

Non-western immigrant preschoolers have lower 25-hydroxyvitamin D than children from western born families

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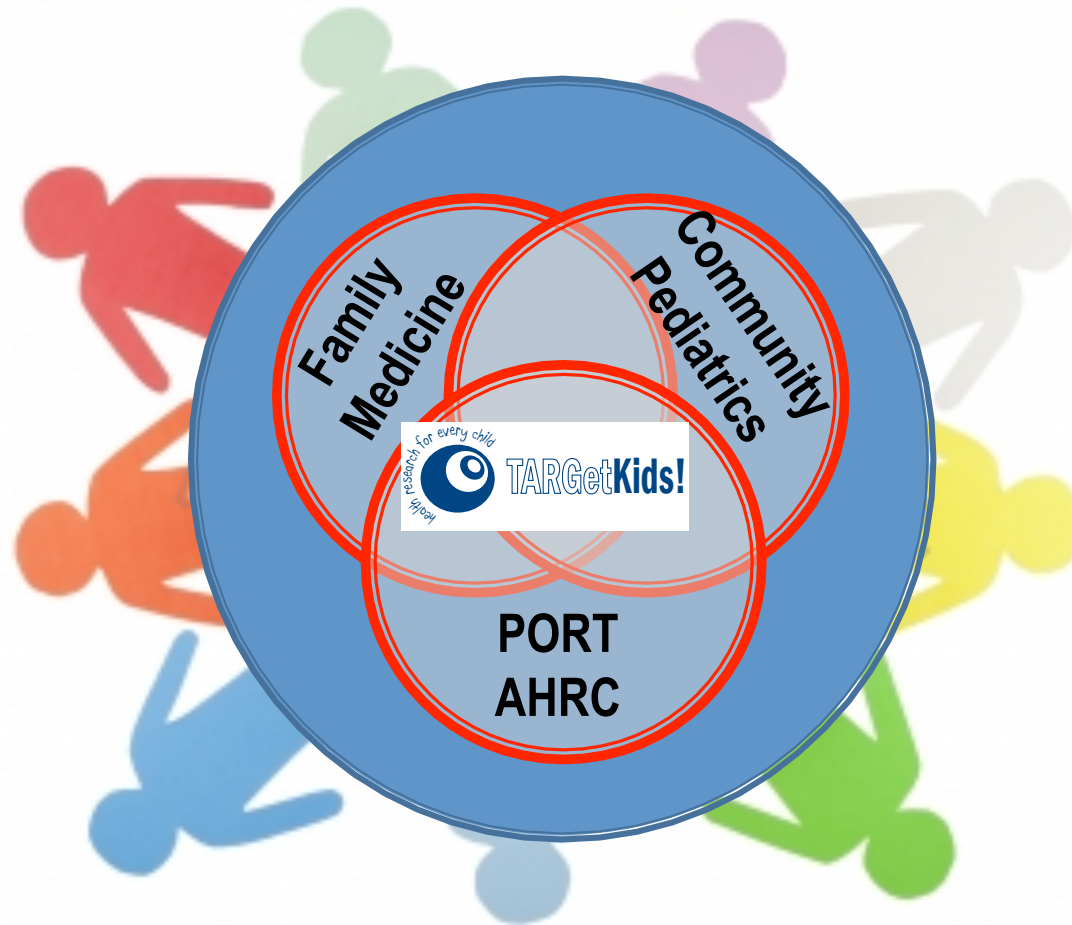
