



Low levels of detectable pertussis antibodies in a large cohort of pregnant women in Canada

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Disclosure Statement

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

Background

- Despite the availability of a vaccine, pertussis (whooping cough) continues to be a significant cause of infant morbidity in Canada.
 - Average annual incidence of pertussis in those <1 year was 64.5 per 100,000 between 2011 and 2015.
 - Nearly all pertussis-related hospitalizations and deaths are in newborns and infants.
- Vaccine recommendations:
 - Primary series: 2,4,6 & 18 months of age
 - Boosters at 4-6 years and 14-16 years of age.
 - Single dose in adulthood
 - Single dose during each pregnancy (February 2018)

Background

Surrogate marker of protection against Pertussis:

- Anti-Pertussis toxin IgG
 - No defined threshold indicating protection
 - However, no detected IgG in pregnant women suggest that no antibodies can be transferred to the fetus.

Study Objective:

Assess pertussis serological status among pregnant women from multiple sites across Canada.

Methods

Maternal-Infant Research on Environmental Chemicals (MIREC)

- Primary objective: Examine potential adverse health effects of prenatal exposure to specific environmental chemicals on pregnancy and infant health.
 - Pregnant women (2008-2011) in ten Canadian cities across six provinces.
 - Enrolment between 6th and 13th week of pregnancy.
 - Consent for use of biological samples in future research
- Maternal blood samples collected in each trimester and at delivery
 - Plasma from 2nd trimester used for testing anti-PT
 - Serum IgG specific for PT were measured using the Sekisui/Virotech EIA
 - This IgG assay was designed to identify clinical *Bordetella pertussis* infections and has a lower limit of detection (LLD) of 5 IU/mL.

Statistical Analysis

- The proportion of participants with anti PT levels < 5 IU/mL (LLD) were calculated for the entire sample across select sociodemographic and household factors.
 - Age at first prenatal visit
 - Highest level of education attained
 - Household income
 - Birthplace
 - Number of previous live births
- Associations between the selected variables and anti- PT level cut-offs were investigated using unadjusted Cochran-Armitage test for trends.

