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IMPLEMENTATION OF A COMMUNITY PHARMACIST-LED TESTING PROGRAM FOR HIV, HEPATITIS C AND SYPHILIS IN CANADA

ABSTRACT

Background

Sexually transmitted and blood-borne infections (STBBI) pose significant public health challenges globally. Pharmacist-led testing programs may overcome barriers and improve access and equity. The APPROACH 2.0 study aimed to assess implementation factors associated with developing and implementing a pharmacist-led testing program for human immunodeficiency virus (HIV), hepatitis C virus (HCV), and syphilis infections in community pharmacies across three Canadian provinces.

Methods

We utilized a mixed-method exploratory cross-sectional design, offering participants a choice of point-of-care (POC) testing for HIV and HCV and/or dried blood spot (DBS) testing for HIV, HCV, and syphilis available at community pharmacies and outreach events. Pharmacists completed a comprehensive training program prior to recruitment. We used the Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) framework to guide evaluation, with focus on reach, effectiveness and implementation.

Results

Between December 2022 and April 2024, 399 participants aged 18-75 years were tested. The study reached participants who had not been tested previously (35% HIV, 43% HCV, and 62% syphilis) despite many reporting risk behaviours supporting STBBI testing. In total, 1424 tests were performed including 598 HIV tests (386 participants), 555 HCV tests (349 participants), and 271 syphilis tests (271 participants). While some participants reported no preference for type of testing (36%), 79% reported the importance of having

test results immediately, some indicating that they would not go elsewhere (15%) or were unsure if they would go elsewhere (32%) if pharmacist testing was not available that day. Twenty-five participants received reactive results with four active HCV infections and two active syphilis infections confirmed. Overall, protocols were delivered as intended and length of testing visit was feasible.

Conclusions

Our findings demonstrate the potential of a pharmacist-led HIV, HCV, and syphilis testing service to reach untested populations. Implementing pharmacist-led testing tailored to individuals' varied needs and preferences may reduce barriers, allow for earlier detection and linkage to care, and contribute to improved public health outcomes. Future research should explore implementation factors to optimize reach to priority populations, integration into existing pharmacy workflow, provincial public health systems and community, and maintenance to support scale and sustainability.

Trial Registration

This study was registered with ClinicalTrials.gov (NCT05534633).

CONTRIBUTIONS TO THE LITERATURE

- There is an urgent need for improved strategies for STBBI prevention, diagnosis, and treatment. Developing and evaluating comprehensive STBBI programs can improve access to testing and strengthen public health efforts to detect, prevent, and manage these infections.
- Our study reports on implementation outcomes of a comprehensive pharmacy-based STBBI testing program that includes multiple infections and testing options with the potential to improve equity and access to services

- Using the Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) framework to evaluate implementation facilitates the translation of research findings into actionable public health interventions and informs the scale-up and sustainability of pharmacist-led testing programs.

KEYWORDS

Sexually Transmitted and Bloodborne Infections, HIV Infections, Hepatitis C, Syphilis, Point-of-Care Testing, Dried Blood Spot Testing, Pharmacists, Community Pharmacy Services, Implementation Science, Public Health

BACKGROUND

Sexually transmitted and blood-borne infections (STBBI) pose a critical global public health challenge, with an estimated 374 million new curable sexually transmitted infections occurring annually, surpassing one million acquisitions daily and syphilis alone accounting for approximately 230,000 deaths per year.¹

Despite international strategic frameworks such as the WHO 2030 Global Health Sector Strategies, the global burden of STBBI remains high, demonstrating the urgent need for improved strategies for prevention, diagnosis and treatment, which are low barrier and stigma-free.²⁻⁵ Comprehensive approaches emphasizing education, awareness, and targeted interventions to improve equity and access to services are necessary, taking a status-neutral approach for both STBBI prevention and management.^{6,7}

Pharmacist-led STBBI testing programs may help overcome structural and social barriers to testing, as demonstrated by their high acceptability.⁸ These programs leverage pharmacy accessibility and the expanded clinical role of community pharmacists in providing STBBI testing and management.^{9,10} Pharmacists who provide rapid testing and linkage to care services can help to bridge healthcare gaps,

reduce barriers to STBBI screening and detection, and facilitate streamlined access to management.^{8,11}

Pharmacists can also provide education about STBBI prevention and the importance of regular testing as part of a personal wellness strategy.^{12,13}

While pharmacies have demonstrated their potential as accessible venues for STBBI screening, there is a notable gap in reporting on the implementation of comprehensive STBBI testing programs led by pharmacists.¹⁴ Given overlapping modes of transmission, programs should strive to offer comprehensive testing for STBBI that align with practice guidelines, while considering sample collection feasibility and available testing modalities.¹⁵ Many studies have concentrated on human immunodeficiency virus (HIV) testing with limited integrated testing for other STBBI, such as hepatitis C virus (HCV) and *Treponema pallidum* (syphilis), within pharmacy settings.^{16,17} Those studies that tested for multiple infections have not systematically reported on implementation and service outcomes.^{9,18} Developing and evaluating comprehensive STBBI programs can improve access to testing and strengthen public health efforts to detect, prevent, and manage these infections.^{19,20}

Building upon our pilot APPROACH^a study, a type 2 hybrid implementation-effectiveness study of pharmacist testing for HIV,^{21,22} we refined and adapted the testing model towards a more comprehensive approach to testing options and implementation outcomes reporting. The goal of this APPROACH 2.0 study was to implement a pharmacist-led testing program for HIV, HCV and syphilis across three Canadian provinces, offering participants a choice of point-of-care (POC) and/or dried blood spot (DBS) testing led by a pharmacist. This innovative approach, which combined testing for multiple STBBI using different testing modalities by participant choice, represents a novel contribution to the field. The inclusion of multiple provinces enables the study to capture different healthcare systems and diverse geographical settings,

^a Adaptation of POCT for Pharmacies to Reduce risk and Optimize Access to Care in HIV

varied socioeconomic strata, and population groups, aligning with the Canadian landscape while also contributing to global conversations on equity and access within social determinants of health.

We used the Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) framework to guide our evaluation of program implementation as this approach facilitates translating research findings into actionable public health interventions.²³ Focusing on Reach, Effectiveness, and selected elements of Implementation of the RE-AIM framework, this study aimed to evaluate the implementation of an STBBI testing service offered by pharmacists. Taken together, this study is the first to evaluate a pharmacist-led program offering participant choice between POC and DBS testing for HIV, HCV, and/or syphilis across multiple Canadian provinces, with implementation outcomes guided by RE-AIM. Reporting of implementation results adheres to the Standards for Reporting Implementation Studies (StaRI)²⁴ to help structure distinguish individual-level Reach and Effectiveness of the testing options from the specific implementation outcomes of the delivery model. The StaRI checklist is included as an additional file (Additional File 1).

METHODS

Study Design

The APPROACH 2.0 study utilized a mixed-methods exploratory cross-sectional design to develop and implement a pharmacist-led STBBI testing program. Participants were not randomized as we wished to provide choice to understand their preferences regarding testing at a pharmacy and available testing options.

