Let's Talk: Mental Health & Substance Use - the Influence of Genetics

Introduction

In Budget 2025, Alberta's Ministry of Mental Health and Addiction has allocated $1.7 billion to support addiction and mental health services[1], underscoring the significant impact of mental health and addiction in the province.

Genome Alberta, as a convenor and a catalyst for bridging knowledge from leading experts in genetics/genomics to address challenges and directly benefit Albertans, is inviting you to join a conversation to explore the current state of mental health and substance use in Alberta and how the body of knowledge from investments in genomics research can contribute to improved care, health outcomes, and cost savings to the health system.

We want to work together with organizations and groups responsible for clinical care to share new knowledge about psychiatric genetics and the genetic determinants of mental health and substance use in order to address existing challenges and integrate the best available knowledge and technology into healthcare training and practice.

Why Genomics in Mental Health and Substance Use?

Mental health and substance use disorders are complex conditions influenced by both genetic and environmental factors. Unlike single-gene disorders, psychiatric disorders arise from a combination of genetic variants, many of which are shared across different diagnoses. Recent advances in psychiatric genetics have led to significant discoveries, but translating these insights into clinical practice for patient's benefit remains a challenge.

[1] Government of Alberta. (2025, April 15). *Budget 2025 highlights*. Alberta.ca. https://www.alberta.ca/budget-highlights

Key developments in psychiatric genetics include:

- Identification of thousands of genetic variants influencing psychiatric conditions, offering new insights into their biological basis to inform objective biomarkers for both diagnostic and therapeutic decision-making.
    - *Clinical utility* – This information could be used to inform treatment options and diagnostic decision-making.
- Evidence that psychiatric disorders share a large degree of genetic risk, suggesting a need to rethink diagnostic categories as defined by the two current leading diagnostic classification systems (ICD-11 and DSM-5).
    - *Clinical utility* – Integration of genomic/genetic evidence into future DSM revisions could be used to refine diagnostic criteria, providing objective biomarkers to reduce the high degree of heterogeneity within diagnostic boundaries of psychiatric disorders, overcoming limitations of diagnosing patients according to their signs and symptoms, and positioning mental health diagnostics in alignment with other medical fields.
- Estimating genetic susceptibility, which may become clinically useful as research advances through development of polygenic risk scores (PRS).
    - *Clinical utility* – This information could be used to help clinicians better communicate what heritability risk means to their patients, improving patient outcomes through a better understanding of their illness leading to reduced self-blame and improved overall wellbeing.
- Personalized (pharmacogenomic) testing to inform prescribing practices for improved patient response rates and decreased adverse drug reactions though using pharmacogenomics tools.
    - *Clinical utility* – Pharmacogenomic information could help clinicians with evidence-based decision making regarding the selection and dosing of medications to optimize treatment efficacy and minimize adverse effects. This is especially useful for conditions such as:
        - Depression - up to two-thirds of patients don't respond to the first medication (e.g., SSRIs, SNRIs) —offering a better alternative to the current trial-and-error approach.

          Substance use – individuals respond differently to specific substances. PGx testing helps tailor prescribing of high-risk drugs like opioids, reducing misuse, addiction, and diversion. The potency and unpredictability of street drugs in a synthetic drug era means that one wrong dose or delay in treatment can be fatal. Pharmacogenomic testing offers a faster, safer alternative to trial-and-error prescribing by enabling more personalized treatment for substance use.

Current Challenges and Opportunities

Despite major breakthroughs, psychiatric genetics has not yet translated into significant improvements in patient care. Challenges include:

- **Limited clinical integration:** Unlike other medical fields, psychiatric care lacks routine genetic testing, limiting the potential for personalized medicine.
- **Support for clinician education:** Many healthcare professionals are not aware of or do not have access to training in psychiatric genetics, making it difficult to interpret and apply genetic findings in practice.
- **Ethical and societal considerations:** The implementation of genetic tools in psychiatry requires careful consideration of ethical, legal, and social implications.
- **Data diversity and inclusion:** Generating and sharing access to datasets that are reflective of the diversity in Canadian society, so that findings are of broader applicability for patients.

Genome Alberta's Initiative

To bridge these gaps, Genome Alberta wants to hear from you! We are initiating a multi-stage engagement process:

1. **Engagement to Understand Core Issues and Current Challenges** – To better understand the current landscape of mental health and substance use care in Alberta we are inviting key groups, including researchers, clinicians, healthcare providers, policymakers, patient advocates, and Indigenous communities to share feedback and perspectives – either via virtual session or written submission to help identify areas which could benefit most from knowledge translation.
2. **Knowledge Translation Through Virtual Presentations** – A series of informational sessions will be organized to share knowledge with organizations and individuals responsible for clinical care about psychiatric genetics and its implications for precision medicine. Potential sessions include:
    A. Genetic testing for mental health and substance use disorders as part of standard clinical practice – Where are we now?
    B. Artificial intelligence in mental health and substance use disorders care – integrating multiomics, neuroimaging, and digital phenotyping data
    C. Genetics testing for mental health disorders – exemplified through autism spectrum disorder
    D. Genetic testing for substance use disorders
    E. Pharmacogenomic testing for prescribing practices
3. **Developing Strategies for Clinical Implementation** – Insights from sessions will guide future efforts to integrate genetic research and findings into healthcare delivery and psychiatric training resources.

Long-Term Goals

By fostering collaboration and knowledge-sharing, this initiative aims to:

- Improve mental health and substance use disorders outcomes through genomics-informed care.
- Enhance resources for clinician training to enable reliable interpretation and return of genetic findings.
- Support the development of policies that facilitate the responsible use of psychiatric genetic tools in Alberta.
- Lay the groundwork for future innovation programs targeting key priorities in psychiatric genomics.

Get Involved!

Please join us in this initiative and contribute your expertise to shaping the future of mental health care in Alberta. To learn more or get involved, please contact Genome Alberta at info@genomealberta.ca