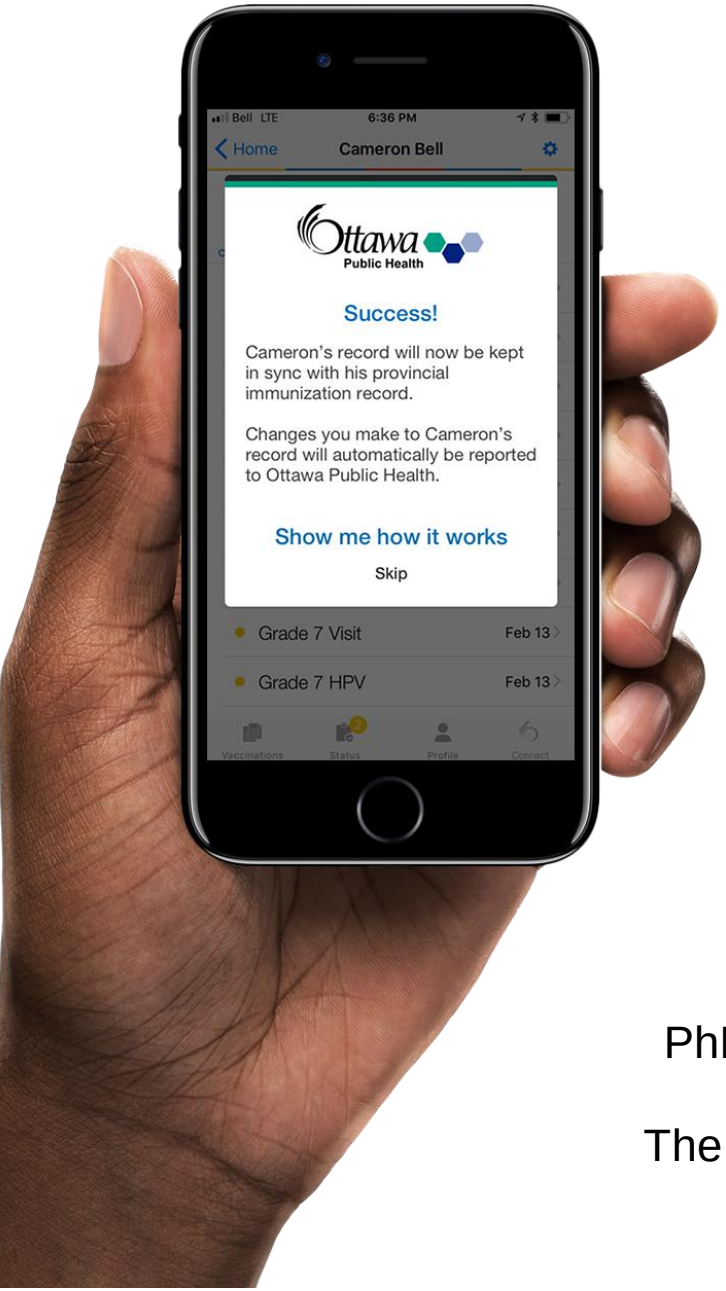


Communicating vaccinations to public health using mobile apps

CANImmunize

The Ottawa Hospital | L'Hôpital d'Ottawa

Katherine Atkinson

PhD Candidate, Department of Public Health Science, Karolinska Institutet, Stockholm, Sweden

The Ottawa Hospital Research Institute, Clinical Epidemiology Program, Ottawa, Canada

Outline

1. Immunization in Canada
2. The CANImmunize Project
3. Reporting to Public Health
4. Integration with Immunization Information Systems
5. Conclusions and Next Steps
6. Questions

Healthcare in Canada

- Canada's healthcare is funded by a "single-payer" system, but it doesn't function as one single, unified system. Coverage is publicly-funded, meaning that the funds come from federal and provincial taxes.
- Each territory and province is responsible for taking this money to create their own system under the guidelines set forth by Canadian Health Act (CHA)

Immunization in Canada

- Scientific guidelines are produced by the National Advisory Committee on Immunization (NACI), a federal initiative
- Each P/T sets their own publicly funded immunization schedule
  - With Individual legislation and regulations
  - Example, Ontario's *Immunization of School Pupils Act* (ISPA)
- Fragmented administration of vaccination
  - Combination of Physicians, Nurses, Public Health in some jurisdictions with an increasing scope of practice for pharmacists

Canada's Provincial and Territorial Routine (and Catch-up) Vaccination Routine Schedule Programs for Infants and Children

This table summarizes the current routine vaccination schedule for infants and children in all provinces and territories across Canada. Changes to this schedule are updated regularly in collaboration with the Canadian Nursing Coalition for Immunization (CNCI) and the Canadian Immunization Committee (CIC) schedules for each province or territory can be found here. Additional information is available on Canada.ca\vaccines (last update: June 2018).

VACCINES		Provincial & Territorial Vaccination Schedules												
Abbreviations	Description	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YT	NT	NU
DTaP-IPV-Hib	Diphtheria, Tetanus, acellular Pertussis, Inactivated Polio Virus, *Haemophilus Influenzae* type B vaccine	Age: 18 mos	Age: ,18 mos	Age: 2,4,6,18 mos	Age: 2,4,6,18 mos	Age: 2,4,6,18 mos	Age: 6 mos	Age: 2,4,6,18 mos	Age: 2,4,6,18 mos	Age: 18 mos	Age: 2,4,6,18 mos	Age: 18 mos	Age: 2,4,6,18 mos	Age: 2,4,6,18 mos
DTaP-HB-IPV-Hib	Diphtheria, Tetanus, acellular Pertussis, Hepatitis B, Inactivated Polio Virus, *Haemophilus Influenzae* type B vaccine	Age: 2,4,6 mos	Age: 2,4,6 mos				Age: 2,4,18 mos			Age: 2,4,6 mos		Age: 2,4,6 mos		
Tdap-IPV	Tetanus, diphtheria (reduced toxoid), acellular pertussis (reduced toxoid), Inactivated Polio Virus vaccine	Age: 4-6 yrs	Age: 4-6 yrs	Age: 4-6 yrs	Age: 4-6 yrs	Age: 4-6 yrs	Age: 4-6 yrs	Age: 4 yrs	Age: 4-6 yrs	Age: 4-5 yrs	Age: 4-6 yrs	Age: 4-6 yrs	Age: 4-6 yrs	Age: 4-6 yrs
Tdap	Tetanus, diphtheria (reduced toxoid), acellular pertussis (reduced toxoid) vaccine	Grade 9	Grade 9	Grade 8	Age: 13-15 yrs	Age: 14-16 yrs	3rd year of high school	Grade 7	Grade 7	Grade 9	Grade 9	Grade 9	Grade 7	Grade 6
HB	Hepatitis B vaccine	HB is provided in a 3-dose combination vaccine (DTaP-HB-IPV-Hib) in infancy	(3-dose) Grade 5	(2-dose) Grade 6	(2-dose), Grade 6	(2-dose) Grade 7	HB is provided in a 3-dose combination vaccine (DTaP-HB-IPV-Hib) in infancy Catch-up (2-dose) 2013/14 to 2022/23 Grade 4[5]	Age: At birth,2,6 mos	(2-doses) Grade 7	HB is provided in a 3-dose combination vaccine (DTaP-HB-IPV-Hib) in infancy	(2-dose) Grade 6	HB is provided in a 3-dose combination vaccine (DTaP-HB-IPV-Hib) in infancy	Age: At birth,1,6 mos	Age: At birth,1,9 mos
MMR	Measles, Mumps, Rubella vaccine	Age: 12 mos				Age: 12 mos	Age: 12 mos					Age: 12 mos		
Var	Varicella vaccine	Age: 12 mos		Catch-up (2nd dose) 2015 to 2021 Grade: 6		Age: 15 mos	Age: 4-6 yrs	Catch-up (2nd dose) 2016/17 to 2022/23 Grade 9				Age: 12 mos		Catch-up Grade 6
MMRV	Measles, Mumps, Rubella, Varicella vaccine	2nd dose Age: 4-6 yrs	Age: 12 mos, 4-6yrs	Age: 12,18 mos	Age: 12 mos, 4-6yrs	2nd dose Age: 4-6 yrs	Age: 18 mos	Age: 12,18 mos	Age: 12 mos, 18 mos-6 yrs	Age: 12,18 mos	Age: 12,18 mos	2nd dose Age: 4-6 years	Age: 12,36 mos	Age: 12, 18mos
Men-C-C	Meningococcal conjugate (Strain C) vaccine	Age: 2,12 mos	Age: 4,12 mos	Age: 12 mos,	Age: 12 mos[4]	Age: 12 mos	Age: 12 mos, 3rd yr of high school	Age: 12 mos	Age: 12 mos	Age: 12 mos	Age: 12 mos	Age: 2,12 mos	Age: 2,12 mos	Age: 12 mos
Men-C-ACYW-135	Meningococcal conjugate (Strains A, C, Y, W135) vaccine	Grade 9	Grade 9	Grade 6		Grade 7		Grade 9	Grade 7	Grade 9	Grade 4	Grade 9	Grade 12[a]	Grade 9
Pneu-C-13	Pneumococcal conjugate (13-valent) vaccine	Age: 2,4,12 mos	Age: 2,4,12 mos	Age: 2,4,12 mos	Age: 2,4,12 mos	Age: 2,4,12 mos		Age: 2,4,12 mos	Age: 2,4,12 mos	Age: 2,4,6 if high risk,12 mos	Age: 2,4,6 if high risk12 mos	Age: 2,4,12 mos	Age: 2,4,6,18 mos	Age: 2,4,6,18 mos
Pnue-C-10	Pneumococcal conjugate (10-valent) vaccine						Age: 2,4,12 mos							
Rota	Rotavirus vaccine	Age: 2,4,6 mos	Age: 2,4 mos	Age: 2,4, 6 mos	Age: 2,4,6 mos	Age: 2,4,6 mos	Age: 2,4 mos	Age: 2,4,6 mos		Age: 2,4,6 mos	Age 2,4 mos	Age: 2,4,6 mos	Age: 2,4 mos	Age: 2,4,6 mos
HPV	Human Papillomavirus vaccine	(2-dose) Grade: 6[1]	(3-dose) Grade 5[1] Catch-up (3-dose) 2014 to 2018 Grade 9[3]	(2-dose) Grade 6[1]	(2-dose) Grade 6[1]) Catch-up (2-dose) Grade: 8,9[3]	(2-dose) Grade 7[1] Catch-up (2 or 3 -dose) Grade 8[1] Grades 9 to 12[2]	(2-dose) Grade 4[1] Catch-Up (2-doses) Grade 9	(2-dose) Grade 7[1]	(2-dose) Grade 7[1]	(2-dose) Grade 6[1]	: (2-dose) Grade 6[1]	(2-dose) Grade 6[1]	(9-14 yrs: 2-dose 15 yrs +: 3-dose) Grade 4-6[1]	(2-dose) Grade 6[1]

Immunization coverage and registries

Learn how Canada tracks immunization against vaccine-preventable diseases. Also find out what we are doing to improve immunization registries and databases.

