Reducing Central Line Associated Bloodstream Infections within Interdepartmental Centre for Critical Care at University Health Network

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Background and Context for Change

Central venous lines (CVLs) are essential in critical care for medication delivery, hemodynamic monitoring, and advanced therapies. Still, they carry a substantial infection risk measured by the Central Line–Associated Bloodstream Infection (CLABSI) rate. Within the Interdepartmental Centre for Critical Care (ICCC), CLABSI rates increased notably across all four ICUs, despite differing patient populations.

> **Baseline Rate (Q2 FY 2024/25):** 3.12 CLABSIs per 1,000 line days
> **Institutional target Rate:** 0.68 per 1,000 line days

Gaps include workflow consistency and compliance monitoring, real-time feedback mechanisms. These learnings informed a new, system-level strategy that integrates Health Human Factors (HHF) and Quality Improvement (QI) methods to achieve sustained, measurable reductions in infection rates.

Aim Statement

The aim is to reduce ICU CLABSI rates from 3.12 to the institutional target of 0.68 per 1,000 line days over 12 months, with a local unit sub-aim of achieving a 30% reduction every six months.

Family of Measures

Outcome measure
CLABSI rate per 1,000 central line days (NHSN definition).

Process measures
Compliance with hand hygiene, aseptic non touch technique (ANTT®), and adherence to the central line maintenance bundle (including line necessity, dressing and tubing integrity, and swab cap usage).

Balancing measures
Rates of premature CVL removal, increased peripheral IV use, and related complications such as extravasation.

## Problem Characterization

CLI ICU rate [u-Chart]
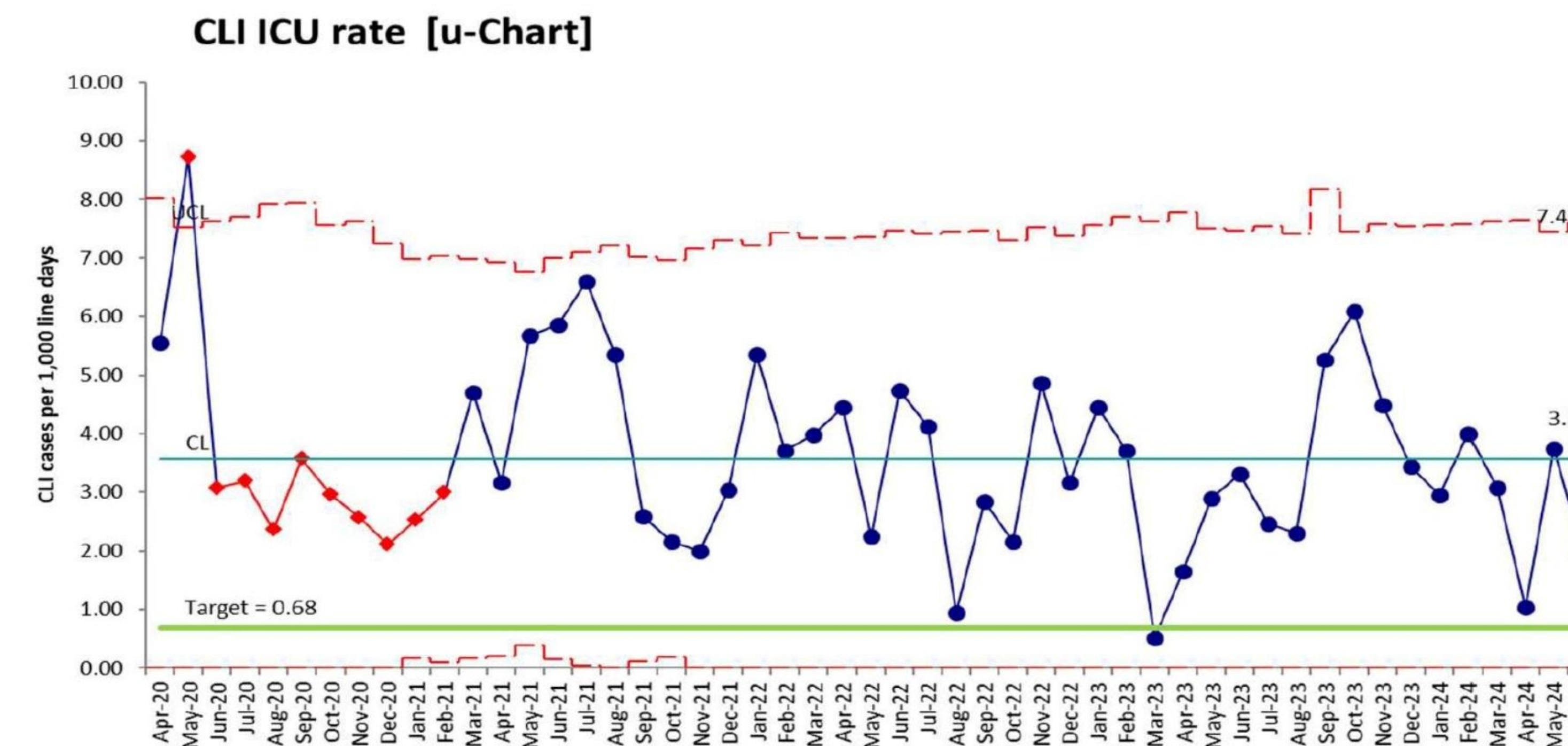
Figure 1. u-chart of ICU central line infection rates per 1,000 line days from April 2020 to June 2024.

