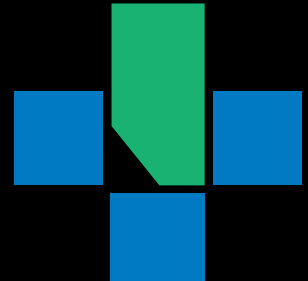# Prevalence of food allergies: What is KNOWN What is UNKNOWN

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Toronto, June 23, 2015

Overview of Presentation

- **Review approaches used to estimate prevalence of food allergy**

- **Discuss prevalence studies conducted in Canada**

Approaches to Assessing Prevalence

- **Population sampled**
  - **Geographic location**
    - **City, province, country**

  - **Age**
    - **Milk, egg, wheat, soy – majority outgrow**
    - **Fish, shellfish – develop later in childhood**

  - **Ethnicity**
    - **Dietary habits**
    - **Other environmental factors**

Approaches to Assessing Prevalence

- **How population sampled**
  - Random population - based
  - Targeted population – vulnerable populations
  - Clinic – based; if allergy clinic – inflated estimates

- **Participation rates will vary**
  - In population-based surveys - response 35 – 70%
  - Non-allergic less likely to respond, ⬆ estimates
  - In challenge studies, allergic less likely to respond, ⬇ estimates

- **Statistical analysis of missing data**

Approaches to Assessing Prevalence

- **Definition of food allergy**
  - Questionnaire
    - Single question on self-reported allergy
    - Detailed history of reaction symptoms & diagnostic testing

  - Diagnostic testing
    - SPT – sensitized but not clinically allergic
    - Allergen-specific IgE – threshold depends on pre-test probability or history
    - Food challenge – presents huge obstacles

Canadian Prevalence Studies

Prevalence of peanut allergy in primary-school children in Montreal, Canada

Rhoda S. Kagan, MD,[a] Lawrence Joseph, PhD,[b,c] Claire Dufresne, BScN,[d]
Katherine Gray-Donald, PhD,[e] Elizabeth Turnbull, RN,[b] Yvan St. Pierre, MA,[b] and
Ann E. Clarke, MD, MSc[b,f] *Montreal, Quebec, Canada*

Is the prevalence of peanut allergy increasing? A 5-year follow-up study in children in Montreal

Moshe Ben-Shoshan, MD,[a] Rhoda S. Kagan, MD,[b] Reza Alizadehfar, MD,[a] Lawrence Joseph, PhD,[c,d] Elizabeth Turnbull,
RN,[c] Yvan St Pierre, MA,[c] and Ann E. Clarke, MD, MSc[d]   *Montreal, Quebec, and Toronto, Ontario, Canada*

