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A French Canadian Perspective to Diet Assessment during Pregnancy

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01



Tools used to assess
dietary intakes
24-h dietary recall and
supplements questionnaire

Web-Based 24-h Dietary Recall for a French-Canadian Population



Its development

- Developed in French, translated in English
- Inspired by the USDA automated multiple-pass method
- Designed as a web-based approach
- Includes a list of 2865 food items, distributed into 16 categories and 98 subcategories, and 687 recipes (Canadian Nutrient File)
- Presents an acceptable relative validity for estimating usual dietary intake when compared with the food record
- Valid to evaluate adherence to Canadian dietary guidelines



Article

Development of a Web-Based 24-h Dietary Recall for a French-Canadian Population

Simon Jacques ^{1,2}, Simone Lemieux ^{1,2,*}, Benoît Lamarche ^{1,2}, Catherine Laramée ¹, Louise Corneau ¹, Annie Lapointe ¹, Maude Tessier-Grenier ^{1,2} and Julie Robitaille ^{1,2}

Public Health Nutrition: 21(15), 2744–2752

doi:10.1017/S1368980018001611

Assessing the relative validity of a new, web-based, self-administered 24 h dietary recall in a French-Canadian population

Jacynthe Lafrenière, Catherine Laramée, Julie Robitaille, Benoît Lamarche and Simone Lemieux*

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Applied nutritional investigation

Relative validity of a web-based, self-administered, 24-h dietary recall to evaluate adherence to Canadian dietary guidelines

Jacynthe Lafrenière M.Sc., Catherine Laramée M.Sc., Julie Robitaille Ph.D., Benoît Lamarche Ph.D., Simone Lemieux Ph.D.*

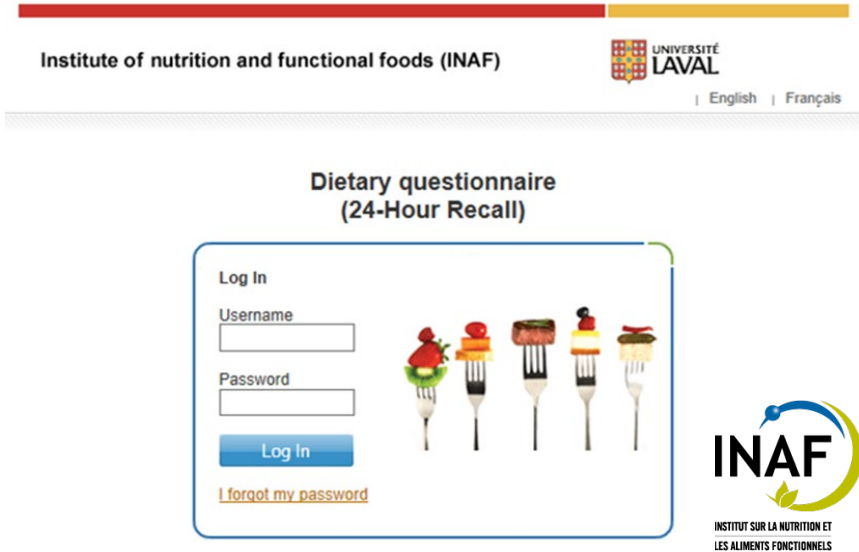
Institute of Nutrition and Functional Foods, Laval University, Québec, Canada



Web - Based 24 - h Dietary Recall for a French - Canadian Population

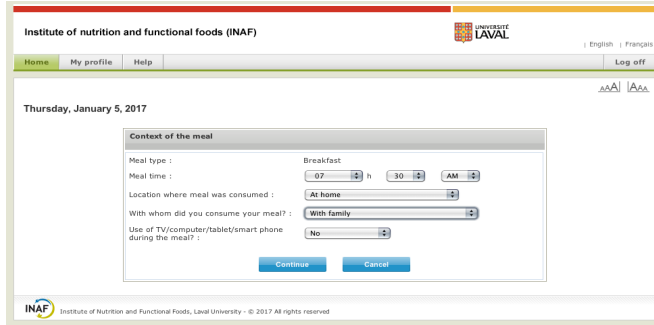
How does it work ?

