



UNIVERSITY OF SASKATCHEWAN  
**College of Medicine**  
DEPARTMENT OF COMMUNITY  
HEALTH AND EPIDEMIOLOGY  
MEDICINE.USASK.CA

# Measles immunization coverage in Saskatchewan: what barriers are there to achieving herd immunity threshold (92 – 95% coverage)?

**Marcus Ilesanmi, MD, MPH, MScIH**

PhD Student, Department of Community Health and Epidemiology, University of Saskatchewan

**Cordell Neudorf, MD, MHSc, FRCPC**

Medical Health Officer, Saskatoon Area, Saskatchewan Health Authority  
Associate Professor, Department of Community Health and Epidemiology, College of Medicine, University of Saskatchewan

# Disclosure Statement

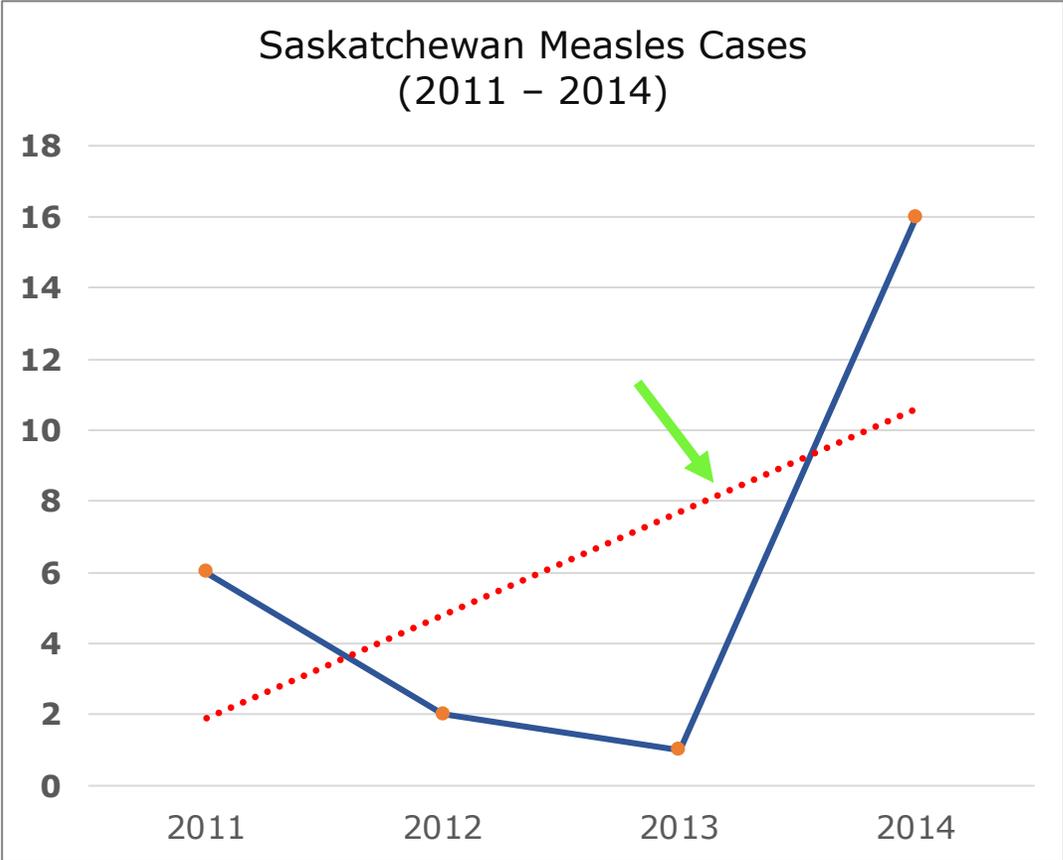
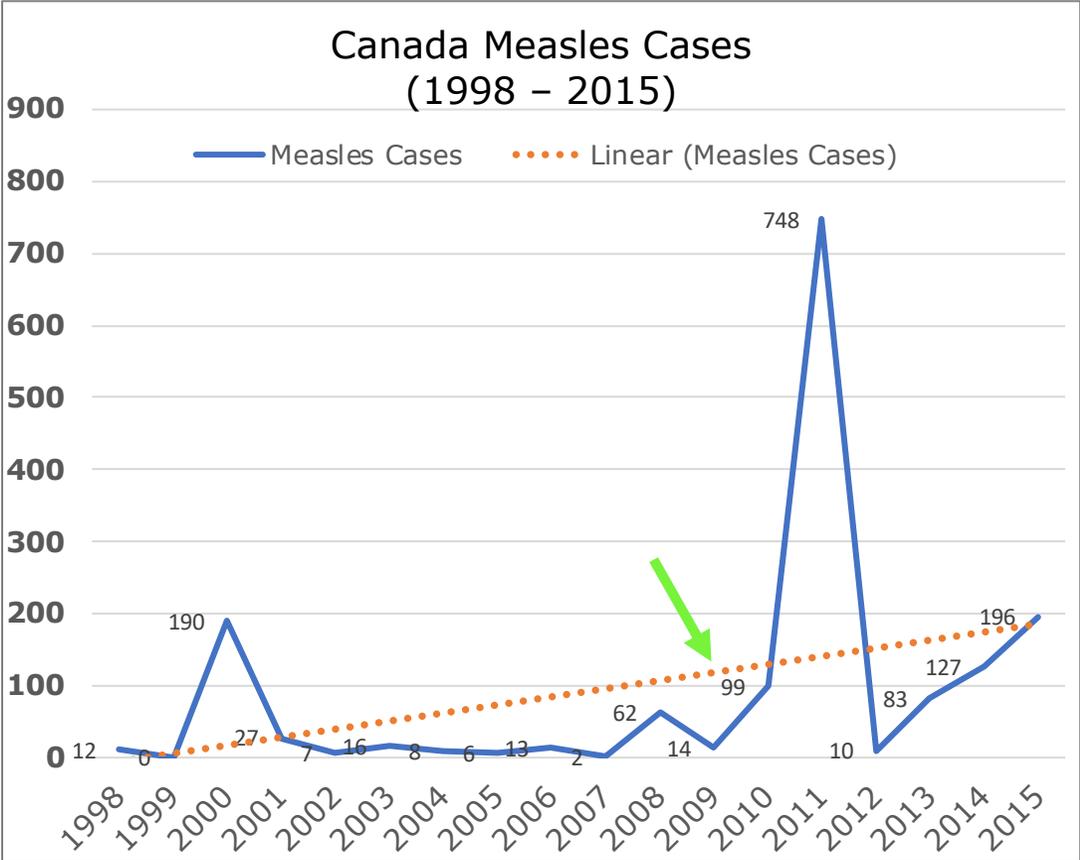
We have no affiliation (financial or otherwise) with a pharmaceutical, medical device or communications organization.