National network of immunization registries

Provinces and territories are currently working towards the development of a national network of immunization registries. Each province and territory maintains its own system for tracking immunization coverage.

In most provinces and territories, immunization data is collected mainly on children.

How provinces and territories record childhood immunization data may be different. Some jurisdictions have electronic databases to track childhood immunization data, while others use paper-based systems. Some use a combination of both.

There are also differences between jurisdictions regarding the type of data being collected.

Electronic registries in Canada will be used to improve immunization monitoring. They will be used to:

- identify children who are due or overdue for immunization
- provide health care providers with the patient's immunization status at each visit
- identify populations at risk for not getting immunized on time so that public health campaigns can reach these people

Can we improve immunization in Canada by empowering individuals?

CANImmunize

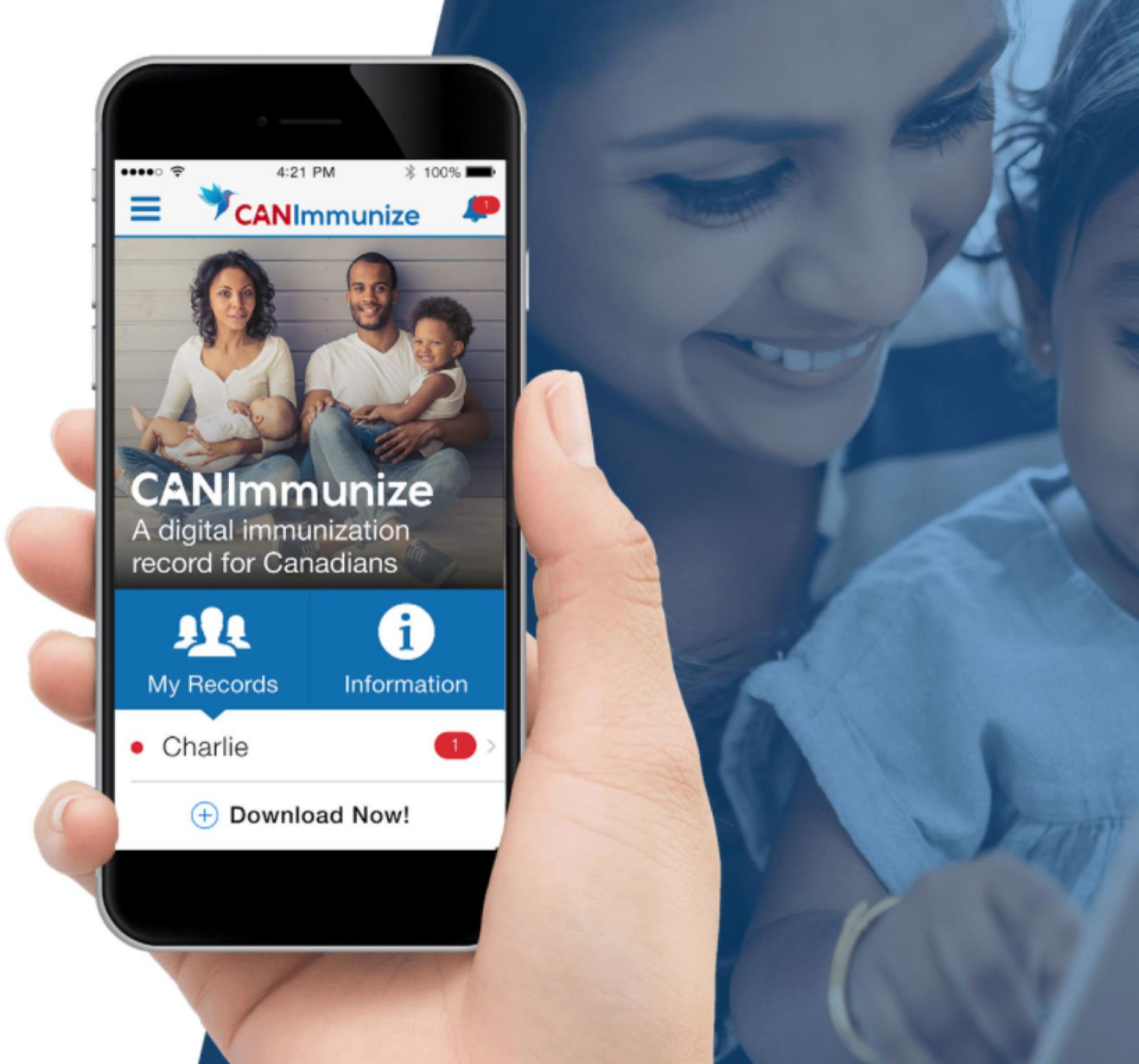
A digital immunization record for Canadians

