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Immunization Coverage in Ontario since the implementation of Panorama

2013-14 to 2015-16 school years

Andi Bunko, Chi Yon Seo, Gillian Lim, Jill Fediurek, Shelley Deeks, Sarah Wilson

PHO Grand Rounds

June 6, 2017

Ontario
Agency for Health Protection and Promotion
Agence de protection et de promotion de la santé

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Outline

- Overview of the immunization context in Ontario
- Methods used to develop up-to-date coverage
- Coverage results from the 2013-14 to 2015-16 school years
- Discussion and Conclusions

Immunization coverage

- What is it?
  - The proportion of a population who have received a specific number of doses of an antigen*, based on their age, at time of assessment
  - Example: 2 doses of MMR on/after 12 months of age, assessed at age 7

- Why is it important?
  - Evaluate the effectiveness of childhood immunization programs
  - Monitor trends in vaccine uptake over time
  - Identify areas with inadequate coverage

*can be applied to a single antigen, a vaccine, multiple vaccines or to the overall immunization program. All doses must be 'valid'.

In the news

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Measles vaccinations of toddlers at 89%, below 'herd immunity' level

Cases have been reported this year in Manitoba, Ontario and Quebec

By Chris Iorfida, CBC News Posted: Jul 21, 2015 5:10 PM ET | Last Updated: Jul 21, 2015 5:56 PM ET

A nurse loads a syringe with vaccine for injection. Statistics Canada says a high percer vaccinated against a variety of childhood diseases and most parents believe such shot Press)

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Complacent parents more of a threat to immunization rates than anti-vaxxers

LOCAL

by MIKE LLOYD

Posted Apr 27, 2017 8:07 am PDT

Home » News » National

Canada's high vaccination rates still need improvement, study finds

MADELINE SMITH AND ELIZABETH CHURCH

The Globe and Mail

Published Tuesday, Jul. 21, 2015 11:10AM EDT

Last updated Tuesday, Jul. 21, 2015 11:21PM EDT

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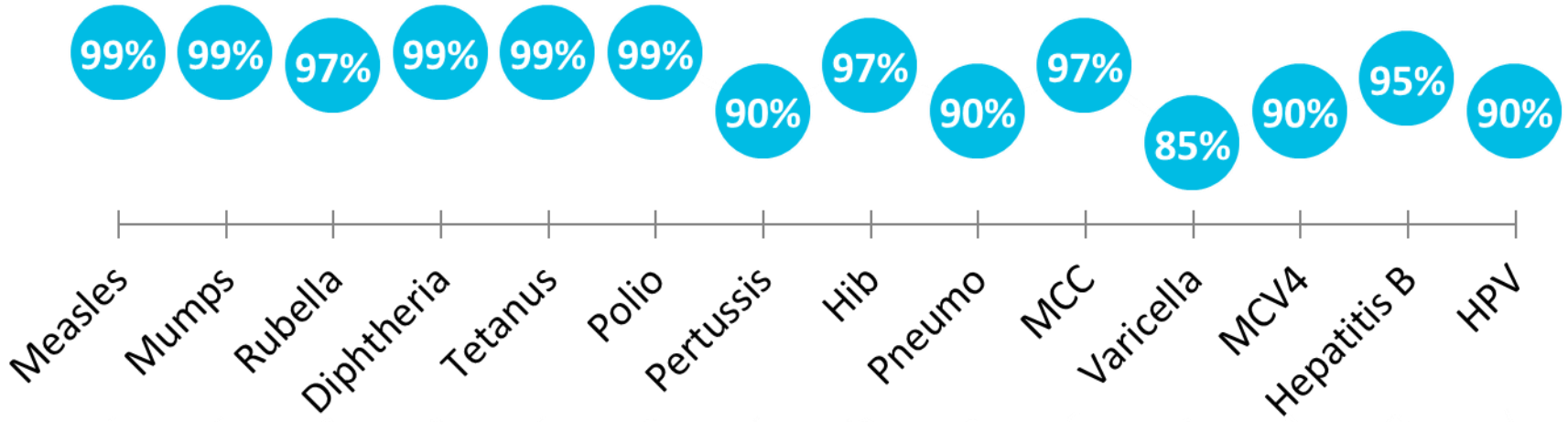
New numbers show close to 90 per cent of Canadian toddlers have been vaccinated against diseases such as measles, mumps and rubella, but health experts say more needs to be done to raise immunization rates.

Immunization Coverage Goals

- National coverage goals established through F/P/T processes[1-3]
  - Existing goals set 7-15 years ago, have not always kept pace with new programs[1,2]
  - Many coverage targets more ambitious than herd immunity thresholds
  - National coverage goals have been recently updated but not yet released



1. CCDR 2008;34 Suppl 2:1-56.
2. CCDR 1997;23(S4)
3. CIC. http://www.phac-aspc.gc.ca/publicat/2008/papillomavirus-papillome/papillomavirus-papillome-index-eng.php

Ontario immunization context

- Immunization delivery model: primarily healthcare providers
  - Exceptions: 3 school-based programs and influenza

- *Immunization of School Pupils Act*
  - Immunization records are collected by Public Health Units (PHUs)
  - Students require documentation of immunization or a *"Statement of Conscience or Religious Belief Affidavit",* or risk school suspension

