# Dried Blood Spot (DBS) Sampling in British Columbia: Evaluating Implementation

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# Acknowledgments


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# Highlights

## Introduction

Sites in British Columbia (BC) have been doing dried blood spot (DBS) sampling in an ad hoc manner since 2019. In 2021, after increased interest, the BC Centre for Disease Control (BCCDC) issued a memo explaining how DBS sampling could be used for sexually transmitted and blood borne infections (STBBIs) testing (HIV, hepatitis C, and syphilis). This pilot phase and related evaluation and laboratory validation work was able to build on key public health innovations emerging during the COVID-19 pandemic and sought to address and mitigate the challenges of inequitable access to testing services, particularly in small urban, rural, and Indigenous communities across the province. The initiative underscores a commitment to enhancing public health infrastructure, leveraging innovative methodologies to foster inclusivity, and ensuring all community members have equitable access to critical health services.

## Overview of DBS Sampling

DBS sampling is a novel approach in BC for screening, diagnosing, and monitoring of STBBIs. This reflects a shift towards more accessible and less invasive sampling modalities. The method involves collecting small samples of blood through a finger prick, which are then absorbed onto special filter paper for analysis. This methodological simplicity facilitates a wider implementation for DBS sample collection, including self-sampling, peer-assisted sampling, and sampling done in an outreach context, working to reduce barriers associated with standard venipuncture-based (phlebotomy) blood collection.

It is important to note while this is a new sampling technique for STBBIs, once DBS samples are processed in the laboratory the same molecular and serology tests are used as for phlebotomy samples.

Despite the advantages, it's important to acknowledge the challenges of DBS sampling, particularly its sensitivity compared to conventional methods. Given the reduced volume of blood collected, there's a slightly elevated risk of false negatives. However, for conditions with high viral loads such as untreated HIV, chronic hepatitis C, and previous or active syphilis infections, DBS testing remains an effective and reliable diagnostic and screening tool.

DBS sampling in BC is done in partnership with the BCCDC Public Health Laboratory (PHL) and the National Microbiology Laboratory (NML) in Winnipeg. Currently, sites offering DBS sampling send DBS cards to the PHL for accessioning (entered in the Laboratory Information System) and then they are sent to Winnipeg for testing. Results are returned to the BCCDC for reporting back to sites. NML has provided scientific and training support for DBS in BC since sampling began.

# Evaluation Framework and Methods

The evaluation of DBS implementation at BC sites employed the RE-AIM framework, focusing on five critical dimensions: reach, effectiveness, adoption, implementation, maintenance, and examining important context pieces. This comprehensive evaluation aimed to assess the positive impacts, key challenges, and operational feasibility of scaling DBS testing across the province, with a specific emphasis on understanding its impact on accessibility, acceptability, and equity in STBBI testing.

During this time the BCCDC Public Health Laboratory (PHL) was able to validate DBS samples of STBBIs on BC laboratory machines. This means the DBS testing method has been run through experiments to ensure that they are suitable for patient use. The laboratory validation has been completed for:

**Mixed methods evaluation of implementation at DBS pilot sites in British Columbia between 2019-2022:**


- HIV, antibody and RNA (screening and diagnosis);
- hepatitis C, antibody and RNA (screening and diagnosis);
- syphilis antibody (screening only); and
- hepatitis B surface antigen (screening only).

If a provincial DBS testing program is operationalized in the future this means DBS samples will no longer need to be sent to Winnipeg for testing.

# Key Findings

### Increased Accessibility and Acceptance:

DBS testing has enhanced the accessibility of STBBI testing, particularly in remote and underserved communities.

Indigenous communities, were early adopters of DBS sampling, leading the way for the province to consider using DBS sampling as a lower barrier testing option. The pilot's reach extends beyond geographical accessibility, promoting inclusivity by offering a less invasive testing option that addresses various barriers associated with traditional testing methods.

### Operational Challenges and Opportunities:

While the initiative has demonstrated substantial benefits, it has also encountered operational challenges, most notably the extended turnaround times for test results and the potential of losing service users or clients to follow-up because of this wait. These challenges highlight areas for improvement and adaptation in the operational framework of DBS testing.

### Community Reception and Impact:

The evaluation findings underscore a positive community reception towards DBS sampling, with many participants valuing the convenience, reduced stigma, and the empowerment associated with choosing a less invasive testing method. The initiative's impact extends beyond individual testing experiences, contributing to a broader public health strategy aimed at increasing STBBI testing uptake and early diagnosis.

## Recommendations for Improvement and Expansion

In response to the evaluation findings, a series of recommendations are proposed to enhance the effectiveness, reach, and sustainability of the DBS testing initiative:

1. **Operational Efficiency:** Implementing strategies to reduce the turnaround time for DBS test results is paramount. This includes exploring provincial laboratory capacities for processing DBS samples and enhancing logistical efficiencies in sample transportation, reporting, and analysis.
2. **Broadening the Testing Spectrum and Modalities:** Expanding the types of infections and conditions that can be tested using DBS samples will significantly enhance the utility and appeal of this testing method. By including a wider array of STBBIs and other infections and possibly other health conditions (like diabetes screening), DBS testing can become a more comprehensive tool in public health screening efforts. Also, increasing the types of testing modalities, such as point-of-care testing, self-sampling or testing, and rapid molecular diagnostic platforms, endorsed and provincially supported would increase engagement in STBBI testing.

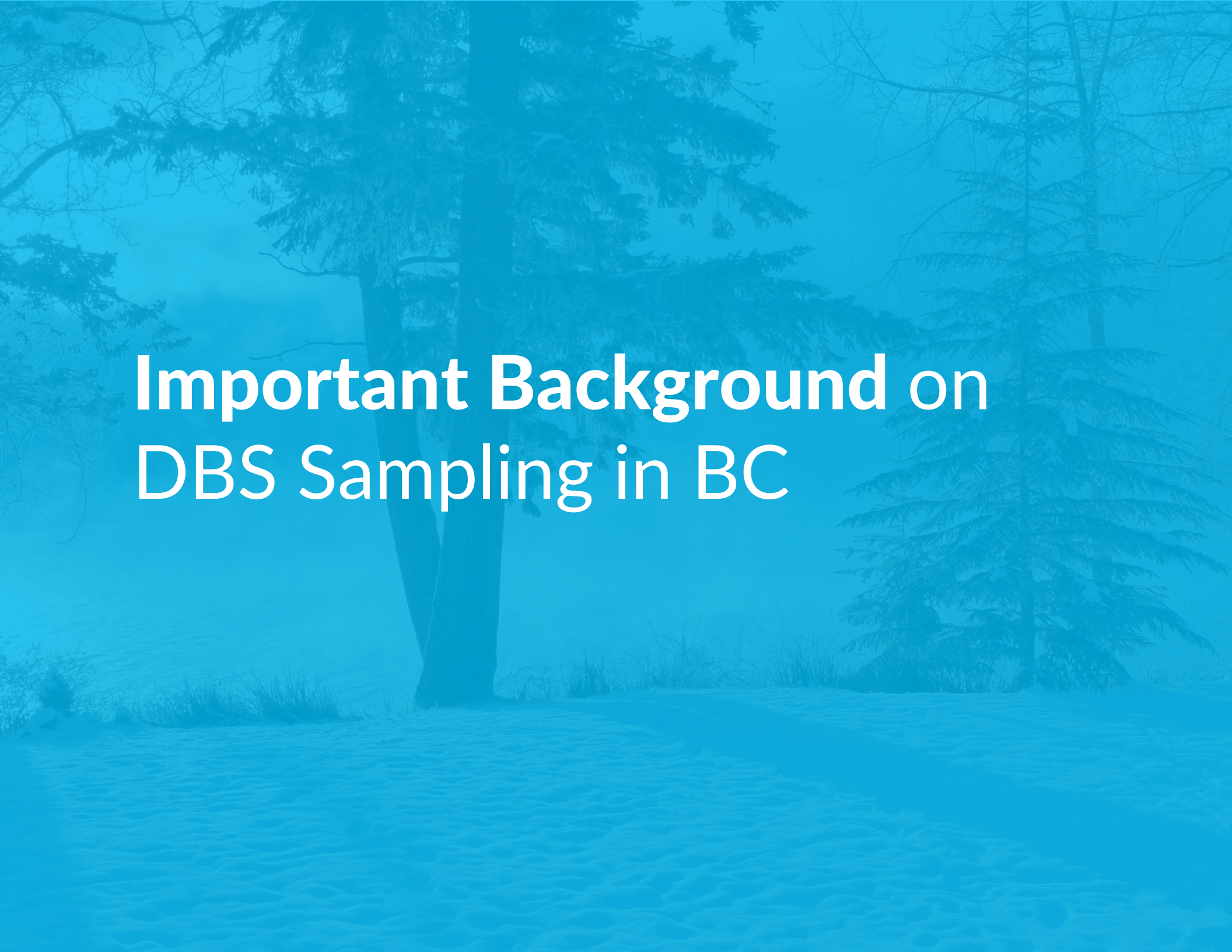
3. **System Integration and Policy Support:**
   Integrating DBS testing into the provincial health testing strategy necessitates policy and scientific support and alignment with broader public health goals. This includes ensuring that DBS testing is recognized and endorsed as a legitimate and valuable tool in the province's public health STBBI test menu, supported by appropriate funding, resources, and policy frameworks.

4. **Community Engagement and Capacity Building:**
   Sustaining the momentum and success of the DBS sampling initiative requires ongoing community engagement, capacity building, training, and central communication resources (such as a website). This involves not only equipping service providers and community workers with the necessary skills and knowledge to implement DBS testing but also engaging communities in a dialogue about the benefits and limitations of this testing method to ensure it meets their needs and expectations.

5. **Research and Innovation:**
   Continued investment in research and innovation is critical to the future success of DBS testing. This includes exploring new and innovative STBBI and other testing technologies and methodologies and evaluating the long-term impacts of DBS testing on public health outcomes.

# Conclusions

The DBS sampling initiative in BC represents a significant leap forward in the province's approach to STBBI testing, embodying a commitment to innovation, equity, and accessibility in public health services. By building on the successes and addressing the challenges identified through the evaluation, BC can be a leader in the adoption and implementation of community-based, low-barrier testing approaches that can serve as a model for others. The continued expansion and refinement of the DBS sampling initiative, supported by robust laboratory science, quality and policy frameworks, community engagement, and ongoing research, will be crucial in achieving broader public health goals and ensuring equitable access to essential health services for all British Columbians.



# **Important Background** on DBS Sampling in BC

# Important Background

The evaluation of dried blood spot (DBS) sampling in BC came from an opportunity, resourced by the Public Health Agency of Canada to take the learnings that came out of the COVID-19 pandemic to support the expansion of innovative community-based testing approaches for communicable diseases in BC. This project is focused on applying these innovations in small urban, rural, remote, and Indigenous communities and populations where inequitable access to timely testing remains a persistent problem.

This evaluation is specifically focused on evaluating dried blood spot (DBS) samples for sexually transmitted and blood borne infections (STBBIs), and more specially for HIV, hepatitis C, and syphilis. This evaluation focused on gathering information, data, and synthesizing key learnings from pilot sites and frontline services providers who had adopted DBS sampling since 2019. Key evaluation questions included (Appendix A):

1. How have each of the pilot sites implemented DBS testing?
2. What are the mechanisms, outcomes, and impacts for pilot sites and across the province resulting from DBS sampling?
3. What are the contexts within which each of the pilot sites operate and how does this impact DBS sampling and other STBBI testing?
4. In parallel, the BCCDC Public Health Laboratory (PHL) worked to validate DBS as a sample type for STBBI tests

It is expected data, learnings, and proposed recommendations from this evaluation would support leaders at the BC Centre for Disease Control (BCCDC), BCCDC Public Health Laboratory (PHL), National Microbiology Laboratory (NML) and other key partners including the Ministry of Health and regional health authorities in exploring the possibility of operationalizing a formal STBBI DBS sampling program in BC.

It will be important to join these evaluation findings with other knowledge and key systems considerations while planning for a provincial program.

To support the sharing of evaluation findings we will first begin with some important background information, which includes:

- **DBS in BC** – a description of this new sampling method and how it is used in BC
- **DBS and Public Health** – a public health approach focused on equity in relation to STBBI testing.
- **Building on COVID-19 Innovations -** information on key learning and opportunities from positive and negative outcomes of COVID-19 pandemic to make systems and services better for BC residents; and how it relates to DBS testing.
- **DBS Testing Provincial Evaluation** – outline of evaluation goals and methods used.

# Dried Blood Spot Testing in BC

## What is DBS testing?

While DBS testing has been used for newborn screening in BC for many years it has more recently been used to test for hepatitis C, HIV and syphilis and uses an alternative blood collection method that does not require a vein puncture with a needle known as phlebotomy. During a DBS test a finger is cleaned for sample collection and is pricked to create a small droplet of blood. Blood drops are placed on a special sample collection card. The process usually takes 5 minutes. These cards are then sent to the laboratory for processing and testing.

DBS samples are known to be less sensitive for detecting infection than standard phlebotomy samples as the volume of blood collected is so much smaller. This means STBBI tests performed on a DBS may produce false negative results slightly more often. However, for active, untreated infections, markers of infections are expected to be high, and therefore easily detectable by both blood sample types.

## DBS Sample vs. DBS Testing

It is more accurate to talk about DBS samples rather than tests because this is a different sampling technique not a different test. All the DBS samples are tested using the same platforms as phlebotomy samples. However, in this report you will read DBS test as this is how most people refer to it.

*Figure 1(Northern Health - Regional Chronic Diseases Program, n.d.)*

## Why collect DBS samples instead of the usual blood sample?

- DBS does not require access to a vein and is not done with a needle, it uses a finger prick.
- DBS samples do not require someone who is trained to take blood with a needle, they can be collected by a peer, an outreach worker, or can be self-collected.
- DBS samples are safer, cheaper, and easier to transport to the laboratory.

# DBS Sampling in BC

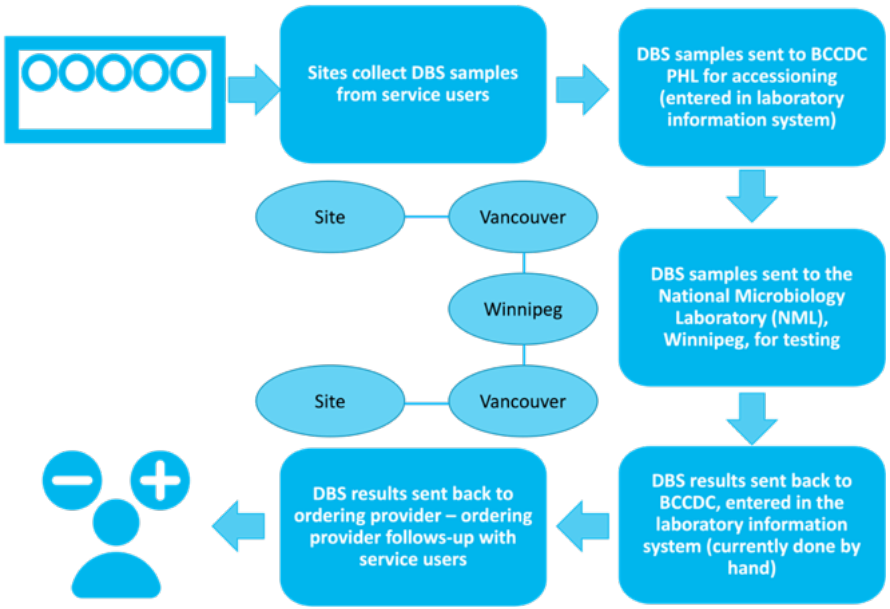
In BC, the first sexually transmitted and blood born infection (STBBI) DBS sampling happened in 2019 on Haida Gwaii with the support of the First Nations Health Authority and The National Laboratory for HIV Reference Services, National Microbiology Laboratory (NML), followed by sampling at Carrier Sekani Family Services working in the North of BC. Indigenous communities were early adopters of DBS sampling in BC and across Canada (*New HIV Screening Method Leads to Apparent Spike in Testing at Sask. First Nations | CBC News*, n.d.)(Trumpener, 2019)(Landy et al., 2022) (Schwientek, 2023)(Smookler et al., 2022). It is due to their leadership we have access to new, lower barrier testing modalities in BC.

After interest from additional sites the BCCDC Public Health Laboratory (PHL) issued a memo in 2021 providing information about how sites could use DBS sampling (BCCDC Public Health Laboratory et al. November 24, 2021).

Since the beginning, NML in Winnipeg has provided leadership on STBBI DBS testing to BC by supplying scientific expertise and training support. Until the summer of 2023 NML has provided DBS training to all the sites implementing DBS sampling in BC.

Currently, NML is doing all the STBBI testing on DBS samples collected in BC. DBS cards are shipped to the BCCDC PHL for accessioning (entered into the laboratory information system, so results can be sent back to inform patient care) and then forwarded to the NML in Winnipeg for testing. Some research studies in BC send DBS samples directly to Winnipeg, without going through the BCCDC.

**DBS Process between Provincial and National Partners**



# DBS Samples at the Laboratory

When DBS collection cards are received at the NML (or in the future at the BCCDC's PHL) they must be processed prior to testing.

The dried blood sample is removed from the cards by firstly, punching out small blood circles using an automated instrument. These punched out blood circles are then added to a specialized solution to rehydrate the blood for testing.

Once this process is completed, DBS samples use the same testing processes and methods as for hepatitis C, HIV, and syphilis (and potentially hepatitis B) molecular and/or serology tests as standard phlebotomy samples. These tests are standard of care and Health Canada approved.

## Ordering Provider

Like other diagnostic tests, DBS samples require an ordering provider who can support follow-up and linkage to care for people with a positive test result. This can be a physician or a STBBI certified practice nurse (in most regions of the province).

### DBS Samples Being Processed at the Laboratory:


Automated instrument punches spots from each dried blood spot circle

One ½ inch dried blood spot circle is used per test

Dried blood spot punches are added to a specialized solution to wash the dried blood off of the sample collection paper

Dried Blood Spot sample can then be tested on the same automated platforms as routine blood samples

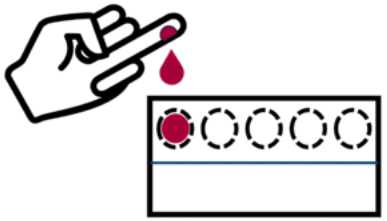
# DBS vs. Standard-of-Care Phlebotomy Test

Below is an image that compares important implementation and access characteristics of the STBBI dried blood spot (DBS) tests and the STBBI standard-of-care phlebotomy tests. It is important to note that there are other STBBI testing modalities available in British Columbia including point-of-care screening tests that can give results in <20 minutes (if positive, diagnostic phlebotomy is required) and at-home, self-tests.

| STBBI Standard-of-Care, Phlebotomy Tests | STBBI Dried Blood Spot (DBS) Samples |
|---|---|
| Primarily done in clinical settings | Can be done in clinical, outreach or event-based settings |
| Needle in arm/vein | Finger prick, no needle |
| Collected by trained healthcare professional | Can be collected by trained peer, community-worker, or self-collected |
| Transported with lab samples to Public Health Laboratory, BCCDC | Can be mailed to BCCDC through Canada Post |
| All test accessioned at BCCDC -- entered in the laboratory and public health records and data systems | |
| Laboratory testing done at Public Health Laboratory and other laboratory sites in BC | Laboratory testing done at National Microbiology Lab in Winnipeg |
| 3.5-6 days average turnaround time for results | 33-34 days average turnaround time for results |

**Testing available:**
HIV antibody (screening)
HIV RNA (diagnosis)
HIV viral load monitoring
Hepatitis C antibody (screening)
Hepatitis C RNA (diagnosis)
Hepatitis C SVR
Syphilis antibody (screening)
Syphilis confirmatory testing (diagnosis)

**+ other testing for STBBIs**



**Testing available:**
HIV antibody (screening)
HIV RNA (diagnosis)
HIV viral load monitoring
Hepatitis C antibody (screening)
Hepatitis C RNA (diagnosis)
Hepatitis C SVR
Syphilis antibody (screening)
~~Syphilis confirmatory testing (diagnosis)~~

Note: Standard-of-care and DBS testing have some minor differences in sensitivity.

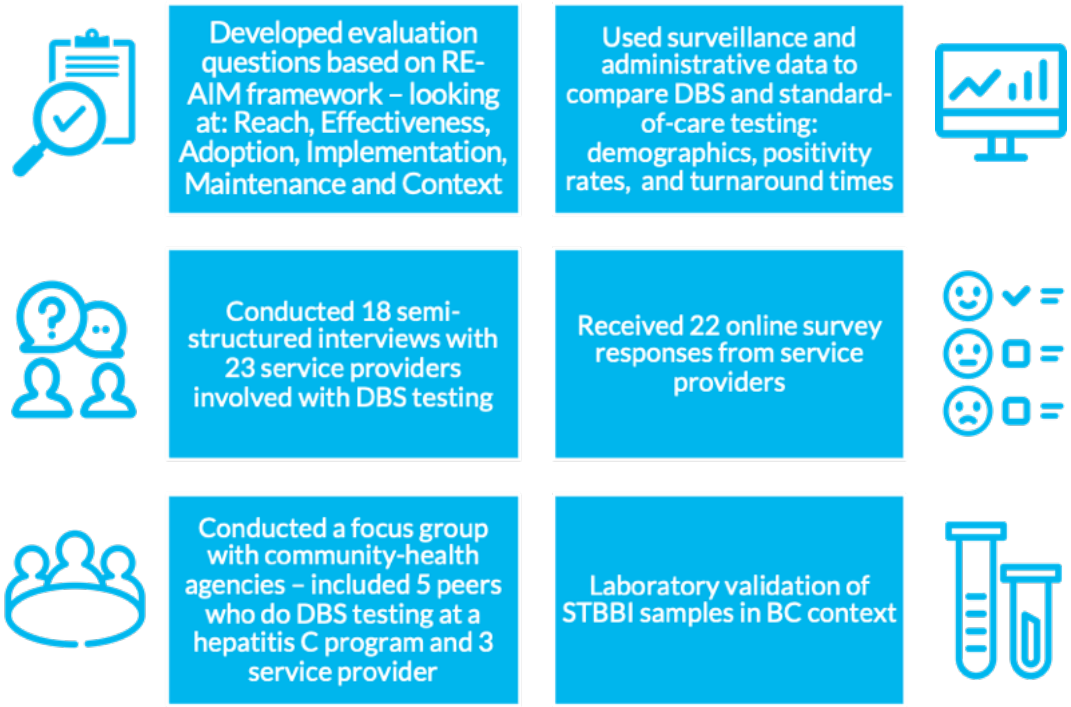
# DBS Sampling Pilot Evaluation

## DBS Sampling Evaluation

The BCCDC has conducted an evaluation of how DBS samples are being used in various sites across the province with the goal of learning what is working, what is challenging, and how the process of DBS sampling could be improved for service providers. Another key goal of the evaluation is to determine if a provincial DBS testing program is feasible and desirable.

The evaluation used a RE-AIM framework to build out evaluation questions and a plan. The evaluation examined data through interviews with program leads at organizations doing DBS sampling, surveys distributed to people doing DBS sampling, a focus group with peer-testers and through administrative and surveillance data and supported the laboratory validation of the DBS testing method for STBBIs (see Appendix A for Evaluation Methods).

## Evaluation Outline:



# Public Health and Dried Blood Spot Testing


**Image:** https://www.patreon.com/posts/hard-to-reach-71983167
Used with express permission from creator: Juliet Young (Young, 2022)

An important value of public health is a commitment to equity, social justice and respect for diversity and self-determination (British Columbia: Office of the Provincial Health Officer, 2023). Public health seeks to build an equitable system responding to discrimination and addressing the social determinants of health.

Many people are finding STBBI testing services and systems hard to reach and access in BC. These people are not "hard to reach" but rather the system and services are "hard to reach" or hard to access for many people. These issues began before COVID but have been exacerbated because of the pandemic.

Many evaluation interview respondents spoke about the challenges people have in accessing STBBI testing in their communities (see Appendix C):

- People are experiencing stigma, discrimination, and trauma at health services, such as hospitals and labs and are reluctant to access care at these sites.
- People don't have access to labs in rural and remote areas of the province (it can take up to three days of travel to go and get a lab test, winter also impacts).
- Laboratory services, especially in smaller urban and rural areas, are hard to reach – you now need appointments, labs are short staffed, wait times have increased, and many labs closed over COVID.

While STBBI testing will not address the underlying structural issues relating to people finding services hard to reach or access, evaluation respondents did speak about some key opportunities that would support STBBI testing. For instance, accessing services from people who are known and trusted (including community workers and peers) and using low-barrier community testing modalities, like DBS sampling, could increase reach and accessibility of STBBI testing.

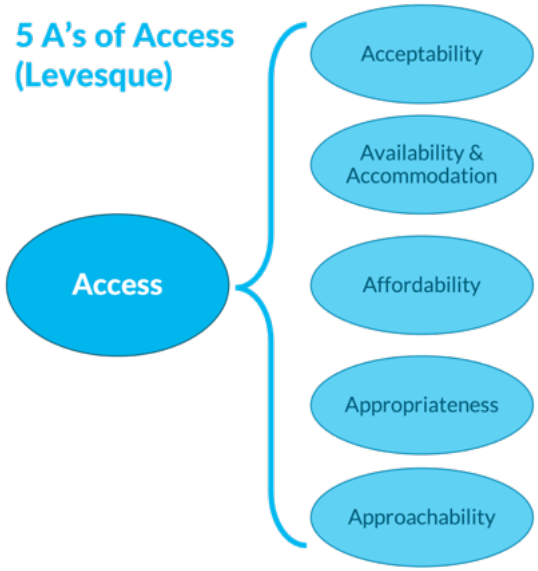
# Primary Care & Poison Drug Supply

Another important contextual piece to consider when evaluating STBBI testing is the primary health care crisis and the continuing drug poisoning crisis, both of which began prior to the COVID-19 pandemic.

The province is facing challenges in primary healthcare. It is estimated one in five, or nearly a million, British Columbians do not have a family doctor. This is along with closure of emergency rooms in rural communities, long wait times for emergency and specialized care, and a lack of paramedics has had severe, sometimes fatal consequences (CBC News with files from Belle Puri, 2022). People have declining access to primary care providers (Esler, 2022), with the crisis is being acutely felt in small urban, rural and remote areas of the province (Baker, 2022). Primary care is meant to be one of the main entry points into STBBI care in BC, but in the current situation this system is not working for many people.

In April 2016, in response to an ongoing, escalating crisis of illegal-drug-related overdose deaths, the BC PHO declared a public health emergency under the Public Health Act. This was a first in BC and Canada (Henry, 2019). This crisis has continued with the BC Coroners Service reporting over 2,500 deaths due to toxic, unregulated drugs in 2023, the largest number of drug-related deaths ever reported to the agency.  No area of BC was spared the devastation caused by toxic drugs in 2023 (Public Safety and Solicitor General, 2024). Many frontline providers' focus has shifted towards manage the acute and severe impacts of this public health emergency.

These compounding and overlapping health crises are limiting people's access to prompt, quality STBBI testing and care. When considering how any healthcare service is implemented and then evaluated we need to consider access. Levesque defines access as the opportunity to identify healthcare needs, to seek healthcare services, to reach, to obtain or use health care services and to actually have the need for services fulfilled (Levesque et al., 2013). Many evaluation participants spoke to access concerns and the impacts of these overlapping healthcare crises impacting both their service users but also in their roles as service providers.



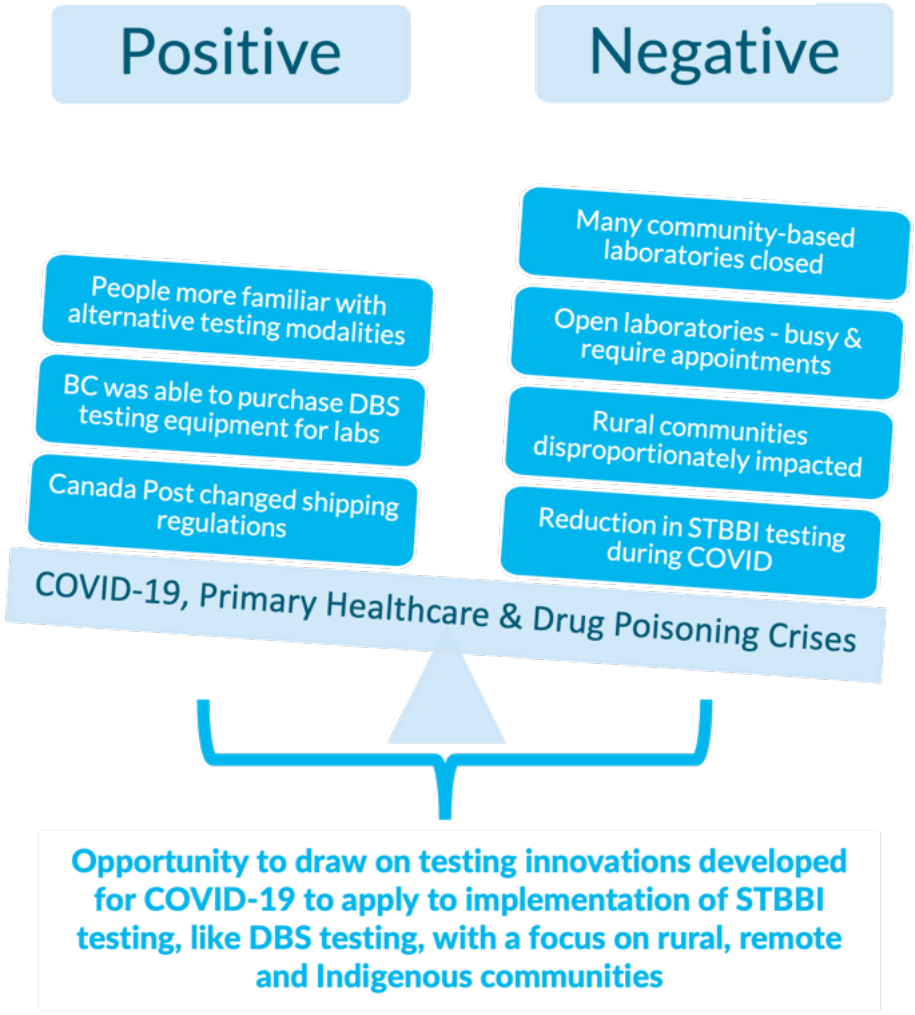
# Building on COVID-19 Innovations

This evaluation grew out of key observations that innovative testing technologies and practices used during the COVID-19 pandemic shifted how the public and health systems implemented community-based testing.

This evaluation brought together a team of public health and laboratory service providers with a common goal of building off key learnings and changes in testing implementation that were outcomes from COVID-19 to expanding community-based testing approaches for STBBIs across BC.

The COVID-19 pandemic had a very big impact on health services and STBBI testing across BC. In this work it is important to recognize both positive and negative outcomes resulting from COVID-19, which lead to opportunities to innovative and support testing in small urban, rural, remote, and Indigenous communities across the province.

## Outcomes from COVID-19



# COVID-19 Positive Outcomes

## Public and Testing

One of the biggest outcomes related to testing coming out of COVID-19 is the public has an increased familiarity and comfort with new testing modalities including at-home testing, DBS sampling, and other community-based testing approaches. This included COVID-19 self-tests and at-home, self-sampling DBS tests for public health studies like the Canadian COVID-19 Antibody and Health Survey (Statistics Canada, n.d.). This shift in testing practice has provided an opportunity to explore new ways of reaching people and new testing modalities for STBBIs.

## Canada Post

During COVID-19 Canada Post changed it policies and DBS samples were no longer consider a dangerous good and therefore could be sent via the mail to laboratories for testing (S. Bartlett, personal communication, October 12, 2023).

## BC Laboratory Validation of DBS

Another positive outcome is that the Public Health Laboratory in BC was able to purchase the equipment to be able to run DBS tests in BC, such as the automated puncher to extract samples from cards. Once processed DBS samples use the same standard STBBI testing assays used on blood. During the COVID-19 pandemic these machines were used to run COVID tests, there was not capacity to run STBBI tests.

However, due to the resources from this evaluation project the laboratory has been able to validate STBBI samples on the BC machines. This means the DBS testing method has been run through experiments to ensure that they are suitable for patient screening.

These experiments ensured that testing methods were 1) specific to the STBBI of interest, 2) sensitive to a range of antibodies and/or RNA provided in a small DBS sample, and 3) accurate when compared to the standard phlebotomy test.