RESULTS

Results

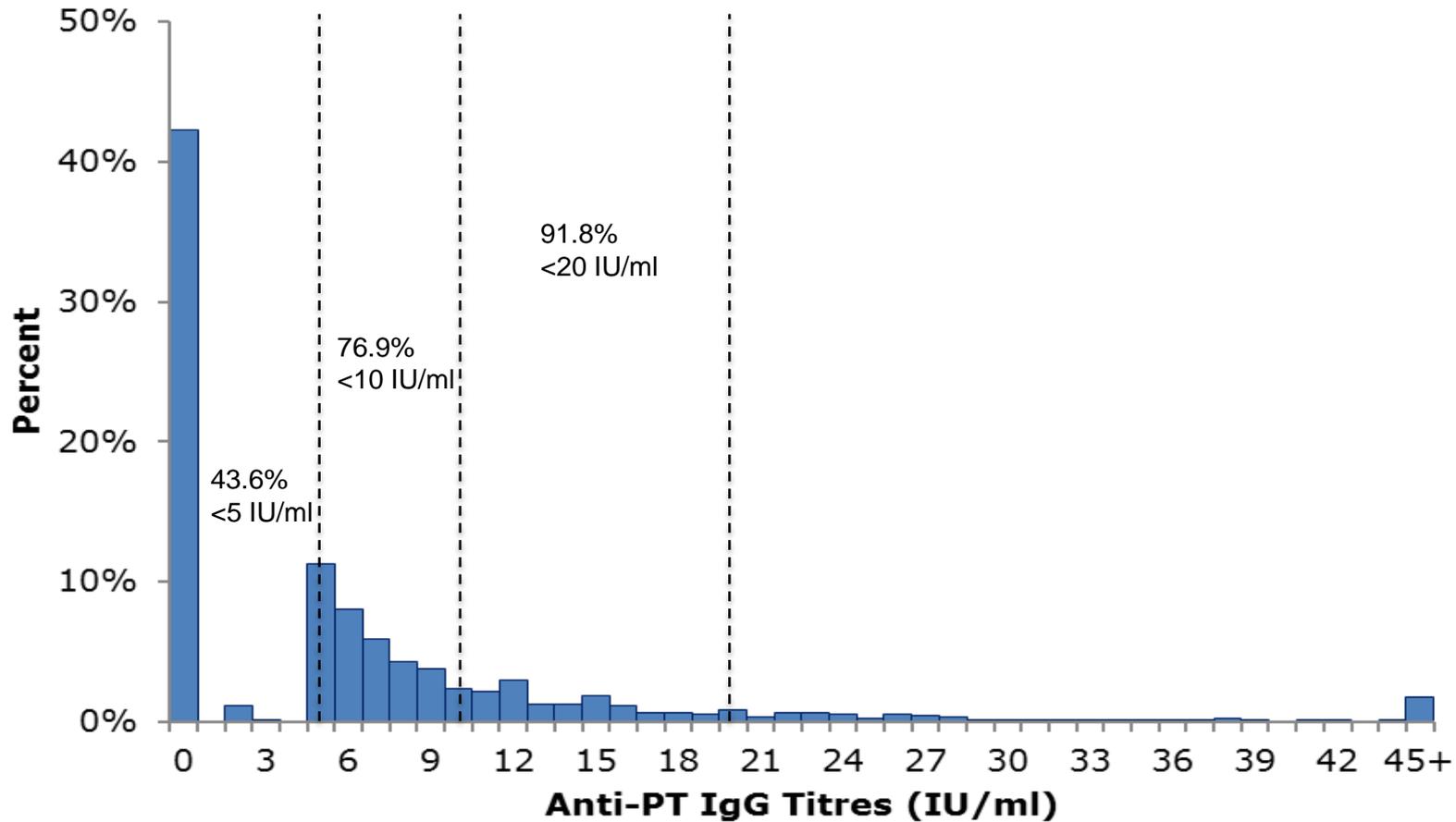
- 1928 participants enrolled in MIREC – 1752 (91%) had a second-trimester plasma sample available for testing.
- Age ranged from 18 to 48 years; 53% from Ontario.
- Geometric mean and median anti-PT titres were both 5.5 IU/ml (0-154)

Table 1. Distribution of Anti-PT IgG titres

	n	Proportion (95% CI)
Negative (≤ 35 IU/ml)	1704	97.3 (96.4-97.9)
Borderline (36-44 IU/ml)	17	0.91 (0.56-1.48)
Positive (45-99 IU/ml)	28	1.66 (1.16-2.37)
Infection (≥ 100 IU/ml)	3	0.17 (0.06-0.50)