Study Aim and Design

- **Aim**
  - **To determine if prevalence of peanut allergy increased over 5 years (00-02 $\rightarrow$ 05-07) in Montreal school children**
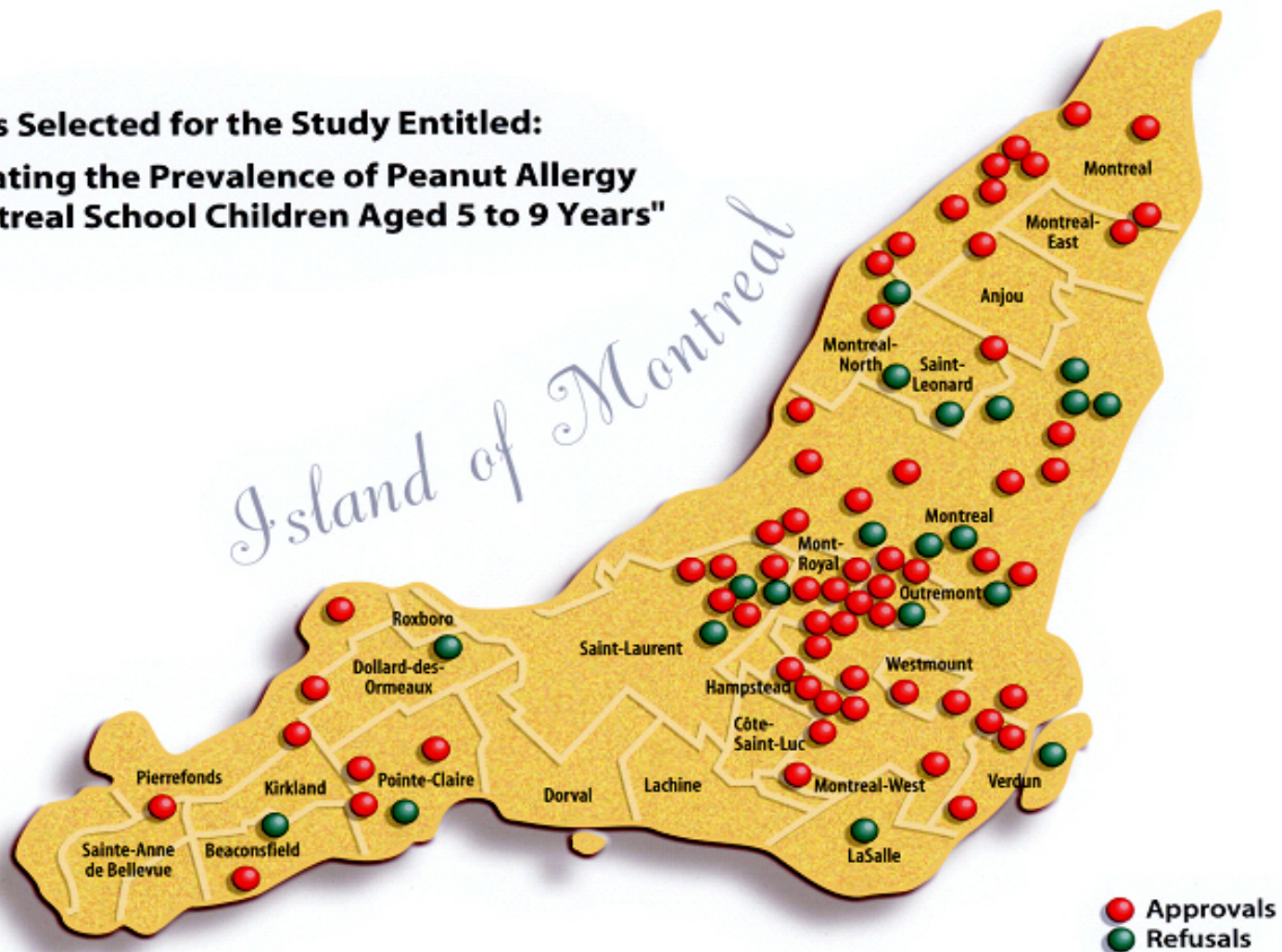
- **Hypothesis**
  - **Prevalence will double over 5 years**
