study also compared Therapeutic Alliance Scores to measure patient satisfaction by the degree to which a client and provider are aligned in their views of the goals of treatment. [62]

Text-messages that facilitated reminders of treatment plans and education messages for individuals with schizophrenia was reported to improve medication adherence, symptoms, and reduce rehospitalization using a generalized estimating equation model in comparison to using just attendance at an existing government community-mental health program. [73,74]

Smartphone-delivered applications for self-management (e.g., medication tracking and symptom monitoring) were successfully installed by adults, but with relatively low usage rates. [88] Psychopathology was assessed through the Positive and Negative Syndrome Scale (PANSS) and low psychotic and general symptoms (measured by the PANSS) were generally low while using the applications, [88] suggesting a stable sample. Thus, smartphone applications can safely promote self-management with no related serious adverse events reported. [88] For other applications that targeted borderline personality disorder, symptoms such as anger, suicidality, impulsivity, and general psychopathology were measured, although no significant improvements in mental health symptoms were noted. [63]

Rural male and female veterans with PTSD and depression who were enrolled in an asynchronous web-based skills training program reported significant improvements in PTSD and depression symptoms, as measured by PTSD Checklist for DSM-5 and Patient Health Questionnaire (PHQ-9). [42] Similarly,

improvements in social functioning and emotion regulation, as measured by the Difficulties in Emotion Regulation Scale post-treatment and 3-month follow-up. [42]

Effects of AVMH on empowerment and engagement among Indigenous peoples:

Some applications specifically designed for Indigenous peoples, such as AIMhi Stay Strong[65,91] and iBobbly, [65,66] have been evaluated to determine if they helped improved client empowerment, cultural appropriateness, and enhanced engagement. [65,91] These apps have aimed to provide visual representations, voiceovers, action-based content, and goal setting with the goal of building mental health coping strategies to reduce risk of suicide. [65] This research found an acceptability of culturally-appropriate applications by Indigenous clients and mental health practitioners, who reported that the applications are a culturally safe AVMH and well-being tool,[70,91] particularly in the area of suicide prevention. [65,66] By making the applications culturally-appropriate, the applications were effective in supporting client goal setting, increasing client self-insight, improving client empowerment, and promoting engagement. [45,91]

Feasibility of AVMH in rural communities:

Web-based platforms, such as webSTAIR, [42] were reported to be feasible in rural communities, [42,50,55,78] for individuals with depression, anxiety and suicidal ideation. [52] However, individuals with psychosis living in rural areas expressed concerns about their ability to use the platform because of poor internet speed in rural locations. [76]

Table 2: Commonly Reported Outcomes

Patient-reported satisfaction	*Self-management, medication adherence, symptoms, and/or rehospitalization*	*Empowerment and engagement among Indigenous peoples*	*Feasibility within Rural communities*
e.g., asking question, feelings, relationships	e.g., Generalized Anxiety Disorder Scale	e.g., Access to treatment, factors facilitating or hindering integration into clinical practice	e.g., Access to treatment, factors facilitating or hindering integration into clinical practice

4. Common Barriers and Enablers to Using AVMH Services

The use of asynchronous technologies has increased during the pandemic when physical distancing prompted the need to leverage the internet and mobile technologies for delivering mental health services. [76] These advances have contributed to improvements in ease of use and convenience for providers and clients, including lower health care costs and reduced requirements for travel, as well as enhanced access. [84] As such, these technologies may be a suitable mode of service delivery in rural and remote communities where there is a higher burden of unmet mental health needs and human resource shortages. [61]

Especially for Indigenous peoples, these technologies require careful consideration and engagement of community partners. Consultations and collaboration are required to define priorities for reducing inequalities and developing context-appropriate interventions. There is increasing recognition in the scientific literature that health technologies often fail to reach their optimal potential if they are not adapted to the cultural, social, and economic contexts in which they are used. [61] These products should

be designed and adapted to the cultural context with empowerment and engagement of the client in mind. [91]

Barriers to the use of technologies can be grouped into two perspectives: clients/users and health care providers. Barriers that health care providers in AVMH uptake include a lack of technological support, demanding workloads, difficult organizational procurement and practice policies, and negative staff perceptions. [51,89] Client/user-level barriers and facilitators can be categorized as technological, socio-economic, or socio-cultural.

Technological barriers and enablers to uptake of AVMH services

The most commonly reported barrier was related to the technology itself, reflecting the challenges in designing technologies for complex problems that overlap with medical, regulatory and social domains, such as mental health care. [18] One of the major barriers was connectivity or the bandwidth in rural/remote and Indigenous populations; rural communities may lack consistent internet and/or cellular coverage or people may not own smart devices, [67,77] limiting the ability of clients to download apps or access web-based materials.

Studies have described special considerations for the use of digital technologies, especially in severe mental health diseases like schizophrenia [70] or when mental health concerns coexist with chronic conditions like diabetes. [48] Individuals with comorbidities may require high quality emotional support. [48] Therefore, virtual mechanisms for treatment may not reach the threshold of care required for these individuals.

Digital apps require attention to issues of privacy and confidentiality, particularly as they may involve repositories of sensitive patient information. [50] Issues of regulation and licencing of apps also arises, particularly in validating apps where the therapeutic effects may be questionable and where there is potential for harm or a worsening of a patient's condition. [92] Catering to clinical and institutional needs is also a consideration for adopting technology; integration of these technologies into clinical practices will require robust infrastructure and a supportive culture to encourage technology adaptation. [79]

Some health care providers value access to digital technologies as they believe it can provide tools that overcome traditional barriers like travel, time, resistance to talk, and save costs. Evidence on provider views about feasibility and acceptability suggested that implementing digital cognitive behavioural interventions would require building greater awareness around apps and integrating platforms into clinical workflows, for example, integrating data collected through digital platforms into medical records. [51] Physicians would be more comfortable with the technology if there were standards in place for data collection and storage to help overcome concerns over privacy. [51,93] The importance of endorsement from other providers as facilitating providers' comfort with technology suggests early adopters may be able to influence integration by the broader community. [51]

Socio-economic barriers and enablers to uptake of AVMH services

Digital literacy was commonly reported as a barrier to the use of AVMH technologies. Higher technological competency or confidence is associated with the use of technology, interest in using virtual mental health options such as iCBT, and adherence to iCBT treatment. [66,74,75] Increasing population age and rural location have been associated with challenges in adoption of digital health tools.[70] In families with a lower household income, devices are often shared between family members which raises concerns for privacy and make AVMH less preferable compared to in-person visits. [72,80]

Black, Indigenous peoples, rural communities, refugees, older adults and other equity-deserving individuals have been particularly challenged by a lack of housing and technology infrastructure and/or costs (e.g., high-speed internet), making it difficult to use asynchronous technologies. [45, 61] Racialized

communities tend to have lower digital literacy, posing as an additional challenge to engaging in virtual technologies. [45,61]

Socio-cultural or culturally appropriateness as barriers and enablers to uptake of AVMH services

Socio-cultural sensitivity and appropriateness were often cited as determining factors for acceptance and usability within Indigenous populations. [45,65] Indigenous peoples may face various individual barriers, such as language and cultural barriers. [53] Culturally-adapted asynchronous technologies are more likely to be used by Indigenous, Black, and other equity-deserving individuals than non-culturally adapted products and can help to overcome barriers to digital mental health services. [45]