The laboratory validation has been completed for HIV, antibody and RNA (screening and diagnosis); hepatitis C, antibody and RNA (screening and diagnosis); syphilis antibody (screening only); and hepatitis B surface antigen (screening only). If a provincial DBS testing program is operationalized this means DBS testing will no longer need to be sent to Winnipeg. We expect this would reduce the time to receive results (see Appendix B for more details on laboratory validation).

# COVID-19 Negative Outcomes

## Changes to Labs in Community

Evaluation participants shared many community-based laboratories, like LifeLabs, were closed during the COVID-19 pandemic, This made access to testing services more challenging because of a reduction in services. (CBC News, 2022; Charach, 2021; Fletcher, 2020) (Harnett, 2022)

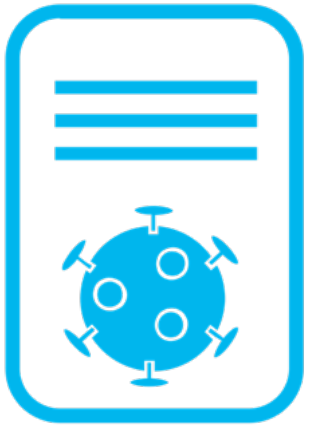
Because of public health measures and more limited laboratory services many of the remaining labs implemented an appointment policy. For many people this increased wait times and limited accessibility to laboratory service. For people who find health services hard to access and who benefit from low-barrier services this put many of the laboratory services in community out of reach.

## Rural Communities

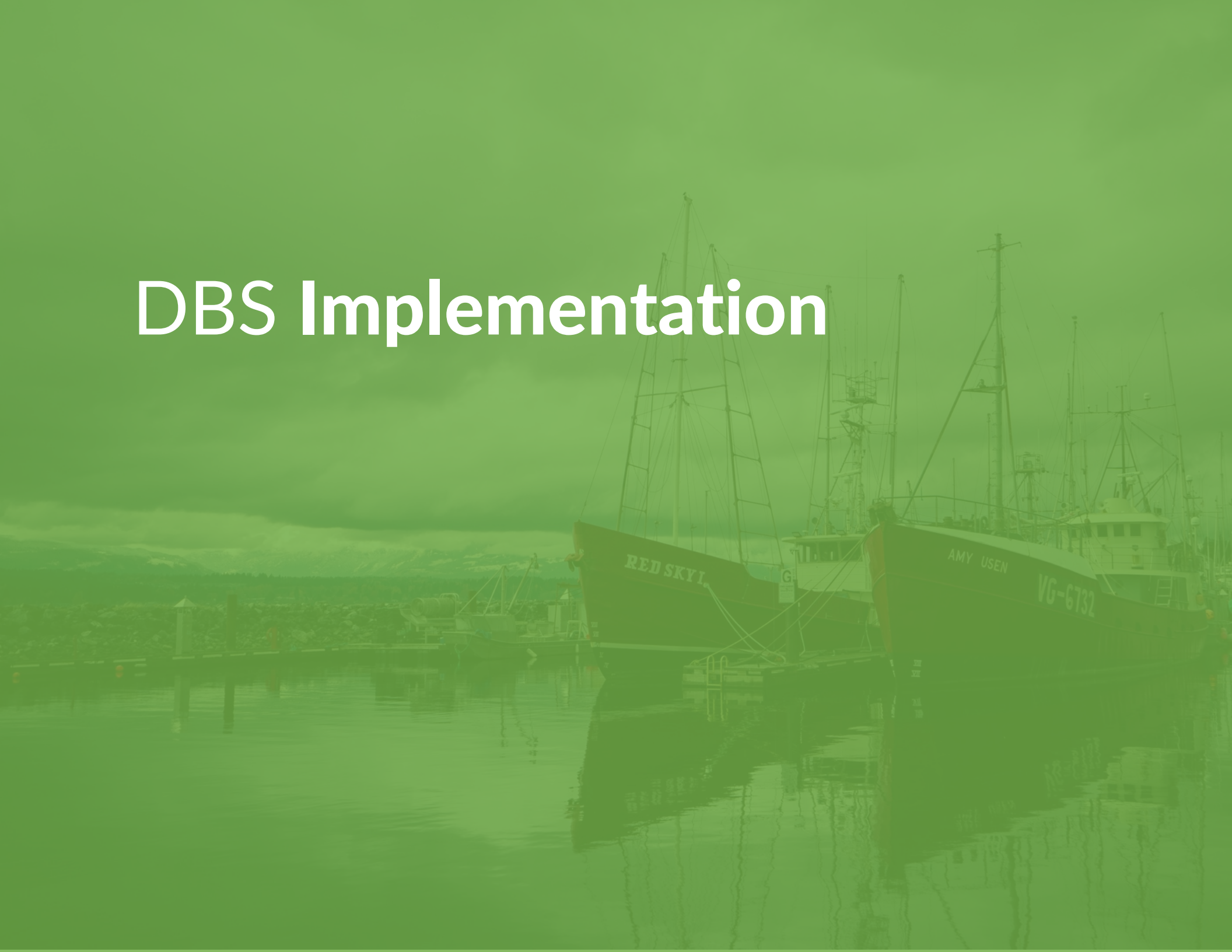
As demonstrated communities across BC have been facing multiple and overlapping health crises, which include COVID-19, the poison drug supply, and the primary health care crisis. This has also been demonstrated in our evaluation data, many evaluation respondents from smaller urban and more rural communities felt the shrinking of laboratory services and accessibility in their communities was negatively impacting people's ability to access STBBI testing.

## COVID-19 Impact STBBI Testing Rates

COVID-19 impacted all aspects of our healthcare system, including STBBI testing. Test episodes for HIV, hepatitis C, and syphilis drastically decreased during 2020 (BCCDC CPS Surveillance, 2023).



# DBS **Implementation**



# DBS Testing Implementation in BC

One of the objectives of the evaluation was to learn about how pilot sites and teams across the province were implementing DBS sampling. This included evaluation questions that looked at:

1. **Reach:**

- How many people have done DBS testing in BC?
- How did the people who did DBS testing differ from those who did not?
- Are we reaching the people who would benefit most from DBS testing?

2. **Implementation:**

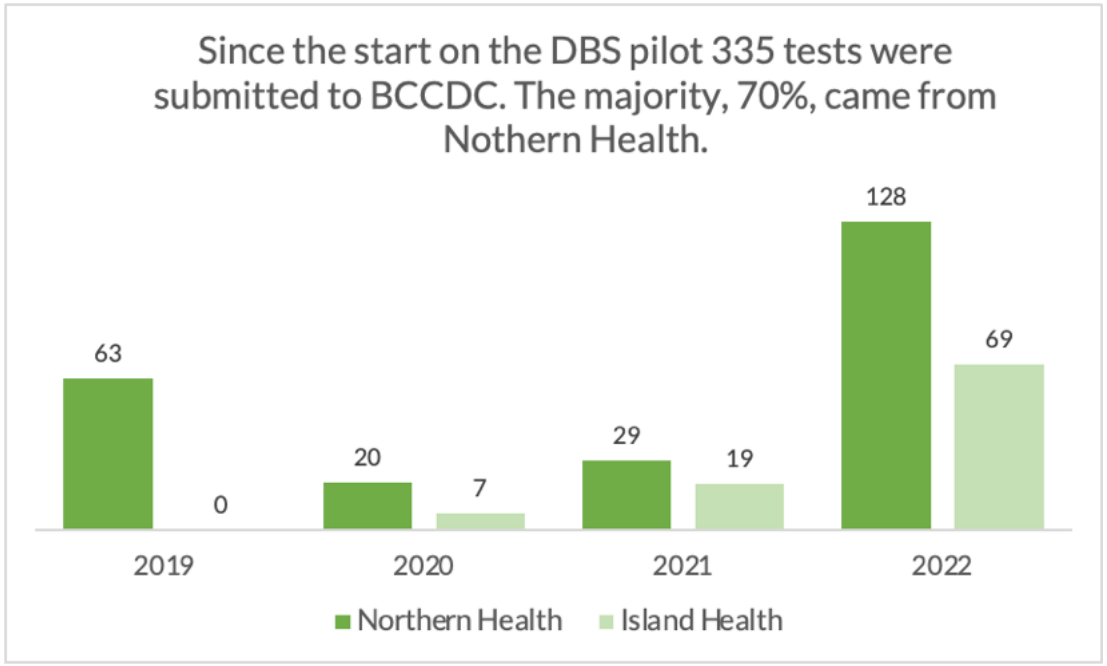
- Under what conditions is DBS the preferred form of testing for service providers? Service users? Testing/labs system?
- How has DBS sampling been delivered at pilot sites? And how do the different implementation approaches impact satisfaction?

# Numbers of DBS Tests between November 2019- December 2022

When looking at the data collected from the DBS tests accessioned at BCCDC we know:

- Northern Health and Island Health were the first regions with DBS sampling sites (no other regions until 2023).
- From the beginning of the DBS pilot to the end of 2022, 335 samples were submitted for testing.
- More than 70% of samples were residents of Northern Health and the majority of those were from Northern Interior HSDA.
- There was a significant drop in samples in 2020 and 2021 and the highest number of samples were submitted in 2022 (197, 59%).

Because of the unique way DBS samples are collected, sometimes requested tests are not able to be performed by the laboratory if there is insufficient sample for all tests.




The prioritization order is typically: HIV, hepatitis C antibody, syphilis, and then hepatitis C RNA. Hepatitis C RNA tests would not be needed If the antibody test was negative. If the client was known to be anti-HCV or anti-HIV positive, sometimes the ordering provider would specify to only do an HIV or HCV RNA test.

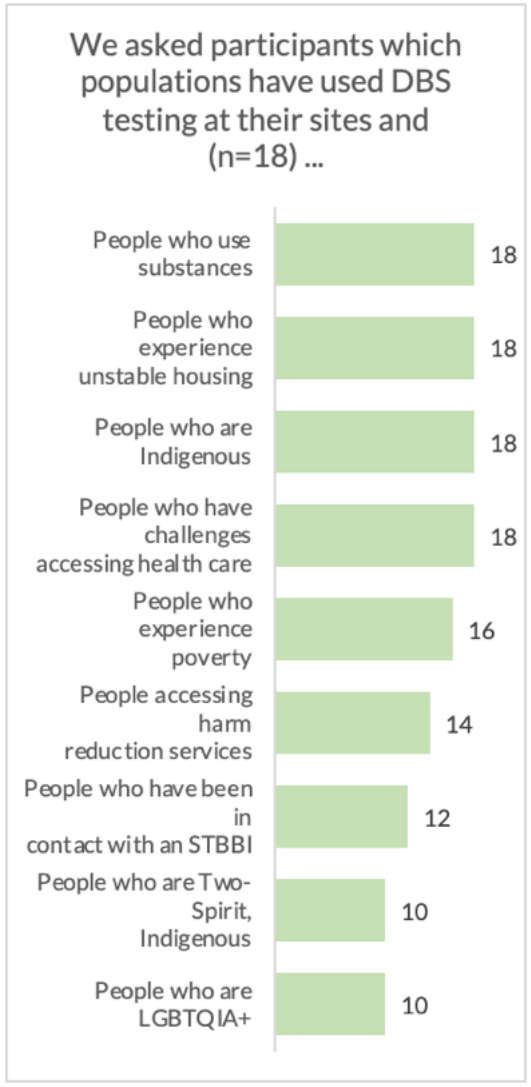
Interview participants reported challenges with filling all the dots on the card with blood or with saturating each dot sufficiently. Lower quality samples impacts the number of tests the laboratory can perform.

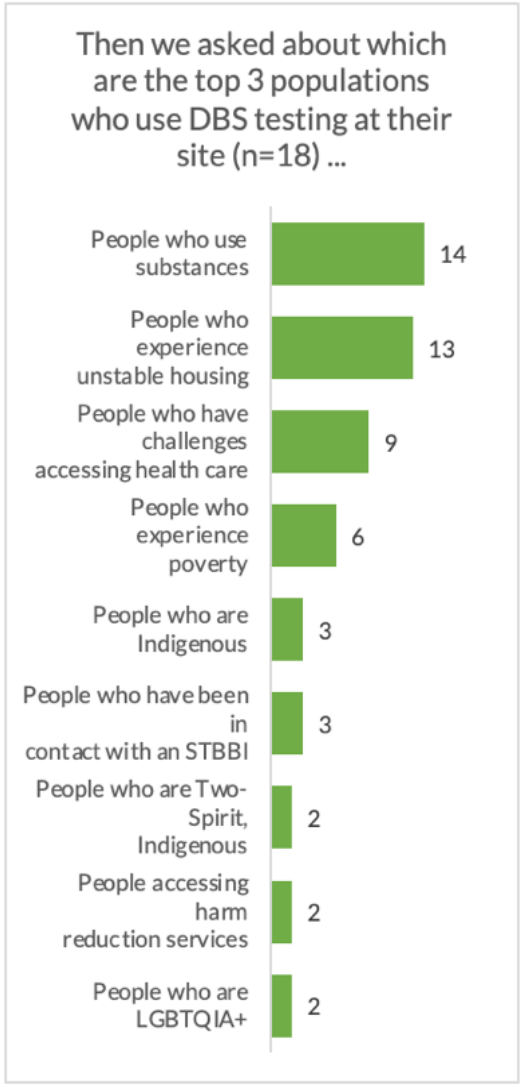
# Who is DBS Testing Reaching?

Throughout the evaluation we heard DBS sampling can be a useful tool in engaging people who are not being served by standard-of-care, phlebotomy testing. This includes people who are economically vulnerable, have complex care needs, and who struggle to access healthcare services.

Interview participants shared many of their clients have experienced discrimination and trauma at healthcare centres, which limits their ability to access STBBI testing. Some felt that DBS sampling and low-barrier services are ways to re-engage people back into care and to increase access to testing (see appendix C).

Survey respondents reflected on key populations who use DBS sampling at their sites including people who: use substances, experience unstable housing, have challenges accessing healthcare, who are Indigenous, and who experience poverty (see appendix D).



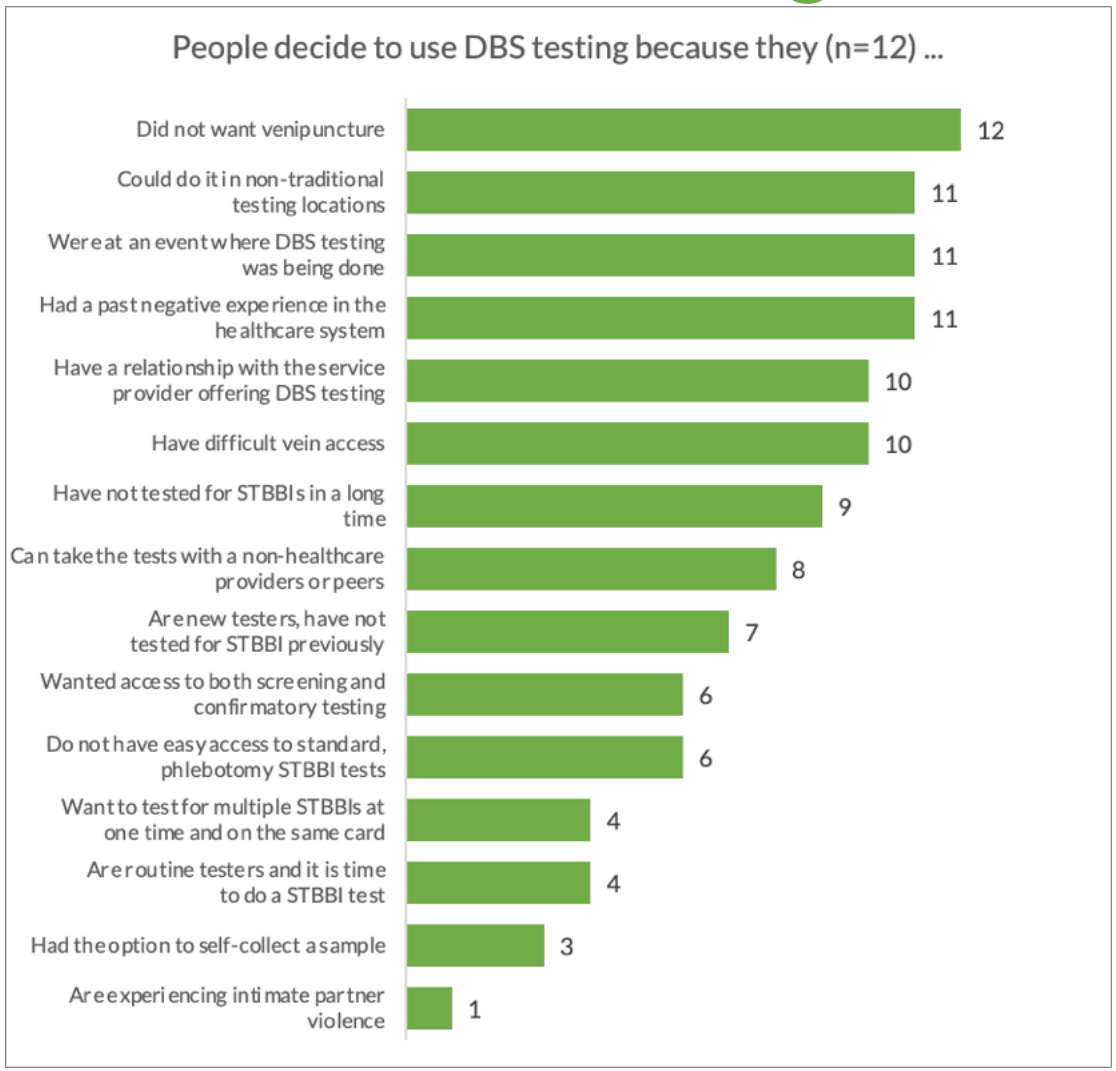
# Why do People Choose DBS Testing?

We asked survey respondents (who were service providers) about why people decided to use DBS testing, the top reasons were because they:

- Did not want venipuncture.
- Could do DBS testing in a non-traditional testing location.
- Were at an event where DBS testing was being done.
- Had a past negative experience in healthcare.

Interview participants reported similar reasons, elaborating DBS is a good method for people who:

- Are hard to draw blood from or who have challenges with venous access.
- Have needle phobias or who don't want phlebotomy.
- Don't want to get their test results right away, sometimes people have prepared to test but need time to prepare for test results.
- Want to complete a sustained viral response (SVR) test after hepatitis C treatment.
- Want diagnostic testing

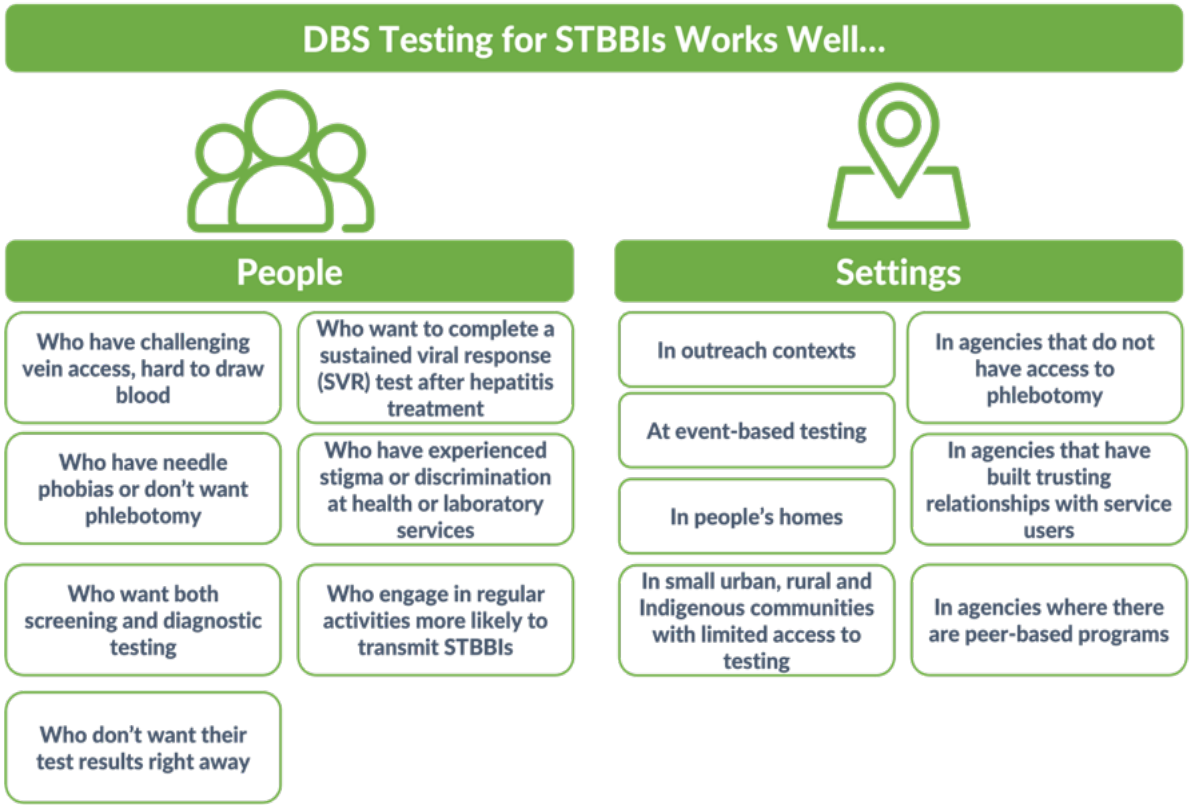


# People and Settings Where DBS Testing Works Well

In synthesizing evaluation data from interviews and surveys there appears to be key populations and settings where DBS sampling appears to be working well and supporting increased reach and access to STBBI testing across the province.

For key populations DBS is helpful in engaging people who have traditionally found healthcare services hard to access and who benefit from low-barrier approaches to testing.

DBS sampling has been used successfully in a variety of settings that are important and relevant to people living in small, urban, rural, and remote communities across the province.



# DBS Sampling Implementation

Sites are using many implementation methods for DBS sampling across the province. These include:

## Nurse-led models

Nurses doing DBS sampling. Nurses often spoke of preferring to do phlebotomy but having DBS sampling for people who did not want phlebotomy, were afraid of needles, or had difficult venous access.

## Community-based or peer-based models

Non-healthcare providers doing DBS sampling including, staff at agencies, like outreach or harm reduction workers, community members in Indigenous or Métis communities (see example below), or people with lived or living experiences or peer testers. This allowed sites without access to phlebotomy or who did not have a nurse present to provide a diagnostic STBBI testing option. This work is built on trusted relationships between services providers and users.

Some agencies established arrangements with health care providers or a regional health authority to set up important systems allowing them to use DBS sampling, like having an ordering provider and supporting follow-up.

Other community-based agencies found implementation more challenging. They faced barriers working with regional health authorities who did not have the capacity to provide programmatic or nursing services across all the infections available on a DBS sample (hepatitis C, syphilis, or HIV). They also found it difficult to engage healthcare providers to act as an ordering provider or in support follow-up when they were in smaller communities with not as many available providers.

Navigating both the healthcare provider and health authority relationships was frustrating because teams felt DBS sampling had great potential to support their clients and engage them in care. At least one site abandoned DBS sampling because they could not figure a way to support DBS implementation at their community-based agency.

## Outreach testing

DBS sampling is a simple tool for use outside of clinics and in outreach settings. Outreach testing increases engagement with people who are not engaged in healthcare and begin to re-build trust with service providers.

# DBS Sampling Implementation Continued

## Event-based testing

When DBS sampling is used at pop-up or community events it has the benefit of testing larger numbers of people at one time and reaching people who may be new to STBBI testing.

> A lot of our clients have had negative experiences with the health care system. Providing DBS testing at various outdoor events/outreach events allows for people to access testing on their own terms, in a sense, and to avoid the traditional healthcare setting which can often times be triggering and traumatic.
>
> -- Survey respondent

## Self-sampling, mail-in model

The Community Based Research Centre (CBRC) has used DBS sampling for their 2022 Our Health Study research. Participants had the option of receiving a COVID-19 and STBBI DBS sampling through the mail, with 44% (~1,900 people) of national survey participants requesting a kit (BC was an above average sampling region). Participants self-sampled and mailed cards back for testing. There was good uptake with about 2/3 of kits returned for testing and a high proportion of tests were able to be completed, 98% had sufficient sample for testing. This suggests DBS self-sampling is a viable option for at-home STBBI testing in communities were there may not be queer-affirming care (Lachowsky & Community-Based Research Centre, 2023).

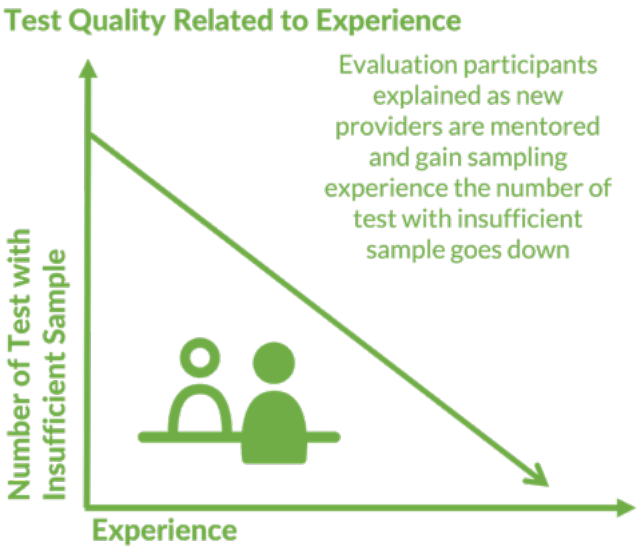
# Peer-Based Models

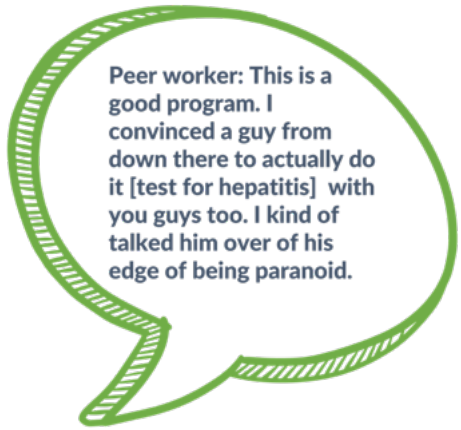
DBS sampling can be done by non-healthcare providers. Some teams had success in using peer testers (these are people with shared lived and living experiences with service users).

Focus group participants at the Cool Aid Community Health Centre in Victoria (see Appendix E) spoke about the value of a peer-based testing model:

- Peers are more accessible to people in the community. They have a shared experience with service users and people trust them, making people more likely to engage in testing.
- Peers, and their relationship developed with service users, supports follow-up and linkage to care.
- Peers are important providers of information about hepatitis C and act as informal educators to help share information about treatment using their shared experience.

One challenge that participants spoke about in the focus groups and was echoed by others was the need to support people new to DBS sampling and testing through training, coaching, and mentoring. When people are new testers they sometimes find collecting an adequate sample on a DBS card challenging. If there is not enough or insufficient sample then some tests cannot be performed, which is very hard for people who are waiting for results. As teams become more experienced, they become better at collecting samples and there are fewer tests that cannot be run because of insufficient sample.



# DBS Testing in Métis Communities

DBS testing in Métis communities in Alberta highlight an Indigenous-led case study. Shining Mountains Living Community Services (Shining Mountains), an Indigenous-run agency, in Red Deer has introduced DBS testing within the Métis community of Alberta.

Evaluation support and connections for DBS testing were provided by the CIHR-funded DRUM & SASH Implementation Science research team. The DBS project and evaluation work was done on behalf of the Métis Nation of Alberta in partnership with Alberta Health Services' Public Health Laboratory, National Microbiology Laboratory, Red Deer Primary Care Network's outreach team, and CAAN Communities, Alliances, & Networks.

This team used DBS testing at two community events attended by Métis community members with the aim of raising awareness about HIV, hepatitis C and other STBBIs; supporting learning about a new testing method; and reducing related stigma (Landy et al., 2022).

This evaluation found:

- DBS testing is an acceptable method of STBBI testing. In speaking with project leads, people seemed to prefer DBS testing over phlebotomy when side-by-side testing rooms were present at an event.
- Participants would recommend DBS testing to friends and family, it was easy, and they would do it again. Many of the participants had not previously tested for STBBIs suggesting, this type of testing method and approach could increase testing access in Métis communities.
- Training and supporting community members to collect DBS samples was relatively easy. Having Métis community members providing DBS testing contributed to positive experiences of testing.
- DBS testing is portable and easy to use at events in rural/remote areas and increases visibility of STBBI testing.
- DBS testing could overcome challenges with existing testing processes for Métis communities including reducing stigma and increasing awareness associated with STBBIs (Landy et al., 2022)

When implementing new STBBI testing approaches it is important to develop Indigenous-led testing models for Indigenous peoples. Shining Mountains and the research team found that providing Métis-specific and culturally safe settings and testing approaches reduces barriers to testing and care (Landy et al., 2022).

Shining Mountains, with the support of the DRUM & SASH team, has created and is using the Red River Cart Model, which provides a Métis approach to STBBI community health services (Atkinson et al., 2023).

# Satisfaction with DBS Training

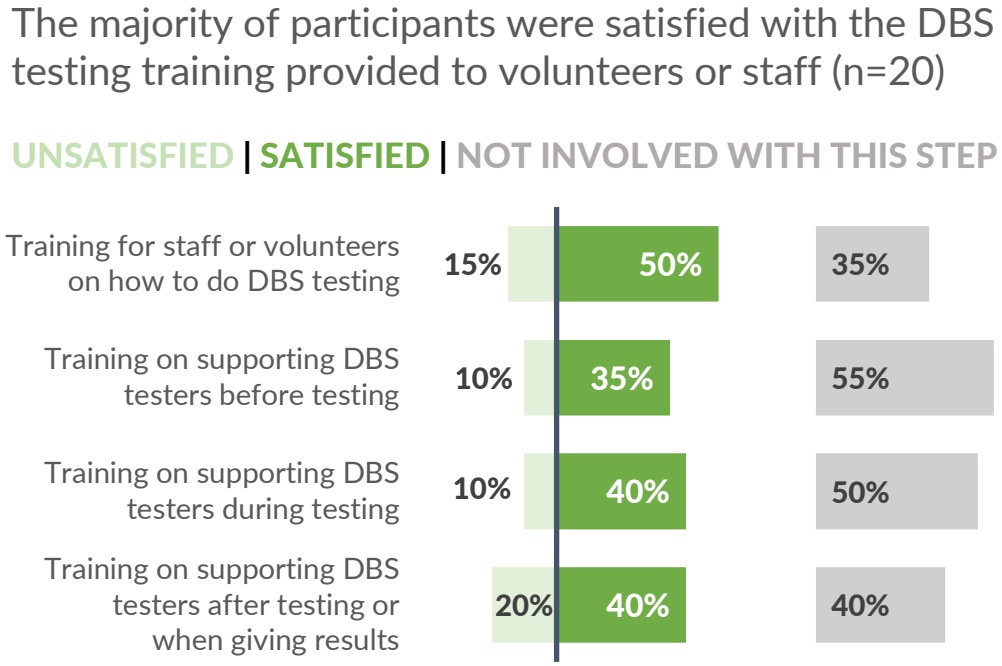
DBS sampling training has been provided by the National Microbiology Laboratory (NML) in Winnipeg. Teams have been trained, mostly virtually, in BC. Once teams have completed training, they are ready to participate in the provincial pilot process, with accessioning happening at the BCCDC.

The survey data shows most people have been satisfied with DBS sampling trainings (many of the respondents had not been involved in this step). Some survey participants expressed a desire to scale training up as there had been staff turnover at the site.

Interview participants were satisfied and appreciated the training and support provided by the NML. Some teams were exploring Northern Health's newly developed online DBS testing course on LearningHub. While other participants expressed the need for some adaptation and additional training supports for non-healthcare providers such as community-based staff, community members and peers, on topics and activities like practicing pokes, conversations on how to get a good sample (full saturated circles), and coaching around public heath guidelines like confidentiality.

Also heard at the focus group, non-healthcare providers sometimes find DBS sampling challenging at first but the quality of the cards they collect improve with experience and mentorship.