Designated diseases under *ISPA*

As established in 1982

Diphtheria
Measles
Tetanus
Polio
Rubella
Mumps

+

Effective September 2014

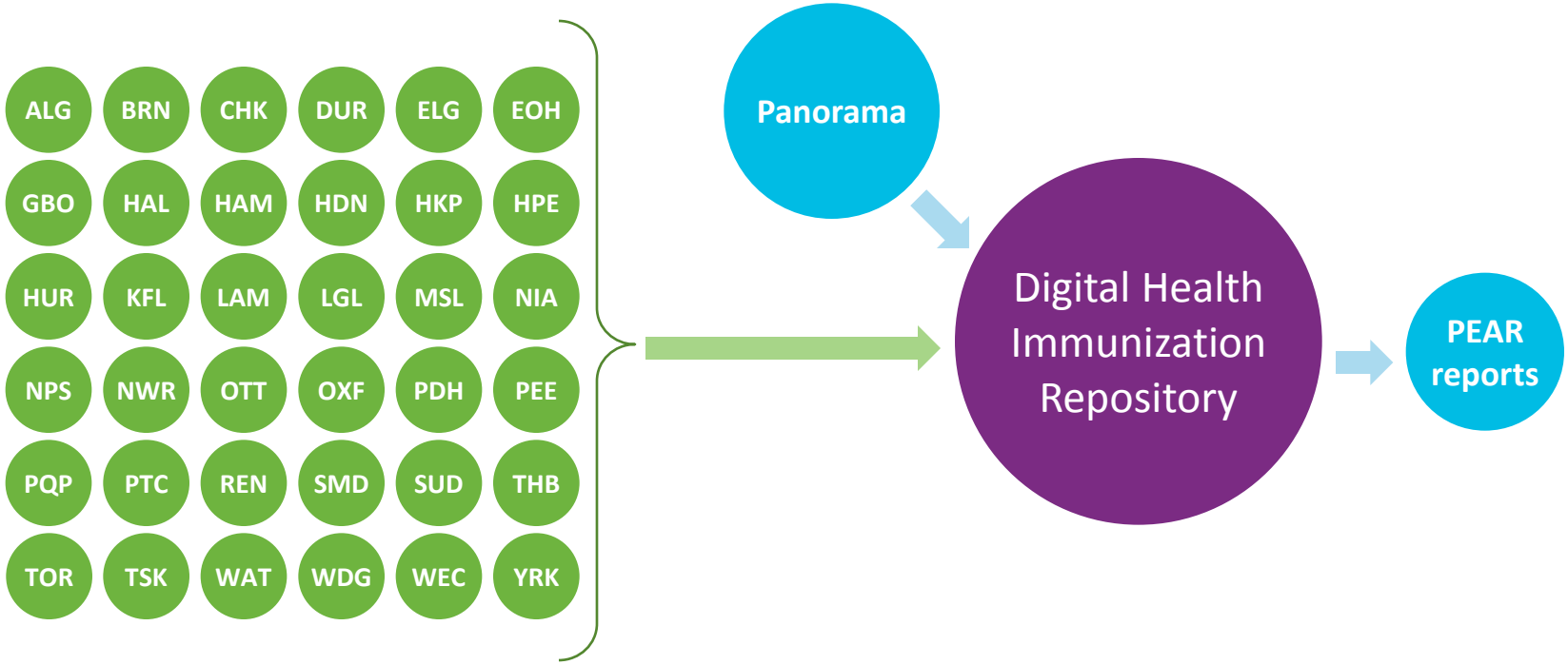
Pertussis
Meningococcal disease
Varicella*

*Applicable to children born in 2010 or later

Panorama and the Digital Health Immunization Repository

IRIS: 36 decentralized databases

DHIR: centralized repository



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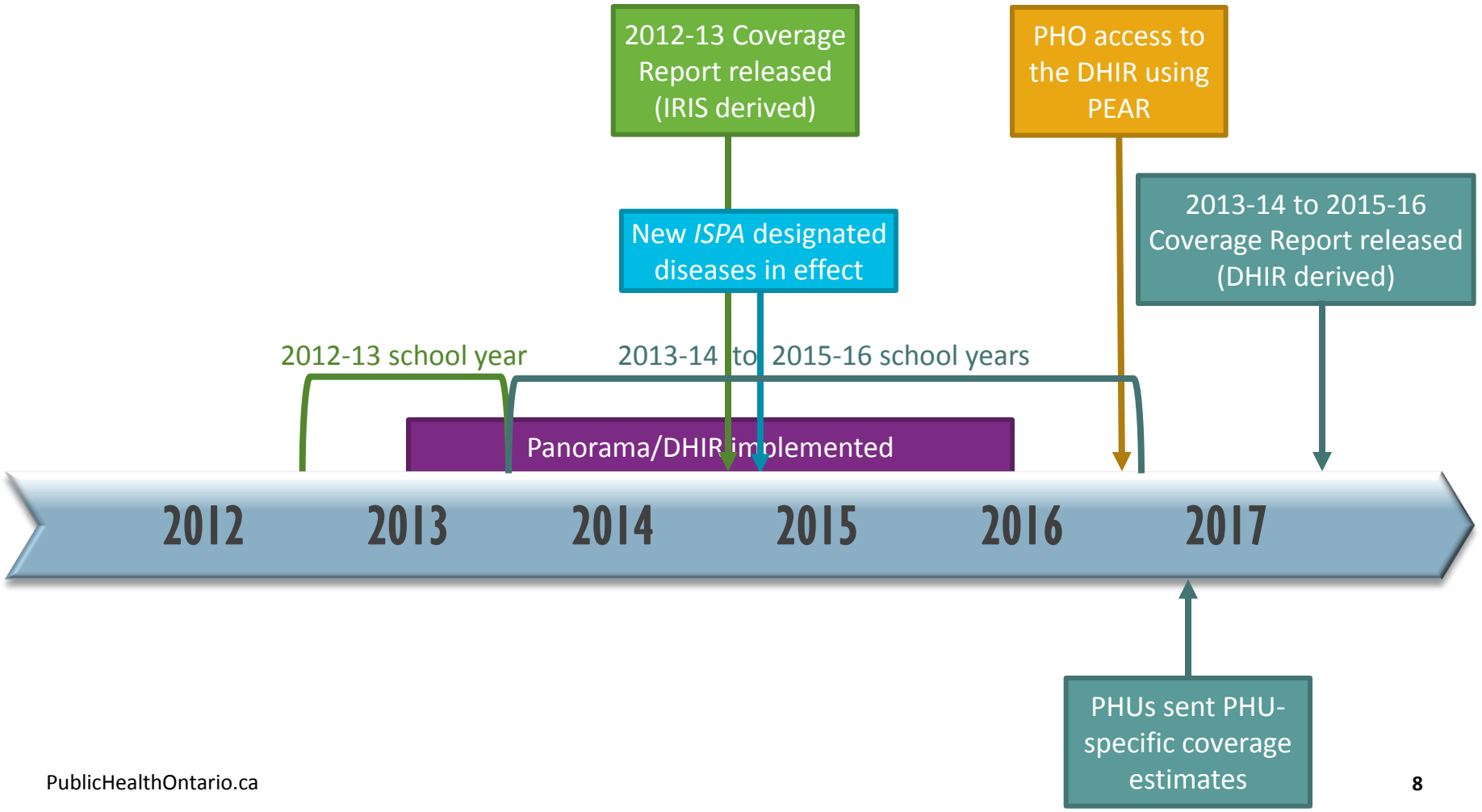
Timeline



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METHODS

Data source and management

- Extracted from the DHIR via PEAR on September 1, 2016
  - Personal information
  - Immunizations
  - Education records
  - Special considerations (exemptions)
  - Health Unit records
  - School information
- Assessment of 7, 12, 13 and 17-year-old age cohorts for the school years of 2013-14, 2014-15 and 2015-16
- Imported, merged and analyzed using SAS

PHU assignment methods

- Education records were used to determine the school each student attended during the school year of analysis (similar to IRIS)
- PHO required a method to assign students to one PHU, when some students had multiple records
- An algorithm was developed to assign students to one PHU per school year

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Up-to-date coverage assessment

- Immunization delivery
  - Coverage by school year included doses administered up to/on August 31st of the relevant school year
- Conducted valid dose assessment with consideration of minimum ages/intervals and interactions
- Review of Panorama forecaster, Canadian Immunization Guide, product monographs, CIRC recommendations, World Health Organization
  - In setting of inconsistency between reference documents, used the interval that will allow for the greatest number of valid doses

