Office of the
Auditor General
of British Columbia

February 2023

B.C.'s COVID-19 Response: Monitoring Vaccination Coverage

An independent audit report

Office of the
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of British Columbia

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The Honourable Raj Chouhan
Speaker of the Legislative Assembly
Province of British Columbia
Parliament Buildings
Victoria, British Columbia
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Dear Mr. Speaker:

I have the honour to transmit to the Speaker of the Legislative Assembly of British Columbia the report *B.C.'s COVID-19 Response: Monitoring Vaccination Coverage*.

We conducted this audit under the authority of section 11(8) of the *Auditor General Act*. All work in this audit was performed to a reasonable level of assurance in accordance with the Canadian Standard on Assurance Engagements (CSAE) 3001—Direct Engagements, set out by the Chartered Professional Accountants of Canada (CPA Canada) in the *CPA Canada Handbook—Assurance*.

Michael A. Pickup, FCPA, FCA
Auditor General of British Columbia
Victoria, B.C.

February 2023

Contents

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The Office of the Auditor General of British Columbia acknowledges with respect that we conduct our work on Coast Salish territories, primarily on the traditional lands of the Lekwungen people (Esquimalt and Songhees Nations).

Audit at a glance

Why we did this audit

- The COVID-19 vaccination program was the largest vaccination campaign in B.C. history, with nearly 14 million doses administered between December 2020 and December 2022.
- To protect vulnerable people and ensure the integrity of the health care system, the vaccination program prioritized high-risk groups, such as long-term care and assisted living residents and staff, and health care workers.
- Reliable and timely information on COVID-19 vaccination rates for high-risk groups, as well as the general population, was vital to making informed decisions on B.C.'s pandemic response and recovery.

Objective

To determine whether the Ministry of Health had the information to monitor the COVID-19 vaccination rates of selected populations to inform decision-making.

This included monitoring rates for the whole province, as well as by age and location. It also included the following high-risk priority groups that we selected for this audit:

- Long-term care and assisted living residents and staff
- Health care workers

Audit period

December 2020 - February 2022

Conclusion

We concluded the ministry had the information it needed to monitor COVID-19 vaccination rates, with some exceptions for the high-risk priority groups selected for this audit.

The ministry has accepted our two recommendations focused on access to registries of residents and staff at long-term care and assisted living facilities, and of health care workers across the province.

What we found

Vaccinations were recorded in a single provincial registry.

- Multiple data collection systems fed records into the Provincial Immunization Registry.
- There was timely input of data into this registry and data quality processes supported the accuracy of vaccine records.

No recommendation

Adequate processes were in place to monitor vaccination rates for the entire province, by age and location.

- Existing databases were leveraged to estimate vaccination rates for these populations.
- Adequate data quality processes were applied to these rate calculations.
- Decision makers were provided with reports regularly.
- For a small number of communities with fluctuating populations (e.g. UBC, Whistler, and Kitimat), vaccination coverage estimates were overstated. Decision makers were aware of the discrepancy.

No recommendation

Audit at a glance *(continued)*

Vaccination rates were monitored for long-term care and assisted living residents and staff, but processes were cumbersome and introduced risk.	▪ Vaccination rates for residents and staff in long-term care and assisted living were reported at the health authority level, but there was limited facility-level reporting. ▪ There is no provincial database for these groups. ▪ Manual processes were used to estimate these vaccination rates, but introduced risk that vaccination rates could have been inaccurate. ▪ Decision makers were aware of these limitations. Recommendation 1
Vaccination rates were monitored for health care workers, but there were information gaps.	▪ Initially, health care workers with high COVID-19 exposure risk were prioritized. ▪ The ministry estimated the size of this group and had adequate processes to monitor the vaccination program's early progress. ▪ As more health care workers became eligible, the ministry did not revise its estimate so it did not have accurate vaccination rates for this group from February to October 2021. ▪ Once vaccination was required in October 2021, there were adequate processes to monitor and report on vaccination rates. Recommendation 2

After reading the report, you may wish to ask the following questions of government:

1. What are the most important lessons learned from the development and rollout of the COVID-19 vaccination program?
2. How could the government apply the lessons learned from the COVID-19 vaccination program to other provincial emergencies?
3. How can the information systems developed for the COVID-19 vaccination program be used for health services in the future?

