

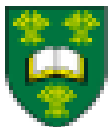
Canada's  
food guide



# ***BEYOND THE BREAK*** ***Does Canada's Food*** ***Guide meet*** ***requirements for*** ***vitamin D and*** ***calcium?***

**Susan J Whiting**

Distinguished Professor of Nutrition



UNIVERSITY OF  
SASKATCHEWAN

**OSTEOPOROSIS**

# *“Where’s calcium?”*

Canada's  
food guide



Canada's  
food guide



# ***Outline***

## **1. Requirement for Calcium**

- Recommended intakes (2011) from Health Canada (IOM) and Osteoporosis Canada
- Food sources of calcium - are they in the new Food Guide?
- Dietary factors affecting calcium retention

## **2. Concern about Excess**

- More is not better ... the upper level
- Is there a concern about supplement use?

## **3. What are Canadians currently getting from foods and supplements?**

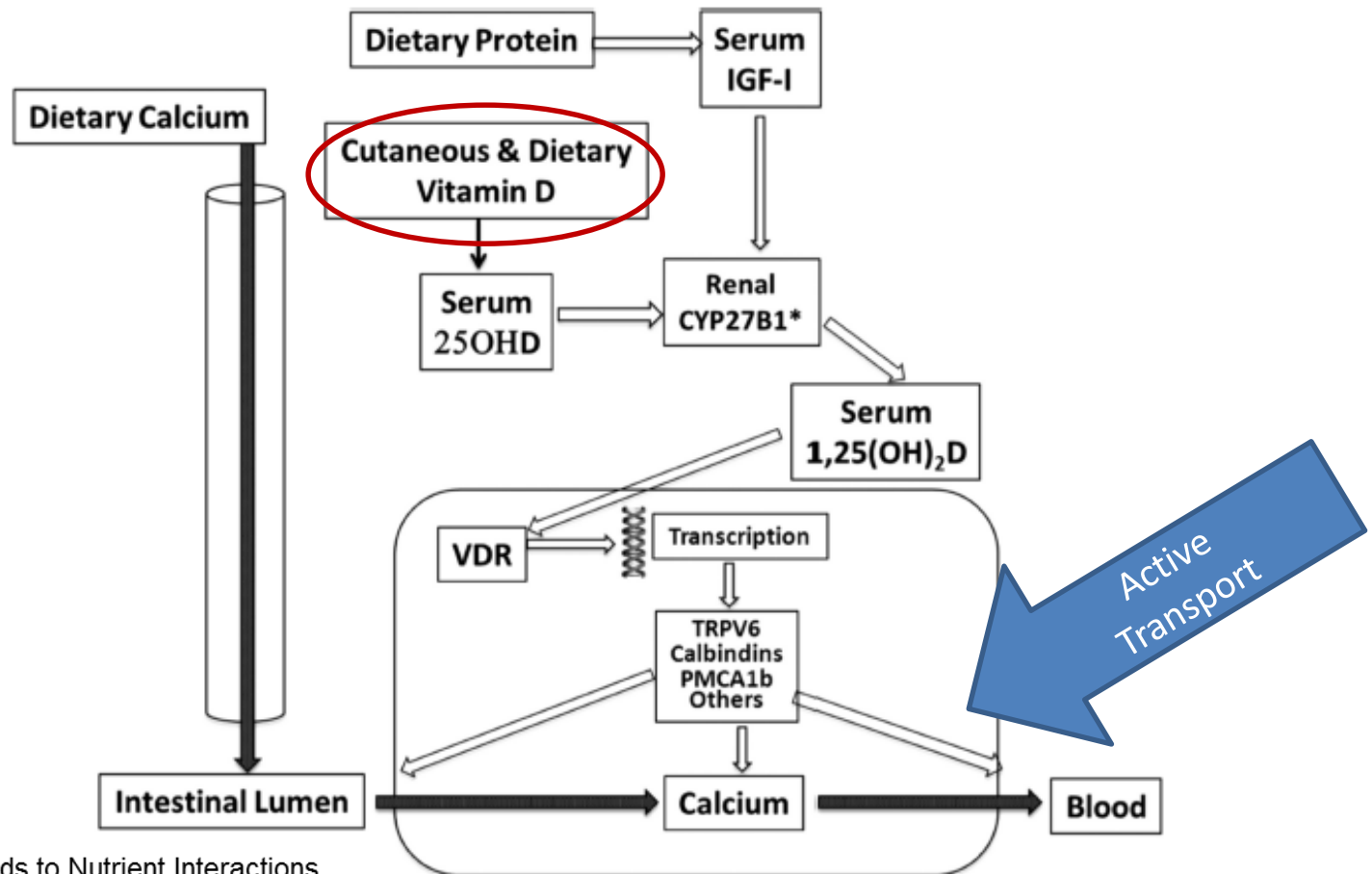
- Who is most at risk for inadequacy (2015)

**Calcium – still a nutrient of concern**

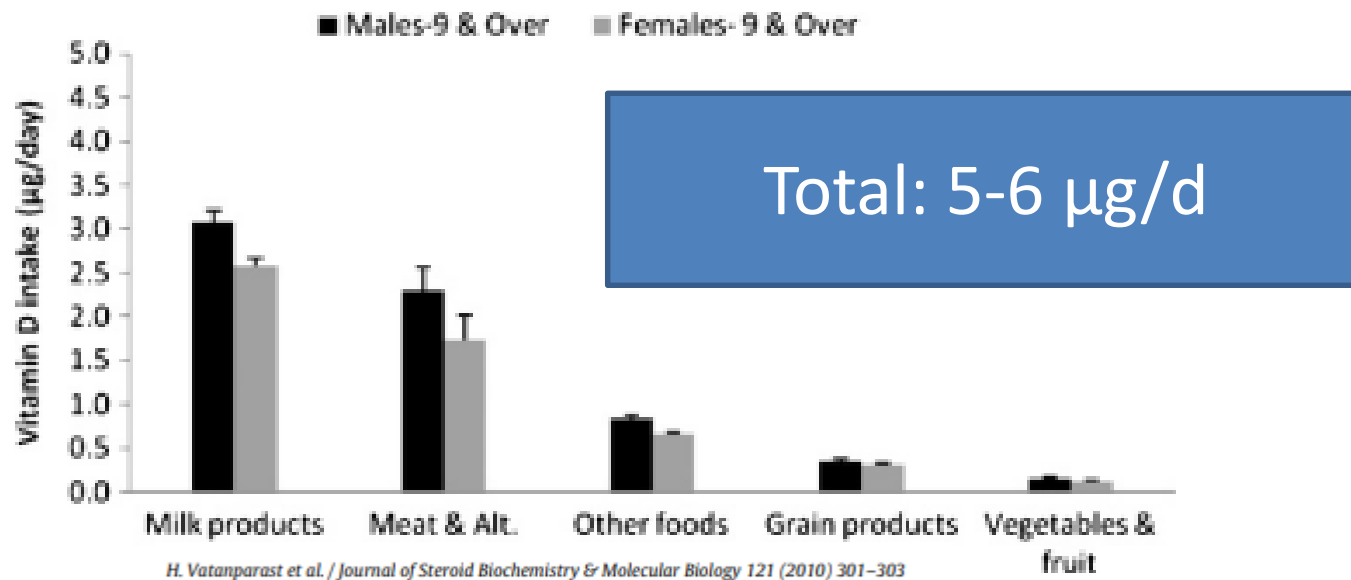


# ***What about Vitamin D?***

- Bone Matters: The D-Lemmas of D with Dr Stephanie Atkinson – March 20, 2019*



# ***Does the Canadian diet supply enough vitamin D to reach EAR of 10 µg (400 IU)?***



**Fig. 2.** Vitamin D intake (mean ± SEM, µg/day) of Canadians from food groups in males and females age 9 and over.

Vol. 152, No. 6 — February 10, 2018

## **Regulations Amending Certain Regulations Made Under the Food and Drugs Act (Nutrition Symbols, Other Labelling Provisions, Partially Hydrogenated Oils and Vitamin D)**