# Introduction/Background

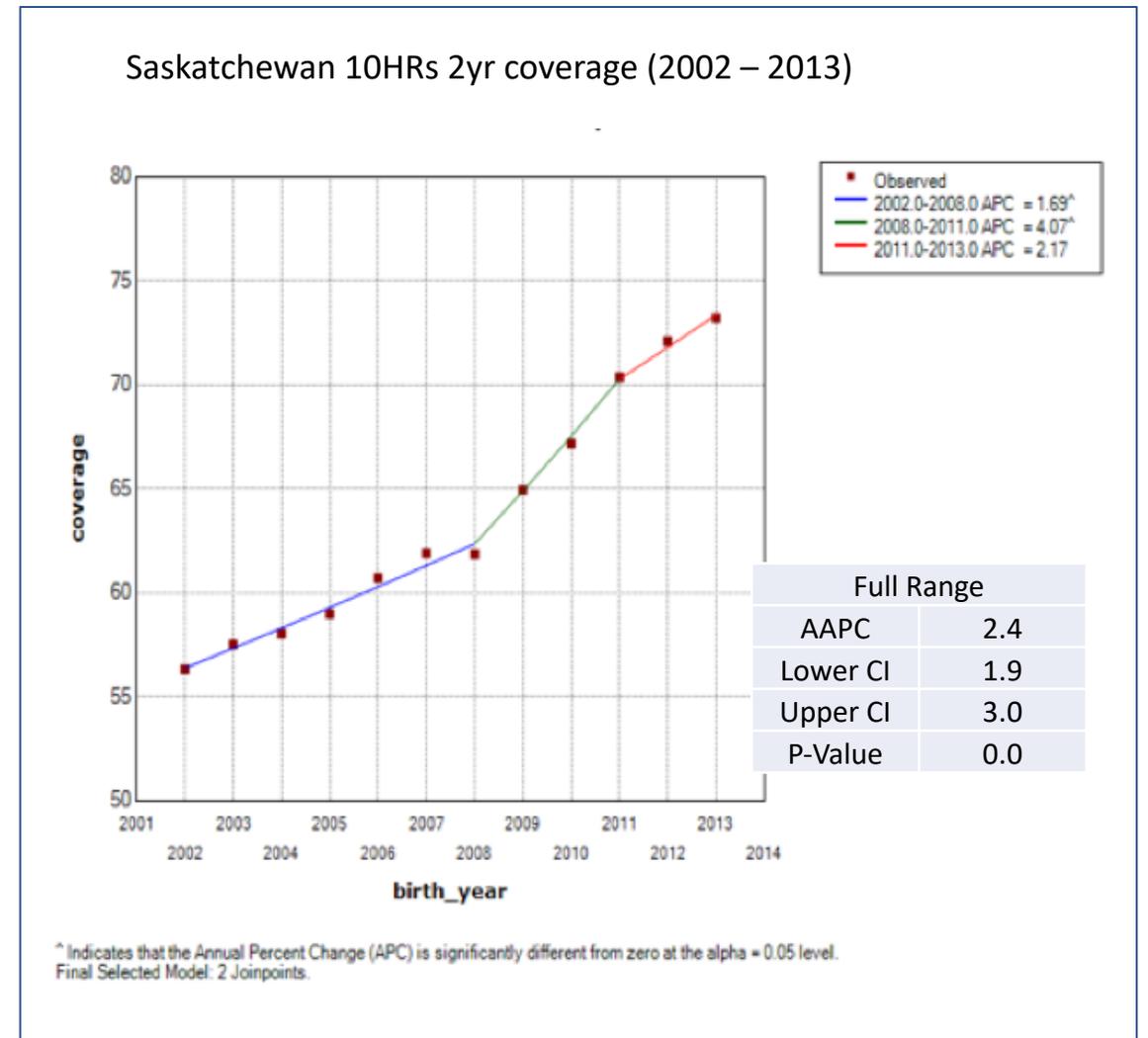
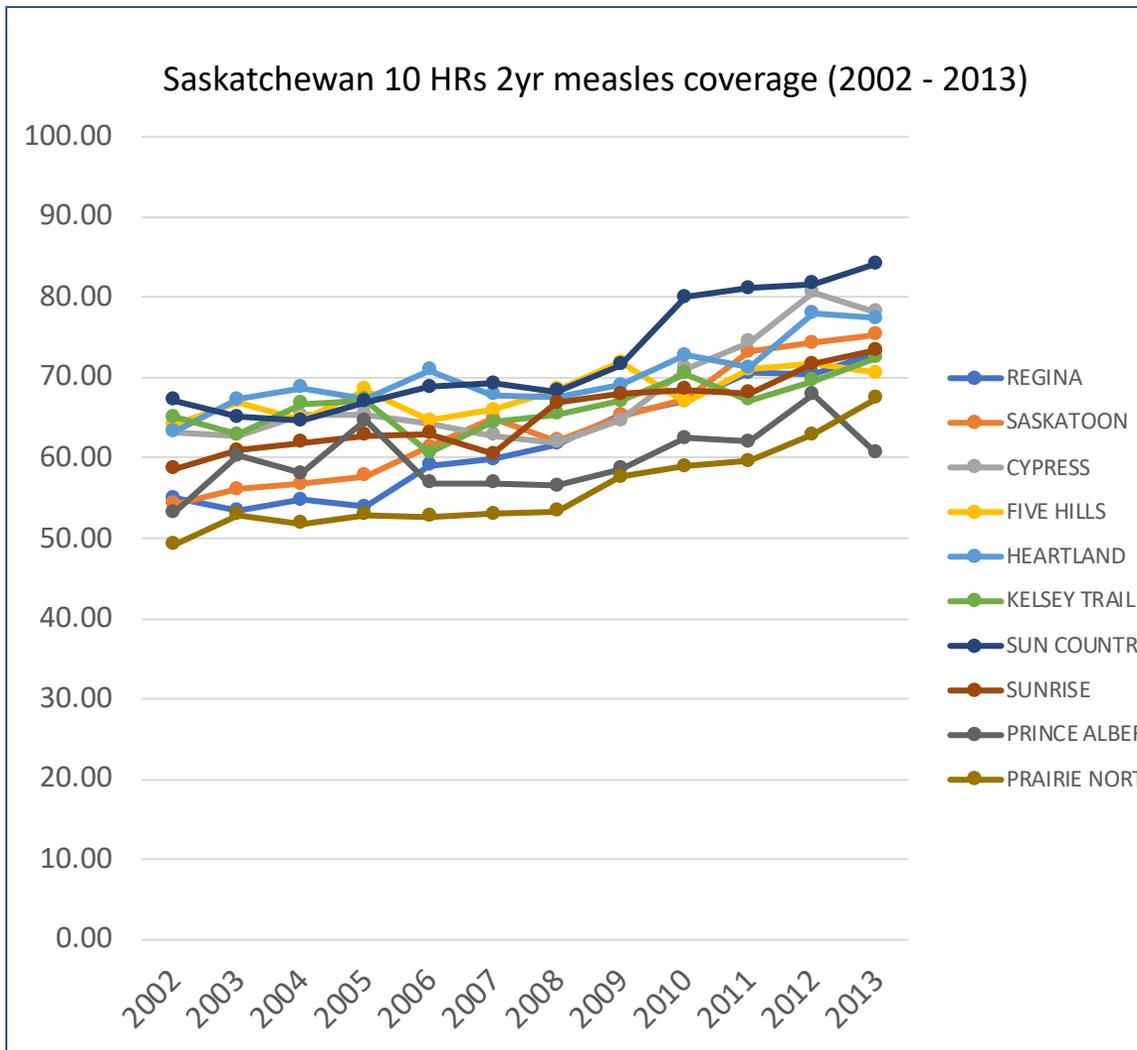
- Immunization
  - Immunization is the single most cost-effective health investment
    - cornerstone in health promotion and disease prevention efforts
  - providing immunity or resistance to an infectious disease
  - controlling and eliminating life-threatening infectious diseases (1-3)
  - averting 2 and 3 million deaths each year (3, 4)
- Measles deaths prevented - 20.3 million (2000 – 2015) (5)
- Canada achieved Measles elimination in 1998 (6-8)
  - Last endemic Measles case in 1997
  - Increasing measles cases from 1999
  - Largest outbreak in American region in 2011
  - Saskatchewan has a similar pattern since 2011
- WHO advocates 92-95% Herd Immunity Threshold for population health protection against measles (1, 9)
- Saskatchewan **75.9%** of 2yr old had 2 complete dose (2014) (10)
- Immunization levels may be too low to prevent periodic outbreaks