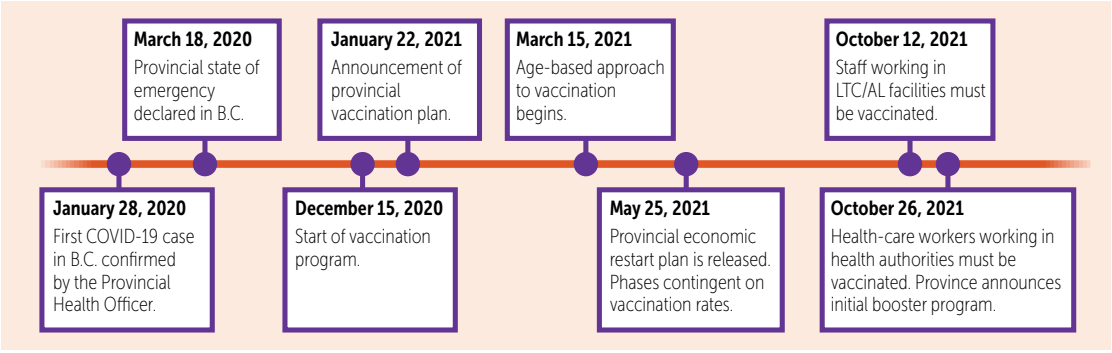
Background

The COVID-19 vaccination program is critical to B.C.'s response to the pandemic. It is the largest vaccine program in the province's history with nearly 14 million doses administered between December 2020 and December 2022. The B.C. government relied on vaccination rates alongside other data, such as COVID-19 cases and hospitalizations, to inform decision making on public health measures, such as mandatory masking and limits on public and private gatherings.

B.C. implemented the program as part of a national plan by the federal government to deliver vaccines to Canadians. The federal government authorized, procured, and paid for COVID-19 vaccines, while provinces distributed and administered them. In B.C., the Ministry of Health is the lead agency responsible for the COVID-19 vaccine program. It coordinated the vaccine rollout with several entities including the Provincial Health Officer, the Provincial Health Services Authority, regional health authorities, the First Nations Health Authority, and community pharmacies. The ministry also worked closely with the Provincial Health Services Authority to monitor vaccination rates.

COVID-19 vaccines arrived in B.C. in December 2020, but the initial supply of vaccines was limited. In January 2021, the ministry announced a vaccination plan for the provincial population. The plan prioritized high-risk groups, such as residents of long-term care. As more vaccines became available in the spring of 2021, the ministry set up mass vaccination clinics and immunized the general population using an age-based approach. According to the plan, everyone who wanted to be vaccinated would have access to a vaccine by September 2021. The province later expanded its vaccination program to include children from six months to 17 years old, as well as booster doses. The vaccination program timeline is illustrated below.

B.C.'s vaccination program timeline: key events



The ministry needed to record each vaccination so that it could monitor the program's progress. It also needed ways to estimate how many people within a given group had been vaccinated. It then determined the vaccination coverage rate by dividing the number of vaccinations given by the number of people within the provincial population or in a specific group. This information was needed to help the ministry understand whether vaccination efforts had been effective.

Objective

The objective of the audit was to determine whether the Ministry of Health had the information to monitor the COVID-19 vaccination rates of selected populations to inform decision-making.

Scope

This audit examined whether the Ministry of Health had the necessary information to monitor COVID-19 vaccination rates for the whole province, as well as by age and location.

The audit also examined monitoring of the following priority groups:

- Long-term care (LTC) and assisted living (AL) residents and staff, and
- Health care workers.

We looked at:

- How information was collected to monitor COVID-19 vaccination rates,
- Processes used to determine COVID-19 vaccination rates, and
- Reporting to key decision makers, including the Minister of Health, the Deputy Minister of Health, the Provincial Health Officer, and the Vaccination Program Lead.

Audit period: December 2020 to February 2022.

Learn more about how we did this audit on page 16.

Learn more about the audit criteria on page 18.