Identity empowerment is important in the well-being of Indigenous peoples, which is deeply rooted in the appreciation and conservation of cultural practices and knowledge. [86] Cultural expertise can be used to ensure appropriate language, imagery, and design, which can increase the uptake of technology. [65] Education on how to use new AVMH applications should target key respected champions from diverse backgrounds to promote the use of products in their communities. [64]

Co-design with users of technology can make the design aspects culturally appropriate and user-friendly and affirms users' identity and preferences. Participants from a series of workshops in designing mental health information technologies in a non-urban area in Australia recommended that technology should provide meaningful guidance and consider the fact that different cultures treat mental health differently and, thus, destigmatize culturally-appropriate approaches to mental illness. [18]

To help make asynchronous technologies more socio-cultural or culturally appropriate, language translation, modification of audio/visual content, and inclusion of culturally salient messaging have been employed. [45] Design features need to be attractive and digitally secure platforms also enable safe use. [89] An example of visual modification includes producing digital avatars on mobile applications that are consistent with the racial/ethnic group for which the AVMH intervention was developed. [45] Translation of an AVMH intervention into participants' native language was the most common strategy to enable adaptation identified in a scoping review. [45] The inclusion of culturally relevant messages [45] aligned with worldviews and perceptions health [83] further enabled adoption.

AVMH Policies, Practices, and Lessons for Canada

What lessons can Canada learn about implementing and evaluating asynchronous mental health technologies in rural, remote, and Indigenous communities?

Lesson 1: AVMH services/platforms may not be effective for some adults.

This lesson is targeted at health care providers. While there is evidence that AVMH can be widely used, including within rural and remote communities, this modality does not solve broader issues related to equitable access to mental health care. One way to change that would be to bridge the digital divide so that reliable high-speed internet is available to everyone, no matter where they live in Canada. Until that happens, AVMH care will continue to be inaccessible to some. Other factors limit uptake of AVMH interventions across individuals and settings, including as cultural factors, lack of social support, behaviours and beliefs, and the environment. Although the benefits of asynchronous virtual care may not be equally distributed across all Canadians, research into its limitations will elucidate how, why, and for whom there is merit in the application of these technologies and services.

Lesson 2: A micro-focus on implementation of AVMH in specific settings/populations may reveal factors affecting client/patient engagement, which might improve uptake and effectiveness.

This lesson is targeted at researchers. Key informant interviews highlighted that while virtual care was previously used more often in rural and remote settings due to a lack of mental health providers, the COVID-19 pandemic resulted in a shift where these technologies are now often used and evaluated in

urban settings. Consequently, we have a better understanding of the implementation process, particularly how individual communities incorporate new AVMH services which may inform organizations looking to adopt new technologies. [94] Rigorous studies of AVMH products, such as randomized control trials that explore socioeconomic and cultural covariates may be useful. As much literature has highlighted barriers that prevent rural and remote populations and Indigenous peoples from using asynchronous technologies, a deeper understanding of all the factors that influence engagement and enrollment is needed. As such, qualitative and co-designed research methodologies can help supplement quantitative research and offer a more holistic understanding of adoption and use of AVMH technologies. This is particularly important as much of the evidence on this topic has been gathered via quantitative research, whereas the nuances of acceptability, context, and preferences would benefit from qualitative approaches for a deeper understanding. For instance, rigorous enrollment processes with strict eligibility criteria may have influenced uptake and the extent of engagement, but these were not described in enough detail to understand which strategies would increase engagement.

While rural and remote communities as compared to Indigenous communities may each be unique in their engagement with asynchronous technologies, the nuances in experiences and factors that influence engagement can differ across communities and groups. Yet, studies in the existing literature have tended to approach and study these communities as a homogenous group, ignoring the diversity of the peoples and their communities. As such, there is a need for further study to better understand how AVMH can support inclusive engagement.

Lesson 3: Uptake and effectiveness of AVMH services is affected by cultural appropriateness.

This lesson is targeted at content developers and vendors. Indigenous peoples understand mental health within traditional knowledge and culture. [95,96] Rural and remote communities may have varied understandings of mental health that is situated within their local ecologies. [97,98] Thus, rural and remote vs. Indigenous communities may be very different depending on their setting and characteristics. [99]

This complexity related to setting, culture, and local knowledge contributes to challenges in designing and implementing health services that are culturally-appropriate – both methodologically and conceptually, [96] necessitating consideration of local environments and social relationships. [100] As such, those involved in the development of mental health services are encouraged to consider the role of community, land, and spirit in the design of asynchronous technologies and in the delivery of mental health service. [101] While this is not an exhaustive list, at a minimum, some consider that it would be beneficial to offer methods for amplifying and expressing Indigeneity, and address colonialism through trauma-informed care. [102] Language revitalization in the development of technologies can also be used to support this and health literacy, [103] as can the use of peer support. [104] In considering the cultural relevance of existing and future asynchronous mental health interventions, we suggest that researchers and content developers examine outcomes of interest at multiple levels, including patients, providers, organizations, and systems. Critical investigations of how AVMH interventions may have contributed to the exacerbation of cultural inequities may provide guidance for culturally appropriate interventions to eliminate such disparities. We recommend that future AVMH interventions report comprehensive details of their methods to enable future reviews to critically appraise the quality of evidence.

Lesson 4: Focus on AVMH services/care, rather than products, might improve effectiveness and uptake.

This lesson is targeted at funders, regulators, and vendors. Although key informants reported that there are thousands of technologies and applications worldwide that offer virtual mental health services, most of the existing research has focused on individual applications as a product, rather than as part of a wider service or program of services within a complex system of care. By exploring and evaluating the efficacy of various technologies themselves, less attention has been placed on the broader portfolio of local and regional services and resources required to ensure delivery of AVMH care suited to the local context and needs of rural, remote, and Indigenous communities. Consequently, existing evaluations of health applications and technologies may have adopted a narrow approach and are less considerate of the real-

life complexities around people's experiences of health and illness that influence their needs from services. [105] Evaluations tend to focus on use for a population with a single illness or diagnosis, rather than considering complexities in treating of mental health, such as multimorbidity and polypharmacy. [105]

Government-vendor contracts can help develop products that meet the service needs of health care providers, as existing vendors may not have access to clinical staff who influence how technologies are introduced and offered to patients. [106] For example, existing trials and evaluations may specially exclude those with poor literacy skills and may not therefore reflect the needs of those in that demographic who require services or use services. Better product evaluations can inform developers so that their products become more impactful and beneficial to the public and health professionals.

Conclusion

Overall, we found positive experiences and outcomes related to usage and acceptability of AVMH interventions by users in rural, remote, and Indigenous communities. The majority of existing AVMH use recorded messaging (text, email, video, audio) and knowledge exchange for self-management. Many studies explored the role of AVMH in terms of usage, acceptability, and the impact on managing symptoms and day-to-day functioning with those with chronic mental health concerns. Few studies considered the appropriateness or effectiveness of delivering asynchronous care in comparison to traditional in-person means. Some barriers exist for end-users and providers aiming to use AVMH, including socio-economic, technological, and cultural factors. As such, AVMH may not be suitable for all Canadians.

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APPENDICES

Appendix 1: More information on Included Papers and Search Strategy

Detailed information on search for academic and grey literature.