# Measles Cases – Canada and Saskatchewan

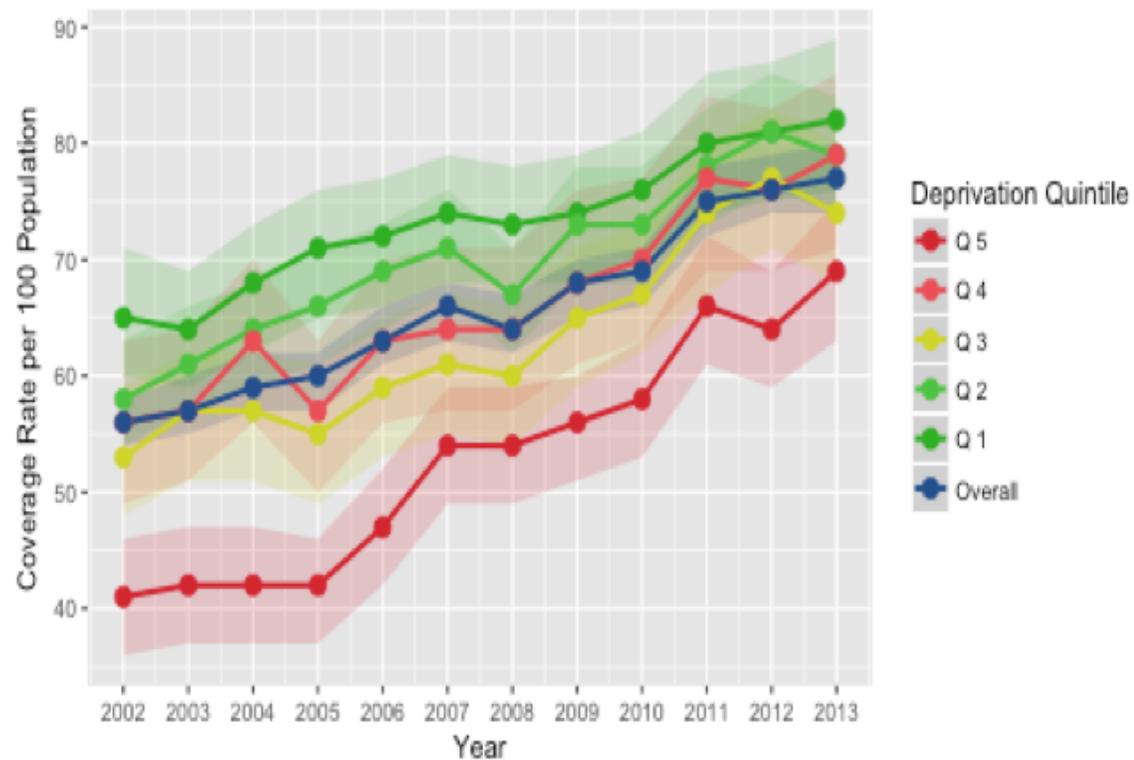


# Saskatchewan Measles Coverage (10HRs) (2002 – 2013)

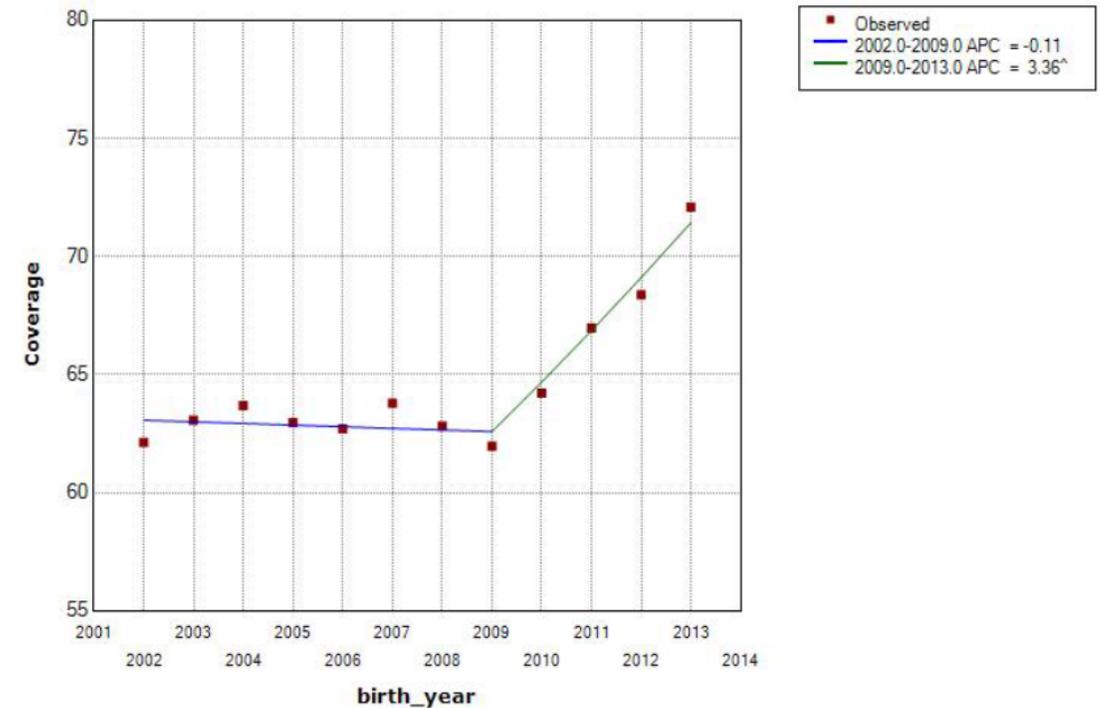


# Saskatoon HR Measles Coverage Rate (2002 – 2013)

Coverage rate per 100 population by deprivation quintile