Source: Shutterstock

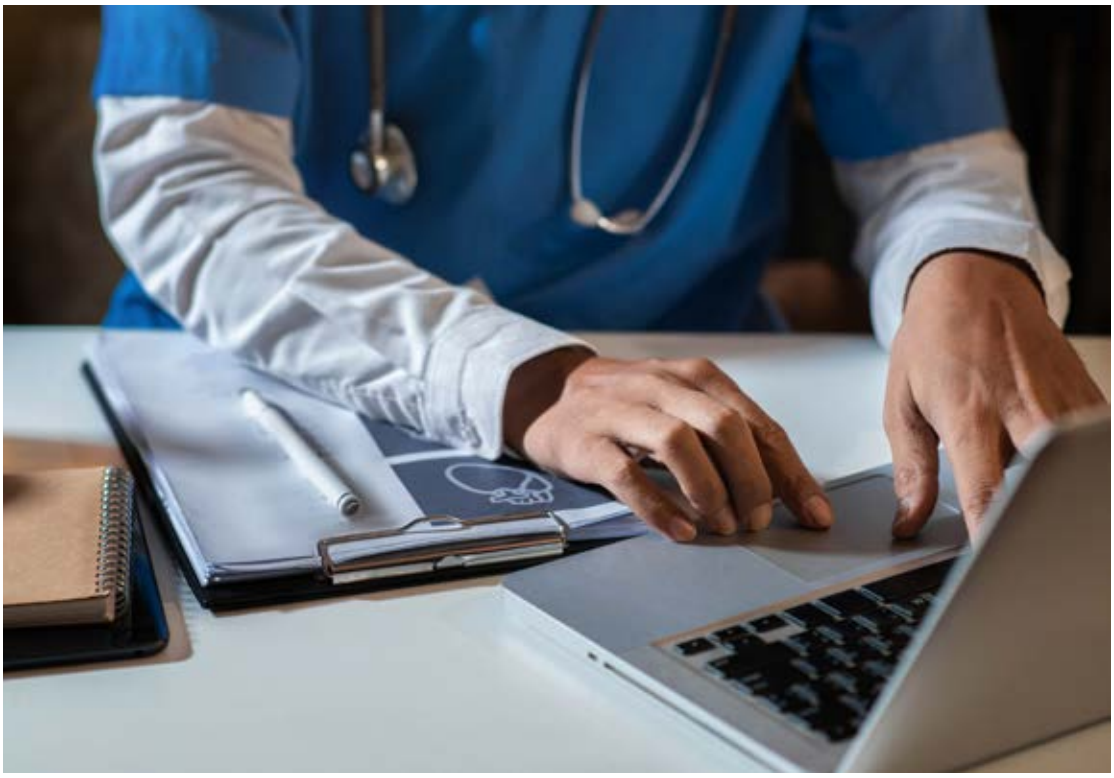
Conclusion

We concluded the ministry had the information it needed to monitor COVID-19 vaccination rates, with some exceptions for the high-risk priority groups selected for this audit.

The ministry had adequate processes to estimate vaccination rates for the whole province, as well as by age and location. The ministry frequently reported this information to key decision makers who used it to guide the vaccine program and other public health responses.

The ministry had processes to estimate the vaccination rates for residents and staff in long-term care and assisted living. However, the processes were cumbersome and introduced risk to the quality of the data used, meaning the vaccination rates for these priority groups could have been inaccurate.

The ministry had information to estimate the vaccination rates for health care workers working in health authorities in the early phase of the program and once the ministry required vaccination for this group. However, there was a gap in the ministry's monitoring of this group from February to October 2021.



Source: Shutterstock

Findings and recommendations

Vaccination information systems

Vaccination information systems are a key component of a vaccination program. They can support the management of registrations, appointment bookings, vaccine inventory, and critically, provide a record of each vaccine dose provided. Systems can also capture information about vaccine recipients, such as their age, community of residence, and priority group status. Decision makers need this information to estimate vaccination coverage rates.

Vaccinations were recorded in a single provincial registry

What we looked for

We examined whether the ministry had information systems to:

- Record COVID-19 vaccinations at the site of vaccination,
- Ensure timely entry of records into the provincial immunization registry, and
- Capture recipient information, such as date of birth, location, and priority group status.

Learn more about the audit criteria on page 18.