In searching academic and grey literature, the following key search terms and definitions were used and inclusion criteria applied.

Search Terms

Areas	Asynchronous	Mental Health
• Remote • Rural • Rural health services • Non-traditional locations • Northern Québec • North West Territories • Northern Communities • Indian Reserve • American Indian • Nunavut • Iqaluit • Labrador • Indigenous populations of Australia	• Tele-medicine • Telemental health • Telepsychiatry • Telemonitor • Telehealth • Digital health • Digital clinic • E-mental health • mHealth • Mobile apps • Apps • Instant chats • Text messages • Social media • Patient portals • Smartphone • Mobile device • Bots • Artificial Intelligence	• Mental health • Wellbeing • CBT • Psychiatry • Counselling • Psychotherapy • Consults • Therapy • Spiritual health

Key Definitions

Asynchronous Technology: Services provided in ways that don't rely on 'real-time' interactions with services or providers.

Telehealth: The use of digital information and communication technologies to access health care services remotely and manage your health care. Technologies can include computers and mobile devices, such as tablets and smartphones.

Digital Health: Digital health includes categories such as mobile health (mHealth), health information technology (IT), wearable devices, telehealth and telemedicine, and personalized medicine. Digital health technologies use computing platforms, connectivity, software, and sensors for health care and related uses.

Digital clinic: Digital health and clinics as using asynchronous technologies such as apps and sensors to collect comprehensive data and inform care[107].

E-mental health: E-mental health delivers timely, effective mental health services by using the internet and other related technologies. [108]

mHealth: General term for the use of mobile phones and other wireless technology in medical care.

Sample Gray Literature Search

https://www.proquest.com/results/50375314B0DA405CPQ/1?accountid=14771	(Telehealth OR mental health OR telepsychiatry) AND (rural OR remote) AND (asynchronous OR services OR platform OR mobile application)
www.google.ca for Canadian sites	site: .ca (telemental health OR mHealth OR telepsychiatry) AND (rural OR remote OR indigenous OR First Nations) AND (asynchronous OR services OR platform OR mobile application)
www.google.ca for US government sites	site: .gov (telemental health OR mHealth OR telepsychiatry OR E-mental health) AND (rural OR remote OR indigenous OR First Nations) AND (asynchronous OR services OR platform OR mobile application)
www.google.ca for Canadian Government websites	site: canada.ca (telemental health OR telepsychiatry OR mHealth) AND (rural OR remote OR indigenous OR First Nations) AND (asynchronous OR services OR platforms OR mobile application)
www.google.ca for Canadian Government websites	site: gc.ca (telemental health OR telepsychiatry OR mHealth) AND (rural OR remote OR indigenous OR First Nations) AND (asynchronous OR services OR platforms OR mobile application)
www.google.ca for World Health Organization	site: who.int telemental health (telepsychiatry OR mHealth) AND (rural OR remote OR indigenous OR First Nations) AND (asynchronous OR services OR platforms OR mobile application)
www.google.ca for European Union	site: europa.eu telemental health (telepsychiatry OR mHealth) AND (rural OR remote OR indigenous OR First Nations) AND (asynchronous OR services OR platforms OR mobile application)

Journals Hand Searched

Journal of Telemedicine and Telecare, Canadian Journal of Counselling & Psychotherapy, Journal of Medical Internet Research Mental Health, Psychiatric Quarterly, Telemedicine and e-Health, Journal of Rural and remote health) and rural and remote health journals (i.e., Australian Journal of Rural Health, Canadian Journal of Rural Medicine, International Journal of Circumpolar Health, Journal of Rural and Tropical Public Health, Journal of Rural Community Psychology, Journal of Rural Nursing and Health Care, Rural and Remote Health, Rural Social Work Journal)

Inclusion-Exclusion Criteria Table

	Inclusion criteria	Exclusion criteria
Age	+18	Services for paediatric groups and youth under 18 years
Sex	All sexes	
Ethnicity	All populations + focus on First Nations	
Country	All countries	
Intervention of interest	Asynchronous services/modalities: Apps, blogs, AI, bots etc.	Synchronous and in person mental health services
Language	Papers available in English	Non-English publications
Date of publication	2021-2022 Hand search for 2020 papers in 2021 & 2022 articles	< 2019 as the focus of the review was on evidence published during the COVID-19 pandemic period.
Methodology/source	Journal papers Reviews (systematic/scoping/rapid) Qualitative Quantitative (Surveys) Books & chapters Key informant interviews Grey literature: -Non gov reports -Gov archives -News reports & articles -Press conferences -Webpages	

Data on review approach, study design, setting, jurisdiction, population studied (e.g., rural/remote, Indigenous, illness), and type of impacts were extracted when reported. We summarized the results narratively due to variation in methodology in the included papers.

In total, 3,625 documents were identified, 122 were screened for relevance, and 53 included. These papers spanned various populations, as illustrated on the following pages.

Authors	Country	Condition focused on	Rural/Indigenous
Antoniou et al, 2022	Australia	Depression	Rural
Ashrafi et al, 2021	Canada	Diabetes	Rural
Bauer et al, 2021	United States	Depression	Rural
Bhat et al, 2020	India	Depression	Rural
Brogly et al, 2021	Canada	Not specified	Rural
Brown et al, 2020	Australia	Suicide	Indigenous
Cai et al, 2020	China	Schizophrenia	Rural
Cai et al, 2022	China	Schizophrenia	Rural
Canadian Institute for Health Information, 2022	Canada	Not specified	Rural and Indigenous
Cheng et al, 2021	Australia	Not specified	Rural
Chivilgina et al, 2021	Switzerland	Not specified	Rural
Choukou, 2021	Canada	Mental cognitive diseases	Indigenous
Choukou, 2021	Multi-countries	Depression	Indigenous
Ellis et al, 2022	Australia	Depression	Rural and Indigenous
Fien et al, 2022	Australia	Mental cognitive diseases	Indigenous
Graham et al, 2021	United States	Not specified	Rural
Gunn et al, 2022	Australia	Distress	Rural
Hensel et al, 2019	Canada	Not specified	Indigenous
Hilty et al, 2021	United States	Not specified	Rural and Indigenous
Hobson et al, 2019	Australia	Suicide	Indigenous
Hollan et al, 2021	United States	Anxiety	Rural
Huang et al, 2022	United States	Depression	Rural
Ilagan et al, 2020	United States	Personality Disorder	Indigenous
Jia Li et al, 2022	Multi-country	Not specified	Indigenous
Lal et al., 2020	Canada	Psychosis	Rural
Liwag, 2021	United States	Not specified	Rural