Setting

185 The study was conducted in three Canadian provinces: Newfoundland & Labrador (NL), Nova Scotia (NS),
186 and Alberta (AB). Participating APPROACH 2.0 pharmacies were selected from those who expressed
187 interest, had management support for pharmacist participation, and at least one pharmacist interested in
188 testing who agreed to participate in the mandatory training program. Efforts were made to recruit
189 pharmacists from rural and urban areas in each province, especially from areas with a lack of STBBI
190 services or a perceived need for services in the community, with attempts to ensure there was more than
191 one testing pharmacist at each pharmacy for continuity. The study offered participants a choice of POC
192 testing for HIV and/or HCV, as well as DBS testing for HIV, HCV, and/or syphilis infections in participating
193 community pharmacies and at community outreach events in NL, NS, and AB.

194

195 ***Pharmacist Training and Site Preparation***

196 Prior to study launch, pharmacists completed a comprehensive online and in-person training program. The
197 online program provided an overview of HIV, HCV, and syphilis symptoms and diagnosis, and an
198 introduction to testing modalities. The in-person curriculum covered pre-and post-test counselling, POC
199 test administration and results interpretation, DBS sample collection and interpretation of result reports,
200 communication strategies to address reactive test results, and linkage to care protocols as well as
201 informed consent and study procedures. Pharmacists were asked to facilitate individual stigma
202 assessments²⁵ with their pharmacy staff, which were kept private, followed by discussions on ways to
203 create a welcoming, inclusive environment in the pharmacy. Site visits were conducted by research staff to
204 walk through the testing visit and data collection protocols and address logistical issues. Research staff
205 were on call to respond to pharmacists throughout the study.

206

207 Each pharmacist was offered an honorarium of \$50 per study participant and for completing the training
208 program, in recognition of time spent on training and data collection.

209

210 ***Participant Recruitment***

211 Adults aged 18 years or older were eligible to participate if they could understand and communicate in
 212 English and if they had a provincial healthcare number (required for linkage to care but not shared with the
 213 research team).

214

215 The study employed a multipronged promotion strategy to advertise the availability of the testing study,
 216 testing locations, and testing hours to encourage participant recruitment. Efforts were made to promote
 217 the program to key populations as defined by STBBI testing guidelines,²⁶ although anyone who met the
 218 eligibility criteria could participate. Promotion strategies included advertising through Google AdWords and
 219 social media (Facebook, Instagram, Snapchat), dating applications and blog sites (Squirt, Tinder, Grindr),
 220 and posters and other print materials displayed in pharmacies and distributed by partnering with
 221 community organizations. Interviews with researchers on radio, television, and in print media and a study
 222 website were also used to promote the study. Outreach testing events, such as on university campuses
 223 and public libraries, were promoted through social media and in collaboration with community partners.
 224 Pharmacy staff attached study brochures to prescription bags and to harm reduction kits distributed to
 225 clients. Additionally, pharmacists were encouraged to verbally mention the study and offer testing to
 226 interested individuals in their day-to-day practice. STBBI testing was available to research participants by
 227 self-referral appointment or on a walk-in basis during the advertised testing hours as determined by each
 228 pharmacy and based on staffing and workflow.

229

230 ***Intervention***

231 Pharmacists were responsible for the testing process. Testing visits began in a private counselling room in
 232 the pharmacy or in a pre-approved private room at an outreach location (e.g., a community organization,

233 local library, or university campus). The pharmacist explained the study objectives, obtained written
234 informed consent, and collected study data. The POC and DBS testing options were explained, and
235 participants could choose any combination of tests and testing modalities for which they were eligible
236 based on their prior infection status (explained below).

237

238 Testing for HIV and HCV could be conducted via either POC or DBS methods. Syphilis testing was only
239 available through DBS in this study. The INSTI® HIV-1/HIV-2 Antibody Test²⁷ and OraQuick® HCV Rapid Test²⁸
240 used fingerstick blood samples to test for infections. These rapid POC tests are Health Canada-approved
241 for use by trained healthcare providers to detect antibodies to HIV in approximately one minute and HCV in
242 20 minutes, respectively. DBS testing could identify any combination of HIV, HCV and/or syphilis antibodies
243 as well as RNA for HIV and HCV. HIV testing was not offered to those with a previous diagnosis of HIV
244 because infection is lifelong. HCV POC testing was not offered to those with a previous diagnosis of HCV as
245 antibodies persist lifelong; however, DBS testing was offered if participants had a known prior infection as it
246 can detect HCV RNA which would indicate a current infection. Syphilis testing was originally offered to all,
247 but a protocol amendment was made shortly after study launch to exclude patients with a previous
248 diagnosis of syphilis since DBS testing could not differentiate between past and current infections.

249

250 For DBS testing, a fingerstick blood sample was applied to a specialized filter paper card (Whatman™ 903
251 Proteinsaver Card) and samples were sent to the National Microbiology Laboratory (NML) in Winnipeg,
252 Manitoba, Canada for analysis. In NL and NS, DBS samples were mailed directly from the pharmacy to the
253 NML via standard postal services and DBS test results were faxed directly to pharmacies. In contrast, AB
254 DBS samples were mailed to the AB Provincial Laboratory for Public Health (AB Prov Lab), which then
255 forwarded samples to the NML. NML results were returned to the AB Prov Lab and subsequently entered
256 into the participants' health records for retrieval by the pharmacists. Once the DBS results were

received/retrieved, the pharmacist contacted the participant to explain the test result(s) and address any questions or concerns. Pharmacists aimed to deliver reactive test results in person whenever possible.

Results of POC and DBS tests were considered screening in this study, meaning that any reactive (positive) POC or DBS test results required confirmatory testing via standard testing through the respective provincial laboratory. Participants with reactive results, indeterminant or inconclusive results, or who disclosed known previous infections or possible exposure to infection within the last three months (ie. the window period for the POC test), were offered a requisition for standard testing. Linkage to care plans were created for each STBBI in each province. In all provinces, these participants were offered laboratory requisitions for confirmatory testing through local laboratories, with follow-up care provided by collaborating physicians or public health providers.

Pharmacists provided pre- and post-test counselling as part of the testing visit and provided information about HIV pre-exposure prophylaxis (PrEP) and other harm reduction education to support STBBI prevention. Condoms were offered to all participants as well as information about local resources for access to HIV PrEP.

Outcomes

As noted by Pinnock and colleagues²⁴ not all implementation studies designate a primary outcome; in this study, measures of reach, effectiveness, and implementation were of equal importance. We assessed the reach of the pharmacist STBBI testing service to priority populations as measured by the proportion of those tested who had never been tested before; proportion who had risk factors indicating need for STBBI testing; and, describing demographics for those who were tested by a pharmacist. Effectiveness of the pharmacist-led STBBI testing service was assessed through testing outcomes including: the proportion of

281 clients tested for each infection type with POC and/or DBS testing; proportion of test reactivity (and
282 secondarily, the results of confirmatory testing for each infection); and, participant preferences for POC
283 and/or DBS testing, infections to be tested for, and reasons for choosing pharmacist testing over other
284 testing options. The extent and quality of the implementation of a pharmacist-led STBBI testing service was
285 assessed by measuring: the degree to which testing protocols were delivered as intended through
286 evaluation of the fidelity of the service and reporting of protocol deviations; and feasibility was assessed
287 through reporting time to perform testing, and time from DBS sample collection to return of participant
288 results.

289

290 Additional measures of fidelity were assessed through pharmacist focus groups after the study ended and
291 effectiveness measures included participant satisfaction and acceptability of the pharmacist testing
292 program, which will be reported in a separate publication.