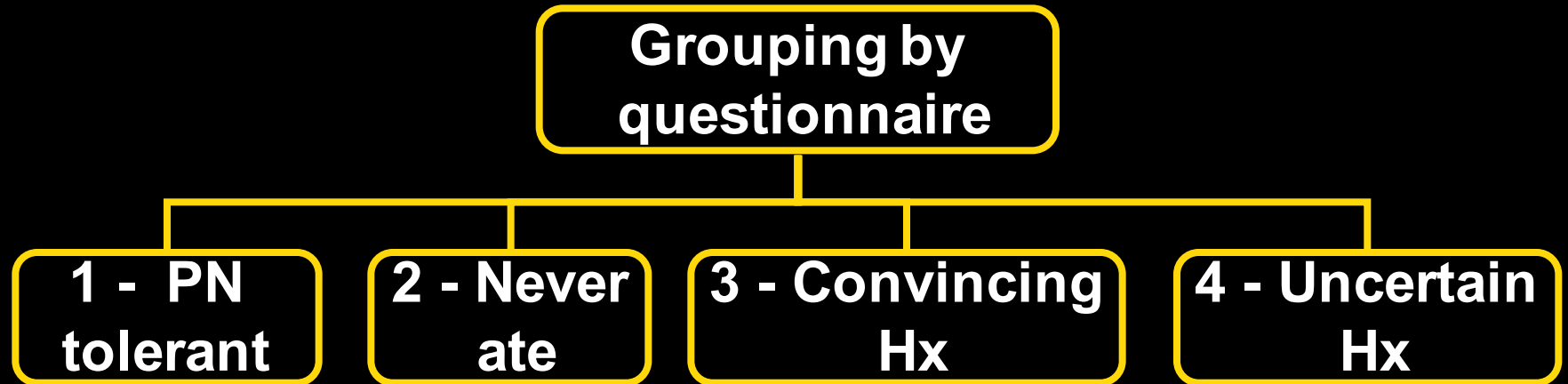
- **Methods**
  - **Re-visit schools randomly selected in 2000-02**
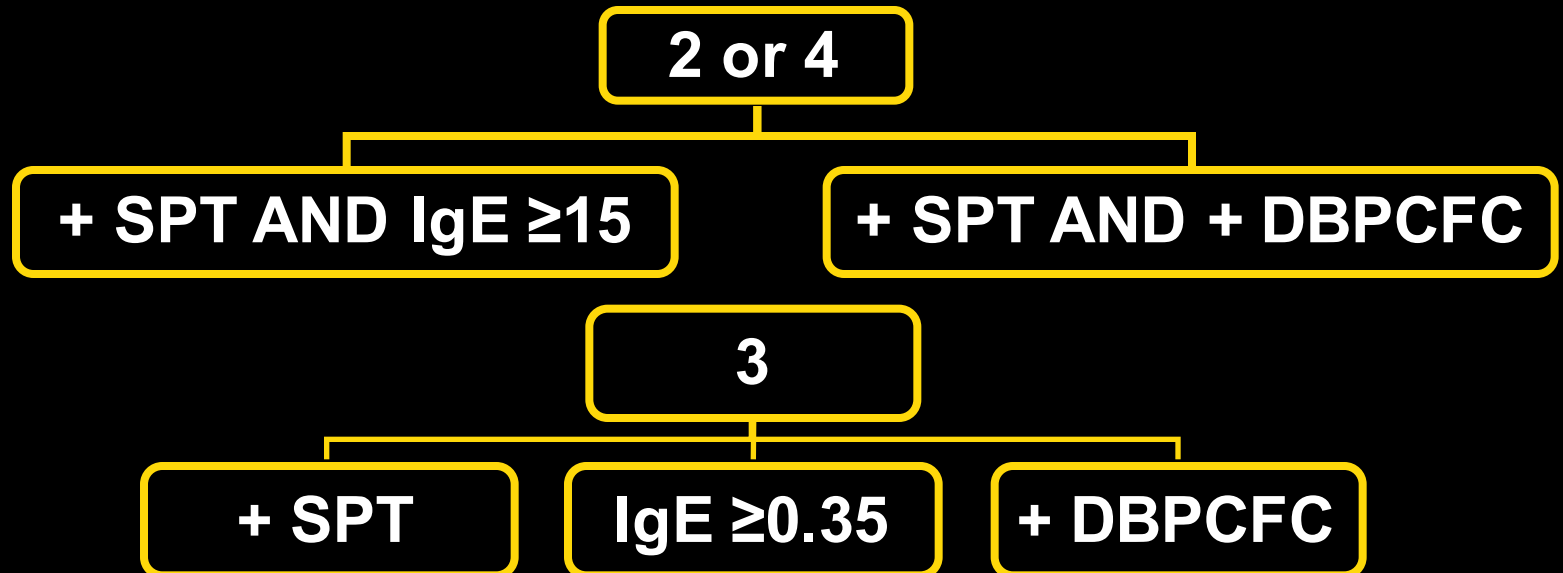 - **Random selection of K – Gr 3**
  - **Identical diagnostic criteria**