- E-mails automatically sent to the participants
- 24 hours to enter the food and drinks they consumed the day before
- Completion 20-30 minutes
- Ideally for 3 days (2 weekdays + 1 weekend day)
- If the participant does not complete the recall within 24 hours, a new date is automatically set by the system until all recalls are completed



The screenshot shows the login interface for the INAF Dietary questionnaire. At the top, there is a red and yellow horizontal bar. Below it, the text "Institute of nutrition and functional foods (INAF)" is on the left, and the "UNIVERSITÉ LAVAL" logo is on the right, with "English" and "Français" links below it. The main heading is "Dietary questionnaire (24-Hour Recall)". The login section includes a "Log In" label, "Username" and "Password" input fields, a blue "Log In" button, and a link "I forgot my password". To the right of the login fields is an illustration of five forks with various food items on them. At the bottom right is the INAF logo, which consists of a blue and yellow circular graphic with the text "INAF" and "INSTITUT SUR LA NUTRITION ET LES ALIMENTS FONCTIONNELS" below it.

Web - Based 24 - h Dietary Recall for a French - Canadian Population



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Home My profile Help Log off

Thursday, January 5, 2017

Context of the meal

Meal type : Breakfast

Meal time : 07 h 30 AM

Location where meal was consumed : At home

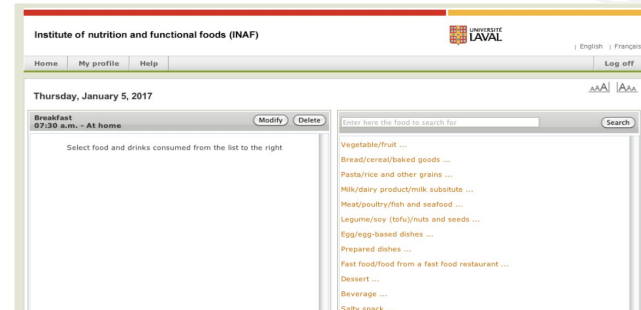
With whom did you consume your meal? : With family

Use of TV/computer/tablet/smart phone during the meal? : No

Continue Cancel

INAF Institute of Nutrition and Functional Foods, Laval University - © 2017 All rights reserved

Questions about the meal context



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Thursday, January 5, 2017

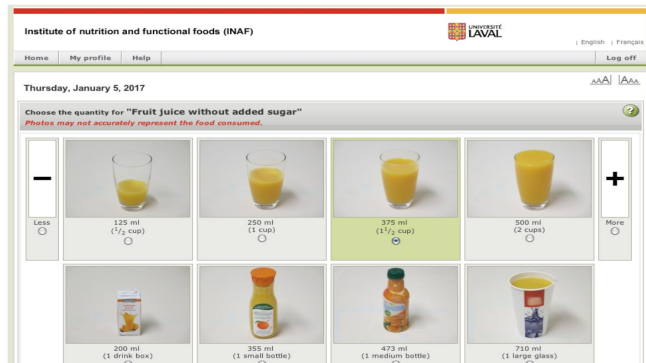
Breakfast 07:30 a.m. - At home Modify Delete

Select food and drinks consumed from the list to the right

Enter here the food to search for Search

- Vegetable/fruit ...
- Bread/cereal/baked goods ...
- Pasta/rice and other grains ...
- Milk/dairy product/milk substitute ...
- Meat/poultry/fish and seafood ...
- Legume/soy (tofu)/nuts and seeds ...
- Egg/egg-based dishes ...
- Prepared dishes ...
- Fast food/food from a fast food restaurant ...
- Dessert ...
- Beverage ...
- Salty snack ...

Food and drink selection with structured food list



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Thursday, January 5, 2017

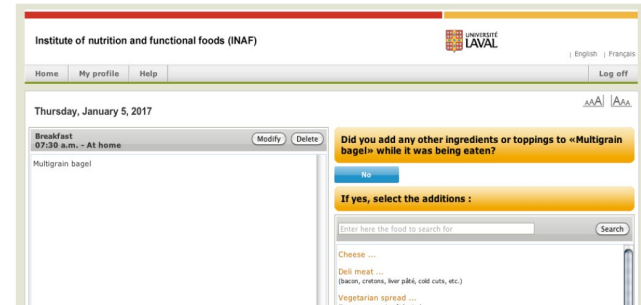
Choose the quantity for "Fruit juice without added sugar"

Photos may not accurately represent the food consumed.

