April 2026

AI for youth mental health and substance use health: A primer

Knowledge Institute
on Child and Youth Mental Health and Addictions

Suggested citation

Knowledge Institute on Child and Youth Mental Health and Addictions. (2026). *AI for youth mental health and substance use health: A primer.* Knowledge Institute on Child and Youth Mental Health and Addictions.

Funded by: Ontario

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About this resource

Artificial Intelligence (AI) is becoming increasingly relevant for everyday practice in the child and youth mental health and addictions sector (the sector). As AI becomes more present in our lives, it will be important to stay up to date and continually assess how it can be incorporated into our work. Our sector will need to examine the potential for AI to create both beneficial and harmful changes in practice, services, and client concerns and outcomes.

This resource is the first in a series of three focused on exploring the use of AI.

- This first primer was created for **leaders, decision-makers, and all audiences** in the sector. It focuses on introducing new concepts related to the use of AI and offers an overview of opportunities, considerations, and practical suggestions.
- The second resource in this series is for **agencies and providers**. It explores the in-depth use of AI, including opportunities, considerations, and practical suggestions within community-based agencies.
- **Young people and families** is the third resource in the series. It explores the use of AI at an individual level — specifically, the potential impacts of AI on young people and families through the lens of the sector's services.

While this series is mainly for leaders and service providers, we encourage you to share the information in this resource with young people and families, as they may be interested in knowing more about how AI impacts mental health and substance use health care.

AI basics: Definitions and essential ideas

Artificial Intelligence (AI) is a broad term that describes software and technologies in computer science that mimic human intelligence (Sheth et al., 2023; Terra et al., 2023). AI can handle complex tasks such as decision-making, reasoning, problem-solving, speech recognition, pattern recognition, learning, and creating new things (Nuwasiima et al., 2024). Due to its ability to quickly process large amounts of information, AI can spot patterns in data and make predictions based on these patterns (Terra et al., 2023; Topol, 2019).

Machine learning uses statistics and algorithms, which are step-by-step instructions, sets of rules, and processes that tell a computer how to learn from data. Machine learning allows AI to improve its performance over time without needing more computer programming (LeCun et al., 2015). AI focuses on imitating human thinking processes, while machine learning focuses on continually improving speed, predictions, and accuracy through data-driven learning experiences within specific limits. Machine learning is shaped by the data it is trained on, so any biases in the data can be reflected and even amplified in a model's output, which emphasizes the need for careful, responsible training (Chen et al., 2023; Verma, 2019).

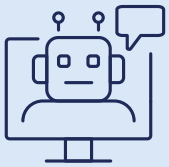
Machine learning uses three types of learning (Iyortsuun et al, 2023):

1. **Supervised learning:** A model learns from labeled data.
    - Example: Using a dataset of clients, including their symptoms and diagnosis, a supervised learning model can learn from the data and help predict if new clients might receive the same diagnosis based on their symptoms.
2. **Unsupervised learning**: A model learns from unlabeled data and tries to find patterns or groupings in a way that makes sense.
    - Example: Unsupervised learning can go through thousands of therapy session notes to help find patterns, like grouping together clients with similar stress triggers or coping styles, to help tailor treatment plans more effectively.
3. **Reinforcement learning**: A model learns by interacting with the environment or data and gets "rewards" or "penalties" based on its actions.
    - Example: Reinforcement learning can help mental health chatbots or virtual therapists improve. Over time, the model can respond in ways that are most helpful to users based on user feedback.

Deep learning is also a type of machine learning. It uses neural networks (many computer systems that work together) with multiple layers of networks to process information, learn from complex patterns in data, and coordinate to solve problems. For example, when deep learning is used to analyze a message for signs of anxiety, the first layers of the neural network may break down the message from sentences into words. The next layers look for emotional patterns like sadness or worries. The deeper layers then combine these patterns to understand the overall mood.

Natural Language Processing (NLP) is another area of AI that uses machine learning techniques to analyze language, pull out meaningful information, understand context, and communicate effectively through generated text or speech (Lovejoy, 2019; Singh et al., 2024; Stryker & Holdsworth, n.d.). Real-life examples of AI-powered NLP are used in chatbots.