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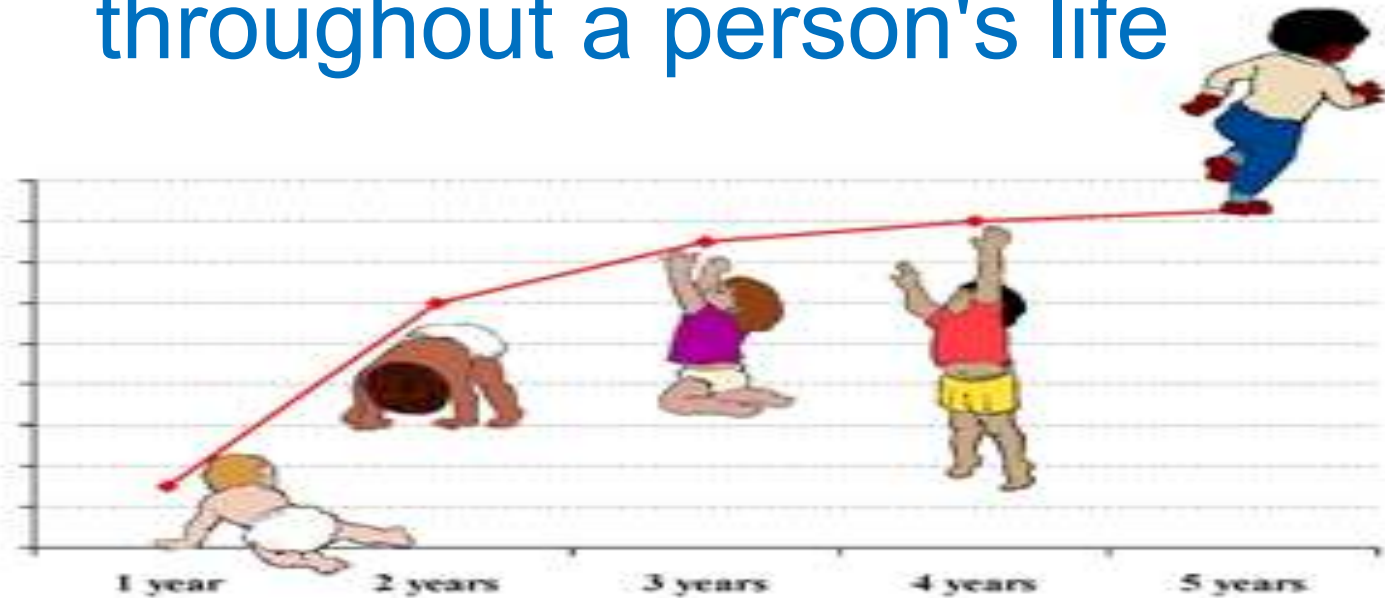
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What is TARGet Kids?