Schools Selected for the Study Entitled:

"Estimating the Prevalence of Peanut Allergy in Montreal School Children Aged 5 to 9 Years"

Island of Montreal

Montreal

Montreal-East

Anjou

Montreal-North

Saint-Leonard

Montreal

Outremont

Westmount

Mont-Royal

Saint-Laurent

Hampstead

Côte-Saint-Luc

Roxboro

Dollard-des-Ormeaux

Dorval

Lachine

Montreal-West

Verdun

Pierrefonds

Kirkland

Pointe-Claire

Sainte-Anne de Bellevue

Beaconsfield

LaSalle

● Approvals
● Refusals

Methods

Grouping by questionnaire

- **1 - PN tolerant**
- **2 - Never ate**
- **3 - Convincing Hx**
- **4 - Uncertain Hx**

Diagnosis

2 or 4

- **+ SPT AND IgE ≥15**
- **+ SPT AND + DBPCFC**

3

- **+ SPT**
- **IgE ≥0.35**
- **+ DBPCFC**

Prevalence: Temporal Change

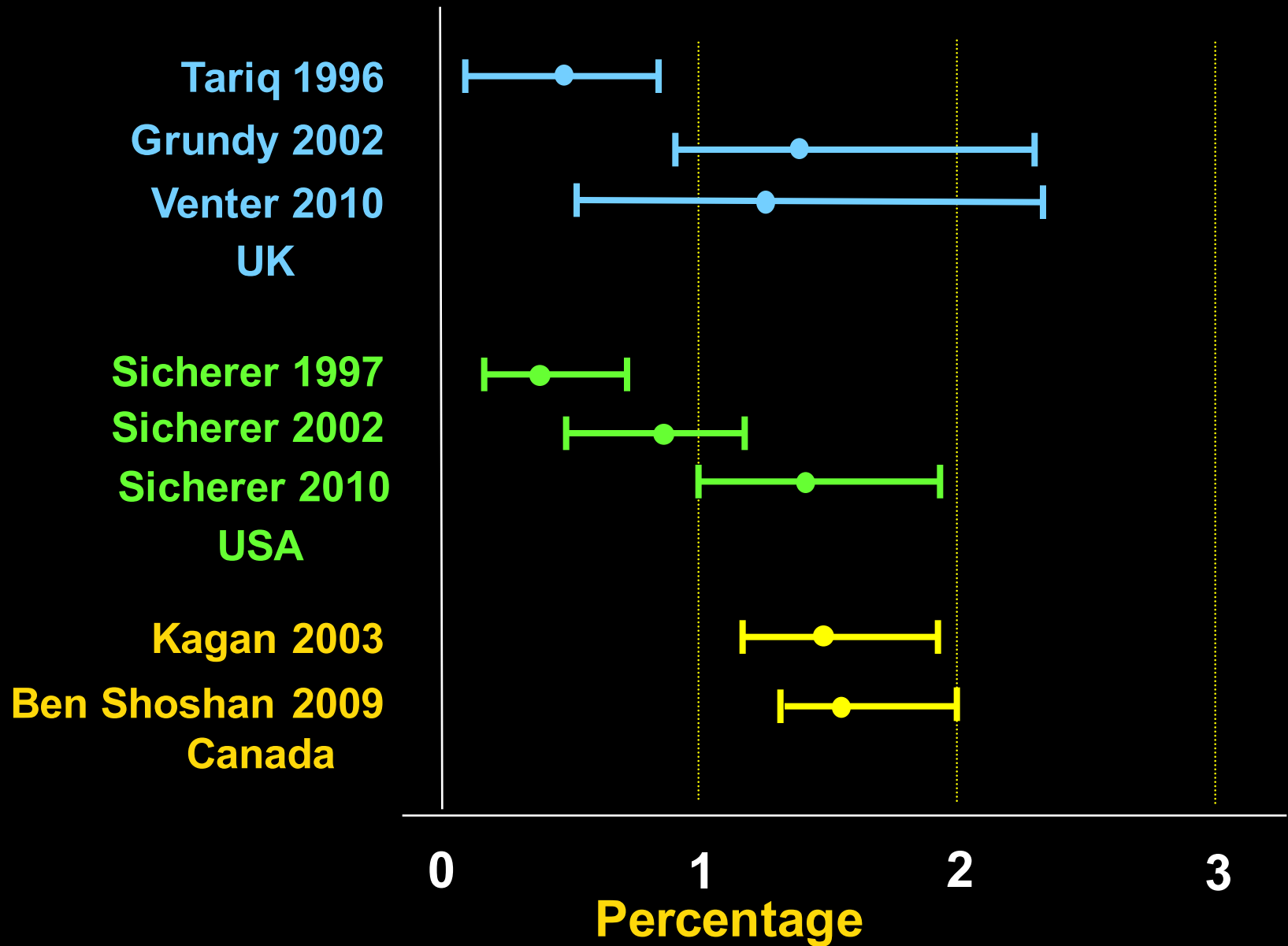|	Prevalence 2000/02	Prevalence 2005/7	Difference (95%CI)
Full responders	1.50%	1.63%	0.13% (-0.4%, 0.6%)
Full & partial responders	1.76%	2.06%	0.30% (-0.3%, 0.9%)
Full, partial, & non-responders	1.34%	1.62%	0.28% (-0.2%, 0.7%)
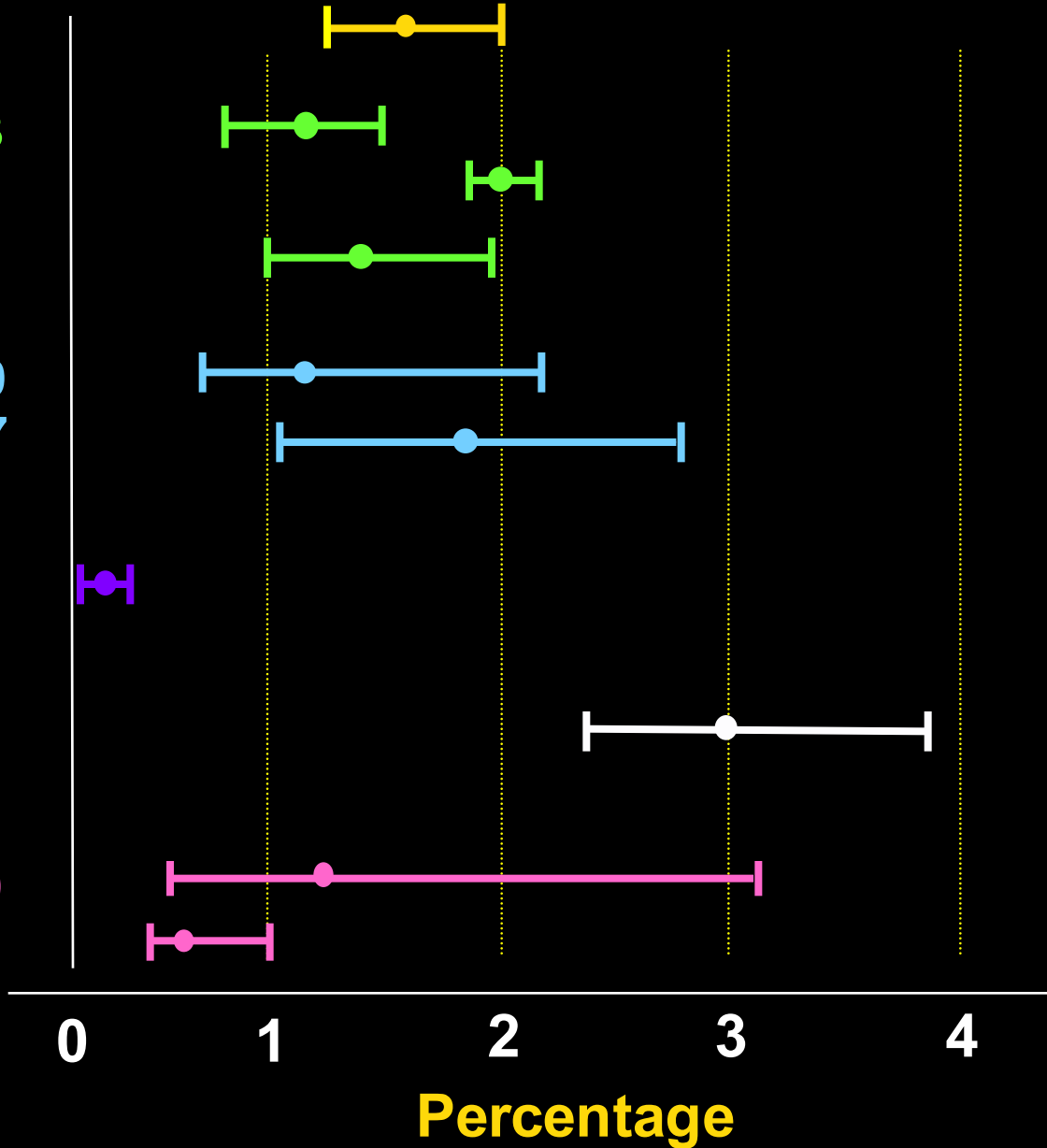
Is Peanut Allergy Increasing?