293

294 ***Process Evaluation and Data Collection***

295 Reach was determined by assessing self-reported participant demographics, risk behaviours, and
296 previous STBBI testing status. Because we did not know the total number of eligible individuals in the
297 population in each community/province, we could not calculate the proportions reached. Participants
298 were asked to complete a pre-test survey, which included geographic and demographic questions (age,
299 gender, ethnicity, relationship status, highest education attained, employment and income level),
300 information about risk factors and previous STBBI testing history.

301

302 Effectiveness was assessed through number of tests performed, testing outcomes and participant
303 preferences. Pre-test survey questions asking about preferences for pharmacist testing and POC or DBS

304 testing options helped inform motivation for participation, and whether it was to access specific testing
305 options vs. preference for testing by the pharmacist.

306

307 Implementation of the testing program was determined by assessing fidelity to the study protocol and
308 reporting on protocol deviations, including appropriate test administration, results interpretation and
309 linkages to care. Time to perform the testing visits and the time taken from testing visit to DBS testing
310 participants receiving their results were also documented. Pharmacist workload logs were used to capture
311 testing visit dates, participant study ID, type of test(s) performed, test lot numbers, and test results (i.e.
312 reactive, non-reactive, invalid, or indeterminate), and the time to complete each testing visit. For DBS tests,
313 pharmacists recorded the dates of sample collection, sample sent to the lab, receipt of results, and
314 reporting results to participants.

315

316 The REDCap (Research Electronic Data Capture; Vanderbilt University) tool hosted at the University of
317 Alberta was used to collect pharmacists' worklog data and for participant survey data collection.^{29,30}

318

319 **Sample**

320 This study did not include a predetermined sample size calculation because of its exploratory nature and
321 lack of prior knowledge regarding the total population size. Participants were recruited using convenience
322 sampling allowing for the inclusion of individuals who met eligibility criteria. No maximum number of
323 participants was pre-specified. Efforts were made to encourage diversity within the sample by targeting
324 promotion efforts towards different demographics and in specific geographic regions.

325

326 **Data Analysis**

Descriptive statistics were used to summarize participant characteristics and testing outcomes. Pearson's Chi-square tests were utilized to examine exploratory subgroup comparisons. Fisher's Exact Test was employed to calculate p -values when more than 20% of expected cells had a frequency of less than five. All analyses were conducted using SPSS v29.0 and a two-sided p -value of <0.05 was considered statistically significant.

RESULTS

A total of 77 pharmacists from 34 pharmacies located across urban and rural areas of NL, NS, and AB completed the training and participated in the study. Of these, 51 pharmacists (66%) conducted at least one testing visit. Between December 1, 2022, and April 3, 2024, 401 participants enrolled in the study; two withdrew prior to testing, with one requesting pharmacist-ordered standard testing outside of the study and the other declining testing after counselling. This analysis describes the results for the 399 participants who underwent at least one test during their visit.

REACH: Participant Demographics, Prior Testing Status, and Risk Behaviours

Table 1 details participant-reported characteristics from those who completed pre-test survey responses.^b Participant ages ranged from 18 to 75 years, with a median age of 33 years. The majority self-identified as being men (57%) and Caucasian/White (68%). One-third (34%) of participants reported either not having or being uncertain about having access to a primary care provider (e.g., a family doctor or nurse practitioner). Most testing visits (78%) occurred in larger urban centers; with 60% of participants residing in large urban areas. Participants reported travelling an average of 14.1 km to undergo testing, with a range of 0–700 km. Significant geographic variations were observed across several demographic indicators, including gender ($p < 0.001$) and highest educational attainment ($p = 0.004$). Additionally, the proportions of participants

^b 387 participants completed at least one question on the pre-test survey.

EFFECTIVENESS: Testing Uptake, Outcomes and Preferences

During the study period, 1424 tests were performed among the 399 participants. To assess participants' preferences for POC and/or DBS testing, this study allowed them to select any combination of testing options for which they were eligible. Most eligible participants (60%) chose both the POC and DBS tests. In contrast, 30% chose only POC HIV or HCV test(s), whereas 10% selected only the DBS test. The NML routinely tested DBS study samples for all three infections if sufficient quantity was received unless pharmacists specified not to test for a given infection; as result, many samples were tested for HIV and HCV even if a POC test was also conducted. There were no discordant results between POC and DBS tests performed for the same infection in the same participant. Five hundred ninety-eight HIV tests were administered to 386 participants, including 350 HIV POC tests and 248 DBS tests. Five hundred fifty-five HCV tests were administered to 349 participants, including 309 HCV POC tests and 246 DBS tests. Two hundred seventy-one DBS tests for syphilis were conducted with 271 participants.

In total, 25 participants received reactive results from 32 tests (11 POC and 21 DBS). This included one participant with a reactive HIV POC result, 11 participants with at least one reactive HCV result (10 POC, 8 DBS), and 13 participants with reactive syphilis DBS test results. The testing outcomes, including the number of testing encounters, infections screened, tests performed, and reactive results are presented in Table 4.

Table 4: POC and DBS Testing Results				
	NL	NS	AB	Total
Testing Encounters				
Total number consented testing visits	138	147	116	401
Testing visits with at least 1 test completed	138	146	115	399
Infection Testing				
Participants with <i>any</i> HIV testing	136	142	108	386
Participants with <i>any</i> HCV testing	118	138	93	349
Participants with <i>syphilis</i> testing	96	119	56	271

Tests Performed				
HIV POC test	131	118	101	350
HCV POC test	110	113	86	309
<i>DBS samples collected^c</i>	<i>100</i>	<i>119</i>	<i>58</i>	<i>277</i>
HIV DBS testing	92	104	52	248
HCV DBS testing	90	104	52	246
Syphilis DBS testing	96	119	56	271
Total tests performed	519	558	347	1424
Reactive Tests (N = 25 participants)				
HIV POC	0	0	1	1
HCV POC	8	1	1	10
HIV DBS	0	0	0	0
HCV DBS	7	1	0	8
Syphilis DBS	3	5	5	13
Total tests with reactive results	18	7	7	32

All 25 participants with reactive results were offered a laboratory requisition to facilitate confirmatory standard testing and referral to the designated healthcare provider for follow up care, according to provincial linkage to care plans. Sixteen of the 25 participants with reactive study test results completed confirmatory testing (Table 5).

Table 5: Confirmatory Testing Results					
Participants	Reactive	Confirmatory testing complete	Confirmed negative infection	Confirmed current infection	Unknown*
Total participants with HIV reactive	1	0	-	-	1
Total participants with HCV reactive	11	7	3	4	4
Total participants with Syphilis reactive	13	9	7	2	4
Total participants	25	16	10	6	9
<i>*Unknown includes participants who declined further testing (1), were not offered confirmatory testing (protocol deviation; 3), and those who sought follow-up outside of the study protocol (1) or were given a lab requisition that was not completed (4).</i>					

Standard testing conducted through the respective provincial laboratories confirmed four current HCV infections (i.e. HCV antibody positive and detectable HCV RNA) and two current syphilis infections (i.e. T.

^c The National Microbiology Lab routinely tested study samples for all three infections if sufficient quantity was received, unless pharmacists specified not to test for a given infection. Therefore, the number of DBS tests for each infection does not necessarily reflect the number of patient requests for testing for that infection.