What we found

The ministry had processes to capture vaccination information at the start of the program, and had a provincial immunization registry (PIR), also known as Panorama, to store vaccination records. However, it needed an information system that could meet the demands of a mass vaccine rollout.

In December 2020, the ministry instructed all health authorities to use an electronic form (eForm) developed to record COVID-19 vaccinations. eForms enabled entry of vaccination records into the PIR but were not able to manage registrations, appointment bookings, and vaccine inventory. The ministry needed these additional functions to manage the delivery of a high volume of vaccinations across the province.

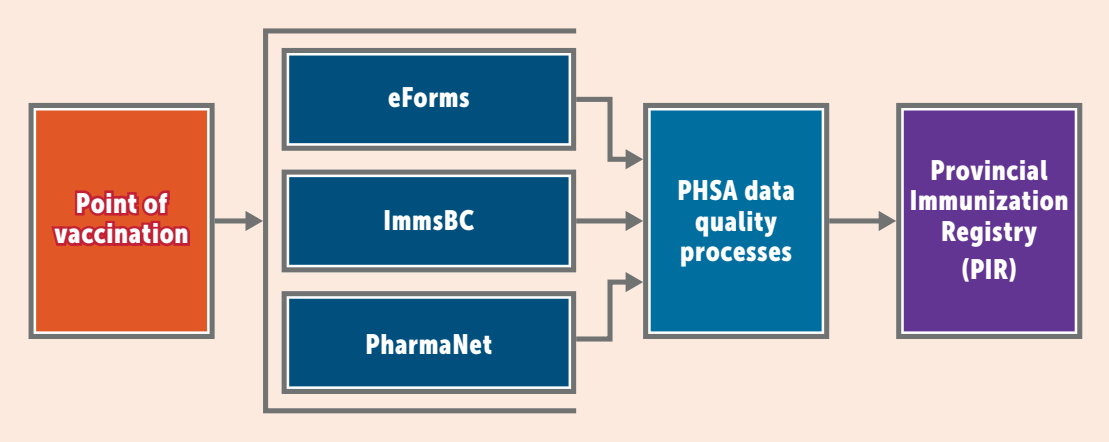
In January 2021, the ministry began working on a new information system to meet the needs of the vaccine program. ImmsBC was rolled out in April 2021 as the general population started to become eligible for COVID-19 vaccinations. At the same time, pharmacies administering

COVID-19 vaccinations recorded these using an existing system, PharmaNet, which also fed records into the PIR. Pharmacies would later adopt ImmsBC as directed by the ministry.

All of the above systems enabled collection of patients' date of birth, postal code indicating community of residence, and priority group status.

Vaccine records flowed into the PIR in a timely manner, with minor exceptions. At the introduction of both eForms and ImmsBC, some records were delayed as they were flagged by data quality processes that identified errors, such as duplicate records or records with missing or inaccurate information. However, the number of delayed records was small relative to the total volume of vaccination records and had minimal impact on the ministry's vaccination coverage monitoring. PHSA staff were responsible for the identification and manual correction of records flowing into the PIR to support the accuracy of vaccine records. The chart below illustrates the flow of information from the point of vaccination into the PIR.

Flow of vaccine record information



All the systems used to record vaccinations enabled immunizers to record vaccinations on site. There were instances where immunizers used paper records when internet connectivity was limited and updated digital records later.

Why this matters

Having an information system that could record and store all vaccinations administered was important as the ministry needed this information to estimate vaccination coverage rates and guide public health measures.

Recommendation

We have no recommendations in this area.

Vaccination rate estimation and reporting

Vaccination rate estimates are critical for decision makers to monitor program success. Vaccination rates indicate vaccine uptake by location and population, which allow decision makers to target locations and groups with lower uptake. This was particularly important for priority groups who were more vulnerable to the effects of COVID-19 or at greater risk of being exposed due to their occupation or residence.

To successfully monitor the rates of priority groups it was important for the vaccination program to have standardized processes to estimate the number of people in these groups. They needed processes to help ensure vaccination rates were accurate and to regularly and quickly report to decision makers to allow for a timely response to emerging issues.

Adequate processes were in place to monitor vaccination rates for the entire province, by age and location

What we looked for

We assessed whether the ministry had processes to estimate COVID-19 vaccination rates by:

- The province as a whole,
- Age, and
- Location.

