

Increasing Online Vaccine Reporting

Toronto Public Health (TPH) and Ontario's Behavioural Insights Unit (BIU)
December 5, 2018





Disclosure Statement

We have no affiliations (financial or otherwise) with a pharmaceutical, medical device or communications organization.



Behavioural Insights in a single-page summary



A person's behaviour...

- Is often automatic, and based on common cognitive shortcuts.
- Depends on their mental, emotional and physical context.
- Is not always consistent with their attitudes, beliefs or intentions.



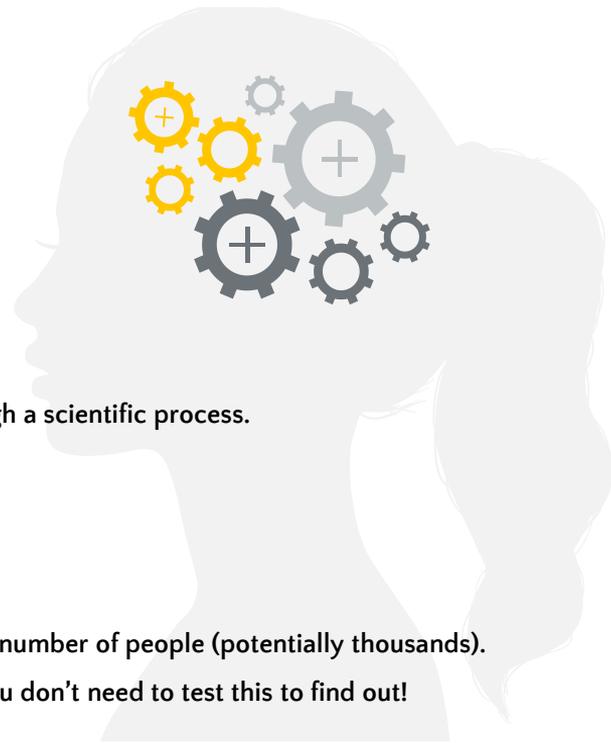
A Behavioural Insights (BI) intervention...

- Is often a subtle, but calculated change to a decision point, product, or process.
- Works best when rigorously tested against possible alternatives, and iterated upon through a scientific process.
- Is not a silver bullet, and often just “one link in the chain” to improved outcomes.



A good candidate for a BI intervention is...

- When you are trying to change an observable, measurable action.
- When you have touchpoints (i.e., interactions via form, e-mail, service kiosk) with a large number of people (potentially thousands).
- When there isn't a stand-out solution that would likely work better than a nudge - and you don't need to test this to find out!





Opportunity

Ontario's new Immunization Connect Ontario (ICON) enables convenient updating of student immunization records online while also reducing transcription errors and required staff time – yet uptake by parents / students is lower than expected.



How might we...

Increase the number of parents / students who report their immunizations on time and online, so that fewer students are suspended, and the associated educational benefits and administrative savings are realized.

Project methodology



T

Target

Identified what *consequential behaviour* we are trying to change, and how it will be measured

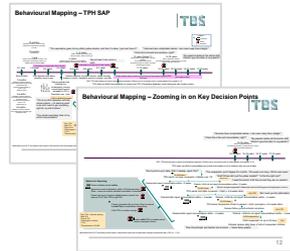
- Increase online and on time vaccine reporting
- Measured using existing administrative data



E

Explore

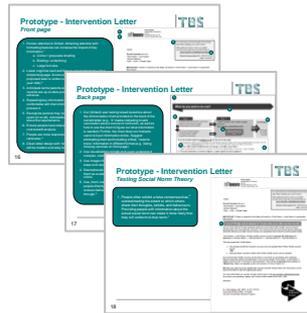
Used a range of methods (observation, interviews, staff workshop) to *map the behavioural context* and identify barriers



S

Solutions

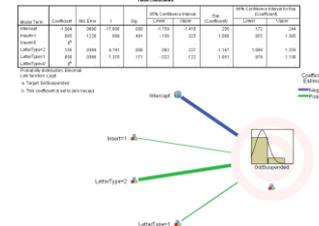
Generated *multiple intervention ideas* and prototyped those identified as viable



T

Trial

Systematically tested the different prototypes, comparing their performance against each other and a 'status quo' control where nothing has changed



S

Scale

Use the findings from the tests to *decide whether to scale up* the best-performing intervention, given return on investment

- Next steps for consideration by Toronto Public Health (TPH) and the Ministry of Health and Long-Term Care (MOHLTC)



Preparing for the Trial

To support shifting users online, it is important to consider how the online process itself facilitates the desired behaviour change. The BIU worked collaboratively with MOHLTC and TPH to make behaviourally informed tweaks to the online process, prior to solution development and testing.