Growth and Development

Healthy growth and development beginning in early childhood, are associated with good health throughout a person's life



Getting the Best Start

Many of the greatest health challenges Canadians face begin in early life, and can be traced back to problems such as poor nutrition and obesity



TARGet Kids! Research Focus

Common health problems faced by urban preschool-aged children (1-6 years):

Overweight/Obesity

Vitamin D deficiency

Iron Deficiency

**Intervene
here**

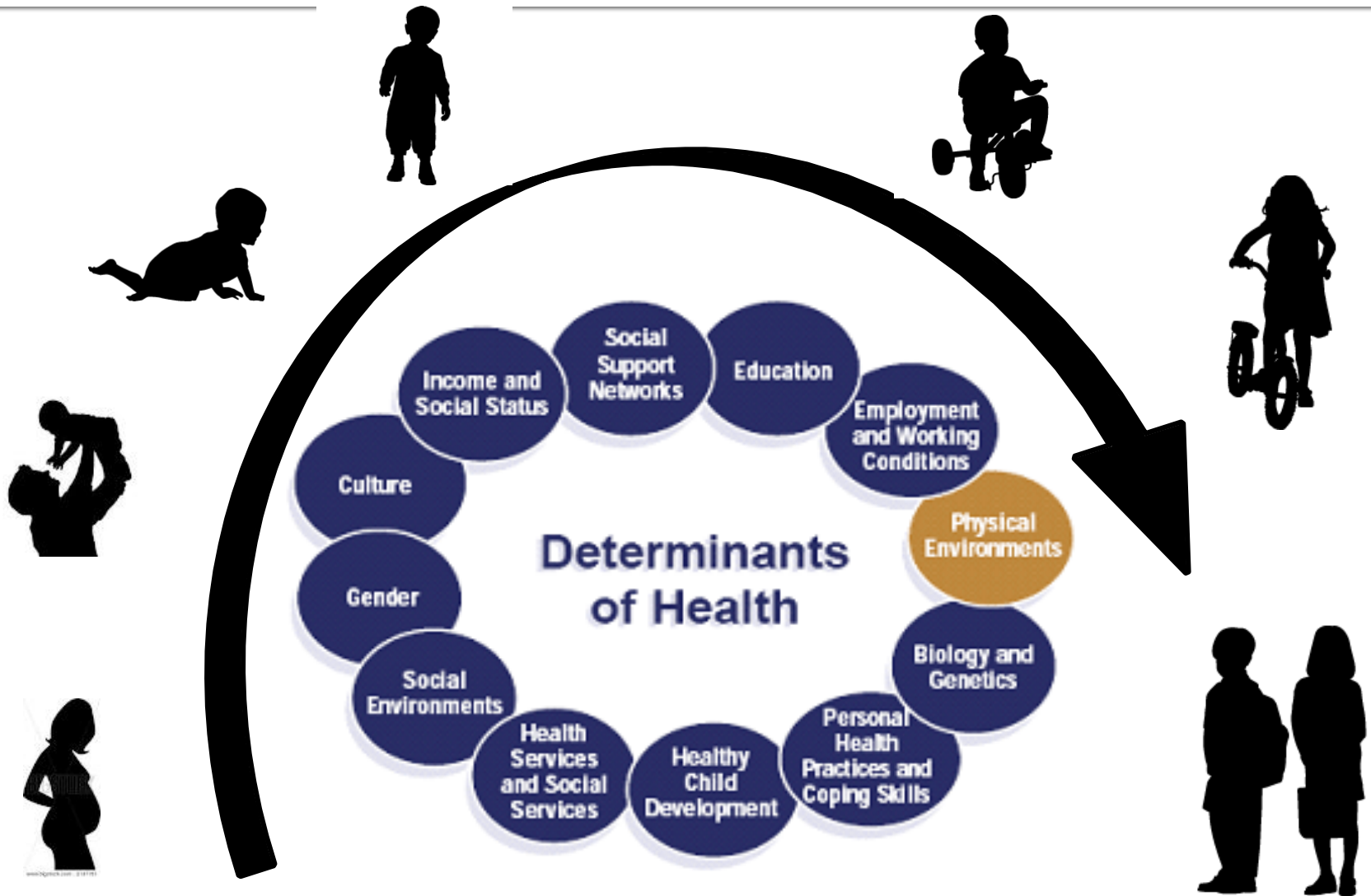
Birth

Nutritional disorder

Adverse health outcomes



Building Healthy Children



Primary Care for Children

Children attend a primary care visit 19 times in the first 5 years



Getting the best start to life can be accomplished with the help of primary care health professionals

Practice Embedded Data Collection

Primary Healthcare Practice

Age newborn to 5 years



Height, weight, BMI
waist circumference,
blood pressure,
head circumference,
parent BMI



Questionnaires



Laboratory
tests

**DATA MANAGEMENT
SYSTEM**
**Applied Health Research
Centre**
Secure web-based data
management using
Medidata RAVE™ software

