



Mental Health  
Commission  
of Canada

Commission de  
la santé mentale  
du Canada

# Artificial Intelligence in Mental Health Services: An Environmental Scan

**Artificial intelligence (AI)** in medicine has been characterized as a major disruptor with the potential to change the way health care is delivered. Interest in AI in Canada began early and is continuing, with a number of advanced AI research and development labs now established.

This report is based on information from a limited literature search (English documents published between January 1, 2014 and September 5, 2019) and targeted stakeholder consultations. Stakeholder interviews – which included individuals involved in AI and mental health via research, industry, clinical practice, and lived experience – sought to supplement information from the literature and provide perspectives for decision-makers.



## Key messages

AI can be used in the **prevention, detection, diagnosis, and treatment** of mental health conditions. With Canada's high demand for mental health services, these technologies could play an important role in their provision.

- AI for mental health care is rising. Many research and development initiatives are underway, both in Canada and internationally.
- AI applications are still largely at the stage of research and development. While most are aimed at diagnosis, other applications are for prevention or predicting a person's response to treatment, and some use social media data to identify at-risk individuals.
- Interest is growing (including research in progress) on developing AI applications for wearable devices and smartphone-based sensors for mental health data collection.
- The clinical use of AI in mental health care is limited. When used, it is mainly for diagnosis, prevention, and treatment.
- When considering the use of an AI intervention for mental health care, policy-makers should be sure it is suitable and effective, that any ethical concerns and biases in its algorithms have been addressed, and that clinician and client perspectives are taken into consideration.
- Research on the effectiveness of AI applications for mental health in real-world settings is limited. Mostly, it addresses bipolar disorder, schizophrenia, and major depression, with only limited information on conditions such as post-traumatic stress disorder, postpartum depression, and anxiety.
- The effectiveness of AI initiatives for specific populations (e.g., lesbian, gay, bisexual, transgender, and queer or questioning, and two-spirit – 2SLGBTQ+ – and Indigenous peoples) is not known, although limited evidence exists for youth and seniors.
- The long-term effectiveness of AI interventions for mental health is not known.

AI includes self-learning computer systems that can imitate human brain functions such as problem solving and pattern recognition. With its use increasing in health care, **AI has the potential to augment care, change how it is delivered, and improve access.**



## Key findings

This Environmental Scan explored the types of **AI emerging or currently in use in mental health**. The scan also aimed to identify AI research and development initiatives, professional groups and organizations using or developing AI for mental health care (across Canada and internationally), and policy considerations for AI as they relate to mental health.

### **Types of AI for the prevention, diagnosis, or treatment of mental health issues**

The most common types of AI applications for mental health are conversational agents and computerized adaptive testing. Conversational agents mimic natural human-to-human conversations and “talk” with participants and clinicians. They can be text-based or include an embodied agent (i.e., an avatar using body language, movement, and facial expressions). A familiar example is the customer service chatbot (such as in LiveChat Facebook Messenger). Computerized adaptive testing allows a computer to give exam-takers more targeted questions based on answers to previous questions.

### **AI use in mental health care**

While several research and development projects are in progress, AI has not been widely integrated into clinical practice – although some AI programs are being used or explored for use in mental health services. In diagnosis and prevention, AI is mainly used to determine the presence of mental illness or assess risk (e.g., by analyzing words in messages or detecting changes in

behaviour), and to direct users to appropriate support. In treatment, AI usually takes the form of a conversational agent that delivers psychological treatment (e.g., cognitive behavioural therapy).

### **AI research and development initiatives**

The environmental scan includes a list of Canadian and international organizations working in the field of AI mental health research.

Current research and development initiatives focus mainly on prevention, diagnosis, and prognosis. These initiatives include robot companions to address loneliness in elderly people, as well as the use of data obtained through brain scans, voice recordings, or wearable sensors to help with early or improved diagnoses of mental illness and predict responses to treatment (prognosis). There is also research on AI initiatives to support mental health care in military and veteran populations (e.g., early diagnosis of post-traumatic stress disorder and detection of suicide risk). In addition, the analysis of social media posts has been explored as a way to support the early detection and diagnosis of mental health illness in people experiencing major depression, anxiety,

and postpartum depression. There also appears to be increasing interest in wearable devices that can record real-time data and notify individuals or their counsellors of progress, and in other mobile applications and e-health applications for client use.

## Policy considerations

In addition to planning, incorporating AI into the care pathway must consider several factors. These include determining:

- how applicable lab-based findings are to a clinical practice setting
- the effectiveness of AI for mental health treatment
- the feasibility of adding AI to the workload of clinicians

- whether health-care providers focus only on patient data while overlooking an individual's lived experience.

Future research could focus on the suitability of AI for mental health interventions (i.e., whether they should be used as a screening tool, a replacement for human therapists, or an adjunct intervention) and on including individuals with lived experience (e.g., asking them why they use AI and for what purpose).

The key findings are based on **68 publications and 10 consultations** with individuals in Ontario, Alberta, Nova Scotia, and British Columbia.

# CADTH ACMTS

The Mental Health Commission of Canada commissioned a [CADTH literature review](#) and an [environmental scan](#) to address the role of AI in mental health services. This summary report is based on the environmental scan [Artificial Intelligence and Machine Learning in Mental Health Services: An Environmental Scan. Ottawa: Canadian Agency for Drugs and Technology in Health (CADTH), Mental Health Commission of Canada (MHCC); 2021 June.]



Mental Health  
Commission  
of Canada

Commission de  
la santé mentale  
du Canada



Financial contribution from

Health Canada Santé Canada