Directing traffic to and through www.toronto.ca

The screenshot shows the top navigation bar of the City of Toronto website. On the left is the Toronto logo. To its right is a search bar with a magnifying glass icon, and buttons for 'A+' and 'A-'. Further right is a dropdown menu labeled 'I want to...' with a downward arrow. Below the navigation bar are five menu items: 'Services & Payments', 'Community & People', 'Business & Economy', 'Explore & Enjoy', and 'City Government'. Below these is a breadcrumb trail: 'City of Toronto / Community & People / Health & Wellness / Health Programs & Advice / Immunization / Vaccinate Your Children / Report Student Immunization / Immunization Connect'.

Immunization Connect



Welcome to ICON (Immunization Connect Ontario), a new secure online system for submitting student immunization information to Toronto Public Health.

[Report or Access Your Immunization Information](#)

Under the *Immunization of School Pupils Act* all children attending school in Ontario need to be vaccinated against the following diseases:

The sidebar has a dark blue header with the text 'In This Section'. Below the header is a table with two columns. The first column contains the text 'Report Student Immunization' and the second column contains a minus sign '-'. Below the table is a blue button with the text 'Immunization Connect'.

ICON: Tweaking the Online Reporting Process

Original

YYYY-MM-DD	Diphtheria	Tetanus	Pertussis	Polio	Hib	Pneumococcal	Rotavirus	Measles	Mumps	Rubella	Varicella	Meningococcal	Hepatitis B	HPV	Influenza	Hepatitis A	Other	Additional Info
2011-02-17	✓	✓	✓	✓	✓	✓												Show Info
2011-04-18	✓	✓	✓	✓	✓	✓												Show Info
2011-06-27	✓	✓	✓	✓	✓	✓												Show Info
2011-12-19						✓	✓	✓	✓			✓						Show Info
2012-04-12											✓							Show Info
2012-07-16	✓	✓	✓	✓	✓													Show Info
2014-12-18	✓	✓	✓	✓			✓	✓	✓	✓								Show Info

The information in the record above comes from the Ontario Immunization Repository.

Immunizations Needed

As recommended by the [Ontario Immunization Schedule](#) you need immunizations to be protected against the following diseases:

- Meningococcal
- HPV
- Hepatitis B

Note: Immunizations needed may change if additional immunization information is submitted.

For more information please visit [Ontario's Ministry of Health and Long-Term Care Immunization page](#).

Revised

YYYY-MM-DD	Diphtheria	Tetanus	Pertussis	Polio	Hib	Pneumococcal	Rotavirus	Measles	Mumps	Rubella	Varicella	Meningococcal	Hepatitis B	HPV	Influenza	Hepatitis A	Other	Additional Info
2000-03-14							✓											Show Info
2000-05-14							✓											Show Info
2001-01-14								✓	✓	✓								Show Info
2001-04-14											✓							Show Info
2017-03-00												✓						Show Info

The information in the record above comes from the Ontario Immunization Repository.

Immunizations Needed

Merrill Perker's immunization record is incomplete and requires immunizations for the following diseases:

- Diphtheria
- Polio
- Tetanus
- Pertussis
- Measles
- Mumps
- Varicella
- Meningococcal
- Hepatitis B

Note: Immunizations needed may change if additional immunization information is submitted.

For more information please visit [Ontario's Ministry of Health and Long-Term Care Immunization page](#).

[Printable PDF Version of Immunization Record](#)

Missing information from the record above?

[Submit Immunizations](#)

[I'm Done, Return Home](#)

Personalized and direct language

Increased salience

ICON: Tweaking the Online Reporting Process

Original

The immunization information that you have submitted, reference number: TPH – 3SMRSFM2W, has been reviewed by your local public health unit. Your (or your child’s) personal immunization record has been updated, if required.

