Personalized Preventive Plan (*Persoventa*) Project

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CONTEXT & PURPOSE

Preventive health care is widely recognized as one of the most effective strategies for improving population well-being, reducing inequities, and lowering the long-term costs of chronic disease management. In Canada, where chronic conditions account for a substantial share of healthcare expenditures, prevention is both a public health necessity and a system sustainability imperative. Despite established prevention governance and programs at the federal, provincial/territorial, and community levels, preventive services often rely on broad, population-level guidance that does not sufficiently account for individual risk profiles, preferences, and lived circumstances. As a result, Canada's prevention paradigm remains limited in its ability to deliver personalized, adaptive, proactive and patient-centred preventive strategies at scale.

Within this context, **Personalized Medicine** offers a compelling framework for modernizing prevention. Based on established definitions from authoritative organizations and the scientific literature, we define Personalized Medicine (PM) as *"a medical model using the characterization of individuals' phenotypes and genotypes (health info, molecular profiling, environmental, lifestyle and social factors) for tailoring the right clinical strategy (prevention, diagnostic or treatment) for the right individual at the right time."* This definition is intentionally prevention-inclusive: PM is not limited to tailoring treatment after disease onset, but extends upstream to risk stratification, early detection, and timely intervention based on multi-domain determinants of health. Building on prior work in Ontario (Zavar, et all 2022), the report emphasizes that PM requires integrated data domains—clinical information, omics, lifestyle factors, environmental exposures, and social determinants of health (SDoH)—to support individualized decisions and more precise prevention pathways.

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Canada's emphasis on health data integrity and interoperability has yet to foster the necessary point-of-care infrastructure for personalized prevention. Significant gaps remain in proactive, data-driven prevention efforts, including fragmented health information across jurisdictions, limited interoperability despite widespread adoption of electronic medical records (EMRs), and minimal integration of patient-generated data into clinical workflows. These challenges impede effective risk profiling and complicate anticipatory prevention. As a result of these structural limitations, preventive care often becomes reactive, triggered by symptoms, acute events, or late-stage clinical presentations, rather than by systematic identification of modifiable risks and early intervention. This reactive approach leads to higher costs, an increased burden of chronic diseases, and delayed detection of conditions that could benefit from early, risk-based screening and intervention. Moreover, fragmentation is not solely due to isolated EMRs; it also reflects the lack of validated, interoperable tools that consistently capture patient-reported outcomes, risk factors, and social determinants of health (SDoH) across care settings. Access to this data is essential for achieving equity-oriented, proactive personalized prevention.

The **Personalized Preventive Plan (*Persoventa*) Project** addresses a national need by providing a structured, evidence-based approach to personalized prevention. It begins with validated risk-assessment tools and expands to include systematic mapping of risk factors to diseases. By moving away from generic recommendations, Persoventa adopts a multi-domain, data-driven strategy that considers the overlapping clinical, behavioural, social, and environmental risks individuals face. The goal is to transition healthcare from a primarily reactive model to a proactive one that focuses on early risk detection and mitigation. In doing so, Persoventa lays the groundwork for future integration into clinical workflows and supports subsequent analytic and AI-enabled prevention initiatives that require comprehensive, standardized preventive data at the point of care.

OBJECTIVES

The four-phase Persoventa aims to establish a standardized, evidence-informed approach to preventive assessment in Canadian primary care by (i) identifying validated, self-administered preventive assessment instruments and (ii) transforming their content into an interoperable, guideline-aligned knowledge base linking risk factors to diseases across 15 preventive domains. These domains span clinical, behavioural, social, and environmental determinants: *cancer screening, environmental health exposures, ethnic susceptibility, geriatric and aging health, mental health, nutrition, occupational health, oral/dental conditions, physical inactivity, sexual health, sleep health, socioeconomic determinants, spiritual/religious influences, substance use/dependency,* and *youth health concerns*; and collectively capture major modifiable contributors to chronic disease burden. By curating and evaluating existing tools and harmonizing preventive data elements, Persoventa is designed to support earlier risk identification and personalized preventive interventions, while advancing connected and interoperable preventive data capture within Canadian health systems.