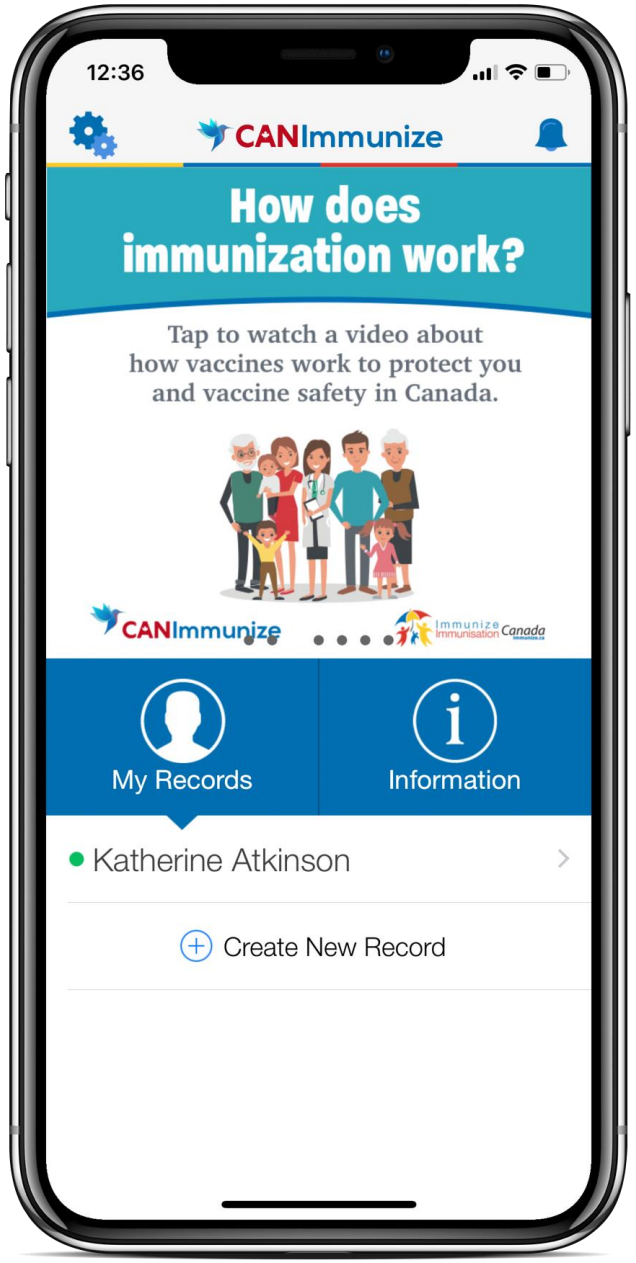
Download on the App Store

GET IT ON Google Play

2015
Connected to the Community Award
Canadian Wireless Technology Association

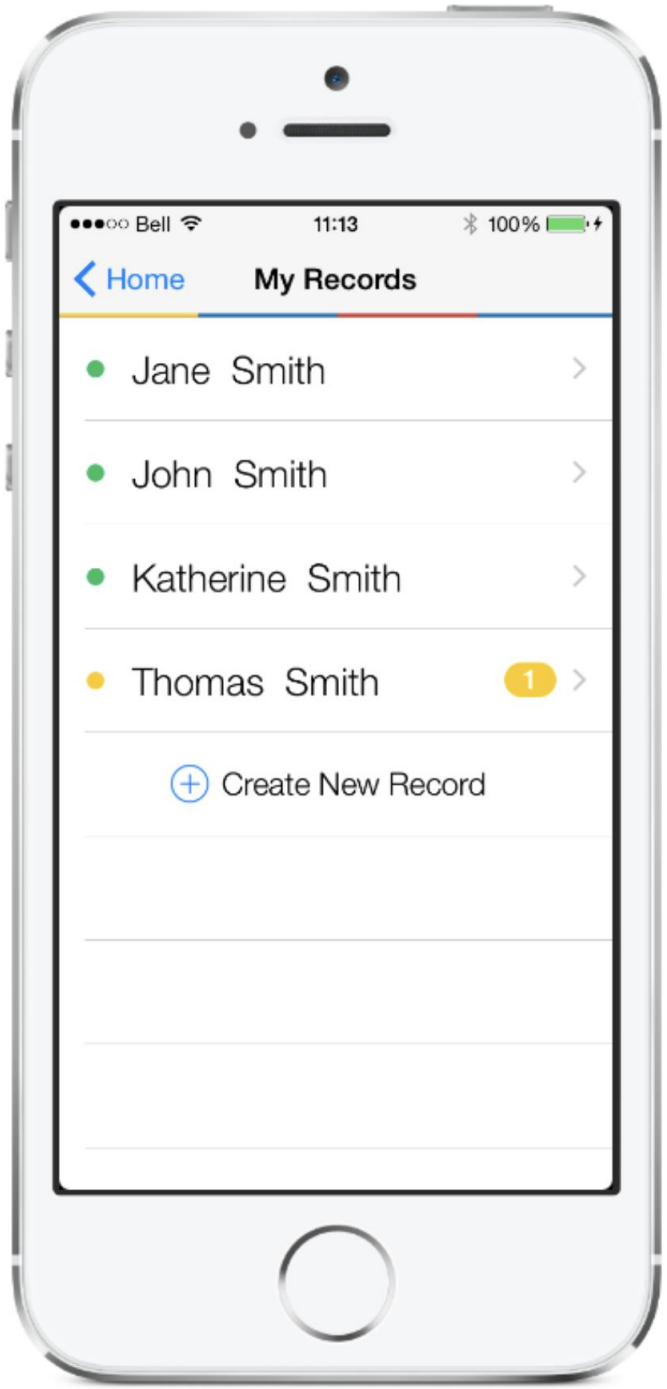
~ 250,000 users across Canada

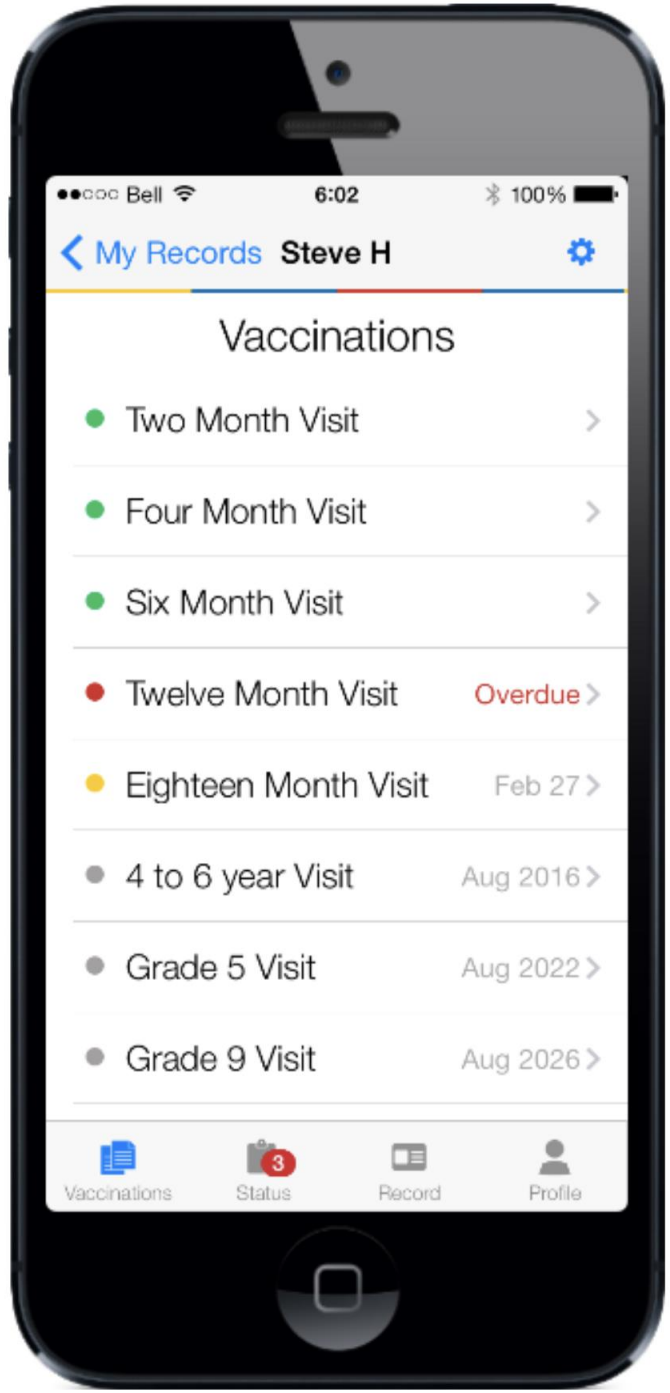


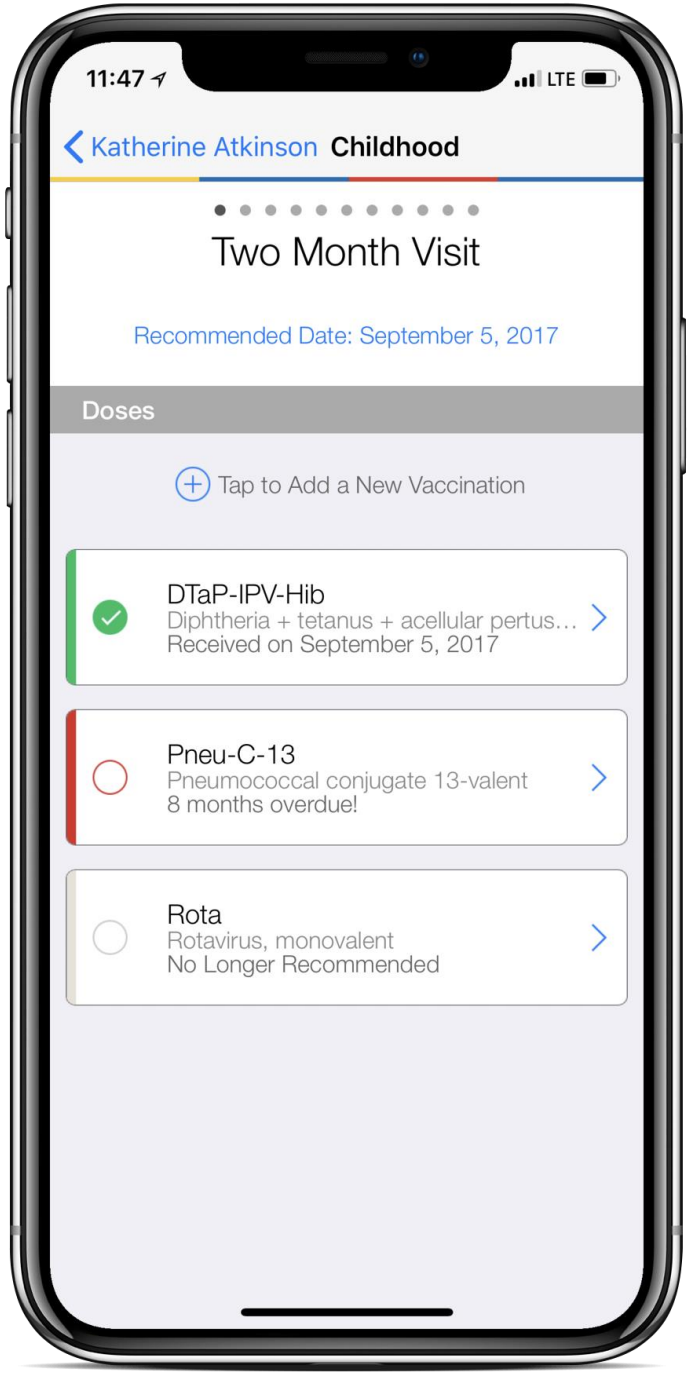


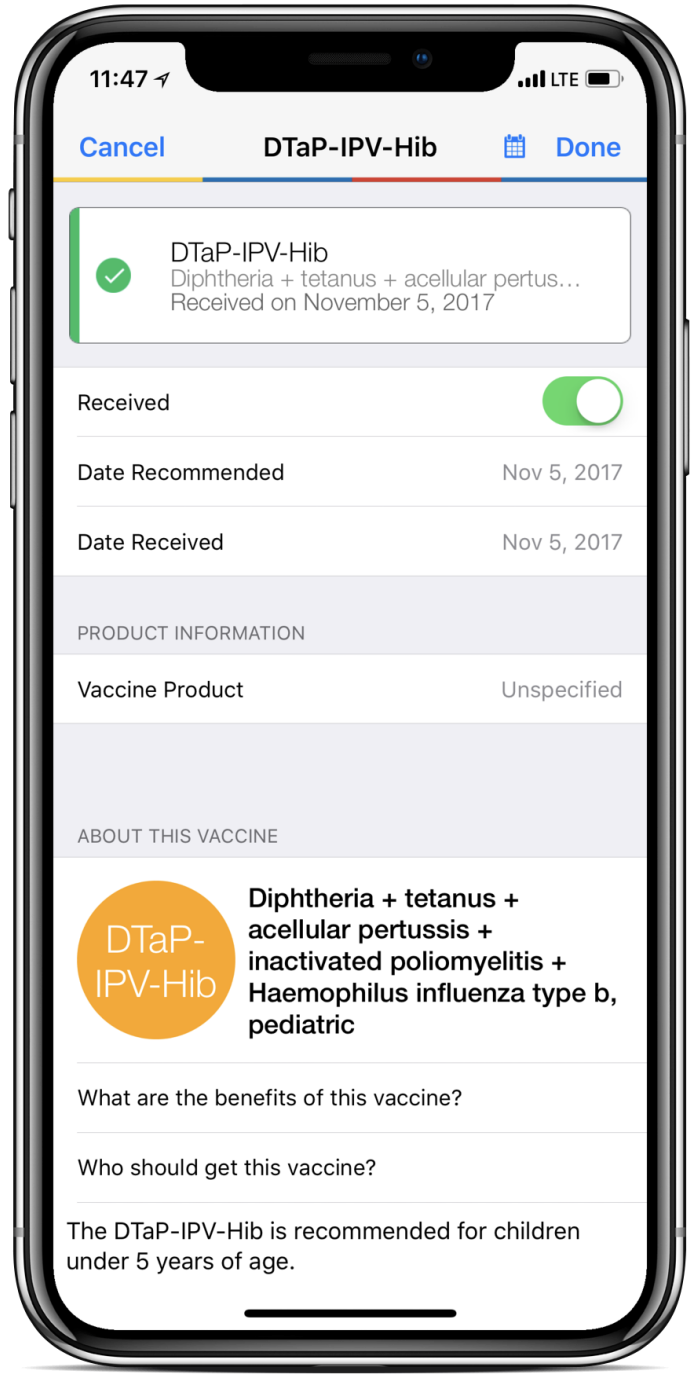
CANImmunize

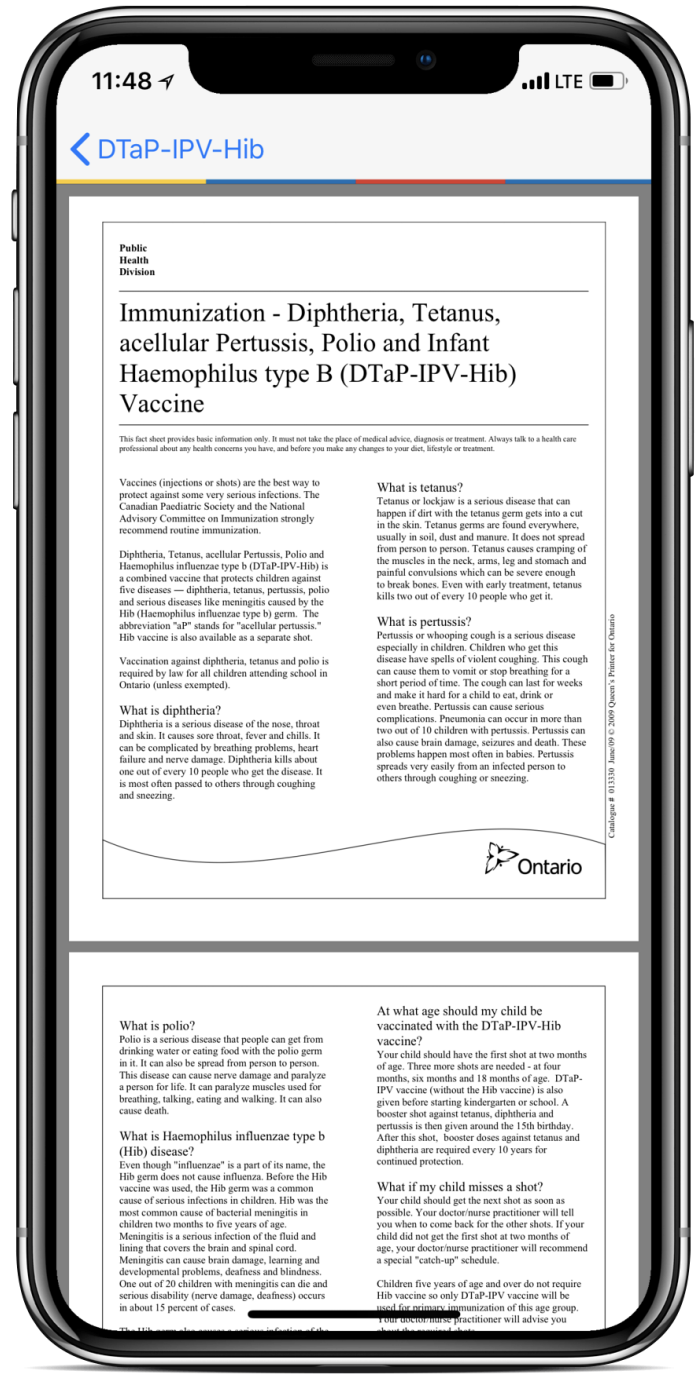
- Funded by the Canadian Federal Government
- Free download on iOS, Android and (very soon) at CANImmunize.ca
- Available in both English and French
- Publicly funded Pediatric and Adult schedules for all 13 Canadian Provinces and Territories
- Customized schedules for each family member
- Recall-reminders when its time to vaccinate
- Outbreak alerts powered by HealthMap

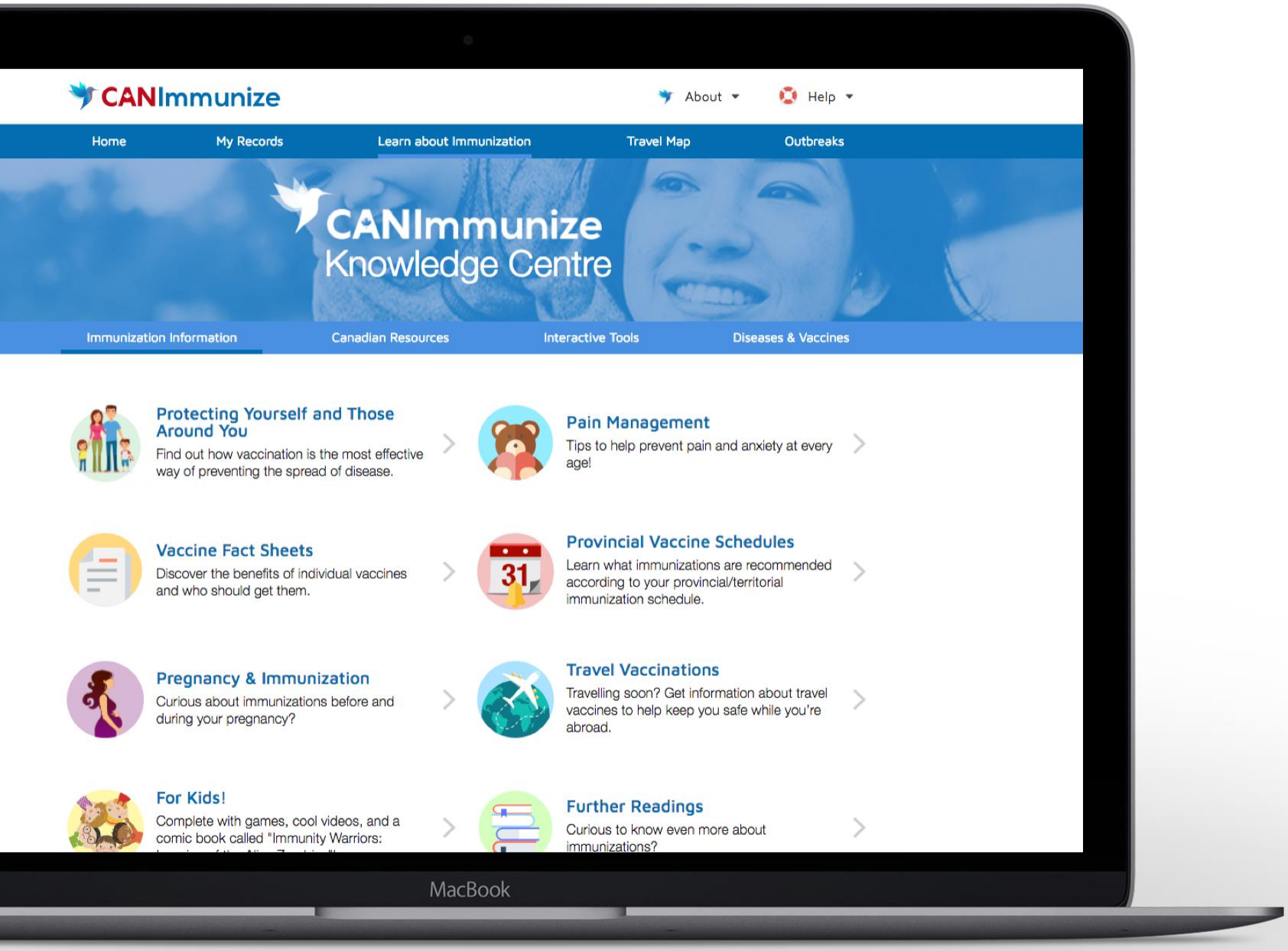

Bell 11:13 100%
Home
My Records
Jane Smith
John Smith
Katherine Smith
Thomas Smith
1
Create New Record

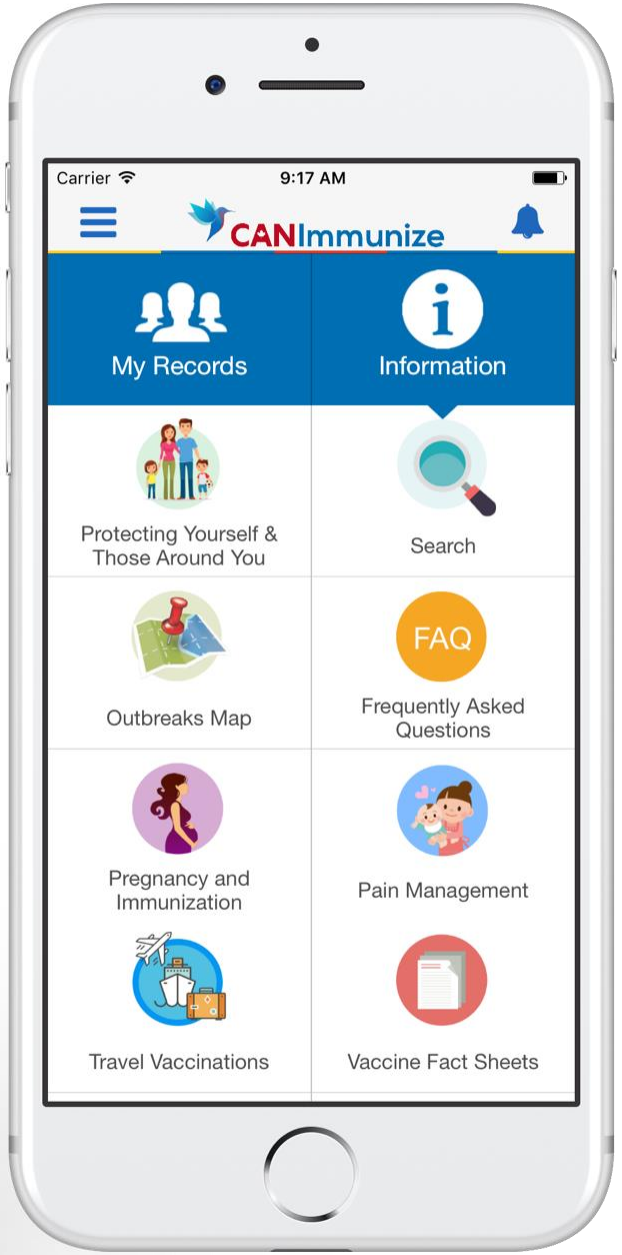

Bell 6:02 100%
My Records
Steve H
Vaccinations