To look up your personal immunization record (sometimes called the Yellow Card) you will need your Ontario Immunization ID and PIN. The Ontario Immunization ID is a 10 digit number that uniquely identifies you (or your child) in the provincial Digital Health Immunization Repository.

The PIN is a 6 digit number that protects your immunization information.

Please contact your local public health unit to obtain these numbers if you do not already have them.

Thank you,

Revised

Dear <Name>,

Clear, simple language overall

Personalized

The immunizations you submitted have been reviewed by your public health unit. The record has been updated as required.

Reassurance; contacted if further action is required

If you (your child) have received a letter from your public health nurse about missing immunizations, they will contact you again if there are any more issues under the *Immunization of School Pupils Act* that could result in suspension from school.

Direct link to information

Please check the [Ontario Immunization Schedule](#) to see if you (or your child) are up-to-date for required vaccines.

Education re: digital yellow card

You can review your (or your child’s) updated digital yellow card online. This service can be used to update vaccine records in the future.

Reminder of overall objective

Thank you for helping to keep Ontario healthy!



Designing the Solutions

In addition to tweaking the online service, it was hypothesized that small, cost-free changes to TPH's vaccine assessment letters could have an outsized impact on reporting behaviour.

Test Letter A: Online Salience

Behavioural Design Changes

1. Human attention is limited. Attracting attention with formatting features (greyscale shading, bolding, font size) can increase the impact of key information.¹
2. Use simple language to lower cognitive load and literacy requirements; written on average for grade 6 (10–11 year olds).²
3. Parents and students require reassurance that the process has been completed; empower user to self-serve.
4. Repeating key information can make people more comfortable with that information³ and more likely to process it.
5. Recognize parents may not have interacted with TPH for years (or at all). Acknowledge they may not have known about the requirements.
6. Ensure people have relevant information for an accurate cost-benefit analysis.
7. People are more responsive to requests that come with rationales.⁴
8. Clean letter design with “white space” suggests the website will be modern and easy to use.

1 Toronto Public Health
235 Danforth Ave., 2nd Floor
Toronto, Ontario, M4K 1N2
Phone: 416-392-1250
Fax: 416-338-2487

3 **Done Updating Your Record?**
After you update the student's online vaccine record, we'll send you an email to confirm within **3-5 business days**.
Once you get the email, you can view the updated vaccine record at:
www.toronto.ca/studentvaccines
Log in with the ID below and the student's health card.
Ontario Immunization ID: A1BCDEFGHI

4 **FINAL REMINDER** David Student can be **suspended** from school if David's vaccine record is not updated.

5 Did you know that all Toronto students must have up-to-date vaccine records with Toronto Public Health? The vaccines are **free** and prevent **serious diseases**. Students who are not up-to-date can be suspended from school per the *Immunization of School Pupils Act*.

7 David's record with Toronto Public Health is missing vaccine(s) for the following diseases:
Diphtheria, Pertussis, Tetanus

6 Here's what you need to do by **February 28, 2018**:

A. Check David's yellow vaccine card. If the **diseases listed above** are checked off, then the vaccines are probably complete, but you still need to update the student's record with Toronto Public Health. Visit www.toronto.ca/studentvaccines to update the record.
OR
B. If David has not had these vaccines, see your doctor. Once the vaccine(s) are given, [update](#) the student's record with Toronto Public Health at www.toronto.ca/studentvaccines.

4 If the vaccine record is not updated, David will be suspended from Toronto Collegiate Secondary School on April 5, 2018. Follow the steps on the back of this letter. When you're done, you will have an online vaccine record that you can access in the future.

8 Sincerely,
Vinita Dubey
Dr. Vinita Dubey, MD, MPH, CCFP, FRCPC
Associate Medical Officer of Health
Vaccine Preventable Diseases Program

01
Client ID: 1005010110

Test Letter B: Online Salience + Social Norm

Behavioural Design Changes

1. People often exhibit a false consensus bias⁶, overestimating the extent to which others share their thoughts, beliefs, and behaviours. Providing people with information about the actual social norm can make it more likely that they will conform to that norm.⁷



Toronto Public Health
235 Danforth Ave., 2nd Floor
Toronto, Ontario, M4K 1N2
Phone: 416-392-1250
Fax: 416-338-2487

January 18, 2018

To the parent/guardian of, and/or
David Student
1234 Home Rd.
Toronto, Ontario N1N 1N1

Done Updating Your Record?