Less +

125 ml (1/2 cup)	250 ml (1 cup)	375 ml (1 1/2 cup)	500 ml (2 cups)
200 ml (1 drink box)	355 ml (1 small bottle)	473 ml (1 medium bottle)	710 ml (1 large glass)

Portions selection



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Home My profile Help Log off

Thursday, January 5, 2017

Breakfast 07:30 a.m. - At home Modify Delete

Multigrain bagel

Did you add any other ingredients or toppings to "Multigrain bagel" while it was being eaten?

No

If yes, select the additions :

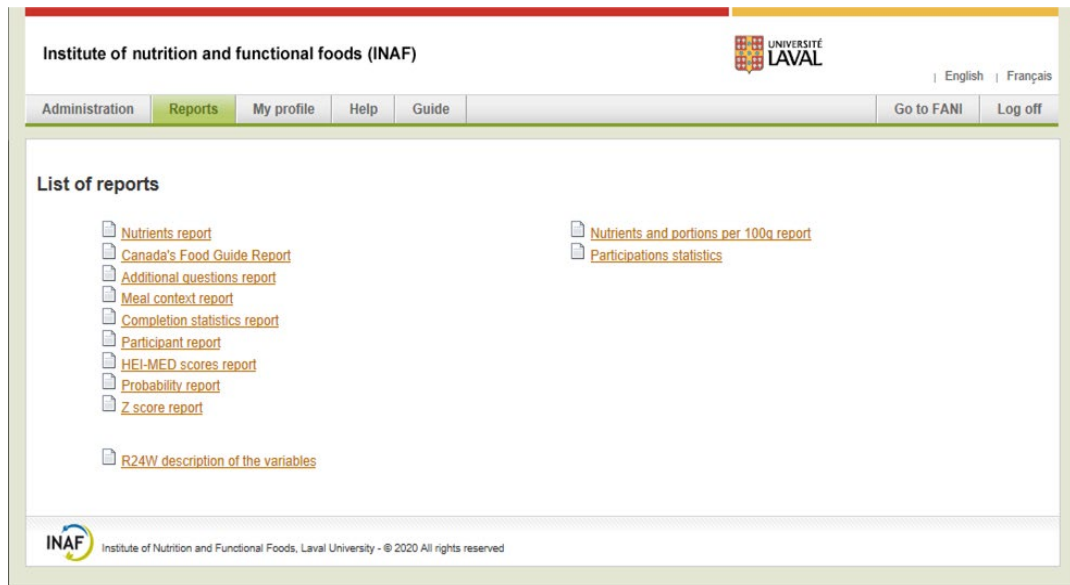
Enter here the food to search for Search

- Cheese ...
- Deli meat ... (bacon, chicken, beef, pork, cold cuts, etc.)
- Vegetarian spread ... (mustard, mayonnaise, etc.)

Selection of additions

Web - Based 24 - h Dietary Recall for a French - Canadian Population

Data report



The screenshot shows the INAF web application interface. At the top, there is a header with the text 'Institute of nutrition and functional foods (INAF)' and the 'UNIVERSITÉ LAVAL' logo. Below the header is a navigation bar with tabs: 'Administration', 'Reports' (highlighted), 'My profile', 'Help', and 'Guide'. To the right of the tabs are links for 'Go to FANI' and 'Log off'. The main content area is titled 'List of reports' and contains a list of report links, each preceded by a document icon:

- Nutrients report
- Canada's Food Guide Report
- Additional questions report
- Meal context report
- Completion statistics report
- Participant report
- HEI-MED scores report
- Probability report
- Z score report
- R24W description of the variables
- Nutrients and portions per 100g report
- Participations statistics

At the bottom of the page, there is a footer with the INAF logo and the text: 'Institute of Nutrition and Functional Foods, Laval University - © 2020 All rights reserved'.

- Nutrients (macro, %, micro)
- Canada's Food Guide servings (2007)
- Diet quality (e.g. Healthy Eating Index)
 - Total per day
 - Average per participation
 - Total per meals and foods

Dietary supplements questionnaire

**Canada's
food guide**

Healthy eating when pregnant and breastfeeding



You need a multivitamin with 0.4 mg folic acid everyday if you:

- are pregnant
- could become pregnant

This can reduce the risk of your baby developing a neural tube defect.

While you are pregnant, make sure your daily multivitamin also contains 16 to 20 mg of iron.

A health care provider can help you find the multivitamin that is right for you.



Government
of Canada

Gouvernement
du Canada

<https://food-guide.canada.ca/en/tips-for-healthy-eating/pregnant-breastfeeding/>

Dietary supplements questionnaire



What is asked to the participant?