Two Month Visit
Four Month Visit
Six Month Visit
Twelve Month Visit
Overdue
Eighteen Month Visit
Feb 27
4 to 6 year Visit
Aug 2016
Grade 5 Visit
Aug 2022
Grade 9 Visit
Aug 2026
Vaccinations
Status
3
Record
Profile


11:47
LTE
Katherine Atkinson Childhood
Two Month Visit
Recommended Date: September 5, 2017
Doses
Tap to Add a New Vaccination
DTaP-IPV-Hib
Diphtheria + tetanus + acellular pertus…
Received on September 5, 2017
Pneu-C-13
Pneumococcal conjugate 13-valent
8 months overdue!
Rota
Rotavirus, monovalent
No Longer Recommended


11:47
LTE
Cancel
DTaP-IPV-Hib
Done
DTaP-IPV-Hib
Diphtheria + tetanus + acellular pertus…
Received on November 5, 2017
Received
Date Recommended
Nov 5, 2017
Date Received
Nov 5, 2017
PRODUCT INFORMATION
Vaccine Product
Unspecified
ABOUT THIS VACCINE
DTaP-IPV-Hib
Diphtheria + tetanus + acellular pertussis + inactivated poliomyelitis + Haemophilus influenza type b, pediatric
What are the benefits of this vaccine?
Who should get this vaccine?
The DTaP-IPV-Hib is recommended for children under 5 years of age.