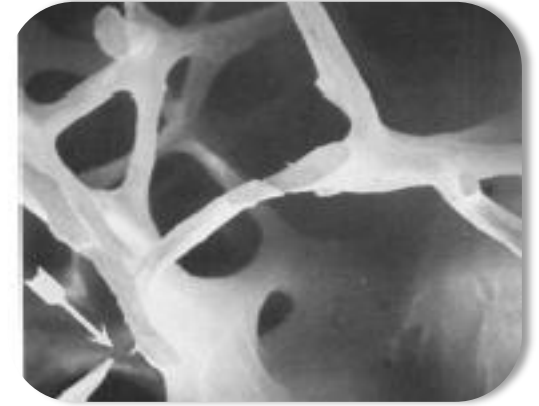
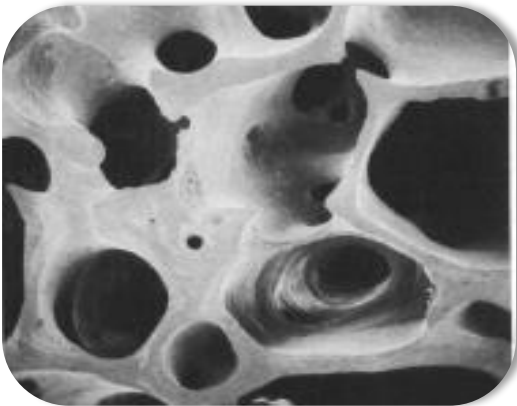
Statutory authority

*Food and Drugs Act*

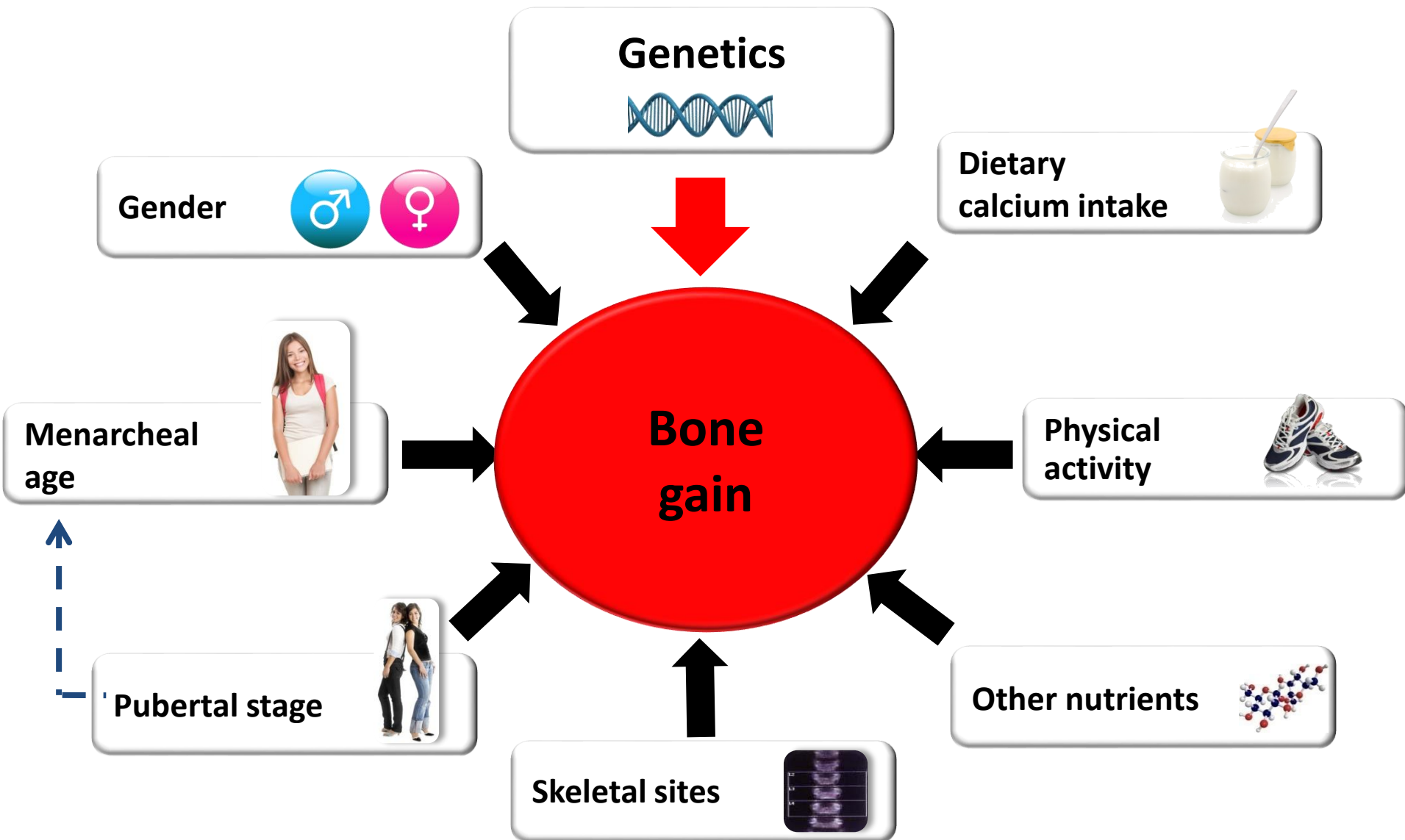
# ***Calcium:***

## ***Important for bone health***

- RDA based on attaining Peak Bone – youth*
- RDA based on slowing bone loss - adults*

