# Data-Driven Decision Support Tool Co-Development Project Phase 1: Problem Scoping

A rapid increase in the amount of health care data being generated and collected, coupled with advancements in data-analysis methods and technologies, is transforming healthcare. Artificial intelligence (AI) and related decision-support tools show remarkable potential for using data to empower quality improvement and tailoring of programs and services to meet client and community needs.

The EPIC Practice-Based Learning Network (PBLN), part of the Alliance's EPIC Learning Health System, is exploring how to harness value from electronic medical record (EMR) data by developing an AI-enabled decision support tool for use in Community Health Centres (CHCs) across Ontario. Below, we summarize the first phase of work.

## Stage 1: Population-level descriptive-exploratory study

*Goal: Summarize sociodemographic, clinical, and health care use characteristics of ongoing primary care clients served by CHCs across Ontario from 2009 to 2019.*

The project started with a large-scale descriptive epidemiology study to better understand CHC EMR data and how clients are represented in it, and to learn about health and care characteristics of the population being served by CHCs. To capture complex patterns in the data, we used both traditional statistical methods as well as unsupervised machine learning methods (a type of AI) applied with an epidemiological lens.

This study was published in IJPDS, and our findings provided a foundation for problem-selection and other methodological decisions that followed.

## Stage 2: EPIC PBLN Team Engagement

*Goal: Engage the Alliance community in EMR data discussions and invite participation in the project.*

At a Lunch 'n' Learn webinar in October 2022, we presented Stage 1 findings and encouraged brainstorming about what patterns did or did not match expectations, and what challenges to target with a decision support tool. People were invited to join the co-development project through the webinar and e-mail blasts. The resulting team includes EPIC PBLN members, Alliance research leaders, and researchers from Western University.

## Stage 3: Decision Support Tool Problem Selection

*Goal: Select the best decision support tool initiative to pursue first.*

We narrowed ideas down to three major types of decision support (risk prediction/screening, triaging specialized program needs, and identifying care access needs). From there, we decided to start with risk prediction to support earlier identification of mental health decline after diabetes diagnosis. We chose risk prediction because of its potential impact (there is a high prevalence of diabetes with known mental health comorbidities); actionable outputs (CHCs have services and programs to support mental health wellness); and feasibility (advances in machine learning methods have made it particularly effective for prediction tasks).

## Stage 4: Sandbox Case Study 1 – Individual-level Risk Predictions

> **Goal:** *Assess feasibility and utility of a tool to support mental health care decisions when a client is newly diagnosed with diabetes.*

We developed *sandbox* (preliminary/trial) models to predict mental health decline within a year of diabetes diagnosis. The case study supported deeper discussions around the prediction task and associated clinical actions, resulting in:

1. Refined strategies to better harness value from CHC EMR data and improve predictive performance. These include cohort definition, most valuable input variables, and ways to identify the outcome in the data.

2. Revised assessment of the clinical problem, which identified the upstream challenge of mental health care service capacity. Implementing a tool to identify clients at risk of mental health decline is intended to support earlier preventative care, but it may increase the demand of already stretched mental health services past capacity.

## Stage 5: Sandbox Case Study 2 – Population-Level Planning Predictions

> **Goal**: *Extend learning from Case Study 1 to improve methodology and gauge feasibility of developing a tool to support advocacy and capacity planning around future CHC mental health care needs.*

We developed sandbox models to predict the number of clients with diabetes (new or existing) who would require mental health care in the next year. Discussions about predictive performance and intended use of the associated insights highlighted strong potential for this type of tool to be developed and benefit the health system.

## Stage 6: Project Recap and Next Steps Decision

> **Goal:** *Review progress and select which project direction to pursue.*

Given the novelty of this project and several possible next steps, we paused to reflect and to share our work, as it may inform future CHC EMR initiatives and those at similar primary health care organizations. Our next phase of work will revisit the second case study problem, gathering further input and refining the model with newer data to make predictions around future mental health service needs for clients with diabetes.

## Summary

This is the first EMR data-driven decision support tool co-development project with and for CHCs in Ontario. The work completed so far will contribute to a tool to support diabetes and mental health care, and it lays groundwork for future CHC AI and EMR data initiatives. Our vision is for this to grow into a larger and longer-term decision support tool strategy that would integrate multiple types of tools with the CHC EMR system.

This project furthers the Alliance's learning health system work at three levels: data analysis capacity (using AI to make data more meaningful), staff and provider engagement (new avenues for involvement in data-driven learning initiatives), and process refinement (laying a baseline for decision support tool development that future initiatives can build on).

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### *Want to learn more?*

**Detailed Phase 1 Project Report***: Kueper J, Rayner J, Bhatti S, *et al.* Data-driven decision support tool co-development with a primary health care practice based learning network. *Scholarship@Western Epidemiology and Biostatistics Publications*. Published online November 18, 2023. https://ir.lib.uwo.ca/epidempub/186

**Contact information:** Sara Bhatti, Research and Evaluation Lead@ sara.bhatti@allianceon.org