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Development of up-to-date coverage methodology

- Applied current evidence regarding immunologic protection to retrospective coverage assessment
  - Example: 2 dose HPV schedule
- Ensured 'late starters' assessed as up-to-date if a minimum number of doses received
- Incorporated evidence of prior disease/immunity, where appropriate

$$Up\text{-}to\text{-}date\ Coverage\ (\%) = \frac{\#\ UTD\ \{+\ \#\ Prior\ immunity\}}{\#\ in\ birth\ cohort} X\ 100\%$$

Pertussis: Valid dose assessment

1st Valid Dose

a. Age >= 42 days

2nd Valid Dose (requires valid 1st dose)

a. Interval between 1st valid and current dose >=28 days[3]

3rd Valid Dose (requires valid 2nd dose)

a. If first valid dose was administered when < 7 years, then interval between 2nd valid and current dose>=28 days
b. If first valid dose was adminstered when >=7 years, then interval between 2nd valid dose and current dose >=168 days[4]

4th Valid Dose (requires valid 3rd dose)

a. If first valid dose was administered when < 7 years, then interval between 3rd valid dose and current dose >=168 days[4] AND age at current dose >=1 year
b. If first valid dose was administered when >= 7 years, then
   i. Interval between 3rd valid dose and current dose>=10 years OR
   ii. Age at current dose >=14 years and interval between 3rd valid dose and current dose >=28 days

5th Valid Dose (requires valid 4th dose)

a. If first valid dose was administered when < 7 years AND age at 4th valid dose was (1 y
   valid and current dose>=28 days AND age at current dose must be >=4 years
b. If first valid dose was administered when < 7 years AND age at 4th valid dose >=4 yea
   i. Interval between 4th valid dose and current dose>=10 years OR
   ii. Age at current dose >=14 years and interval between 4th valid dose and c
c. If first valid dose was administered when >=7 years, then interval between 4th valid

6th Valid Dose (requires valid 5th dose)

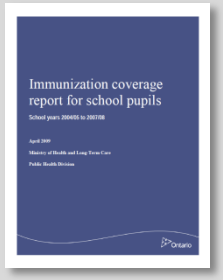
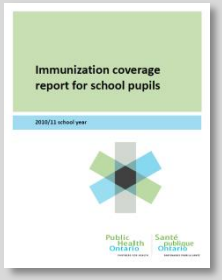
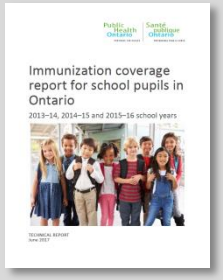
a. If first valid dose was administered when < 7 years AND age at 4th valid dose was (1 year to)<4 years, then
   i. Interval between 5th valid dose and current dose >=10 years OR
   ii. Age at current dose>=14 years and interval between 5th valid dose and current dose>=28 days
b. If
   i. first valid dose was administered when < 7 years AND age at 4th valid dose >=4 years OR
   ii. first valid dose was administered when >=7 years,

hen interval between 5th valid dose and current dose >= 10 years

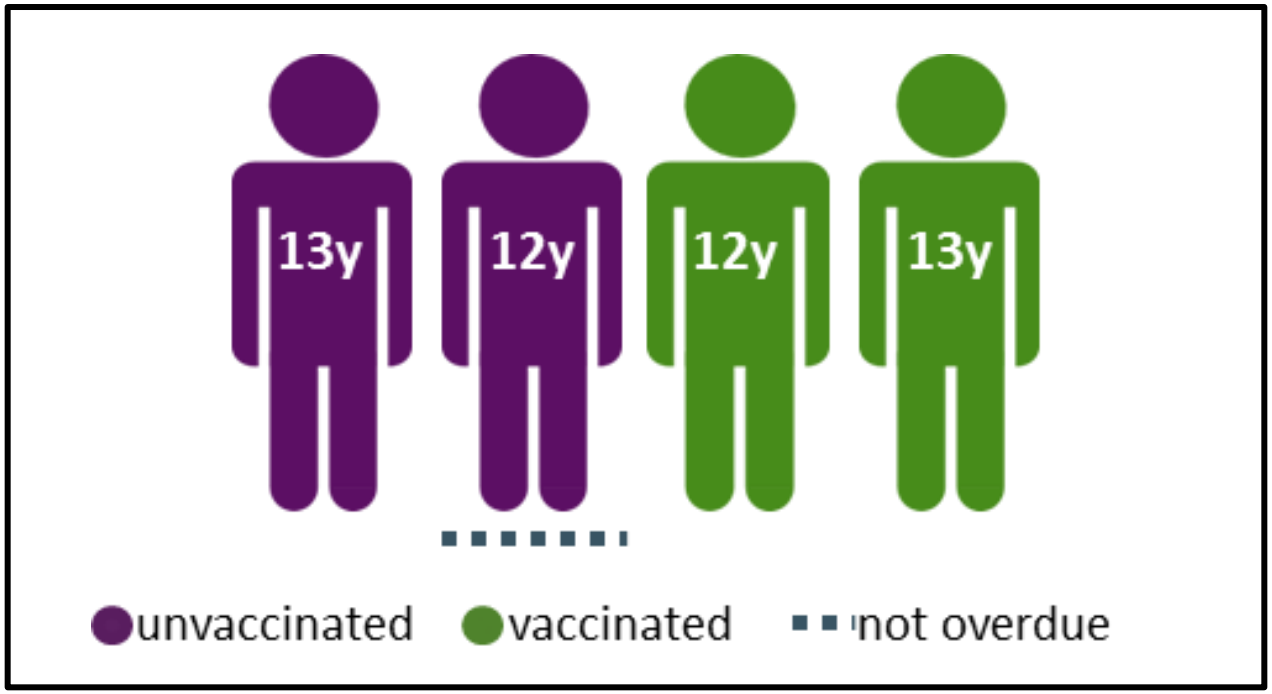
Minimum interval requirement between doses depends on age at series initiation

'Adolescent' dose accepted if 10 year interval or minimum age (14 years) satisfied.

Distinction between coverage methods

	Complete-for-age (IRIS-derived)	***Up-to-date*** (Panorama-derived)
Report Examples	  	
Definition	The proportion of clients who **<u>are not overdue</u>** for vaccine dose(s) based on age and immunization history.	The proportion of clients who **<u>have received</u>** a specific number of vaccine doses based on their age at the time of assessment.
Key differences	Includes children who are **<u>fully immunized</u>** and those who are inadequately protected, because they are **<u>not yet overdue</u>** for a vaccine dose.	Identifies children who are **<u>fully immunized</u>** for their age on the date of assessment (i.e. August 31st of the school year of analysis).