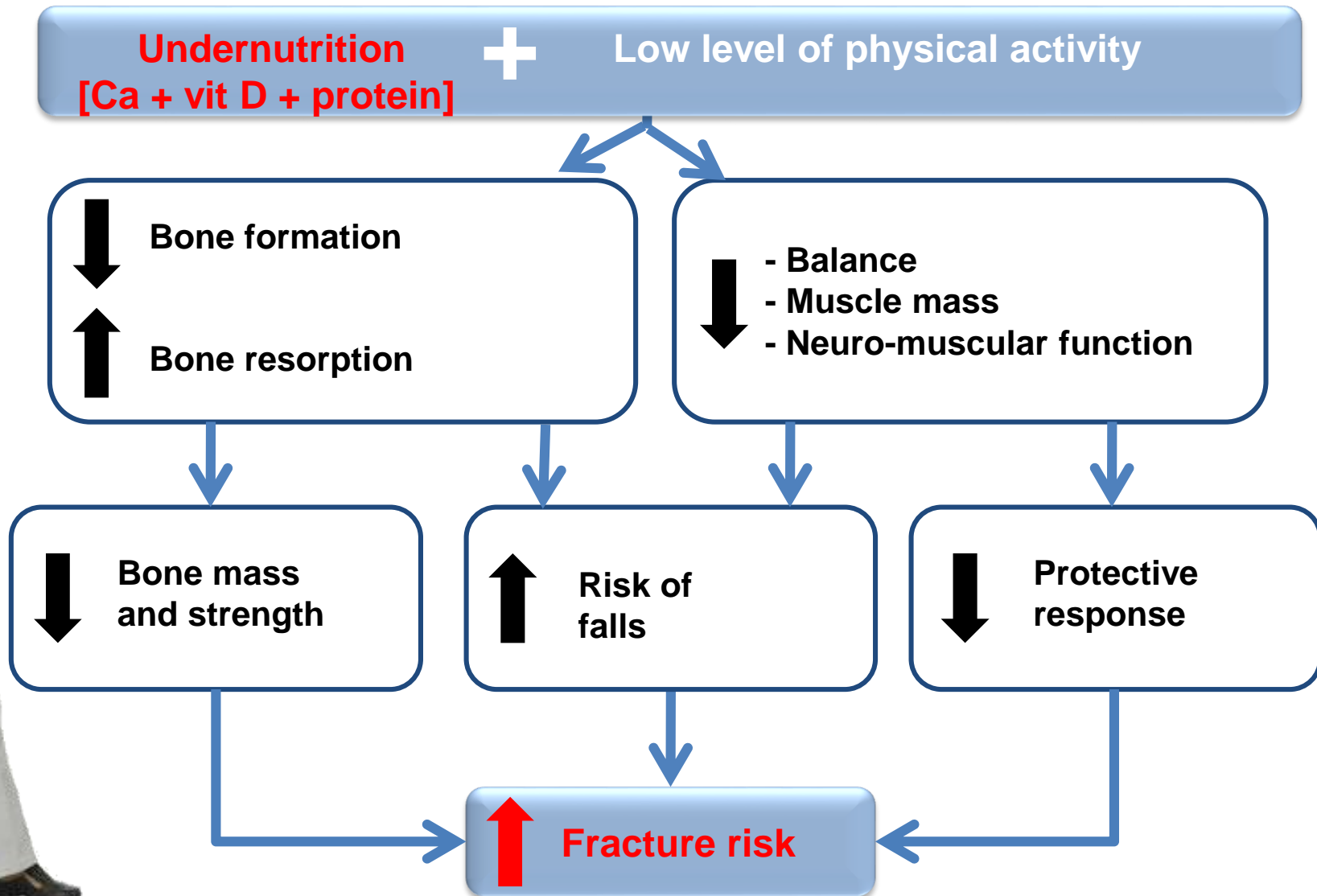


# Many Factors Affect PBM





# Pathophysiology of fragility fracture risk: Adults



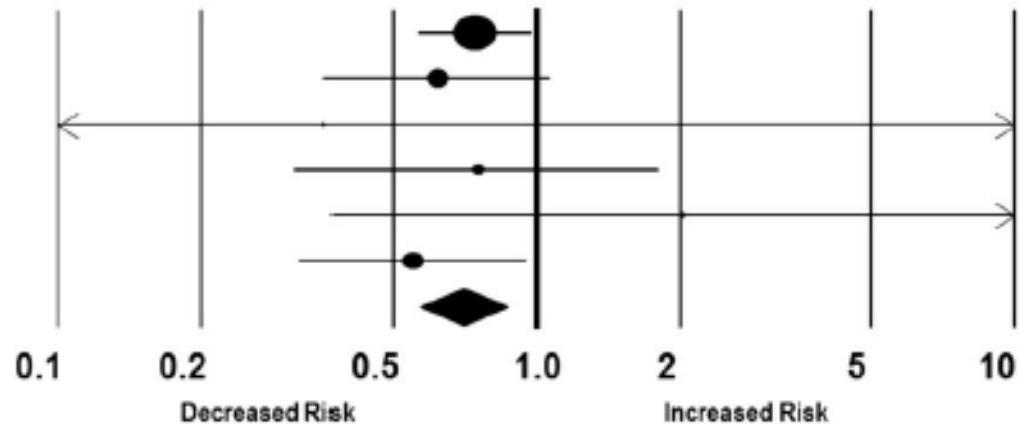
# Both calcium and vitamin D are needed to reduce hip fracture risk