Authors	Country	Condition focused on	Rural/Indigenous
Lo et al, 2022	Canada	Depression	Indigenous and Rural
Marshall et al, 2020	Multi-country	Depression	Rural
Mental Health Commission of Canada, 2020	Canada	Depression	Rural and Indigenous
Miralles et al, 2020	Multi-country	Not specified	Rural
Moskalenko et al, 2020	Canada	Depression	Rural
Nadi Nina Kaonga & Jonathan Morgan, 2019	Multi-country	Depression	Rural
Ojagbemi et al, 2022	Nigeria	Not specified	Rural
O'Keefe et al, 2021	Multi-country	Depression	Rural
Parish, 2021	United States	Not specified	Rural
Pendse et al, 2022	Not specified	Depression	Indigenous
Perdacher et al, 2022	Australia	Not specified	Indigenous
Philippe et al, 2022	Multi-country	Not specified	Rural
Rush et al, 2022	Canada	Not specified	Rural
Salisbury et al, 2021	Nigeria	Depression	Rural
Shalaby et al, 2022	Multi-country	Depression	Rural
Silang et al, 2022	Multi-country	Depression	Rural
Silfee et al, 2021	United States	Depression	Rural
Skaczkowski et al, 2022	Australia	Depression	Rural
Spanhel et al, 2021	Multi-country	Depression	Indigenous
Steare et al, 2020	United Kingdom	Psychosis	Rural
Strudwick et al, 2021	Multi-country	Anxiety	Indigenous
Thenral & Annamalai, 2020	India	Not specified	Rural
Tighe et al, 2020	Australia	Suicide	Rural
Toombs et al, 2020	Multi-country	Depression	Indigenous
Turmaine et al, 2022	France	Distress	Rural

Authors	Country	Condition focused on	Rural/Indigenous
Yu et al, 2022	Canada	Depression	Rural
Zaslavsky et al, 2022	United States	Depression	Rural

The 53 papers comprise the following:

- 11 were quantitative studies
- 20 were review articles
- 6 were qualitative studies
- 5 used mixed-methods
- Other study designs included protocols, quality improvement studies, reports, commentaries, and a thesis.

The countries this research was conducted in include:

- Multi-countries (n=13)
- Australia (n=10)
- Canada (n=11)
- United States of America (n=10)
- India (n=2)
- China (n=2)
- Switzerland (n=1)
- Nigeria (n=2)
- United Kingdom (n=1)
- France (n=1)

The study population varied. The majority (n=35/53, 66%) of the studies focused on rural and remote populations. Approximately 24.5% of the studies had populations that were Indigenous (n=13). Some studies (~9.4%) had both Indigenous and rural populations (n=5). Out of these studies, the most common illness was depression (n=22). Following depression were suicide (n=3), schizophrenia (n=2), anxiety (n=2), psychosis (n=2), mental and cognitive diseases (n=2), distress (n=2), diabetes (n=1), and personality disorder (n=1). 16 articles did not specify the illness.

The list of included papers with key findings is attached as **Appendix 3.**

Appendix 2: Sample Interview Guide

Welcome. Hello, my name is [name]. I am a Research Associate with Can Covid. I want to thank you for agreeing to participate in this interview. At CanCOVID, we are writing a report for Health Canada, and our team are conducting some key informant interviews to understand the use of asynchronous technologies for mental health concerns for rural/remote populations. We are particularly keen to understand the use of these technologies in Indigenous Communities. Throughout this interview, I would like to encourage you to share your experiences and perspectives regarding your knowledge of asynchronous technologies.

If you have any questions, please do not hesitate to ask. If you do not want to answer a question, please let me know, and we can move to the next question. Please also let me know if you want to stop the interview. You can do so at any time. If you have no further questions, we can begin. I am now turning on the recording device.

Opening Questions:

1. I know you are an expert in your field, but for clarity, I wonder if you would summarize your background and expertise for me (professional training, current position). What is your professional training? Role in your current position?

2. Generally speaking, can you provide a brief overview of how are you involved/engaged/researched the use of synchronous/asynchronous technologies within the context of mental health?

(a) How has your work and learning changed/modified since the pandemic? In what ways? What have been the enablers?

Key Questions:

For Question 1 on asynchronous technologies/modalities in rural and remote populations, including indigenous

Asynchronous Rollout Strategy

3. What are the most common asynchronous technologies used of for rural, remote and Indigenous Peoples to address mental health needs? Please explain them.

(a) How do the technologies used vary by population (i.e., rural/remove vs Indigenous etc.)? or vary by the type of mental illness? What was the rationale for these differences?

4. (a) What outcome measures have been used to evaluate asynchronous technologies? How do they vary by type of modality/technology?

(b) What outcomes do you think are most important to rural, remote and Indigenous Communities? Please explain why. What about for Indigenous Communities? Please explain why.

5. Please describe any barriers to implementing asynchronous technologies for rural, remote communities? What about Indigenous Communities?

(a) Were there any institutional influences, external influences, innovations and knowledge that influenced the rollout of these technologies?

(b) Were there any policy guidelines that were used to influence the roll out of these technologies?

(c) What strategies were put in place to address confidence or hesitancy in using these technologies?

(d) What was the role of stakeholders (primary care professionals (nurses, nurse practitioners, family physicians), public health, private industry (pharmacies), and hospitals) in the decisions related to the use of asynchronous technologies?

(e) Are there any other barriers (i.e., historical relationships, remuneration, stakeholders, vaccines) and facilitators (i.e., partnership) to the use of asynchronous technologies for mental health in rural and remote populations?

6. What is required to overcome these barriers? Probe each of the points mentioned. Based on lessons learned, how should Health Canada proceed with the use of asynchronous technologies for mental health care in rural and remote communities in Canada?

7. Do you have any recommendations on how to make asynchronous mental health technologies more culturally appropriate for Indigenous Communities?

(a) What are the key facilitators of this approach?

Common for Questions 1& 2

11. Anything else that you think is important for us to know (we can ask if they have any other key document/publication that we should refer)

12. Is there anyone you would recommend we interview on this subject, perhaps someone you consider a thought leader or expert on this topic?

13. What jurisdictions whether in Canada or abroad, do you consider have great examples of virtual mental health care services for rural or remote or indigenous populations or youth?

14. Are there any risks or special considerations you think are important in setting up or expanding virtual mental health services to rural or remote or Indigenous Communities?

Appendix 3: Overview of the Papers' Key Findings

Study details, organized alphabetically by author name.

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
Antoniou et al. (2022)	Australia	To identify a client's mental health status, while examining if computational linguistic methods can be applied to text-based communications.	Quantitative	Rural/Remote - participants with stress, depression, and anxiety	270 59 M, 167 F, 44 Undisclosed	- Immediately after the counseling sessions, a total of 29.7% (49/165) of responses from 40.9% (43/105) of the participants were collected. - Among the responses to the self-rating question, 51.5% (85/165) reported anxiety, depression, and stress as presenting problems. Among these participants, 72.4% (76/105) were women, 15.2% (16/105) were men, and 12.4% (13/105) gender undisclosed. - On the other hand, for the sessions without responses to the self-rating question, only 44.7% (272/608) reported anxiety, depression, and stress as presenting problems. Among these participants, 57.6% (95/165) were women, 21.8% (36/165) were men, and 20.6% (34/165) sex undisclosed. - Older women who reported anxiety, depression, and stress were more likely to respond to the self-rating question - Average self-rating score was 2.7 (SD 1.3).
Ashrafi et al. (2021)	Canada	To explore the mental health needs of adults with type 1 diabetes living in rural and remote regions of Interior, British Columbia (BC), while identifying factors and strategies (such as peer support and digital health) relevant to delivering and accessing mental health support.	Mixed methods	Rural/Remote - Participants with type 1 diabetes	NR	- Four core themes: (1) emotional challenges associated to type 1 diabetes management, (2) unique type 1 diabetes-related concerns in rural and remote communities, (3) previous support experiences and future support needs and (4) diabetes- related mental health support interventions (ex. peer support and digital health). - Current services in the community are insufficient to meet community needs. - Social media viewed as an option to support the community.
Bauer et al. (2021)	United States	To examine the feasibility and effectiveness of a web-based skills training programme (web STAIR) combined with home-based telehealth sessions.	Mixed methods	Rural - veterans with depression and PTSD	80 27 M, 53 F	- Overall satisfaction in programme → significant improvements seen in PTSD and depression symptoms, social functioning, emotion regulation, and interpersonal problems, at post- treatment and 3-month follow-up - No differences among gender or MST status in symptom outcomes or satisfaction.