Example: Quadrivalent meningococcal conjugate (MCV4) vaccine program



75% **Complete-for-age**

- 2 vaccinated
- 1 not overdue

50% **Up-to-date**

- 2 vaccinated

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RESULTS

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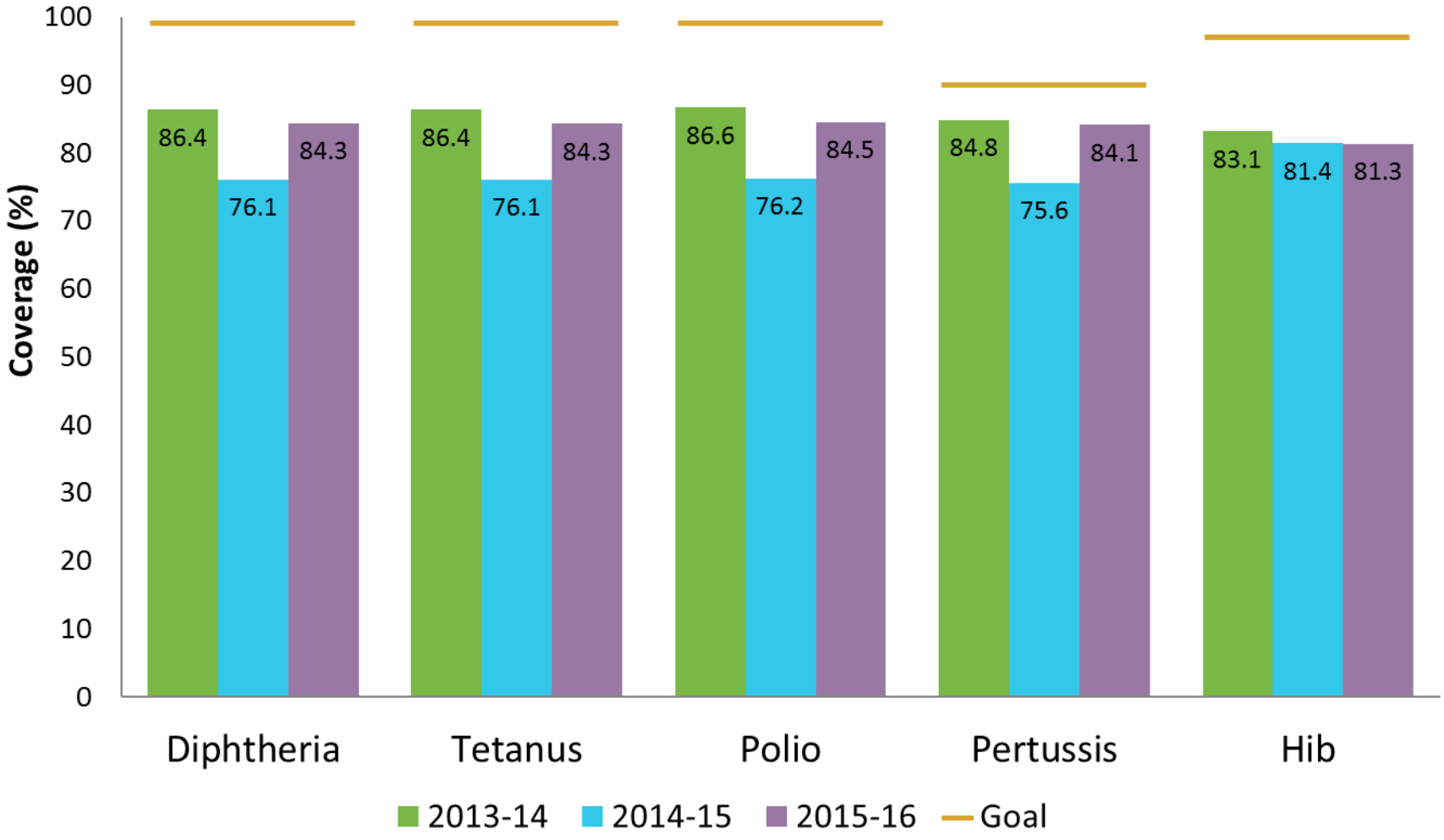
Immunization coverage among children 7 years old in Ontario



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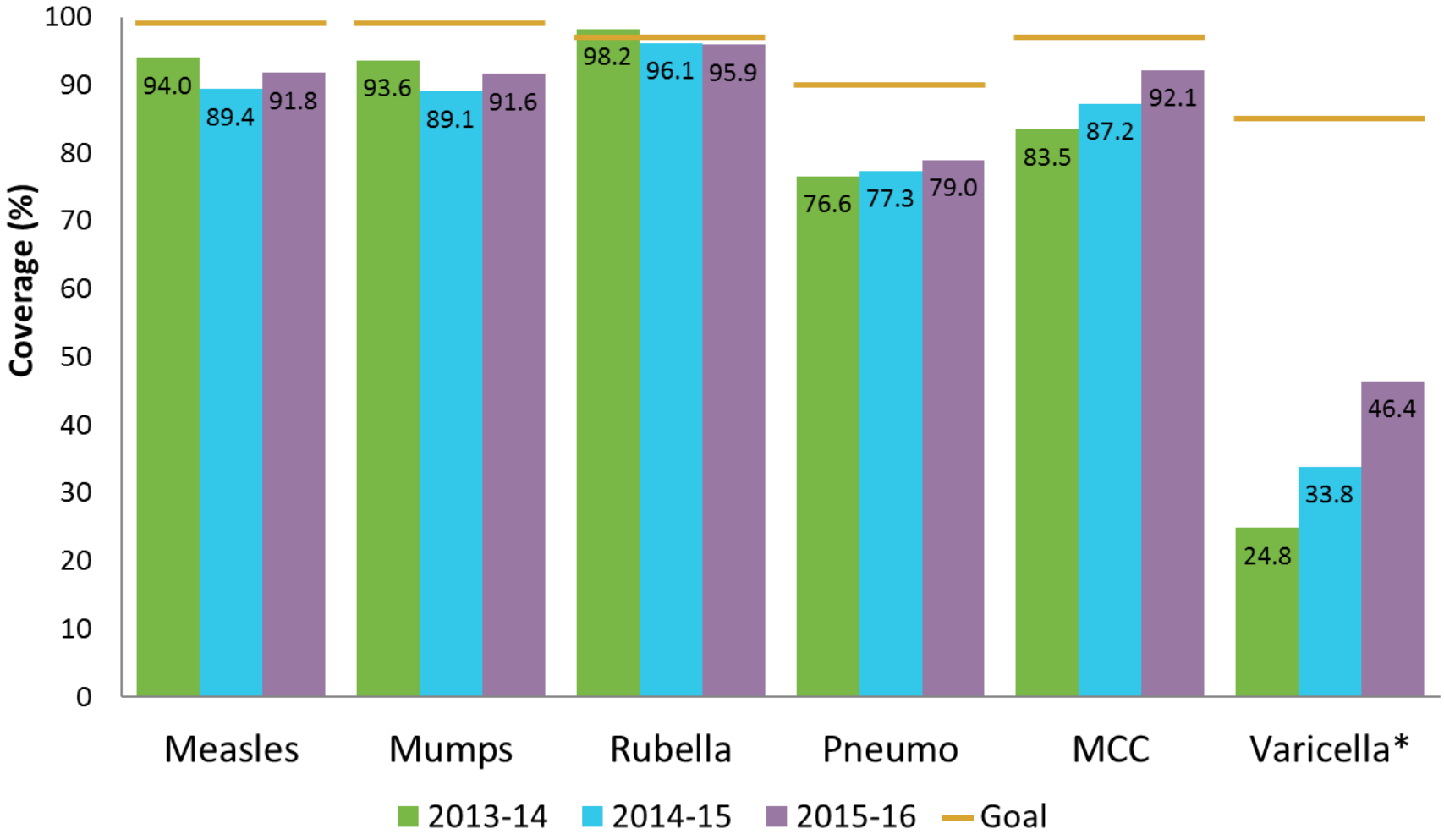
Immunization coverage among children 7 years old in Ontario