NOF 2016

Study Name

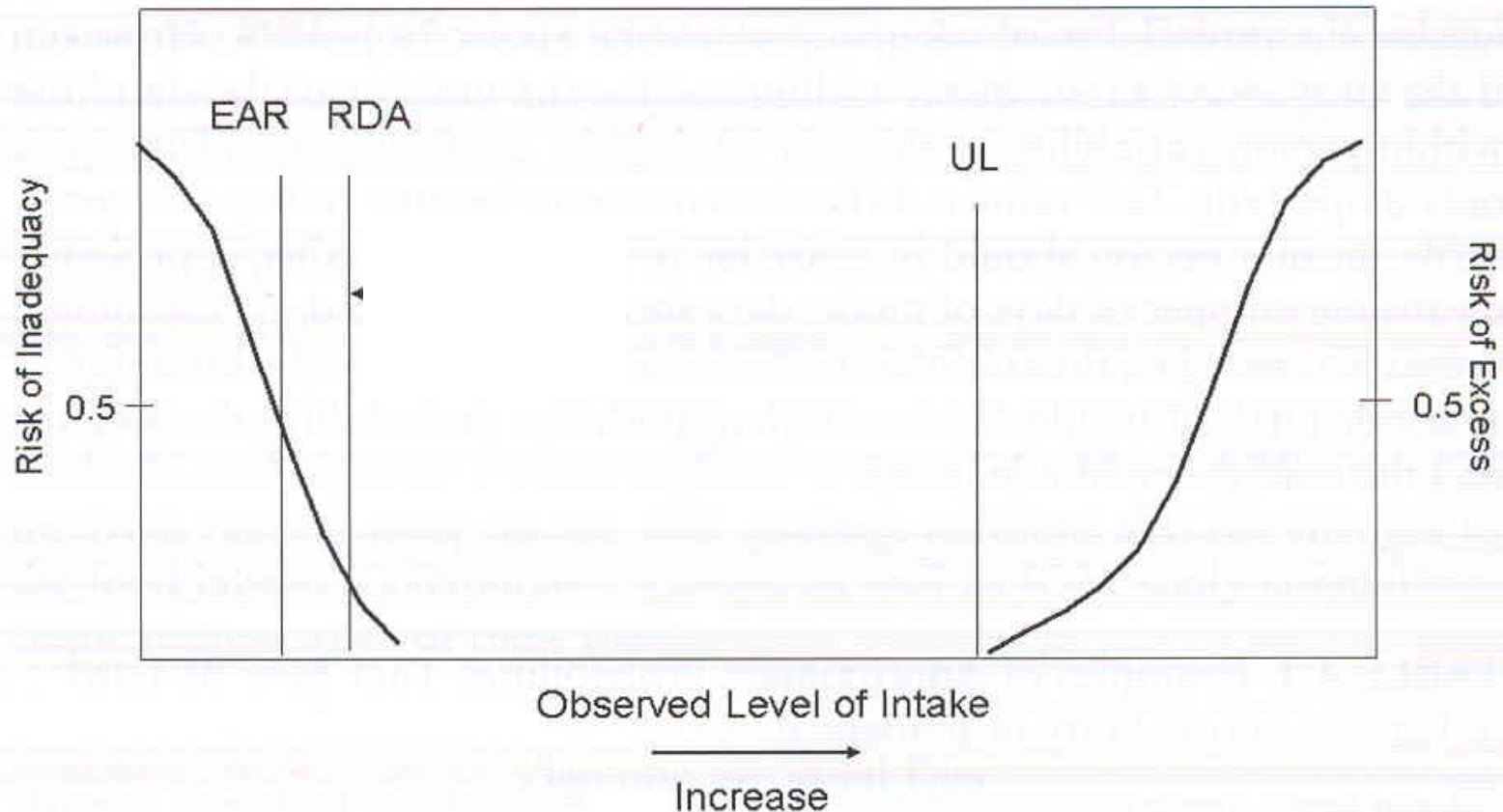
Rate Ratio and 95% CI

Chapuy, 1992 [20]  
Chapuy, 2002 [21]  
Dawson-Hughes, 1997 [22]  
Porthouse, 2005 [23]  
Salovaara, 2010 [24]  
Prentice, 2013 [10]<sup>a</sup>  
SRRE = 0.70 (0.56–0.87)  
*P*-heterogeneity = 0.74  
*I*<sup>2</sup> = 0.00



**Benefit of  
calcium + vitamin  
D is a 30%  
reduction in risk  
of hip fx**

# ***Describing Dietary Adequacy and Excess***



**FIGURE 4-2** Relationship of the AI to the EAR and RDA.

NOTE: EAR = Estimated Average Requirement; RDA = Recommended Dietary Allowance; AI = Adequate Intake; UL = tolerable upper intake level.

# Calcium has recommended intakes:

## RDA and EARs

Population groups	Calcium (mg/d)	
	EAR	RDA
Children 1-3	500	700
Children > 3	800	1000
Adolescents 9 - 18	1100	1300
Adults 18 – 50 (F) 18-70 (M)	800	1000
Pregnancy/lactation	800	1000
Adult men > 70	1000	1200
Adult women > 50	1000	1200

**EAR is cutoff for estimation of prevalence of inadequacy of a population**

**RDA is goal for optimal intake by an individual**

# ***“Where’s calcium?”***

Canada's  
food guide








# Food Sources of Calcium

## The Calcium Calculator™

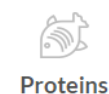
Print version  
Calcium-rich foods  
organized by content  
50 mg, 75 mg, 150  
mg, 200 mg, 300 mg  
Online  
Calcium sources by  
amount

BC Dairy Foundation

CALCIUM-RICH FOODS	PORTION SIZE	# OF PORTIONS LATE	TOTAL PORTIONS	MILLIGRAMS PER PORTION	TOTAL MILLIGRAMS OF CALCIUM
 Black beans, Lima beans, Lentils—cooked Bread Broccoli Gai lan, Mustard greens Hummus Orange—fruit, not juice	(1 cup or 250 mL) (2 slices or 70 g) (¾ cup or 175 mL) (½ cup or 125 mL) (½ cup or 125 mL) (1 medium)	] = _____		x 50 mg =	
 Almonds Bok choy, Kale, Rapini, Okra—cooked Chickpeas, Kidney beans, Pinto beans, Romano beans—cooked Cottage cheese—regular or low fat Dessert tofu Ice cream, Frozen yogurt Parmesan cheese	(¼ cup or 60 mL) (½ cup or 125 mL) (1 cup or 250 mL) (½ cup or 125 mL) (100 g) (½ cup or 125 mL) (1 Tbsp or 15 mL)	] = _____		x 75 mg =	
 Baked beans, Soybeans, White beans—cooked Blackstrap molasses Collards—cooked Cheese—soft and semi-soft such as Blue, Feta, Mozzarella Pancake or Waffle Pudding—made with milk Tofu—made with calcium	(1 cup or 250 mL) (1 Tbsp or 15 mL) (½ cup or 125 mL) (25 g) (1 large or 2 small) (½ cup or 125 mL) (100 g)	] = _____		x 150 mg =	
 Cheese—firm such as Cheddar, Swiss, Gouda Cheese—processed Salmon—canned with bones Sardines—canned with bones Soup—made with milk Yogurt, fruit flavoured—regular or low fat*	(25 g) (2 slices, 21 g each) (½ can) (½ can) (1 cup or 250 mL) (¾ cup or 175 mL)	] = _____		x 200 mg =	
 Milk—skim, 1%, 2%, whole, buttermilk, chocolate, flavoured* Calcium-fortified beverages such as Soy, Rice, Orange juice Skim milk powder Yogurt—plain, regular or low fat*	(1 cup or 250 mL) (1 cup or 250 mL) (½ cup or 75 mL) (¾ cup or 175 mL)	] = _____		x 300 mg =	

## SELECT YOUR FOODS

WHAT DID YOU EAT? ENTER THE NUMBER OF SERVINGS FOR EACH OF THE CALCIUM-RICH FOODS THAT YOU ATE  
YESTERDAY FROM EACH CATEGORY:





<b>Amt mg</b>	<b>Food Examples</b>	<b>New FG Groups</b>
50	1 cup lentils, 2 slices bread $\frac{3}{4}$ c broccoli, orange	Grain Fr&Veg Protein
75	1 cup chickpea, 1 pancake $\frac{1}{2}$ c cottage cheese, 5 figs	Grain Fr&Veg Protein
150	1 cup soybeans, $\frac{1}{2}$ c collards Instant oatmeal	Grain Fr&Veg Protein
200	$\frac{1}{2}$ can salmon, 25 g cheese	Protein
300	1 milk, 1 c fortified soy beverage	Protein

Amt mg	Food Examples	New FG Groups
50	1 cup lentils 3/4 c...	
75		
150	...ards (1)	Grain Fr&Veg Protein
200	...mon, 1 c yogurt	Protein
300	1 milk, 1 c fortified soy beverage	Protein

- Consideration of energy intake
- Education needed to identify higher calcium foods

# Calcium in Grains: Flour – 100 g

Food	Calcium (mg)	
White flour	14	
Whole wheat	26	
Barley	52	
Ca-enriched (NL- no longer made)	110	
<b><i>Ancient grains</i></b>		
Amaranth	152	
Teff	146	
Quinoa	36	

# *Other Calcium Sources*

1 T Blackstrap Molasses = 150 mg

10 g dried kelp = 80 mg

1 L Mineral water (hard water) = 180 mg

## Fortified foods:

- Calcium as a food ingredient
  - Some breakfast cereals – 110 mg/serving
- Fortified beverages = 30 % DV