After you update the student's online vaccine record, we'll send you an email to confirm within **3-5 business days**.

Once you get the email, you can view the updated vaccine record at:

www.toronto.ca/studentvaccines

Log in with the ID below and the student's health card.

Ontario Immunization ID: A1BCDEFGHI

**FINAL
REMINDER**

David Student can be **suspended** from **school** if David's vaccine record is not updated.

1

Each year, 9 out of 10 high school students get the vaccines needed to go to school – have you?

Did you know that all Toronto students must have up-to-date vaccine records with Toronto Public Health? The vaccines are **free** and prevent **serious diseases**. Students who are not up-to-date can be suspended from school per the *Immunization of School Pupils Act*.

David's record with Toronto Public Health is missing vaccine(s) for the following diseases:

Diphtheria, Pertussis, Tetanus

Here's what you need to do now:

- A.** Check David's yellow vaccine card. If the **diseases listed above** are checked off, then the vaccines are probably complete, but you still need to update the student's record with Toronto Public Health. Visit www.toronto.ca/studentvaccines to update the record.
- OR**
- B.** If David has not had these vaccines, see your doctor. Once the vaccine(s) are given, update the student's record with Toronto Public Health at www.toronto.ca/studentvaccines.

If the vaccine record is not updated, David will be suspended from Toronto Collegiate Secondary School on April 5, 2018. Follow the steps on the back of this letter. When you're done, you will have an online vaccine record that you can access in the future.

Sincerely,

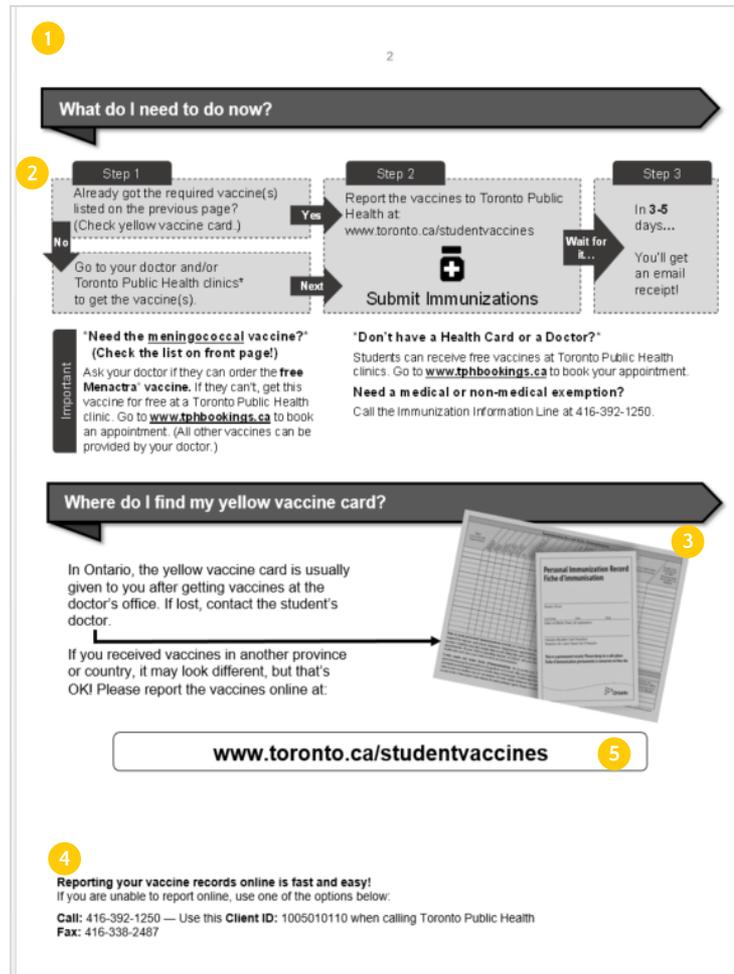
Dr. Vinita Dubey, MD, MPH, CCFP, FRCPC
Associate Medical Officer of Health
Vaccine Preventable Diseases Program