11:48
LTE
DTaP-IPV-Hib
Public Health Division
Immunization - Diphtheria, Tetanus, acellular Pertussis, Polio and Infant Haemophilus type B (DTaP-IPV-Hib) Vaccine
This fact sheet provides basic information only. It must not take the place of medical advice, diagnosis or treatment. Always talk to a health care professional about any health concerns you have, and before you make any changes to your diet, lifestyle or treatment.
Vaccines (injections or shots) are the best way to protect against some very serious infections. The Canadian Paediatric Society and the National Advisory Committee on Immunization strongly recommend routine immunization.
Diphtheria, Tetanus, acellular Pertussis, Polio and Haemophilus influenzae type b (DTaP-IPV-Hib) is a combined vaccine that protects children against five diseases — diphtheria, tetanus, pertussis, polio and serious diseases like meningitis caused by the Hib (Haemophilus influenzae type b) germ. The abbreviation "aP" stands for "acellular pertussis." Hib vaccine is also available as a separate shot.
Vaccination against diphtheria, tetanus and polio is required by law for all children attending school in Ontario (unless exempted).
What is diphtheria?
Diphtheria is a serious disease of the nose, throat and skin. It causes sore throat, fever and chills. It can be complicated by breathing problems, heart failure and nerve damage. Diphtheria kills about one out of every 10 people who get the disease. It is most often passed to others through coughing and sneezing.
What is tetanus?
Tetanus or lockjaw is a serious disease that can happen if dirt with the tetanus germ gets into a cut in the skin. Tetanus germs are found everywhere, usually in soil, dust and manure. It does not spread from person to person. Tetanus causes cramping of the muscles in the neck, arms, leg and stomach and painful convulsions which can be severe enough to break bones. Even with early treatment, tetanus kills two out of every 10 people who get it.
What is pertussis?
Pertussis or whooping cough is a serious disease especially in children. Children who get this disease have spells of violent coughing. This cough can cause them to vomit or stop breathing for a short period of time. The cough can last for weeks and make it hard for a child to eat, drink or even breathe. Pertussis can cause serious complications. Pneumonia can occur in more than two out of 10 children with pertussis. Pertussis can also cause brain damage, seizures and death. These problems happen most often in babies. Pertussis spreads very easily from an infected person to others through coughing or sneezing.
Catalogue # 015330 June/09 © 2009 Queen's Printer for Ontario
Ontario
What is polio?
Polio is a serious disease that people can get from drinking water or eating food with the polio germ in it. It can also be spread from person to person. This disease can cause nerve damage and paralyze a person for life. It can paralyze muscles used for breathing, talking, eating and walking. It can also cause death.
What is Haemophilus influenzae type b (Hib) disease?
Even though "influenzae" is a part of its name, the Hib germ does not cause influenza. Before the Hib vaccine was used, the Hib germ was a common cause of serious infections in children. Hib was the most common cause of bacterial meningitis in children two months to five years of age. Meningitis is a serious infection of the fluid and lining that covers the brain and spinal cord. Meningitis can cause brain damage, learning and developmental problems, deafness and blindness. One out of 20 children with meningitis can die and serious disability (nerve damage, deafness) occurs in about 15 percent of cases.
At what age should my child be vaccinated with the DTaP-IPV-Hib vaccine?
Your child should have the first shot at two months of age. Three more shots are needed - at four months, six months and 18 months of age. DTaP-IPV vaccine (without the Hib vaccine) is also given before starting kindergarten or school. A booster shot against tetanus, diphtheria and pertussis is then given around the 15th birthday. After this shot, booster doses against tetanus and diphtheria are required every 10 years for continued protection.
What if my child misses a shot?
Your child should get the next shot as soon as possible. Your doctor/nurse practitioner will tell you when to come back for the other shots. If your child did not get the first shot at two months of age, your doctor/nurse practitioner will recommend a special "catch-up" schedule.
Children five years of age and over do not require Hib vaccine so only DTaP-IPV vaccine will be used for primary immunization of this age group.


CANImmunize
About
Help
Home
My Records
Learn about Immunization
Travel Map
Outbreaks
CANImmunize
Knowledge Centre
Immunization Information
Canadian Resources
Interactive Tools
Diseases & Vaccines
Protecting Yourself and Those Around You
Find out how vaccination is the most effective way of preventing the spread of disease.
Pain Management
Tips to help prevent pain and anxiety at every age!
Vaccine Fact Sheets
Discover the benefits of individual vaccines and who should get them.
Provincial Vaccine Schedules
Learn what immunizations are recommended according to your provincial/territorial immunization schedule.
Pregnancy & Immunization
Curious about immunizations before and during your pregnancy?
Travel Vaccinations
Travelling soon? Get information about travel vaccines to help keep you safe while you're abroad.
For Kids!
Complete with games, cool videos, and a comic book called "Immunity Warriors:
Further Readings
Curious to know even more about immunizations?
MacBook


Carrier
9:17 AM
CANImmunize
My Records
Information
Protecting Yourself & Those Around You
Search
Outbreaks Map
FAQ
Frequently Asked Questions
Pregnancy and Immunization
Pain Management
Travel Vaccinations
Vaccine Fact Sheets

- Ontario Population: 13,448,494 (38.3%)
- 40% of Canadian live births

The Immunization of School Pupils Act (ISPA)

Parents of children attending school must show proof of the vaccines their children have received to the Health Department.

The mandatory vaccines are diphtheria, tetanus, polio, measles, mumps, rubella, meningococcal disease, pertussis (whooping cough), and varicella (chickenpox) for children born in 2010 or later.

Many parents are unaware that health care providers do not report these records to the Health Department.

This law gives the Medical Officer of Health the authority to order the suspension of a student from school for not complying with this law.

Source: Halton Region Public Health

Reporting and Retrieving Immunizations

Other ways to update a child's immunization record

- Phone: 613-580-6744 Monday to Friday, 9 am to 4 pm
- Mail: Immunization Program (mail code 26-42), 100 Constellation Drive, Ottawa, ON. K2G 6J8
- Fax: 613-580-9660

Immunization Connect Ontario (ICON) Tool

Please note that this service will be unavailable on August 20th at 10:00 AM to 4:00 PM for scheduled maintenance. We apologize for the inconvenience. For information on alternative ways to update your child's immunization record during this time, please see "Updating your child's record" and "Other ways to update a child's immunization record".

You can now update, view and/or print your child's immunization record through the new **Immunization Connect (ICON) portal**. ICON is a new secure online tool for submitting

NEWS OTTAWA & REGION

App working to solve Ottawa Public Health vaccination data backlog

BY DANI-ELLE DUBE, OTTAWA SUN

FIRST POSTED: THURSDAY, APRIL 30, 2015 04:48 PM EDT | UPDATED: THURSDAY, APRIL 30, 2015 05:33 PM EDT

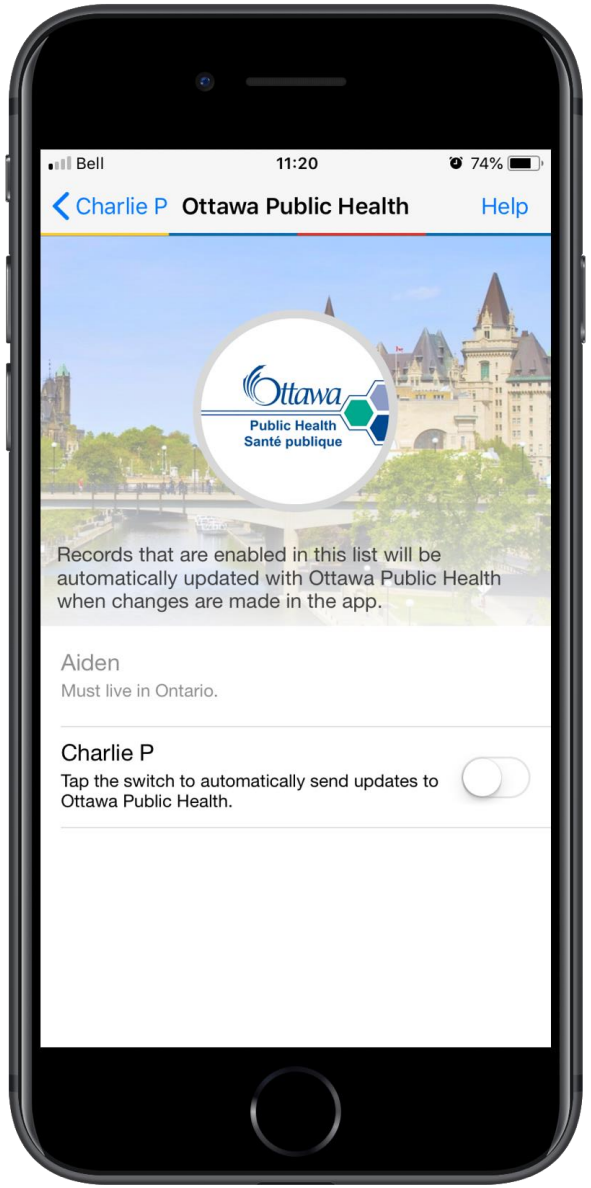
Sherry Nigro, Manager of Health Promotion and Disease Prevention with Ottawa Public Health, holds an IPhone running the ImmunizeCA app on Thursday April 30, 2015. Errol McGihon/Ottawa Sun/Postmedia Network

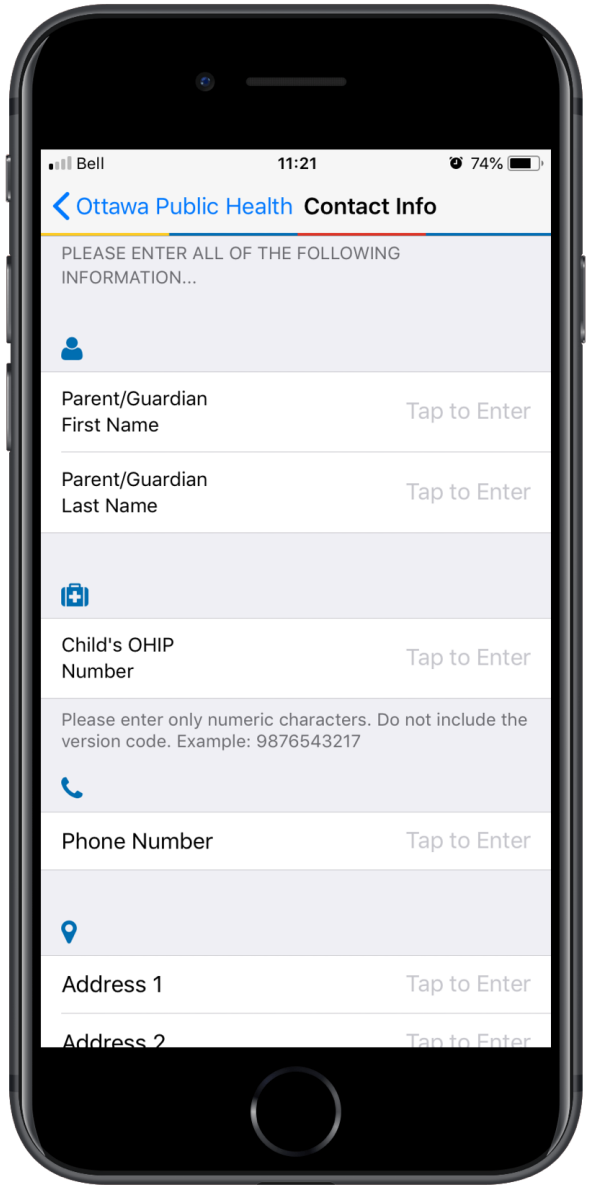
After making it possible for parents to electronically document their child's immunization records, smartphone app ImmunizeCA now allows parents to send their child's records directly to Ottawa Public Health (OPH).