# Plant-based beverages (excluding soy)

**Not all are  
fortified &  
all are  
low in protein**

**Coconut “original”(L)  
Almond “original” (R)  
beverages**

**0.5 - 1 g protein  
0% DV for Calcium**

Nutrition Facts Valeur nutritive	
Per 1 cup (250 mL) / pour 1 tasse (250 mL)	
Amount Teneur	% Daily Value % valeur quotidienne
Calories / Calories	50
Fat / Lipides	5 g 8 %
Saturated / saturés + Trans / trans	5 g 25 %
Cholesterol / Cholestérol	0 mg
Sodium / Sodium	110 mg 5 %
Carbohydrate / Glucides	1 g 1 %
Fibre / Fibres	0 g 0 %
Sugars / Sucres	1 g
Protein / Protéines	0.5 g
Vitamin A / Vitamine A	0 %
Vitamin C / Vitamine C	0 %
Calcium / Calcium	0 %
Iron / Fer	2 %

\*3 g MEDIUM CHAIN FATTY ACIDS (MCFAs) PER 250 mL SERVING. COCONUTS NATURALLY CONTAIN MCFAs, WHICH ARE EASILY DIGESTIBLE AND SUPPORT A HEALTHY METABOLISM.  
\*3 g D'ACIDES GRAS À CHAÎNE MOYENNE (AGCM) PAR PORTION DE 250 mL. LA NOIX DE COCO CONTIENT DES AGCM, QUI SE DIGÈRENT FACILEMENT ET CONTRIBUENT À UN MÉTABOLISME SAIN.

INGREDIENTS: COCONUT BASE (WATER, COCONUT CREAM), GELLAN GUM, XANTHAN GUM, SEA SALT.  
INGRÉDIENTS : BASE DE NOIX DE COCO (EAU, CRÈME DE NOIX DE COCO), GOMME GELLANE, GOMME DE XANTHANE, SEL DE MER.

Nutrition Facts Valeur nutritive	
Per 1 cup (250 mL) / pour 1 tasse (250 mL)	
Amount Teneur	% Daily Value % valeur quotidienne
Calories / Calories	40
Fat / Lipides	2.5 g 4 %
Saturated / saturés + Trans / trans	0.2 g 1 %
Cholesterol / Cholestérol	0 mg
Sodium / Sodium	190 mg 8 %
Potassium / Potassium	35 mg 1 %
Carbohydrate / Glucides	3 g 1 %
Fibre / Fibres	0 g 0 %
Sugars / Sucres	0 g
Protein / Protéines	1 g
Vitamin A / Vitamine A	0 %
Vitamin C / Vitamine C	0 %
Calcium / Calcium	2 %
Iron / Fer	2 %

INGREDIENTS: ORGANIC ALMOND BASE (WATER, ORGANIC ALMONDS), ORGANIC RICE STARCH, SEA SALT, ORGANIC VANILLA, NATURAL FLAVOUR, CARRAGEENAN. CONTAINS: TREE NUTS (ALMONDS).  
INGRÉDIENTS : BASE D'AMANDE BIOLOGIQUE (EAU, AMANDES BIOLOGIQUES), AMIDON DE RIZ BIOLOGIQUE, SEL MARIN, VANILLE BIOLOGIQUE, ARÔME NATUREL, CARRAGHÉNINE. CONTIENT : NOIX (AMANDES).

PRODUCED BY • FABRIQUÉ PAR :  
PACIFIC FOODS OF OREGON, INC., TUALATIN, OR 97062 USA  
CERTIFIED ORGANIC BY • CERTIFIÉ BIOLOGIQUE PAR :  
OREGON TILTH

NON GMO  
Produit  
VERIFIED • VÉRIFIÉ  
PROFIT SANS OGM  
Produit  
VÉRIFIÉ • VÉRIFIÉ

RECYCLABLE

# Plant-based beverages

## Original vs. Fortified

**Low in protein (1 g)**

**Almond “original” (L)  
Almond (R ) beverages**

**Fortified:**  
**30% DV Ca**  
**-from calcium carbonate**  
**45% DV as vitamin D2**  
**Plus**  
**vitamin A, B<sub>12</sub>, zinc,**  
**riboflavin...**

Nutrition Facts Valeur nutritive		
Per 1 cup (250 mL) / pour 1 tasse (250 mL)		
Amount Teneur		% Daily Value % valeur quotidienne
<b>Calories / Calories 40</b>		
<b>Fat / Lipides</b> 2.5 g		<b>4 %</b>
Saturated / saturés 0.2 g		<b>1 %</b>
+ Trans / trans 0 g		
<b>Cholesterol / Cholestérol</b> 0 mg		
<b>Sodium / Sodium</b> 190 mg		<b>8 %</b>
<b>Potassium / Potassium</b> 35 mg		<b>1 %</b>
<b>Carbohydrate / Glucides</b> 3 g		<b>1 %</b>
Fibre / Fibres 0 g		<b>0 %</b>
Sugars / Sucres 0 g		
<b>Protein / Protéines</b> 1 g		
Vitamin A / Vitamine A		0 %
Vitamin C / Vitamine C		0 %
Calcium / Calcium		2 %
Iron / Fer		2 %

INGREDIENTS: ORGANIC ALMOND BASE (WATER, ORGANIC ALMONDS), ORGANIC RICE STARCH, SEA SALT, ORGANIC VANILLA, NATURAL FLAVOUR, CARRAGEENAN. CONTAINS: TREE NUTS (ALMONDS).

INGRÉDIENTS : BASE D'AMANDE BIOLOGIQUE (EAU, AMANDES BIOLOGIQUES), AMIDON DE RIZ BIOLOGIQUE, SEL MARIN, VANILLE BIOLOGIQUE, ARÔME NATUREL, CARRAGHÉNINE. CONTIENT : NOIX (AMANDES).

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OREGON TILTH



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Nutrition Facts Valeur nutritive		
Serving Size 1 cup (250 mL) / Portion 1 tasse (250 mL)		
Servings Per Container 4 / Portions par contenant 4		
Amount Teneur		% Daily Value % valeur quotidienne
<b>Calories / Calories 80 (330 kJ)</b>		
<b>Fat / Lipides</b> 2.5 g		<b>4 %</b>
Saturated Fat / lipides saturés 0.2 g		<b>1 %</b>
+ Trans Fat / lipides trans 0 g		
Polyunsaturated / polyinsaturés 0.6 g		
Omega-6 / oméga-6 0.5 g		
Omega-3 / oméga-3 0 g		
Monounsaturated / monoinsaturés 1.5 g		
<b>Cholesterol / Cholestérol</b> 0 mg		<b>0 %</b>
<b>Sodium / Sodium</b> 150 mg		<b>6 %</b>
<b>Potassium / Potassium</b> 170 mg		<b>5 %</b>
<b>Carbohydrate / Glucides</b> 13 g		<b>4 %</b>
Fibre / Fibres 1 g		<b>4 %</b>
Sugars / Sucres 12 g		
<b>Protein / Protéines</b> 1 g		
Vitamin A / Vitamine A		10 %
Vitamin C / Vitamine C		0 %
Calcium / Calcium		30 %
Iron / Fer		4 %
Vitamin D / Vitamine D		45 %
Vitamin E / Vitamine E		10 %
Riboflavin / Riboflavine		25 %
Vitamin B12 / Vitamine B12		50 %
Phosphorus / Phosphore		2 %
Magnesium / Magnésium		6 %
Zinc / Zinc		15 %

INGREDIENTS: WATER, CANE SUGAR, ALMONDS, CALCIUM CARBONATE, NATURAL VANILLA FLAVOUR, SEA SALT, POTASSIUM CITRATE, SUNFLOWER LECITHIN, GELLAN GUM, ZINC GLUCONATE, VITAMIN A PALMITATE, RIBOFLAVIN (VITAMIN B2), VITAMIN D2, VITAMIN B12. CONTAINS ALMONDS

NOT FOR USE AS AN INFANT FORMULA

INGRÉDIENTS : EAU, SUCRE DE CANNE, AMANDES, CARBONATE DE CALCIUM, ARÔME NATUREL DE VANILLE, SEL DE MER, CITRATE DE POTASSIUM, LÉCITHINE DE TOURNESOL, GOMME GELLANE, GLUCONATE DE ZINC, PALMITATE DE VITAMINE A, RIBOFLAVINE (VITAMINE B2), VITAMINE D2, VITAMINE B12. CONTIENT DES AMANDES.