394 *pallidum* particle agglutination assay and Rapid Plasma Reagin reactive enzyme immunoassay with
 395 antibody titers indicative of new or current infection when compared to previous results, if available). Of
 396 these six participants with confirmed infection, five reported being first-time testers, four reported having a
 397 primary care provider, and three were in the lowest annual income bracket (< \$15,000).

398

399 When participants were asked why they came to the pharmacy today in the pre-test survey, 36% indicated
 400 that they wanted to be tested at the pharmacy but had no preference for the type of test (POC or DBS)
 401 used. Having test results immediately was important for 79% of participants who responded, consistent
 402 with the high uptake of POC testing. Overall, 69% preferred finger-stick blood samples (used for both POC
 403 and DBS testing) to venous sample collection required for standard testing.

404

405 Forty-seven percent of participants indicated that if pharmacist testing was not available that day, they
 406 would not go elsewhere (15%) or were unsure if they would go elsewhere (32%). Approximately 11%
 407 reported that they had “nowhere else to get tested,” but this average varied by province – 18% of responses
 408 from NS, 10% from NL, and 4% from AB ($\chi^2(2) = 13.84$, $p < 0.001$).

409

410 ***IMPLEMENTATION: Fidelity and Feasibility***

411 Among those who disclosed prior infections, two individuals with a known previous HCV infection received
 412 POC HCV testing and syphilis testing was conducted on five participants despite a known prior infection,
 413 constituting protocol deviations. No current infections were confirmed in any of these cases.

414

415 Nine participants with reactive results did not receive further testing through the study: three (1 HCV DBST,
 416 2 syphilis) later disclosed they had prior infection but were not offered additional testing through the study
 417 (protocol deviations), one (HIV POCT) declined the offer of confirmatory testing despite follow up efforts

418 made by the pharmacist, one (HCV POCT) decided to pursue confirmatory testing through their primary
419 care provider outside of study protocol, and four accepted a laboratory requisition from the pharmacist but
420 did not complete the confirmatory testing. These last four participants were lost to follow-up, rendering
421 their status unknown.

422

423 Nine syphilis DBS test results were indeterminate; eight of those participants had confirmatory testing with
424 no cases of current syphilis infection found, and the other participant did not complete laboratory testing.
425 These did not constitute protocol deviations, nor were the results due to improper sample collection by the
426 pharmacist. Rather, the laboratory reported these results as indeterminate or “grey zone,” indicating a
427 borderline-positive result for which standard testing was recommended to confirm.

428

429 Pharmacists documented “invalid” results for six HIV and one HCV POC tests, which were predominantly
430 due to insufficient sample collection to complete the test. On repeat POC testing, results were obtained for
431 four participants, two were offered standard testing but opted to wait for their DBS test results instead, and
432 one participant declined repeat POC or standard testing. Seven participants who requested DBS testing
433 could not receive results due to insufficient sample. Often participants requested multiple tests, which
434 may have impacted ability to collect sufficient samples to conduct all tests, though other factors including
435 cold or callused hands, poor circulation and difficulty filling the pipette for HIV POC were also noted.

436

437 Pharmacists estimated an average of 25 minutes to complete a testing visit (not including time to consent).
438 Testing visit length depended on the number and types of tests requested and ease of sample collection.

439

440 Pharmacists received DBS test results within a median of 20 days (IQR, 17 – 21) in NL, 22 days (IQR 21 – 24)
441 in NS, and 25 days (IQR 19 – 27) in AB from the date of sample collection. The NML processed DBS samples

within an overall median of 13 days (IQR 9 – 13) from the date of receipt. The overlap between the median and the third quartile indicates that the vast majority ($\geq 75\%$) of samples were processed within 13 days.

DISCUSSION

APPROACH 2.0 demonstrated that pharmacist-led testing for HIV, HCV and syphilis is a feasible and effective STBBI screening strategy, which found new infections and reached people who had not previously been tested. This study provides foundational data on a pharmacist-led STBBI testing program to offer both a choice of POC and DBS testing options, and which offered testing for all three of HIV, HCV and syphilis infections. Considering their shared risks of transmission, STBBI guidelines recommend screening for all STBBI among people at risk.²⁶ Offering a suite of testing options is an improvement over our earlier work in the APPROACH pilot study,²¹ which offered testing for HIV only. The testing approach from the current study offers an important public health service that pharmacists can provide.

Understanding implementation factors is necessary for scale and spread of this effective intervention. Despite having access to a primary care provider, many participants in this study were being tested for the first time, highlighting gaps in access to routine testing and opportunities for earlier diagnosis. Among those with confirmed STBBI, 83% were first-time testers and two-thirds indicated they had a primary care provider outside of their pharmacy supporting that pharmacist-led testing is reaching those who may benefit most and overcoming barriers beyond lack of access. This is consistent with findings from other studies of pharmacist-led testing, which have been found to improve accessibility and equity, and are associated with high participant satisfaction.^{31,32} Our pilot study of pharmacist-administered POC testing for HIV reached 27% first-time testers, found one new case of HIV among 123 participants, and was felt to offer a convenient, discreet, supportive testing experience to participants.²¹ Similar findings were also reported in a scoping review, where patients reported positive experiences with pharmacy-based STBBI

services, citing accessibility and trust in pharmacists as significant factors.¹⁴ By offering an accessible and inclusive environment, pharmacists may increase uptake of STBBI testing in communities.

Part of the effectiveness of this intervention may lie with the testing options offered in the study. Attributes of the testing modalities offered were attractive to study participants and may have influenced some people in choosing to get tested at the pharmacy if they were not available elsewhere. There were strong preferences for fingerstick testing over providing a venous blood sample and to receive results immediately, indicating that POC and/or DBS testing are useful tools to support increased uptake. Most DBS samples were analyzed for syphilis infection alongside HIV and HCV, suggesting the inclusion of syphilis testing may have been an important factor motivating participants to choose DBS testing. This finding aligns with evidence showing that multiplexed testing for multiple STBBI enhances testing uptake and acceptability by offering a comprehensive screening option.³³ The relative ease of DBS sample collection and the ability to test for multiple infections simultaneously address barriers to testing access, particularly in community settings. A community syphilis awareness campaign in NL revealed that the availability and accessibility of testing sites varied across health zones with no consistent pathways to testing across the province,³⁴ which underscores the value of offering pharmacist testing to help address syphilis outbreaks in communities.

Several important implementation findings related to time for return of DBS results, testing eligibility, DBS results interpretation, and linkage to care plans were noted. The return of DBS test results to the pharmacy took 3-4 weeks in most cases and was dependent on whether samples were sent directly to the testing laboratory or were routed through a provincial laboratory first for sample registration and results recording. Outside of research settings it is likely that testing pharmacists would offer one of POC or DBS testing, and not both tests for the same infection, considering feasibility and other factors that would help to streamline

490 workflow processes and reduce redundancy. These logistic considerations are important to plan for as
491 testing programs are scaled because documentation of results in patient care records and reporting
492 infections to public health are essential elements of STBBI testing programs. Provincial and professional
493 regulatory requirements will influence pathways but efficiencies to reduce turn-around times and integrate
494 into existing care pathways should be sought to support sustainability.