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
Bhat et al. (2020)	India	To explore the barriers women with MDD in rural south India had in relation to accessing mental health treatment, while examining their attitude towards mHealth solutions.	Qualitative	Rural - South India- women with major depression disorder	69 69F	- Factors that contribute to poor treatment access include: limited autonomy within family structures, economic/financial and systemic barriers
Brogly et al. (2021)	Canada	To recognize the risk and protective factors for undergraduate students' mental health through a mobile surveillance system.	Quantitative - protocol	Rural - Undergraduate students	427	- Retention from the baseline survey (N=427) to app sign-up was 74% (315/427), with 175-215 (55%-68%) app participants actively responding to weekly surveys.
Brown et al. (2020)	Australia	To develop a better understanding of how a mobile application (app) could be served to aid suicide prevention gatekeepers in Australian Indigenous Communities.	Qualitative	Indigenous	12 10M, 2F	- Training programs should target key, accessible, and respected people from diverse, designated, and emergent groups in Indigenous Communities to act as gatekeepers - Culturally appropriate term to 'gatekeeper' (e.g., responder) was requested - Training should prepare gatekeepers for a range suicide prevention role, such as identifying and managing at-risk Indigenous persons, providing psychoeducation and ongoing support, and facilitating integrated care - Recommended app features: culturally appropriate refresher content on suicide intervention, training recall, integrated care, accessing gatekeeper peer support, and debriefing
Cai et al. (2020)	China	To test the effectiveness of a texting program in improving participants' medication adherence, functioning, and symptoms. In an extended implementation of the intervention after its initial phase.	Quantitative	Rural	277	- Improvements in symptoms, anti-psychotics medication adherence and a reduction in rehospitalization were noted - However, there was no improvement in functioning
Cai et al. (2022)	China	To analyze the primary (pill count adherence) and secondary (depression, cognition) outcomes at an 18-month follow-up after the intervention was discontinued.	Quantitative	Rural	NR	- In phase 1, antipsychotic adherence and rehospitalization incidence improved significantly, while in phase 2 the difference was not statistically significant. - There was no improvement in other outcomes in either phase.
Canadian Institute for Health Information (2022)	Canada	To investigate the current landscape of Canadian virtual care data and information, while recommending new areas of pan-Canadian focus for measuring the quality and accessibility of virtual care.	Report	Rural & remote communities, Indigenous	N/A	

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
Cheng et al. (2021)	Australia	To explore the best option in enhancing a mental health and well-being HIT for Australians from different cultural backgrounds living in rural areas.	Qualitative	Indigenous-Aboriginal and Torres Strait Islander people, Rural (predominantly nonurban areas of Australia)	105 58F, 44M, 1 transgender, 2 gender neutral	- 4 main themes (control, usability, affirmation, and health service delivery factors) were identified - The first 3 themes describe participant recommendations on designing HITs and are similar to the 3 basic needs autonomy, competence, and relatedness) proposed by the self-determination theory - The final theme focuses on the difficulties in implementing HITs for mental health care, while addressing how HITs can be used to support care coordination and delivery
Chivilgina et al. (2021)	Switzerland	To explore the ethical aspects surrounding the implementation of digital technologies in psychiatry.	Commentary/ Systematic review	Rural	N/A	- Digital technologies within psychiatry allow for access to a wide range of diagnostic and therapeutic options that meet the health needs of patients - These technologies' (ex. wearable devices, smartphone applications) telepsychiatry accessibility may improve mental disorder diagnosis and access to mental health services
Choukou (2021)	Canada	To explore the current telehealth programs, which have been implemented to aid Indigenous older adults.	Scoping Review	Indigenous (older adults)	N/A	- Twenty-six articles analyzed - 8 different types of telehealth solutions were discovered after an analysis of results from 5 countries. - No known telerehabilitation technologies available to older adults living in Indigenous Communities - Indigenous OAs with various chronic diseases are seeking telehealth technologies for ease of access to health care, increased health equity and cost-effectiveness - Various advantages and difficulties in the implementation of telehealth for Indigenous OAs
Choukou (2021)	Multi-country	To review the current telehealth programs, which have been implemented to aid Indigenous older adults.	Scoping Review	Indigenous	N/A	- Among the 26 included studies, 15 studies reported improvements in clinical outcomes, psychiatric assessment, treatment and mental health services
Ellis et al. (2022)	Australia	To determine culturally adapted DMHIs and assess its' efficacy and feasibility among racial and ethnic minorities	Scoping Review	Rural and Indigenous	Randomized controlled studies (n = 12) comprising 653 participants	- 32 studies reviewed - In the majority of studies (n = 24), DMHIs were deemed acceptable and practicable - Culturally adapted DMHIs produced a large, positive, significant effect (g = 0.90) across a range of outcomes - Average attrition rate per study was 42% - Most participants reported high satisfaction - Hence, culturally adapted DMHIs are effective and acceptable

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
						- This intervention provides for an opportunity to overcome the obstacles surrounding mental health treatment and mental health equity among marginalized communities
Fien et al. (2022)	Australia	To determine whether telehealth benefited First Nations and culturally and linguistically diverse (CALD) patients during the COVID-19 pandemic.	Scoping Review	Indigenous	Seventeen studies (N = 4,960 participants)	- 17 studies (N = 4,960 participants) were reviewed (mostly qualitative studies focusing on First Nations and CALD patients of telehealth in the United States, Canada, Australia, and the Pacific Islands) - Telehealth considered feasible, satisfactory, and acceptable for the provision of health care health screening, and education for those living in remote and linguistically isolated communities - Convenience, affordability, reduced travel encouraged uptake and adherence to telehealth service - Insufficient evidence on the wider availability of technology and target communities' participation in determining priorities to address inequalities
Graham et al. (2021)	United States	N/A	Commentary	Rural	N/A	N/A
Gunn et al. (2022)	Australia	To co-design (with farmers) the functionality and content of a website (farewell) that aids in implementing transferable coping techniques, while also ultimately determining its feasibility in the broader farming population.	Qualitative	Rural (farmers)	Stage 2: 18 11M, 7F Stage 4: 2 1M, 1F Stage 7: 4 1M, 3F Stage 8a: 157 105F, 52M	- Web-based resource (farewell) built based on acceptance and commitment therapy, with the ultimate goal of reducing barriers to engagement with traditional mental health and well-being strategies - Resource considered an easily accessible and confidential source of self-help techniques for farmers - 5 interactive modules (written, drawn, and audio- and video-based psychoeducation, exercises, and farming-related jokes, metaphors, examples, and imagery) used to deliver techniques - SMS text messages provided personalized reminders and support - Although results showed high acceptability, some improvements such as additional reminders, higher quality audio recordings, and shorter modules were recommended. - 37.1% (52/140) of users who started module 1 completed all of the modules