# ***Bioavailability***

## Foods that don't allow GI absorption



- Spinach – absorption  $< 5\%$  due to oxalates
- Plant-based beverages made with tricalcium phosphate

## Food constituents causing urine excretion

- High salt (NaCl) intake ( $> \text{UL } 2300 \text{ mg}$ )
- Excessive caffeine
- Extreme dietary practices (e.g. paleo, keto)



# Check the Nutrition Facts Label

ORIGINAL

Nutrition Facts	
Valeur nutritive	
Per 250 mL / par 250 mL	
Amount	% Daily Value
Teneur	% valeur quotidienne
<b>Calories / Calories 110</b>	
<b>Fat / Lipides 0 g</b>	<b>0 %</b>
Saturated / saturés 0 g	0 %
+ Trans / trans 0 g	
<b>Cholesterol / Cholestérol 0 mg</b>	
<b>Sodium / Sodium 0 mg</b>	<b>0 %</b>
<b>Carbohydrate / Glucides 26 g</b>	<b>9 %</b>
Fibre / Fibres 0 g	0 %
Sugars / Sucres 22 g	
<b>Protein / Protéines 2 g</b>	
Vitamin A / Vitamine A	0 %
Vitamin C / Vitamine C	120 %
Calcium / Calcium	2 %
Iron / Fer	10 %

NEW

Nutrition Facts	
Valeur nutritive	
Per 1 cup (250 mL) pour 1 tasse (250 mL)	
	% Daily Value*
	% valeur quotidienne*
<b>Calories 110</b>	
<b>Fat / Lipides 0 g</b>	<b>0 %</b>
Saturated / saturés 0 g	0 %
+ Trans / trans 0 g	
<b>Carbohydrate / Glucides 26 g</b>	
Fibre / Fibres 0 g	0 %
Sugars / Sucres 22 g	22 %
<b>Protein / Protéines 2 g</b>	
<b>Cholesterol / Cholestérol 0 mg</b>	
<b>Sodium 0 mg</b>	<b>0 %</b>
Potassium 470 mg	10 %
Calcium 26 mg	2 %
Iron / Fer 0 mg	0 %
*5% or less is a little, 15% or more is a lot	
*5% ou moins c'est peu, 15% ou plus c'est beaucoup	

Serving size  
stands out more  
and is more  
similar on  
similar foods

Daily Values  
updated

New % Daily Value  
for total sugars

Updated list of  
minerals of public  
health concern

Calories is larger  
and stands out  
more with bold  
line below

mg amounts  
are shown

New % Daily Value  
footnote

DV based on  
1100 mg

DV based on  
1300 mg

# ***Summary***

## **1. Requirement for Calcium**

- Recommended intakes (2011) from Health Canada (IOM) and Osteoporosis Canada

**EAR (adults): 800-1000 mg**

**RDA (adults): 1000-1200 mg**

- Food sources of calcium - they are in the new Food Guide

**F&V, Grains: foods with 50-150 mg**

- Dietary factors affecting calcium retention

**Salt – expect to be less if follow CFG**

# ***Outline***

## **1. Requirement for Calcium**

- Recommended intakes (2011) from Health Canada (IOM) and Osteoporosis Canada
- Food sources of calcium - are they in the new Food Guide?
- Dietary factors affecting calcium retention

## **2. Concern about Excess**

- More is not better ... the upper level
- Is there a concern about supplement use?

## **3. What are Canadians currently getting from foods and supplements?**

- Who is most at risk for inadequacy

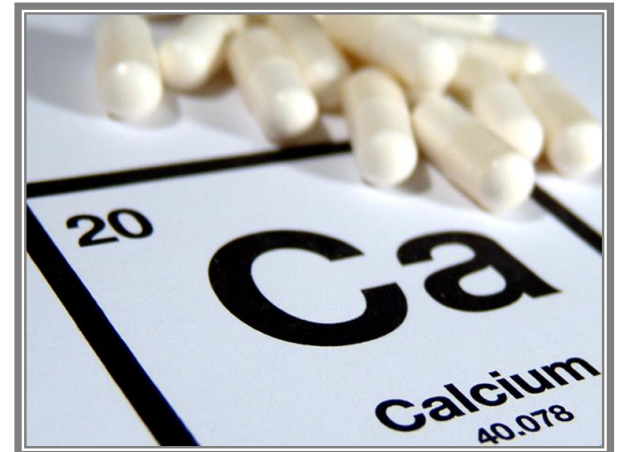
# *Upper Level for calcium*

Since 2011, set to prevent **kidney stones**

- UL set in older adults (> 50y) as **2000 mg** as at this intake, there is risk of kidney stones
- For adults 19-50 y, UL set at **2500 mg** as risk of kidney stones from calcium not common
- In adolescents, UL increases to **3000 mg** as kidney stone risk very low.
- Younger children: UL is **2500 mg** due to smaller body size

# *Upper Level for Calcium*

- Other concerns; “milk-alkali syndrome” which is soft tissue calcification when calcium is excessive
- Prostate cancer risk in men
- Possible risk of low iron or zinc with high intakes of calcium
- Risk of heart disease - evidence is conflicting...





# Calcium in the News



Harvard Health Publishing  
HARVARD MEDICAL SCHOOL

*Trusted advice for a healthier life*

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What can we help you find?



HEART HEALTH

MIND & MOOD

PAIN

STAYING  
HEALTHY

CANCER

DISEASES &  
CONDITIONS

MEN'S HEALTH

WOMEN'S  
HEALTH

*Harvard Heart Letter*

## Calcium and heart disease: What is the connection?

*There's no good evidence that calcium supplements harm your heart. Still, it's best to get calcium from food, not pills.*

Published: January, 2017

*The New York Times*

### Are Calcium Supplements Safe?

Kidney stones are a known risk, but studies have investigated other potential safety concerns, including an increased risk of death, cancer and heart disease.



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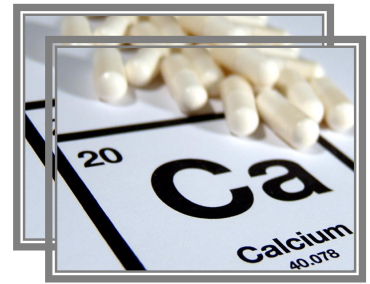
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Our FREE E-Newsletter



Get health information and advice from  
the experts at Harvard Medical School.