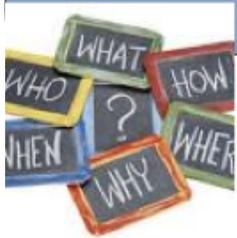
Annual Percentage Change of overall coverage



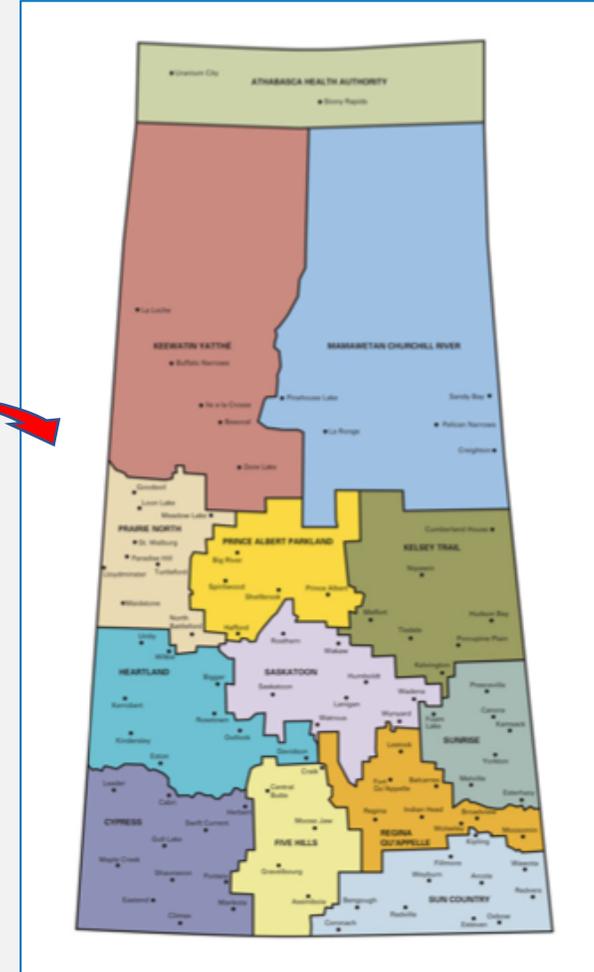
<sup>^</sup> Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level. Final Selected Model: 1 Joinpoint.