495

496 Several protocol deviations were documented including participants with prior infections being offered
497 antibody-detecting tests that could not discern between prior and current infections, some of whom did
498 not receive laboratory requisitions for standard testing to rule out a current active infection requiring
499 treatment. In some situations, participants did not disclose their prior infection to the pharmacist until
500 after receiving a reactive screening test result. Additionally, there were several indeterminate or “grey zone”
501 DBS syphilis test results, which provided a challenge to pharmacists for both interpretation and
502 explanation to participants as the results were not clearly reactive, nor were they non-reactive or indicative
503 of performance failure, as had been explained in their training program. Syphilis testing by DBS relies only
504 on detection of treponemal-specific antibodies and the NML reported samples within a close margin of the
505 reactive cutoff for syphilis serology as indeterminate results. This conservative approach increases the
506 sensitivity of the test to avoid reporting false-negative results, but comes at the expense of specificity,
507 resulting in some potential false positive results. Indeed, none of the indeterminate syphilis DBS test
508 results for which confirmatory testing was available (8/9) were confirmed current infections, although it is
509 possible some of these cases were reactive by treponemal antibody screen due to prior infection.
510 Explanation of these results requires some nuance and a higher level of understanding about DBS syphilis
511 testing procedures than was included in the training program. Explanation of the limitations of the tests to
512 participants as part of pre-test counselling may mitigate some of these issues but it is recognized that

people may still choose not to disclose their prior infection status and pharmacists must be prepared to manage this situation.

Our findings suggest that linkage to care plans are necessary but should be flexible. We defined specific linkage to care pathways for each province as a supportive measure for study pharmacists and to ensure participants without a primary care provider would receive follow-up. However, some participants chose to receive care outside of our study protocol. Linkage to care rates in other pharmacist testing studies have varied, ranging from 28% to 100%,³⁵ with higher rates of confirmatory testing and care when assessment was conducted in pharmacies rather than being referred outside the pharmacy.^{32,36} Balance between ensuring participants have access to follow up and providing flexibility to allow participants to receive care if and how they choose is needed. Our documented linkage to care rate may have been increased if participants had the flexibility to receive care from a provider of their choosing or from pharmacists with the ability to order and receive confirmatory lab tests themselves, which was the case in AB but not the other provinces at the time of the study. As scope of practice continues to expand across Canada this could be an opportunity in future. Data from studies such as ours could support the policy changes needed to reduce barriers to not only testing, but also confirmatory testing and treatment.

Finally, this work has important implications for pharmacy practice. Numerous studies have demonstrated that pharmacist testing for STBBI is effective and highly accepted by participants and this study provides useful data to inform implementation.^{8,32} Feasibility and fidelity measures show that pharmacists can implement testing services within their workflow with planning and preparation. As pharmacist scope of practice continues to evolve in this area, tools and strategies to support implementation are needed. Balancing fidelity with flexibility to adapt to clients' diverse needs and preferences will enable scale up.

More work is needed to influence the factors necessary for successful reach, adoption, implementation, and maintenance of pharmacist-based STBBI services.

Limitations

The APPROACH 2.0 study provided valuable information about the reach, effectiveness and implementation considerations in providing a comprehensive STBBI testing strategy inclusive of HIV, HCV, and syphilis by pharmacists. The project included many strengths including multi-province scope, real world implementation, integration with national (and in the case of AB, also provincial) public health labs, and a strong theoretical foundation embedded in science implementation. Importantly though, there are some limitations that deserve attention.

While efforts were made to recruit participants with diverse demographics and risk behaviours, some groups are under-represented, such as people who use drugs and gender-diverse individuals. A non-randomized study design was selected to allow assessment of participant preferences but consequently it is not possible to say whether pharmacist testing is equivalent or preferred to other testing options. Participants who reported a preference for testing at the pharmacy/by a pharmacist versus other testing venues and options are subject to selection bias as data are available only for those who chose to access pharmacist-led testing. Similarly, participant preferences regarding POC as compared to DBS testing should be interpreted with caution since DBS was the only way to access syphilis testing in this study and participants expressed their preferences before receiving testing; therefore, a full comparison of testing methods preference was not possible. At the time of study launch, the INSTI® Multiplex HIV-1/2 Syphilis POC test was not approved by Health Canada; availability of this option may have influenced preferences around DBS testing. Finally, provincial laboratory and care pathways and the scope of pharmacist practice differed among the provinces in this study, which both shaped and challenged the study protocols. This

had an influence on turnaround times for receipt of DBS results and may have impacted how pharmacists interacted with study participants, including whether alternative confirmatory testing options and linkage to care pathways could be offered outside of study protocols.

CONCLUSIONS

Despite relatively few confirmed infections, this pharmacist-led STBBI testing program reached a large proportion of first-time test takers and individuals who otherwise would likely not have tested. This demonstrates public health value beyond case finding alone. Increasing the accessibility of screening among asymptomatic individuals is critical to achieve national and global targets for HIV, HCV and other STBBI.⁷ Testing is not a “once and done” action but rather a dynamic process to keep people engaged in prevention, testing, treatment, and follow-up care as needed. Therefore, testing options should be accessible and tailored to individuals’ varied needs and preferences. The high proportion of first-time testers and participant preferences supports pharmacist-led testing as a promising engagement strategy in the STBBI test-prevent-treat continuum.

Pharmacist-led STBBI testing programs represent an important opportunity to expand access to essential healthcare services, as these programs leverage the expertise of pharmacists and the convenience of community pharmacies to provide timely and confidential testing for STBBI. By offering STBBI testing in pharmacies, barriers to care are reduced, allowing for the earlier detection, treatment, and prevention of these infections, and ultimately contributing to improved public health outcomes. The body of evidence for pharmacist testing models for STBBI strongly support this direction, and future studies should continue to explore implementation factors to optimize reach to priority populations, integration into existing pharmacy workflow, provincial public health systems and community, and maintenance to support scale and sustainability.

584 **LIST OF ABBREVIATIONS:**

AB	Alberta
APPROACH 2.0	Adaptation of POCT for Pharmacies to Reduce Risk and Optimize Access to Care in HIV
DBS	Dried blood spot
ELISA	Enzyme-Linked Immunosorbent Assay
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
HREB	Human Research Ethics Board
NL	Newfoundland and Labrador
NML	National Microbiology Laboratory
NS	Nova Scotia
POC	Point-of-care
PrEP	Pre-exposure prophylaxis
RE-AIM	Reach, Effectiveness, Adoption, Implementation, and Maintenance.
REB	Research Ethics Board
REDCap	Research Electronic Data Capture
RPR	Rapid Plasma Reagin
StaRI	Standards for Reporting Implementation Studies
STBBI	Sexually transmitted and bloodborne infections
STI	Sexually transmitted infections
TPPA	<i>Treponema pallidum</i> particle agglutination assay

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586 **ADDITIONAL MATERIALS**587 ***Additional file 1_StaRI Checklist (.doc)***

588 Standards for Reporting Implementation Studies: The StaRI checklist is used to guide reporting of
 589 implementation results.

590

591 **DECLARATIONS**592 ***Ethics approval and consent to participate***

593 Ethics approvals according to the principles and guidelines of the Tri-Council Policy Statement for the
 594 Ethical Conduct for Research Involving Humans³⁷ were obtained from the respective Health Research
 595 Ethics Boards for Memorial University (lead site, HREB File 2022.060), the University of Alberta
 596 (Pro0012128), the Nova Scotia Health Authority (REB File 1028410), and the Public Health Agency of

597 Canada / Health Canada (REB 2022-032P). Informed consent was obtained from participants and
598 documented by the pharmacists. Data privacy and confidentiality were maintained through secure data
599 storage and de-identification of participant information.