We also assessed whether the ministry made this information available to key decision makers.

What we found

The ministry had adequate processes to estimate rates of COVID-19 vaccination for the entire province, by age, and location based on Community Health Service Area (CHSA).

To estimate the provincial vaccination coverage rate, the ministry used the PIR, containing all COVID-19 vaccination records, as the numerator. The ministry used a March 2021 snapshot of its existing registry of health care client information, the client registry, as the denominator to represent the B.C. population. The ministry used the same data sources to estimate the coverage rates by age and location.

Vaccination coverage rate calculations for the entire province, by age and location

$$\frac{\text{(Numerator) Provincial Immunization Registry records}}{\text{Client registry records (Denominator)}} = \begin{array}{l}\text{Provincial vaccination coverage rate (\%)}\\ \text{Vaccination coverage rate by age (\%)}\\ \text{Vaccination coverage rate by location (\%)}\end{array}$$

To maintain data quality, the PHSA had processes to identify and correct vaccine records with errors prior to recording them in the PIR. In addition, the ministry had processes to exclude incomplete or out-of-date records from its snapshot of the client registry, such as records that lacked key information for individuals (e.g. age).

Because the ministry's population denominator reflected a point in time, it did not include new arrivals or departures to or from each CHSA. As a result, vaccination rates for a small number of communities with large fluctuations in population size were inaccurate. For example, reported vaccination rates for the University of British Columbia, Whistler, and Kitimat were overstated. Ministry staff were aware of these challenges. Further, data limitations related to CHSA vaccination coverage estimates were disclosed on the BC Centre for Disease Control's public vaccination coverage dashboard.

The ministry regularly provided key decision makers with information on the rates of COVID-19 vaccination for the province, by age, and location. From March 2021 onwards, provincial coverage rates were reported daily by age, with the scope of reporting expanding as each age group became eligible for vaccination. The ministry also provided CHSA-specific reports from May 2021 onwards. Further, the BC Centre for Disease Control published provincial coverage rates by age, as well as rates by location.

Why this matters

Having a process to estimate and monitor rates of COVID-19 vaccination for the whole province, as well as by age and location ensured decision makers were informed about whether vaccination efforts were effective and enabled comparisons of locations within and outside of B.C. These rates also informed other public health decisions and measures.

Recommendation

We have no recommendations in this area.

Vaccination rates were monitored for long-term care and assisted living residents and staff, but processes were cumbersome and introduced risk

What we looked for

We examined whether the ministry:

- Had processes to estimate the COVID-19 vaccination rate for residents and staff of LTC and AL facilities, both provincially and by facility (including publicly and privately-operated facilities), and
- Made this information available to key decision makers.

What we found

We found that the ministry had processes to collect information on the vaccination rates of LTC and AL residents and staff, but data limitations meant the population estimates may have been inaccurate. Decision makers were aware of these limitations.

From the beginning of the vaccination rollout to September 2021, the ministry monitored the number of vaccines administered to LTC and AL residents and staff based on the PIR against population estimates for LTC and AL in each health authority. These population estimates were based on available ministry and PHSA data. This coverage information was reported to decision makers daily.

In addition to the provincial and health authority-specific reporting during this time, the ministry created two ad hoc facility-level reports on resident vaccination rates. The reports on provincial and health authority-level coverage, as well as the ad hoc facility-level reports, helped the ministry monitor progress during this time.

However, the ministry did not have a provincial database of residents and staff in LTC and AL facilities, which made the data collection and analysis for these groups cumbersome. There are approximately 500 LTC and AL facilities in the province. In the absence of a provincial database, ministry and PHSA staff had challenges confirming the number of residents and staff in LTC and AL facilities, including:

- A lack of data on privately-funded AL facilities because these facilities do not report resident or staff population data through any ministry or PHSA system,
- Difficulty defining LTC, AL, and independent living in cases where facilities were co-located, and
- Regular turnover of LTC and AL residents in these facilities.