To accomplish these objectives, the Persoventa Project adopts a four-phase Double-Diamond approach:

- **Phase 1 – Identification (Discover):** Conduct systematic, multi-source searches to identify reliable, preferably Canadian-validated, self-administered assessment instruments for each domain, incorporating patient advisory input and documenting selection rationale and gaps.
- **Phase 2 – Decomposition (Define):** Decompose selected instruments to the item/metric level and map items to captured risk factors and candidate diseases with traceable evidence.
- **Phase 3 – Validation (Develop):** Validate Phase 2 risk factors against the most up-to-date Canadian clinical guidelines for the top 30 preventable (non-infectious) conditions, refining tools and terminology to resolve gaps and ensure cross-domain consistency.
- **Phase 4 – Mapping (Deliver):** Map validated items and risk factors to diseases/disorders using a semantic taxonomy and harmonize overlaps across all domains into a unified, query-able risk factor–disease knowledge base that can underpin future AI-enabled preventive decision support.

METHODOLOGY

The Persoventa Phase 1 project, funded by *Canada Health Infoway*, took place from May 2024 to June 2025. It involved a customized systematic search across 15 different domains. Teams of specialists (clinicians and researchers) in each domain (15 teams), along with methodologists and subject-matter experts, followed a standardized protocol.

- **Search and eligibility.** Each team searched databases (PubMed, Scopus, Web of Science) and grey literature, using domain-specific terms for health constructs, measurement tools and psychometric properties. Searches were limited to English-language studies published from 2014 to 2025. Inclusion criteria required self-administered questionnaires with psychometric evaluation relevant to preventive health and populations aged 15 years and older.

- **Screening and appraisal.** Records were managed and screened in Rayyan; reviewers independently screened titles and abstracts, then full texts, using standardized inclusion/exclusion criteria. A multi-disciplinary Appraisal Committee evaluated each tool using a consensus-based rubric that considered psychometric strength, preventive relevance, feasibility, population coverage and accessibility.
- **Patient engagement.** Canada Health Infoway's (CHI) Patient Advisory Committee reviewed recommended tools for clarity, cultural appropriateness, and comfort. They provided feedback through surveys and focus groups, and their comments informed the final selection of tools, ensuring face validity for diverse populations.
- **Scoring framework.** Tool selection was guided by two complementary indices that balanced evidence readiness with real-world implementability. The ***Screening Proof Score (SPS)*** captured a tool's foundational "readiness to screen" by rating three core criteria: (i) self-administration suitability, (ii) psychometric strength, and (iii) Canadian relevance/validation—to ensure that shortlisted instruments were credible and appropriate for preventive assessment in Canadian primary care. In parallel, the ***Persoventa Suitability Index (PSI)*** assessed "front-door fitness," emphasizing (i) risk-factor coverage, (ii) feasibility (length, complexity, accessibility), and (iii) patient usability/acceptability. Based on structured feedback from CHI's Patient Advisory Committee, the PSI criteria were refined to enhance patient-facing considerations. These improvements included clarity, comfort when discussing sensitive topics, cultural appropriateness, and perceived relevance. As a result, the final recommendations were grounded in evidence while remaining practical and acceptable to diverse populations. Tools that received satisfactory scores on both the Scientific Performance Score (SPS) and the Patient-Facing Impact (PSI) were prioritized for recommendation.

KEY FINDINGS (Results of Phase 1)

Search yield and selection outcomes

Across 15 preventive health domains, Phase 1 implemented a standardized, domain-tailored evidence review that screened ~43,000 records from peer-reviewed databases and grey literature. Search yields varied substantially by domain, reflecting both differences in the maturity of measurement science and the breadth of relevant constructs. Following title/abstract screening and full-text review, each domain advanced a small subset of tools with evidence of psychometric evaluation and relevance to preventive assessment in populations aged ≥15 years.