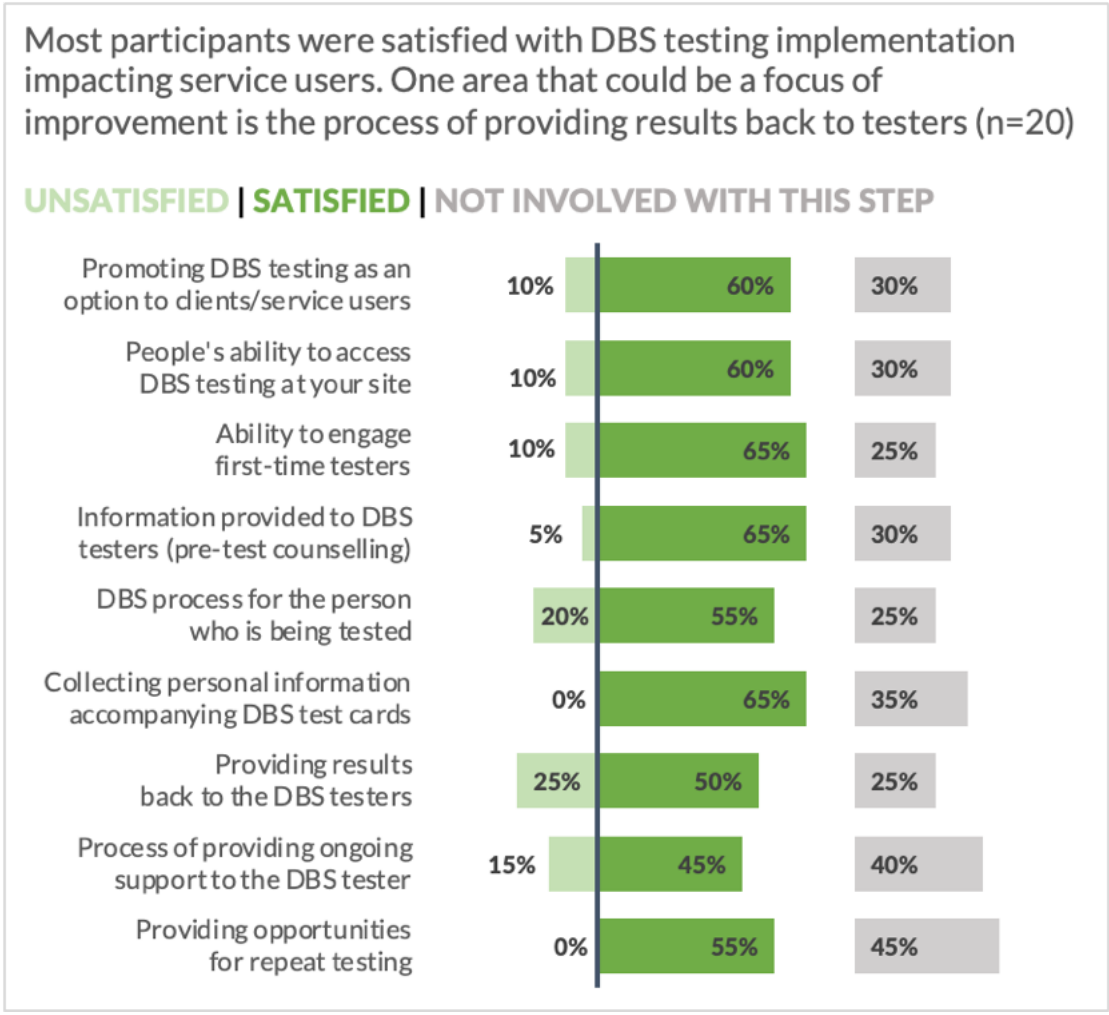
The majority of participants were satisfied with the DBS testing training provided to volunteers or staff (n=20)



# Implementation Impacting Service Users

Most survey respondents were satisfied with the implementation steps relating to service users. One area of improvement was providing results back to service users. People cited long wait times and losing clients to follow-up as a result (heard from interview participants also).

Interview participants felt that DBS testing was a good, low-barrier testing method. Many clients are receptive to DBS testing, especially if it allowed them to choose testing methods and providers (not always healthcare providers). People felt it was a good option for small urban and rural areas that lack access to phlebotomy. However, sites report it was sometimes challenging to get a good DBS sample (fill circles and saturate cards) and sometimes required multiple pokes. But many frontline providers had found creative ways to increase blood flow and improve samples including, having people stand, do exercises, squeezing fingers, and giving people warm drinks.

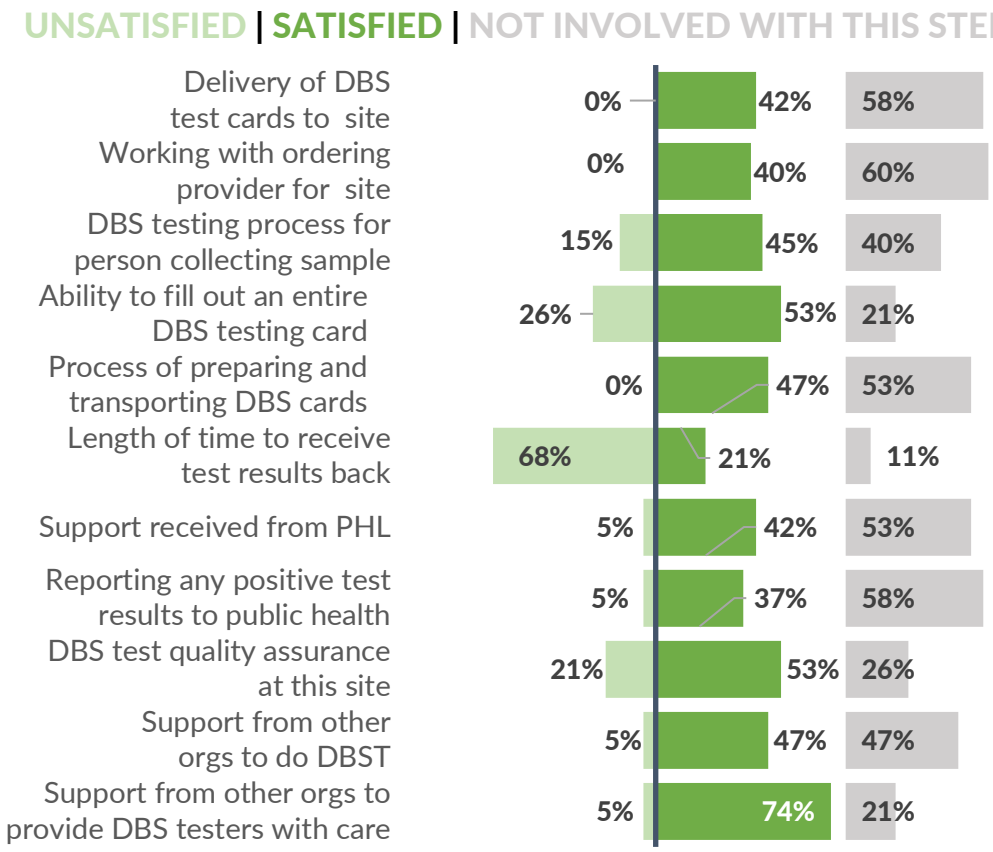


# Implementation Impacting Providers

From the survey, the major area of dissatisfaction with the implementation steps impacting service providers was the length of time it took to get DBS test results back (echoed in the interviews). People were also less satisfied with the DBS test quality assurance at sites.

Interview participants liked: the being able to test for syphilis on the DBS cards, although in high-prevalence areas an antibody test was not as useful as a potential diagnostic test for syphilis (which is not currently available); DBS sampling allow service providers to re-engage people in care; and inventory support. They highlighted challenges with getting a good sample; results coming back into the electronic health record including, coding and interpretation issues; finding an ordering provider; and sometimes a lack of coordination between public health and sites on follow-up.

Service providers were most unsatisfied with the length of time it took to receive results (n=19-20)



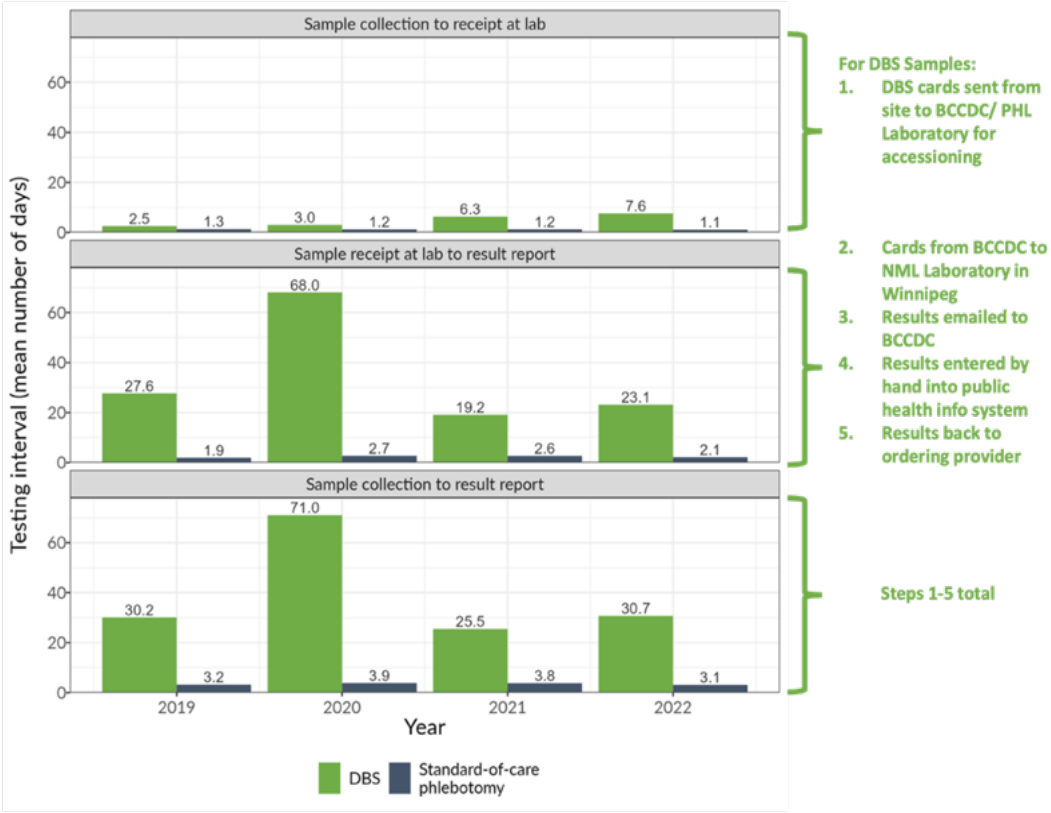
# Turnaround Times – A Look at the Data

DBS sample testing had an average turnaround time of 33-34 days from sample collection to final result, of which approximately 27-28 days of the process occurred after the specimen was received at the BCCDC PHL. Overall turnaround time for standard of care testing was 3.5 days for HIV, antibody HCV and syphilis testing and a slightly longer 6 days for HCV RNA testing.

From 2019 to 2022, the longest turnaround times were in 2020, when laboratory resources were mobilized to respond to the COVID-19 pandemic, and the shortest were in 2021.

During the pilot, DBS sample processing and testing takes place outside of many routine laboratory procedures [see page 12 for an explanation of the steps]. Shipment to NML for testing and manual entry of results into the BC PHL information system both contribute to the extended intervals. Operational integration of DBS testing, including a designated test code and dedicated staff time, would help to improve timing.

## DBS vs. Phlebotomy Turnaround Times



# DBS Sampling
# **Outcomes**

# DBS Sampling Outcomes–Mechanisms of Change

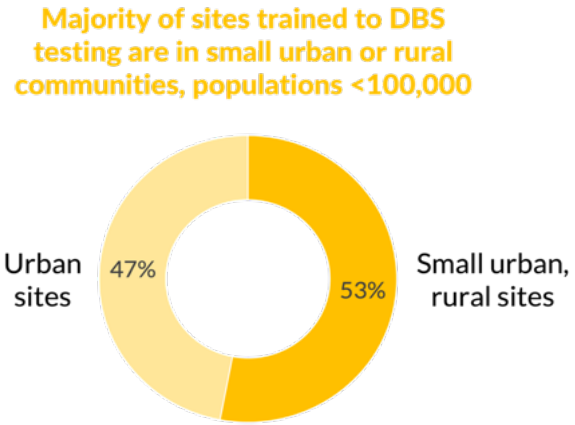
Another objective of the evaluation was to learn about the mechanisms of impact of DBS sampling or how DBS sampling has been received and what has changed as a result of DBS sampling in BC. This included evaluation questions that looked at:

1. **Effectiveness:**
   - What have been the key outcomes or impacts of DBS sampling for service users/clients and staff at sites?
   - Are there DBS sampling implementation approaches that produce more positive outcomes than others?
   - Have there been any unintended consequences resulting from this DBS sampling?
2. **Adoption:**
   - How do people access DBS sampling?
   - Who is accessing DBS vs. those who are not?
   - What are service users and service providers overall perception of DBS sampling?
   - How many sites in BC have adopted DBS sampling? What was the site's motivation for adopting DBS?

# Sites Trained to do DBS Sampling in BC

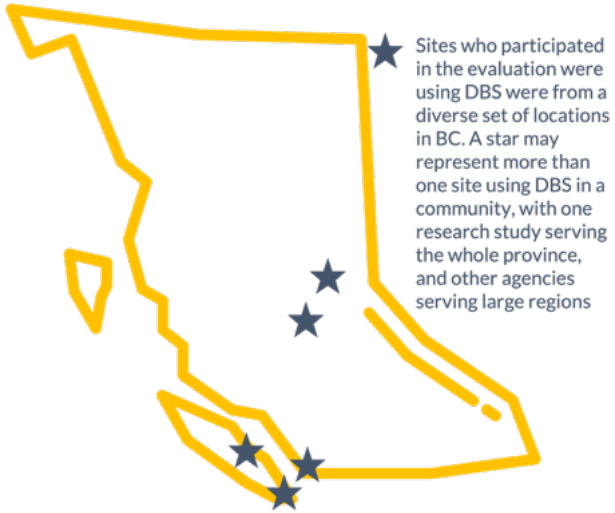
The National Microbiology Laboratory (NML) has supported all of the DBS training at sites in BC up to the summer of 2023. Since 2019 there have been 17 sites that have been trained on DBS sampling. Three sites are doing research projects and send DBS cards directly to NML for testing, without going to the BCCDC for accessioning.

Northern Health and Vancouver Coastal each have 5 sites trained. 53% of the sites trained are from communities with a population of <100,000 (A. H. National Microbiology Laboratory, personal communication, November 2, 2023).

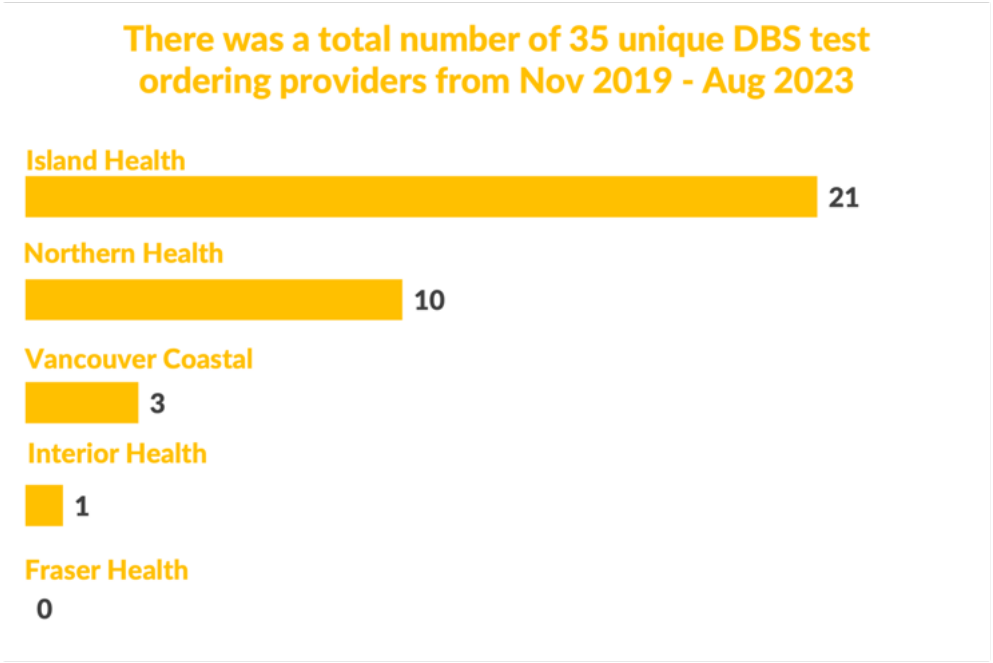



# Sites Adopting DBS Sampling in BC

There have been several sites from diverse communities in terms of population size and location who have adopted DBS sampling for STBBIs, as you can see when we map our evaluation participants who  are using DBS sampling. There are other programs, studies and agencies who serve larger areas of the province including one study that delivered DBS sampling kits across the province and a team who works across the Northern Health Region.




When we examine ordering providers in BC there have been 35 unique ordering providers since 2019 (who have come through the BCCDC for accessioning), with Island Health having the greatest number of ordering providers (K. T. BCCDC, personal communication, October 25, 2023).



# Why Agencies Adopt DBS Sampling

Evaluation participants reported many reasons why sites decided to adopt and use DBS sampling. One main reason is when a site does not have access to nurses or staff who can do phlebotomy. DBS sampling allows these sites to provide diagnostic STBBI testing. However, interview participants were clear that before a site starts DBS sampling it is essential to engage an ordering provider and to have a clear plan for giving test results back and linking people to care after testing. This may mean partnering with other care providers or clinics in the community.

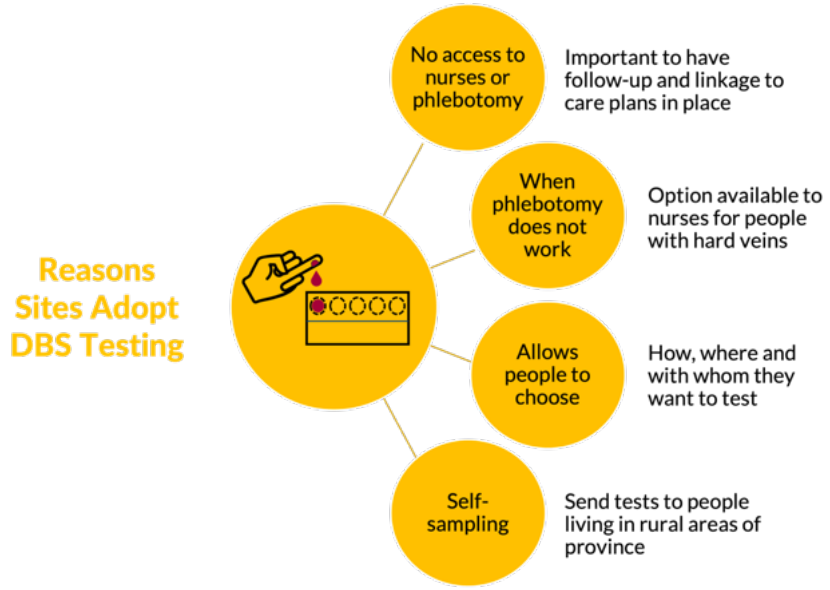
Agencies will also use DBS sampling as an alternative to phlebotomy if a service user does not have good vein access and a nurse is not able to complete a standard-of-care, phlebotomy test.

DBS sampling is also used in outreach settings. People explained they were relatively simple and easy to use in non-clinical settings.

DBS and other low-barrier testing options are helpful when service users refuse to go to labs or health services in their community because of a previous bad experience.

Many evaluation participants spoke about the importance of providing choices and autonomy to service users when it comes to STBBI testing. DBS sampling is another tool in the testing toolkit and important in giving people more control over their own healthcare.

Finally, the CBRC team decided to use DBS sampling because they could send at-home STBBI tests out to people of diverse sexualities and genders living in small urban, rural, and remote areas of the province. Some who did not have access to queer-affirming care (Lachowsky & Community-Based Research Centre, 2023).



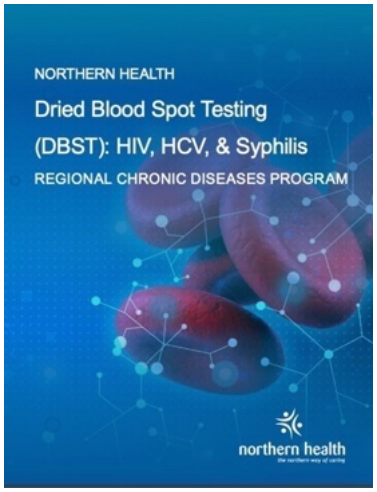
# Northern Health – An Early Adopter

Northern Health (NH) started using DBS sampling on World AIDS Day, December 1, 2021. Since then, sites in Northern Health have done the most DBS tests within BC.

Northern Health serves a very large geographic area of the province with many small urban, rural, and remote communities. Access to primary health care generally and STBBI testing and treatment services in some of these communities is very limited. NH has been exploring ideas on how to increase STBBI testing rates across its region and wanted to investigate if DBS could support increased reach and engagement. They began to explore DBS sampling and worked with a small number of sites to roll out and evaluate DBS sampling.

The leaders at Northern Health have built out a centralized program and have:

- Created online DBS testing training course accessible on LearningHub (Northern Health, n.d.-b).
- Developed guidelines and practice tools for teams within the health region.
- Started using a MHO as an ordering provider for sites who don't have access to one. This allows the communicable diseases team to help with follow-up and linkage to care.
- Initiated an evaluation of their first phase of the DBS testing program. The evaluation is exploring outcomes related to DBS sampling including new positives and people linked to care and providers satisfaction with the program. Once complete, this evaluation will support learnings for the provincial program.
- Prepared to expand and scale out the DBS testing program. Right now, NH sites can apply to do DBS testing. They are asked to explain their reasons for wanting to adopt DBS testing, as well as plans for implementation and linkage to care and follow-up (Northern Health, n.d.-a). Non-Northern Health sites, like community-based agencies and general practitioners will be able to apply at a later date.




NH DBS Guide

# Sites Not Doing as much DBS Sampling as Expected

Several interview participants reported that they were not doing as much DBS sampling as they expected. One of the main reasons was several sites had increased their capacity to do phlebotomy or complex phlebotomy with people who have challenges with venous access. This was positive because it meant nurses could test for a number of things that DBS does not allow for including syphilis diagnosis, other STBBIs, and additional tests required for the special authority request to the Ministry of Health for hepatitis C treatment funding.

Other reasons why sites were not doing as much DBS sampling included staff turnover and not having access to training resources to get new people trained while onboarding and the fact that it takes too long to get DBS test results back to patients, standard phlebotomy testing is much faster.

# Low-Barrier, Community-Based Testing

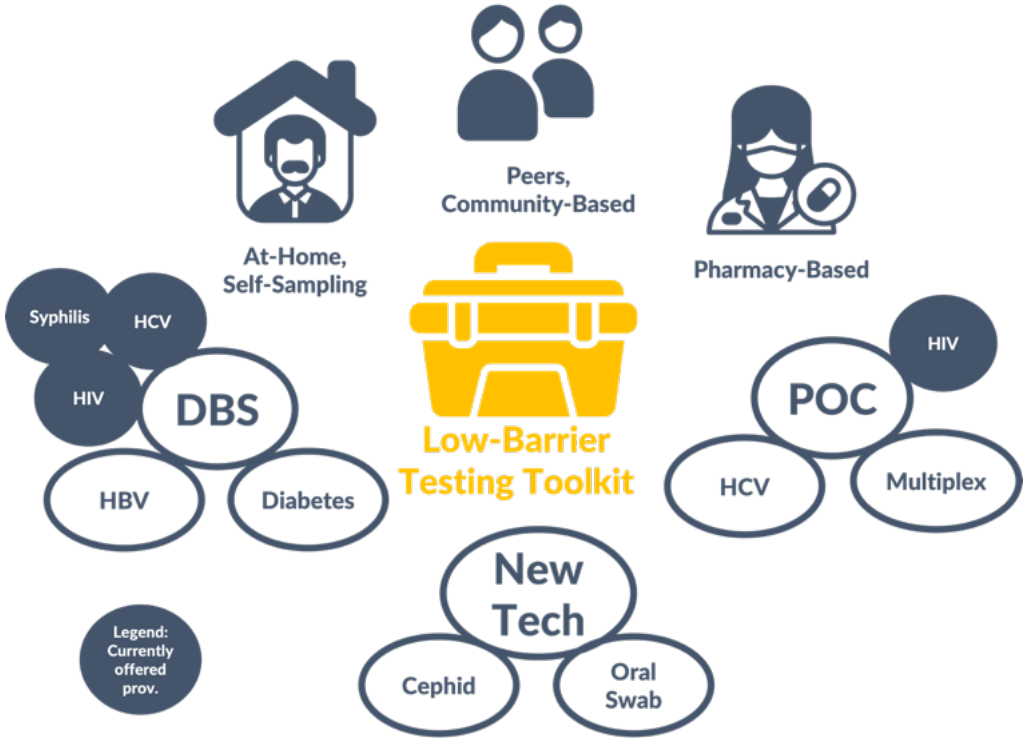
Many evaluation participants spoke about the need to have a wide variety of testing modalities and technologies to support low-barrier STBBI testing engagements with their clients and service users. A diverse testing toolkit will increase the reach and impact of testing across the province to support a variety of settings with differing priority populations and their needs.

Service providers also wanted a menu of community-based, low barrier STBBI testing tools like:

- DBS sampling – keep testing for HIV, hepatitis C and syphilis but expand to include hepatitis B and other chronic diseases, such as diabetes. People felt that having a test for diabetes would increase DBS testing uptake at events and work to reduce stigma and discrimination related to STBBIs.
- Point-of-care tests – HIV, hepatitis C and multiplex tests like the newly approved HIV and syphilis test.
- Exploring new testing technologies like the Cephid/Gene X-pert machines, and oral swab tests.

Evaluation participants felt that having more testing modalities would support their practice. Working to develop programming with training, culturally appropriate resources, and provincial promotion for:

- Self-sampling and at-home testing.
- Peer-based, community-based, Indigenous-led testing.
- Pharmacy-based and -led sampling.



# DBS Sampling Outcomes

When looking at DBS sampling outcomes for agencies, service providers and service users there were both positive and negative impacts noted by evaluation participants.

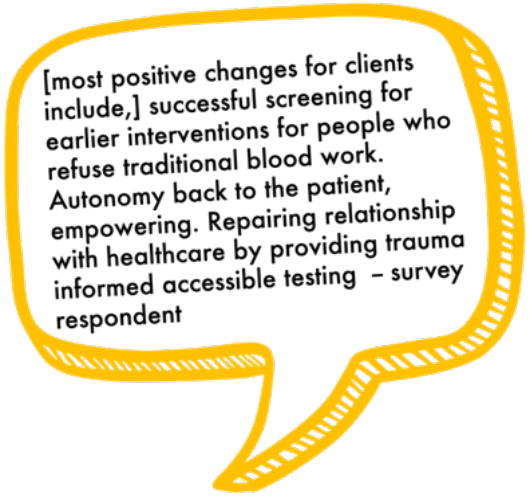
## Positive Impacts

People liked you could:

- Do multiple tests on one testing tool.
- Get a diagnosis for HIV and hepatitis C.
- Use it as a tool to re-engage people back into healthcare, DBS sampling is an opportunity to begin mending relationships with people who had negative experiences with healthcare providers.
- Build on relationships of trust developed between service users and peers, community members, or staff at organizations.
- Gives people choice.

## Importance of Choice

Many evaluation participants spoke about the power of choice when it comes to STBBI testing. They appreciated having DBS sampling as another tool in their testing toolkit and highlighted the importance of allowing people to choose how they test, giving them more control over their healthcare.




## Negative Impacts

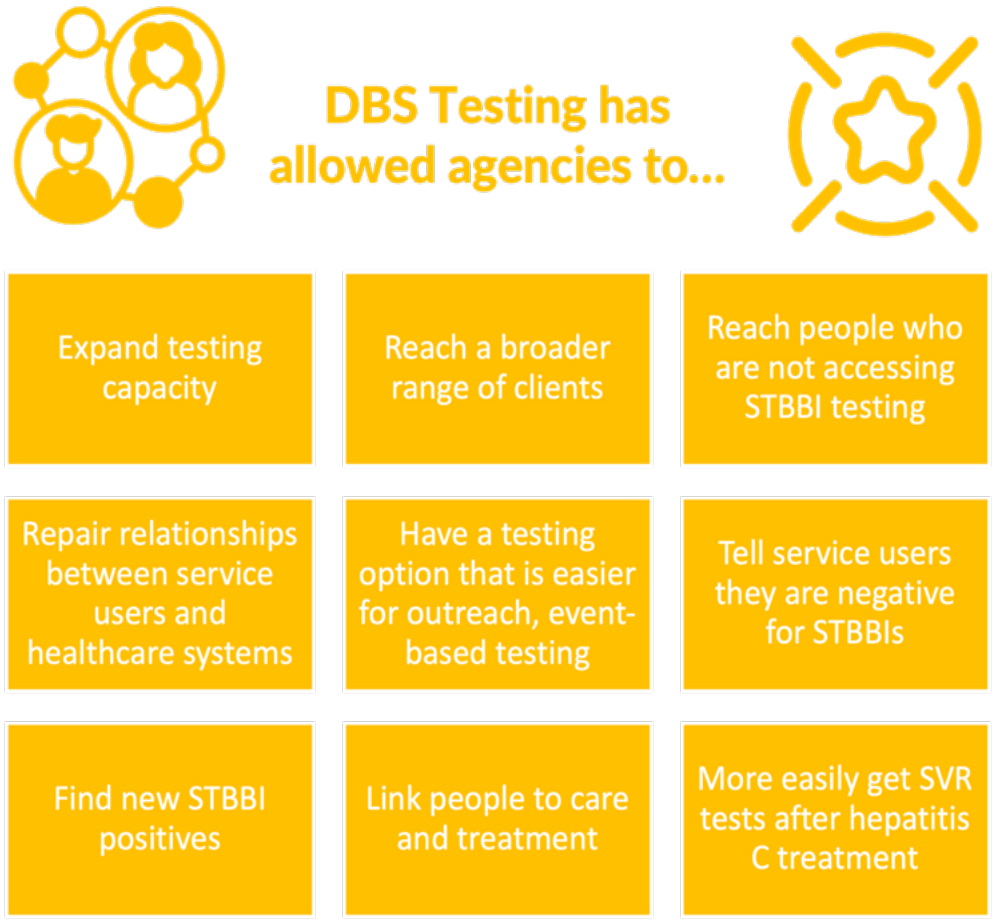
Some noted some frustration or negative impacts related to DBS sampling included:

- Service providers wanting to use DBS more, scale it out, have more staff members trained to do testing, but without a more formal program with more regular access to training this didn't feel possible.
- Not having access to a full suite of low-barrier testing options was challenging, like HIV or hepatitis C point-of-care or self-tests. The desire to have more publicly funded and supported STBBI testing modalities would further support service users' choice/autonomy.

# DBS has Allowed Agencies to…

When exploring effectiveness, evaluation participants reported that DBS sampling allowed their agencies to accomplish a number of things:

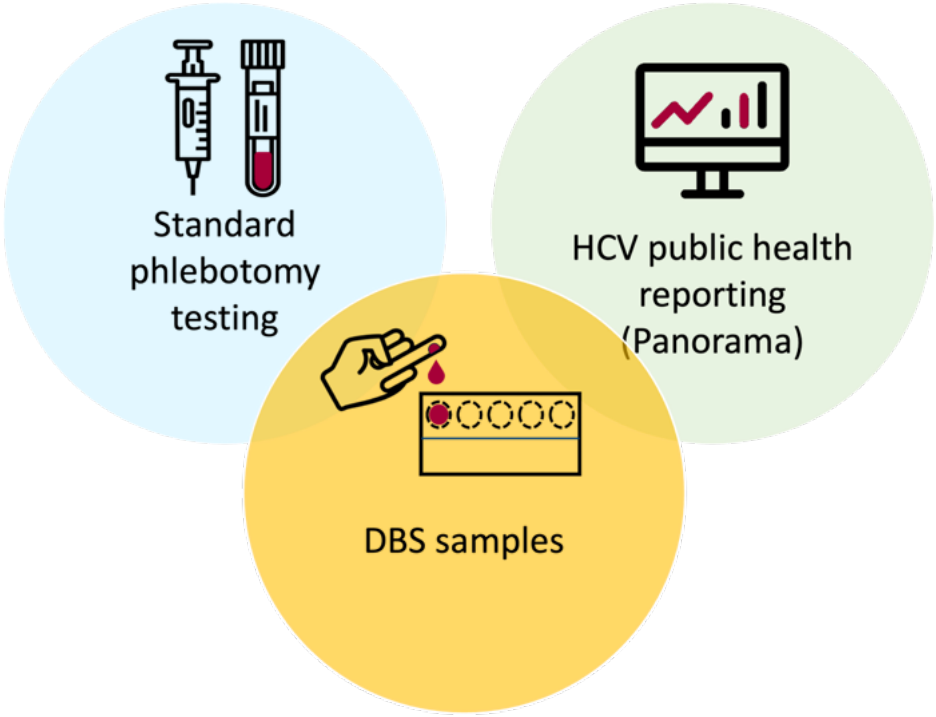
- Expand their agencies testing capacity, allowing agencies to provide different kinds of tests, to reach a broader range of people, and to support testing in people who were not accessing STBBI testing.
- Have a low-barrier testing option that can be used in outreach settings.
- Provide service users STBBI test results, both negative results and positive, then following up on results linking people to care and treatment.
- Provide an alternative testing option for people who had completed hepatitis C treatment to determine if they had been cured.
- Began to repair relationships between service users and healthcare systems.