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
Hensel et al. (2019)	Canada	To outline the digital health solutions being used for Indigenous mental well-being, through the use of literature reported data and examples.	Commentary/ literature review	Indigenous	N/A	- Although digital health solutions are effective in improving Indigenous mental health, there is limited evidence on the various digital health interventions - Digital health solutions categorized into 3 different categories, which include, (1) remote access to specialists, (2) building and supporting local capacity, and (3) patient-directed interventions - Future initiatives should focus on following best practices and expanding the use of digital solutions among the Indigenous Communities
Hilty et al. (2021)	United States	To determine the components of culturally competent, mobile health care, while understanding its implementation process and effectiveness.	Scoping review	Rural & Indigenous	N/A	- 183 studies included - Studies indicate that existing telehealth competency sets (i.e., video, social media, mobile health, tele-behavioral health, asynchronous) have limited cultural components - Further research on the effectiveness of mobile health is required - Further understanding of how the competencies connect with telehealth and rural health is also needed
Hobson et al. (2019)	Australia	To determine the characteristics of mHealth interventions in relation to First Nations populations, while outlining the intervention outcomes and user perspectives (ex. cultural responsiveness and clinical effectiveness)	Scoping review	Indigenous	N/A	- 13 studies (5 randomized controlled trials and 8 quasi-experimental designs) conducted in the various countries; Australia (n=9), the United States (n=2), and New Zealand (n=2) were analyzed - Mental health and suicide were frequently discussed among the studies (n=5) - Intervention modalities included text messaging (n=5), apps (n=4), multimedia messaging (n=1), tablet software (n=1), or a combination of short messaging service (SMS) and apps (n=1) - Findings suggested mixed engagement with the intervention (n=3); favorable user perspectives, including acceptability and cultural appropriateness (n=6); and mixed outcomes for clinical effectiveness (n=10)
Hollan et al. (2021)	United States	To examine the pre-post treatment outcomes of a two-way message-based asynchronous therapy service (Talk space).	Quantitative	Rural	460	- Statistically significant pre–post improvements on both outcomes' measures for both rural and urban clients were demonstrated - Results supported in favour of the two-way message-based asynchronous therapy as a treatment method - Rural clients had significantly better outcomes for depression compared to urban participants - Further investigation on the interactions between telemental health care and sociocultural identities required

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
Huang et al. (2022)	United States	To investigate asynchronous patient responses to the COVID-19 crisis, through a retrospective analysis of portal messages.	Quantitative	Rural (Individuals <18 years old and >65 years old)	COVID-19 message senders: (N=102,470) 60.97%F 39.03%M General message senders (N=384,922), 58.54% F, 41.46%M General patients (N=1,055,319) 54.37%F 45.63%M	- Majority of PGMs on COVID-19 related to COVID-19 symptom self-assessment (42.50%) and COVID-19 tests and results (30.84%) - PGMs associated with COVID-19 care plans followed similar patterns to newly hospitalized cases and fatalities - Declining trend observed in appointment cancellations and anxiety (after an initial peak in March) - Patients used the portal to express their feelings of anxiety and depression, as well as to seek support from their medical providers - Patients frequently worried about their current illnesses getting worse without their usual in-person follow-up visits, while also worrying about the possibility of contracting COVID-19 during visits to clinics and hospitals - Job loss and cancellation of health insurance also concerned patients - Some patients reported depressive symptoms, and suicidal thoughts as a result of the varying stressors mentioned
Ilagan et al. (2020)	United States	To assess the efficacy of applications designed as treatment interventions for adults exhibiting BPD symptoms.	Systematic review	Indigenous	N/A	- No significant effect of smartphone applications above and beyond in-person treatments or a waitlist on BPD symptoms, nor on general psychopathology - Majority of interventions targeted emotion dysregulation and behavioral symptoms - Half of the applications are already commercially available
Kaonga & Morgan (2019)	Multi-country	To comprehend the use of eMental health in resource-limited settings through a literature review.	Review article	Rural (Low resource settings)	N/A	- Technology used to improve data collection (n = 8), behavior change communication (n=26), and service delivery (n = 32). - Adherence (n = 7), ecological momentary assessments (n = 7), well-being promotion (n = 5), education (n = 8), telemedicine (n = 28), machine learning (n = 5), and games (n = 2) were mainly addressed
Lal et al. (2020)	Canada	To evaluate Horyzons' initial acceptability and modify it in preparation of a pilot test in Canada.	Mixed-methods (descriptive quantitative and qualitative methods)	Urban and urban-rural	26 Patients: 11 6M, 4F, 1 other Clinicians: 15 3M, 12F	- 4 themes identified: 1) appreciating the therapeutic approach and relatability of Horyzons; (2) diverging opinions on design, layout, and ease of navigation; (3) being concerned about implementation; and (4) suggestions for changing content and features

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
Li et al. (2022)	Multi-country	To examine the effect, use and perspective of digital technologies in relation to Indigenous mental health.	Literature review	Indigenous	N/A	- 3 themes identified: (1) effective engagement through digital storytelling, (2) positive self-representation and positive feelings of wellbeing, (3) honouring traditional Indigenous knowledge and relationships - Digital technology helps Indigenous youth overcome socioeconomic and mental health barriers and strengthens sense of wellbeing and enhances resiliency
Liwag (2021)	United States	To understand the perspectives behind clinicians' acceptance of contemporary technology in delivering clinical services.	Doctoral Thesis (qualitative descriptive case study + literature review)	Rural	N/A	- 3 themes identified: utility of technology, technology usability, and engaging clinicians - Use of low-effort technologies to streamline business procedures and involving clinicians in the creation of the designs was recommended - Easier access to specialized healthcare and job opportunities for people in underserved areas, increasing the acceptance of contemporary technology among clinicians contribute to positive social change. - Gaining clinicians' acceptance of contemporary technology is important in the success of telemedicine programs
Lo et al. (2022)	Canada	To examine the efficacy of virtual mental health care, and the factors required to access virtual mental health care among Indigenous populations.	Brief (Reporting results from various studies)	Indigenous, rural & remote communities, black & racialized communities, refugees, older adults	N/A	- Findings concern asynchronous modalities
Marshall et al. (2020)	Multi-country	To investigate the effectiveness of 5 apps (Destressify, MoodMission, Smiling Mind, Mindshift, and SuperBetter) in reducing symptoms of anxiety and/or depression.	Single-case design	Rural	N/A	- If the apps prove to be effective as hypothesized, this will offer additional proof of their efficacy. - Advantages of apps include: (1) improved access to mental health services for people in rural areas, lower socioeconomic groups, (2) enhance face-to-face therapy through digital homework tasks that can be shared with a therapist, (3) methodology will be applied to other mental health applications to strengthen the independent evidence base for this mode of treatment.
Mental Health Commission of Canada (2020)	Canada	To examine the recent developments within technology-enabled mental health support, while exploring the incorporation of digital tools into the delivery of mental health care.	Summary Report on 9th Annual E-mental health conference	Youth, Indigenous populations & rural & remote communities	N/A	n/a