# Objective

To explore the facilitators and barriers to achievement of herd immunity threshold for measles immunization coverage in Saskatchewan.



# Study Area



Source of maps: 1. map of Canada –[www.map-of-canada.org](http://www.map-of-canada.org);  
2. Saskatchewan province map – government of Saskatchewan (available at <https://www.saskatchewan.ca/~media/images/health/healthy%20living/health%20regions/rha.jpg?la=en> )

# Methods

- Cross-sectional qualitative study
- Semi-structured interviews
  - Interview guided
  - Through telephone
- Verbatim transcription
- NVivo version 11 qualitative analysis software
  - Hybrid Inductive and deductive thematic coding
    - Fereday and Muir-Cochrane, 2006



# Results

# Interviewed participants

- Medical Health Officers
- Front-line immunization officers
  - 82% response rate

	# interviewed	Average years of experience
Medical Health Officers	9	12.6 years
Front-line immunization officers	9	19.2 years



# Identified Barriers to improved uptake

“a lot of the public is no longer aware of these diseases ...so I think that we are the **victim of our success from immunization success** over the decades”

“they are **not scared of the diseases** because they don't see them so they are more scared by the vaccine than the disease”

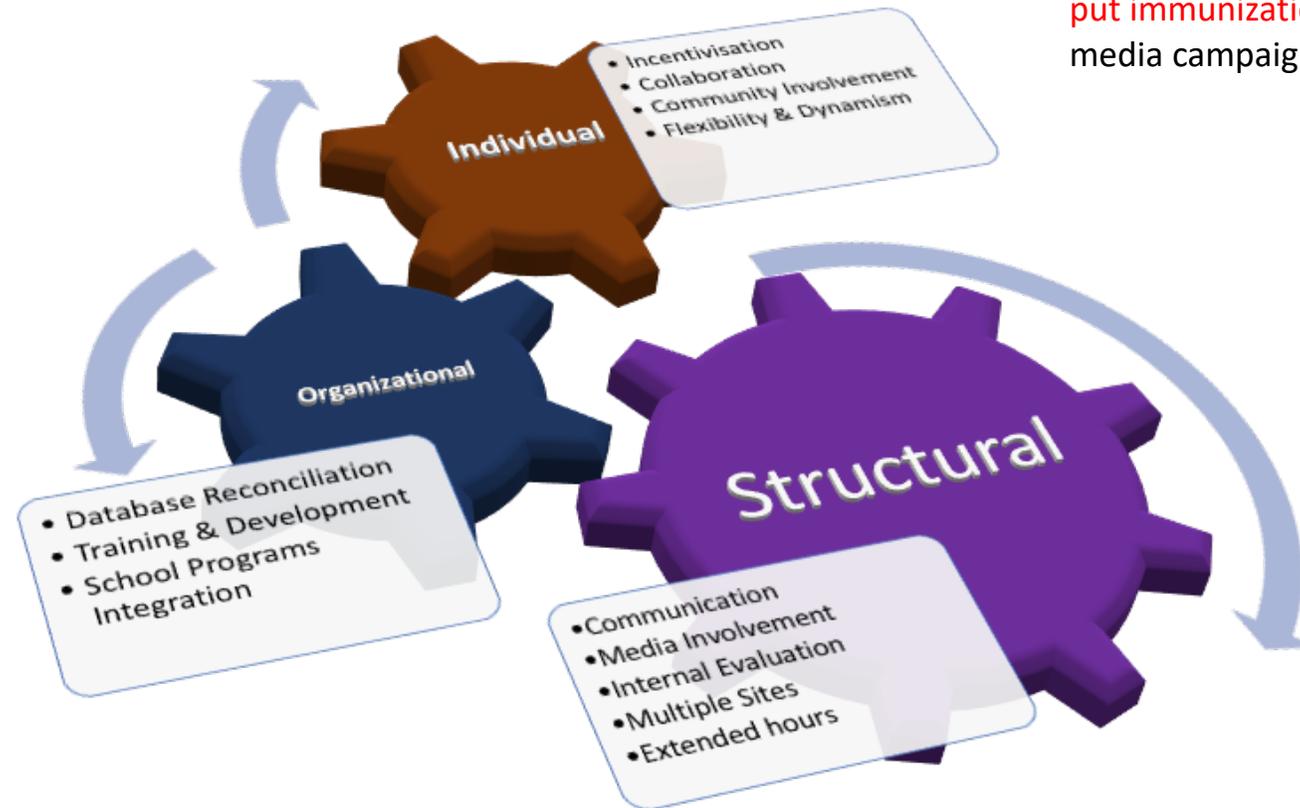


“in the absence of truth, people will believe **fiction**; if all that's on social media as regards to a vaccine is not replaced by the Ministry or the health region with correct information, they are going to believe the misinformation”

“there is a lot of movement between the city and reserves, with low rates on panorama, because the **first nations jurisdiction** ... don't enter anything unto panorama...they **might even be over immunized** but we have no idea”

# Identified Strengths to improve uptake

“we worked on the placement of our clinics, you know areas where we know we have low immunization rates, **where transportation is an issue, we’ve actually put immunization clinics there**, we do media campaigns,”



“the reminder system ...I think is very great...”