1. **In the last month, have you taken a dietary supplement (vitamin/mineral)?**
Note: Also consider dietary supplements sold in the form of oils (e.g. cod liver oil).
2. **Enter the name and identification number of this supplement (DIN).**
3. **In what unit of measure do you wish to report the dose of this supplement?**
(mL, drop, tablet, capsule, tablespoon, teaspoon, other)
4. **Write the dose of your supplement in the unit of measure you chose in the previous**
If it is a multivitamin, enter the number of tablets/capsules.
5. **How often do you take this dose?**
(1 time a day, 2 times a day, 3 times a day, as needed, other)





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02

Context of diet
assessment

The ANGE study



Objectives:

1

To validate a self-administered web-based 24-hour dietary recall among pregnant women.

2

To measure changes in dietary intakes throughout trimesters and to assess pregnant women's dietary intakes in comparison with current Canadian nutritional recommendations



**Apports Nutritionnels
durant la Grossesse**

Co-investigators

Simone Lemieux, RD, PhD

Julie Robitaille, RD, PhD

John Weisnagel, MD

Claudia Gagnon, MD

Véronique Provencher, RD, PhD

Emmanuel Bujold, MD

Bénédicte Fontaine-Bisson, RD, PhD

Study Timeline

n=86

1st trimester
7-14 weeks

2nd trimester
20-27 weeks

3rd trimester
31-37 weeks

3 x 24-hour dietary recalls
+ Food record (3 days)

3 x 24-hour dietary recalls
+ Food record (3 days)

3 x 24-hour dietary recalls
+ Food record (3 days)

Dietary supplement questionnaire

Dietary supplement questionnaire

Dietary supplement questionnaire

Other questionnaires: nausea & vomiting/ eating behaviors (TFEQ, IES2)/physical activity

Other questionnaires: nausea & vomiting/ eating behaviors (TFEQ, IES2)/physical activity

Other questionnaires: nausea & vomiting/ eating behaviors (TFEQ, IES2)/physical activity

Blood samples, anthropometric measurements, ultrasound

Blood samples, anthropometric measurements

Blood samples, anthropometric measurements, ultrasound



Online questionnaires

On-site visits

*TFEQ = Three factors eating questionnaire, IES = intuitive eating scale



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03



Results from diet
assessment during
pregnancy

Results

RESEARCH ARTICLE

Open Access

Validation of a self-administered web-based 24-hour dietary recall among pregnant women



Claudia Savard^{1,2,3}, Simone Lemieux^{1,3}, Jacynthe Lafrenière^{1,3}, Catherine Laramée³, Julie Robitaille^{1,2,3} and Anne-Sophie Morisset^{1,2,3*} 

- Final sample restricted to women who completed both the food record and three (3) 24-hour dietary recalls within each trimester (n = 60)



Table 2 Completion statistics of the R24W

	Mean (SD)			P value
	1st trimester	2nd trimester	3rd trimester	
Completion time (minutes)	21.8 (7.5)	19.2 (6.8)	16.3 (5.1)	< 0.0001
Reported meals (N)	5.1 (0.9)	4.8 (1.1)	5.0 (1.2)	0.13
Reported items (N)	20.5 (4.0)	20.3 (4.1)	19.4 (4.0)	0.025

Results

Table 3 Differences between mean dietary intakes reported by the R24W and the FR in the 2nd trimester

	R24W (SD)	FR (SD)	% difference	Pearson correlation
Energy (kcal)	2357 (489)	2239 (506)	5.3*	0.68*
Carbohydrates (g)	286.7 (67.7)	279.1 (76.2)	2.7	0.76*

Table 4 Cross-classification of intakes by quartiles and weighted kappa coefficient in the 2nd trimester

	%				Weighed Kappa
	Same quartile	Adjacent quartiles	± 1 Quartile apart	Misclassification (quartile 1 vs 4)	
Energy	43.3	38.3	81.6	1.7	0.39
Carbohydrates	53.3	33.3	86.6	3.3	0.49
Fat	40.0	41.7	81.7	1.7	0.36

Table 5 Seven criteria validity analysis of the R24W in the 2nd trimester

	Individual level			Group level		Total of poor outcomes
	Association	Agreement		Agreement	Presence of bias	
	Pearson coefficient	Cross-classification	Kappa score	% difference	T-test	Bland- Altman
Criteria for good (G) outcome	≥0.50	≥ 50% in same quartile; < 10% in opposite		0-10.9%	P > 0.05	P > 0.05

Results

- 79 women for whom we have nutritional data at each trimesters
- Seventy-four (93.7%) of the women filled all nine dietary recalls.