*Two-dose coverage

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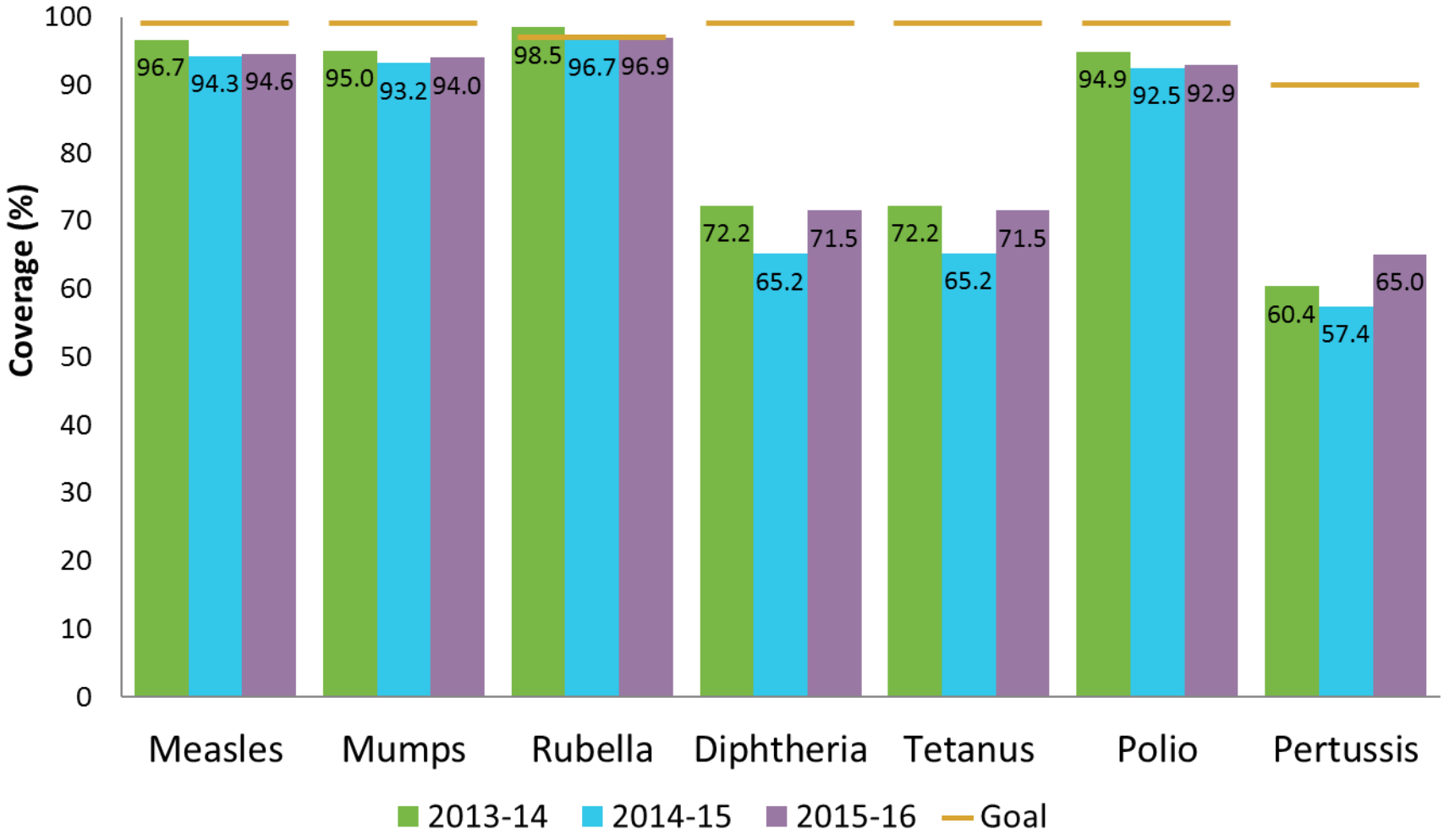
Immunization coverage among children 17 years old in Ontario