LABORATORY SERVICES
Mount Sinai Services

A research assistant trained in phlebotomy is embedded in each practice site

The TARGet Kids! Platform

Village Park Paediatrics

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Building Linked Databases



A Platform for Randomized Trials



randomize

Group A

Group B

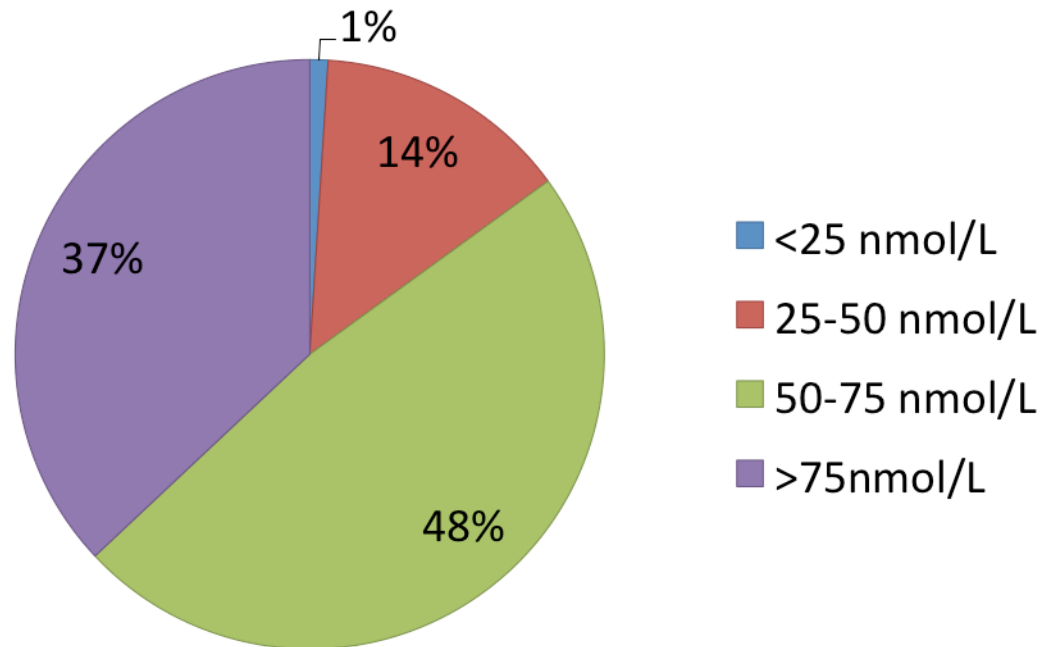
Building Research Capacity

- Research Fellows/New Investigators :
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- Graduate Students:
 - Kawsari Abdullah, Jessica Omand
- Clinical Fellows and Residents:
 - Maya Kumar, Amy French, Joan Abohweyere, Anne Fuller
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Research Study

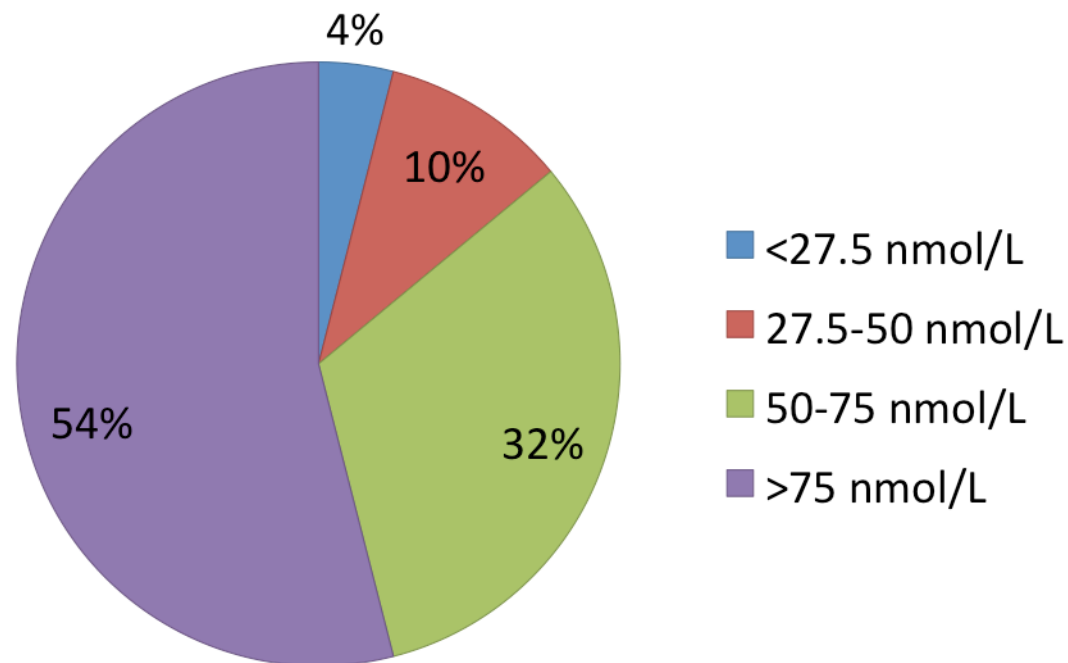
The National Health and Nutrition Examination Survey (NHANES) 2001-2004

25-Hydroxyvitamin D serum levels	
	Mean nmol/L (95% CI)
Ages 1-5 (n=1799)	70 (68-73)

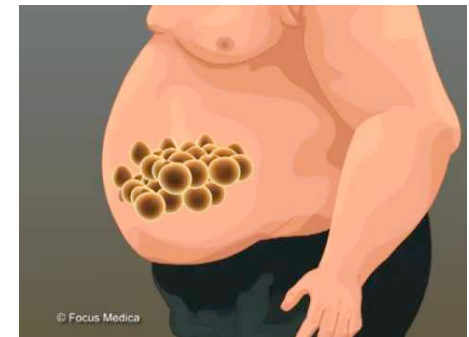


Canadian Health Measures Survey (CHMS)

25-Hydroxyvitamin D serum levels	
	Mean nmol/L (95% CI)
Ages 6-11	75 (70-80)