From September to December 2021, the ministry required that all LTC and AL facilities use a portal to report information on residents and staff, including their Personal Health Number, to the ministry. This helped the ministry implement a public health order requiring vaccinations for staff in LTC and AL facilities by October 12, 2021. Data from this portal and the PIR allowed the ministry to monitor compliance and estimate vaccination rates at the facility-level. The ministry regularly shared this information with decision makers.

Why this matters

Processes to collect information on the vaccination rates of LTC and AL residents and staff allowed the ministry to monitor vaccination uptake for these groups. However, the data limitations and cumbersome methods used to collect the data created significant work for health authority and ministry staff and introduced a risk that the information could have been inaccurate. Decision makers were aware of these limitations and supplemented the data with regular communication with health authority staff. A consistent and ongoing process for collecting information on these groups across the province would have allowed for more accurate and timely information to be reported to decision makers.

Recommendation

We recommend that:

1. The Ministry of Health ensure it has access to a current registry of residents and staff at public and private LTC and AL facilities in B.C. to address future public health needs.

See the response from the auditee on page 17.

The ministry monitored vaccination rates for health care workers, but there were information gaps

What we looked for

We examined whether the ministry:

- Had processes to estimate the COVID-19 vaccination rate for health care workers working in health authorities. This includes individuals employed by health authorities, as well as medical staff funded by the Ministry of Health working in health authority facilities.
- Made this information available to key decision makers.

What we found

When the vaccine rollout began in December 2021, the ministry estimated the number of health care workers initially eligible for vaccination. Using the PIR, it tracked the number of health care workers vaccinated against this point-in-time estimate.

The health care workers initially eligible for the COVID-19 vaccine were those most likely to be exposed to patients with COVID-19 or to spread the virus to patients, including workers in Intensive Care Units, medical or surgical units, emergency departments, and paramedics. The ministry used information provided by the health authorities to estimate this population. The ministry reported this information to key decision makers daily, which helped them monitor progress in the first phase of the vaccine rollout.

As more health care workers working in health authorities became eligible, the ministry continued to track the number who were vaccinated, but it did not revise its population estimate to account for newly eligible workers. Therefore, the coverage rate became overstated and was not useful, leaving a gap in information reported to decision makers from February to October 2021.

In October 2021, the Provincial Health Officer issued an order requiring vaccination for all health care workers working in health authorities. The ministry used health authority databases of health care workers to help implement the order. Ministry and PHSA staff indicated that they did not have the authority to access these health authority databases until the introduction of the COVID-19 vaccination mandate. Once they had access to these databases, the ministry had adequate processes to monitor vaccination rates and regularly provided this information to decision makers.

Why this matters

Processes to collect information on health care worker vaccination rates in the early phase of the vaccine program allowed the ministry to monitor uptake for the highest risk workers during this period. However, from February to October 2021 decision makers had incomplete information on the vaccination rates of health care workers, making it more challenging to know if changes needed to be made to increase uptake during this period.

Recommendation

We recommend that:

2. The Ministry of Health ensure it has access to a current registry of health care workers working in health authorities to address future public health needs.

See the response from the auditee on page 17.

About the audit

We conducted this audit under the authority of section 11(8) of the *Auditor General Act* and in accordance with the Canadian Standard on Assurance Engagements (CSAE) 3001—Direct Engagements, set out by the Chartered Professional Accountants of Canada (CPA Canada) in the *CPA Canada Handbook—Assurance*. These standards require that we comply with ethical requirements and conduct the audit to independently express a conclusion against the objective of the audit.

A direct audit involves understanding the subject matter to identify areas of significance and risk, and to identify relevant controls. This understanding is used as the basis for designing and performing audit procedures to obtain evidence on which to base the audit conclusion.

The audit procedures we conducted included: conducting interviews with ministry and Provincial Health Services Authority staff, gathering and reviewing documents such as ministry coverage reports, conducting walkthroughs of key information systems, and assessing the design and implementation of relevant internal controls.

We believe the audit evidence we have obtained is sufficient and appropriate to provide a basis for our conclusion.

Our office applies the Canadian Standard on Quality Management (CSQM 1), and we have complied with the independence and other requirements of the code of ethics issued by the Chartered Professional Accountants of British Columbia that are relevant to this audit.

Audit report date: February 4, 2023

Michael A. Pickup, FCPA, FCA
Auditor General of British Columbia
Victoria, B.C.