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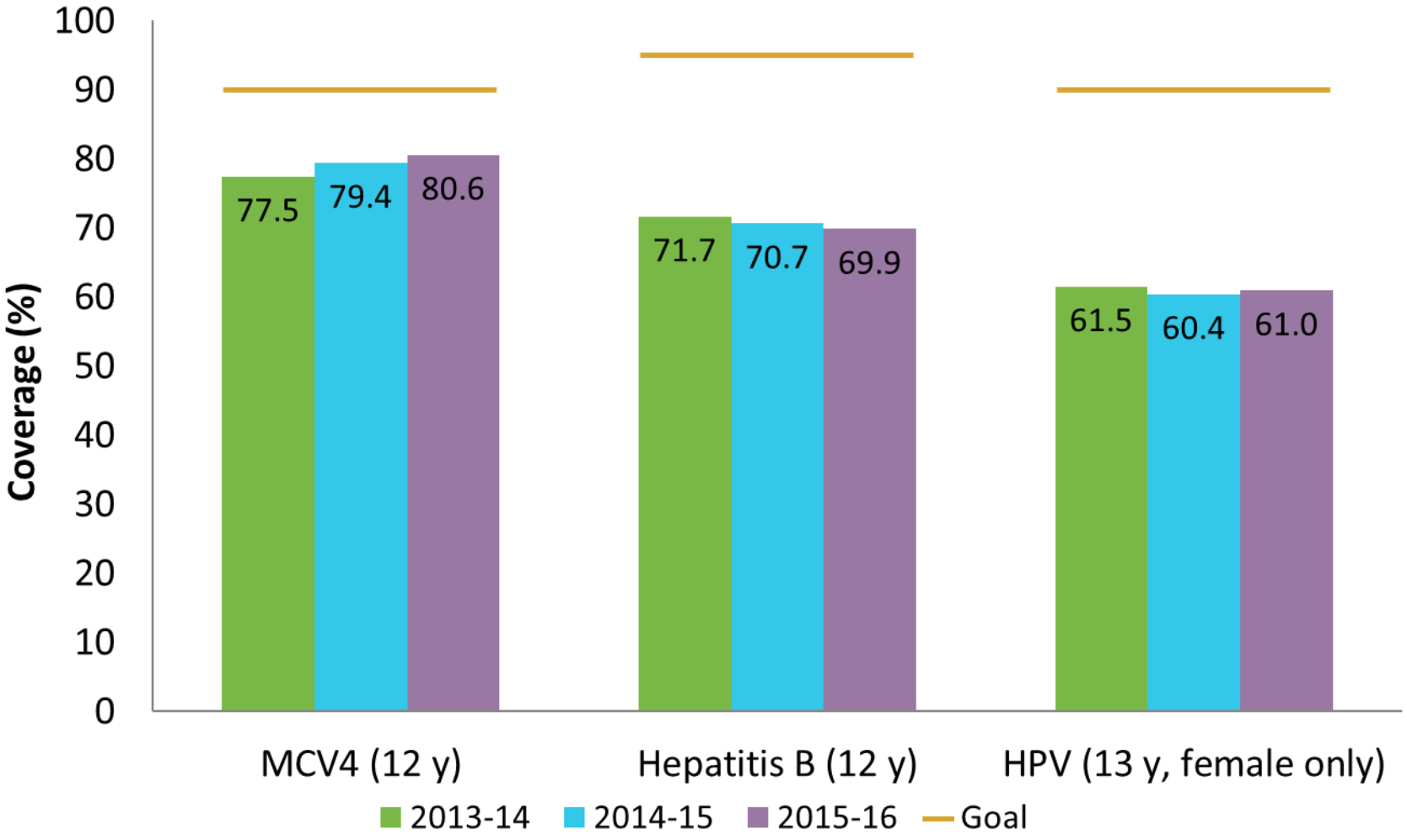
Immunization coverage for school-based programs in Ontario



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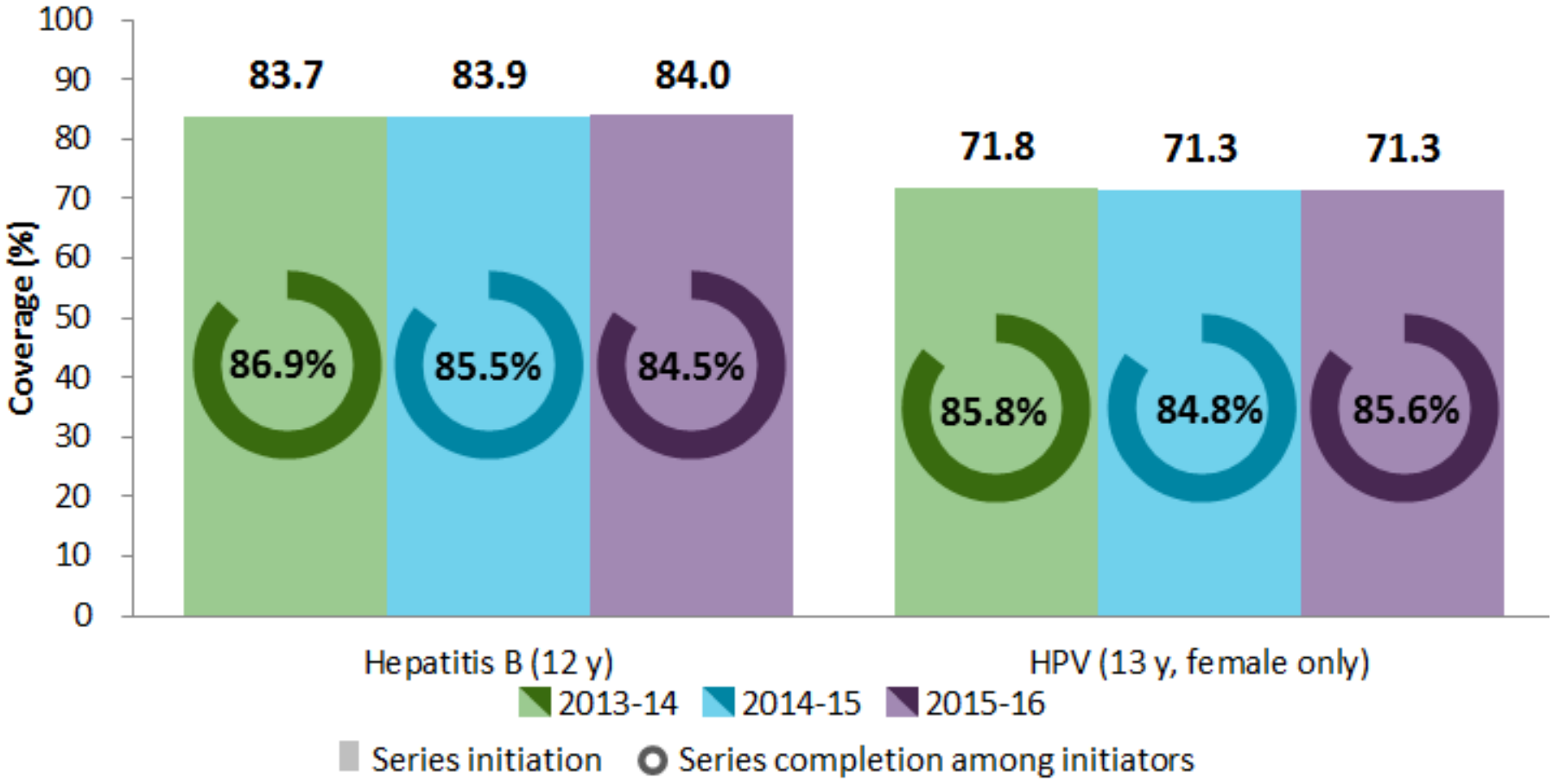
Series initiation and completion for school-based programs in Ontario