# DBS Testing Compared with Routine Laboratory Testing and Public Health Data

To understand the effectiveness of the DBS testing more fully across BC we used two different data methods:

1. We wanted to better understand who was being tested using DBS samples by using BCCDC data on standard phlebotomy testing to compare aggregate attributes of people who have tested and of those who tested positive for HIV, hepatitis C, and syphilis.
2. We reviewed clients with HCV positive results to see if they had been reported to public health. This was an individual-level comparison to see whether DBS testing was being used by people already engaged with the public health system.



# Proportion of Tests Completed

We used BCCDC datasets to compare aggregate attributes of DBS testing (HIV, hepatitis C, and syphilis) with standard of care, phlebotomy testing (see Appendix F for full overview of data, methods, and results).

To make this comparison we needed to prepare the routine STBBI testing data to be as similar to DBS data as possible. This meant that we excluded prenatal tests, which wouldn't be done by DBS.

Routine phlebotomy testing is performed at much higher volumes than DBS testing, with more than 200,000 HIV, syphilis, and HCV antibody tests per year (for each infection). Like DBS, there was a decrease in all testing between 2019 and 2020. Testing patterns after 2019 may not be completely comparable to following years because of the shifts in lab testing prioritization from the COVID-19 pandemic.

The standard-of-care testing patterns differed by infection:

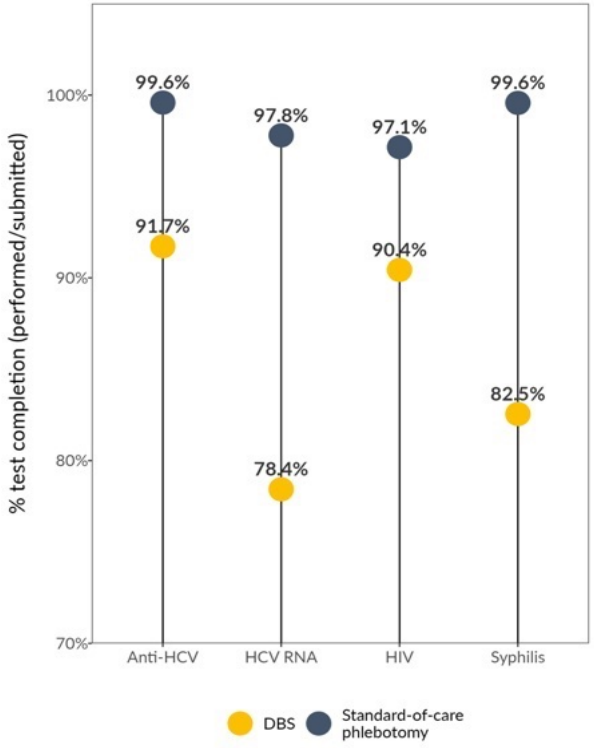
- Majority of HIV and syphilis testing in VCH, followed by FHA.
- Majority of HCV testing in FHA and then VCH.
- While the majority of all DBS tests were submitted from Northern Health (72%) only 3-6% of standard-of-care, phlebotomy STBBI tests were submitted from that region.

Routine phlebotomy testing doesn't have the same challenges as DBS in terms of collecting sufficient sample. More than 99% of standard-of-care HCV and syphilis antibody tests ordered were performed and 97% of HCV RNA tests and HIV tests.

In contrast, the highest proportion of DBS tests performed for tests ordered was for HCV antibody tests (92%), followed by HIV (90%), and syphilis (82%).

The lowest proportion of tests performed were for hepatitis C RNA (78%), which may be linked to insufficient sampling issues given that it is more often a subsequent test in a series.

**Differences in sampling technique means DBS testing has lower proportion of tests completed than phlebotomy testing**

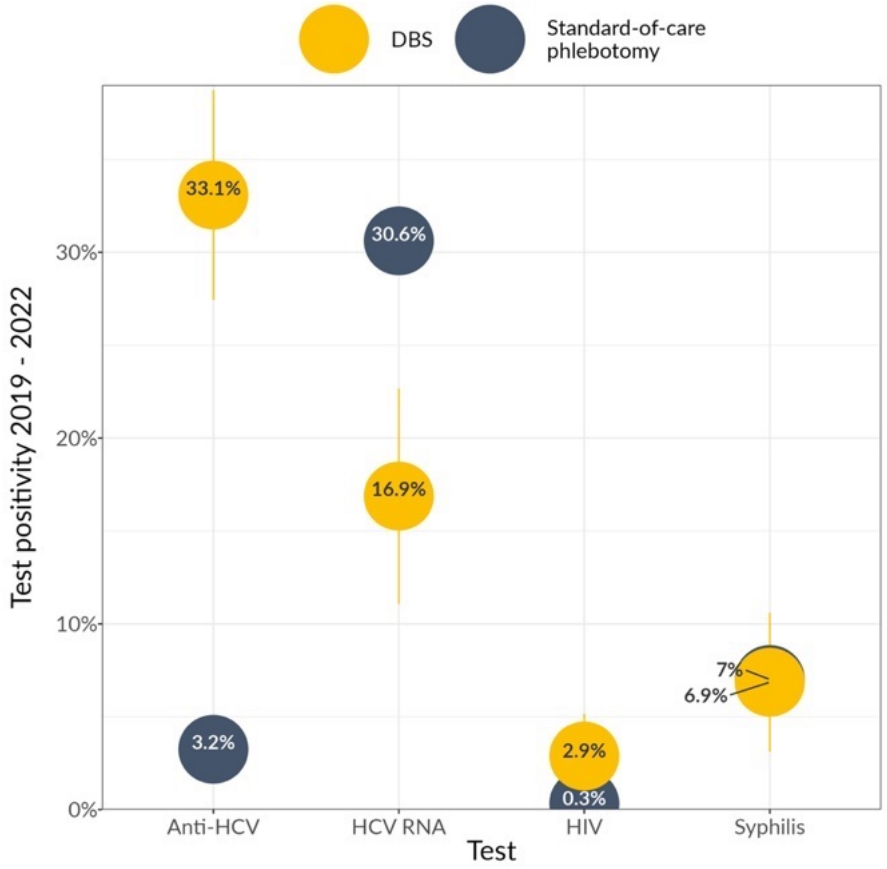


# Overall Test Positivity Rates

There were interesting findings when we examined the positivity rates, or the number of positive test results compared to the total number of tests performed:

- Hepatitis C antibody and HIV positivity were about ten times higher for DBS than standard of care testing.
- Hepatitis C RNA positivity was higher in standard-of-care testing. This may be due to the sequential, reflex testing process. Most samples are first tested for hepatitis C antibodies. If that is positive the sample is tested for hepatitis C RNA (shows active infection). Standard of care testing would be more likely to have sufficient sample to complete this second test.
- It is important to remember that the number of people who were tested by DBS is quite low. This means that the positivity calculations can be impacted by small changes in the number of positive results.

**Differences in test positivity trends suggests DBS sampling may be used by people with different STBBI risk to the general population being tested**



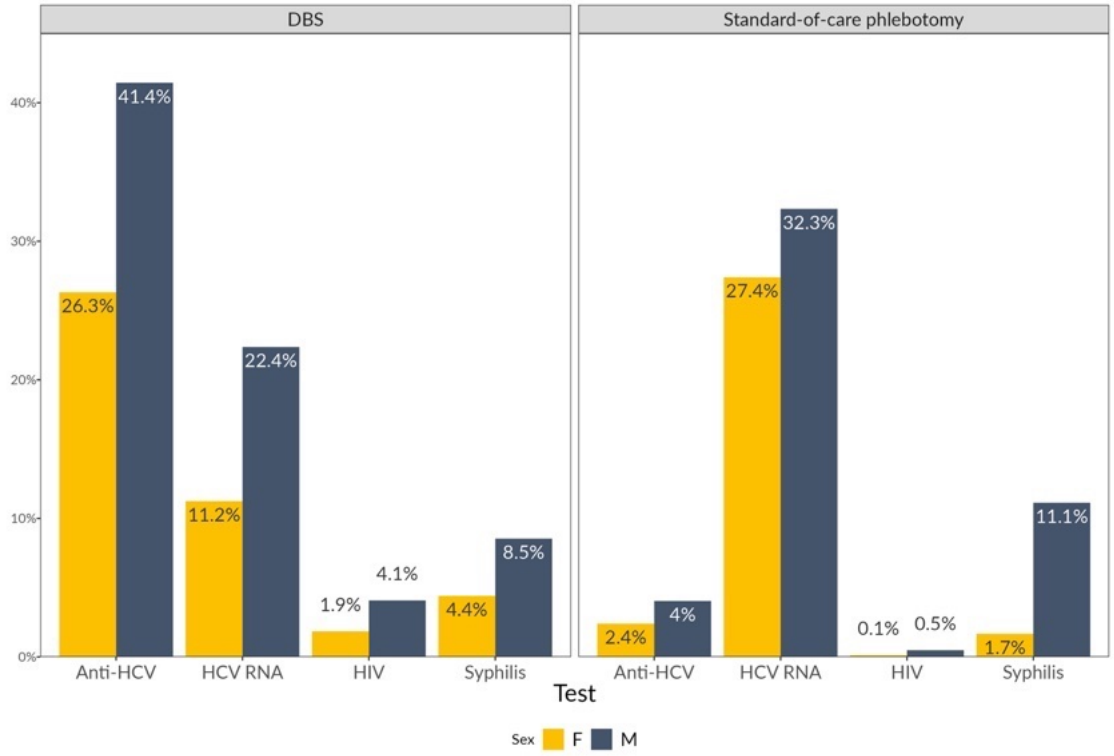

Error bars represent 95% confidence intervals and show uncertainty in the calculated test positivity. Due to smaller sample sizes, there is greater uncertainty for the DBS results.

# Trends in Testing and Test Positivity by Sex

When we looked at test positivity by sex for DBS tests in comparison to standard-of-care tests we see that the trend of higher positivity for males compared with females was similar between DBS and standard of care testing.

We recognize the limitations of data on sex collected through laboratory testing. Additional categories of Unknown (1.5% of DBS tests, 0.5% of routine lab tests) and Undifferentiated (0.3% of DBS tests and 0.03% of routine lab tests) are hard to interpret because they may include people for whom we are missing information on sex, those who prefer not to respond, or those who have interpreted the question as relating to gender identify. Sex may also not be the most relevant indicator of vulnerability to and barriers in accessing care for STBBIs. Lack of appropriate and well-defined categories for sex and gender may prevent us from measuring disease burden in marginalized groups.

**There was higher test positivity for males in both DBS and standard of care testing**




Does not include data for those with sex reported as 'Unknown' or Other/Undifferentiated' due to small numbers. Labels indicate the number of positive tests.

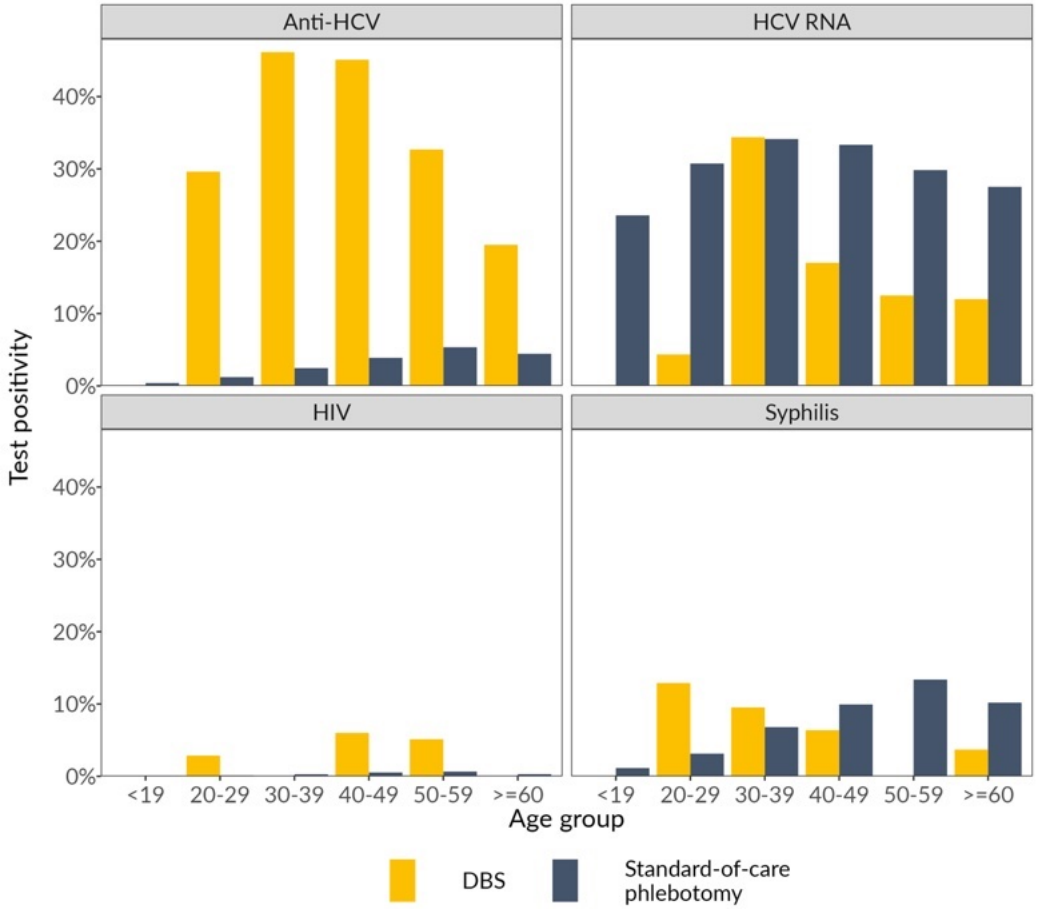
# Trends in Testing and Test Positivity by Age

When looking at positivity by age we see:

- Standard of care HCV antibody testing (anti-HCV) positivity peaked for those aged 50-59 years, however DBS testing showed the highest rates in the 30-39 age group.
- Overall HCV RNA positivity trends were similar but HCV RNA positivity was much higher in the 50+ age groups in standard of care testing.
- Syphilis positivity in standard of care testing was highest in the 50-59 age group, while DBS testing had a higher positivity in younger age groups (20-29 and 30-39).

The median age of those tested by DBS was higher than in standard of care testing for anti-HCV, HIV and syphilis, but the median age of those who tested positive by DBS was lower than for standard of care testing.

**Test positivity for those tested using DBS sampling was generally in younger age groups compared with standard of care testing**



# Prior Public Health Engagement for People with Positive DBS Hepatitis C Test Result

We did an individual-level comparison of the DBS test results and case information recorded in the public health system using hepatitis C data. This analysis aimed to assess whether DBS testing was being used by people who were already engaged with the public health system or was being used by those who might not have easy access to routine testing (see figure on next page).

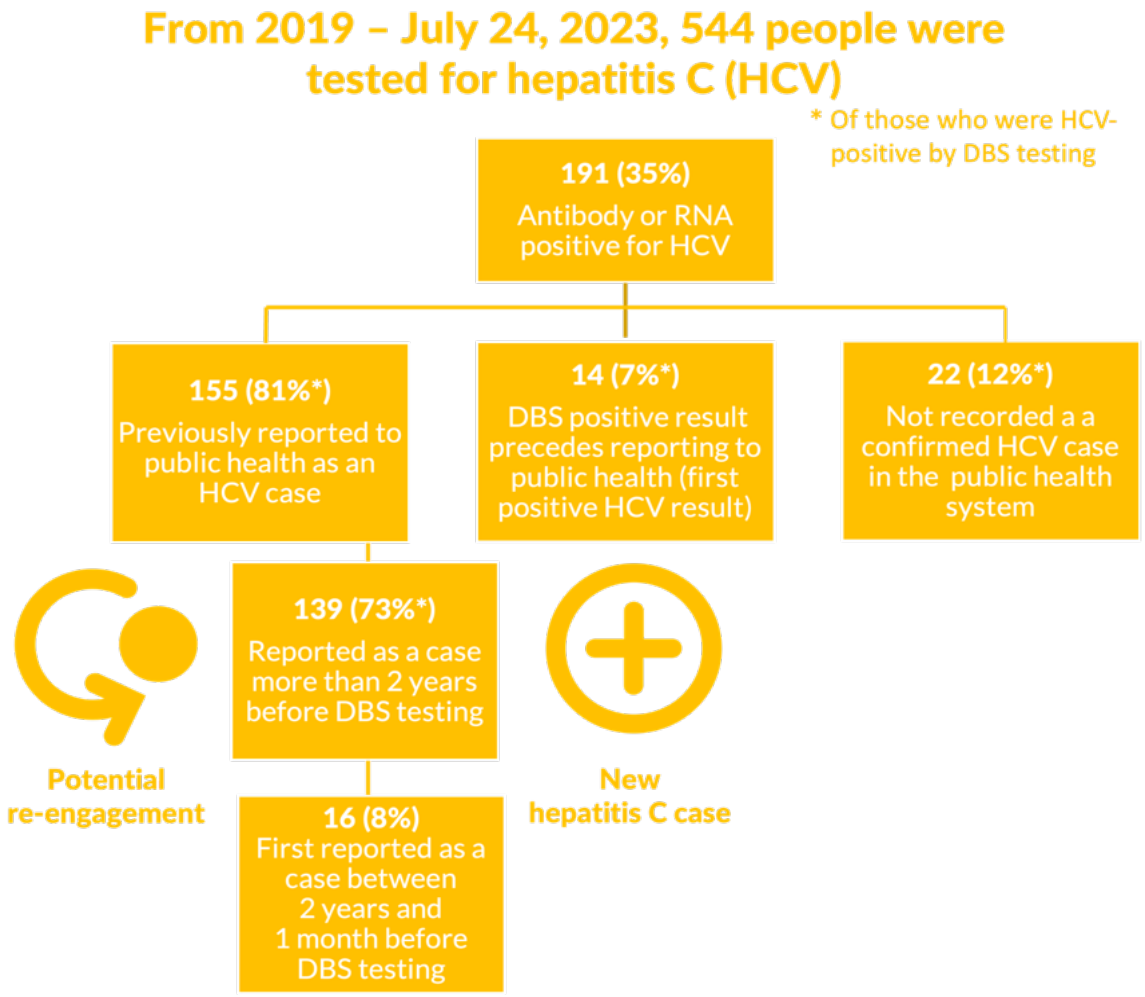
Using DBS results up to July 24, 2023, there were 191 people with a positive hepatitis C antibody or RNA test out of 544 people tested. We found:

- >80% of positive DBS HCV results were for people who had been previously reported to public health as an HCV infection. However, most had been living with hepatitis C for a while: 73% had been initially reported as being HCV positive more than 2 years prior to DBS testing.
- Since HCV antibody tests will remain positive even after the infection is cleared, we also looked at HCV RNA tests for active infection. 45% of people (n = 71) who were a known prior HCV cases were HCV RNA positive by DBS, which means they had an ongoing or new active infection and still required care and treatment.
- We suspect that some people who were initially diagnosed with HCV a while ago and were accessing DBS sampling may be those re-engaging into the healthcare system with a chronic infection.
- We believe that some people may have also been using DBS sampling to check for sustained virologic response (SVR) for hepatitis C cure after infection.

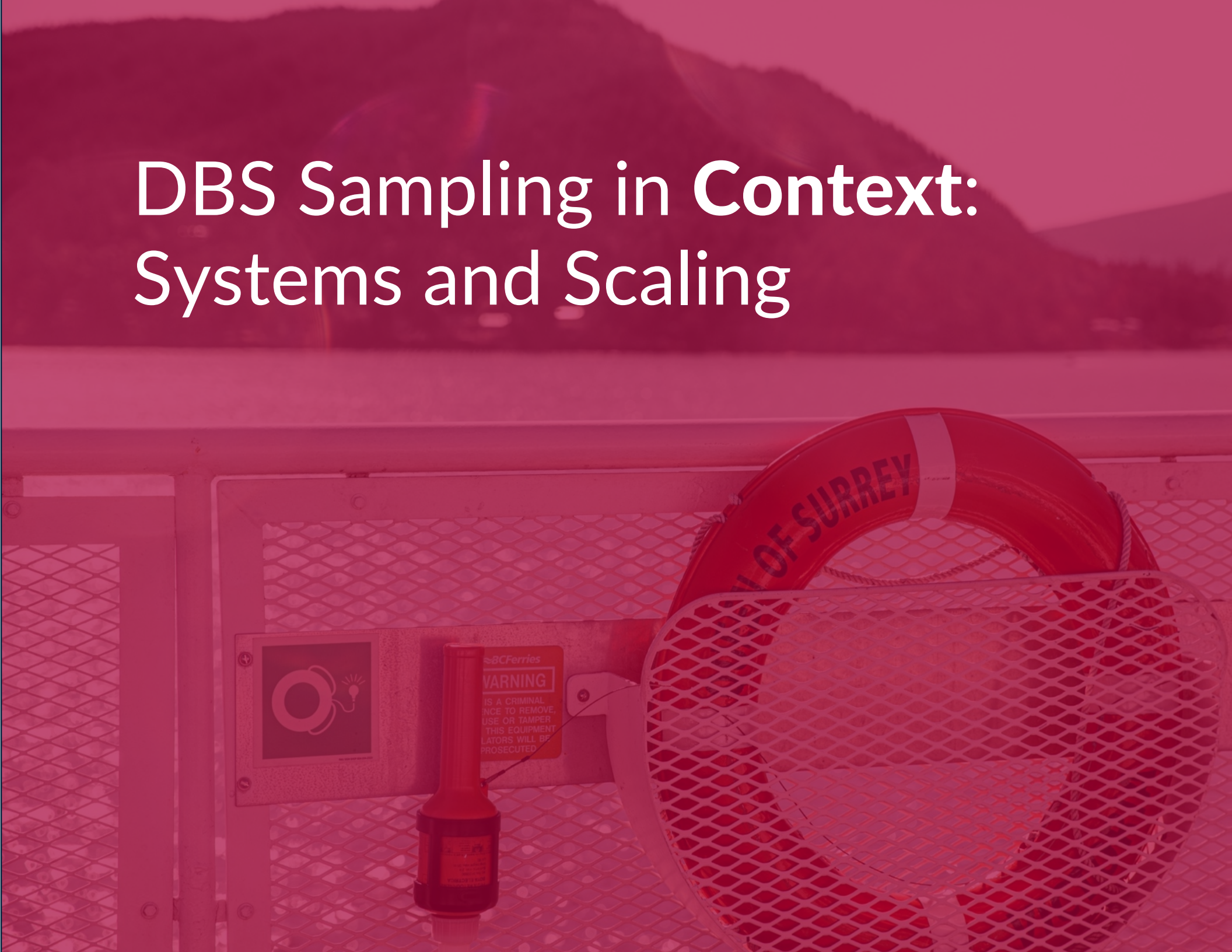
# Hepatitis C Cases Identified through DBS Testing

There were also people who did not have a previous HCV positive test before being tested by DBS:

- There were 14 (7%) people who were reported as cases and appeared to have had their first HCV positive result by DBS test, which means they were a new infection that this type of testing may have helped to identify.
- The remaining 12% of cases (22 people) were not able to be linked to confirmed HCV case investigations in the public health system. This might have resulted from incomplete or incorrect linkage information, cases that were not updated to be confirmed or results for clients that were not able to be followed up.



# DBS Sampling in **Context**: Systems and Scaling

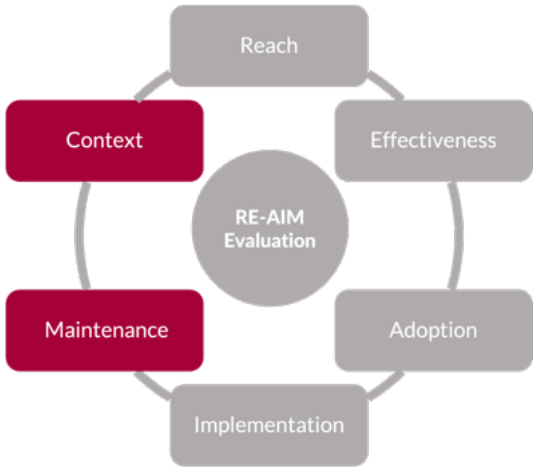


# DBS Sampling Context, Improvements and Future State

In looking at the evaluation objectives and questions (see Appendix A) one major objective of the evaluation was to better understand the context on both the pilot sites and the system where DBS sampling is happening. This information supports our ability to potentially scale DBS testing across the province in the future. This included evaluation questions that looked at:

1. **Maintenance**:
   - What infrastructure or system supports will be needed to sustain DBS testing in BC?
   - What are the likely implementation modifications or adaptations that will need to be made to sustain the initiative over time?

2. **Context**:
   - What is the strength of the evidence base for DBS testing in BC?
   - What is the strength of the evidence for different DBS sampling implementation approaches used in BC?
   - What have been the community demands or requests for DBS sampling in BC?
   - What are systems challenges impacting DBS sampling and testing in BC?



# Contexts Impacting DBS Sampling in BC

There are many important contexts to acknowledge when evaluating implementation and scaling of DBS sampling in BC. There were some key themes that emerged from evaluation participants:

- Healthcare and laboratory services are not safe for some people to access, mentioned elsewhere in this report. People who use drugs, have insecure housing, or are poor face stigma and discrimination when accessing healthcare.

> You definitely have a label, and I am seeking. Even if that's never the thing, because they don't have anything I would want anyways... I went in and I went septic, and I was telling them I wasn't [dope]sick. They didn't believe me until they got a temperature of 103F – you aren't [dope]sick. Well, I have been telling you this the whole time.
> -- Focus Group Participant

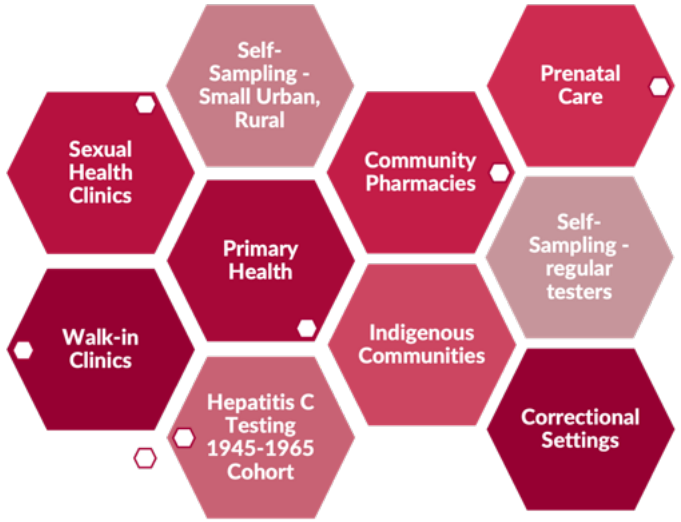
- Providing low-barrier, ongoing care and treatment to people with complex social and health conditions is difficult. People spoke about the challenges of following-up on a test result when people do not have phones or secure housing.
- In small urban, rural, and remote communities there is sometimes a lack of queer-affirming services for people of diverse sexualities and genders.
- The lack of primary health care capacity contributes to challenges in providing ongoing, effective, and relational healthcare to people across the province.
- Community-based organizations want to have increased participation in STBBI testing. They have built trusting relationships with service users that could benefit from testing and they feel capable implementing DBS sampling, including peer-based testing.
- Peers are important partners in STBBI testing and should be engaged in DBS sampling and other low-barrier testing models. This may require adaptation for training, practice guidelines, and mentorship.

# Proposed New Settings for DBS Sampling

Many evaluation participants had considered new settings where DBS sampling would be helpful or effective:

- Walk-in clinics or, primary care providers could have DBS cards available if they needed to complete a STBBI test without quick access to phlebotomy.
- Sexual health clinics.
- Correctional settings (Canadian Network on Hepatitis C. Blueprint Writing Committee and Working Groups, 2019; You Matter - Pathways to Care for STBBIs, 2022)
- Community pharmacies, many people have access to pharmacies when they might not have access to laboratories for sample collection.
- Pharmacists as ordering provider for STBBI DBS tests.
- Prenatal care for people not accessing care, DBS sampling could be used at outreach appointments.
- In Indigenous communities where there is limited access to nursing support or phlebotomy collection, could have testing events where many people could be engaged, and multiple samples collected. It was suggested that having the option to also test for chronic diseases, like diabetes, would increase the uptake of DBS sampling and could reduce stigma related to STBBI testing in communities.
- In support of the hepatitis C testing guideline everyone in the 1945-1965 birth cohort have a one-time test for hepatitis C (Canadian Network on Hepatitis C. Blueprint Writing Committee and Working Groups, 2019)
- Self-sampling, at home for a) people living in small urban, rural, and remote communities who do not have access to STBBI testing or safe healthcare services and b) for regular testers who are familiar with STBBI testing as a way to free up laboratory and clinical services that would be better applied to new testers who may need more information about testing or testing support.

**Potential Future Settings for DBS Testing**



# Recommendations for Changes to Improve and Scale DBS Sampling in BC

When considering the evaluation question of maintenance and examining implementation modifications or adaptations to sustain and grow DBS sampling in BC there are two areas of focus emerging from the evaluation data: a) what can be changed or improved within the current system and b) what does a future, ideal state look like and what needs to be planned, put in place, or developed to build an improved DBS testing system?

## Improving the Current State

Recommendations for improving the current DBS testing system include:

### Shorten the time it takes to get results back to service providers/users.

The turnaround time for results was the biggest DBS testing complaint. As the evaluation has progressed there has been real-time feedback back to operation leads at NML and PHL. Steps have already been taken to improve turnaround times within the current process.

Regarding a future state, work is under way to examine workflows, system processes, and operational resource needs, like staffing, that could be improved. Discussions are underway to bring STBBI DBS testing in-house to the BCCDC PHL, not requiring cards to be shipped to Winnipeg for testing. If this occurs, it is expected the time to receive test results will be shortened.

### Improve communication when results are going back to service providers.

Evaluation participants noted that results are sometimes hard to find, challenging to interpret, and are not standardized. Right now, results appear all together under a "miscellaneous" code and not in the usual places HIV, hepatitis C or syphilis results are posted. Thus, the expected visual cue for needed follow-up is not available on the electronic record. Providers also noted that they would prefer a quantitative viral load rather than a range when receiving results. Providers would benefit from more instruction on how to interpret results and decision support tools for clinical interpretation and procedures.

# Recommendations for Current State Improvements Continued

**Ongoing monitoring of DBS sampling data** to improve implementation and scale out in the province.

Indicators could include:

- First time testers, stratified by phlebotomy/DBS sample (and other demographic information)
- Intervals between prior test (positive or negative) and DBS sample for repeat testers
- New hepatitis C cases, stratified by phlebotomy/ DBS tests.

**Central communication support from BCCDC.** More comprehensive communication between NML, BCCDC, PHL, and sites would improve DBS implementation.

Evaluation participants stated that having more central and coordinated DBS testing communication and promotion would support their practice. These could include a dedicated page on the BCCDC website for DBS, information sheets, posters, advertising, and improving DBS test packaging to make it look more official, with branding and take away materials. Participants recommended Chee Mamuk should be involved in developing culturally safe DBS materials for Indigenous communities.

**Increase access to DBS sampling training** to support sites in training new people on staff and to allow for consistency in program implementation. This could be implemented using Northern Health's new eLearning course on the LearningHub (Northern Health, n.d.-b).

**Provide more guidance on how to get good blood flow to fill cards.** Work with frontline providers to collate innovative methods to improve DBS samples within a quality framework.

**Ensure clear guidance from the College of Nurses regarding whether** STBBI Certified Registered Nurses can be ordering providers for DBS samples and if they can delegate DBS sampling to other providers.

# Current State Recommendations Continued

**Support peers, non-medical staff, community testers to do DBS sampling** by developing appropriate tools and trainings to ensure non-healthcare providers feel well supported in DBS sampling and supporting service users to connect with care and treatment following testing.

**Ordering providers on STBBI tests**
Explore expanding professional practice regulations for STBBI testing to include others professions as ordering providers, allowing them to utilize DBS sampling and expanding access to STBBI testing across BC.