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
Miralles et al. (2020)	Multi-country	To provide an overview of the following: coverage of mental disorders, the types of assessments, the use of advanced technical features, smartphone apps used for mental disorder in research articles, and the key characteristics of empirical assessments.	Systematic review	Rural	N/A	- Infer a growing interest in usage of smartphone apps to deliver psychological treatment - Apps can play a role in enhancing the efficacy and availability of therapist-led psychological treatment - When converting to smartphone-based interventions, in-person sessions and manual follow-up is reduced and as a result, costs are lowered and waiting lists are shortened - Smartphones are beneficial for interactive quizzes for training skills and improved learning, assessments for panic attacks, suicidal intentions symptoms of various disorders, and communication with therapists or other users through message/chat
Moskalenko et al. (2020)	Canada	To construct a pathway analysis framework using structural equation modeling to understand both direct and indirect relationships between barriers to care with interest in ICBT.	Survey	Urban and Rural	200	- Results from the path analysis demonstrated the relationships between demographic factors and interest in ICBT and complex barriers
O'Keefe et al. (2021)	Multi-country	To analyze the current asynchronous telepsychiatry (ATP) research according to the telehealth domains established by NQF, and assess the quality of ATP and the areas in which more research is required.	Systematic Review	Rural	N/A	- Preliminary analysis of published ATP literature indicates promising outcomes - ATP research shows that services increase access to care, can be easily implemented and maintain patient satisfaction at low cost - Further research required to evaluate ATP research according to quality domains
Ojagbemi et al. (2022)	Nigeria	To evaluate PHCWs' opinions of the viability, acceptability, and advantages of using smartphone-based clinical guidance and the emhGAP-IG to manage patients with mental health conditions in Nigeria.	Qualitative	Rural	39?	- 3 themes emerged - apps went beyond clinical consultation and decision-making - PHCWs preferred an app-based decision-making tool over paper-based guidance - In future, staff training and helpful design features would enhance usage of emhGAP-IG
Parish (2021)	United States	To summarize the development of a training model for ATP clinician skills.	Training module for 5	Rural		- 3 main themes emerged: (1) comprehensive skills in brief psychiatric interviewing, (2) adequate knowledge base of behavioral health conditions and therapeutic techniques, and (3) clinical documentation, integrated care/consultation practices, and e-competency skill sets - Recommendations for technology training included: (1) privacy/confidentiality awareness for electronic data collection, storage, management, and

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
						sharing; (2) technology troubleshooting; and (3) video recording/retrieval.
Pendse et al. (2022)	Not specified	To explore how technology-mediated mental health methods can be designed to be decolonial and to understand the current methods in digital mental health in relation to historical power relations.	Commentary type article	Indigenous	N/A	- Digital mental health is progressing in its use of technology to increase patient access to care - Claim that digital mental health is one that prioritizes lived experience over rigid categorization, is aware of structural factors that affect mental wellbeing, and is fundamentally intended to prevent the creation of power differentials - Suggestions for how researchers and designers can support more equitable futures for people experiencing mental distress and illness were provided
Perdacher et al. (2022)	Australia	To examine the feasibility of Stay Strong app as a digital tool for Indigenous prisoners' mental health and wellbeing.	Qualitative	Indigenous prisoners	N/A	- Identifying and resolving the precondition requirements of implementation was difficult - App was acceptable by clients and practitioners at the practice level - 9 themes identified: satisfaction with the current Stay Strong app, supported client goal setting, increased client self-insight, improved client empowerment, cultural appropriateness, enhanced engagement, ease of use, issues with using an Android emulator, and suggestions to enhance personalization
Philippe et al. (2022)	Multi-country	To evaluate the current state of digital health interventions for the treatment of mental health conditions, by conducting a comprehensive systematic meta-review of the literature	Review & meta review	Rural	N/A	- A majority (52%) of research involved the treatment of substance use disorders, 29% focused on mood, anxiety, and traumatic stress disorders, and >5% for each remaining mental health conditions - Synchronous and asynchronous communication, computerized therapy, and cognitive training appear to be effective - Further research on the above-mentioned interventions required for understudied mental health conditions - Some novel technologies (ex. virtual reality, mobile apps) have potential to enhance mental health but call for stronger supporting evidence.
Rush et al. (2022)	Canada	To evaluate the availability, use, and satisfaction of virtual care in rural and urban areas during the pandemic and to discover any unmet needs.	Mixed methods (Cross-sectional online survey (quantitative	Rural & urban	501 373F, 121 M, 6 nonbinaries, 1 prefer not to answer	- Internet quality and eHealth literacy were positively associated with participants' opinions of virtual care usefulness, simplicity, and satisfaction - No differences in results between rural and urban areas - Rural participants were less likely to have used video in communicate with their medical practitioners

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
			and qualitative)			
Salisbury et al. (2021)	Nigeria	To evaluate the feasibility, acceptability, and adoption of the e-mhGAP-IG for the diagnosis and treatment of depression in two lower-middle-income countries (Nepal and Nigeria), as well as to conduct a feasibility cluster randomized controlled trial (cRCT) to assess the trial procedures by comparing the clinical effectiveness and cost-effectiveness of the e-mhGAP-IG.	Cluster Randomized Control Trial	Rural Nigerians and Nepali	NR	- The e-mhGAP-IG and remote supervision guidelines have been developed, and qualitative formative work has been carried out at both sites - incorporation of mobile digital technology has the potential to raise the quality and accuracy of care while increasing the scalability of mental health services in primary care - research revealed that the majority of health professionals had access to personal smartphones, were knowledgeable about using different smartphone apps, and valued the idea of an electronic version of the mhGAP-IG - The ability to operate in offline mode, decision support features, and a simple interface with minimal text entry were all requested features
Shalaby et al. (2022)	Multi-country	To evaluate efficiency, viability, acceptability of TM services in different contexts of mental health diagnoses and during crucial times of patients with mental health symptoms/disorders.	Rapid review	Rural/Indigenous	N/A	- 60 articles (published over last decade) analyzed - Majority of reviews covered alcoholism and other substance use disorders (SUD) - Texting services were reported as effective in psychotic disorders and SUD - Conflicting findings in regards to depression and anxiety - High satisfaction and acceptability of the texting services were reported for patients with various mental health conditions.
Silang et al. (2022)	Multi-country	To identify the efficacy of eHealth interventions in preventing and treating depression, anxiety, and insomnia during pregnancy.	Systematic Review and Meta Analysis	Rural (Pregnant women 25-37 years old)	N/A 100% F	- Total of 17 studies, that examined changes in depression (11/17, 65%), anxiety (10/17, 59%), and insomnia (3/17, 18%) - During pregnancy, eHealth interventions showed small effect sizes for preventing and treating symptoms of anxiety and depression and a moderate effect size for treating symptoms of insomnia - No significant moderators were discovered, except for depressive symptoms; in which mindfulness interventions outperformed other intervention types
Silfee et al. (2021)	United States	To evaluate healthcare professionals' perspectives on the viability and acceptability of delivering a mobile app	Quality improvement project	Rural/ Urban Participating providers included BH and	19 11F, 8M	- Providers valued their patients' access to RxWell → believed tool will aid patients overcome traditional barriers related to in-person therapy (i.e., talk therapy resistance, time, scheduling, travel, and costs)