Using a harmonized selection funnel, the review culminated in a final shortlist of 31 self-administered questionnaires (each offering one or more tools per domain) intended for “front-door” preventive intake across primary care, distributed across the 15 domains based on the strongest balance of feasibility, psychometric performance, and applicability to preventive workflows. In practical terms, these results demonstrate that a unified, prevention-first intake model is feasible, but requires structured selection logic because “validated” instruments are not automatically fit for universal, patient-facing deployment.

Scoring results and cross-domain patterns

To promote transparent cross-domain comparability, tools were evaluated using a 10-point scoring system based on five implementation-related criteria: Canadian relevance, self-administration, and psychometric strength. Consistent with the main idea from Phase 1, the synthesis revealed that validity alone is insufficient to justify their use for universal intake. Many instruments showed strong psychometric foundations, and some even had adaptations for Canada; however, they remained operationally inadequate for universal intake due to recurring limitations:

- **Length and respondent burden**, limiting feasibility in routine pre-visit workflows.
- **Missing cut-points or unclear thresholds**, reducing interpretability for triage.
- **Absence of embedded triage guidance**, leaving clinicians without decision support after screening.
- **Partial construct coverage**, requiring bundling to reflect the breadth of modifiable risk factors relevant to prevention.

Accordingly, Phase 1 operationalized a dual-index approach that distinguishes (i) evidence readiness from (ii) front-door suitability. This clarified why some tools are “research-ready” yet not “workflow-ready,” and why other highly usable tools require Canadian validation or strengthened interpretive pathways before broad deployment.

PSI–SPS shortfall profiling

Phase 1 further synthesized results using a shortfall-based visualization (Figure1), which plots tools by their SPS shortfall (evidence/readiness gap) and PSI shortfall (front-door usability/fitness gap). This approach yields three practically important archetypes that recurred across domains:

1. **High SPS + High PSI (low shortfalls): “Deployment-ready” tools**
   Instruments with strong psychometrics and clear usability characteristics (including

interpretable thresholds and feasible completion time) that can be implemented with minimal modification.

2. **High SPS + Lower PSI: “Evidence-ready, workflow-incomplete” tools**
   Tools with robust validation but requiring bundling, item re-ordering, or explicit triage logic to function safely and effectively as universal intake instruments.

3. **Lower SPS + High PSI: “Promising, requires Canadian strengthening” tools**
   Highly feasible tools that may be acceptable for patient-facing workflows but require Canadian validation, bilingual adaptation, and/or more explicit interpretive guidance before being positioned as default screening measures.