**Explore an MSP code for DBS collection,** allowing doctors, pharmacists, and others to be compensated for DBS sampling in offices or at community pharmacies, which may increase access for STBBI testing across the province.

**Improve processes for MSP billing for STBBI testing generally** to ensure service providers can be adequately compensated for STBBI testing across all their service users (whether in general practices or in other roles like OAT providers...). Limiting the rules and restrictions on billing for STBBI testing would increase reach and uptake across the province.

**Consider independent RNA testing for hepatitis C testing.** Given the challenges with collecting samples, in populations with high hepatitis C rates the program could explore skipping antibody testing on a DBS sample when specific individuals are known to be antibody positive and instead allow providers to order only a hepatitis C RNA test (diagnostic test), which allows providers to know if someone has an active infection. It is more helpful to confirm an active infection.

**Simplify pharmacare requirements for approval for hepatitis C treatment funding** for people who are treatment naive and under 40 years of age there is little clinical benefit in requiring liver function tests and other bloodwork results for funding approval, therefore removing these as a requirement for applying for Pharmacare funding approval for this population group would allow access to treatment coverage with only a DBS test result.

**Streamline the process of reordering materials** such as DBS cards, lancets, desiccants, etc. Inquire about adding other publicly funded materials that would help with testing, like hot pockets to warm up hands.

# Current State Recommendations Continued

**Develop a DBS Community of Practice** for frontline providers and PHL leaders to support sharing, collaboration, and program improvement. This may also support sites in smaller communities to problem solve implementation challenges.

**Share the evaluation report** to evaluation participants and the public. Other teams across Canada would benefit from the evaluation findings.

# Improved Future State Recommendations

## Improving DBS Testing in a Future State

Recommendations for improving the future, ideal state for DBS testing in BC:

**Integrate DBS test results into the provincial information systems.**

This would require the creation and integration of laboratory test codes (specimen type and results). This would automate how tests are entered into the system, how results are processed, and how they are returned to ordering providers. It would also allow for better surveillance and evaluation of DBS testing in BC.

**Explore validating additional tests using DBS samples** like hepatitis B, syphilis diagnostic tests, and chronic diseases like diabetes. The more testing options you can provide on a DBS sample the more you can test and the more you can potentially reduce stigma around STBBI testing (allowing people to choose what they are testing for confidentially).

**Establish capacity at the BCCDC Public Health Laboratory to evaluate new testing strategies.**

Explore dedicated resources at the PHL to support ongoing research and development for STBBI and other types of testing allowing BC to evaluate new test samples and technologies as they emerge. With increased capacity BC will be at the forefront of STBBI testing innovation and would ensure British Columbians benefit from an novel and responsive testing system.

**House DBS testing within a larger provincial, community-based, low-barrier testing program.**

There is demand for an increased STBBI testing toolkit with additional testing technologies and centralized supports. One existing resource that is well placed to support this kind of approach is the Provincial HIV Point-of-Care testing Program. This program is under-utilized with consistently declining point-of-care testing rates (BC Centre for Excellence in HIV/AIDS and BC Ministry of Health, 2022). Co-housing these programs could increase engagement and provincial support for low-barrier testing models.

# Future State Recommendations Continued

**Explore DBS self-sampling, at-home testing.**

This could engage more people who live in small urban, rural, remote, and Indigenous communities in STBBI testing. These are traditionally underserved populations and would benefit from a health equity approach to testing. As people have become more familiar with at-home testing since COVID-19 the feasibility of this kind of testing model has increased. In addition, there are models providing online testing and treatment support that could be explored for a one-stop STBBI service and improved linkage to care and treatment.

**Advocate for increased funding for hepatitis C, HIV, syphilis and other STBBI testing, care, and treatment especially in small urban, rural, and remote communities in BC.**

It is important that programs can be holistic and responsive in supporting people across all these infections while also providing services for other STBBIs, harm reduction and other related healthcare needs. Increased funding and strategic planning to de-silo testing and treatment would improve service users' outcomes across the province.

# Actioning Evaluation Findings

Building on lessons from the COVID-19 pandemic has benefited the expansion of DBS sampling in BC. The BCCDC, with the support of the NML in Winnipeg, has created a successful DBS testing program in BC that has the potential to be scaled up to reach more people, supporting communities with limited access to STBBI testing or with people who are not currently testing.

The evaluation has shown that dried blood spot (DBS) sampling plays an important role in providing low-barrier testing options to people living in BC. It has shown to be an effective tool for nurse-based programs but also programs with peer-based or non-healthcare provider service providers. While there needs to be clear care pathways for returning results and supporting service users in follow-up, non-healthcare providers can build on trusting relationships to support individuals who may find mainstream healthcare and laboratory services hard to access.

Many teams expressed the desire to have an expanded STBBI testing toolbox, with other low-barrier STBBI testing options like point-of-care, self-tests, and self-sampling processes. There is an opportunity to build a centralized program that supports training, promotion, and inventory across the province.

The major challenge with DBS sampling in BC is the length of time it takes to return results back to ordering providers. Teams at the BCCDC have already begun to explore what is needed operationally to support improvements in reporting and other key areas relating to DBS sampling.

It is recommended the BCCDC and NML teams continue to build action plans to make progress on the recommendations laid out in this evaluation report. With key ongoing monitoring, evaluation and accountability structures the DBS testing program has the potential to improve and grow.

Service providers and agencies participating in DBS sampling in BC as well as decision-makers like the Ministry of Health are key partners in thoughtfully developing mechanisms for improving and growing the program in both the current state and for a future state. They have expressed a desire to support this work, and the program will benefit from including these voices.

The fact that people are still facing stigma and discrimination at healthcare services in our province is extraordinarily disheartening. Everyone deserves access to safe and accessible healthcare services. While it is beyond the scope of this program to fix these, systemic barriers do impact people's ability to access STBBI testing, care, and treatment. This is why carefully developing responsive, safe, and accessible STBBI testing programs, built on cultural humility and safety are essential while we wait for the bigger system to do the work of improving systemic barriers and challenges.

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# Appendix A – Evaluation Methods

The evaluator worked in partnership with the Public Health Physician, Clinical Prevention Services at the BCCDC and an internal team to create an evaluation plan, data collection tools and implementation plans for the evaluation.

This project builds on systems put in place during the pandemic for building BC capacity for COVID-19 serological testing by DBS. With the larger project objectives:

1. To draw on BC's experience with testing innovations developed or used for COVID-19 testing, and determine if and how they should be further brought to scale in BC or applied to testing for other communicable diseases;
2. To focus on application of these innovations in rural, remote and Indigenous communities and populations, where inequitable access to timely testing for COVID-19 and other infectious diseases remains a persistent problem in BC;
3. To strengthen relationships & identify further opportunities for collaboration among the agencies involved in this proposal to enhance community-based testing in BC;
4. To develop a road-map identifying priorities and next steps for scaling up community-based testing approaches in BC.


The team decided on using a **RE-AIM** (Reach, Effectiveness, Adoption, Implementation, Maintenance + Context) framework to draft evaluation questions and indicators for this project. The evaluation questions were:

1. **How have each of the pilot sites implemented DBS testing?**

**Reach** Sub-Questions:

- How many people have done DBS testing in BC?
- How did the people who did DBS testing differ from those who did not?
- Are we reaching the people who would benefit most from DBS testing? [how do these people compare to the general population?][linked to implementation questions - Under what conditions is DBS the preferred form of testing?]
- Are the pilots reaching first-time testers? Infrequent testers? Repeat testers?
- What are the inclusion/exclusion criteria for DBS testing?

**Implementation** Sub-questions:

- Under what conditions is DBS the preferred form of testing for service providers? Service users? Testing/labs system?
- How has DBS testing been delivered at pilot sites? And how do the different implementation approaches impact satisfaction?

Additional Implementation Questions:

- Who does the DBS testing?
- Where are DBS tests delivered?
- Do service providers complete training or have they developed training?
- How are staff involved in DBS testing?
- Do the trained personnel doing the DBS collections often struggle to fill out an entire card
- How are clients engaged in DBS testing?
- How are samples transported to the labs?
- How are DBS samples tested?
- How are results reported?
- How are clients linked to care?
- What are the quality assurance mechanisms for DBS at sites?
- Have there been an unanticipated pathways or consequences with DBS testing implementation?

**2. What are the mechanisms of impact for each of the pilot sites?**

**Effectiveness** Sub-Questions:

- What are the key outcomes of goals of the DBS testing program at the pilot sites?
- What have been the key outcomes or impacts of DBS testing for service users/clients and staff at sites?
- Are there DBS testing implementation approaches that produce more positive outcomes then others?
- Have there been any unintended consequences resulting from this DBS testing program at the pilot sites? In the province?

**Adoption** Sub-Questions:

- How do people learn about DBS testing?
- How do people access DBS testing?
- Who is accessing DBS vs. those who are not?
- What are patients' overall perception of the DBS testing card and collection method? (Trust in sample type/testing method, knowledge of method, ease and comfort of DBS collection?)
- How many sites in BC have adopted DBS testing? What was the site's motivation for adopting DBS?
- How many staff at each site are engaged with DBS testing?
- What has been the level of satisfaction with implementation approaches at the sites?
- How have staff and client responded to the DBS test pilots?
- What supports would service providers/sites find beneficial from the labs?

3. **What are the context within which each of the pilot sites operate?**

**Maintenance** Sub-Questions:

- Can the PHL support DBS testing? Can tests be adequately validated for use in community-based sites?
- What infrastructure or system supports will be needed to sustain DBS testing in BC?
- What are the likely implementation modifications or adaptations that will need to be made to sustain the initiative over time? [preliminary evaluation – more in-depth analysis in future work]

**Context** Sub-Questions:

- What is the strength of the evidence base for DBS testing in BC [in other contexts]? What is the strength of the evidence for different DBS testing implementation approaches used in BC?
- Are each of the DBS implementation approaches patient-centered? Do the implementation approaches give patients choice over testing?
- Are there community resources supporting DBS testing in BC? What have been the community demands or requests for DBS testing in BC?
- In what kinds of organizations has DBS testing been most successful? What kinds of implementation approaches have had the most uptake of DBS testing? Most satisfaction from service users and providers?

In order to collect data to answer the evaluation questions above we designed a mixed method methodology

# Data Collection

Methodology and Limitations:

- BCCDC data – administrative data
- Interviews
- Survey data
- Peer Focus Group

# Appendix B – Lab Evaluation

The BCCDC Public Health Laboratory (PHL) performed an extensive evaluation of dried blood spot samples for multiple STBBI markers and on multiple STBBI testing platforms. It is important to note that all of the assays used for DBS testing are Health Canada approved and are currently used in standard of care testing at the BCCDC PHL. Thus, the primary objective of the laboratory evaluation was to demonstrate the suitability of DBS samples to be tested on the various STBBI testing platforms at the BCCDC PHL. The evaluation scope included the selection of appropriate buffers for DBS elution, optimization of DBS punching and processing, and determining the accuracy, sensitivity, specificity, and precision of dried blood spot samples on the selected STBBI assays. Below is a table of the evaluation results in the buffer pre-determined to be optimal. The acceptability criterion for this evaluation (in order to implement DBS testing at the PHL) is that DBS samples must have ≥95% accuracy, ≥95% specificity, and ≥90% sensitivity when compared to the gold-standard serum sample on any given STBBI assay/test and/or demonstrate precision by having coefficients of variation ≤15% when tested as mock DBS samples across a range of target concentrations.

In this evaluation, paired samples refer to a phlebotomy sample collected at the same time as a DBS sample from a given patient and mock samples refer to DBS samples that were created in the lab by spotting diluted whole blood samples, collected from a vein, directly onto a DBS sample card (vs DBS samples that were collected via finger prick). A distinction is made between the two evaluation sample types since there are differences in the characteristics of blood collected from a vein (standard phlebotomy sample) versus capillary blood (DBS sample). Additionally, there are preservatives in standard phlebotomy blood collection tubes that are not used in DBS sample cards; therefore, it is possible that the mock DBS samples perform differently than actual DBS samples

**Summary of Serum and DBS Paired Sample Results**

| | Performance of DBS Samples in the Paired Sample Study | | | Performance of Mock DBS Samples | |
|---|---|---|---|---|---|
| | *Accuracy* | *Sensitivity* | *Specificity* | *Approx. Index Range* | *Coefficient of Variation Range* |
| **Abbott ARCHITECT Anti-HCV Assay** | 97% | 92% | 100% | 4-12 S/CO | 6-14% |
| **Hologic Panther Aptima® HCV Quant Dx Assay** | 100% | 100% | 100% | 1.77-3.61 $Log_{10}$ IU/mL | 2-6% |
| **Siemens ADVIA Centaur® XP Syphilis Assay** | 100% | 100% | 100% | 1-12 S/CO | 3-13% |
| **Abbott ARCHITECT HIV Ag/Ab Combo Assay** | 100% | 100% | 100% | 1-81 S/CO | 3-12% |
| **Hologic Panther Aptima® HIV-1 Quant Dx Assay** | Paired samples not suitable for evaluation purposes | | | 2.03-3.75 $Log_{10}$ copies IU/mL | 2-9% |
| **Abbott ARCHITECT HBsAg Qualitative Assay** | 100% | 100% | 100% | 1-553 S/CO | 3-8% |

All paired sample results were interpreted as positive or negative using the routine STBBI testing guidelines at the BCCDC PHL. No numerical results were used in the analyses to assess accuracy, sensitivity, nor specificity. The serology assays evaluated in this validation do not provide quantitative results, thus no comparison of the numerical outputs of a DBS sample versus a serum sample was done. While the *HCV Quant Dx Assay* and the *Hologic Panther Aptima® HIV-1 Quant Dx Assay* can provide quantitative results, the scope of the laboratory validation cannot effectively compare quantitative results from DBS samples versus serum samples. Additional validation work is being done at the BCCDC PHL to further evaluate the suitability of DBS samples for quantitative testing, such as HCV and HIV viral loads. Success of previous and ongoing validation work greatly depends on the ability to obtain a diverse selection of positive paired samples for testing.

# Appendix C – Interview Method & Results

## Interviews Data Collection

We conducted 18 online interviews with 23 service providers involved with DBS testing in BC (from 15 different agencies) between February 2023 and September 2023. Interviewees fell into three different categories: community health clinics or clinicians who are using DBS testing as a clinical tool; research studies who used DBS testing as part of a research study; and laboratory or high-level program experts. We are grateful for teams at the following organizations who did interviews and contributed time and expertise to this evaluation:

Community Health Clinics, Clinicians, Health Authority Leads:

- Cammy LaFleur Street Outreach Program, Turning Points Collaborative Society
- Central Interior Native Health, Prince George
- Dr. Peter Centre, Vancouver
- Harm Reduction Nurse, Port Hardy, Island Health
- Northern Health Chronic Disease and Communicable Disease Team
- Pacific Gastroenterology Associates, Vancouver
- Positive Wellness North Island, Island Health, Campbell River and Comox Valley
- Prince George Detox and OAT Clinic, Northern Health, Prince George
- Quesnel OAT Clinic, Northern Health, Quesnel
- Specialized Support Team, Northern Health
- Victoria Cool Aid Society, Victoria

Research Studies

- The Cedar Project, Prince George and Vancouver
- Community Based Research Centre (CBRC), across BC
- Drum and Sash Research Team –CAAN and Shining Mountains Living Community Services, Alberta

BCCDC or Laboratory Experts

- Dr. Sofia Bartlett, BCCDC
- Dr. John Kim, National Microbiology Laboratory
- Christine Mesa, National Microbiology Laboratory

Notes were taken following each of the interviews and then these notes were used to code for themes.

# Interview Results

A thematic analysis has been completed – counting when an agency mentioned a theme (there are 14 agencies total)– see the frequency columns below. Themes have been divided into five sub-categories:

1. Important context pieces
2. What has been working well in relation to DBS testing in BC
3. What has been challenging in relation to DBS testing in BC
4. What would support implementation or increased DBS testing use in BC
5. System barriers to DBS testing

# Context pieces:

There were some interesting themes that served as important context pieces for the evaluation.
The first is that some sites are not using DBS testing as much as they expected for a number of reasons including ranging from human resource issues such as having improved access to nurses who can do phlebotomy at sites on the positive side and not having enough human resources or people trained to do DBS testing on the negative side. Participants also reported a number of systems challenges that discourage them using DBS testing including needing to do phlebotomy testing for approvals to hepatitis C treatment access and that it takes too long to get DBS test results back to patients.

Interviewees shared that many of the people they are working with have complex care needs including, people who are homeless, people who use substances, and people who require queer-affirming care. However, some people are not using traditional healthcare or laboratory services because they have faced stigma, discrimination, or trauma when accessing services in the past and don't feel safe accessing these services. This makes innovative testing technologies like DBS testing appealing to service providers, especially as this kind of testing can be done at agencies or with staff or peers service users trust. DBS testing can be an important engagement tool to support people learning about and receiving other care or treatment services.

Some participants also highlighted geographic equity as an important context piece when discussing STBBI testing. This includes the lack of laboratory or testing services in smaller urban or rural areas of the province that limits people's ability to test regularly.

Finally, with regards to important context pieces relating to the DBS test some respondents suggested that service users liked this test because they don't get their results right away – sometimes people are ready to do the testing but not ready to hear the results – and this is one advantage to this testing modality.

# Important context pieces – Frequency of codes:

Frequency counts the number of agencies that mentioned each theme or code in the interviews for the evaluation.

| THEME | FREQ |
|---|---|
| People we are serving are not accessing traditional healthcare -- experienced too much trauma -- People face discrimination and lack of respect at traditional health services | 5 |
| Labs have too many barriers (appointments, short staffed, wait times) | 3 |
| People don't have access to labs in rural and remote areas | 3 |
| People don't feel safe in hospitals or labs | 3 |
| Many clients do not like needles (even PWUD) | 3 |
| Our clinic/services is one way to re-engage people back into healthcare | 3 |
| Program includes nurse-led DBS testing | 3 |
| Program includes peer-based testing | 3 |
| Are distributing HIV ST through I'm Ready | 3 |
| People really don't want to go to labs | 2 |
| Clients have very intensive care needs | 2 |
| Covid shut down a lot of STBBI testing | 2 |
| Many clients have scared veins | 2 |
| People don't want results back right away, need time to process and get ready for a result (POC vs. DBS) | 2 |
| Our agencies does not have the resources/human resources to do blood draws | 2 |
| We are shipping DBS tests through hospital/lab mail | 2 |
| DBS testing was done for research | 2 |
| Program includes peer-led work | 2 |
| Some people are not accessing regular STBBI or HIV testing (like viral load, CD4) | 1 |
| Unsure: Can DBS do viral load and CD4 HIV testing? | 1 |

| | |
|---|---|
| People trust testing done with people from their own community (ie. Metis, Indigenous) | 1 |
| People like POC testing but it doesn't tell you if someone is actively infected | 1 |
| People generally opt for phlebotomy | 1 |
| Have had people re-test on a DBS test - take more than on DBS test by choice | 1 |
| Program included non-nurse testing (i.e. social workers community members) | 1 |
| Program included self-sampling | 1 |
| Program part of hepatitis C program | 1 |
| Hepatitis C POC testing not good for reinfection -- DBS is a better tool | 1 |
| Working in partnership with other agencies and CBOs to support clients | 1 |
| Higher uptake of HIVST than DBST | 1 |
| People ask for POC tests after a risky event | 1 |
| People ask for POC if they want results right away | 1 |
| General lack of understanding about how to access testing | 1 |
| People trust testing done with staff they know | 1 |
| Some people in small communities have to travel and take a lot of time to get labs done (sometimes up to 3 days) | 1 |
| In winter we sometimes have problems with blood transportation and freezing samples -- this is mitigated by DBS testing | 1 |
| Need to ensure that there is good linkage to care when doing DBST | 1 |
| NML will always tests samples (even if not packed properly) but will add a caveat on the report | 1 |
| Big push for CEPHID machines | 1 |
| POC testing is a great engagement tool -- can talk with people as you are waiting for results | 1 |
| People are interested in HCV POC -- it is less scary than HIV POC because there is treatment avaliable | 1 |

| | |
|---|---|
| While people don't like phlebotomy you can't get people on hepatitis C treatment without it | 1 |
| In other parts of Canada (i.e. SK) you can get someone on treatment with a DBS test | 1 |
| It is more important to focus on getting people on treatment -- so should prioritize phlebotomy | 1 |
| New hepatitis C infections are happening in youth and from injection drug use | 1 |
| For self-sampling sent two lancets for each test -- in case someone need to prick another finger | 1 |
| Lancets that hurt more give a better sample -- more blood -- also more expensive (cost consideration) | 1 |
| With a change in the Canada Post regulations were able to send self samples through mail | 1 |
| Have a large unhoused population in our community | 1 |
| **Have not been using DBS testing a lot because:** | 5 |
| because we need to do phlebotomy to get hepatitis C treatment approved | 2 |
| As clinic has gotten better and more available for blood draws we have been doing DBS less | 2 |
| When providing nursing care makes more sense to do phlebotomy because can test for other things | 2 |
| Don't have the human resources to do DBS -- service is too busy | 1 |
| Haven't been able to train new people to support DBS testing | 1 |
| It takes too long to get results | 1 |
| People who were trained on DBS have taken leave | 1 |

# What has been working well with regards to DBS testing in BC

Many of the interview respondents felt that DBS testing can be a useful testing method for STBBIs for people who:

- Have challenging venous access and blood draws can be hard
- Have a needle phobia or a triggered by needles (this includes many people who use substances)
- Do not want phlebotomy
- Don't want to get their test results right away
- Want to complete a test for sustained viral response (SVR) after hepatitis C treatment
- Have experienced stigma or discrimination at health or laboratory services
- Who want to do both screening and diagnostic testing
- Engage in activities more likely to transmit STBBIs
- Who are regular testers but want a more convenient, at-home testing option

And in the following settings:

- Outreach contexts
- Event-based testing
- In people's homes
- In small urban, rural, remote, and Indigenous communities where there is limited health or laboratory services
- In agencies that don't have access to phlebotomy – like community-based organizations, Corrections
- In agencies that have built trusting relationships with service users

# What has been working well with regards to DBS testing in BC – Frequency of codes:

Frequency counts the number of agencies that mentioned each theme or code in the interviews for the evaluation.

| THEME | FREQ |
|---|---|
| **DBS is a good method of testing for:** | |
| people who are a hard blood draws, have challenging veins | 7 |
| Outreach contexts | 7 |
| people who have a needle phobia or are trigged by needles | 6 |
| People who don't want test results right away | 6 |
| people who did not want to do phlebotomy | 5 |
| Event-based testing | 4 |
| When agencies don't have access to phlebotomy/ not enough resources for phlebotomy | 4 |
| completing a SVR test (sustained viral response after hepatitis C treatment – determine cure) | 3 |
| Community-based agencies, don't usually have access to testing | 3 |
| people who have shame going to a lab or who have had bad experiences or trauma going to labs | 2 |
| re-infection of hepatitis C | 2 |
| Engaging first time testers at event-based testing | 2 |
| People who prefer a finger prick | 2 |
| doing both hepatitis C screening and confirmatory on same test | 1 |
| Getting an HIV viral load from a person who won't/can't test, can keep them on HIV treatment | 1 |
| Diagnostic and treating tests when phlebotomy isna't an option | 1 |

| | |
|---|---|
| When people can't/won't make it to labs for long lengths of times -- better than nothing | 1 |
| When agencies don't have someone who can do complicated blood draws | 1 |
| Testing in people's homes | 1 |
| People who have engaged in behaviours at high risk of contracting STBBIs | 1 |
| Testing in Corrections - can't do phlebotomy on site | 1 |
| In rural and remote communities | 1 |
| People who face barriers to queer-affirming and culturally safe testing | 1 |
| People who have good access to testing but are busy and don't want to go to a clinic for testing -- more convenient | 1 |
| People who don't want any one interacting with their veins | 1 |
| People who want to test with a peer | 1 |
| Indigenous communities | 1 |
| People who don't want to be judged | 1 |
| Prenatal screens for people not in care | 1 |
| People who don't want to role up sleeves because of scarring on arms | 1 |

**What is working well in relation to DBS Testing:**

| | |
|---|---|
| Training and support from the NML has been great | 7 |
| DBS is a low barrier testing model, meeting people where they are at | 4 |
| DBS testing allows people to engage with agencies, community-organization where they feel safe at and trust staff | 4 |
| Some teams reported that DBS testing is the preferred method of testing over phlebotomy | 4 |
| People are receptive to DBS, in support of DBS, high acceptability | 4 |
| People liked that they didn't have to do it in a clinical space | 4 |

| | |
|---|---|
| Good to have an ordering provider engaged with site and good that nurses can be the ordering provider | 4 |
| Allowed us to re-engage people in care, discussion about harm reduction… | 3 |
| DBS testing has allowed us to Identify new cases of syphilis | 3 |
| DBS testing has allowed us to Identify new cases of hepatitis C | 3 |
| Non-nurses can do DBS testing | 3 |
| Peers or community members can do testing | 3 |
| People liked they could test for HIV, HCV, and syphilis on same card | 2 |
| DBS is user friendly and relatively easy to do | 2 |
| DBS testing gives people more testing options and gives them choice/control over their healthcare | 2 |
| DBS test results are easy to read | 2 |
| Receiving inventory is working well | 2 |
| DBS is easy for people to relate to if speak about parallels with diabetes testing | 2 |
| Peers can reach people that services cannot - engage people in testing | 2 |
| Like incentive/gift card for doing DBS testing | 2 |
| Using the NH training manual / the NH training | 2 |
| DBS testing is easier than POC or self-test | 2 |
| Have been successful linking people to care after testing | 2 |
| Allowed us to re-engage people who hadn't been testing | 1 |
| After getting a positive RNA it motivates people to go to the lab, to engage in treatment | 1 |
| When POC testing does not feel confidential people are willing to wait longer for results, like with DBS testing | 1 |
| DBS is more confidential in smaller communities | 1 |
| Some teams stated that people are excited about DBS testing | 1 |
| People could chose what STBBIs they wanted to test for | 1 |

| | |
|---|---|
| Metis people like to be tested by Metis people | 1 |
| Using an Metis service model | 1 |
| DBS testing is a good education tool for people new to testing (at events) | 1 |
| Event-based testing can be good for role modelling testing and help to reduce stigma | 1 |
| Like having a cheat sheet for DBS testing with pictures | 1 |
| Support from the BCCDC has been great (n=2) | 1 |
| DBS testing has allowed us (find positives we wouldn't have found) | 1 |
| DBS tests are free to organizations | 1 |
| Nurse with certified practice ordering provider | 1 |
| Having MHO in health authority act as ordering provider | 1 |
| Training has worked well for nurses | 1 |
| DBS testing is less invasive for people who have anxiety about blood work | 1 |
| Shipping directly to NML means getting results within one week of them receiving the samples | 1 |
| Services that provide low barrier services are working to re-establish trust with healthcare providers | 1 |
| Work in partnership with CBOs (service providers) to look up PHNs during events | 1 |
| Having a lot of community supporting testing i.e. agencies and politicians coming up to support | 1 |
| Having Indigenous people doing follow-up with Indigenous people | 1 |
| People feel more comfortable testing with peers | 1 |
| Having a peer mentor supporting peers doing testing and organizing peers doing testing | 1 |
| Allowed teams to catch up on STBBI testing that slowed down during covid | 1 |
| Important to meet people where they are at i.e. in their homes | 1 |

| | |
|---|---|
| Because of DBS testing we have added testing into our scope of work | 1 |
| DBS testing is shorter then phlebotomy | 1 |
| People who have used drugs don't like to do phlebotomy because providers see scars -- triggers a bias and stigmatizing response | 1 |
| Accessioning at BCCDC -- supports ongoing monitoring and access to healthcare | 1 |
| Mail home tests -- people were able to self-sample with instructions (got samples that we were able to process) | 1 |
| Shipping self-samples through the mail | 1 |
| Even when people who did self-sampling didn't package them perfectly they were still viable for testing | 1 |
| One person can manage logistics for several thousand DBS test -- low human resource investment | 1 |
| At least 50% of respondents said DBS testing (self-sampling) was as good or better than other testing methods | 1 |
| Generally people felt it wasn't as bad as they expected | 1 |
| All samples submitted have been viable for testing/not rejected -- robust test | 1 |
| Great to have another STBBI testing option | 1 |
| Like the design of the cards -- for sampling and drying | 1 |
| DBS is portable -- good for rural and remote communities | 1 |
| DBS testing is allowing us to test people who wouldn’t otherwise be tested | 1 |
| Like getting a note from NML stating "we have received your samples" | 1 |

**Teams have learned approaches that make filling cards easier including:**

| | |
|---|---|
| Standing -- use gravity | 3 |
| Push ups or exercise | 2 |
| Squeeze finger to get a big drop of blood (hasn't impacted ability to test) | 2 |

| | |
|---|---|
| Warm up arm | 1 |
| Hot drink/coffee | 1 |
| Warm up people | 1 |
| Wash hands with warm water | 1 |
| Get blood flowing, don't wipe the first drop of blood | 1 |
| Having people squeeze their own fingers -- often person themselves can do better with sampling | 1 |

# What has been challenging in relation to DBS testing in BC – Frequency of codes:

Frequency counts the number of agencies that mentioned each theme or code in the interviews for the evaluation.

| THEME | FREQ |
|---|---|
| Wait is too long to get results back | 9 |
| Filling all the circles on the card can be challenging | 7 |
| Pain after poke (some pain -- most people put the caveat on this tht it wasn't too bad, people didn't mind) | 5 |
| Because of the wait we lose contact with people/can't find people | 4 |
| Syphilis testing not very helpful because can't tell if it is an active infection | 4 |
| Sometimes need to poke person more than once | 4 |
| Some people have calloused fingers have issues getting enough blood | 4 |
| Newer staff/peers need more support in sampling -- increase in re-test calls/rejected samples | 4 |
| Pharmacare won't accept DBS tests for funding approval for hepatitis C treatment | 3 |
| Results are not easy to find on the EMR | 3 |
| Can't access training to get more/new people trained | 3 |
| Sometimes lack of coordination on positive results between site and public health -- site should follow-up with their patient | 3 |
| Saturating the cards can be challenging | 3 |
| Need a lot of blood, big drop | 3 |
| Sometimes people don't bleed well from fingers | 3 |
| People often have cold hands and it is hard to get good circulation | 3 |
| Can't get the other lab counts needed to start HCV treatment on a DBS test | 2 |

| | |
|---|---|
| Results are not flagged when ready on the EMR | 2 |
| Other providers don't know where to find DBS  results (or to look for results) on EMR | 2 |
| Packaging up tests for shipping can be complicated | 2 |
| Doing a DBS test can take longer than phlebotomy | 2 |
| A lot of people don't have doctors/GPs to support follow-up and linkage to care | 2 |
| Pricking your finger on a place on your finger where it is easy to physically drop it on to the card | 2 |
| Access to labs for blood work testing is limited | 1 |
| Hard to find an ordering provider | 1 |
| Sometimes it is challenging getting results back to people | 1 |
| If people are having a lot of sex waiting longer times for results is not helpful -- might not reflect current sexual health status | 1 |
| Results can be confusing, with a lot of text to weed through | 1 |
| We have had a sample go missing when it was sent to the lab | 1 |
| Results are confusing - doctors are having a hard time interpreting results (ie. Indeterminant result) | 1 |
| System of lab coding confusing -- the same test has multiple codes | 1 |
| If you are not the ordering provider but someone who did the testing, connected to patient, you don't get notified when results are ready | 1 |
| Health authority labs sometimes open packaging before sending to BCCDC | 1 |
| End up spending a lot of time follow-up on reactive syphilis tests when people already know status | 1 |
| Providers in more rural and remote areas haven't been able to be trained to take samples | 1 |
| Training -- needed more troubleshooting for clients who are difficult to get a sample from | 1 |
| DBS training is too complicated for peers | 1 |

| | |
|---|---|
| DBS training was accessible for peers but if you are doing it virtually need a provider working with peers to answer questions and support | 1 |
| Need a provider who doesn't mind getting poked available when peers trainings, so they can practice | 1 |
| Peers need more education on how to get good blood flow going | 1 |
| Peers may need some training, support, and coaching about public health guidelines relating to privacy and confidentiality when doing testing | 1 |
| Ordering provider and testing stie should work more closely together to follow-up on results | 1 |
| You can get blood all over if someone is bleeding well and you are not in control of their hand | 1 |
| The lancet has slipped off the finger a few times and am worried about needlestick injuries | 1 |
| Early in the process peers benefit from ongoing coaching and training | 1 |
| After having cards rejected peers are reluctant to do DBS testing | 1 |
| Viral load for HCV seems too high -- might miss someone early in their infection, seroconverting | 1 |
| HIV viral load limit higher than phlebotomy -- doesn't tell you if someone is suppressed or not | 1 |
| Not as sensitive as other tests | 1 |
| Need more informational materials about DBS testing -- for doctors, public... to increase knowledge about this form of testing | 1 |
| Agency is understaffed, it is challenging to follow-up with people | 1 |
| When people are given incentives for DBS testing sometimes get peopel re-testing who already know their STBBI status | 1 |
| Some doctors don't like the viral load ranges | 1 |
| New service and not all of the systems are set up yet | 1 |
| Have stopped doing hepatitis B testing | 1 |

| | |
|---|---|
| Not able to send via health authority lab | 1 |
| Quality of the samples for most part have been good | 1 |
| There are provider barriers to hepatitis C treatment | 1 |
| Reflex testing -- labs won't run a viral load for hep C if there is a past positive antibody on record | 1 |
| Maybe a nurse could have done a DBS test faster but we (non-nurses) wanted to do it right | 1 |
| Lack of STBBI testing during COVID still having impacts | 1 |