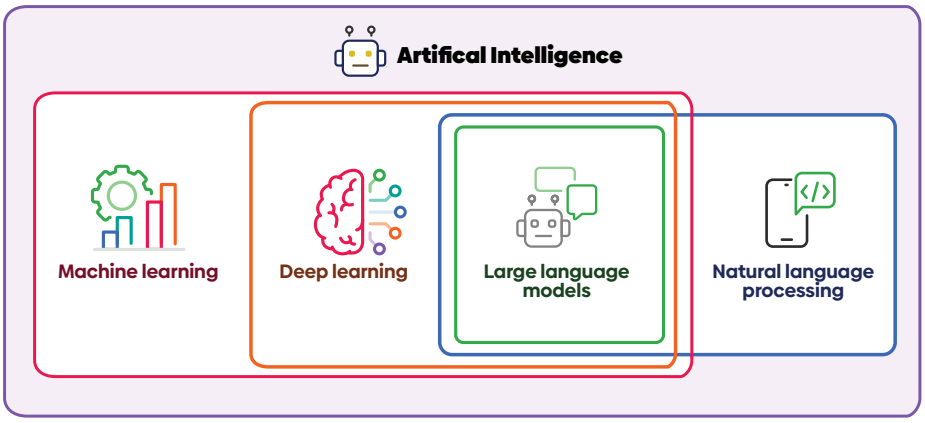
Generative AI is a type of AI that can create new content or information based on patterns it has "learned" within data (McKinsey & Company, 2024). By analyzing these patterns, generative AI can make new and unique outputs, like new text, images, music, or videos that mirror human-like creativity (Almassaad et al., 2024; McKinsey & Company, 2024). It combines machine learning, deep learning, and NLP to create these outputs. Generative AI can be used in a mental health app to write unique daily affirmations tailored specifically to someone's emotional state.



Chatbots are digital systems, capable of engaging with people through spoken, written, and visual languages using NLP, and have the potential to expand mental health access through apps (Abd-alrazaq et al., 2019; Casu et al., 2024).

Large language model (LLM) is a type of AI trained to understand, use, and interpret text in a similar way to humans. The model uses advanced algorithms and language structures to analyze large amounts of text and identify patterns, relationships, and nuances in language. The model tries to predict the next most appropriate word in a sentence or phrase based on the context of the text (Pereverzieva, 2025; Zhu et al., 2024). An LLM can understand and create text to make translations and summaries, generate answers to questions, and figure out how someone might feel based on what they write (also known as sentiment analysis; Franc et al., 2024; Pereverzieva, 2025). However, because an LLM learns entirely from the data it is trained on, it can also recreate and enhance the societal biases rooted in the data, which can surface in areas like healthcare, legal matters, hiring practices, or other contexts that can potentially worsen already existing inequalities (Gallegos et al., 2024). ChatGPT, for example, a pre-trained LLP model that is freely available on the internet and become very popular uses NLP to understand what users are saying, interpret the meaning and tone of the words, and then create appropriate responses.