Known risk factors for low 25-hydroxyvitamin D



Greer 2008; Clemens 1982; Carpenter 2012; Gibson 2005; Nakao 1988; Maguire 2011; Vatanparast 2010; Kumar 2009; Gordon 2004; Ladizesky 1995; Matsuoka 1989; Webb 1988; Gilbert-Diamond 2010; Cizmecioglu 2008; Wortsman 2000; Goel 1976; Compston 1979; ; Glerup 2004; Holvik 2005; Robinson 2006; Ward 2007; McGillvray 2007; Lips 2007; Hintzpeter 2008; Madar 2009; Andersen 2008; Gozdik 2009

Immigration



- Immigration may be a risk factor for low 25-hydroxyvitamin D
- Infants and children of non-western immigrant families appear to be at risk of severe vitamin D deficiency rickets

Hypothesis

- Children older than 1 year from non-western immigrant families in Toronto may be at risk of lower serum 25-hydroxyvitamin D concentration than children from western born families
 - This might be explained by known modifiable risk factors for low 25-hydroxyvitamin D, which could be targets for interventions

Objectives

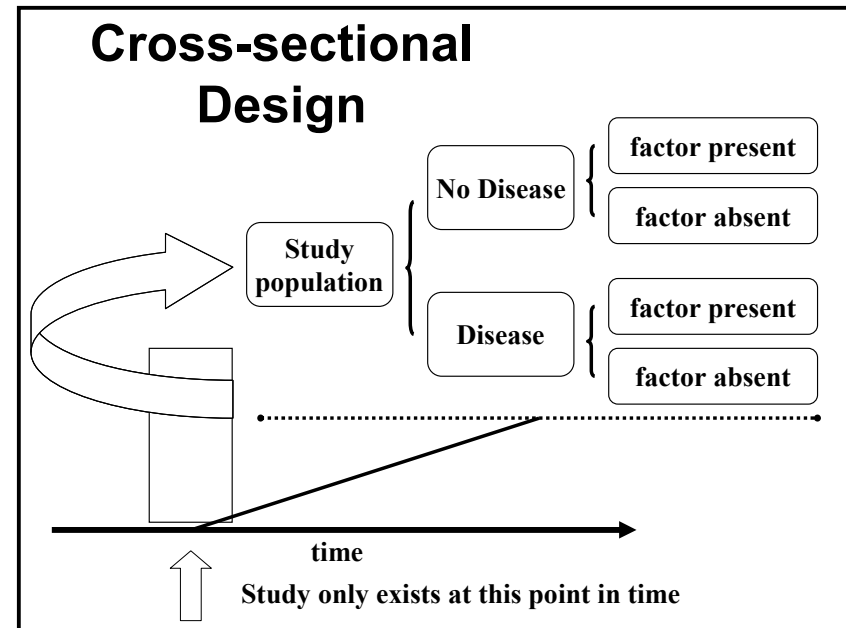
- **Primary objective**: to determine whether children older than 1 year of age from non-western immigrant families have lower serum 25-hydroxyvitamin D levels than children from western born families
- **Secondary objective**: to examine whether known dietary, environmental or biological determinants of 25-hydroxyvitamin D influence this relationship

Methods

Design

Cross-sectional observational study - TARGet Kids! Cohort

- Recruited during routine well child doctor's visits in Toronto
December 2008 - July 2011



Population



Inclusion criteria

- Healthy children ages 1-6 and attend routine primary health care

Exclusion criteria

- Any chronic condition(s) except for asthma
- Severe developmental delay
- Non-verbal English
- Medications known to affect vitamin D metabolism

Measurements



Survey Measurement

- Parent completed standardized data collection form adapted from the Canadian Community Health Survey (Statistics Canada, 2004)



Physical Measurement

- BMI (kg/m^2) - weight and height



Laboratory Measurement

- Serum 25-hydroxyvitamin D concentration

Exposure

Primary exposure: non-western immigration (non-western vs. western)

- **We defined the exposure as:**
 - **Non-western** = child born outside of a western country (Europe, North America, Australia or New Zealand) or a child who has a parent (one or both) who emigrated from a non-western country
 - **Western** = child born in a Western country and both parents born in western countries

Outcomes

- **Primary outcome**: 25-hydroxyvitamin D in nmol/L
(continuous)
- **Secondary outcome**: 25-hydroxyvitamin D <50 nmol/L
(binary)

Covariates

- Sex
- Age
- Skin pigmentation
- Ethnicity
- BMI
- Season
- Current vitamin D supplementation
- Cow's milk intake
- Outdoor play