“More ministry advertising ... not just saying get your vaccine but talking about it, **displaying what whooping cough looks like, this is the impact on your child** etc”

“much closer relationships with our vulnerable populations ..., like **home visiting and building those relationships so we can talk about those tougher vaccines, questions** and hard topics”

# Conclusions

Immunization rates experiencing an upward trend – coverage still low to protect

Varying challenges, varying innovative and targeted strategies in place

Challenges grounded in Social Determinants of Health (SDH)

New insights on immunization practice and health equity

Harmonization of novel strategies necessary – (one of the next steps for this research)

Further study on parental perspectives on barriers to uptake needed



# Acknowledgements

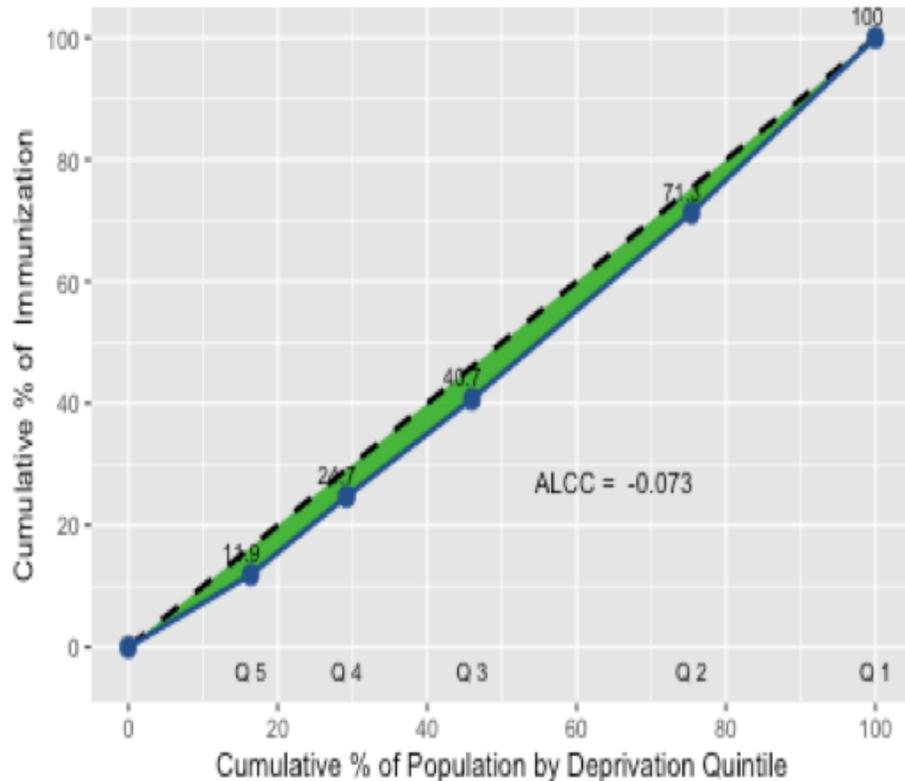
1. Dr. Sylvia Abonyi, Community Health & Epidemiology, University of Saskatchewan
2. Medical Health Officers Council of Saskatchewan (MHOCOS), Canada
3. Front-line Immunization Officers, Saskatchewan, Canada
4. Saskatchewan Innovation and Opportunities Scholarship Fund
5. NSERC/CREATE ITraP (Integrated Training Program in Infectious Disease, Food Safety and Public Policy) Scholarship Fund