600

601 ***Consent for publication***

602 Not applicable

603

604 ***Availability of data and materials***

605 Participants did not explicitly consent to the public release of their data. Due to the sensitive information
606 collected, the datasets generated and analysed for the APPROACH 2.0 study are not publicly available but
607 may be available from the corresponding author on reasonable request.

608

609 ***Competing interests***

610 DVK received research funding from Canadian Institute of Health Research and Gilead Sciences and
611 speaking/consulting fees from Gilead Sciences and ViiV Healthcare. KW received research funding from
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613 Scotia, and Shoppers Drug Mart. TH received research funding from Canadian Institute of Health Research
614 and CDC and speaking/consulting fees from Hologic and Pfizer. CLC received research funding from Merck,
615 in-kind support for research from Roche, Abbott and BioRad, and consulted for GSK. None of these
616 relationships impact this work. Authors AB, CMC, CH, GH, GY, JG, JK, JN, MdE-H, NJ, PD, RL, TR, YZZMM
617 declare that they have no competing interests.

618

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622

623 ***Authors' contributions***

624 DVK is the APPROACH 2.0 study Principal Investigator, responsible for leading the study design and
625 research activities with provincial co-investigators CH and TR. AB, JN, and Md'E-H participated in data
626 collection. YZZMM analyzed and interpreted testing visit data with support from AB. DVK and YZZMM wrote
627 the manuscript with support from AB. All authors made substantial contributions to the interpretation of
628 data and reviewed the manuscript.

629

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REFERENCES

1. WHO. Sexually transmitted infections (STIs) [Internet]. World Health Organization; 2025. Available from: [https://www.who.int/news-room/fact-sheets/detail/sexually-transmitted-infections-\(stis\)](https://www.who.int/news-room/fact-sheets/detail/sexually-transmitted-infections-(stis))
2. Canadian Institutes of Health Research. CIHR HIV/AIDS and STBBI Research Initiative Strategic Plan: 2022–2027 [Internet]. Ottawa, ON: Canadian Institutes of Health Research; 2022. Available from: <https://cihr-irsc.gc.ca/e/52951.html>
3. Public Health Agency of Canada. Reducing the health impact of sexually transmitted and blood-borne infections in Canada by 2030: A pan-Canadian STBBI framework for action [program descriptions] [Internet]. 2018 [cited 2025 Jul 14]. Available from: <https://www.canada.ca/en/public-health/services/infectious-diseases/sexual-health-sexually-transmitted-infections/reports-publications/sexually-transmitted-blood-borne-infections-action-framework.html>
4. Public Health Agency of Canada. Government of Canada's Sexually Transmitted and Blood-Borne Infections (STBBI) Action Plan 2024–2030 [Internet]. Ottawa, ON: Public Health Agency of Canada; 2024. Available from: <https://www.canada.ca/en/public-health.html>
5. WHO. New report flags major increase in sexually transmitted infections, amidst challenges in HIV and hepatitis [Internet]. World Health Organization; 2024. Available from: <https://www.who.int/news/item/21-05-2024-new-report-flags-major-increase-in-sexually-transmitted-infections---amidst-challenges-in-hiv-and-hepatitis>
6. Laprise C, Bolster-Foucault C. Understanding barriers and facilitators to HIV testing in Canada from 2009-2019: A systematic mixed studies review. *Can Commun Dis Rep Relevé Mal Transm Au Can*. 2021 Mar 4;47(2):105–25. doi:10.14745/ccdr.v47i02a03
7. Myers JE, Braunstein SL, Xia Q, Scanlin K, Edelstein Z, Harriman G, et al. Redefining Prevention and Care: A Status-Neutral Approach to HIV. *Open Forum Infect Dis*. 2018 Jun 1;5(6):ofy097. doi:10.1093/ofid/ofy097
8. Bergin KM, Black EK, Murphy AL, Kelly DV, Wilby KJ. Pharmacists' acceptability of provision of sexually transmitted infection services: a scoping review. *Int J Pharm Pract*. 2025 Jul 24;33(4):369–77. doi:10.1093/ijpp/riaf039
9. Navarrete J, Yuksel N, Schindel TJ, Hughes CA. Sexual and reproductive health services provided by community pharmacists: a scoping review [Internet]. 2021 Jul 1. doi:10.1136/bmjopen-2020-047034
10. Newman TV, Hernandez I, Keyser D, San-Juan-Rodriguez A, Swart ECS, Shrank WH, et al. Optimizing the Role of Community Pharmacists in Managing the Health of Populations: Barriers, Facilitators, and Policy Recommendations. *J Manag Care Spec Pharm*. 2019 Sep;25(9):995–1000. doi:10.18553/jmcp.2019.25.9.995
11. Alshorman K, Hussain R. Community pharmacy-led point-of-care testing (POCT): expanding roles and strengthening health systems in low- and middle-income countries (LMICs). *J Pharm Policy Pract*. 18(1):2578803. doi:10.1080/20523211.2025.2578803

- 673 12. Harris IM, Hilaire ML, Jeon M, Kier KL, Munir FM, Carmon AS, et al. Pharmacists' role in combating
674 medical misinformation. *JACCP J Am Coll Clin Pharm*. 2024;7(9):947–51. doi:10.1002/jac5.2005
- 675 13. Hazelet E, Oliver A, Salay K, Rizzo B, Huet A, DiPietro N. Healthy People 2020: Identifying Roles for
676 Pharmacists in Public Health. *Pharm Wellness Rev*. 2011;2(2):16–21.
- 677 14. d'Entremont-Harris M, MacNabb K, Wilby KJ, Ramsey TD. Pharmacy-based sexually transmitted
678 infection service implementation considerations: A scoping review. *J Am Pharm Assoc*. 2024 Jan
679 1;64(1):186-196.e2. doi:10.1016/j.japh.2023.10.029
- 680 15. Gilbert M, Haag D, Hottes TS, Bondyra M, Elliot E, Chabot C, et al. Get Checked... Where? The
681 Development of a Comprehensive, Integrated Internet-Based Testing Program for Sexually Transmitted
682 and Blood-Borne Infections in British Columbia, Canada. *JMIR Res Protoc*. 2016 Sep 20;5(3):e6293.
683 doi:10.2196/resprot.6293
- 684 16. Crawford ND, Dean T, Rivera AV, Guffey T, Amesty S, Rudolph A, et al. Pharmacy Intervention to Improve
685 HIV Testing Uptake Using a Comprehensive Health Screening Approach. *Public Health Reports®*. 2016
686 Jan 1;131(1_suppl):139–46. doi:10.1177/00333549161310S116
- 687 17. Kherghehpoush S, McKeirnan KC. Pharmacist-led HIV and hepatitis C point-of-care testing and risk
688 mitigation counseling in individuals experiencing homelessness. *Explor Res Clin Soc Pharm*. 2021 Mar
689 1;1:100007. doi:10.1016/j.rcsop.2021.100007
- 690 18. Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, et al. Outcomes for implementation
691 research: conceptual distinctions, measurement challenges, and research agenda. *Adm Policy Ment*
692 *Health*. 2011 Mar;38(2):65–76. doi:10.1007/s10488-010-0319-7
- 693 19. Arrington-Sanders R, Hailey-Fair K, Wirtz AL, Morgan A, Brooks D, Castillo M, et al. Role of Structural
694 Marginalization, HIV Stigma, and Mistrust on HIV Prevention and Treatment Among Young Black Latinx
695 Men Who Have Sex with Men and Transgender Women: Perspectives from Youth Service Providers.
696 *AIDS Patient Care STDs*. 2020 Jan 1;34(1):7–15. doi:10.1089/apc.2019.0165
- 697 20. Baah FO, Teitelman AM, Riegel B. Marginalization: Conceptualizing patient vulnerabilities in the
698 framework of social determinants of health – An integrative review. *Nurs Inq*. 2019 Jan;26(1):e12268.
699 doi:10.1111/nin.12268
- 700 21. Kelly DV, Kielly J, Hughes C, Gahagan J, Asghari S, Hancock S, et al. Expanding access to HIV testing
701 through Canadian community pharmacies: findings from the APPROACH study. *BMC Public Health*.
702 2020 May 7;20(1):639. doi:10.1186/s12889-020-08719-0
- 703 22. Kielly J, Kelly DV, Hughes C, Day K, Hancock S, Asghari S, et al. Adaptation of POCT for pharmacies to
704 reduce risk and optimize access to care in HIV, the APPROACH study protocol: examining acceptability
705 and feasibility. *Pilot Feasibility Stud*. 2018;4:59. doi:10.1186/s40814-018-0252-1
- 706 23. Holtrop JS, Estabrooks PA, Gaglio B, Harden SM, Kessler RS, King DK, et al. Understanding and applying
707 the RE-AIM framework: Clarifications and resources. *J Clin Transl Sci*. 2021 Jan;5(1):e126.
708 doi:10.1017/cts.2021.789