Appendix A: Recommendations and auditee responses

Recommendation 1: We recommend that the Ministry of Health ensure it has access to a current registry of residents and staff at public and private LTC and AL facilities in B.C. to address future public health needs.

Recommendation 1 response: The ministry accepts this recommendation.

The Ministry of Health will build upon the work completed in the early response to COVID-19 by working with the health authorities and LTC and AL operators to create a framework of policy, business processes, and legal authorities required so that this information can be collected and maintained on a regular basis. Several challenges will need to be addressed. For example, there can be a lack of IT systems in LTC and AL facilities to support data collection and reporting.

The ministry will initiate planning and consultations with the health authorities and operators of these facilities in fiscal year 2023/24, which will inform the ministry's implementation plan to address this recommendation.

Recommendation 2: We recommend that the Ministry of Health ensure it has access to a current registry of health care workers working in health authorities to address future public health needs.

Recommendation 2 response: The ministry accepts this recommendation.

Establishing a permanent, up-to-date registry of health authority health care workers (including medical staff) is a key priority for the ministry. The Ministry of Health released a Health Human Resources Strategy in September of 2022 that outlines specific actions it is taking to support a healthy and productive workforce and a better health care system for everyone in B.C. Under Action #30 in this Strategy, the Ministry of Health and Provincial Health Services Authority are collaborating with health authorities to replace aging and legacy Human Capital Management Systems.

This will provide the ministry and health authorities with more accurate data on the numbers and types of health care workers, as well as the ability to link this data with the Provincial Immunization Registry, to understand the vaccination status of those employed by the health authorities. Until this is in place, the ministry will continue to leverage existing systems with health authority health care worker data (e.g., WHITE and Cactus) for public health needs.

Appendix B: Audit criteria

Audit objective: To determine whether the Ministry of Health had the information to monitor the COVID-19 vaccination rates of selected populations to inform decision-making.

Line of enquiry 1: Information systems

Criterion 1: The ministry had information systems to record COVID-19 vaccinations.

1.1 The ministry's information systems enabled immunizers to record individuals' vaccine records on site

1.2 The ministry's information systems enabled timely entry into the Provincial Immunization Registry

1.3 The ministry's information systems collected the following information about vaccine recipients:

- The community in which the recipient resides
- Date of birth of recipient
- Whether the recipient is a resident of a long-term care or assisted living facility
- Whether the recipient works at a long-term care or assisted living facility
- Whether the recipient is a health authority health care worker

Line of enquiry 2: Vaccination rate estimation

Criterion 2: The ministry had processes to estimate the COVID-19 vaccination rates of selected populations.

2.1 The ministry had processes to estimate the provincial rate of COVID-19 vaccination

2.2 The ministry had processes to estimate the rate of COVID-19 vaccination by Community Health Service Area

2.3 The ministry had processes to estimate the rate of COVID-19 vaccination by age

2.4 The ministry had processes to estimate the COVID-19 vaccination rate for residents living in long-term care and assisted living provincially and by facility (including public and privately-operated facilities)

2.5 The ministry had processes to estimate the COVID-19 vaccination rate for staff working in long-term care and assisted living facilities provincially and by facility (including public and privately-operated facilities)

2.6 The ministry had processes to estimate the COVID-19 vaccination rate for health authority health care workers

Line of enquiry 3: Vaccination rate reporting

Criterion 3: The ministry made information available to key decision makers on COVID-19 vaccination rates.

3.1 The ministry made information available to key decision makers on the provincial rate of COVID-19 vaccination

3.2 The ministry made information available to key decision makers on COVID-19 vaccination rates by Community Health Service Area

3.3 The ministry made information available to key decision makers on COVID-19 vaccination rates by age group

3.4 The ministry made information available to key decision makers on the COVID-19 vaccination rates for residents living in long-term care and assisted living facilities provincially and by facility (including public and privately-operated facilities)

3.5 The ministry made information available to key decision makers on the COVID-19 vaccination rates for staff working in long-term care and assisted living facilities provincially and by facility (including public and privately-operated facilities)

3.6 The ministry made information available to key decision makers on the COVID-19 vaccination rate for health authority health care workers

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Cover image source: Shutterstock

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