# meta-Analysis

Asemi et al. 2015



- No significant association between total and dietary calcium intake and mortality
  - Mortality from all-causes, CVD, and cancer.
- A significant positive association between total calcium intake and CVD mortality for cohort studies with a mean follow-up duration of >10 years yet an inverse (protective) effect if < 10 years.

Use foods to achieve RDA for calcium where possible  
Supplements can “fill the intake gap”:  $\leq 500$  mg

# *Outline*

## 1. Requirement for Calcium

- Recommended intakes (2011) from Health Canada (IOM) and Osteoporosis Canada
- Food sources of calcium - are they in the new Food Guide?
- Dietary factors affecting calcium retention

## 2. Concern about Excess

- More is not better ... the upper level
- Is there a concern about supplement use?

## 3. What are Canadians currently getting from foods and supplements?

- Who is most at risk for inadequacy

# Summary of Calcium Intakes

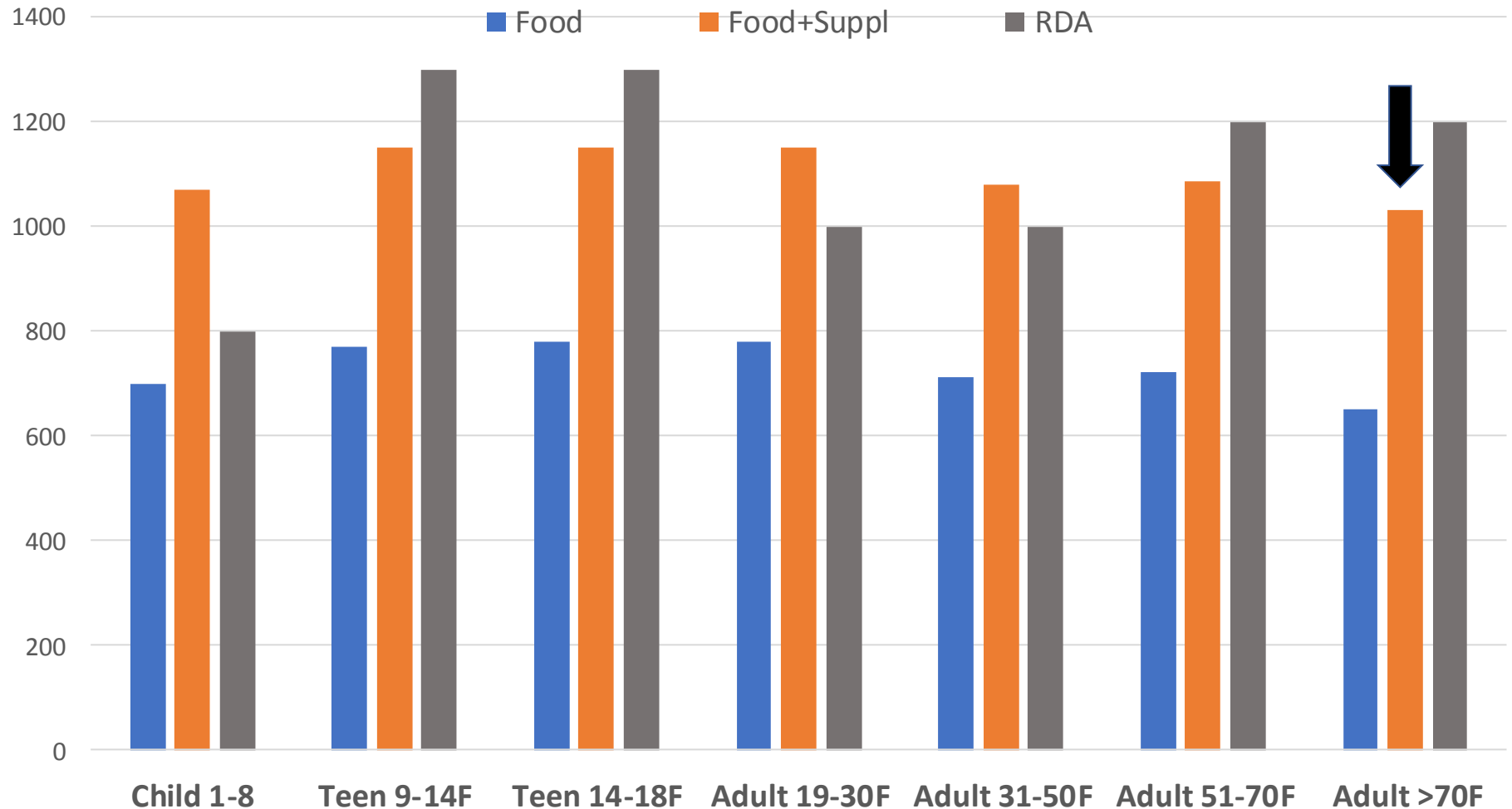
(All CANADIANS  $\geq 1y$ )

INTAKE	2004	2015
Food alone	875 mg	840 mg
Food + Supplements	1220 mg	1160 mg

# CALCIUM FROM FOOD, SUPPLEMENTS - FEMALES

## In **2015** compared to 2011 recommendations

VATANPARAST et al., 2019




# Summary of Calcium Intakes

(All CANADIANS  $\geq 1y$ )