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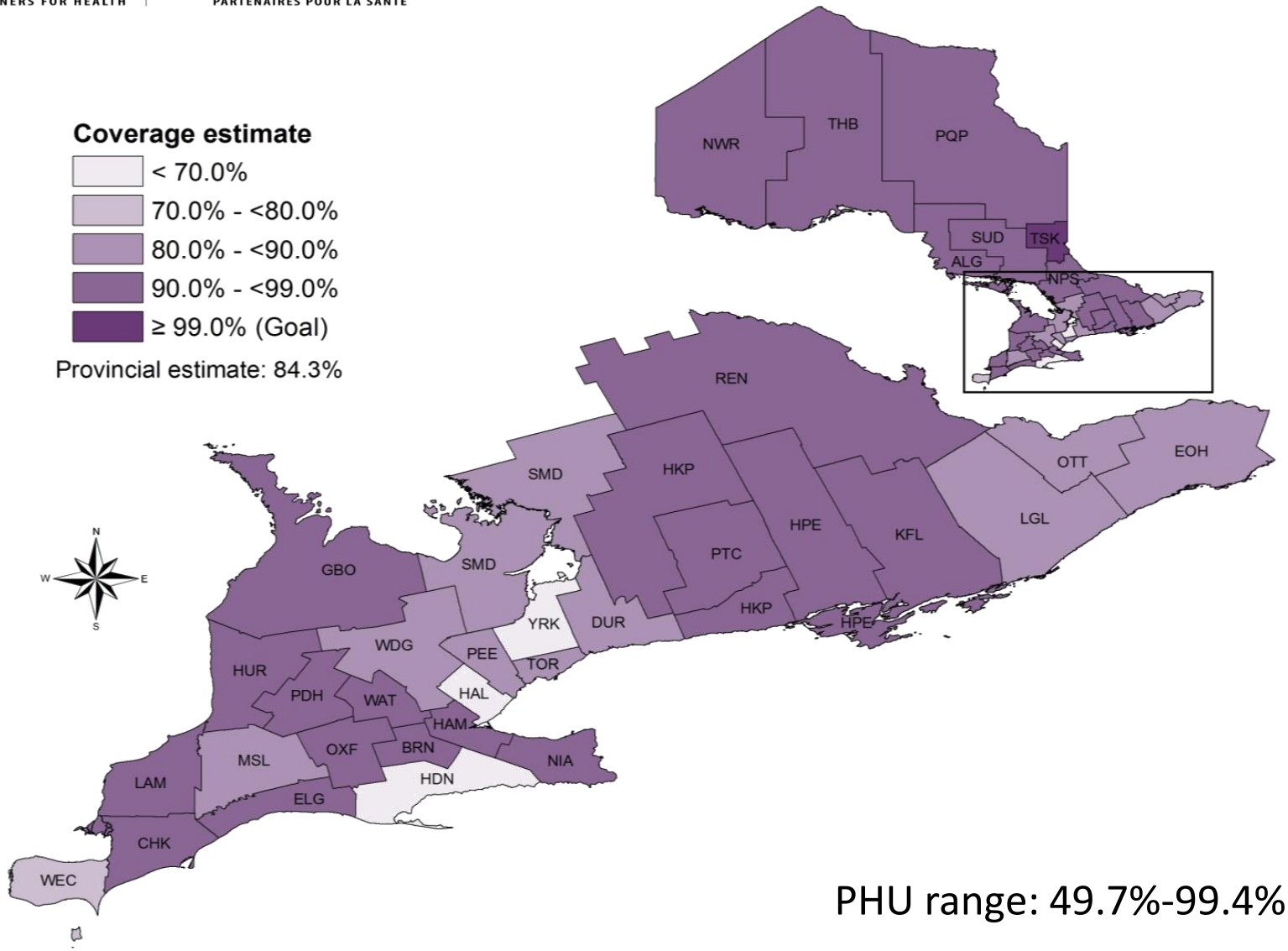
Immunization coverage for diphtheria in 7-year-olds by PHU, 2015-16



PHU range: 49.7%-99.4%

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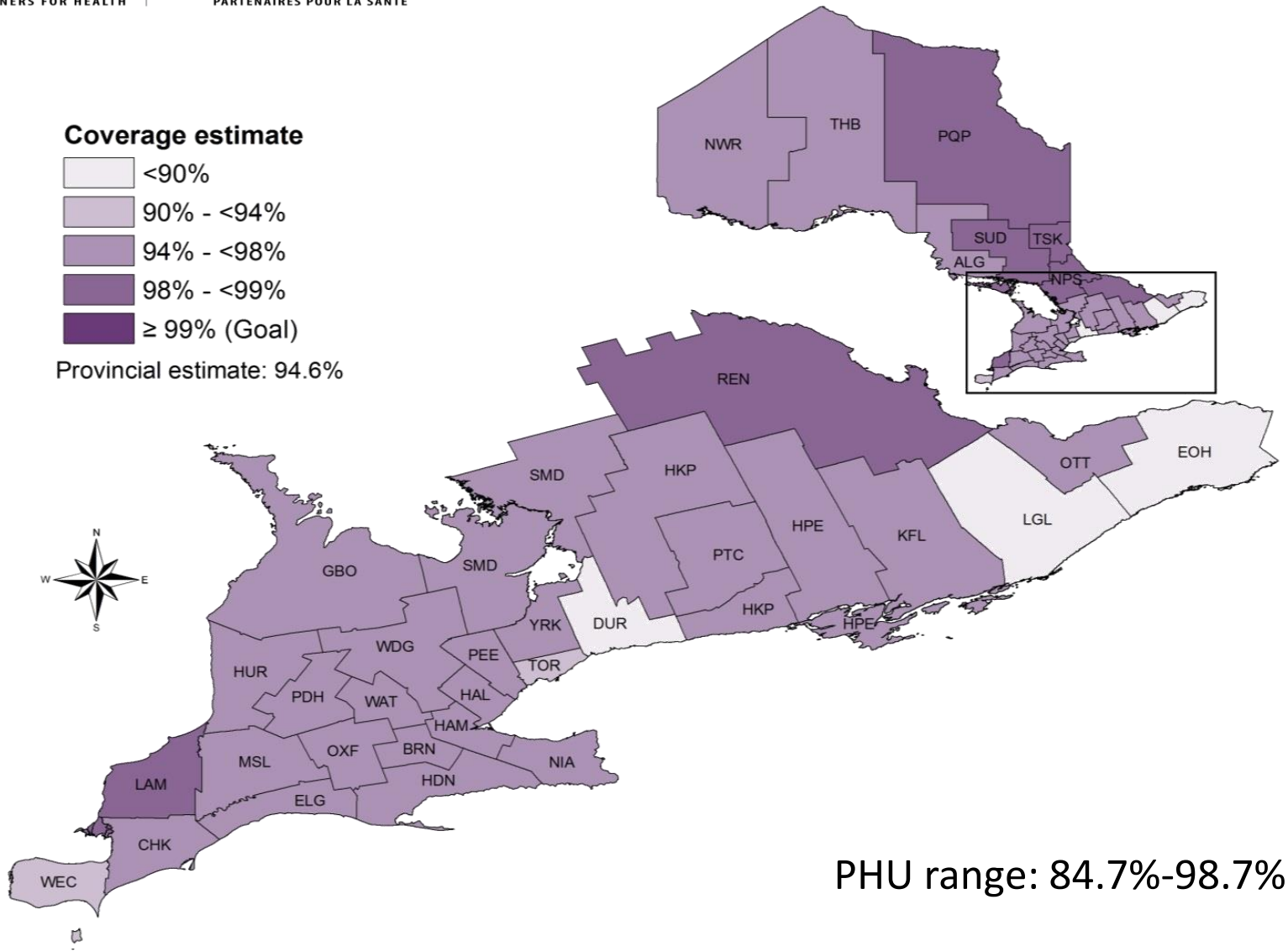
Immunization coverage for measles in 17-year-olds by PHU, 2015-16