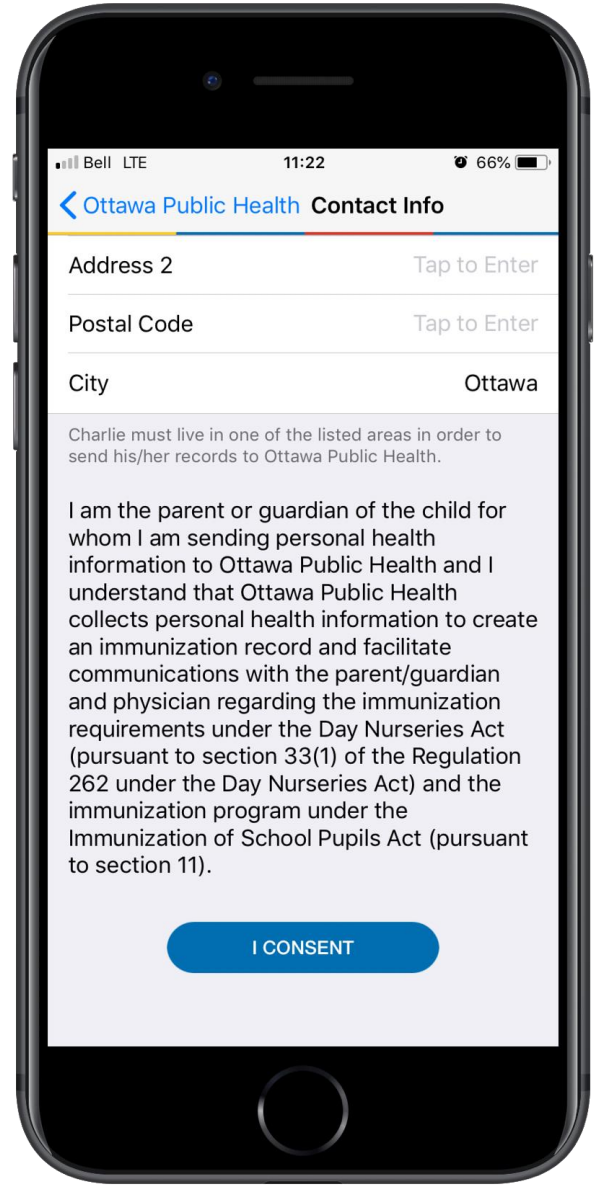
"It's become increasingly more important to have accurate information on immunizations," said Dr. Kumanan Wilson, senior scientist at the Ottawa Hospital Research Institute and one of the app's creator. "What we're hoping with this system is that we allow parents to manage their family's health information and at the same time when their child gets vaccinated they send their information directly to public health."

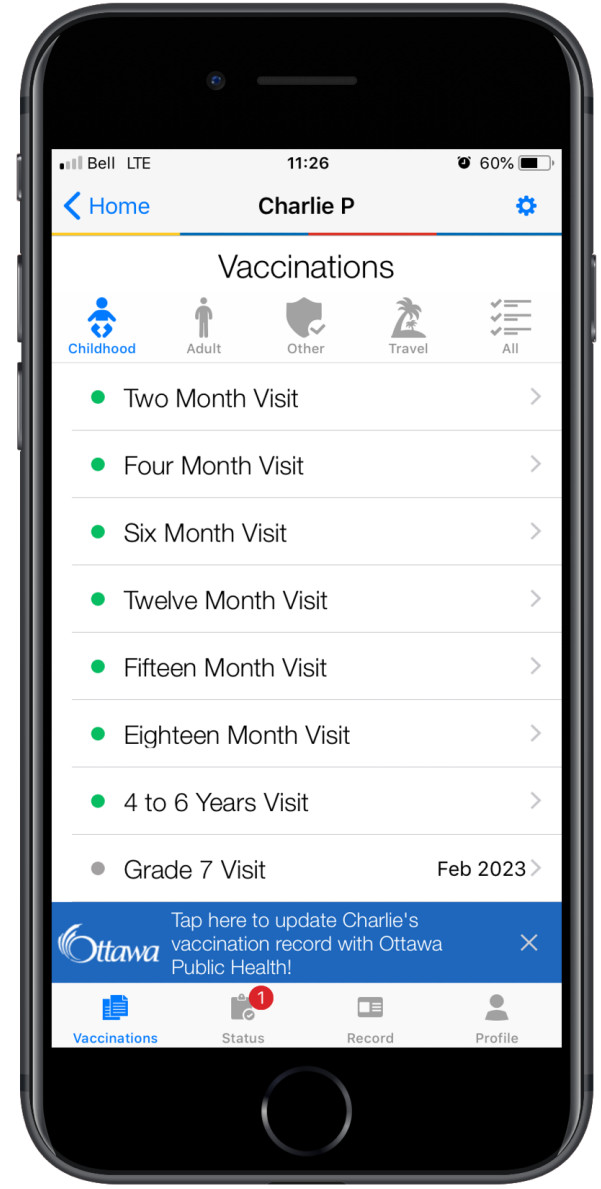
Launched in March 2014, ImmunizaCA's new feature took Wilson and his team

- Released on iOS April 27, 2015
- Released on Android January 10, 2017
- Allows parents of children aged 15 and under to report their immunization records directly to Public Health via CANImmunize
- More than 5,500 children's records reported as of April, 2018.


Bell
11:20
74%
Charlie P
Ottawa Public Health
Help
Ottawa
Public Health
Santé publique
Records that are enabled in this list will be automatically updated with Ottawa Public Health when changes are made in the app.
Aiden
Must live in Ontario.
Charlie P
Tap the switch to automatically send updates to Ottawa Public Health.


Bell
11:21
74%
Ottawa Public Health
Contact Info
PLEASE ENTER ALL OF THE FOLLOWING INFORMATION...
Parent/Guardian First Name
Tap to Enter
Parent/Guardian Last Name
Tap to Enter
Child's OHIP Number
Tap to Enter
Please enter only numeric characters. Do not include the version code. Example: 9876543217
Phone Number
Tap to Enter
Address 1
Tap to Enter
Address 2
Tap to Enter


Bell LTE
11:22
66%
Ottawa Public Health
Contact Info
Address 2
Tap to Enter
Postal Code
Tap to Enter
City
Ottawa
Charlie must live in one of the listed areas in order to send his/her records to Ottawa Public Health.
I am the parent or guardian of the child for whom I am sending personal health information to Ottawa Public Health and I understand that Ottawa Public Health collects personal health information to create an immunization record and facilitate communications with the parent/guardian and physician regarding the immunization requirements under the Day Nurseries Act (pursuant to section 33(1) of the Regulation 262 under the Day Nurseries Act) and the immunization program under the Immunization of School Pupils Act (pursuant to section 11).
I CONSENT


Bell LTE
11:26
60%
Home
Charlie P
Vaccinations
Childhood
Adult
Other
Travel
All
Two Month Visit
Four Month Visit
Six Month Visit
Twelve Month Visit
Fifteen Month Visit
Eighteen Month Visit
4 to 6 Years Visit
Grade 7 Visit
Feb 2023
Tap here to update Charlie's vaccination record with Ottawa Public Health!
Vaccinations
Status
1
Record
Profile

Records sent from CANImmunize to OPH April, 2015 to April 2018

Unique children related to Immunization Records sent	5,562
Immunization Records sent	**29,752**
Immunization Records sent with an added or updated dose	16,054
Unique Vaccinations	**69,862**

Better Outcomes Registry and Network (BORN) Ontario. Years Provided: 2015 to 2018. Resource Type: Tabulated. Data Provided on April 20th, 2018

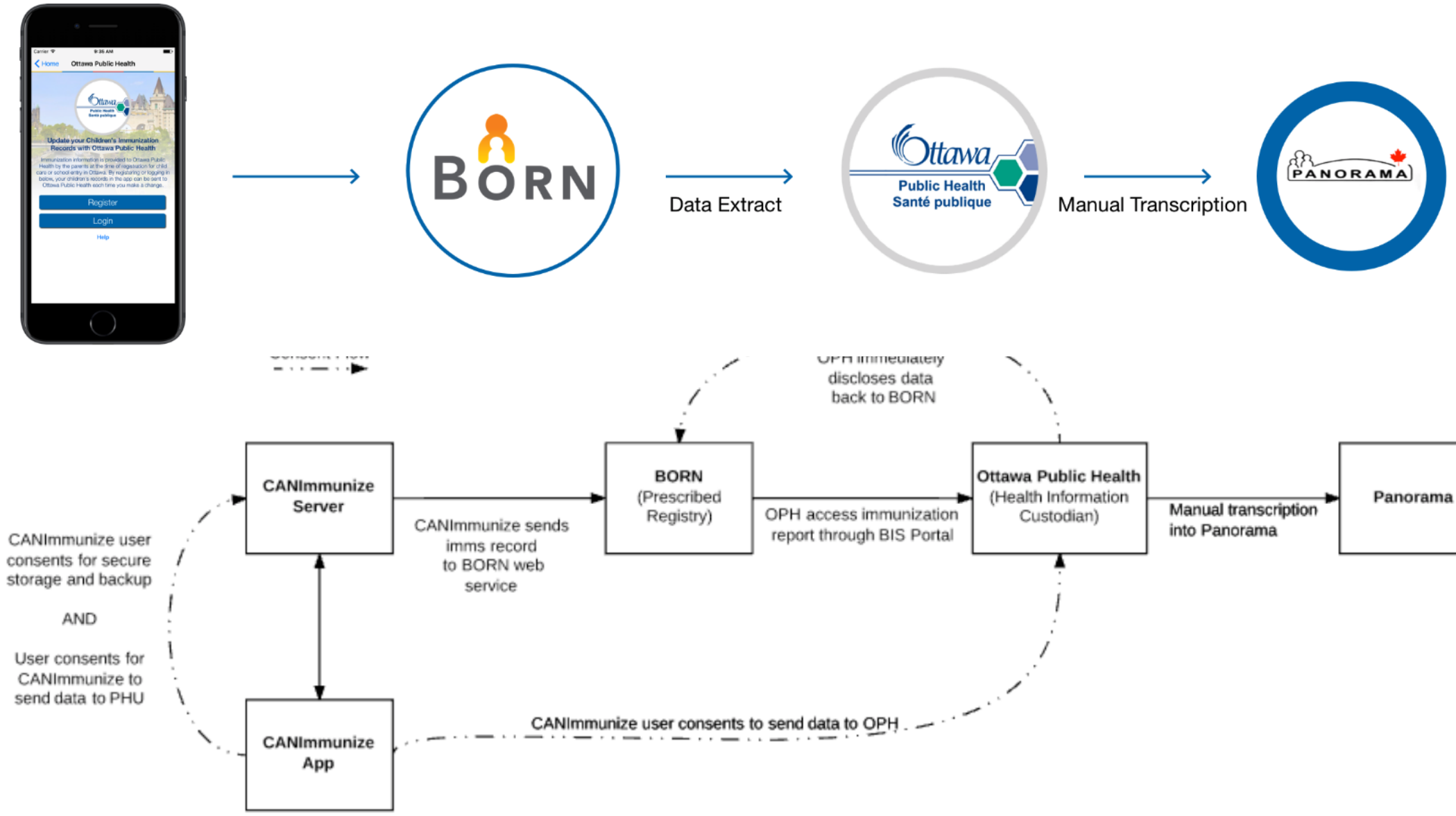


Figure 1 - Phase 1:Physical flow of data and the consent framework that facilitates the flow of information