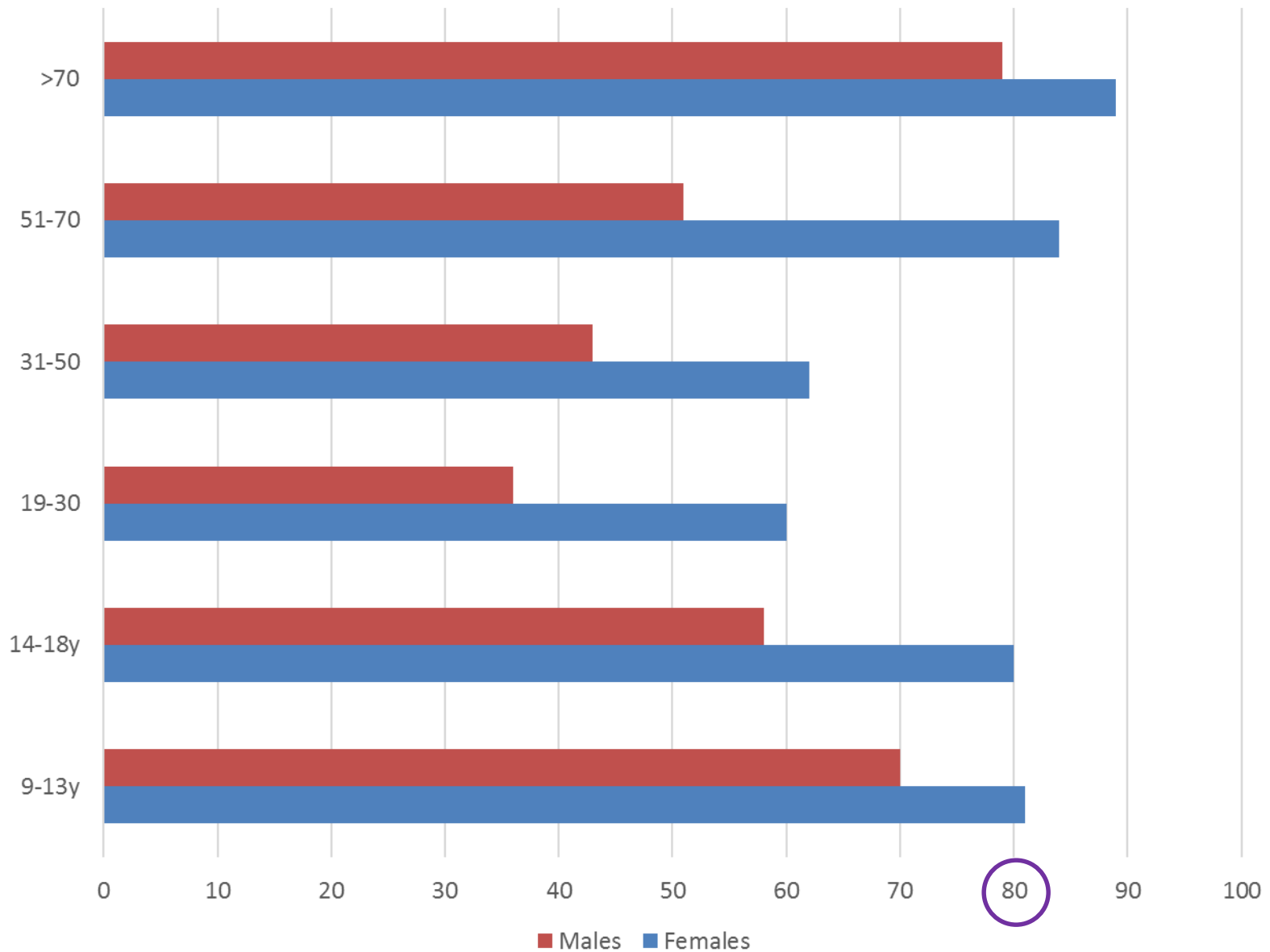
INTAKE	2004	2015
Food alone	875 mg	840 mg
Food + Supplements	1220 mg	1160 mg

PREVALENCE OF INADEQUACY	2004	2015
Food alone	58 %	69 %
Food + Supplements	32 %	33 %

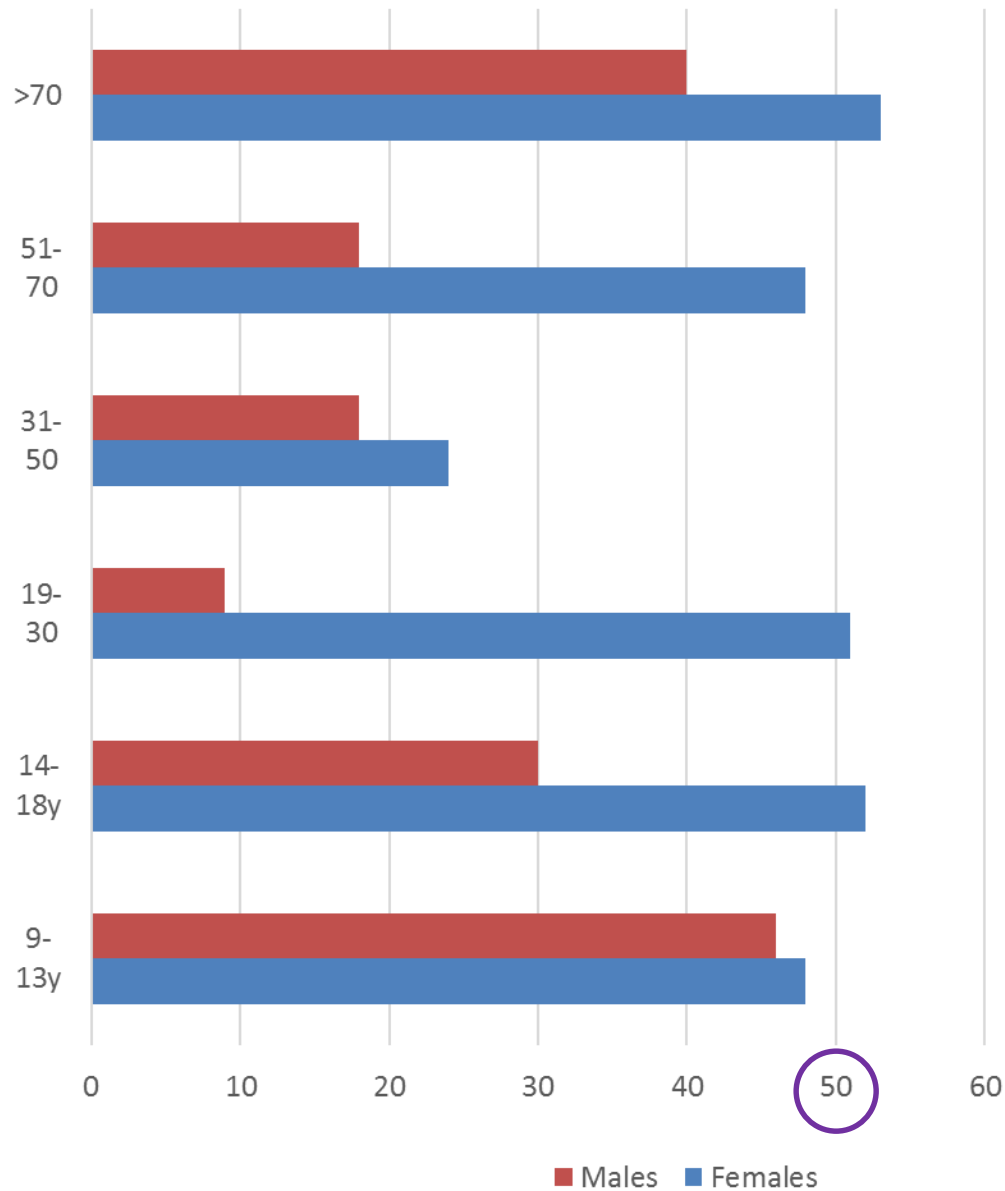




# PREVALENCE OF INADEQUACY IN 2015 FROM FOOD: Males and Females



# PREVALENCE OF INADEQUACY IN 2015 FROM FOOD & SUPPLEMENTS: Males and Females (22%)



# Summary

## 1. Requirement for Calcium

- Food sources of calcium are in the new Food Guide
- Need to select **higher calcium foods** from each group

## 2. Concern about Excess

- No risk in consuming supplements to *“fill the intake gap”* to the RDA

## 3. What are Canadians currently getting from foods and supplements?

- Those most at risk for inadequacy: **Women and girls**
  - **80% Prevalence of Inadequacy** → a calcium strategy is warranted for women
- Supplements improve % adequacy yet use has fallen since CVD story appeared

# Canada's food guide



# International Osteoporosis Federation (IOF) 2017

- **Dietary protein intake of 1.0–1.2 g/kg/day**  
> 20-25g of high-quality protein at each main meal.
- **Vitamin D 800 IU/day**  
25(OH)D levels >50 nmol/L.
- **Calcium intake of 1,000 mg/day**

2014 European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO)



## IOF COMPENDIUM OF OSTEOPOROSIS



Our vision is a world without fragility fractures, in which healthy mobility is a reality for all.