# What would support implementation or increased DBS testing use? Potential areas of exploration – Frequency of codes:

Frequency counts the number of agencies that mentioned each theme or code in the interviews for the evaluation.

| THEME | FREQ |
|---|---|
| Promotion about DBS from BCCDC/central authority -- people don't know about this kind of testing, doctors need more information too | 5 |
| Interested in peer-led testing/sampling | 4 |
| Interested in having non-healthcare providers do sampling as they have strong relationships with clients | 4 |
| Streamlined reporting in the EMR -- make results easier to find | 3 |
| Training needs to be more accessible -- in order to get new/more people trained on DBS testing | 3 |
| Interested in self-sampling, at-home mail-in tests | 3 |
| Would be good to add in other chronic disease tests (like diabetes) because this would reduce stigma around using the DBS cards | 3 |
| First Nations would be interested in DBS | 2 |
| Would use DBS more if results were faster to come back | 2 |
| Would be helpful if we could use a DBS test to attach to Pharmacare application for funding approval for hepatitis C treatment | 2 |
| Training materials that were developed for peers/non-healthcare providers -- more simple and accessible | 2 |
| DBS promotional materials/test kits need to look more official so people will trust testing, maybe have a take away of info after the test | 2 |

| | |
|---|---|
| Explore using DBS tests at GPs offices -- don't need a lab appointment, could process recommended hep C testing faster (once a lifetime) | 2 |
| Using DBS for outreach testing in rural communities | 2 |
| Use DBS testing for prenatal testing for people not in care | 2 |
| Would like hand warmer/hot pockets for DBS testing | 2 |
| Would like to be able to test for diabetes | 2 |
| Streamline follow-up plans, linkage to care after a positive result | 2 |
| When doing DBS testing it would be helpful to know previous testing history, would support follow-up (if we know someone has already tested positive won't follow-up as aggressively) | 1 |
| Interested in exploring having public health/MHO as the ordering provider | 1 |
| Easier access to an ordering provider | 1 |
| Bring clarity/ provide resources to GPs on how to read DBS testing results | 1 |
| Could use DBS testing to follow testing guidelines where everyone should receive one HCV test in lifetime | 1 |
| Have the required test for hepatitis C treatment approval be run of a DBS test | 1 |
| Can syphilis testing be better -- would be more helpful if we could tell if it was an active infection | 1 |
| Continue to have good communication and support from the BCCDC/PHL | 1 |
| Build a peer-to-peer training model for DBS | 1 |
| Training materials and information for doctors on finding and interpreting results | 1 |
| Think about using social media/Facebook in small communities to do promotion | 1 |
| Create culturally appropriate DBS testing materials -- through Chee Mamuk | 1 |
| Emphasize what the materials look like in information materials | 1 |
| DBS testing swag (ie. Lighters) would help with promotion | 1 |
| Get a funding code for GPs to be able to doing DBS testing in their offices | 1 |

| | |
|---|---|
| Develop quick information/resource tools for GPs who want to do DBS testing in their offices | 1 |
| Use DBS teting in Indigenous communities -- more confidential | 1 |
| Use DBS testing at large scale testing events -- test a whole community | 1 |
| Helpful to have guidance if there are alternative spots to poke/prick if the fingers aren't working | 1 |
| Would consider using DBS testing at events | 1 |
| Can we make the sensitivity lower with out getting a false positive? | 1 |
| Need to focus on reaching out to new people, who don't already know their status | 1 |
| Find ways to have non-clinical testing sites support sharing positive test results (working in partnership with ordering provider) | 1 |
| Have a way for people/agencies who did the testing/sampling to get notified when results are ready (people who are not the ordering provider) | 1 |
| Unsure: Can us DBS for SVR? | 1 |
| Self-sampling, at-home testing could limit people's interaction with an unsafe/discriminatory health system | 1 |
| Would like to be able to test for hepatitis B | 1 |
| It would be helpful to hear from other programs to learn what they are doing with DBS testing | 1 |
| Find ways to use DBS testing to minimize travel/time people have to do to get lab testing in rural and remote communities -- like using DBS testing for HIV and HCV treatment monitoring | 1 |
| Allow pharmacists to be an ordering provider for DBS tests | 1 |
| Work to standardize and streamline DBS testing process/system so it doesn't feel extra | 1 |
| Refine NH's patient contact form to make this a more streamlined process | 1 |

| | |
|---|---|
| Helpful to query about DBST acceptability, vs. other forms of testing, and whether people are able to use the card for self-sampling | 1 |
| Share findings on this evaluation back please | 1 |
| Could combine POC and DBS testing -- use DBS tests to confirm preliminary positives | 1 |
| Provincial DBST program needs to have resources in place to support testing sites and to communicate with partners | 1 |
| Trying to source a better lancet | 1 |
| Target DBS testing to people who face barriers to queer-affirming testing | 1 |
| Use DBS testing for people who are regular testers and don't need a lot of support -- becomes normal testing -- frees up space in the system for new testers or complicated tests | 1 |
| If we could get the viral load levels lowered for DBS that would be beneficial -- would tell you if someone's HIV is suppressed | 1 |
| Need to weigh and balance the increased reach of a self-administered test vs. surveillance -- air on the side of increasing testing | 1 |
| Consider finding a way to make DBS testing anonymous - it is beneficial for people to have access to their personal health info | 1 |
| Important to be clear and transparent about how long it takes to get results -- so people can make an informed decision on what kind of testing is best for them | 1 |
| Encourage peer-run, peer-driving STBBI testing | 1 |
| Service providers could benefit from a simple one-pager about DBS testing and how it can be used | 1 |
| Need to find good ways to support peers doing community-based testing (supporting mental health, compensation, boundaries...) | 1 |
| Could streamline the DBS packaging process to send tests to the lab | 1 |

# Identified systems-barriers and challenges to DBS testing:

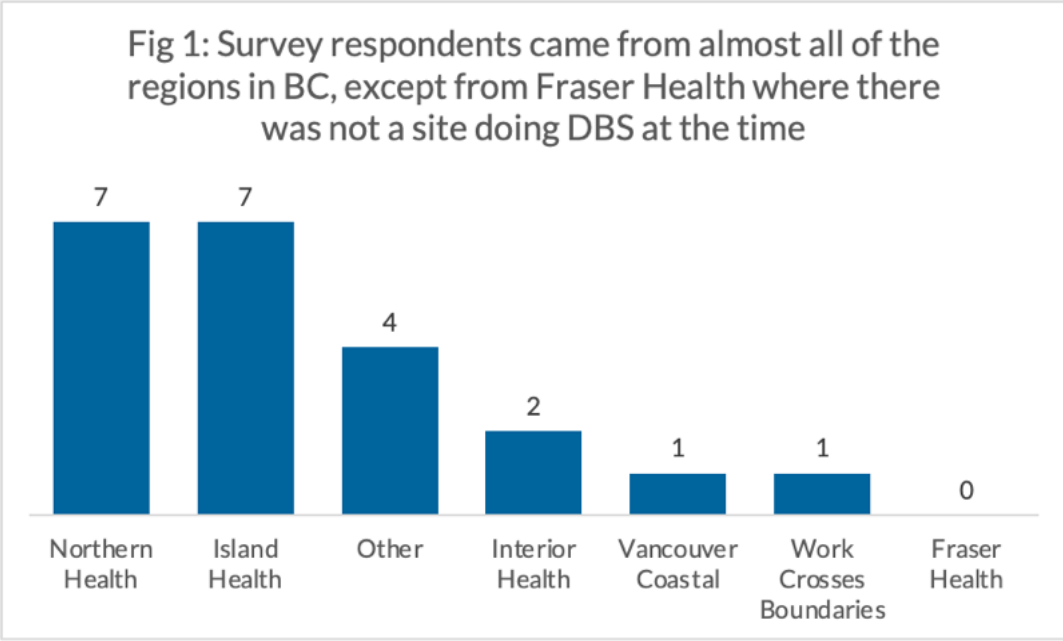
- It is challenging when health systems do not want to empower non-healthcare providers to do STBBI testing and want to control the process
- Pharmacare won't accept DBS to approve funding for hepatitis C treatment -- requires phlebotomy test and testing not available on DBS tests
- Need a MSP code for GPs -- so they could do DBS testing in their offices
- Public health reporting is challenging -- if someone has had a previous RNA positive but they clear their infection they are still reported in the system as positive
- Need to roll out DBS testing in a more official manner -- people need to trust it, testing package/info needs to look more official, having leadership from the BCCDC and PHL would help with this
- Bigger issue -- how to provide low-barrier health services to people living in poverty, people who are underhoused, people who use drugs
- Pharmacists should be able to be ordering provider for DBS testing (like in AB) -- community pharmacies are primary care providers -- expanding the scope of pharmacists to provide testing in community pharmacies
- Check the language in the testing guidelines to see if it encompasses DBS testing -- make the language less specific to encompass more types of testing modalities
- How hepatitis C treatment approvals happen -- it does not make it as accessible as it could be, micromanaging because of drug costs, making treatment decisions on who is deserving of treatment and who will not get reinfected
- In BC, have siloed work on infectious diseases (ie. HIV and HCV) -- HCV has had less of a focus and fewer resources
- Finding care in more rural and remote areas that is culturally safe and queer-affirming
- Racism in the healthcare system -- needs to be at the forefront when planning new program

# Appendix D: Survey Methods and Results

Another data collection method employed by the evaluation was an online survey. The survey was distributed through an email with an url invitation to leads at the pilot sites who then invited others at their agency who are involved in with implementing DBS testing on the frontlines. The survey was open from March 1-17, 2023 and we received 22 responses. Respondents came from almost all of the regions across BC (fig 1) and played various roles across the implementation cycle (fig 2).

The survey asked multiple choice, Likert scale questions, and open ended questions. These focused on questions about who was accessing DBS testing at the site, why they decided to use DBS, satisfaction with various implementation steps relating to DBS testing, and what changes resulted from DBS testing and what could be improved.

Fig 1: Survey respondents came from almost all of the regions in BC, except from Fraser Health where there was not a site doing DBS at the time



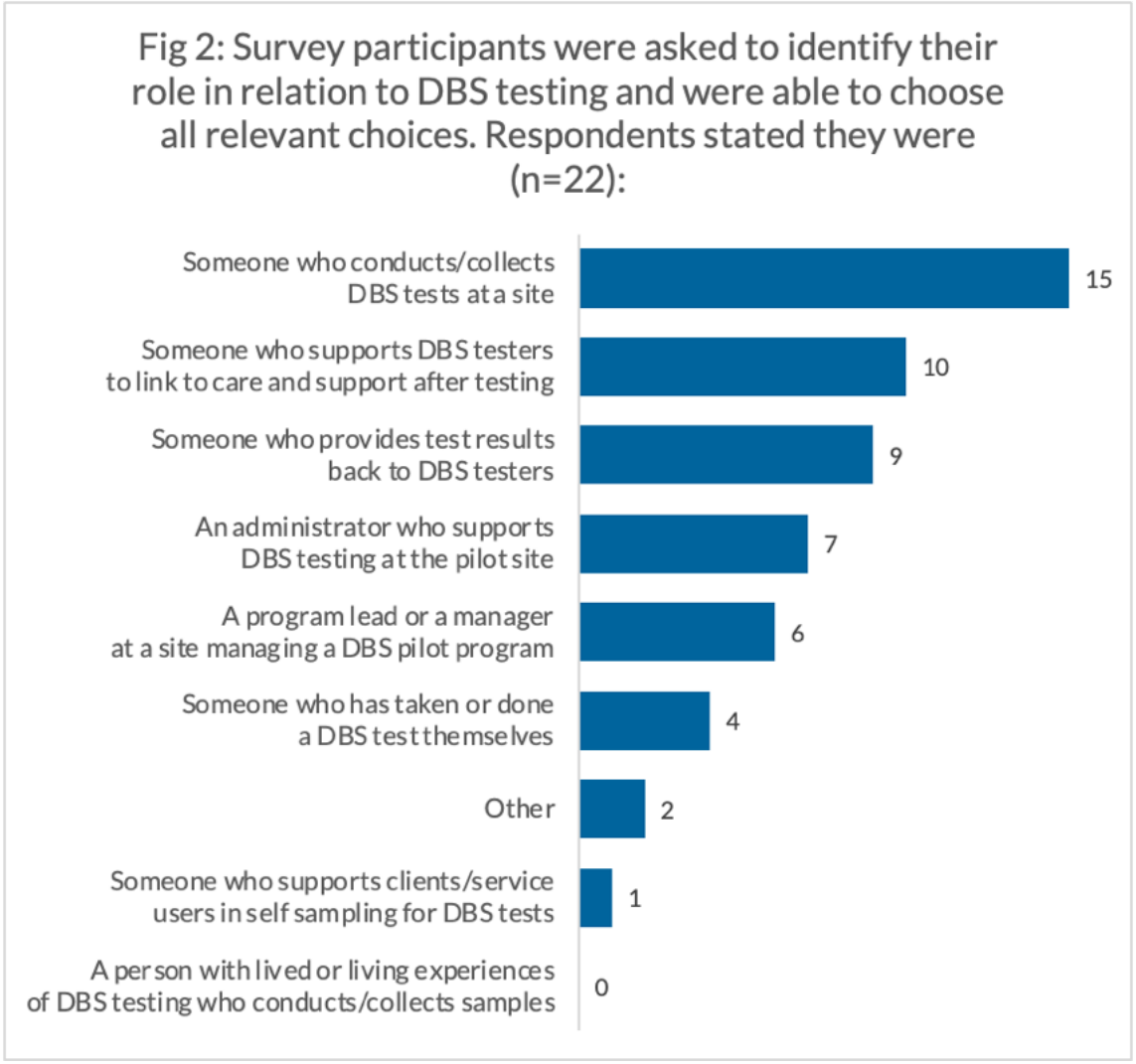


Fig 2: Survey participants were asked to identify their role in relation to DBS testing and were able to choose all relevant choices. Respondents stated they were (n=22):
Someone who conducts/collects DBS tests at a site
15
Someone who supports DBS testers to link to care and support after testing
10
Someone who provides test results back to DBS testers
9
An administrator who supports DBS testing at the pilot site
7
A program lead or a manager at a site managing a DBS pilot program
6
Someone who has taken or done a DBS test themselves
4
Other
2
Someone who supports clients/service users in self sampling for DBS tests
1
A person with lived or living experiences of DBS testing who conducts/collects samples
0

Participants were asked about who was offered a DBS test at their site or how people primarily accessed DBS testing (fig 3) (this was a check all that applied response). From this data we can see that many agencies have been using DBS testing at pop-up events held in community.

We also asked survey respondents about which key populations used DBS testing at their sites – first they answered generally (fig 4) and then they were asked to identify the top three populations (fig 5). The top three populations using DBS at sites were people who: use substances, experience unstable housing, and have challenges accessing health care.

Fig 3: Participants were asked about who were offered a DBS test at their site. Pop-up testing events was the option most frequently selected. (n=18)

Fig 4: We asked participants which populations have used DBS testing at their sites and ...

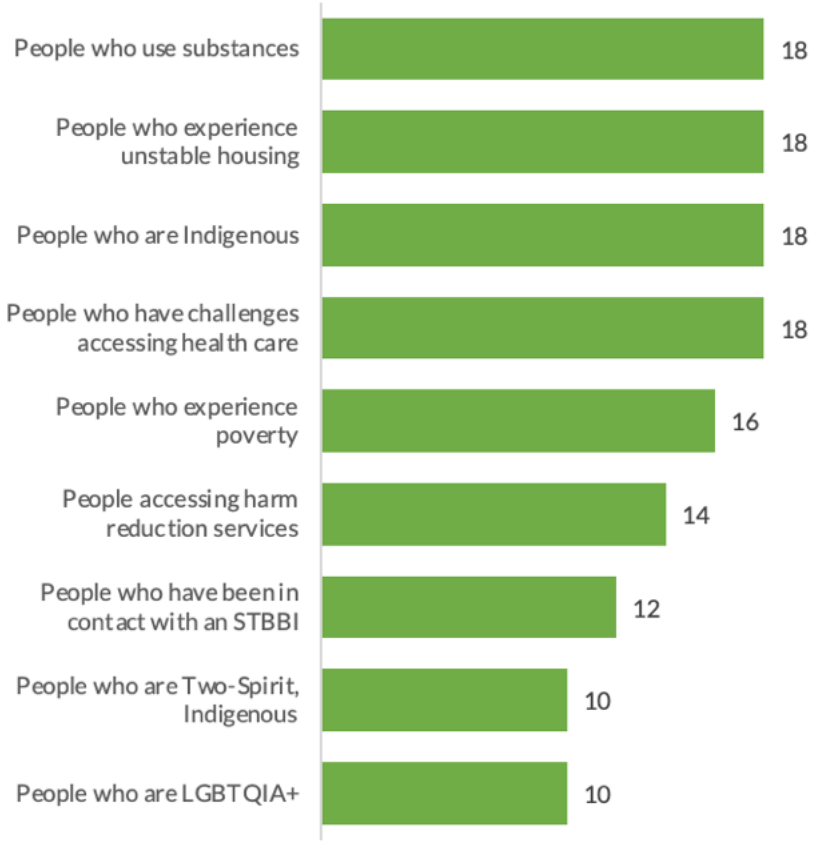
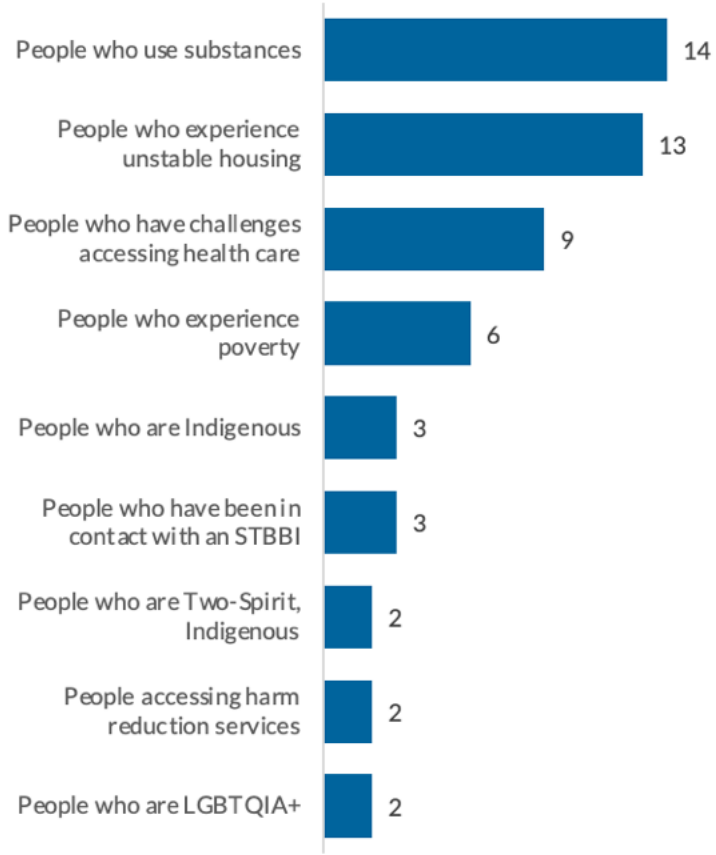
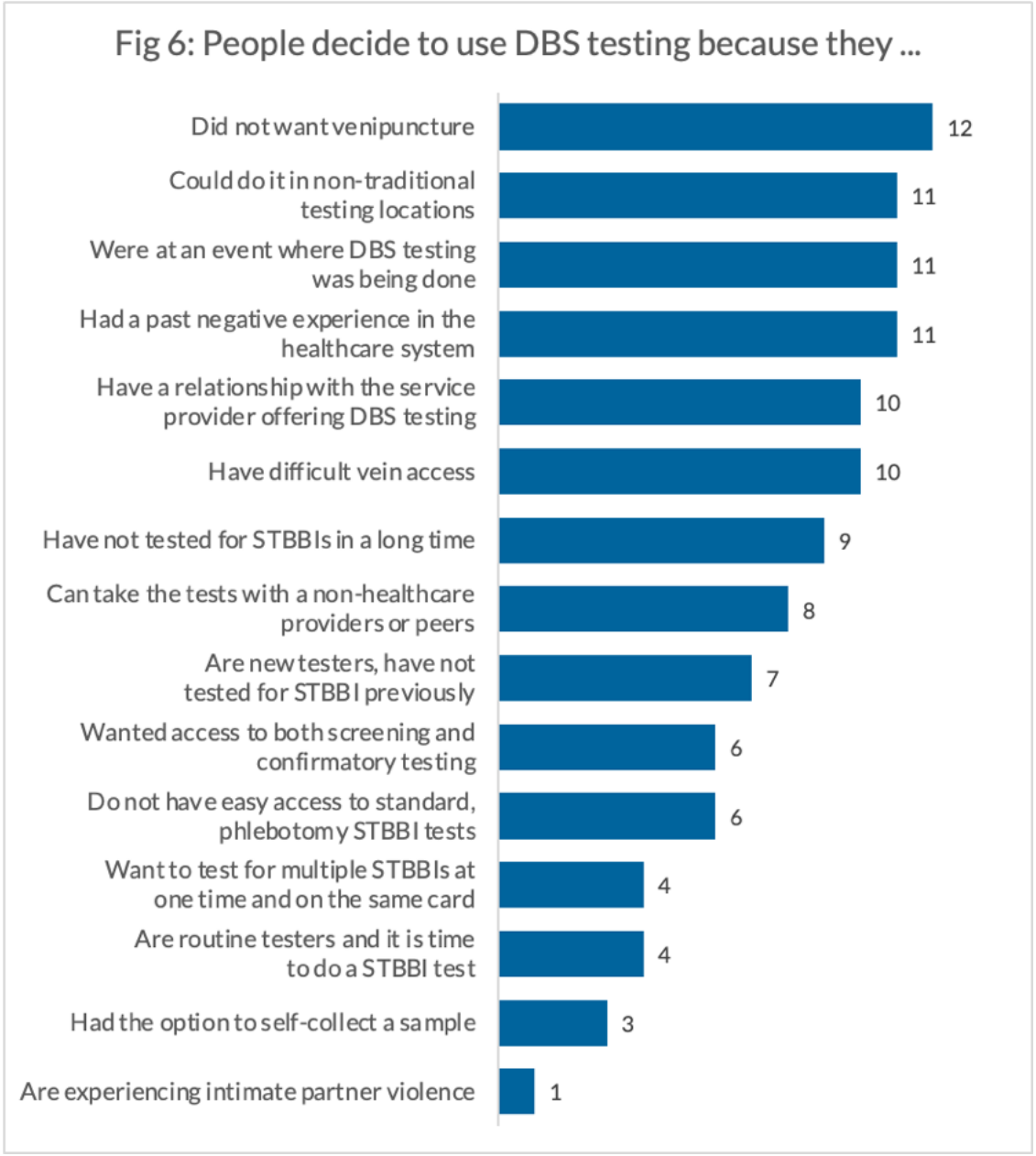



Fig 5: Then we asked about which are the top 3 populations who use DBS testing at their site ...



We also asked survey respondents about why people decided to use DBS testing and the top reasons were because (fig 6):

- They did not want venipuncture
- They could do DBS testing in a non-traditional testing location
- They were at an event where DBS testing was being done
- They had a past negative experience in the healthcare system



# Positive Changes for Service Users

We asked survey participants to reflect, in an open-ended questions, on what was the most positive changes for your clients as a result of DBS testing (Table 1). The top three answers were:

- It gives autonomy, choice to the patient
- Good for people who have had challenges accessing healthcare
- Able to be provided by non-medical staff

**What People Said --** some relevant quotes from these questions are:

- A lot of our clients have had negative experiences with the health care system. Providing DBS testing at various outdoor events/outreach events allows for people to access testing on their own terms, in a sense, and to avoid the traditional healthcare setting which can often times be triggering and traumatic.
- Successful screening for earlier interventions for people who refuse traditional blood work. Autonomy back to the patient, empowering. Repairing relationship with healthcare by providing trauma informed accessible testing.

**Table 1: The most positive changes for your clients as a result of DBS testing:**

| Theme | Frequency |
|---|---|
| Gives autonomy, choice to the patient | 4 |
| Good for people who have had challenges accessing healthcare | 3 |
| Able to be provided by non-medical staff | 3 |
| Involves peers as testers | 2 |
| Engages people into healthcare | 2 |
| People with hard to access veins more willing to test | 2 |
| Good for people who refuse traditional blood work/ phlebotomy | 2 |
| Low-barrier testing option | 1 |
| Increased privacy with results | 1 |
| Repairing relationships with healthcare | 1 |
| Increased options for testing | 1 |
| Less invasive | 1 |
| Less pain | 1 |
| Good option for people with hard to access veins | 1 |
| Connections to care and treatment | 1 |
| Easy to test | 1 |
| Incentives for testing | 1 |
| Event-based testing reaching people who are not accessing testing | 1 |
| Someone learned they had a negative result | 1 |

# Positive Changes for Agency

We also asked survey respondents to reflect on the most positive changes for your organization or agency as a result of DBS testing (Table 2). The top three answers were:

- More people are willing to do DBS, who previously avoid phlebotomy
- Able to reach folks who are left out of other testing options or harder to reach populations
- Easier for outreach or non-traditional testing sites

**What People Said --** some relevant quotes from these questions are:

- 💬 More people are willing for DBS, who have previously avoided venipuncture are willing to be screened via DBS

**Table 2: The most positive change for your organization or agency as a result of DBS testing…**

| Theme | Frequency |
|---|---|
| More people will to do DBS, previously avoided phlebotomy | 5 |
| Able to reach folks who are left out of other testing options, harder to reach population | 5 |
| Easier test for outreach, non-traditional testing sites | 5 |
| Good to be able to offer a variety of testing modalities, low barrier testing options | 3 |
| DBS done by peers | 2 |
| Finding positive results in hardly reached populations | 2 |
| Can now do testing without needing to do serology | 2 |
| Transporting the DBS test is stress-free | 1 |
| More clients accessing care | 1 |
| DBS used at testing events | 1 |
| Expanding our testing capacity | 1 |
| Can get HCV SVR results easier | 1 |
| Costs less for transportation | 1 |
| Good to have a test for multiple STIs at once | 1 |
| Many unique testers | 1 |
| Allowed us to provide support to a broader range of clients | 1 |

# Unexpected or Negative Consequences

We also asked about any unexpected or negative consequences that respondents observed as a result of DBS testing (Table 3). The top answers were:

- Long wait time for results
- Because of wait for results sometimes clients are lost to care
- It is difficult to follow-up with people who have no-fixed address
- Sometimes hard to collect enough sample

**What People Said --** some relevant quotes from these questions are:

> I think the only "negative" aspect of DBS testing is waiting the 4-weeks for results to come through. Since majority of the clients we have tested are unhoused/have no fixed address, it can be difficult to provide follow-up to those who had positive results. Some clients have been lost to follow up.

**Table 3: Any unexpected or negative consequences as a result of DBS testing…**

| Theme | Frequency |
|---|---|
| Long wait time for results | 7 |
| Because of wait for results sometimes clients are lost to care | 6 |
| Follow-up with people with no-fixed address difficult | 4 |
| Hard to collect enough sample | 4 |
| Have had samples that have been lost at the lab | 1 |
| Less uptake in remote/rural than expected | 1 |
| Cannot use as a confirmatory test | 1 |
| Peers have challenges collecting enough sample | 1 |
| Results come back as inconclusive | 1 |
| Pain | 1 |
| Process of packaging and sending tests in | 1 |
| Hard to get sample from people with calloused fingers | 1 |
| If can't get enough sample people have to do further testing | 1 |
| Difficult to follow-up | 1 |
| Syphilis point-of-care test would have been more beneficial as we are seeing increases in infections | 1 |

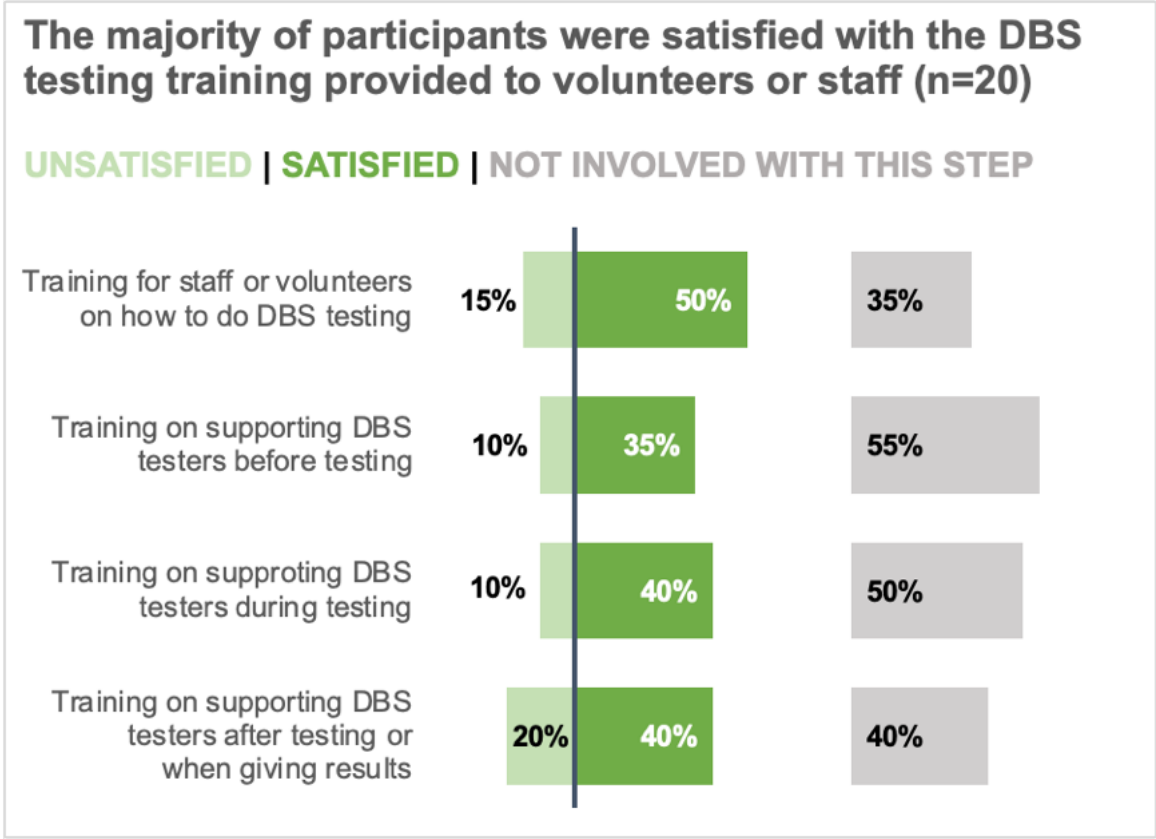
# Implementation of DBS

Next survey participants were asked about their level of satisfaction with various steps in the DBS implementation process. The three broad areas included were:

- How was the DBS testing training
- How did DBS testing implementation impact service users
- How did DBS testing implementation impact service providers

# How is the DBS testing training?

Most participants were satisfied with the DBS testing training provided to volunteers or staff (n=20)



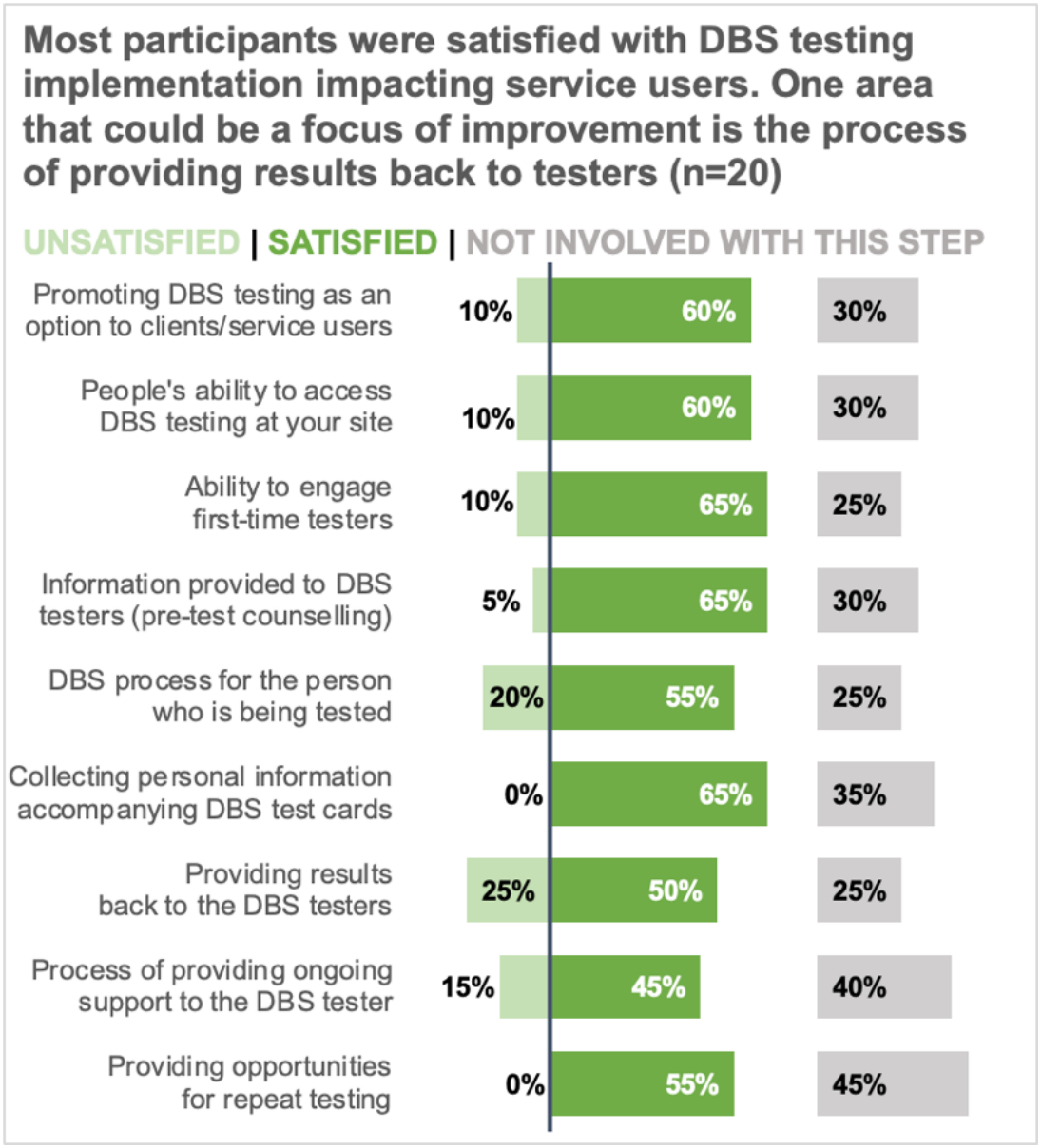
# How is the DBS testing training?