PHU range: 84.7%-98.7%

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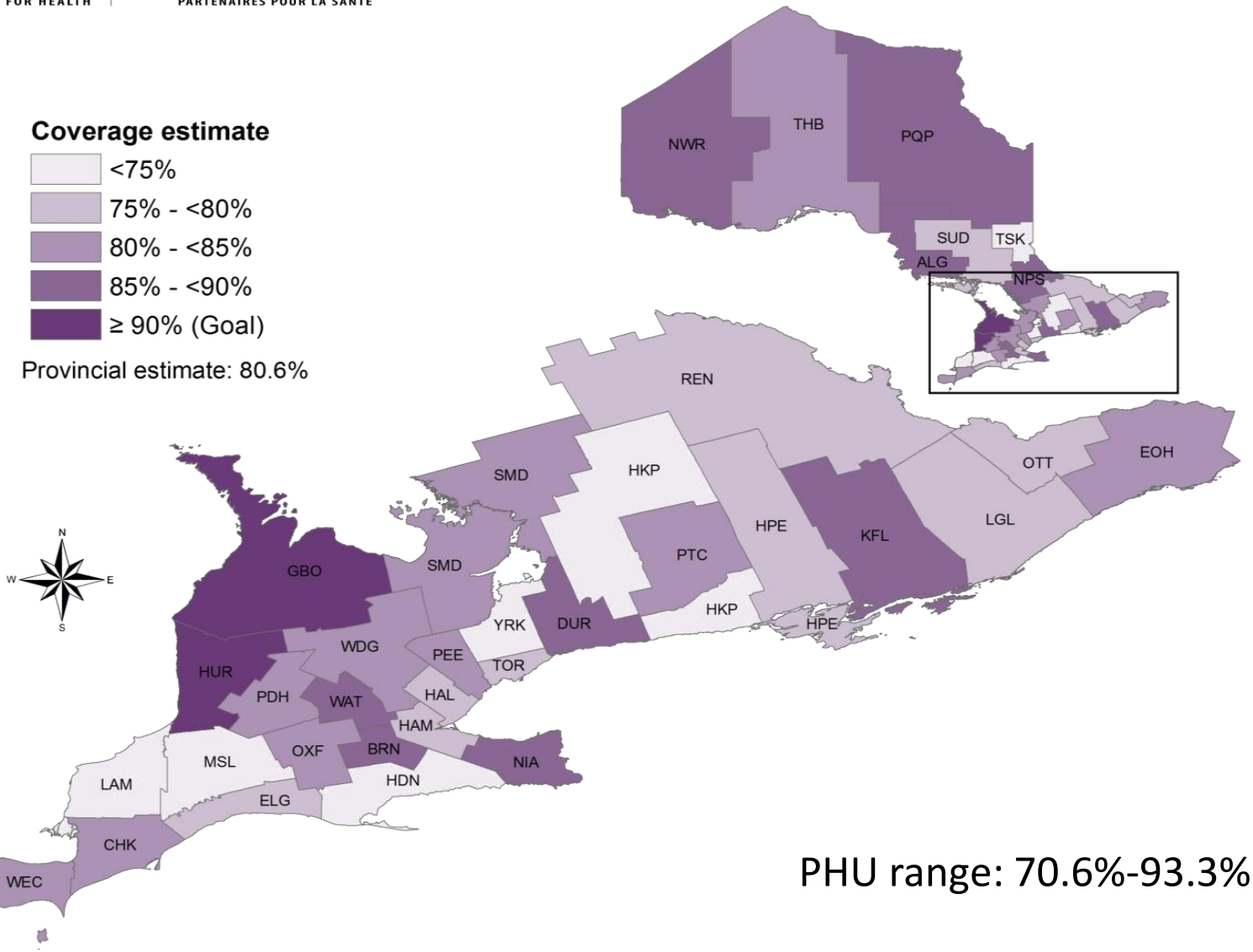
Immunization coverage for MCV4 in 12-year-olds by PHU, 2015-16



PHU range: 70.6%-93.3%

DISCUSSION AND CONCLUSIONS

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Discussion

- Coverage estimates vary greatly by vaccine and by age group

- Examples (2015-16 provincial estimates):
  - Polio coverage 84.5% (age 7) versus 92.9% (age 17)
  - Pertussis coverage 84.1% (age 7) versus 65.0% (age 17)
  - Rubella coverage 95.9% (age 7) versus 96.9% (age 17)

- Likely influenced by:
  - Number of doses in series (i.e. booster doses)
  - Timing of doses in relation to age of assessment
  - Designated disease status under ISPA (including length of time)

Discussion

- Coverage estimates vary greatly between PHUs, and vary within PHUs by time and age assessed

- Many possible explanations:

  - Coverage will be under-estimated if immunization records are not captured
    - Immunizations not reported or recorded in yellow card provided
    - Frequency/age groups of PHU ISPA enforcement activities
    - Records not entered in time to be captured in coverage assessment

  - Community level acceptance for immunization

Strengths of Coverage Assessment using DHIR/Panorama

- Single data source
  - Duplicate management
  - Best practices to standardize data entry
- Ability to calculate up-to-date coverage
  - More accurate measure of population protection
  - Measurement used by other Canadian jurisdictions and internationally
- Individual-level data enables more sophisticated analyses
  - E.g. series initiation, completion among initiators, on-time coverage
  - Program evaluation

Challenges

- Data limitations
  - Many records used in assessment were migrated from IRIS
  - Incomplete data e.g. trade name, grade
- Cohort assignment to PHUs is complex
- Cannot directly compare *up-to-date* coverage estimates to other measures
  - *Up-to-date* coverage estimates provide a new baseline for Ontario
  - PEAR and Panorama in-application reports measure compliance and not up-to-date coverage
- Remaining gaps in coverage assessment of infants, pre-school children, adults, and high risk groups

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Conclusions

- The report represents the largest immunization coverage assessment conducted by PHO and the first time UTD coverage has been assessed at the provincial level
  - >1.5 million Ontario students included in assessment
- Ontario falls short of most immunization coverage goals
- A centralized DHIR is an important achievement for Ontario
  - Has strengthened the ability to accurately monitor immunization coverage
  - Can support program evaluations and initiatives aimed at increasing the number of children protected against vaccine-preventable diseases

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And many others….

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QUESTIONS?