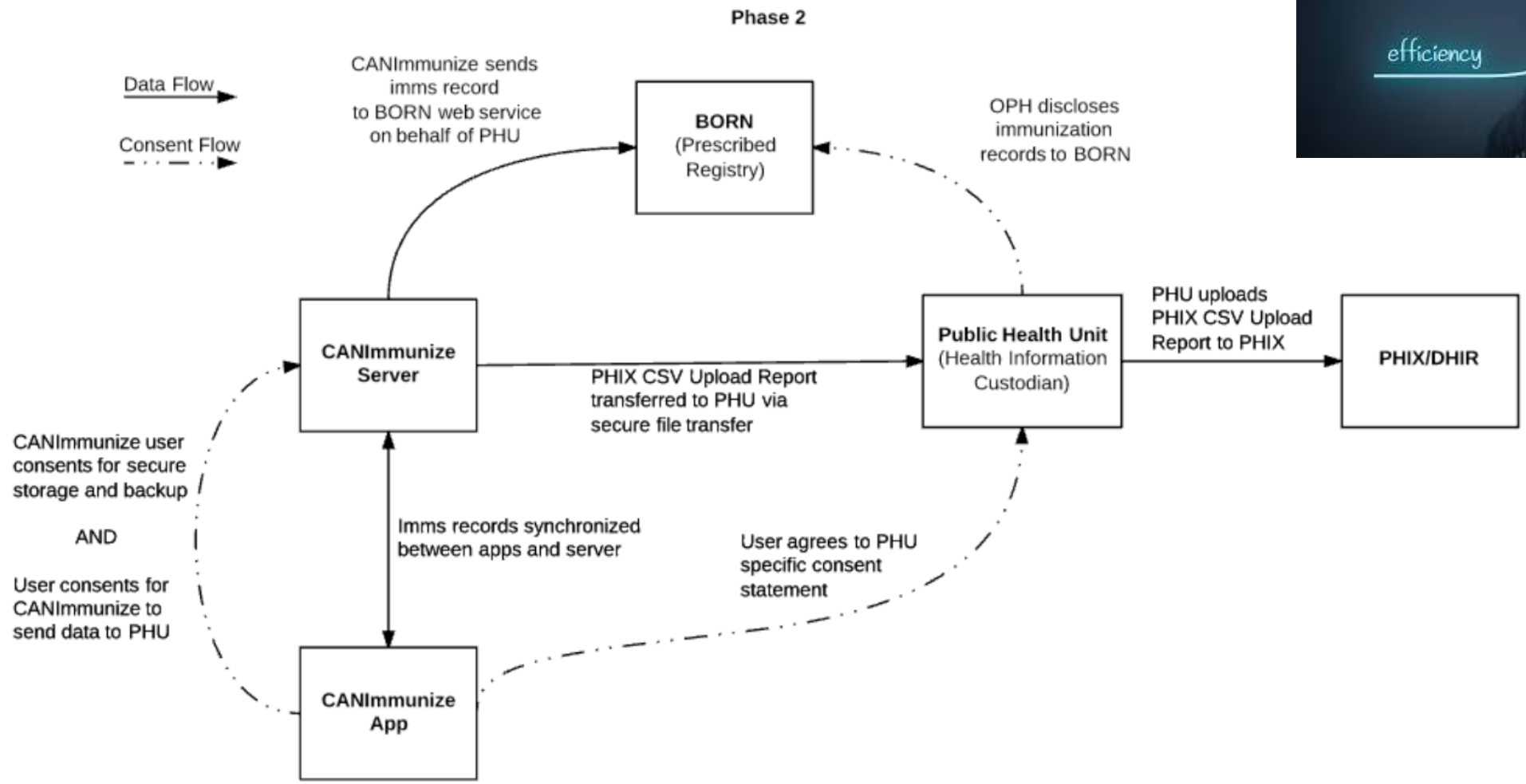
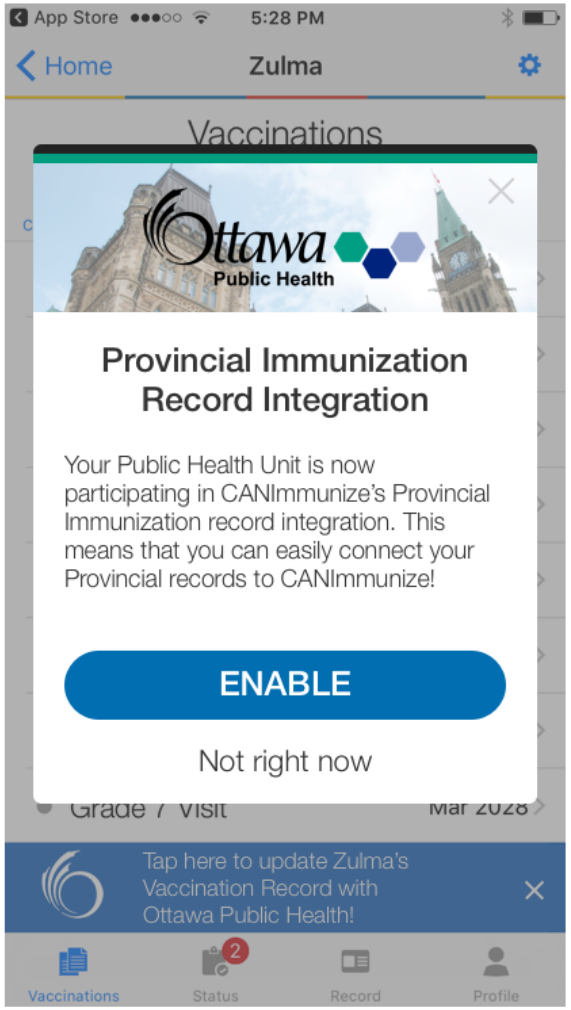
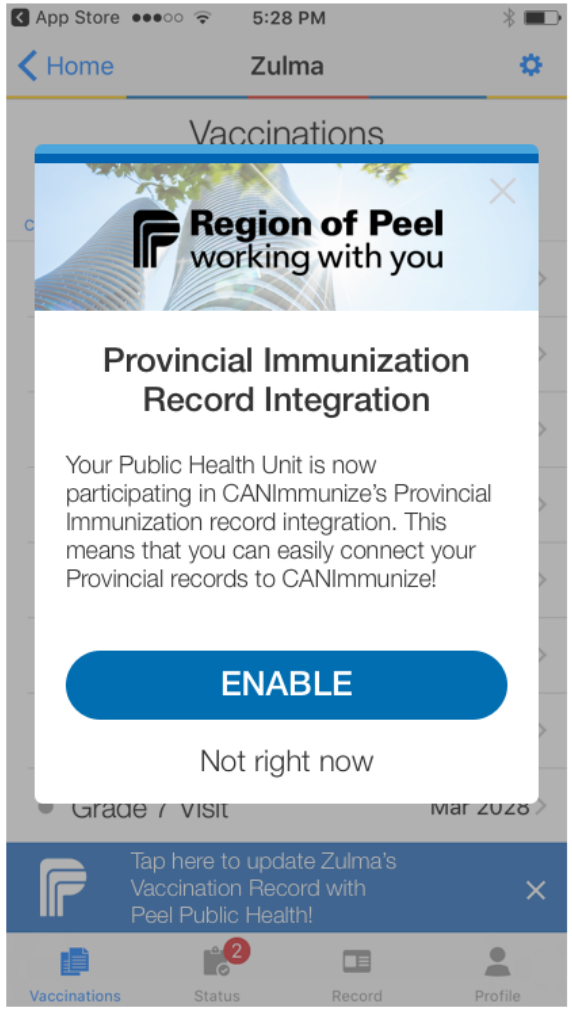
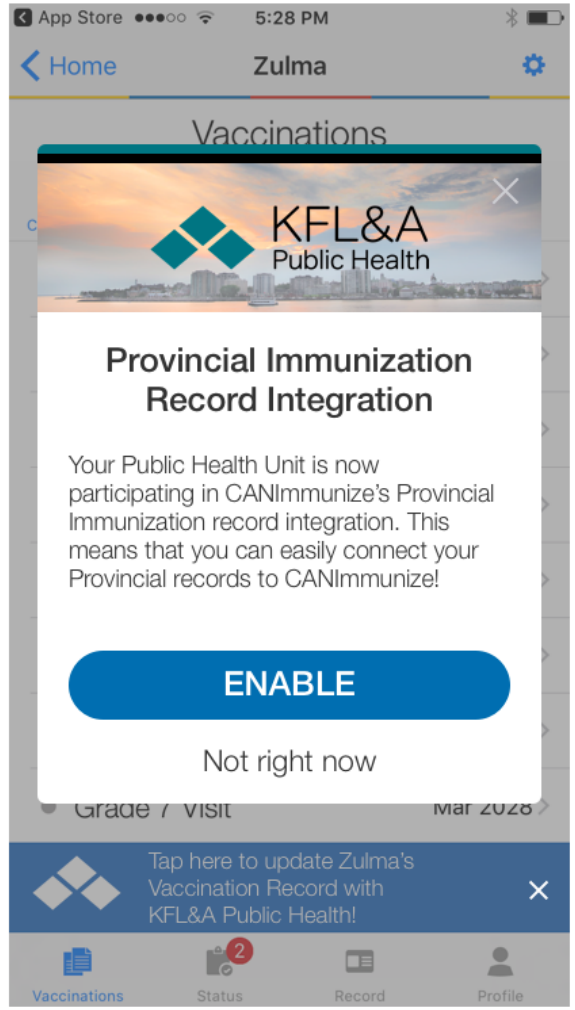