Test Letters A & B: Back Page

Behavioural Design Changes

1. Eliminate vaccine chart, which our user testing suggests is confusing for end users.
2. Use visualizations to help end-users understand complex, contingent, multi-step processes.
3. Use images that help cue recognition of important steps and resources.
4. Deemphasize alternate channels and position them as available for those unable to report online.
5. Use, short, memorable url addresses that link people directly to the service they intend to use reduces behavioural barriers and increases follow-through.⁵

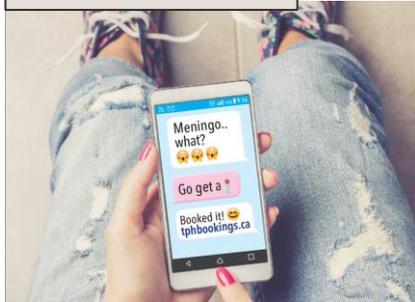




Postcard Inserts

- To supplement communications with parents / students, Toronto Public Health also sends postcards with the letter.
- For this trial, the mailroom included postcards every second mailing, enabling the BIU to measure the impact of postcards on online and on-time vaccine reporting behaviour.

Sent with Letter 1: Initial Notice



Toronto Public Health needs your vaccination record.

- ✓ See your doctor to get vaccinated.
- 📱 **Need the meningococcal vaccine?** Call your doctor's office to see if they have the free Menactra® vaccine for high school students. If not, make an appointment at tphbookings.ca.
- 🖱️ Report your vaccination record to Toronto Public Health: toronto.ca/studentvaccines

416.338.7600 | toronto.ca/health |  Toronto Public Health

Sent with Letter 2: Reminder



Avoid Suspension!

Make sure all your vaccines are up to date.

Don't procrastinate, vaccinate. Avoid school suspension.

- ✓ Need the meningococcal vaccine? Make an appointment at tphbookings.ca
- ✓ See your doctor for all other vaccines.
- 🖱️ Report your vaccination record online at toronto.ca/studentvaccines

416.338.7600 | toronto.ca/health |  Toronto Public Health

Sent with Letter 3: Suspension Order



You will be suspended from school due to missing vaccine information.

By law you need to be fully vaccinated or provide a valid exemption to attend school.

- ✓ Report your vaccination record online at toronto.ca/studentvaccines
- ✓ **Need the meningococcal vaccine?** Make an appointment at tphbookings.ca

416.338.7600 | toronto.ca/health |  Toronto Public Health

4

Trial & Results

Trial Design

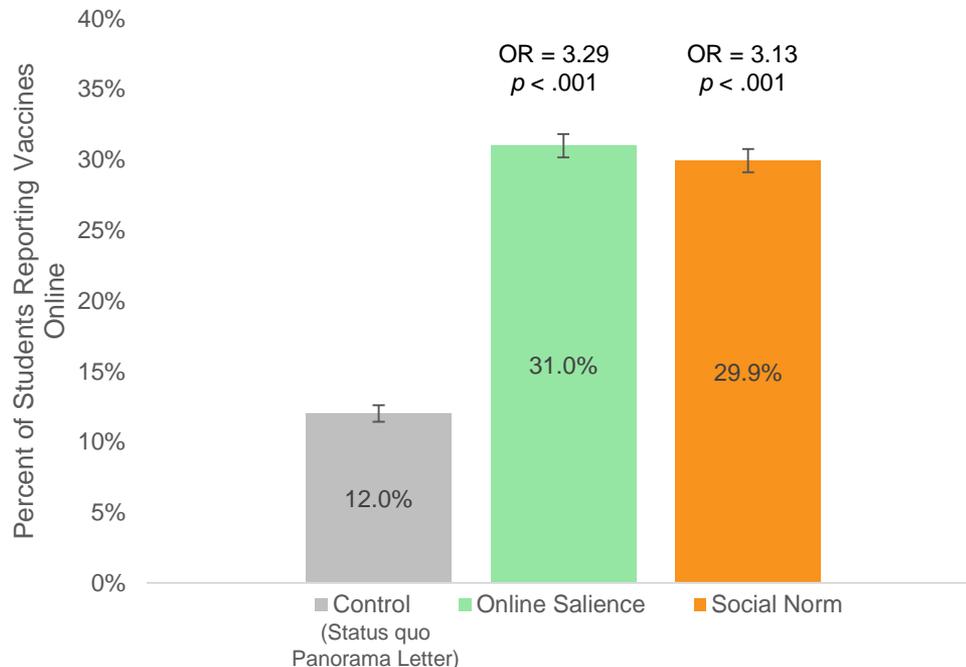
- The trial was conducted as a prospective, fully-crossed, three-by-two randomized field experiment.
- Students were assigned to one of three assessment-letter treatments by simple randomization.
- Students were also assigned to one of two postcard treatments by cluster quasi-randomization, according to the assignment of their school into a mailing group (which was determined by a load-distributing algorithm).