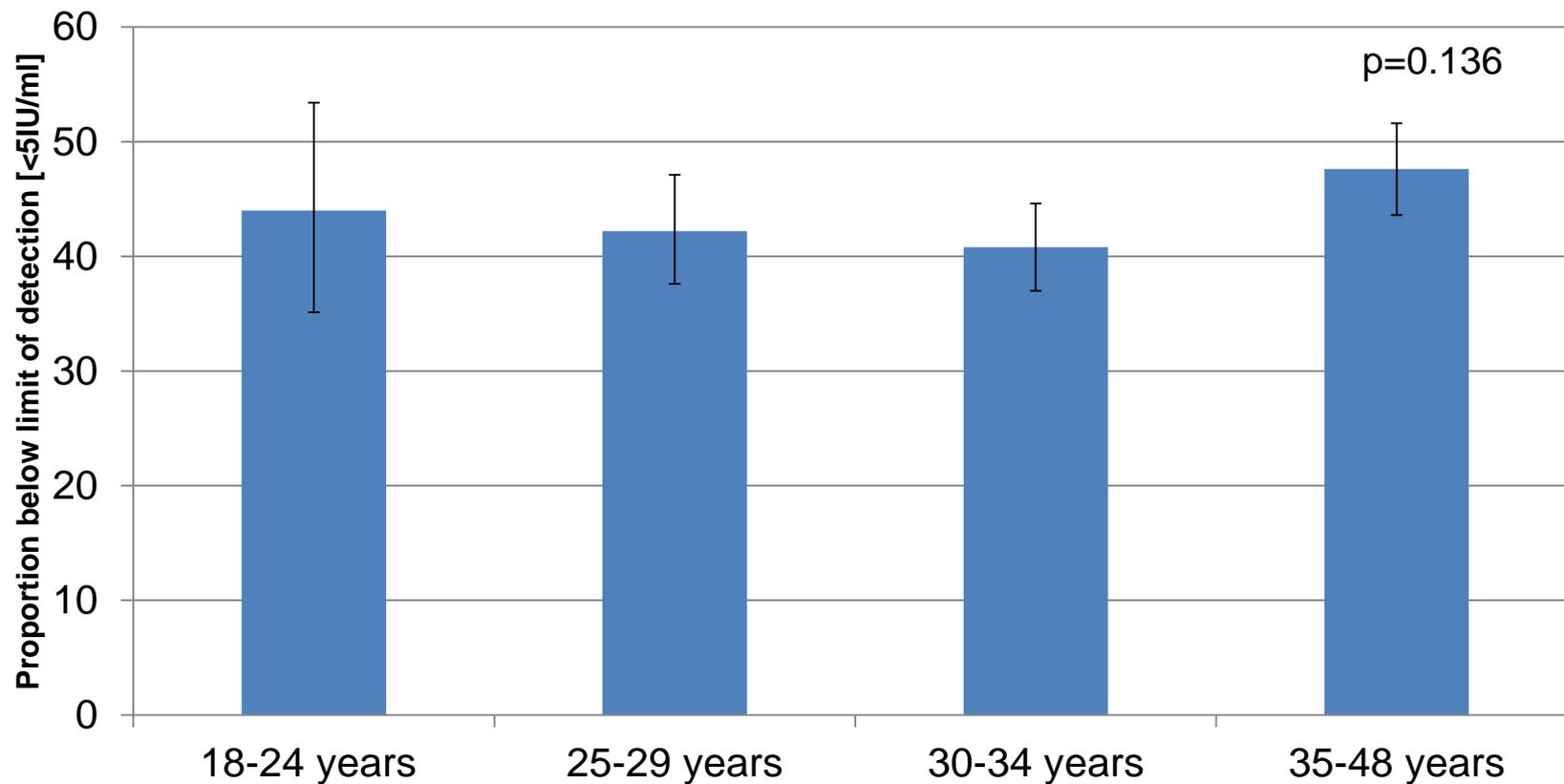
Results

Figure 1. Distribution of anti-PT IgG titres for MIREC study participants with a second-trimester plasma sample available for testing (n=1,752)