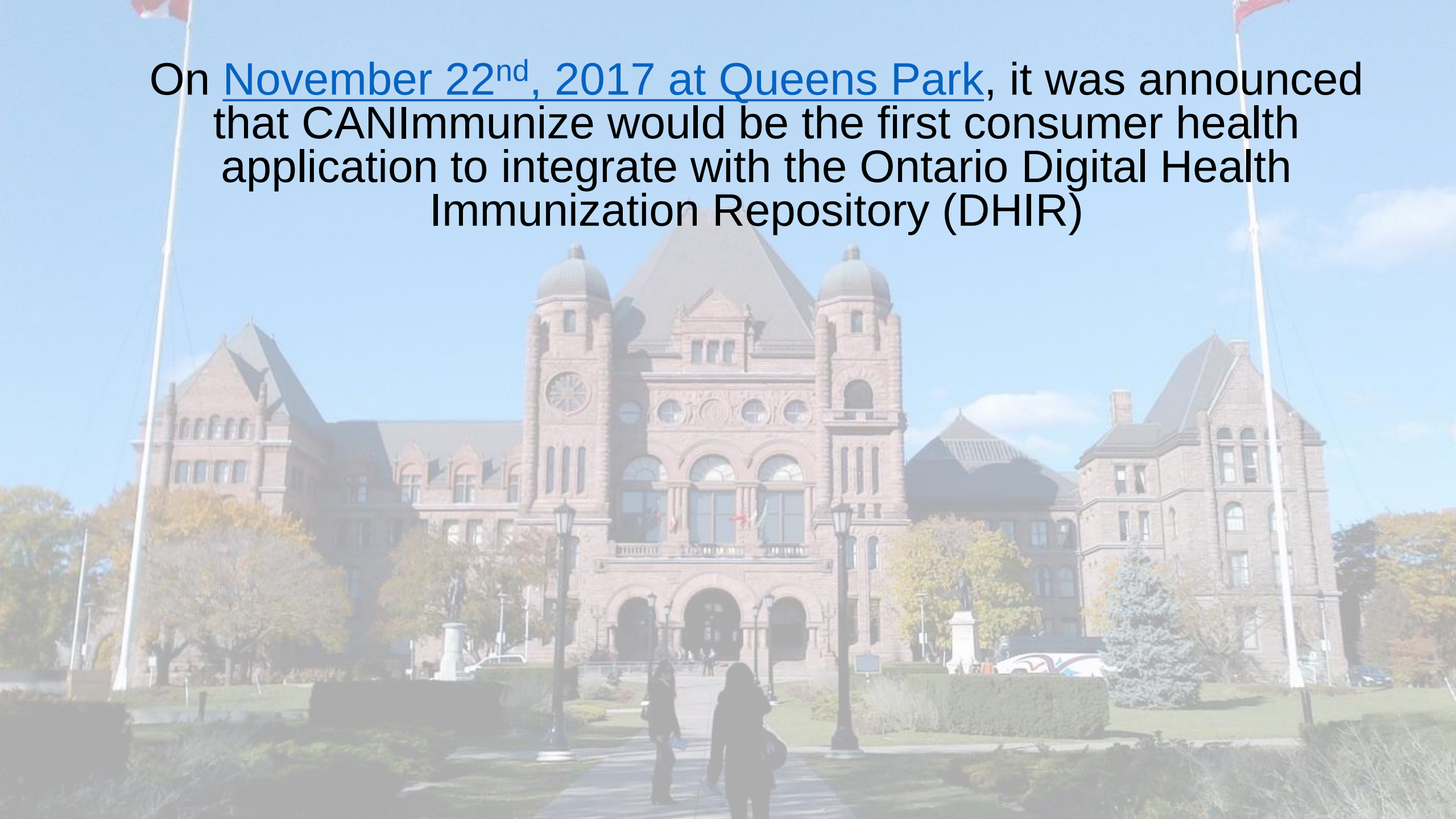
Figure 2 - Phase 2: Physical flow of data and the consent framework that facilitates the flow of information

Expansion of Reporting to additional Public Health Units









On November 22nd, 2017 at Queens Park, it was announced that CANImmunize would be the first consumer health application to integrate with the Ontario Digital Health Immunization Repository (DHIR)

The Ontario Immunization Landscape

The Digital Health Immunization Repository (DHIR), developed by the MOHLTC, has laid a foundation for the way public-reported health information can be leveraged to improve provincial health information repositories. The lessons learned integrating CANImmunize with the DHIR will inform the implementation of similar systems across Canada and far beyond immunization.

Public

CANImmunize - Ontarians will be able to use CANImmunize to keep track of their immunization records, learn about immunization, and report their records to Panorama.

ICON - Ontarians can submit immunization records through portal customized to their local public health unit.

BORN

CANImmunize

Synchronization Engine

PANORAMA Ontario

Digital Health Immunization Repository

Public Health

PHIX - Public health validates and merges reported immunizations through administration tools.

m-IMMS - Public health immunizers can query and update DHIR immunization records through the m-IMMS mobile app.

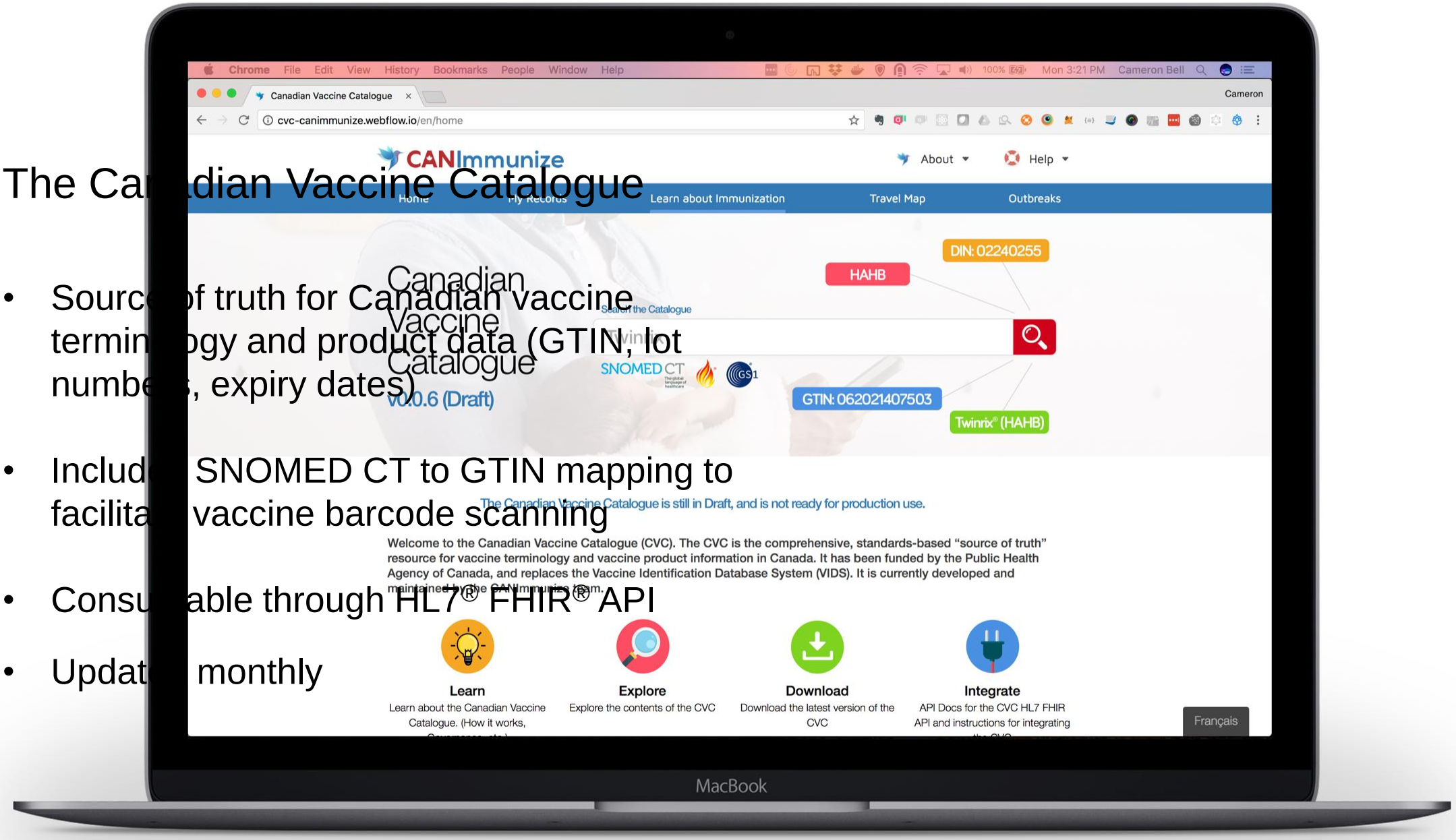
Vaccine Providers

Vaccine providers will report immunizations through online portal until EMRs become integrated with Panorama.

Phase 3 – Late 2018 +

The Canadian Vaccine Catalogue

- Source of truth for Canadian vaccine terminology and product data (GTIN, lot numbers, expiry dates)
- Includes SNOMED CT to GTIN mapping to facilitate vaccine barcode scanning
- Consumable through HL7® FHIR® API
- Updated monthly



How accurate is publicly reported immunization data?

Protocol for a quality assurance in partnership with the Better Outcomes Registry and Network (BORN)

born Ontario | Data
Early health. Lifelong health.

Objective: Compare parental and provider reporting of children's immunization records. Specifically, to measure the magnitude and direction of discrepancy between these two data sources.

Data quality will be compared as follows:

- For vaccines recommended by the provincial immunization schedule between 0- and 5-months of age, what is the magnitude and direction of discrepancy for number of vaccinations reported by parent and providers?
- For immunization doses recorded by both parents and providers, what is the magnitude and direction of discrepancy between the reported dates of vaccine administration?
- For immunization doses with discrepancy of 0 days on the above objective, what is the magnitude and direction of discrepancy between the date when the vaccine is reported as administered and when the vaccine was reported to public health through their respective channels?

Conclusions and Next Steps

- Mobile reporting of vaccinations is feasible and being used in multiple jurisdictions across Ontario
- Full integration between consumer health apps and the immunization information system is underway, with CANImmunize serving as the first implementation
- More work is needed to understand the accuracy of public versus provided reporting, despite legislation supporting public reporting exclusively

Thank you!

CANImmunize