Article

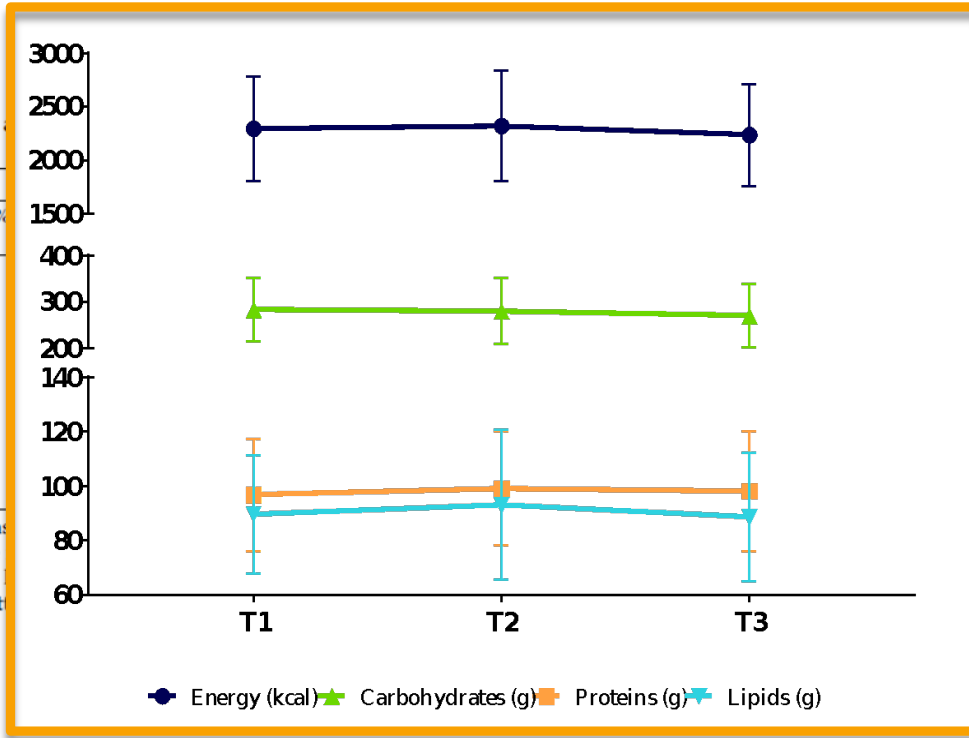
Trimester-Specific Dietary Intakes in a Sample of French-Canadian Pregnant Women in Comparison with National Nutritional Guidelines

Claudia Savard ^{1,2,3}, Simone Lemieux ^{1,3}, S. John Weisnagel ^{2,4}, Bénédicte Fontaine-Bisson ^{5,6}, Claudia Gagnon ^{2,3,4}, Julie Robitaille ^{1,2,3} and Anne-Sophie Morisset ^{1,2,3,*}

Table 2. Trimester-specific energy intakes

	First Trimester	
	Mean $\pm$ SD or AMDR Range	%Below AMDR or EER
EER (kcal/day)	2122.4 $\pm$ 265.9	-
Energy intake (kcal/day)	2294.3 $\pm$ 487.2	36.7
AMDR protein, E%	10–35	-
Protein, E%	16.9 $\pm$ 2.5	0
AMDR carbohydrate, E%	45–65	-
Carbohydrate, E%	49.4 $\pm$ 4.7	20.3
AMDR total fat, E%	20–35	-
Total fat, E%	35.1 $\pm$ 4.0	0
SFA, E%	12.8 $\pm$ 2.1	-
MUFA, E%	12.3 $\pm$ 2.1	-
PUFA, E%	7.1 $\pm$ 1.9	-

^a *p*-value for repeated measures ANOVA performed to assess differences in nutrient intakes across trimesters. The “-” is used instead of a 0. AMDR: acceptable macronutrient distribution range; SFA: saturated fatty acids; MUFA: monounsaturated fatty acids; PUFA: polyunsaturated fatty acids.



Energy intakes.