- 709 24. Pinnock H, Barwick M, Carpenter CR, Eldridge S, Grandes G, Griffiths CJ, et al. Standards for Reporting
710 Implementation Studies (StaRI): explanation and elaboration document. *BMJ Open*. 2017 Apr
711 3;7(4):e013318. doi:10.1136/bmjopen-2016-013318
- 712 25. Canadian Public Health Association. Organizational Assessment Tool for Sexually Transmitted and
713 Blood-Borne Infections (STBBIs) and Stigma [Internet]. Ottawa, ON: Canadian Public Health
714 Association; 2017. Available from: [https://www.cpha.ca/organizational-assessment-tool-stbbis-and-](https://www.cpha.ca/organizational-assessment-tool-stbbis-and-stigma)
715 stigma
- 716 26. Public Health Agency of Canada. Syphilis guide: Screening and diagnostic testing [education and
717 awareness;guidance] [Internet]. 2021 [cited 2025 Jul 15]. Available from:
718 [https://www.canada.ca/en/public-health/services/infectious-diseases/sexual-health-sexually-](https://www.canada.ca/en/public-health/services/infectious-diseases/sexual-health-sexually-transmitted-infections/canadian-guidelines/syphilis/screening-diagnostic-testing.html)
719 transmitted-infections/canadian-guidelines/syphilis/screening-diagnostic-testing.html
- 720 27. bioLytical Laboratories. INSTI.com [Internet]. 2026 [cited 2026 Jan 7]. HIV Self Test | INSTI. Available
721 from: <https://insti.com/hiv-test/>
- 722 28. OraSure Technologies, Inc. OraSure.com [Internet]. 2026 [cited 2026 Jan 7]. OraQuick® HCV Rapid
723 Antibody Test. Available from: <https://orasure.com/products/OraQuick-HCV.html>
- 724 29. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture
725 (REDCap)--a metadata-driven methodology and workflow process for providing translational research
726 informatics support. *J Biomed Inform*. 2009 Apr;42(2):377–81. doi:10.1016/j.jbi.2008.08.010
- 727 30. Harris PA, Taylor R, Minor BL, Elliott V, Fernandez M, O’Neal L, et al. The REDCap consortium: Building
728 an international community of software platform partners. *J Biomed Inform*. 2019 Jul;95:103208.
729 doi:10.1016/j.jbi.2019.103208
- 730 31. Gonzalez PR, Black EK, Trenaman S, Wilby KJ. Improving equity of services for sexually transmitted
731 infections through community pharmacies: A scoping review. *J Am Pharm Assoc JAPhA*.
732 2024;64(1):197-203.e2. doi:10.1016/j.japh.2023.11.005
- 733 32. Winkelman S, Inamdar G, Kesler M, Kelly DV, Somani Z, Ho J, et al. Pharmacist-delivered HIV point-of-
734 care testing in Ontario: Lessons learned from the GetaTest pilot. *Can Pharm J CPJ*. 2022 Oct
735 2;155(6):309–14. doi:10.1177/17151635221128001
- 736 33. Naeem F, Karellis A, Nair S, Routy JP, Yansouni CP, Kim J, et al. Multiplexed technologies for sexually
737 transmitted infections: global evidence on patient-centered and clinical health outcomes. *BMJ Glob*
738 *Health*. 2021 Jul 23;6(7):e005670. doi:10.1136/bmjgh-2021-005670
- 739 34. Van Gennip J, Kazatchkine C, Chu SKH, Capretti A, Boulanger AR, Butler-McPhee J. The State of HIV in
740 Canada: Rights, Progress, and Unfinished Work [Internet]. HIV Legal Network; 2025 Dec. Available
741 from: <https://HIVLegalNetwork.ca/site/StateOfHIV2025>
- 742 35. Collins B, Bronson H, Elamin F, Yerkes L, Martin E. The “No Wrong Door” Approach to HIV Testing:
743 Results From a Statewide Retail Pharmacy–Based HIV Testing Program in Virginia, 2014-2016. *Public*
744 *Health Rep*. 2018 Nov 20;133(2 Suppl):34S-42S. doi:10.1177/0033354918801026

745 36. Hayes MJ, Beavon E, Traeger MW, Dillon JF, Radley A, Nielsen S, et al. Viral hepatitis testing and
746 treatment in community pharmacies: a systematic review and meta-analysis. *EClinicalMedicine*. 2024
747 Mar;69:102489. doi:10.1016/j.eclinm.2024.102489

748 37. Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of
749 Canada, and Social Sciences and Humanities Research Council of Canada. TriCouncil Policy
750 Statement: Ethical Conduct for Research Involving Humans. December 2022.