A population-based study on peanut, tree nut, fish, shellfish, and sesame allergy prevalence in Canada

Moshe Ben-Shoshan, MD,[a] Daniel W. Harrington, MA,[e] Lianne Soller, BSc,[b] Joseph Fragapane, BSc,[b] Lawrence Joseph, PhD,[b,d] Yvan St Pierre, MA,[b] Samuel B. Godefroy, PhD,[f] Susan J. Elliot, PhD,[e] and Ann E. Clarke, MD, MSc[b,c]   *Montreal, Quebec, and Hamilton and Ottawa, Ontario, Canada*

Overall prevalence of self-reported food allergy in Canada

Possession of epinephrine auto-injectors by Canadians with food allergies

Demographic Predictors of Peanut, Tree Nut, Fish, Shellfish, and Sesame Allergy in Canada

M. Ben-Shoshan,[1] D. W. Harrington,[2] L. Soller,[3] J. Fragapane,[3] L. Joseph,[3,4] Y. St. Pierre,[3] S. B. Godefroy,[5] S. J. Elliott,[6] and A. E. Clarke[3,7]

SCAAALAR:
Surveying CAnadians on the prevalence of food Allergy and Attitudes towards food LAbelling and Risk

- **Canadian population in 10 provinces**

- **Methodology**
  - Random sampling across provinces
  - Household level

- **Diagnosis of food allergy**
  - History
  - Unable to do individual assessments

Sampling Frame

10 596 households randomly selected from e-White Pages

↓

Information letter mailed

↓

Households called

↓

3666 households (35%) participated

↓

9667 individuals

Food Allergy: Definitions

1. **Perceived:** Self-reported food allergy

2. **Probable:** Self report of convincing history and/ or physician diagnosis

3. **Confirmed:** Clinical history with confirmatory tests provided by treating MD

Prevalence Estimates: Children

	Perceived	Probable	Confirmed
Peanut	1.77%	1.68%	1.03%
Tree nut	1.73%	1.59%	0.69%
Fish	0.18%	0.18%	-
Shellfish	0.55%	0.50%	0.06%
Sesame	0.23%	0.23%	0.03%

Overall Prevalence of Self-Reported Food Allergy

	Children	Adults	Entire study population
Including all adults	7.14%	8.34%	8.07%
Excluding some adults	7.14%	6.56%	6.69%
Estimate #2 adjusted for non-response	7.12%	6.58%	6.67%

Respondent Characteristics

	SCAAALAR	CDN Population
College/University	60.5%	33%
Born in Canada	85.6%	81%
Immigrated < 10 yrs	1.9%	6.3%
Married/ Co-habit	70.3%	72%
Dwelling owned	82.1%	68%
HH income, median	70K	64K
Urban	61 – 84%	68 – 86%

The use of incentives in vulnerable populations for a telephone survey: a randomized controlled trial

Megan Knoll[1*], Lianne Soller[1], Moshe Ben-Shoshan[2], Daniel Harrington[3], Joey Fragapane[1], Lawrence Joseph[1,4], Sebastien La Vieille[5], Yvan St-Pierre[1], Kathi Wilson[3], Susan Elliott[6] and Ann Clarke[1,7]

Prevalence and Predictors of Food Allergy in Canada: A Focus on Vulnerable Populations

Lianne Soller, BSc, MSc[a], Moshe Ben-Shoshan, MSc, MD[b], Daniel W. Harrington, MA, PhD[c], Megan Knoll, MSc[a], Joseph Fragapane, BEng, MD[a], Lawrence Joseph, PhD[a,d], Yvan St. Pierre, MA[a], Sebastien La Vieille, MD[e], Kathi Wilson, PhD[f], Susan J. Elliott, PhD[g], and Ann E. Clarke, MSc, MD[a,h]   *Montreal, Quebec; Kingston, Ottawa, Toronto, and Waterloo, Ontario; and Calgary, Alberta, Canada*

Adjusting for nonresponse bias corrects overestimates of food allergy prevalence

Lianne Soller, BSc, MSc, PhD candidate[a],

Moshe Ben-Shoshan, MD, MSc[b],

Daniel W. Harrington, MA, PhD[c], Megan Knoll, MSc[a],

Joseph Fragapane, BEng, MD[a], Lawrence Joseph, PhD[a,d],

Yvan St. Pierre, MSc[a], Sebastien La Vieille, MD[e],

Kathi Wilson, PhD[f], Susan J. Elliott, PhD[g], and

Ann E. Clarke, MD, MSc[a,h]

Likelihood of being prescribed an epinephrine autoinjector in Canadians with lower educational levels

Eczema in Early Childhood, Sociodemographic Factors and Lifestyle Habits Are Associated with Food Allergy: A Nested Case-Control Study

Ben-Shoshan M.[a] · Soller L.[b] · Harrington D.W.[d] · Knoll M.[b] · La Vieille S.[e] · Fragapane J.[b] · Joseph L.[b, c] · St. Pierre Y.[b] · Wilson K.[f] · Elliott S.J.[g] · Clarke A.E.[h]