Daily School / Mail Group Assignment	Letter 1: Initial Letter		Letter 2: Reminder Letter			Letter 3: Suspension Order		
	Initial Letters Sent	Postcards Sent	Mail Group Consistency	Reminder Letters Sent	Postcards Sent	Suspension Orders Sent	Postcards Sent	
Each day a group of schools were designated to receive letters (E.g., Group 1 = Day 1, Group 2 = Day 2).	Each student in each group had an equal likelihood of receiving any one of the three letters.	All students in odd/even mail groups did not receive/ received a postcard with their letter.	Except for 22 students who switched schools, mail-group assignment was maintained.	All outstanding students received the same reminder letter as their initial letter. Deadline added to Online Salience letter.	The postcard image changed between letters, but presence/ absence of postcards was consistent across all letters.	All outstanding students received the same, status quo suspension order letter.	The postcard image changed between letters, but presence/ absence of postcards was consistent across all letters.	
Day 1 - Mail Group 1		No postcard	Mail Group 1		No postcard	Mail Group 1		No postcard
Day 2 - Mail Group 2		 *	Mail Group 2			Mail Group 2		
Day 3 - Mail Group 3		No postcard	Mail Group 3		No postcard	Mail Group 3		No postcard
... this pattern repeats until the last day (36)				
Day 36 - Mail Group 36			Mail Group 36			Mail Group 36		

* Due to a delivery delay, Mail Group 2 did not receive the first of three postcard inserts. Excluding this group from the analyses did not alter statistical results.



The BI letters tripled the likelihood that individuals would report online, relative to the status quo letter.

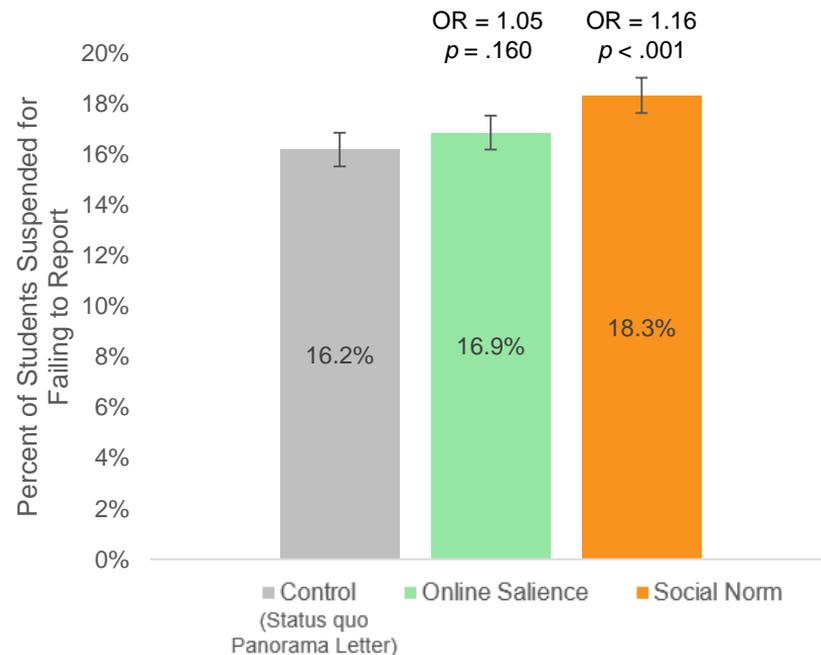
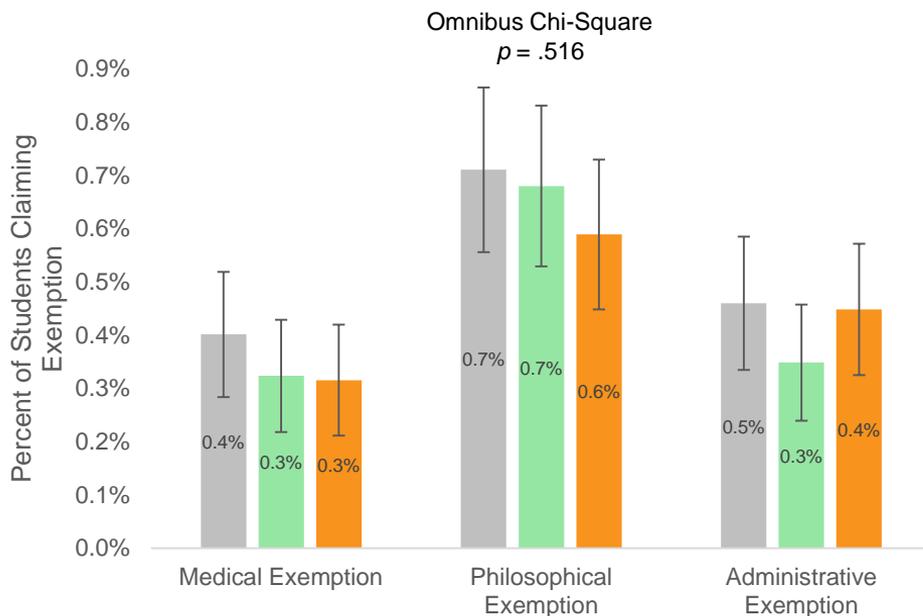