Above AMDR or EER	<i>p</i> -Value ^a
-	-
29.1	0.09
-	-
0	0.14
-	-
0	0.27
-	-
57.0	0.53
-	0.047
-	0.49
-	0.03

A formula was established for a given age group (age in years):
 Energy (kcal) = 354 – (6.91 $\times$ age)
 Saturated fatty acids; MUFA: monounsaturated fatty acids; PUFA: polyunsaturated fatty acids.

Results

A large majority of women took at least one supplement (mainly a multivitamin)



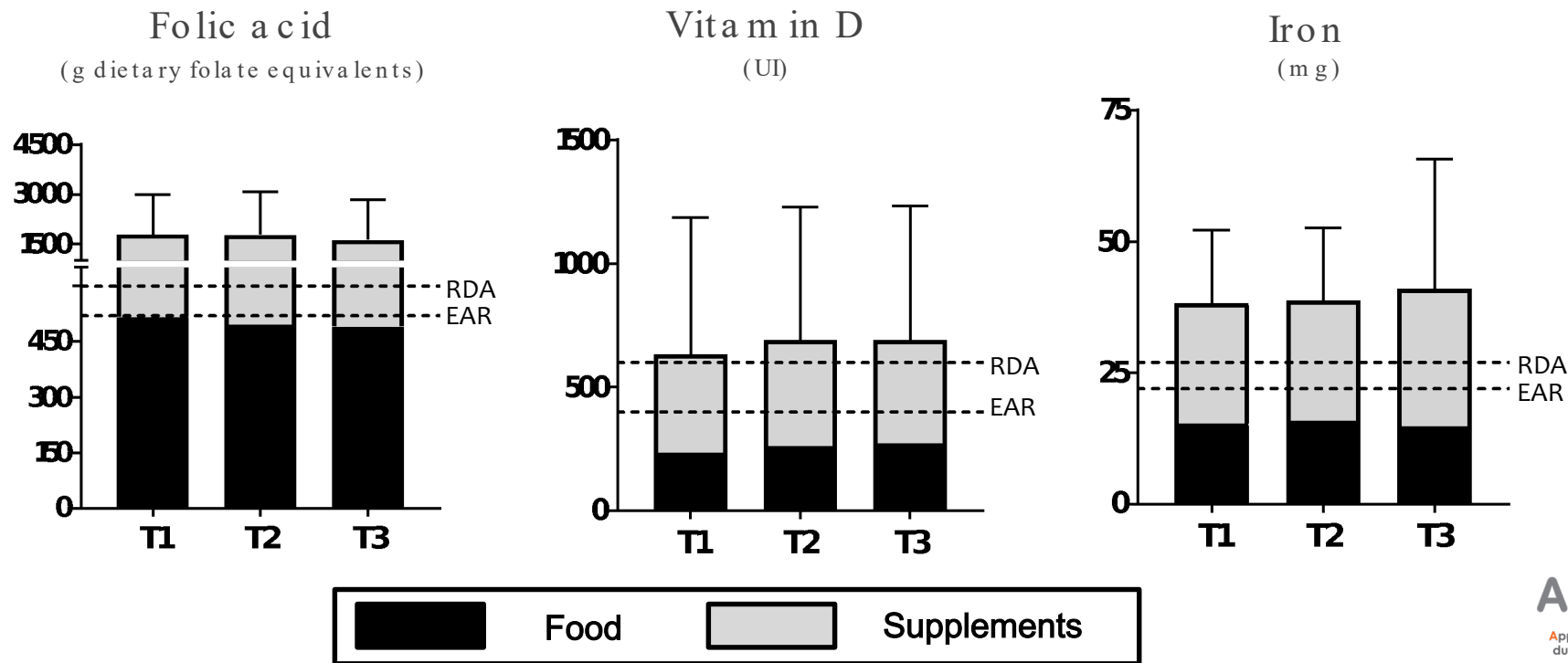
nutrients



Article

Trimester-Specific Dietary Intakes in a Sample of French-Canadian Pregnant Women in Comparison with National Nutritional Guidelines

Claudia Savard ^{1,2,3}, Simone Lemieux ^{1,3}, S. John Weisnagel ^{2,4}, Bénédicte Fontaine-Bisson ^{5,6}, Claudia Gagnon ^{2,3,4}, Julie Robitaille ^{1,2,3} and Anne-Sophie Morisset ^{1,2,3,*}



Results

- 2007 version of the Canadian Healthy Eating Index (GHEI)

Table 3. Healthy Eating Index total and subscores throughout pregnancy.