SPAACE:
Surveying Prevalence of food Allergy in All Canadian Environments

- **Vulnerable populations**
  - New Canadians
  - Low income/ education
  - Aboriginal identity

- **Methodology**
  - Target CTs with >% vulnerable populations
  - Ensure all regions represented
  - CTs were converted to postal codes
  - Random sample of household numbers from these postal codes

Sampling Frame

12 762 households randomly selected from e-White Pages

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Information letter & **incentive** mailed

↓

Households called

↓

6258 households (49%) participated

↓

15 022 individuals
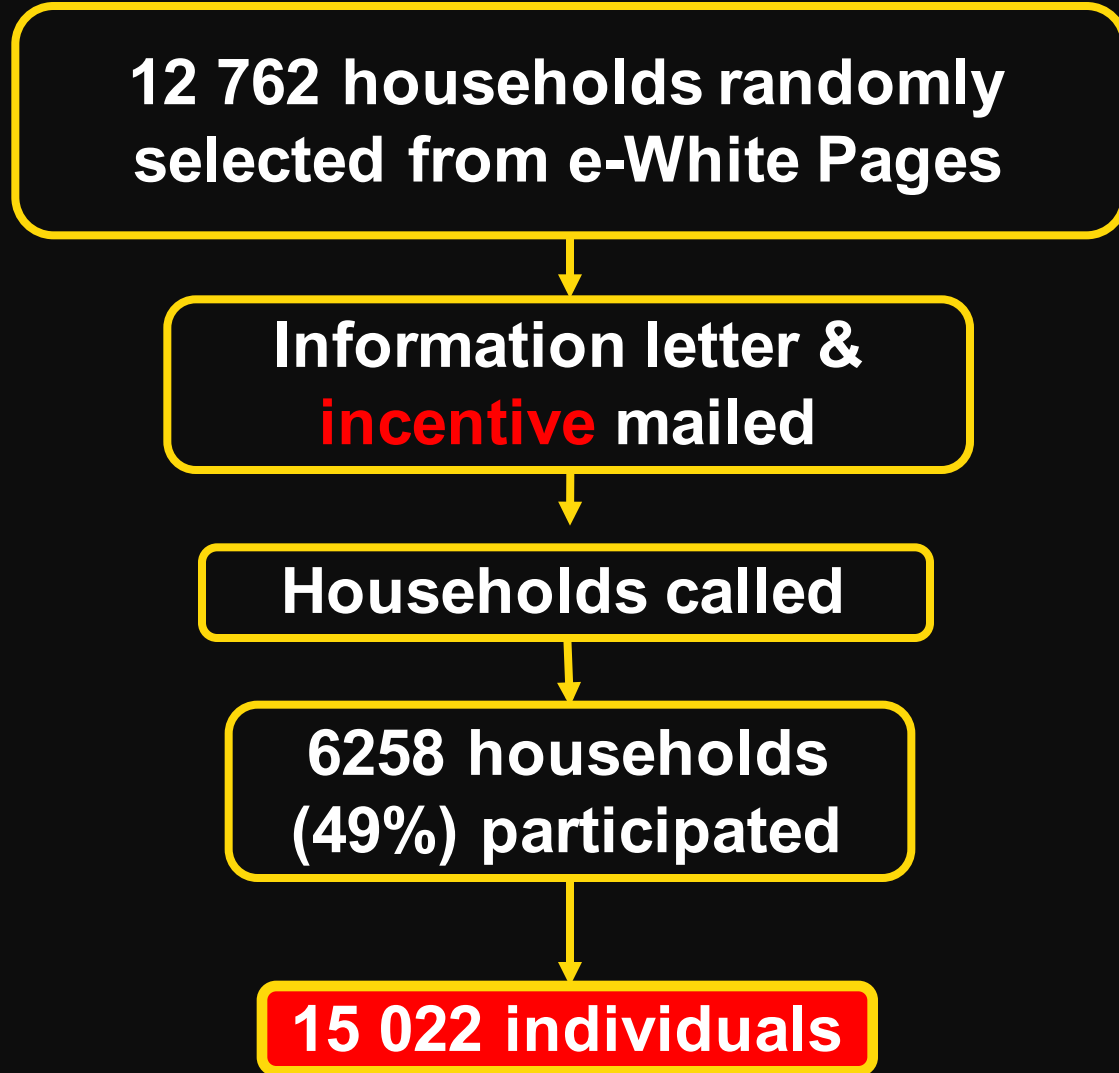
Respondent Characteristics