Statistical analysis indicates the effect of the letters is the same across the 143 schools included in this evaluation.[†]

- Results on this page were calculated using a binary logistic regression.
- Error bars represent 95% confidence intervals (CIs). When 95% CIs overlap more than 25% of their length, differences are not significant.
- Results were also confirmed with a multi-level binary logistic regression with random intercepts to account for differences between schools.
- [†]A multi-level binary logistic regression with random slopes indicates the effect of the letters is the same across schools, given the non-significant random effect of letters, $\sigma^2_s=0.004$, $p=.489$.



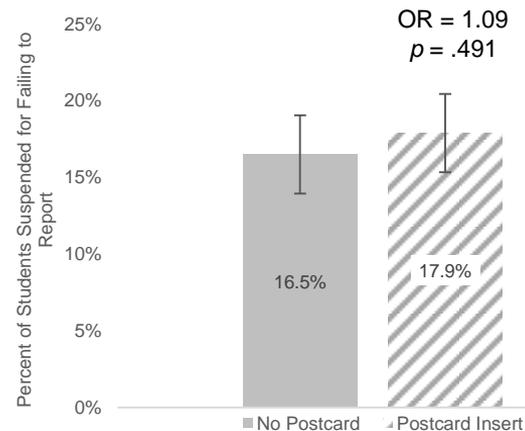
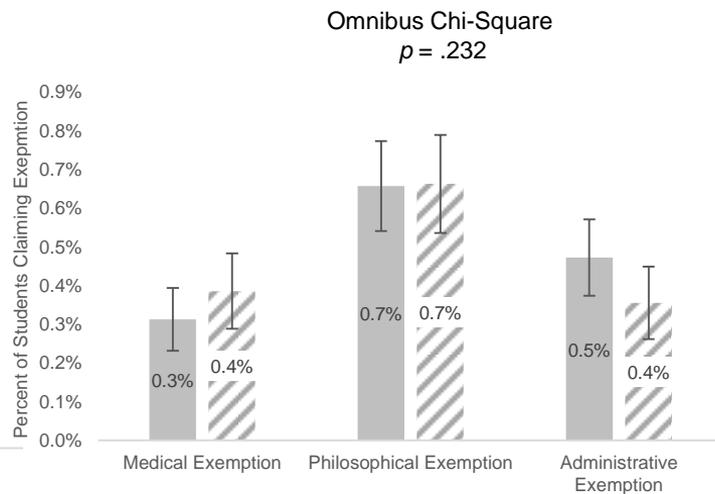
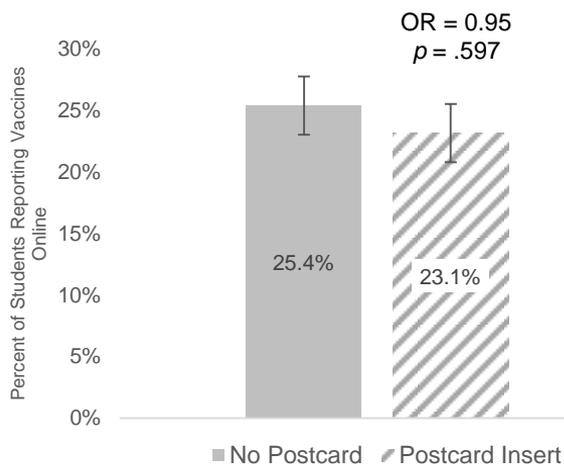
The letters had little to no effect on the likelihood of exemption or suspension.