Survey participants were asked if they would like to add anything about how each implementation component or steps work at their site. The following is a summary of key ideas coming from these open-ended questions.

| Implementation Step | Key Ideas |
|---|---|
| Training provided to staff or volunteers on how to do DBS Testing | - Training happened internally without outside support from BCCDC<br>- Training happened remotely<br>- Would like to scale up people who can do DBS sampling but time is limited and full validation of DBS testing in BC is not complete<br>- Upcoming Learning Hub course |
| Training on how to support DBS testers before testing | NO COMMENTS |
| Training on how to support DBS testers during training | - Because already doing phlebotomy and POC testing already had training on this. Was not included in the DBS training. |
| Training on how to support DBS testers after testing or when receiving a result | - There have been some overlapping processes due to ordering provider and some duplicate notifications being done<br>- Testers are not following up with positive results |

# How does DBS testing implementation impact service users?

Most participants were satisfied with DBS testing implementation impacting service users. One area that could be a focus of improvement is the process of providing results back to testers (n=20)



# How does DBS testing implementation impact service users?

Survey participants were asked if they would like to add anything about how each implementation component or steps work at their site. The following is a summary of key ideas coming from these open-ended questions.

| Implementation Step | Key Ideas |
|---|---|
| Promoting DBS testing as an option to clients/service users | - Not allowed to promote as much as we would want until processes and training are rolled out, this is taking time and we thought the community would have been able to access DBS testing a year ago<br>- Don't routinely offer DBS testing anymore because it takes too long to get results back.<br>- For HCV treatment if pharmacare would only require HCV RNA that would be helpful, but as of right now we still need a DBS, liver enzymes… |
| People's ability to access DBS testing at site | - Tests were mailed out with return by Canada Post<br>- Mostly through outreach – not a testing or drop-in site<br>- May be a good option for sexual health/Options for Sexual health clinics as well as primary care providers to alleviate stress on some of the [health authority] labs that are often understaffed and very busy |

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|---|---|
| Ability to engage first time testers | - Most of our clients have been tested in the past at some point<br>- Less uptake than expected<br>- We provided incentives to folks to encourage them to get tested. Incentives can be candy, coffee, gift cards, etc. and it has worked very well to provide testing to those who would otherwise not get tested<br>- I wouldn't routinely recommend this testing platform to new testers because of how anxious people are to get results in a timely fashion |
| Information provided to DBS testers about the test and what to expect | - This was provided by staff at CBRC<br>- Staff developed<br>- We created a multi-purpose pamphlet for phlebotomy or DBS as well as a DBS pamphlet |
| DBS process for the person who is being tested (finger prick, filling cards) | - Sometimes hard to get enough blood while on outreach in the cold<br>- Difficult to get enough blood from cold, calloused fingers<br>- It is very difficult to get enough blood on the card. We needed to poke the person multiple times to get enough blood to do the testing<br>- Difficult to get sufficient blood on cards without overlapping blood/milking finger<br>- Challenging at times for folks with very calloused fingers (often due to living outside) |

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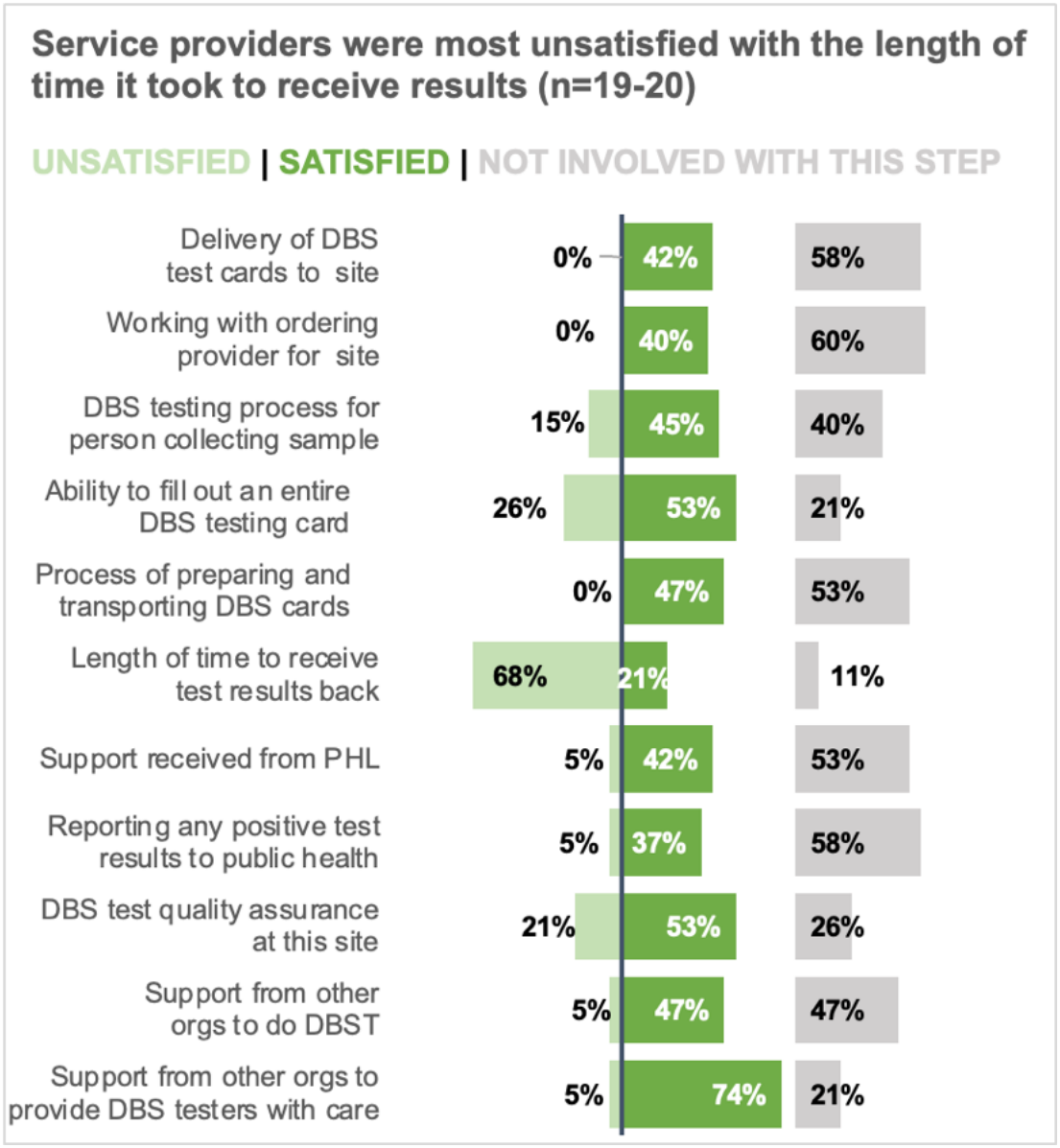
|---|---|
| | - It has been a learning process to get the spots filled on the card<br>- I would like access to some 'hot pockets' or something that could be used to warm the hands of clients. In the winter, street-involved folks tend to have cold hands and the blood flow is not awesome until the hands warm up |
| Collection of personal information (i.e. BCCDC serology screening req) | - We have not collected this type of personal health information in our studies<br>- Only a couple of people have never accessed the [health authority] system and couldn't find a PHN. |
| Providing results back to DBS testers | - Long wait times, results are not received due to card going missing<br>- Self managed by agency<br>- Difficult to reach people<br>- Losing people due to length of time in receiving results – the people being tested often forget thy were tested and lose interest as result have taken between 4-6 weeks<br>- Test results are difficult to interpret, many providers have misinterpreted "indeterminate result" and results are not yet coded by test (it is grouped together under miscellaneous)<br>- Results are not returned in a timely fashion and people get upset. I living in a rural community and if you plan to do more DBS testing I hope there are quicker methods of |

| | |
|---|---|
| | getting test to the lab and results back more quickly<br>- Long wait times |
| Providing ongoing support to DBS testers | - Self-managed by agency<br>- Phlebotomy still required [for hepatitis C treatment, so this is] and extra step in the cascade of care<br>- Again, losing people due to length of time. However it has been helpful to have results once/if the person reconnects to services<br>- Much success with linking people to care and treatment |
| Providing opportunities for repeat testing | - Not offered through our program<br>- I have had a few people return 6-12 months later asking for a DBS as a preferred testing modality<br>- We don't have an ordering provider, so it is a bit of a process each time |

# How does DBS testing implementation impact service providers?

Service providers were most unsatisfied with the length of time it took to receive results (n=19-20)



# How does DBS testing implementation impact service providers?

Survey participants were asked if they would like to add anything about how each implementation component or steps work at their site. The following is a summary of key ideas coming from these open-ended questions.

| Implementation Step | Key Ideas |
|---|---|
| How cards are delivered to sites | - In [our health authority] they are ordered centrally and then sent to us<br>- I have accessed cards through our inter office mail system |
| Working with the ordering provider for your site | - I am able to find a provider (MSP#) due to my existing relationships, however, this could be a barrier should we hopefully one day expand DBS testing (more nurses, support workers, peers, etc…)<br>- Sometimes it is a lot of work for us and the ordering provider is notified before we know the results and can inform them. But the MHO as an ordering provider has lessened a lot of the steps for us. |
| DBS testing process for the person collecting the sample or support the tester | - I think we could expand and increase access |
| Ability to fill out an entire DBS card | - Can be challenging in certain scenarios<br>- Sample quality has been high in our studies<br>- Tricky depending on context of person (cold hand, calloused hands, etc.) |

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|---|---|
| | - Great to receive feedback from the lab on indeterminate samples and how we can do better – is it true multiple samples can be done off one spot if it is large enough?<br>- This really varies person-to-person. Some of the folks we tested have very calloused and cold hands so getting sufficient sample can be difficult |
| Preparing and Transporting DBS test cards to PHL | NO COMMENTS |
| Length of time to receive test results back from PHL | - Could be improved<br>- We work with the NML and wait times can be long when there are competing studies/projects<br>- It is taking 8 weeks to get results for the national lab. This is too long<br>- The return time has varied from 4 to 7 weeks for return of results. This presents challenges with clients who have no fixed address or no phone as it becomes harder to find them in follow-up. I believe the reason for delay was the sample was sent by regular mail rather than courier from BCCDC to NML<br>- I think the time to results will improve once they don't have to be sent to Winnipeg<br>- I don't know if this is something that can be fixed or improved upon, but the 4 week waiting time for results can be hard for those tested with no fixed address because they are often lost to follow up |

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|---|---|
| | - There was only one event I was involved with for follow-up on and the results took 6 weeks. I believe weather conditions were a factor – but this was still way too long to be waiting for the results. Clients were told ~3-4 weeks for results<br>- Three weeks is too long |
| Support received from PHL | - I have not connected with them personally<br>- Difficult to get a hold of over the phone<br>- More clarity around HCV ab vs. HCV RNA – it seems that we don't really need to know the antibody, more important is the RNA, but the current processes at BCCDC always have antibody done first – might make more sense to just test RNA. It is hard for us to prioritize the HCV Ab vs. HCV RNA if we don't know the person – it is always reflexive or only if a new diagnosis? If it is not always reflexive I would rather just order the HCV RNA only |
| Reporting any positive results to public health officials | - Not reported<br>- This lab reports back as "miscellaneous test" and does not flag in careconnect or local EMR's. The report is not quick to read and takes time to review results. Would be nice to have it names "Dried Blood Spot" and have parameters for each test done<br>- So far, I have not received a positive from the DBS process |
| DBS Quality Assurance at site | - Can be challenging in certain scenarios |

| | |
|---|---|
| | - It's difficult to fully be sure a card will be okay<br>- Most of the time I would not discard the first drop of blood as it is difficult to get enough drops for most people and if they are bleeding fast and it is too hard to discard a drop |
| Support from other organizations/agencies in the community to do DBS testing | - No others currently providing DBS testing<br>- I have heard reports that public health is calling a [downtown] clinic for any "difficult to find" patients who are often not even attached to their clinic. There is too much emphasis on finding people immediately – it is not an emergency<br>- |
| Support to provide DBS testers ongoing linkage to care support from other organizations | NO COMMENTS |

# Final Feedback

There were additional questions that respondents were asked to think about and provide feedback on:

**With regards to DBS implementation what could be changed of improved:**

- Better client engagement
- More access to information
- Interpretation of the tests locally
- Improvement of reporting time
- Scaling up people who can administer tests, including peers
- We need more people trained to collect the samples so this can be expanded
- Knowing if you can test for SVR HCV cure
- I think it would be nice to open up DBS testing to walk-ins to our site of work, but this would involved a continual relationship with an ordering provider
- Setting for DBST should be considered – best practice for group/pop up clinics (i.e. privacy for education, assessment and completion of testing
- [need] clear pathways for health care provider following up on positive results to contact the client
- I'd like to get the results back quickly
- I would also really like to include Hep B as well
- Having a provider (NP or GP) covering or allowing RN's to be the provider and follow-up would make it easier to do
- It should be offered to community pharmacies and ministry billing code created for them to encourage/enable testing (similar to vaccine administration)
- It would be interesting to consider POC vs. DBST

| | |
|---|---|
| **Tools, resources or other support from the Public Health Laboratory that would help you do DBS testing:** | • Client information posters for advertising tests<br>• Formalized process for reordering desiccants, humidity cards, DBS cards, lancets allow RNs to be person ordering (currently do not have MSP unless practicing as certified practitioner)<br>• Resources similar to HIV point-of-care program could be helpful!<br>• More comments on how to interpret results included in results<br>• Separating each result (not grouping all together)<br>• Quicker tur around time on testing<br>• It would be nice to have access to the little disposable hand warmers (I think they are called hot pockets) |

# Appendix E: Focus Group at Cool Aid

## Benefits of DBS Testing

The Cool Aid teams provide STBBI testing in outreach and event-based settings. They use a variety of testing options depending on each person's situation and preference including, phlebotomy, hepatitis C point-of-care, and DBS testing. **Participants felt that DBS testing was able to reach people who wouldn't have tested otherwise and is a positive and helpful tool for a variety of reasons** including:

**Being able to do a follow-up test to a preliminary point-of-care positive when there is not a nurse available**;

**DBS testing provides an option for testing that doesn't involve a needle**;

> *Peer worker: The first day I worked, the person didn't want the needle. She [staff member] did that [a DBS test] and that person gave a big sigh of relief kind of thing.*

> *Peer worker: I know too that somebody's an IV user and they are trying to quit, it is harder with having been poked with something in your vein.*

**DBS testing gives people choices**;

> *Peer worker: It gives people choices. And for people who don't want to get poked it gives them a nice option. Especially if you are trying to quit, that kind of thing.*

**You can host testing nights out in the community to meet the needs of key populations**;

> *Non-peer staff member: … some of the positive things, we have a testing night our Prism wellness testing night that happens twice a month. Open to all genders but thinking of folks who are men who have sex with men as a way for people to make sure that there is a chance if people show up in the evening rather than trying to call at 9am.*

**DBS testing can be performed by peers, or people with lived and living experiences of hepatitis C, and this was a major benefit to this testing modality.** Focus group participants spoke to many key advantages of having peers involved with testing for hepatitis C. The first is that peers are more accessible to people out in the community. They have a shared experience with the service users and people trust them. This makes people more likely to engage in testing and provides comfort to people deciding to test:

> *Non-peer staff member: We were on one of the main streets and I went out and said "hi" and people were looking at me like whatever. Today [peer's name] was out there and before you know it all of these other folks were coming up and you have a way better way of approaching people. You get it.*
> *Peer worker: They see me around. I have been homeless.*

*Peer worker: This is a good program. I convinced a guy from down there to actually do it [test for hepatitis] with you guys too. I kind of talked him over of his edge of being paranoid.*

*Non-peer staff member: [getting a positive result…] those are really hard to process in those moments. So whatever we can do – again that is why having a friendly face that is "I just went through treatment and it is not a big deal anymore, it is okay, it is not like it used to be, it is all good, these guys are going to be with you" these are really helpful things*

**Peers and the relationship they develop with service users supports follow-up and linkage to care**:

*Non-peer staff member: we have given people their results and they have just bolted. Okay you are positive, and bolt, they are gone. Then you worry about them for sure. I know [name of peer worker] brought me in on one of our clients a brought him back later on after he learned to trust [name of peer worker] and we did the blood work and got him on treatment.*

Finally, **peers are important providers of information about hepatitis C and act as informal educators with the people they work with and help to reduce fear around hepatitis C** and share information about treatment using their shared experience:

*Peer worker: I mean, even before I was asked to participate in the testing I was already spreading the word. It is a great way to make people aware. And not freak them out. Because people are very scared of what they don't know.*

*Peer worker: I tell my friends and that, if you have a friend who needs it [treatment], don't be afraid, check it out. A lot of people are under the impression that the treatment is so hard on the body like it used to be.*

The peers at the focus group also spoke about what they gained from working with the Cool Aid program and supporting people to do hepatitis C testing. They all talked about **appreciating being able to give back to their community**:

*Peer worker: It is good to be part of it and it is good to give back.*

*Peer worker: I am peer support. Giving back because I was in a bad spot. I got clean. It is a good thing. I believe in what we are doing. It is great.*

*Peer worker: I have had nothing but positive stuff come out of it [being a peer worker at this program]. I would do it for nothing*

**While the team had supported more formal in-house DBS training the team had also used on-the-spot training when they are doing outreach testing** – a staff member will show, mentor, or coach new people on how to do DBS testing. This was a way to build on key testing opportunities when they were out in the community:

> *Non-peer staff member: When I have brought people into training I usually don't go over the DBS and just on the fly if we are in the situation when we need to do one then I will show people. Just because, we haven't had to do them in a while. I haven't trained new people on how to do it.*

> *Peer worker: It is definitely on-the-spot training. I have seen [staff member] and [staff member] step in too – okay we are trying to make this happen and you are either watching or giving it a good go. It is definitely something that you just need to practice.*

# Challenges with DBS Testing

There were some challenging points to highlight in relation to the DBS tests. **Participants spoke about how taking a DBS sample can be challenging to get enough blood from people and have to prick fingers multiple times** and how this impacts people waiting for a test:

> *Peer worker: It is a bit of a struggle to do it. It is not as easy as a poke. You got to load those [circles]... it takes awhile. The person has to be really patient with you. You have to rub their hand to get their blood. It is not 5 mins it takes a good 15 mins to do it right.*

> *Peer worker:* [when it takes a long time to do a DBS test]… *they don't understand what they are really doing. And other people are watching what you are doing and not wanting to do it next.*

Participants talked about how **some people had calloused fingers and it is hard to get a good DBS sample** but they also spoke about finding ways around this and how to get creative when collecting a sample.

> *Peer worker 1: Today I got lots of blood. It was really easy today. I was poking everybody there.*
> *Facilitator: You are saying the pinky is a good place to poke people.*
> *Peer worker 1: Yea, on the side too.*
> *Non-peer staff member: The side of the pinky.*

People also spoke about how it is sometimes **hard to guide people's hands to the right places to fill dots on the card**:

*Non-peer staff member: People are also failing all around with their hand Peer worker : finally you take their hand and guide their hand. Take their finger and put it on the paper.*

*Non-peer staff member: I have noticed that some people … don't really understand what we are doing so they just have their hand there. People are trying to fold the card around to get the dots… I have seen [peer worker name] trying to hold their hand to try and get some. It can be challenging in that way.*

An important point that was raised during the focus group was **people new to DBS testing can have challenges collecting enough sample and this can be very hard for service users because they have waited for a test result but the learn there is no result because there wasn't enough sample**.

*Non-peer staff member 1: when we started the peer testing program. We were like, we can do this and we can do the DBST instead. We were like, we can handle this situation. Of the DBSs probably 60% came back saying inconclusive. So there wasn't enough on the cards. That was with us trying to figure out how to do this.*
*Non-peer staff member 2: and that is devastating because. We tried to find the person again with an inconclusive result is always in the back of your mind.*

*Non-peer staff member: However, I feel like we have gotten way better but it is a practice.*

Perhaps this speaks to the importance of having good mentoring and coaching supports available to peer workers as they begin DBS testing knowing they will get better with practice.

**Participants talked about the turnaround time for DBS test results as challenging**:

*Non-peer staff member: Right now it is still 8-12 weeks to get results back.*

As well as, **how important it is to find ways to get test results back to people**. The Cool Aid team has found creative ways to find people in order to share their DBS test results:

> *Non-peer staff member: I wonder what that will look like to get the results both we struggle to make sure we have people's contact information – well, here is my email address that I never check and look for me here… let me write down 6 things about you, including your tattoos so I can try to find you again… That stuff with DBS will be a tricky thing – about the folks that actually need to get tested. Where you are going to be able to find them again and share the information? And then what does it look like in terms of that sharing? And how do you do that in a trauma-informed way?*

From a programmatic perspective participants spoke about some of the **challenges to setting up a responsive and low-barrier testing program**. This includes the cost of tests, including hepatitis C point-of-care tests that are not covered by a provincial program:

> *Non-peer staff member: the tests cost $30 each. [staff name] has had to scramble around to get people to pay for that but otherwise we don't have the funding to pay for it. So that has been a real challenge in being able to offer testing.*

One area that seemed to straddle both a benefit and a challenge related to DBS testing is **providing incentives for testing.** While incentives are important tool to support testing in terms of reaching new people and engaging people who are not accessing regular healthcare or who have limited financial resources, it can be a challenge to know who has recently tested or repeat testers. However, in listening to the focus group participants it appears when you have a tight team working together people will often identify people who have already tested and having an active presence in the community allows people to test regular, every three months, which is important when people are participating in activities that come with risk of hepatitis infection:

> *Peer worker: I enjoy it too. $10 to some people is a lot of money.*
> *Facilitator: You are able to give them $10 to do the testing?*
> *Peer worker: Yes, which is nice because. Some people don't get anything and $10 is a very big thing.*
>
> *Peer worker: we still have a girl, she talked to me last week "when are you doing that testing again so I can get some money". And I say "honey, you have already been tested"*
>
> *Non-peer staff member 1: I can remember a name and face and we have tested them before but we have been doing this for a year. But I don't know when they have been tested. And yea, that is definitely an issue with the $10 we will have people come back. And I will be I know we have tested you 2 weeks ago, can we wait.*
> *Staff member 2: We try a let people to wait 3 months. That seems like a reasonable time. Something might have happened in that 3 months. Some should probably be tested every three months.*

Incentives seem like a balancing act for teams. On the one hand it increases testing engagement but it may also lead to some repeat, and unnecessary testing. For this team the benefit outweighs the costs when it comes to incentives.

# Barriers to Healthcare

Participants spoke about the **challenges of people who are economically vulnerable and with complex care needs accessing healthcare generally but also of receiving quality, responsive healthcare specifically**:

> *Peer worker: when you are a street person you don't really go to a doctor's very much…I got tested for HIV/AIDS and that kind of stuff from street nurses … if you don't have the access to it then it is not really close by you are not going to do it. You have other priorities because you are into your own thing.*

One important context piece is hearing that **people are experiencing stigma and discrimination at hospitals and clinics** from staff and healthcare providers:

> *Peer worker: When my liver was three times it size. I went to the hospital and I couldn't sit up because it was so big. And they didn't have spots so I tried to lie down in the hallway. But the security made me feel like shit. Then the doctor came out and said [this person] has a medical reason why he can't sit up. She felt like shit. But I hope she got the lesson, right. When people don't respect me, I don't respect them. It just keeps going. That happens with everybody.*

> *Peer worker: You definitely have a label and I am seeking. Even if that's never the thing, because they don't have anything I would want anyways. That is the label that comes down … I went in and I went septic and I was telling them I wasn't [dope]sick. They didn't believe me until they got a temperature of 103F – you aren't [dope]sick. Well, I have been telling you this the whole time.*

> *Non-peer staff member: I think about when people talk about emerg and emergency nursing. And it is always super interesting to me because if you are going into emerg you are going in for a medical problem. If you are going in drug seeking it is easier to go outside and get what you need. I always thing this is crazy to me – you know. I don't know that kind of thinking, that has to be dealt with in school and your managers have to be monitoring that. The whole curriculum for physicians and probably nurses needs to be changed in that way.*

Another **challenge is access to healthcare providers or primary care overall**. There is not a lot of capacity within the current system. Cool Aid does not have enough appointments for the demand within clinic and this may be limiting STBBI testing:

> *Non-peer staff member: [I was working with the MOA]… just after 9 and I said to them, in joking but not joking, this is the sad part of the day that you are telling everyone that all of the appointments are done for the day already. People are still getting in to*

*see the nurses, which is amazing, because we have nurses that can do all of that testing throughout the day. But they also fill up. So we have a province/country and many places in the world where there is not enough primary care going on. Definitely here it is an issue as well that we have 6, 000 people that are active patients over the last 3 years. And there are just not enough spots in the day for everyone to come in. So I know there are lots of chances when people wanted to come in and testing might have been part of the things they were looking for but they might not have come.*

When focus group were asked about the **qualities of a good testing or healthcare service** an active and engaged conversation ensued. People spoke about sites or providers that were: non-judgemental, respectful, good listeners, patient, empathetic, and one-stop shop or not having to explain yourself over and over:

*Peer worker: you don't want to go and see somebody that you trust when you don't trust people to begin with because of all of the crap.*

*Peer worker 1: That is what I think Cool-Aid is doing by being different.*
*Facilitator: Can you talk to me a little bit about that? What does different look like?*
*Peer worker 2: Being different is not being judgemental, being nice*
*Peer worker 3: Showing a lot of empathy*
*Peer worker 4: not rolling your eyes*
*Peer worker 5: I find that Cool Aid people are nice people, you can talk to them. They care.*
*Peer worker 1: you can tell they have the respect. That other people wouldn't*
*Peer worker 3: I always call this my second family down here.*

*Non-peer staff member: The question is what makes a good program around STBBI so one of the things is a notion of a one-stop-shop. The idea of going to your doctor and having an awkward conversation about the fact that you think you might have gotten something. You are kind of worried. Then they are going to send you to LifeLabs. Especially, as we have seen during covid we have seen with the privatized systems it is really hard to get in there. It is a two week wait and it is a whole other place to feel vulnerable and stigmatized and like a piece of crap because of, especially if you are someone who has used injection drugs and some of your veins are blown out or you have scars or burns or other things where you are embarrassed. Or if you are private, people are private, I'm private and just to have to go to another place. And there are people here that are happy to give you all of the swabs, needles or whatever you need in one place… It is super helpful to have that happen so you don't have to prolong what is going on… If you can get it all done at the same time, especially when it works for you in terms of time is the very best.*

People participating in the focus group felt that Cool Aid was a model for a good health centre. **Having a program like Cool Aid's that is low barrier, patient-centred, non-judgemental is helping people**:

> *Peer worker: I think the whole thing is great [Cool Aid] and it is nice that something positive – when it comes to the medical thing .. because when you go to the hospital you are treated less than human at certain hospitals. It restores some faith. [peer worker]*

One peer worker talked about how their relationship with their family doctor changed when they tested positive for hepatitis C, they explain: *I walked out of there [the doctor's office] twice crying. Feeling like I was nobody, like a piece of crap…* They fired their healthcare provider *… I walked out and I didn't cry and then ta-da here I am with all of these wonderful people down here. What a blessing.*

Not only is Cool Aid prioritizes equity-based care but it has **built accountability frameworks to track progress toward this goal**:

> *Non-peer staff member: That wouldn't be socially acceptable here to be treating people like shit. For example we do evaluations twice a year where we ask 100 people whether in our outreach sites or here about how they were treated – have people been asking you're the right kind of questions, have you ever been treated with disrespect, have you ever been racially profiled? We ask those questions to make sure people are getting equity-based care in this space. This is a priority.*

Finally, the team **shared ideas of other settings where DBS testing could be useful** including in more rural and remote locations, with teams who have trained peers or non-medical staff, or when people want to complete a sustained viral response (SVR) test after hepatitis treatment:

> *Non-peer staff member: Anywhere more rural and remote. There are tones of opportunity when you wouldn't have a nurse with you at all.*

> *Non-peer staff member: By having POC and DBS it means it doesn't have to be in the hands of professionals at all. Any group of peers … or people who are doing outreach or people who are working in SCS [supervised consumption sites]… anywhere that if they got the training and the know how it could be added on as long as they have been given the good skills and capacity to do the test properly and to pass the information up the chain and backdown so people can actually be found again. There is a shortage of primary healthcare and nurses especially those trained for hep.*

> *Non-peer staff member 1: Some of our nurses will use it for SVR bloodwork… Staff member 2: It has been amazing. We have a spreadsheet of folks who we are looking for SVR – from 2018 – someone is terrified. We haven't got their SVR. Just come in please and we will do the DBS instead. It can be a real gamechanger.*

# Appendix F: Quantitative Evaluation Analysis

## Contents

# Background

- Dried blood spot (DBS) samples are an option to expand sexually-transmitted and blood-borne infection (STBBI) testing to people who are in small urban, remote or isolated areas with limited laboratory facilities or those who have challenges providing venous-collected samples.
- DBS samples are more easily collected and transported than venous samples because:
    - they are obtained via finger prick and can be performed by non-healthcare providers or self-collected,
    - can be stored at room temperature for 14 days,
    - and can be shipped by regular mail.
- In BC, STBBI testing by DBS is available through a pilot program from the BCCDC Public Health Lab (PHL) and National Microbiology Lab (NML). The tests included in this pilot are:
    - HIV antibody and confirmatory nucleic acid amplification test (NAAT)
    - Hepatitis C (HCV) antibody and NAAT
    - Syphilis antibody screening (no confirmatory testing, therefore a reactive screen is not considered confirmed positive)
- The BC PHL receives DBS samples, accessions them and then forwards on for testing at NML. NML sends back results, which are then reported out to the ordering provider.