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
		based on cognitive behavioral therapy (CBT) in multiple care settings.		physical health (PH) providers from a women's health center, an outpatient BH clinic, and both rural/urban primary care settings		- trained digital health coach supporting patients in using the CBT-based digital app was considered an added benefit - Providers expressed some reluctance about recommending the app to patients with particular traits and provided some suggestions for how to enhance patient monitoring
Skaczkowski et al. (2022)	Australia	To identify the variety of web-based mental health interventions and its' impact, acceptability, therapeutic approach, and key features in addressing depression, anxiety, suicidal ideation and general mental well-being of Australian adults.	Scoping Review	Rural/Indigenous expectant mothers or new parents (6/52, 12%), tertiary students (3/52, 6%), farmers or rural communities (2/52, 4%), church-going adults (1/52, 2%), the LGBQ community (1/52, 2%), Aboriginal and Torres Strait Islander people (1/52, 2%), young adults (1/52, 2%), adults aged 26 to 65 years (1/52, 2%), and older adults (1/52, 2%).	N/A	- 19% (10/52) of programs offered free therapist support, and 21% (11/52) allowed users to link in their current clinicians - conflicting results from studies involving the effectiveness of therapist-guided vs. self-guided web-based interventions
Spanhel et al. (2021)	Multi-country	To assess culturally adapted IMI (internet and mobile based interventions) for mental disorders, through a systematic review	Systematic Review	Indigenous	N/A	- 17 components of culturally adapting IMI were determined and they included the following: characters, activities, environments/burdens, values, translation, language tailoring, visualisation of language, mental health concepts, goals of treatment, methods of treatment, structure, functionality, design/aesthetics, guidance, >2 methods, >2 persons involved, theoretical framework.
Steare et al. (2020)	United Kingdom	To determine the viability and acceptability of a smartphone-based self-management tool for Early Intervention in Psychosis (EIP) services	Randomized clinical trial	Rural	40 12F, 28M Control: 20 7 F, 13M Intervention:20 5F, 15M	- At the 4-month and 12-month assessments, 83% and 75%, respectively, of participants were still enrolled in the trial - Technical difficulties caused delays in ensuring timely access to the intervention - Median number of My Journey 3 uses was 16.5 (IQR 8.5 to 23) and median total minutes spent using My Journey 3 was 26.8 (IQR 18.3 to 57.3) - No serious negative events were reported

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
Strudwick et al. (2021)	Multi-country	To examine the digital interventions that could be used to support Canadians' mental health during the COVID-19 pandemic, by identifying the target population, the effect and the barriers/facilitators of the interventions	Rapid review	Indigenous	N/A	- 31 mobile apps and 114 web-based resources (e.g., telemedicine, virtual peer support groups, discussion forums) to support the mental health of the Canadian population during the pandemic were identified - Further evaluation on equity-related issues is required - All of the interventions identified in this synthesis were not reported to have an effect, but among the ones reported, it was established that they were efficient in the setting in which they were applied - Access, cost, and connectivity were recognized as barriers/facilitators
Thenral & Annamalai (2020)	India	To examine the state of telepsychiatry in India and the function of artificial intelligence (AI) in mental health and potential applications	Scoping Review	Rural	N/A	- Although there are a number of potential opportunities, the time is not yet right for telepsychiatry and AI to be widely used in the field of mental health care - Psychiatrists must select the best tool based on their needs, the resources that are available, and the practicality of deployment - Harmony between conventional care and technology-based care must be attained gradually
Tighe et al. (2020)	Australia	To outline the pilot usage and acceptability of the iBobbly, suicide prevention app.	Mixed methods (Randomized controlled trial)	Indigenous	13 10F, 3M	- Regression analysis showed that app use improved psychological outcomes, although only minimally (insignificant effect) - Thematic analysis results indicated that the iBobbly app was deemed effective, acceptable, and culturally appropriate - iBobbly app considered to be culturally safe and of therapeutic value - All 13 participants stated they would recommend the app to others - 92% (12/13) stated that they would take part in a similar trial again
Toombs et al. (2020)	Multi-country	To assess the use of eHealth interventions for Indigenous youth to communicate empirically supported practices and to provide suggestions on developing future digital interventions.	Systematic review	Indigenous (youth)	N/A	- Preliminary findings demonstrate the usefulness and affordability of eHealth interventions - Qualitative outcomes generally indicated positive community or individual response to eHealth interventions from service providers or service users - Quantitative findings described outcomes for alcohol screening, brief intervention, smoking cessation and suicide prevention

Author (year)	Country	Objective(s)	Study Design	Participants	Sample Size, Sex	Study Results
Turmaine et al. (2022)	France	To determine whether the local use of the eHealth tool StopBlues (SB), which aims to prevent psychological distress and suicide, varied depending on local contexts and if implementation was related to the use of the tool.	Cluster Randomized Controlled Trial	Rural & urban		- 3 distinct promotion patterns were identified - From highest to lowest utilization rates, they are listed as follows: the privileged urban localities, investing in health that implemented a high-intensity and digital promotion, demonstrating a greater capacity to take ownership of the project; the urban, but less privileged localities that, in spite of having relatively little experience in health policy implementation, managed to implement a traditional and high-intensity promotion; and the rural localities, with little experience in addressing health issues, that implemented low-intensity promotion but could not overcome the challenges associated with their local context
Yu et al. (2022)	Canada	To determine the factors associated with the utilization of eMH services across Canada during the COVID-19 pandemic, through the use of Andersen and Newman's framework of health service utilization.	Quantitative	Rural & urban Canadians aged 16 years and older in rural and urban areas	12,052 Used eMH services in the past 12 months: n=883 412M, 467F, 18 other Did not use eMH services in the past 12 months: n=11,169 5384M, 5658F, 113 other	- Only a small percentage of survey respondents (883/12,052, or 7.33%) used eMH services - Logistic regression results state that people who regularly visited their family doctors, lived in urban communities, had undergrad or postgrad education and were eHealth literate were more likely to use eMH services - Individuals with lower eMH usage were less likely to speak English at home
Zaslavsky et al. (2022)	United States	To investigate the extent of potential differences in the acceptance of different health technologies to support patient care in various clinical situations between major groups of primary care providers and staff.	Quantitative	Rural	151 91F, 46M, 14 no response	- Highest acceptance for technologies across clinical contexts was among BHCs (32/51, 63%) and PCPs (30/52, 58%) for live video and among nurses for mobile apps (30/48, 63%) - Compared to BHCs and PCPs, a higher percentage of nurses accepted all other technologies - PCPs indicated lower levels of acceptance compared to other groups - Social media received the lowest level of provider acceptance (9.3% [14/151])

Appendix 4: Commentary on the Evidence Retrieved

In Appendix 1, we present a brief description of the nature and types of evidence retrieved in this rapid review. Although a formal assessment of quality was not possible given the tight timeframe for producing this paper, some observations are made here on the quality and limitations of included papers. Most of the included papers focused on services for a specific mental illness. However, a few did not specify the illness, making it unclear how asynchronous technologies may be more appropriate for certain conditions or situations, than others. Many studies also used both asynchronous and synchronous technologies making it difficult to separate the attributes and appropriateness of solely the asynchronous technologies. A large number of studies took place in rural and remote areas. Studies that targeted both rural/remote and Indigenous populations did not consider differences in how the asynchronous technology or service affected populations differently (i.e., differences between Indigenous and non-Indigenous peoples). Only a few of the studies focused on developing countries with the majority produced from and on high-income, Western cultures (e.g., United States and Australia). Having an equal number of studies from both developed and developing countries would have given a better illustration of the unique challenges in developing countries.