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771 **TABLE 1: Participant Self-reported Characteristics [insert in Line t]**

Table 1: Participant Self-reported Characteristics											
Participants Demographics, n (%)	NL		NS		AB		Overall		Pearson χ^2	df	P-Value
Mean Age, years (range)	38.1	(18 - 74)	35.3	(18 - 72)	37.9	(18 - 75)	37	(18 - 75)	17.18	12	0.14
Gender	130	(33.8%)	143	(37.1%)	112	(29.1%)	385	(100.0%)	-	-	<0.001*
Woman	37	(28.5%)	47	(32.9%)	45	(40.2%)	129	(33.5%)			
Man	86	(66.2%)	69	(48.3%)	63	(56.3%)	218	(56.6%)			
Trans woman	2	(1.5%)	1	(0.7%)	1	(0.9%)	4	(1.0%)			
Trans man	1	(0.8%)	4	(2.8%)	0	(0.0%)	5	(1.3%)			
Trans person	0	(0.0%)	2	(1.4%)	0	(0.0%)	2	(0.5%)			
Non-binary	0	(0.0%)	8	(5.6%)	2	(1.8%)	10	(2.6%)			
Genderqueer	2	(1.5%)	8	(5.6%)	0	(0.0%)	10	(2.6%)			
Gender fluid	0	(0.0%)	1	(0.7%)	0	(0.0%)	1	(0.3%)			
None of the above	1	(0.8%)	2	(1.4%)	1	(0.9%)	4	(1.0%)			
I prefer not to answer	1	(0.8%)	1	(0.7%)	0	(0.0%)	2	(0.5%)			
Ethnicity	138	(34.4%)	147	(36.7%)	116	(28.9%)	401	(100.0%)			
Caucasian/White	95	(68.8%)	116	(78.9%)	62	(53.4%)	273	(68.1%)	21.31	2	<0.001
Indigenous	6	(4.3%)	4	(2.7%)	5	(4.3%)	15	(3.7%)	0.71	2	0.70
African, Caribbean, or Black	7	(5.1%)	7	(4.8%)	10	(8.6%)	24	(6.0%)	1.95	2	0.38
South Asian or Middle Eastern	22	(15.9%)	11	(7.5%)	23	(19.8%)	56	(14.0%)	9.04	2	0.011
I belong to another group	6	(4.3%)	6	(4.1%)	12	(10.3%)	24	(6.0%)	5.37	2	0.068
I prefer not to answer	2	(1.4%)	3	(2.0%)	4	(3.4%)	9	(2.2%)	1.13	2	0.57
Access to primary care provider	128	(33.8%)	143	(37.7%)	108	(28.5%)	379	(100.0%)	9.15	6	0.17
Yes	85	(66.4%)	90	(62.9%)	66	(61.1%)	241	(63.6%)			
No	37	(28.9%)	50	(55.6%)	32	(29.6%)	119	(31.4%)			
Unsure	3	(2.3%)	2	(4.0%)	3	(2.8%)	8	(2.1%)			
I prefer not to answer	3	(2.3%)	1	(50.0%)	7	(6.5%)	11	(2.9%)			
Rural/urban residence	128	(33.7%)	143	(37.6%)	109	(28.7%)	380	(100.0%)	15.30	10	0.12
Rural area (e.g. Less than 1,000 population)	4	(3.1%)	10	(7.0%)	6	(5.5%)	20	(5.3%)			
Small urban area (e.g. 1,000 – 29,999 population)	19	(14.8%)	21	(14.7%)	6	(5.5%)	46	(12.1%)			
Medium urban area (e.g. 30,000 - 99999 population)	23	(18.0%)	22	(15.4%)	15	(13.8%)	60	(15.8%)			
Large urban area (e.g. > 100,000 population)	76	(59.4%)	82	(57.3%)	69	(63.3%)	227	(59.7%)			
Unsure	4	(3.1%)	7	(4.9%)	8	(7.3%)	19	(5.0%)			
I prefer not to answer	2	(1.6%)	1	(0.7%)	5	(4.6%)	8	(2.1%)			
Relationship status	136	(32.9%)	160	(38.7%)	117	(28.3%)	413	(100.0%)			
Single	43	(31.6%)	48	(30.0%)	46	(39.3%)	137	(33.2%)	1.98	2	0.37
Casually dating or hooking up	27	(19.9%)	51	(31.9%)	17	(14.5%)	95	(23.0%)	16.15	2	<0.001
Married, common-law, or in a committed relationship	56	(41.2%)	44	(27.5%)	37	(31.6%)	137	(33.2%)	4.78	2	0.092
Separated, divorced, or widowed	1	(0.7%)	3	(1.9%)	9	(7.7%)	13	(3.1%)	-	-	0.008*
Other	5	(3.7%)	9	(5.6%)	2	(1.7%)	16	(3.9%)	3.31	2	0.19
I prefer not to answer	4	(2.9%)	5	(3.1%)	6	(5.1%)	15	(3.6%)	0.92	2	0.63
Education (highest level)	129	(33.6%)	143	(37.2%)	112	(29.2%)	384	(100.0%)	-	-	0.0040*
Less than grade 12	3	(2.3%)	2	(1.4%)	8	(7.1%)	13	(3.4%)			
High school diploma, or equivalent	24	(18.6%)	12	(8.4%)	15	(13.4%)	51	(13.3%)			
College, trade, or technical diploma or certificate	27	(20.9%)	22	(15.4%)	26	(23.2%)	75	(19.5%)			
Some university or college	13	(10.1%)	22	(15.4%)	9	(8.0%)	44	(11.5%)			
Bachelor's degree	31	(24.0%)	61	(42.7%)	34	(30.4%)	126	(32.8%)			
Above a bachelor's degree (e.g. master's, doctorate)	27	(20.9%)	22	(15.4%)	16	(14.3%)	65	(16.9%)			
Other	0	(0.0%)	0	(0.0%)	2	(1.8%)	2	(0.5%)			
I prefer not to answer	4	(3.1%)	2	(1.4%)	2	(1.8%)	8	(2.1%)			

Annual income	128	(33.7%)	143	(37.6%)	109	(28.7%)	380	(100.0%)	19.23	16	0.267
\$0 to less than \$15,000	18	(14.1%)	17	(11.9%)	8	(7.3%)	43	(11.3%)			
\$15,000 to less than \$30,000	16	(12.5%)	26	(18.2%)	14	(12.8%)	56	(14.7%)			
\$30,000 to less than \$45,000	20	(15.6%)	19	(13.3%)	9	(8.3%)	48	(12.6%)			
\$45,000 to less than \$60,000	19	(14.8%)	25	(17.5%)	13	(11.9%)	57	(15.0%)			
\$60,000 to less than \$75,000	14	(10.9%)	16	(11.2%)	13	(11.9%)	43	(11.3%)			
\$75,000 to less than \$100,000	13	(10.2%)	11	(7.7%)	12	(11.0%)	36	(9.5%)			
Greater than \$100,000	12	(9.4%)	13	(9.1%)	21	(19.3%)	46	(12.1%)			
Unsure	4	(3.1%)	2	(1.4%)	6	(5.5%)	12	(3.2%)			
I prefer not to answer	12	(9.4%)	14	(9.8%)	13	(11.9%)	39	(10.3%)			
Distance travelled to visit the pharmacy	98	(32.8%)	120	(40.1%)	81	(27.1%)	299	(100.0%)	-	-	<0.001*
<5 kms	39	(39.8%)	66	(55.0%)	25	(30.9%)	130	(43.5%)			
5 - 10 kms	45	(45.9%)	31	(25.8%)	24	(29.6%)	100	(33.4%)			
11 - 20 kms	6	(6.1%)	9	(7.5%)	21	(25.9%)	36	(12.0%)			
21 - 30 kms	4	(4.1%)	1	(0.8%)	7	(8.6%)	12	(4.0%)			
31 - 40 kms	0	(0.0%)	1	(0.8%)	2	(2.5%)	3	(1.0%)			
41 - 50 kms	1	(1.0%)	2	(1.7%)	2	(2.5%)	5	(1.7%)			
>50 kms	3	(3.1%)	10	(8.3%)	0	(0.0%)	13	(4.3%)			
*p-value calculated using Fisher's Exact Test due to low expected cell count.											