# Objectives

- Describe data from DBS STBBI testing pilot in BC from 2019 - 2022
- Evaluate whether DBS STBBI testing is reaching groups with less access to standard of care phlebotomy STBBI testing by analyzing aggregate trends of those who are being tested and testing positive through each route.
- Compare positive HCV DBS results with cases reported to public health (Panorama)

# Methods

## Data Sources

- A linelist of DBS samples from the BCCDC PHL
- Standard of care phlebotomy testing data from **STIBBI Data Mart** at the test-level (syphilis and HCV) and episode-level (HIV) data, *excluding prenatal testing and at-delivery syphilis screening*
- Confirmed HCV cases reported in Panorama (BC's Public Health Information System, PHS)

## Evaluation Components

A. Aggregate comparisons of DBS testing (HIV, HCV, syphilis) compared with standard of care phlebotomy testing
B. Individual-level linkage of positive DBS HCV results with cases reported through Panorama

## Indicators

A. Aggregate comparisons of DBS and standard of care testing (2019 – 2022):

- Number and percentage of tests performed and positive by infection, year and regional health authority
- Percent positive by year, regional health authority and sex
- Number of tests and test positivity by year, regional health authority and age group
- Intervals between sample collection, receipt at lab and result (average in days) for standard phlebotomy testing

B. Comparison of DBS positive HCV results and confirmed HCV cases in the PHS (2019 – July 24, 2023):

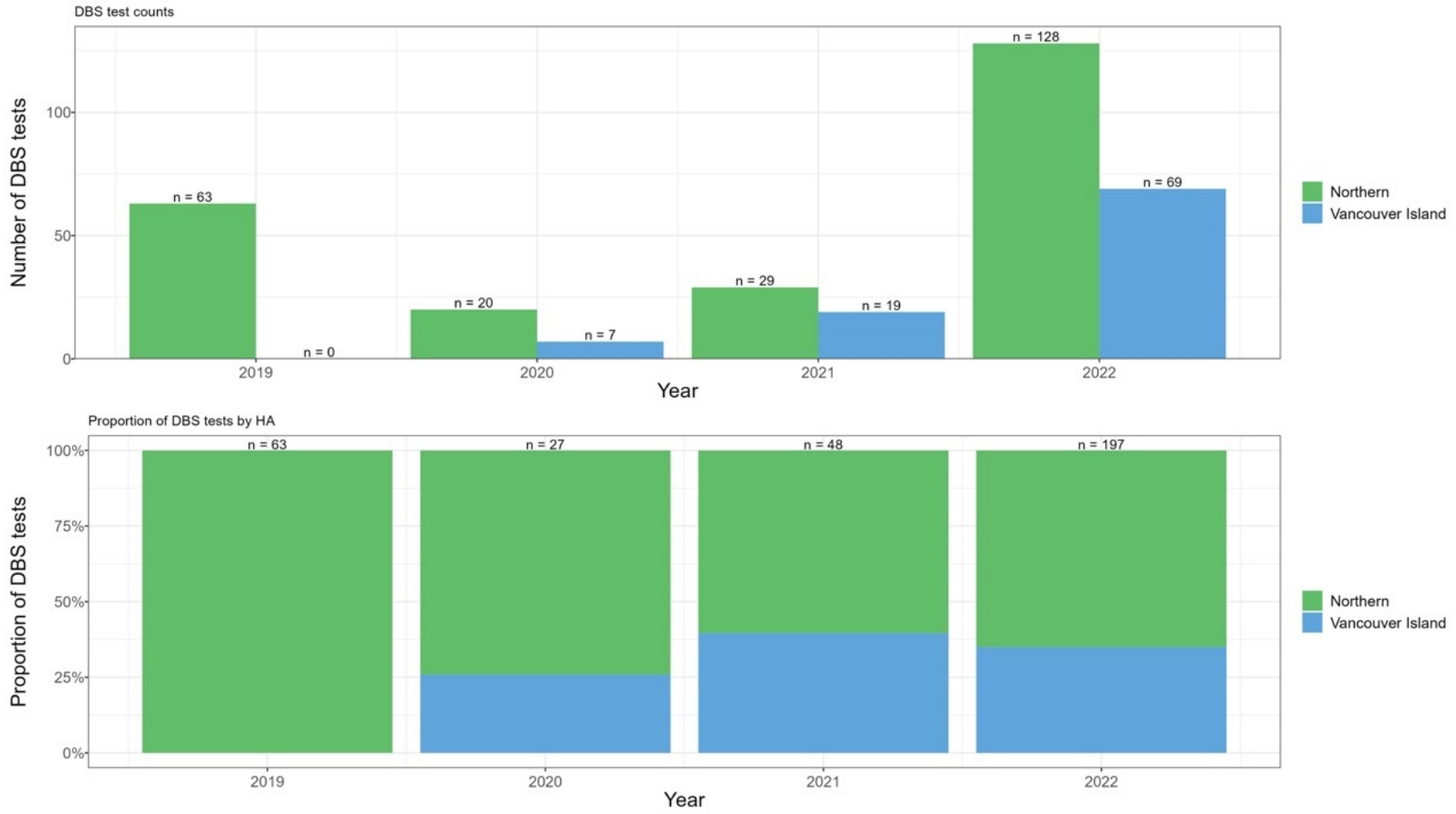
- Interval between PHS case report and DBS positive result
- Reasons why DBS-positive results were not recorded in the PHS

# Results

## DBS Tests

- From the beginning of the pilot to the end of 2022, 335 DBS samples were submitted to the BCCDC for testing. More than 70% of samples were from residents of Northern Health.
- There was a significant drop in samples in 2020 and 2021 and the highest number of samples were submitted in 2022 (197, 59%).

NOTE: Clients with reported residence in Interior, Fraser and Vancouver Coastal health authorities (n = 6) were allocated to the geographic region of their ordering provider because DBS sites were only in Vancouver Island and Northern between 2019 and 2022.


DBS test counts
Number of DBS tests
100
50
0
n = 63
n = 0
n = 20
n = 7
n = 29
n = 19
n = 128
n = 69
2019
2020
2021
2022
Year
Northern
Vancouver Island
Proportion of DBS tests by HA
Proportion of DBS tests
100%
75%
50%
25%
0%
n = 63
n = 27
n = 48
n = 197
2019
2020
2021
2022
Year
Northern
Vancouver Island

# DBS test types

- Of the 335 DBS samples submitted to BCCDC PHL and sent on to the NML:
  - 333 (99%) ordered HCV testing
  - 230 (69%) ordered HIV testing
  - 212 (63%) ordered syphilis testing
- There were 24 tests for which anti-HCV testing was not ordered and only an HCV RNA test was performed.

# Comparing test completion rates

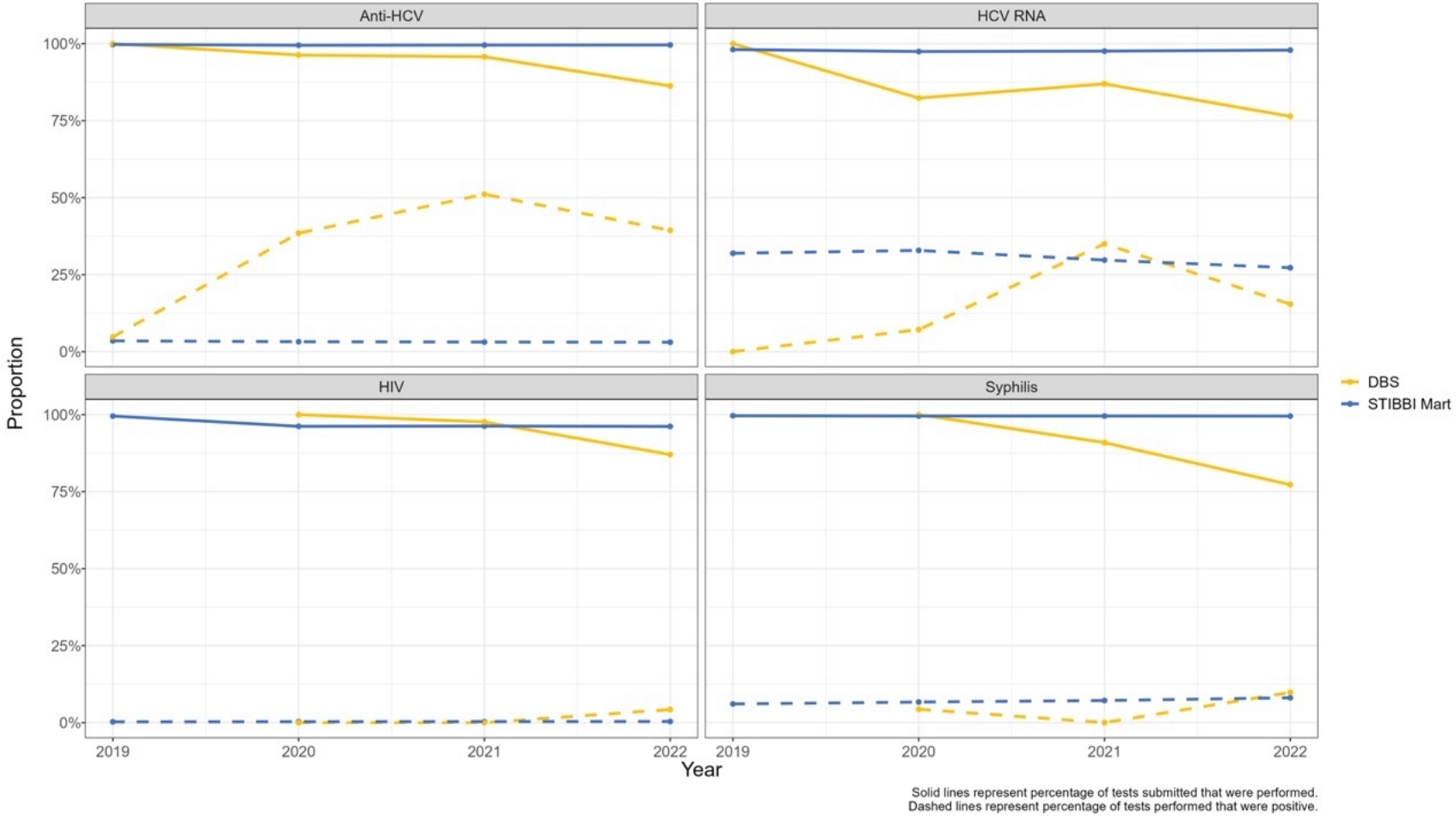
- The highest rate of DBS test completion was for HCV antibody testing (92%), followed by HIV (90%) and syphilis (82.5%). HCV RNA tests were the least likely to be completed (78.4%)
- The annual range for test completion varied between 76% and 100%, with higher completion rates in earlier years when there were fewer samples. The lowest test completion rates were in 2022 for all infections.
- Most DBS tests that were not performed had insufficient sample volumes.
- In contrast, more than 99% of standard-of-care HCV and syphilis antibody tests that were ordered were performed and 97% of HCV RNA tests and HIV episodes.

# Comparing test positivity rates

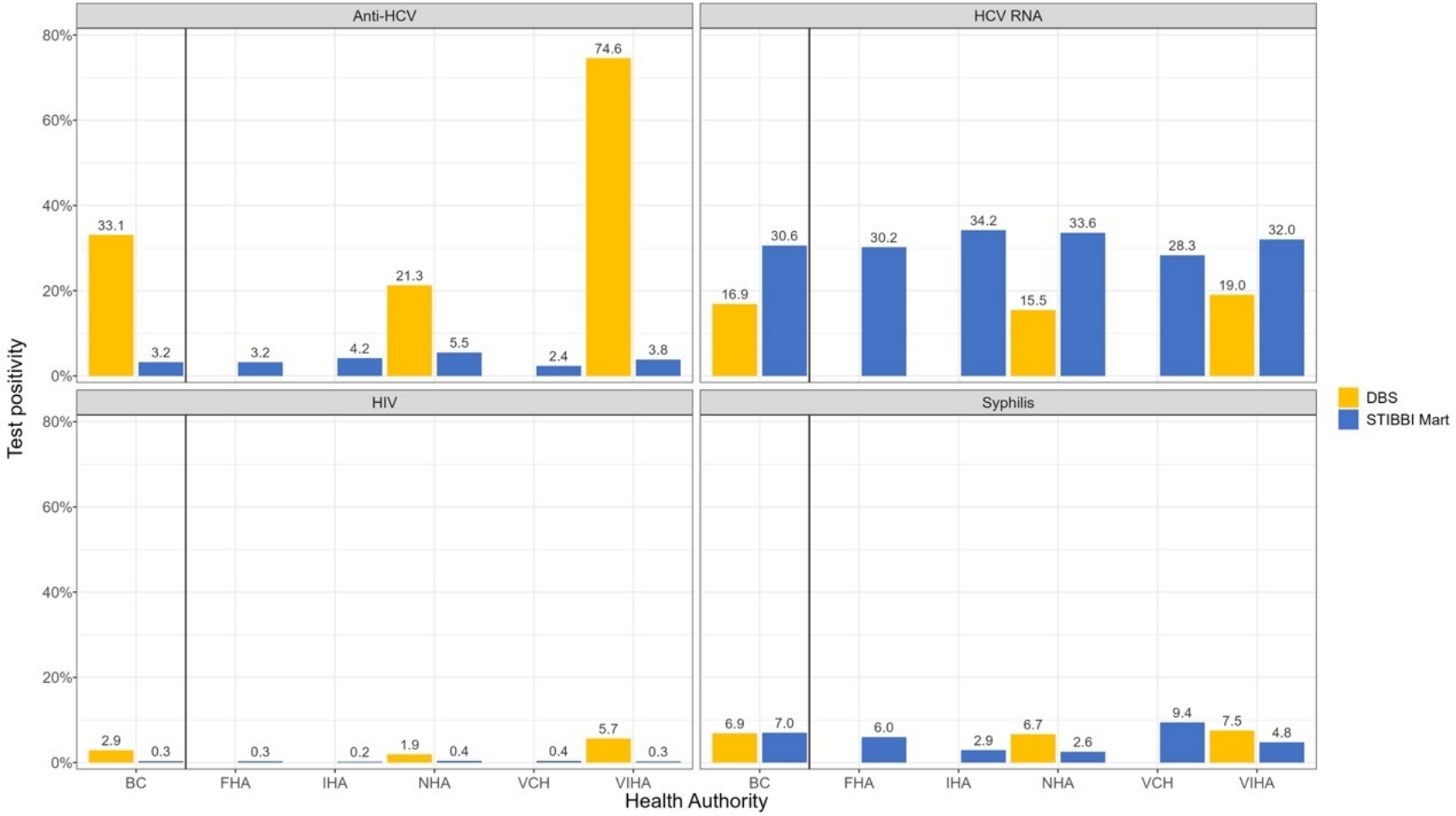
- Overall HCV antibody and HIV positivity were about ten times higher for DBS testing than standard of care testing.
  - 33.1% anti-HCV positivity for DBS vs. 3.2% from standard of care
  - 2.9% HIV positivity for DBS compared with 0.3% from standard of care
- HCV RNA positivity was higher in standard of care testing than DBS testing (30.6% standard of care vs. 16.9% DBST). This may occur because in standard of care testing, HCV RNA tests should only be performed when there are prior anti-HCV positive results. For DBS, there were some instances of only HCV RNA tests being requested. In addition, DBST may have been used for SVR testing and therefore we would expect a higher rate of negative HCV RNA results.

- At a provincial level, DBS test positivity for syphilis was similar to standard of care testing. However, since DBS tests were only from sites in VIHA and NHA and syphilis positivity from standard of care testing is driven by VCH, there was a very different geographic pattern of burden. In 2022, DBS syphilis antibody positivity in Northern was 9.7%, which was more than two times higher than the syphilis antibody positivity from standard of care testing in that region (3.7%).
- There was an increase in test positivity in 2022 for HIV and syphilis, which corresponded to an increase in testing volumes for those infections.

# Comparison of tests performed and positive, by year



# Test positivity, by HA



# Comparison of trends in testing and test positivity by sex

- There was a slightly higher proportion of DBS tests in females compared with standard of care testing, although the proportion of tests for females decreased between 2019 and 2022.
- The proportion of HCV RNA tests was higher for males than females in both datasets, which might be due to generally higher anti-HCV positivity in males.
- Test positivity was higher in males compared with females for both DBS and standard of care testing and for all test types/infections.

# Tests ordered, by sex

| | **Anti-HCV** | | **HCV RNA** | | **HIV** | | **Syphilis** | |
|---|---|---|---|---|---|---|---|---|
| | DBS | STIBBI Mart | DBS | STIBBI Mart | DBS | STIBBI Mart | DBS | STIBBI Mart |
| Total tests | 322 | 1,001,145 | 204 | 84,356 | 230 | 1,438,496 | 212 | 901,573 |
| | | | | | | | | |
| Female | **53.7%** | 48.3% | 48.0% | 36.3% | **50.9%** | 46.8% | **51.4%** | 43.2% |
| Male | 44.4% | **51.2%** | **49.5%** | **63.1%** | 48.3% | **52.7%** | 47.6% | **56.2%** |
| Other/ Unknown | 1.9% | 0.4% | 2.5% | 0.6% | 0.9% | 0.5% | 0.9% | 0.6% |

# Comparison of trends in testing and test positivity by age

**DBS testing:**

- 69% of DBS testing was done for those aged 40+ compared with 48% of standard of care tests in that age group. The median age of those tested by DBS was higher than standard of care testing for anti-HCV, HIV and syphilis testing.
- The median age of those who tested positive by DBS was lower than for standard of care testing.

**Standard-of-care, phlebotomy testing:**

- Standard of care anti-HCV positivity peaked for those aged 50-59 years, and DBST showed the highest positivity rates in the 30-39 age group.
- HCV RNA positivity trends were similar between the testing streams, with the highest positivity in the 30-39 and 40-49 age groups. HCV RNA positivity was higher for standard of care testing in those aged 50 years or older.
- Syphilis positivity in standard of care testing was highest in the 50-59 age group, while DBS testing had a higher positivity in younger age groups (20-29 and 30-39).

Table: Median and interquartile range for client's age at time of test request for DBS and standard of care testing for positive tests and all tests

| | Positive tests | | All tests performed | |
|---|---|---|---|---|
| | DBS tests | Standard of care tests | DBS tests | Standard of care tests |
| Anti-HCV | 44 (38-56) | 53 (40-62) | 49 (38-60) | 42 (30-59) |
| HCV RNA | 42 (37-51) | 51 (39-61) | 44 (36-55) | 53 (40-62) |
| HIV | 47 (42-54) | 48 (37-58) | 44 (35-55) | 40 (28-58) |
| Syphilis | 35.5 (29-40) | 44 (34-56) | 42.5 (34-54) | 34 (27-48) |

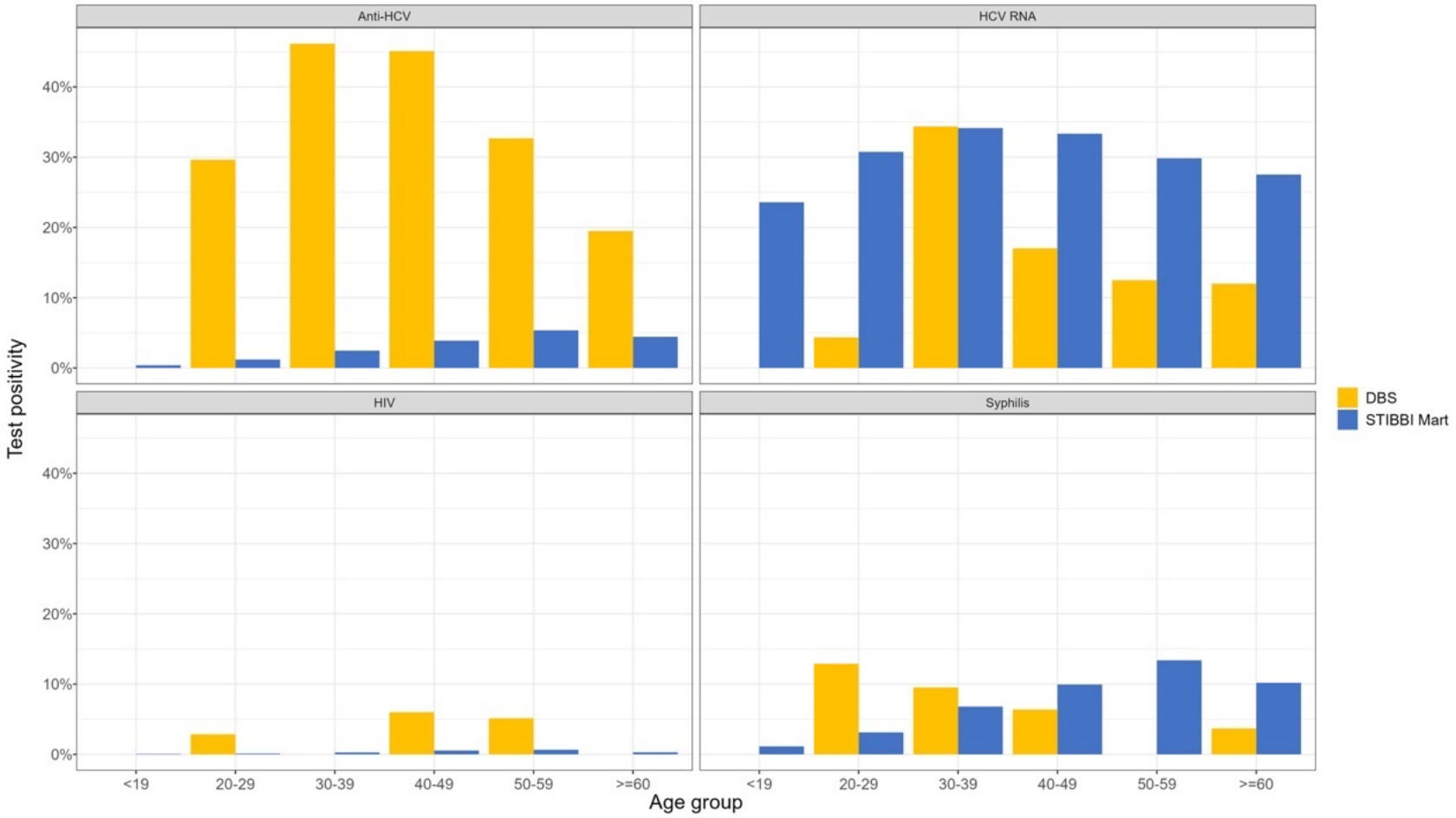
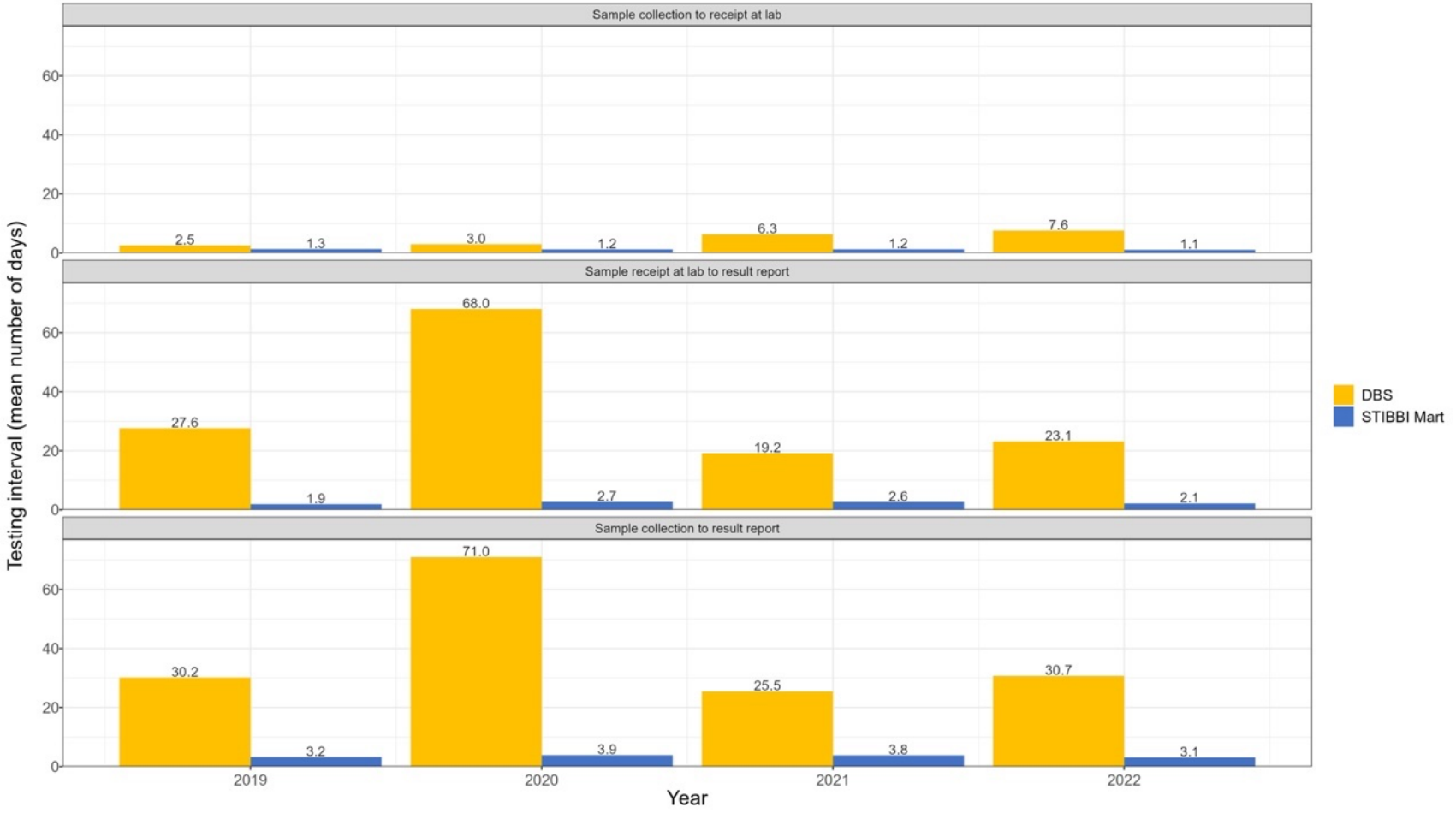



Figure: Test positivity by age group and test type for DBS and standard of care testing

# Comparison of test turnaround times

- Between 2019 and 2022, DBS testing had an average turnaround time of 33-34 days from sample collection to final result, of which approximately 27-28 days of the process occurred after the specimen was received at the BCCDC PHL.
- Overall turnaround time for standard of care testing was 3.5 days for HIV, anti-HCV and syphilis testing and 6 days for HCV RNA testing.
- The first year of the COVID-19 pandemic corresponded to the longest DBS testing turnaround times (average of 71 days). The timing improved in 2021 (25.5 days, n = 48 samples) and increased again slightly in 2022 (30.7 days, n = 197 samples).

# Testing turnaround times, by year



# Individual-level comparison of DBS-positive HCV results and public health case reports

- The majority (81%) of people who tested HCV-positive by DBS testing had previously been reported as a case in the Public Health System (PHS). Most of those people were initially reported more than 2 years prior to their DBS test and 45% of previously reported cases were HCV RNA positive by DBS.
- There were 14 people for whom the positive DBS result preceded their report to the PHS. This suggests that the DBS test may have contributed to their HCV diagnosis.

| Category | Number HCV-positive clients based on DBS results to July 24, 2023 | Percent of total |
|---|---|---|
| **Total HCV positive clients** | **191** | **100%** |
| HCV case reported through PHS prior to DBS results | | |
| HCV investigation more than 2 years prior to DBS testing | 139 | 73% |
| HCV investigation 1-2 years prior to DBS testing | 6 | 3% |
| HCV investigation 3 months to 1 year prior to DBS testing | 6 | 3% |
| HCV investigation 1 month to 3 months prior to DBS testing | 4 | 2% |
| **Total clients with HCV investigations prior to DBS testing*** | **155** | **81%** |
| DBS results prior to HCV case report | | |
| DBS test results more than 30 days before HCV investigation created | 1 | 1% |
| DBS test results between 7 and 30 days before HCV investigation created | 4 | 2% |
| DBS test results less than 7 days before HCV investigation created | 9 | 5% |
| **Total clients with DBS results prior to HCV case investigations** | **14** | **7%** |
| Case not recorded in PHS | | |
| Not reported in PHS, HCV RNA positive according to DBS testing | 5 | 3% |
| Not reported in PHS, anti-HCV positive according to DBS testing | 14 | 7% |
| Reported in PHS as a case, but not classified as confirmed | 1 | 1% |
| Can't find client in Panorama | 2 | 2% |
| **Total clients not linking with investigations in the public health system** | **22** | **12%** |

# Interpretation

## A. Aggregate comparison – interpretation notes

**General**

- Testing volumes and metrics from 2019 may not be comparable to subsequent years due to the impact of the COVID-19 pandemic on client access to healthcare and testing and laboratory priorities.
- Approximately 5% of clients were tested more than once through DBST compared with 20-25% of people in the standard of care testing dataset. Repeat testing can impact positivity calculations so it is important to be aware of the differences in access to and reasons for testing between these data sources.
- Lower absolute numbers of positive results through DBST can cause unstable rate calculations so trends should be interpreted with some caution.

**Comparison with other analyses**

- Positivity metrics used in this analysis will not be comparable to most standard surveillance outputs since they reflect test/episode positivity using only laboratory testing data, rather than case information as reported to the public health system. For example, HIV positivity is usually calculated using first positive testing events but this data would include all HIV positive results.
- Syphilis antibody testing is not sufficient to confirm current syphilis infection so positivity metrics based on antibody results will not be at all comparable to other reported syphilis measures.

# Conclusions

- Generally high test positivity rates for DBS testing suggests that it is reaching people at higher risk for STBBIs in BC. Lower HCV RNA positivity indicates that DBS testing might be being used or could be used for people with known HCV infections who are either checking for continued active infection or a signal of SVR.
- Differences in demographic characteristics for people tested and test positivity (region and age) compared with standard of care phlebotomy testing may mean that that DBS is being done in populations less able to access routine STBBI testing. Unfortunately, in the current system DBS tests are not able to be cross-referenced with

standard of care tests using client information, so we are unable to see if these are new clients or if they are being tests through both routes.

- Almost 20% of positive HCV DBS results with no reported case investigations in the PHS highlights a potential improvement to case detection by making this additional testing method available.
- Turnaround times for DBS testing were much longer than standard of care testing and additional demand may contribute to longer processing times. Being able to perform testing at the provincial level should improve these timings and provide results back to clients much faster.

# Appendix F-1

### A. Aggregate comparison – data notes

- **Geographic allocation**
  - For both DBS and standard of care testing, geographic allocation was based on the patient area of residence, where available, otherwise it was the area of the testing provider.
- **Categories for the sex variable**
  - For DBS tests, the "Unknown" category included: N (Undifferentiated), U (Unknown)
  - For standard of care tests, , the "Other/Undifferentiated" category included: Hermaphrodite, Undifferentiated, Transgender F-M, Transgender M-F. This was further combined as “Unknown/Other” for comparisons with DBS data.
- **HIV test/episode counting**
  - For DBS testing, either HIV antibody or HIV RNA tests or both were counted as one HIV test and a positive HIV result was based solely on HIV RNA results (i.e. HIV RNA tests were confirmatory).
  - Standard of care HIV data was analyzed at an episode-level rather than test-level in order to appropriately count confirmatory results. Episode-level data means that all tests within a 30-day time period were combined.
- **Additional notes**
  - Standard of care tests/episodes flagged as being related to prenatal testing were excluded from the analysis.

## B. Individual comparison – methods

- Comparison of HCV positive results from DBS testing (either anti-HCV or HCV RNA) to **July 24, 2023** with reported confirmed HCV cases recorded in Panorama since 1985 (referred to the public health system [PHS]).
- DBS tests were linked based on PHN. Unlinked DBS results were manually reviewed in the PHS.
- Linked records were categorized based on time of report from each data source (i.e. original HCV investigation prior to DBS test result or DBS result before HCV investigation).
- HCV negative results from DBS testing could not be analyzed for testing patterns of those clients because the HCV testing data available for surveillance has been de-identified and the laboratory information system does not presently include DBS test results.