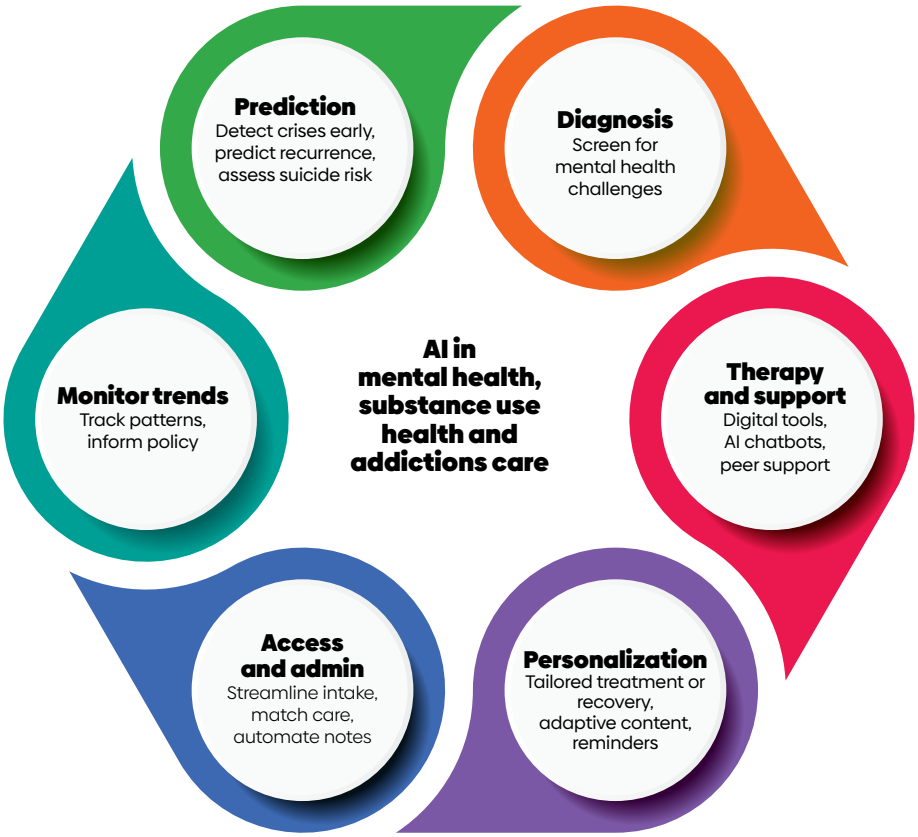
Figure 1. Diagram showing the relationships among machine learning, deep learning, NLP, and LLM within the broader domain of AI. *Adapted from* Grand Challenges Canada et al. (2025).



AI in the sector

Understanding AI's complex impact on our sector is essential in today's fast-changing digital world. AI has the potential to bring about significant advances by offering solutions to improve service access, delivery, and outcomes. As AI becomes integrated across the sector's continuum of care, it can support service providers, young people, and families in many ways, from early detection and diagnosis to personalized treatment and system-level planning. AI can be integrated into the sector by enhancing early prediction of crises, improving system navigation, streamlining diagnosis through data analysis, supporting clinician decision-making, personalizing treatment and recovery plans, and expanding access by improving triage and waitlist management via digital tools and chatbots. Beyond direct service delivery, AI can support insight and guide policy-making through data-driven work (see Figure 2).

Figure 2. How AI can be used within the CYMHA sector. *Adapted from* Dawoodbhoy et al. (2021).



Along with the promise of improved efficiency and effectiveness, there are also challenges that come with using AI. Issues related to privacy, data security, governance, regulation, equity of access, biases in algorithms, the potential for over-reliance or dependency on AI, the need for informed consent, and a disconnect from human empathy and relationships all need to be carefully considered. When we explore opportunities and considerations at multiple levels — such as the sector at large, community agencies, and individuals receiving services — everyone can become better informed to navigate the evolving landscape of care.

Equipping people and organizations with a balanced understanding of how to use and train AI models responsibly is essential for advancing the quality and accessibility of services, as well as ensuring the safety and well-being of AI's users. Considering the risks — such as biases in training data, errors in AI responses, and the potential for people to develop a dependency on AI (Head, 2025) — it is important for the creators and users of these models to emphasize a commitment to acting in the best interest of others. Providing education about the importance of thoughtful, ethical, and inclusive use of AI is also crucial moving forward.

Below is a high-level summary of the key opportunities, important considerations, and practical suggestions related to AI that are relevant to organizations, service providers, and young people and families within the sector (see Figure 3-5).

Echo chambers occur when AI repeatedly presents similar messages or viewpoints to people and limits exposure to diverse ideas or perspectives.

Figure 3. High-level summary of opportunities, considerations, and practical suggestions for AI in the mental health and substance use health system.