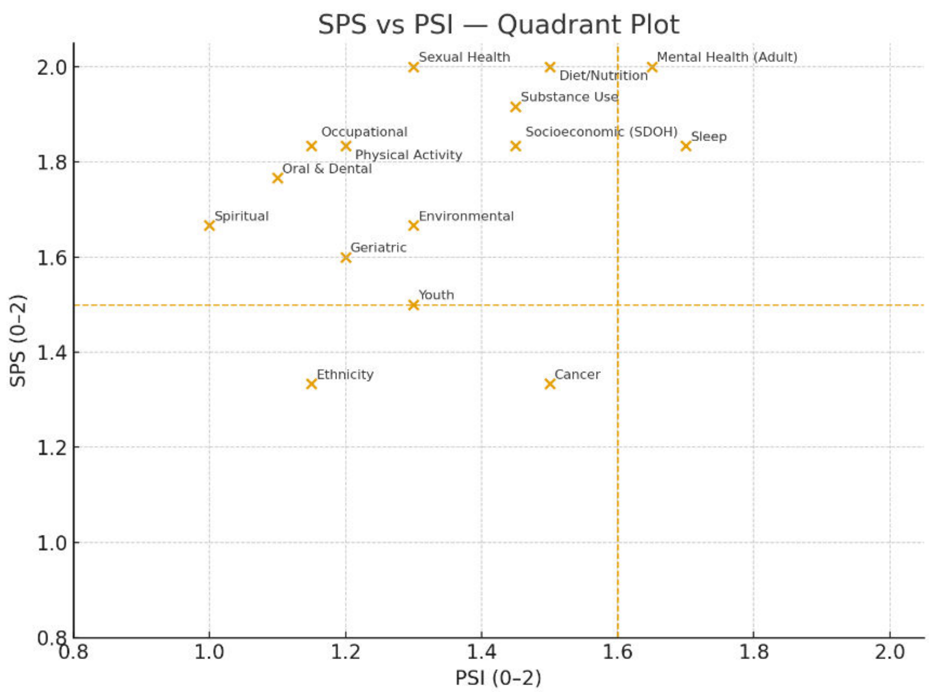

Figure1: PSI vs. SPS Shortfall — Quadrant Plot

Quadrant plot depicting PSI and SPS shortfalls for shortlisted tools across 15 prevention domains. Lower shortfalls indicate stronger readiness for use as a front-door preventive intake instrument. The visualization highlights tools suitable for immediate deployment, tools requiring workflow refinement, and tools requiring additional Canadian validation.

Selected questionnaire set for front-door preventive intake (n=31)

The final report recommends a toolkit that prioritizes brief, self-administered instruments as a universal preventive entry point. The shortlisted Step-1 tools span domains as follows:

Topic	Assessment Toll
Cancer Screening	My CancerIQ (Ontario Health/CCO)
Environmental Health Exposures	Brief Environmental Exposure & Sensitivity Inventory (BREESI)
Ethnic Susceptibility	UHN Health Equity Demographics Questionnaire
Geriatric Health	BC Health Assessment Questionnaire
	EuroQol 5-Dimension 5-Level (EQ-5D-5L)
	World Health Organization Quality of Life (WHOQOL-BREF)
Mental Health Vulnerabilities	Kessler Psychological Distress Scale (K10)
	General Health Questionnaire (GHQ) -12/28
	Mental Health Continuum–Short Form (MHC-SF)
	Modified Mini Screen (MMS) (optional)
Nutritional Deficiencies	Canadian Food Intake Screener (CFIS)
	Seniors in the Community: Risk Evaluation for Eating and Nutrition (SCREEN) II/III
Occupational Health Hazards	OHS Vulnerability Measure
	Mental Health Inventory-5 (MHI-5)
Oral & Dental Health Conditions	Self-Reported Periodontal Disease Screening Scale (SRPDSS)
	Oral Frailty Five-Item Checklist
	3-Item Oral Health Screening
Physical Inactivity	Physical Activity and Sedentary Behaviour Questionnaire
	WHO Global Physical Activity Questionnaire (GPAQ)
Sexual Health Concerns	Safe Sex Behaviour Questionnaire (SSBQ)
Sleep Health	Pittsburgh Sleep Quality Index (PSQI)
	Insomnia Severity Index (ISI)
Socioeconomic Determinants	SPARK (Screening for poverty and related social determinants)
	Measuring Health Equity Survey
Spiritual Behavioural Influences	Spiritual Well-Being Scale (SWBS)
Substance Use and Dependency	Tobacco, Alcohol, Prescription meds, Substances Tool (TAPS)
	Problem Gambling Severity Index (PGSI)
Youth Health Concerns	Revised Child Anxiety and Depression Scale (RCADS-25)
	Screen for Child Anxiety Related Emotional Disorders (SCARED)
	PHQ-9 modified for Adolescents (PHQ-A)
	WHO-Composite International Diagnostic Interview (CIDI) v3

Overall interpretation: The shortlisted toolkit demonstrates that preventive assessment can be effectively implemented through a practical and standardized intake approach. This process should prioritize two key factors: (i) the readiness of evidence and (ii) the compatibility with existing workflows.

CONCLUSIONS & RECOMMENDATIONS

Conclusions

Phase 1 of the Persoventa Project demonstrates that creating a unified, prevention-focused intake pathway for primary care in Canada is feasible when tool selection is based on rigorous evidence evaluation and practical implementation standards. By conducting a standardized, domain-specific review across 15 preventive health areas, the project examined a substantial body of evidence and identified a final shortlist of 31 concise, self-administered questionnaires suitable for initial preventive assessments.