	SCAAALAR	SPAACE	CDN Population*
Below LICO	8.9%	22.8%	15.7%
Immigrant < 10 yrs	1.9%	11.8%	7.2%
Aboriginal	Unknown	15.1%	3.8%

*Statistics Canada 2006

Prevalence Estimates: All Participants

	SPAACE Perceived	SPAACE Probable	SCAAALAR Perceived
Peanut	1.1%	1.0%	1.0%
Tree nut	1.3%	1.2%	1.2%
Fish	0.7%	0.6%	0.5%
Shellfish	1.7%	1.4%	1.6%
Overall	6.4%	_	8.1%
Weighted Overall	7.5%	_	_

Prevalence Estimates: Children

	SPAACE Perceived Weighted	SPAACE Perceived Unweighted	SCAAALAR Perceived Unweighted
Peanut	2.4% (1.6, 3.2)	1.9% (1.5, 2.3)	1.8% (1.2, 2.3)
Fish	1.0% (0.3, 1.8)	0.8% (0.5, 1.1)	0.2% (0, 0.4)
Shellfish	1.4% (0.6, 2.1)	1.0% (0.7, 1.4)	0.6% (0.2, 0.9)
Milk	0.7% (0.3, 1.1)	0.5% (0.3, 0.8)	2.2% (1.5, 3.0)
Wheat	0.3% (0.0, 0.6)	0.2% (0.1, 0.3)	0.4% (0.1, 0.8)

SCAAALAR vs SPAACE

- **Weighted cannot be compared with unweighted**
  - **Weighted provides general population estimates**
  - **Cannot calculate weighted for SCAAALAR because no individual level data, particularly on birthplace**

- **Unweighted cannot be compared with unweighted**
  - **Sampling frame different**
    - **SCAAALAR – random sample**
    - **SPAACE – targeted vulnerable**

- **Confidence intervals overlap**

Prevalence Estimates:
Lower vs Higher Education

	Lower Education	Higher Education
Peanut	0.6% (0.3, 0.9%)	0.8% (0.4, 1.1%)
Tree nut	0.7% (0.4, 1.0%)	1.7% (1.2, 2.3%)
Shellfish	1.5% (1.1, 2.0%)	2.2% (1.6, 2.8%)
Other	2.9% (2.3, 3.5%)	4.1% (3.2, 4.9%)
Overall	6.4% (5.5, 7.3%)	8.9% (7.7, 10%)

Prevalence Estimates:
Immigrant Status

	Immigrant < 10 yrs	Immigrant ≥ 10 yrs	Born in Canada
Peanut	0.4%	0.5%	1.3%
Tree nut	0.2%	0.6%	1.5%
Shellfish	1.3%	1.5%	1.8%
Other	1.3%	2.3%	3.5%
Overall	3.2%	5.5%	8.2%

Prevalence Estimates: Bias-Adjusted

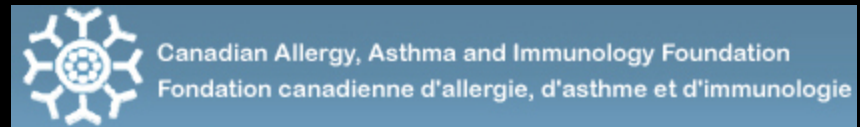|	N	Prevalence
Full Participants	15, 022	6.4%
Refusal Q Participants	1 393	2.1%
Non-participants	17, 059	1.0 – 4.2%
Never Reached	8 491	1.1 – 6.4%
All	41, 893	3.0 – 5.4%

What is KNOWN

- **Prevalence of self-reported food allergy in Canada**
  - **7.5%**

- **Likely an overestimate**
  - **Low response rate and the allergic more likely to participate**
  - **More realistic estimate likely 4% to 5.4%**

- **Diagnosis has to rely on hx**
  - **Unrealistic to require FC**
  - **Supplement with report of testing**

- **Increased awareness about food allergy**

What is UNKNOWN

- **Is the prevalence increasing in Canada?**
  - **Actual increase**
  - **Apparent increase because of increased awareness**
  - **Cannot rely on self-report only**
  - **Appropriate hx is crucial**

- **What are modifiable risk factors?**
  - **Age and mode of introduction**

- **How to translate risk into prevention?**

Funding