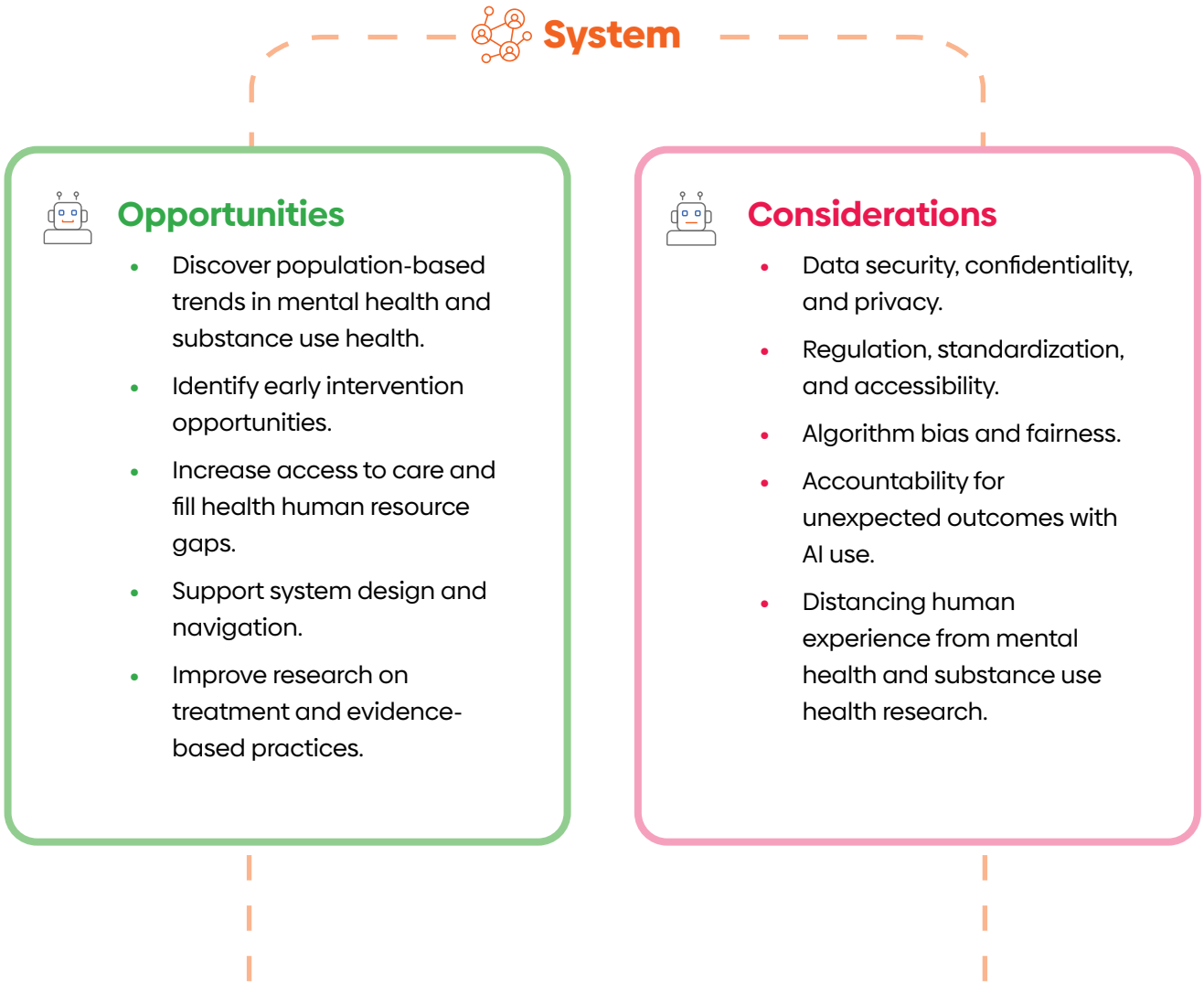


Figure 4. High-level summary of opportunities, considerations, and practical suggestions for the use of AI at the agency and provider level of mental health, substance use health, and addictions care.