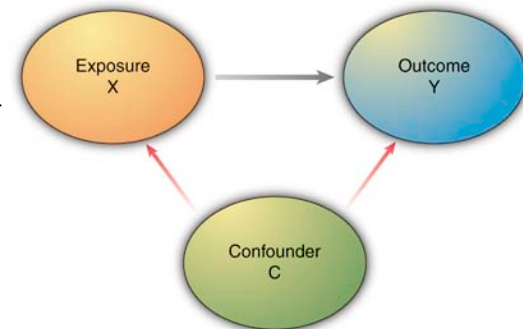
Analysis

Primary analysis:

- Univariate linear regression for the primary outcome
- Univariate logistic regression for the secondary outcome

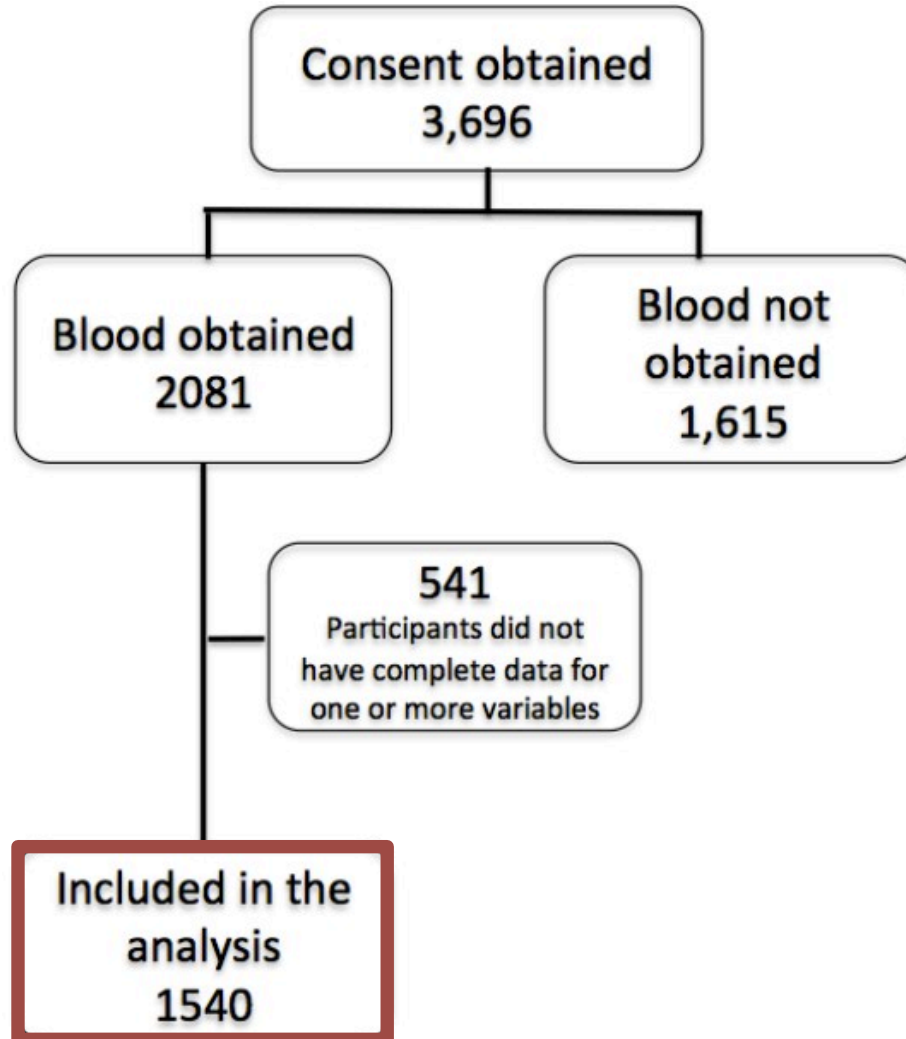
Secondary analysis:

- Multiple linear regression
 - 2 Biologically plausible **interactions** were considered:
 - Immigration and skin pigmentation
 - Immigration and vitamin D supplementation
- Potential confounding variables were explored



Results

Participation flowchart



Population Descriptors

	Children from western born families N=1119 (73%)		Children from non-western immigrant families N=421 (27%)	
Child characteristics	Frequency (%)	Median (Range)	Frequency (%)	Median (Range)
Age, months		36 (12–75)		38 (12–78)
Sex, male	564 (50)		221 (52)	
Skin pigmentation				
Light	1061 (95)		259 (62)	
Ethnicity				
Mixed western	958 (86)		46 (11)	
Mixed western/non-western	143 (13)		202 (48)	
East Asian & Southeast Asian	8 (1)		82 (19)	
Southwest Asian	9 (1)		61 (14)	
African & Caribbean	1 (0.1)		30 (7)	
Vitamin D supplements				
Yes	633 (57)		217 (52)	

Primary analysis

Do children from non-western immigrant families have lower serum 25-hydroxyvitamin D levels than children from western born families?