- Results on this page were calculated using a binary logistic regression and Chi-square.
- Error bars represent 95% confidence intervals (CIs). When 95% CIs overlap more than 25% of their length, differences are not significant.
- Results were also confirmed with a multi-level binary logistic regression with random intercepts to account for differences between schools.
- A multi-level binary logistic regression with random slopes indicates the effect of the letters on suspension likelihood is the same across schools, given the non-significant random effect of letters, $\sigma^2_{\epsilon} = 0.004$, $p = .547$.



The postcard inserts had no effect on online uptake, exemptions or suspensions.



- Results on this page were calculated using multi-level binary logistic regression with random intercepts to account for nesting of postcard intervention within mail grouping (and by extension schools).
- Error bars represent 95% confidence intervals (CIs). When 95% CIs overlap more than 25% of their length, differences are not significant.
- Graphs displaying that there was no interaction between the postcard insert and letter interventions are presented in the appendix.



TPH + BIU: Pilot Project Summary



Opportunity

Ontario's new Immunization Connect Ontario (ICON) enables convenient updating of student immunization records online while also reducing transcription errors and required staff time – yet uptake by parents / students is lower than expected.



Objectives / Description

Toronto Public Health, together with the Behavioural Insights Unit, tested two new versions of the letter requesting immunization record updates from parents / students. A randomized controlled trial (RCT) involving 36,097 students from 143 schools in Toronto identified which letter encourages the most people to report their vaccinations online and in a timely fashion.



RCT Results

- The behaviourally informed letters tripled the likelihood that individuals would report online, relative to the existing letter (from 12% to 31%), at no extra cost.
- The letters had little to no effect on suspension from school (i.e., while the letters increased online reporting, the letters did not increase the number of people who reported by the deadline). There is an opportunity to explore new ways to reduce suspensions.
- The status quo postcard inserts had no effect on online uptake, presenting an opportunity for further testing, or reconsideration of the postcard's objectives.

For full results, see Section 3.



Outcomes

This pilot project:

- Advances the government's objective of promoting online services and improving citizen experience while generating efficiencies for program operations.
- Informs Toronto Public Health's ongoing efforts to increase timely immunization reporting and reduce the number of students suspended from school.
- Provides evidence that can be used to scale the most successful letter template across the province, enabling other public health units to improve their citizen experience while realizing program efficiencies.



Project Team & Acknowledgements

This project would not have been possible without the valued contributions of multiple partners across Toronto Public Health and the Government of Ontario.

Toronto Public Health

Dr. Vinita Dubey, Associate Medical Officer of Health, VPD

Karen Beckermann, Associate Director, VPD

Joanne Cameron, Manager, VPD

Sue Huang, Health Promotion Specialist, VPD

Lil Persaud, Supervisor, Immunization Information Centre

Prema Churaman, Support Assistant, VPD

Sabrina Cheddie, Support Assistant, CDC Health Informatics

Olayemi Kadri, Epidemiologist, CD Surveillance Unit

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City of Toronto Mail Room and Print Shop

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Karen Hay, Director (A), Digital Health Solutions & Innovation Branch

Lori Kane, Public Health Subject Matter Expert

Soma Sarkar, Digital Health Consultant

Juliet Baldwin, Public Health Surveillance Analyst

Ontario's Behavioural Insights Unit

Dr. Julian House, Behavioural Scientist

Brianne Kirkpatrick, Senior Policy Advisor



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