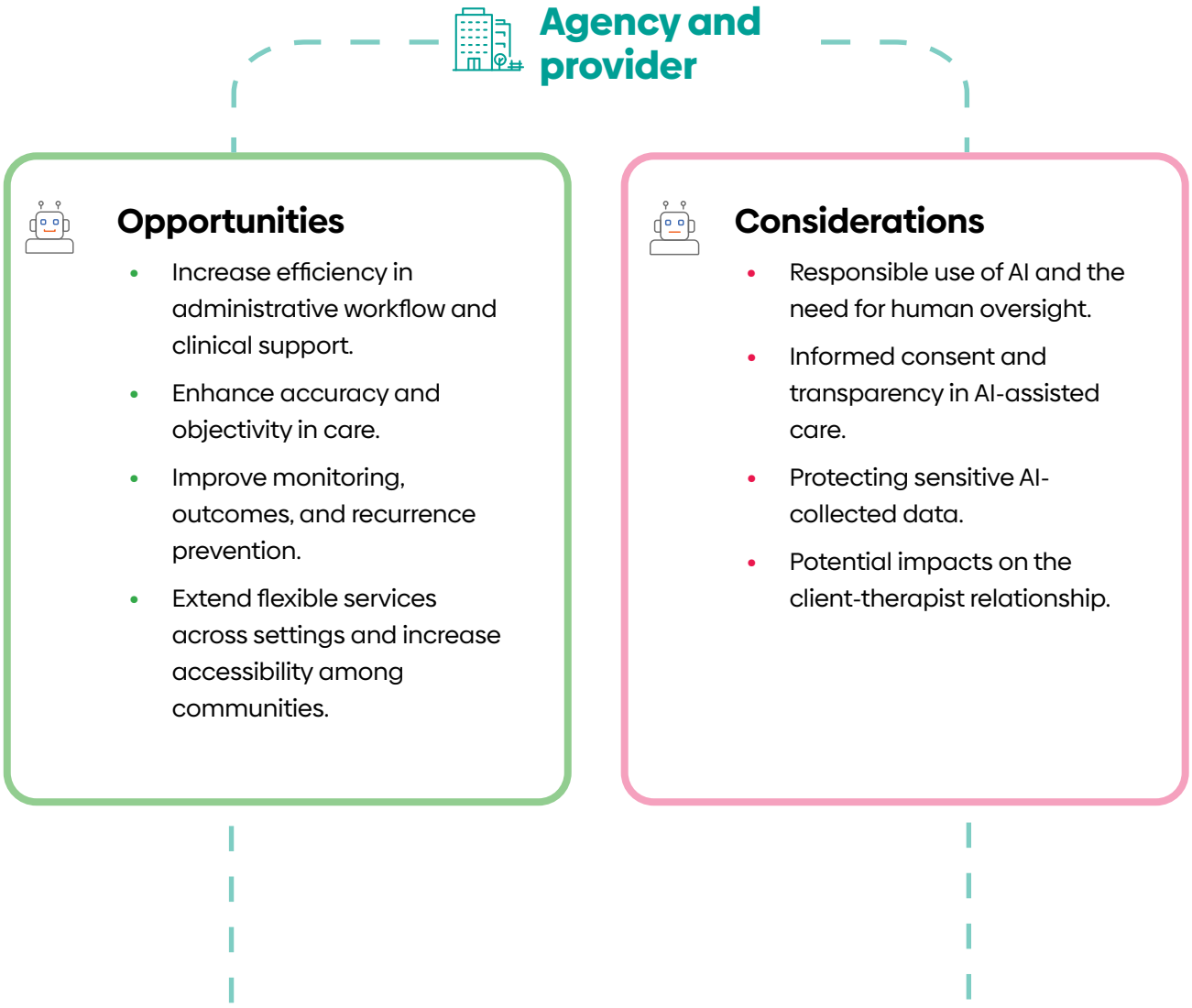
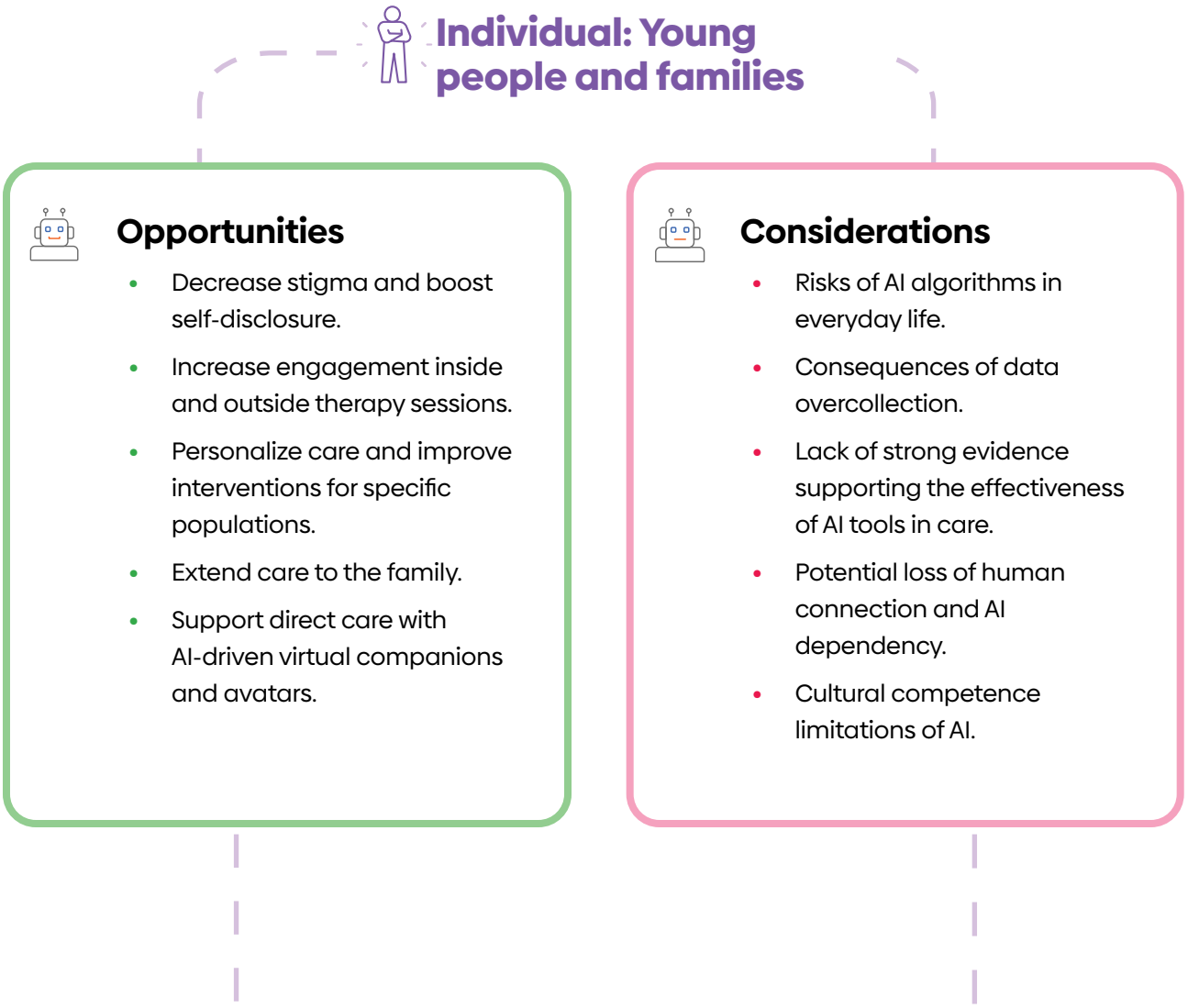


Figure 5. High-level summary of opportunities, considerations, and practical suggestions for the use of AI at the individual level within mental health, substance use health, and addictions care.



Practical suggestions

- Increase AI literacy and critical thinking skills for digital spaces.
- Watch for echo chambers and bias in AI tools.
- Choose verified mental health and substance use health apps that are safe and trustworthy.
- Keep the conversation going about AI in digital spaces.

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