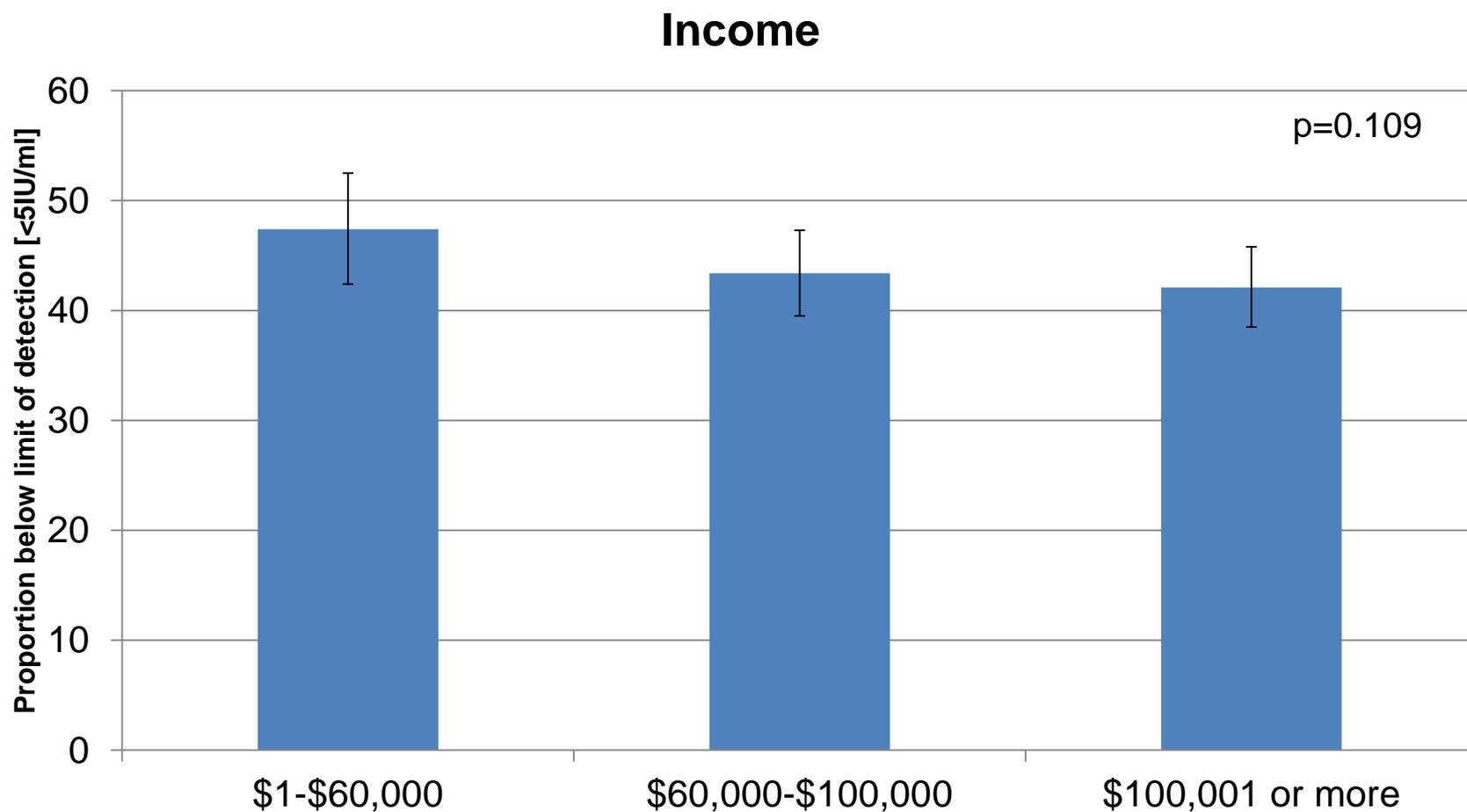


Associations with no detectable anti-PT antibodies

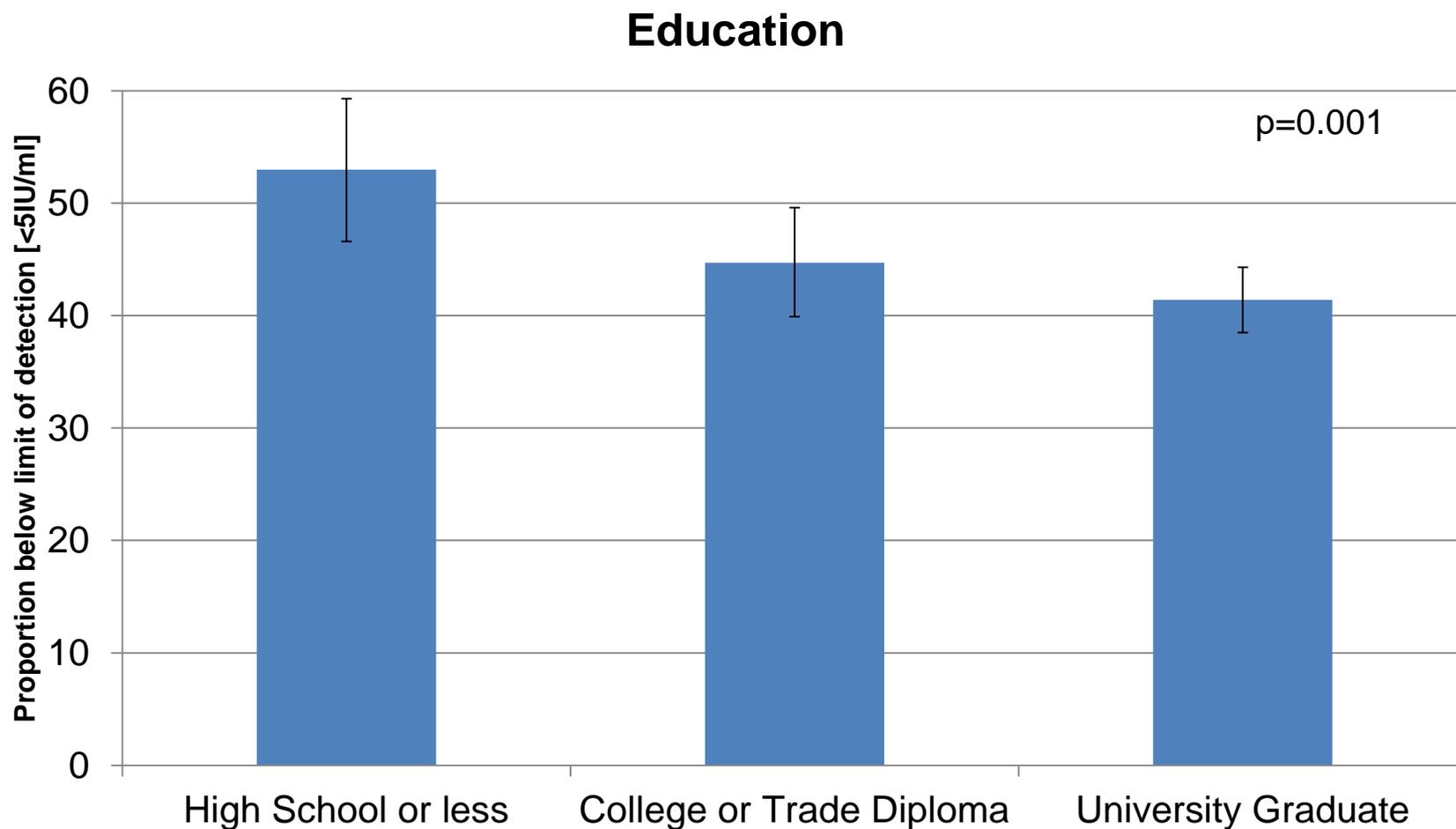
Age at first prenatal visit



Associations with no detectable anti-PT antibodies

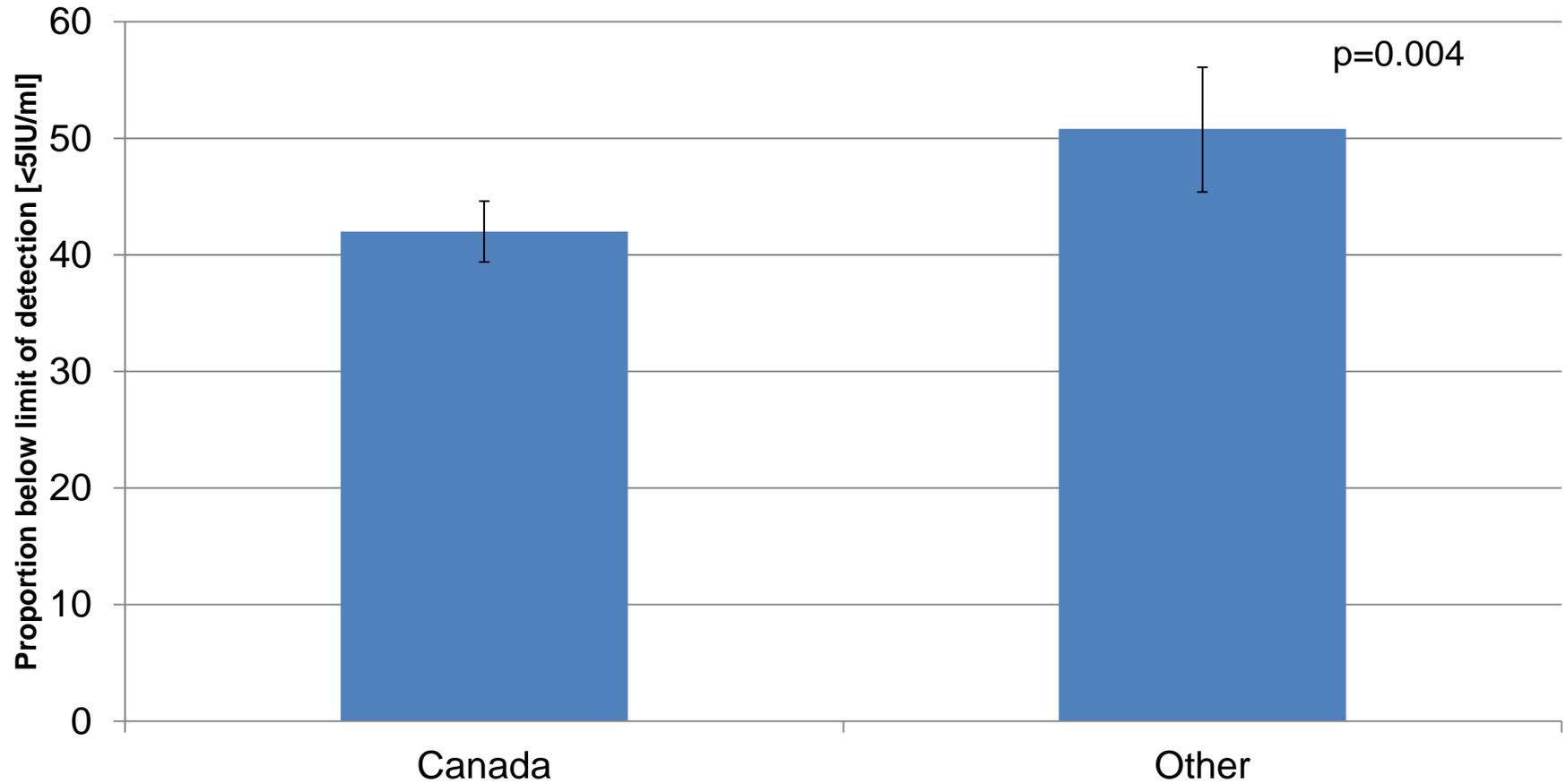


Associations with no detectable anti-PT antibodies



Associations with no detectable anti-PT antibodies

Country of Birth



Discussion

- Our results are consistent with those from other recent studies within Canada and Internationally
 - 79% (Canada) and 87% (Netherlands) with anti-PT titres < 20 IU/mL
- Elapsed time since the most recent pertussis vaccination
 - Lack of durable antibody response
 - Adolescent booster introduced in 2004 – not available to this cohort.
- Anti-PT IgG titres in full-term infants can be 118 to 169% higher than in the mother.

Conclusion

- We observed very low levels of IgG antibodies to PT in this large cohort of pregnant women.
 - Potential that many infants born to women in our study received little maternal antibody protection through placental transfer.
- Monitor the impact of the new maternal Tdap vaccination recommendation in Canada.

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