HEI	1st Trimester	2nd Trimester	3rd Trimester	p-Value *
Total	65.8 ± 10.8	65.0 ± 12.0	62.9 ± 12.6	0.075
Adequacy †	47.2 ± 7.4	46.4 ± 7.7	44.7 ± 8.2	0.016
Total vegetables and fruits	8.3 ± 2.0	7.7 ± 2.1	7.7 ± 2.2	0.018
Whole fruits	4.3 ± 1.5	4.1 ± 1.4	4.3 ± 1.4	0.778
Dark green and orange vegetables	3.5 ± 1.6	3.4 ± 1.6	3.0 ± 1.6	0.056
Total grain products	4.5 ± 0.7	4.4 ± 0.8	4.2 ± 0.9	0.123
Whole grains	2.4 ± 1.8	2.3 ± 1.7	2.4 ± 1.9	0.893
Milk and alternatives	8.9 ± 2.0	8.9 ± 2.1	9.1 ± 1.9	0.685
Meat and alternatives	8.7 ± 2.0	8.9 ± 1.9	8.6 ± 2.2	0.566
Unsaturated fats	6.6 ± 3.0	6.6 ± 3.4	5.4 ± 3.4	0.008
Moderation ‡	18.6 ± 7.2	18.6 ± 7.9	18.2 ± 8.1	0.894
Saturated fats	4.0 ± 2.7	3.6 ± 3.1	3.1 ± 2.8	0.039
Sodium	4.4 ± 2.6	4.7 ± 2.8	5.0 ± 2.7	0.173
Other foods	10.2 ± 5.1	10.3 ± 5.2	10.2 ± 5.7	0.970

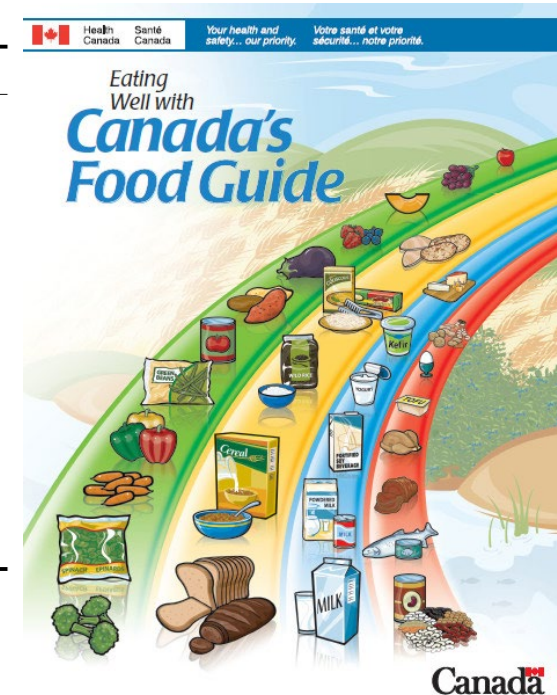
* p-value of the repeated measures analyses of variance performed across trimesters, bold characters indicate significance of the analysis. † for adequacy components, 0 points for minimum intake or less, 5, 10 or 20 for maximum intake or more, and proportional for amounts between minimum and maximum. ‡ for moderation components, 10 or 20 points for minimum intake or less, 0 points for maximum intake or more, and proportional for amounts between minimum and maximum.



Article

Trimester-Specific Assessment of Diet Quality in a Sample of Canadian Pregnant Women

Claudia Savard ^{1,2,3}, Simone Lemieux ^{1,3}, Élise Carbonneau ^{1,3}, Véronique Provencher ^{1,3},
Claudia Gagnon ^{2,3,4}, Julie Robitaille ^{1,2,3} and Anne-Sophie Morisset ^{1,2,3,*} 