A central conclusion is that psychometric strength and Canadian relevance are *necessary* but not *sufficient* for real-world deployment. Across domains, many well-validated assessment tools were not immediately suitable for intake due to foreseeable usability and workflow challenges. The most common issues were their length and burden on users, unclear cut-off points, and the lack of guidance on triage and referrals. Therefore, Phase 1 highlights the importance of using a dual-index selection logic that clearly differentiates between evidence readiness and suitability for initial use. This approach enables transparent prioritization of tools that can serve as universal entry points, while identifying those that require refinement or further validation in Canada.

Phase 1 confirms that engaging with patients significantly enhances the suitability of the tools. Feedback from the CHI Patient Advisory Committee helped refine criteria for patient interactions, including clarity, comfort with sensitive content, cultural appropriateness, and accessibility. This improved the tools' face validity and alignment with equity goals. Together, these findings provide a solid foundation for proactive, connected preventive care. However, it is essential that subsequent phases address standardization, triage logic, and interoperability requirements.

Recommendations

To implement Phase 1 outputs for preventive intake, the following priorities are set:

1. Address usability gaps where evidence is strong (PSI optimization). Focus on:

- Bundling brief tools for comprehensive risk-factor coverage without burdening patients.
- Shortening and reordering items to improve completion rates and clarity.
- Clarifying cut-points, thresholds, and risk stratification, including referral logic.
- Embedding feasible triage pathways within primary care workflows.

2. Improve Canadian preparedness in areas where usability is high, but evidence remains limited (SPS strengthening). Prioritise:

- Canadian validation studies with diverse populations and transparent reporting.
- Development of bilingual and culturally adapted versions with accessibility considerations.

3. Promote equity-informed preventive assessment through governance and co-design. Persoventa should:

- Implement equity-oriented data governance with clear usage of sensitive identity and SDOH variables.
- Pursue co-design with community partnerships for culturally appropriate adaptations.
- Ensure accessibility in tools and workflows to avoid reinforcing inequities.

4. Design for interoperability from the outset. Operationalize outputs by:

- Defining a computable minimum preventive dataset aligned with interoperable standards.
- Structuring outputs to support downstream use cases like patient summaries and shared care planning.

Next Steps (Phases 2–4)

Persoventa's subsequent phases are designed to convert the Phase 1 shortlist into a standardized, computable prevention infrastructure:

- **Phase 2 (Decomposition):** Decompose each shortlisted tool into discrete items, map items to risk factors and candidate conditions, and align data elements to common standards to enable interoperability.

- **Phase 3 (Validation):** Validate the risk-factor sets against current Canadian clinical guidelines for the top 30 preventable conditions, refine terminology and thresholds, and finalize decision-relevant outputs and triage pathways.

- **Phase 4 (Scale):** Construct an interoperable semantic knowledge base linking items, risk factors, and diseases using standardized codes, enabling scalable implementation, evaluation, and future AI-enabled preventive decision support.

Taken together, Phase 1 established a credible, patient-informed foundation for standardized preventive intake; the recommended next steps ensure that Persoventa evolves from a curated set of questionnaires into a deployable, interoperable, equity-aligned personalized prevention framework for Canadian primary care.

ACKNOWLEDGEMENTS

We gratefully acknowledge **Canada Health Infoway** for its financial support of the Personalized Preventive Plan (Persoventa) Project (Phase 1). We also extend our sincere thanks to the **over 65 volunteer contributors**—including clinicians, researchers, methodologists, and students—whogether with their expertise, time, and collaboration, enabled this work across all domains and workstreams. This project reflects a truly multidisciplinary effort, and we are especially grateful to the domain leads and SMEs who coordinated the Phase 1 reviews and synthesis: Akhi Nath (MD), André Luiz Figueirêdo (MD), Arezou Bakhsha, Daniela Patricia Gotera (MD), Humaira Arshad (MD), Janet Wong, Kamalpreet Kaur (MD), Karina Setani (MD), Mary Alehashem, Matvey Kipershtein, Nahal Bano, Ola Maher, Razieh Poornady (MD), Sam Fereshtehnejad (MD), Sara Alshakarji, Stefanny Hardiman (MD), Tanya Jain, Timileyin Awolola, Vanessa Bui, Wale Fadare (MD), and Yetunde Abur (MD).