- **High rates:** CLABSI peaked at 8.9 per 1,000 line days (2020) vs. target of 0.68 per 1,000 line days.
- **Systemic gaps:** Persistent variation signals workflow and compliance issues.
- **Implication:** Previous efforts not sustained and requires redesign, leadership support, and real-time feedback

Intervention

A collaborative team of nurses, physicians, IPAC, and HHF experts identified key challenges and created interventions to improve CLABSI data access, ANTT® training, and daily line assessments. The project began in October 2024, with interventions rolled out via PDSA cycles from January 2025.

Impact and Improvement

CLABSI (ICU) Rate per 1000 Line Days [u-Chart]
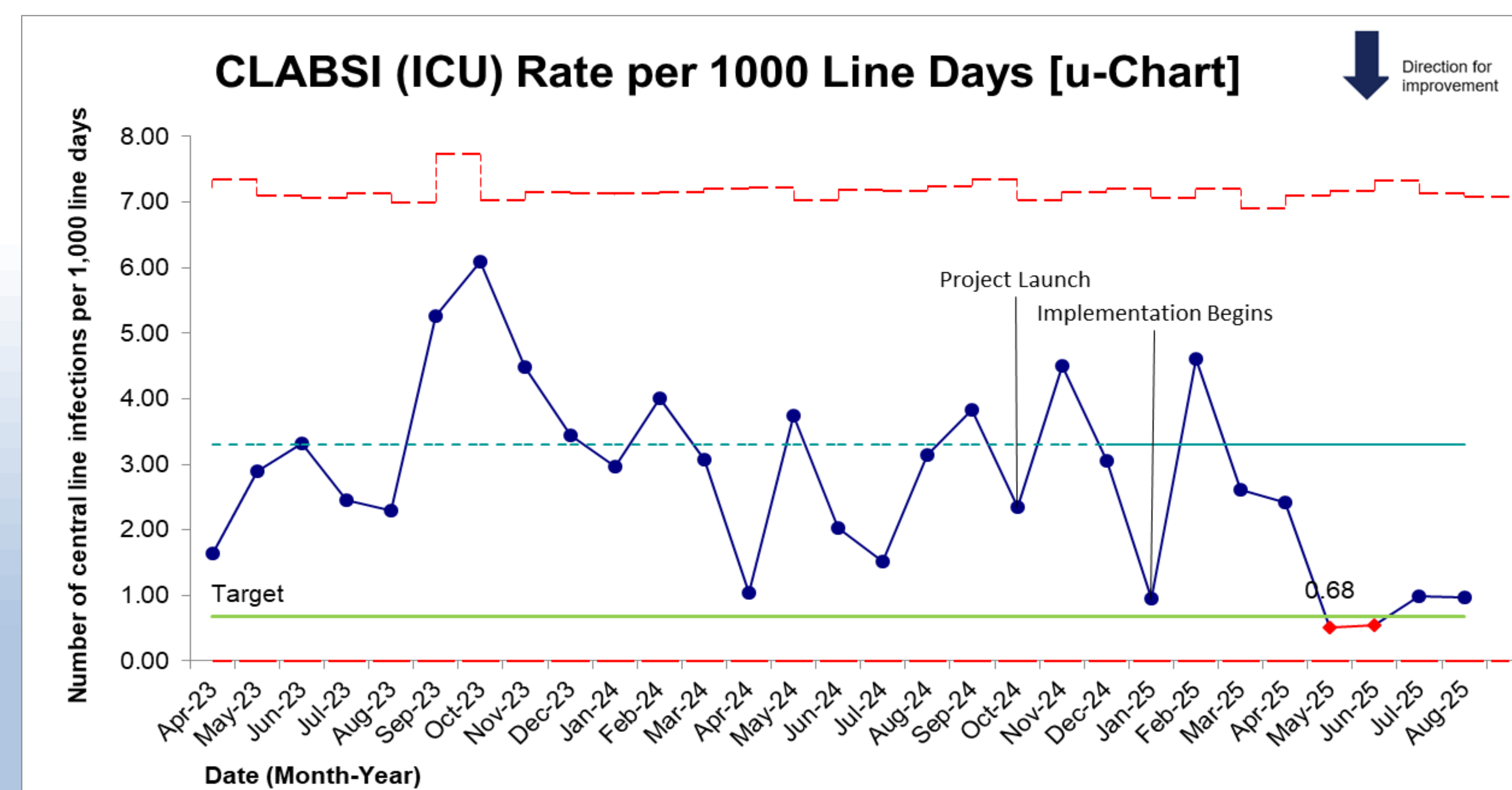
Figure 2. The u-chart illustrates ICU central line infection rates per 1,000 line days from April 2023 to August 2025. Baseline rates averaged around 3.0, with fluctuations between 1.5 and 5.0. Rates declined to 0.68 by May 2025 and sustaining near or below 1.0 through August 2025, indicating a signal of improvement.

Limitations

- **Short observation window:** Early results (≤6 months post-implementation) may not show long-term sustainability or seasonal variation in CLABSI rates.
- **Incomplete data capture:** Relying on IPAC line lists and manual documentation limited detail and risked bias.
- **Heterogeneity across ICUs:** Differences in patient acuity, device use, and workflow likely affected rate comparisons.
- **Staff turnover and onboarding variability:** Many novice post-pandemic staff impacted intervention consistency and compliance.
- **Limited qualitative data:** Staff experience and barriers were informally gathered, not formally analyzed.
- **Process measure dependency:** Improvements in documentation might reflect increased awareness, not actual behavioural change.
- **Resource intensity:** Significant engagement was needed, limiting scalability to lower-resource settings.

Conclusions

This initiative improved infection prevention reliability across four ICUs through shared learning, transparent data, and human-factors-informed redesign. It enhanced safety culture by empowering frontline teams to adapt standard bundles to their context and incorporate daily data review into rounds.

Core success factors—co-design, leadership sponsorship, and real-time feedback—are easily transferable to other systems facing post-pandemic staffing variability and infection control challenges.

The model shows how combining human factors and QI methods can produce scalable, sustainable reductions in CLABSI and improve resilience in complex critical-care environments.

Reference
Yuk, et al. (2023). *Central Line-Associated Bloodstream Infections in Canadian Intensive Care Units: National Surveillance Report.* Canadian Nosocomial Infection Surveillance Program (CNISP), Public Health Agency of Canada.