Results

Figure 1A. Age

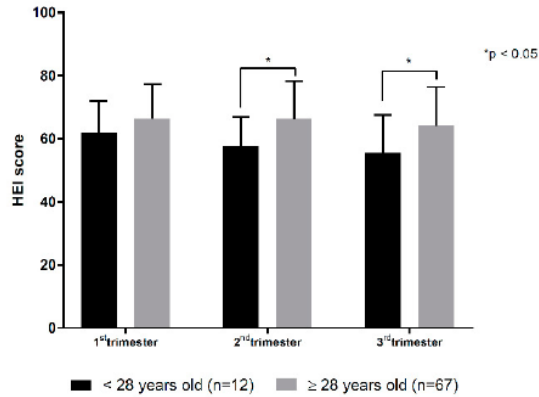


Figure 1B. BMI

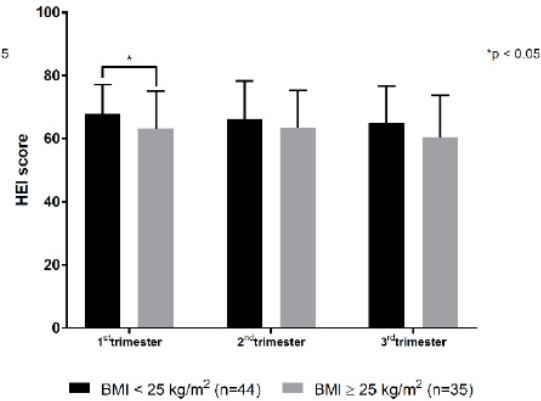


Figure 1C. Physical activity

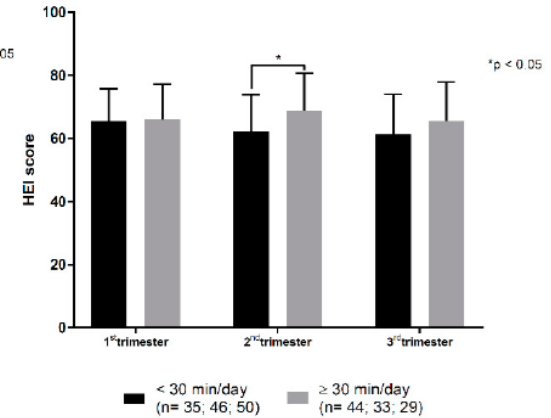


Figure 1D. Education

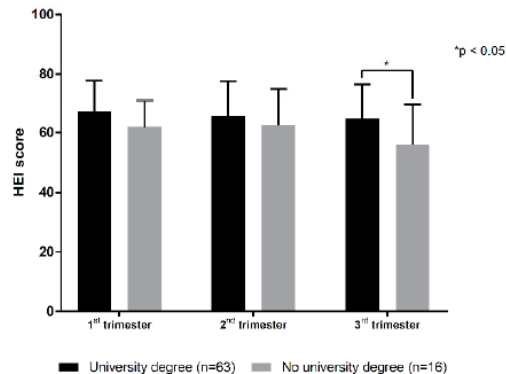
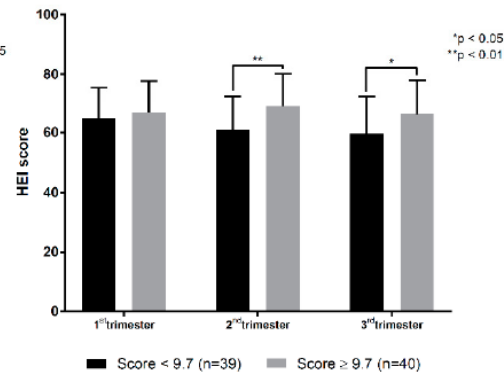


Figure 1E. Nutrition knowledge





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04

Lessons learned,
challenges and
perspectives



Lessons learned

- ✓ The use of a web-based dietary recall was informative and appreciated by the participants.
- ✓ Importance to have recruitment strategies to enroll women early.
- ✓ Importance to maintain on-site visits => creates a bond of trust.
- ✓ Longitudinal assessment of dietary intakes is still important, even if we observed no change for macro and micronutrients : why is that?
- ✓ Relatively small sample => difficult to observe associations with pregnancy outcomes and gestational weight gain.

→ Further studies will help to understand.

Challenges and perspectives

- No diet assessment tool is perfect.
- Importance to combine traditional tools with objective measurement methods to get a better picture!

Longitudinal Assessment of Vitamin D Status across Trimesters of Pregnancy



Claudia Savard,^{1,2,3} Agnieszka Bielecki,⁴ Anne-Sophie Plante,^{2,3} Simone Lemieux,^{1,3} Claudia Gagnon,^{2,5} Hope A Weiler,⁴ and Anne-Sophie Morisset^{1,2,3}

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Thanks!

Do you have any questions?
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Collaborators, participants and funding agencies!

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