- **Univariable linear regression:**
 - 4 nmol/L lower 25-hydroxyvitamin D (85 vs. 89 nmol/L, $p=0.006$, 95% CI: 1.3 – 8.0)

- **Univariable logistic regression:**
 - Increased odds of 25-hydroxyvitamin D levels less than 50 nmol/L (OR 1.9, 95% CI: 1.3 – 2.9)

Secondary analysis

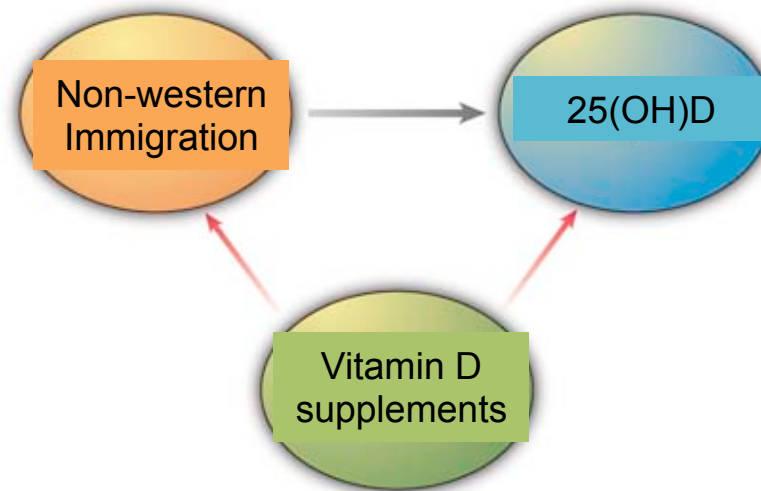
What is the influence of known vitamin D determinants on the relationship between non-western immigration and 25-hydroxyvitamin D?

Child characteristics	Change in serum 25-hydroxyvitamin D (nmol/L)	P-value
Immigration (non-western:western)	-0.04	0.99
Age, months	-0.09	0.04*
Sex (female:male)	-0.03	0.98
Skintype (dark:light)	-2.40	0.37
BMI, z-score	-1.01	0.18
Ethnicity		
Mixed western	Reference	0.09**
East Asian & Southeast Asian	-5.15	
Southwest Asian	-2.44	
African & Caribbean	-14.54	
Mixed Western/non-Western	-4.54	
Season (winter:summer)	-4.15	0.008*
Daily cow's milk intake, mL	0.02	<0.0001*
Vitamin D supplementation (yes:no)	7.58	<0.0001*
Outdoorplay (5-7:1-4hrs/week)	0.03	0.99

hydroxyvitamin D (p <0.05)

Discussion

- We identified an association between non-western immigration and lower 25-hydroxyvitamin D in early childhood
 - The association disappeared once known predictors of 25-hydroxyvitamin D were accounted for
 - 2 modifiable factors were identified cow's milk intake and vitamin D supplementation
 - Vitamin D supplementation had the strongest confounding effect



Strengths & Limitations

Strengths:

- Large sample size
- Urban population

Limitations:

- Cross-sectional design, causality cannot be inferred
- Date since immigration to Canada
- Residual confounding
- Exclusion of non English speaking families
- Representative of non-urban populations

Conclusions

- Children from non-western immigrant families may be at increased risk of lower 25-hydroxyvitamin D concentration
 - Almost 2-fold increased odds of 25-hydroxyvitamin D levels less than 50 nmol/L
- The observed 25-hydroxyvitamin D mean difference between immigration groups could largely be explained by known vitamin D determinants
 - Vitamin D supplementation had the strongest confounding effect

Implications

- **Targeted interventions** to improve vitamin D supplementation among immigrant children beyond the first year of life may be successful at increasing 25-hydroxyvitamin D in this population



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St. Michael's

Inspired Care.
Inspiring Science.



Committee

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