# References

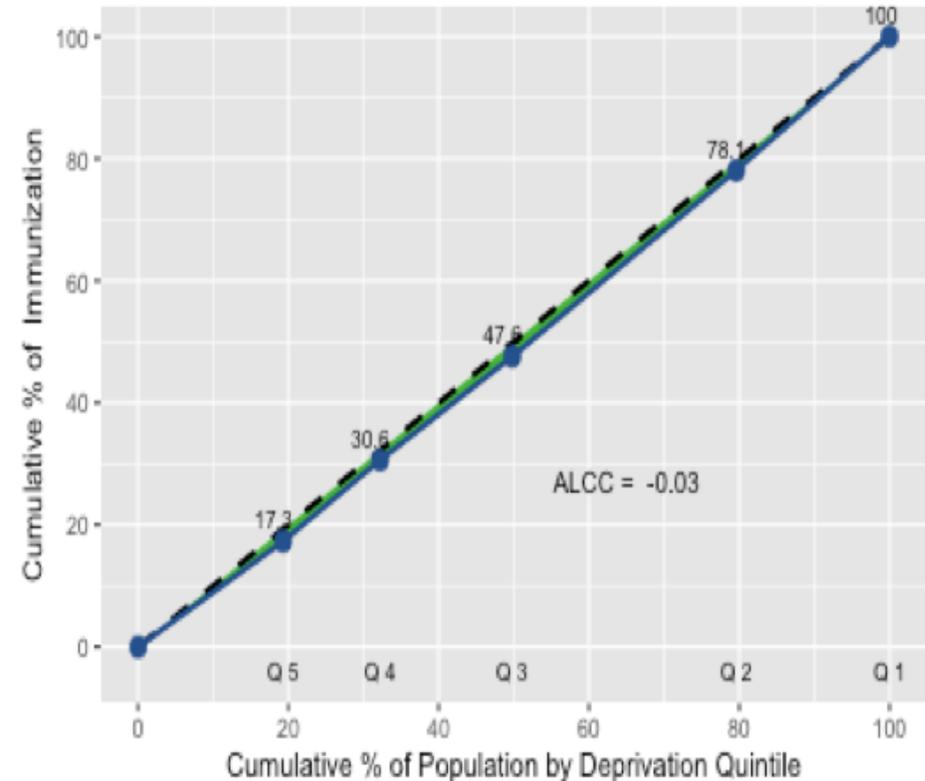
1. WHO: **Vaccines**. 2015:Available from <http://www.who.int/topics/vaccines/en/> accessed Mar 7, 2017.
2. Rinaudo CD, Telford JL, Rappuoli R, Seib KL: **Vaccinology in the genome era**. *The Journal of clinical investigation* 2009, **119**(9):2515-2525.
3. Bbaale E: **Factors influencing childhood immunization in Uganda**. *J Health Popul Nutr* 2013, **31**(1):118-129.
4. Rosen G, Imperato PJ: **A history of public health**: JHU Press; 2015
5. PHAC: **Canada Communicable Disease Report**. 2013, **39**(Available from <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/13vol39/acs-dcc-4/index-eng.php> accessed April 3, 2017).
6. Katz SL, King K, Varughese P, De Serres G, Tipples G, Waters J: **Measles elimination in Canada**. *Journal of Infectious Diseases* 2004, **189**(Supplement 1):S236-S242.
7. Sherrard L, Hiebert J, Cunliffe J, Mendoza L, Cutler J: **Measles surveillance in Canada: 2015**. *Canada Communicable Disease Report* 2016, **42**(7):139.
8. PHAC: **Canada Communicable Disease Report**. 2016, **42-7**(Available at <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-7/ar-01-eng.php> accessed April 11, 2017)
9. CDC: **Public Health Grand Rounds**. 2013(available at <https://www.cdc.gov/cdcgrandrounds/archives/2013/april2013.htm> accessed 7 Apr 2017)
10. MoH Saskatchewan: **Saskatchewan Vaccine Preventable Disease Surveillance - Measles 2014**. available at [file:///Users/MMI\\_7/Downloads/Infectious%20Diseases%20-%20Vaccine%20Preventable%20Disease%20Surveillance.pdf](file:///Users/MMI_7/Downloads/Infectious%20Diseases%20-%20Vaccine%20Preventable%20Disease%20Surveillance.pdf) accessed May 2015.
11. Topley W, Wilson G: **The Spread of Bacterial Infection. The problem of herd-immunity**. *Epidemiology & Infection* 1923, **21**(3):243-249
12. Bester JC: **Measles vaccination is best for children: The argument for relying on herd immunity fails**. *Journal of Bioethical Inquiry* 2017:1-10

# Saskatoon Area level concentration curve for Measles Immunization

2002



2013



# The Concept of Herd Immunity

- First used in 1923 by Topley & Wilson (11)
- High number of the vaccinated – protection of others (the vulnerable)
- Dependent on  $R_0$  (disease transmission potential)
  
- $R_0$  for measles is 12 – 18
- $=((12 - 1)/12)*100 = 91.6\%$
- $=((18 - 1)/18)*100 = 94.4\%$ 
  - Hence,  $HIT_{(Measles)} = 92\% - 95\%$
  
- Bester(2017)(12) – HIT inferior to actual total vaccination

$$HIT = \frac{R_0 - 1}{R_0} \text{ or } 1 - \frac{1}{R_0}$$