Comparison between an interactive web-based self-administered 24h dietary record and an interview by dietitian for large-scale epidemiological studies

M. Touvier, E. Kesse-Guyot, C. Méjean, C. Lassale, S. Peneau, L. Fezeu, K. Castetbon, P. Galan, S. Hercberg

Camille Lassale

ICDAM 8 – Rome – May 16th, 2012

Nutritional Epidemiology Research Unit U557 Inserm / INRA / CNAM / Paris 13
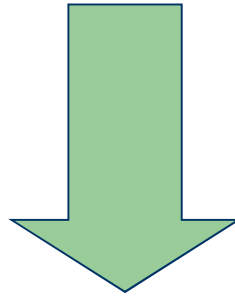
1

Background

Collection of high-quality dietary data in large populations = priority challenge in nutritional epidemiology

Usual methods are based on self-administered questionnaires (food records, FFQs) or interviews by trained dietitians (24h recalls, dietary history, FFQs)
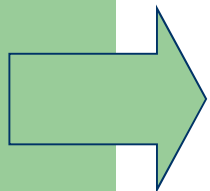
Complex, costly,
requiring substantial logistic resources

2

Background

Online self-administered data collection, by reducing the logistic burden and cost, could advantageously replace classical methods when assessing dietary intake in large epidemiological studies

Studies comparing new instruments to traditional methods are necessary

3

Objective of the comparison study

Objective : to compare the NutriNet-Santé web-based self-administered 24h dietary record with a 24h recall conducted by a trained dietitian (corresponding to the same day), by administering both versions to a sample of mature subjects.

4

Methods

Methodology of the comparative study

-1-
Participants fill in the self-administered web-based 24h record on a date agreed upon beforehand

-2-
Appointment with a dietitian for the following day in order to complete the 24h recall by telephone

6

The NutriNet-Santé self-administered web-based 24h dietary record

- Designed for self-administration on the Internet

- Based on a secured user-friendly interface

- Includes detailed instructions (PDF user's guide, video, tips included within the questionnaire, etc.).

- To avoid omissions, supervision is integrated at two levels:

1) items usually associated with each food item (e.g. sugar in coffee)

2) at the end of the food entry step: usually consumed items (water, bread, sugar, salt, etc.)

7

Meal-based approach:

- Time and type of meal (breakfast, lunch, dinner, snacking,…)

- Capture of data for a specific meal - 2 steps:
    1) Main **foods** and associated foods (dressing, garnish,…)
    2) **Amounts**: photos (validated picture booklet) or quantities

- Link with a nutritional composition table, taking into account the edible portion

8

ÉTUDE NUTRINET SANTÉ

500 000 nutrinautes
pour étudier les relations
entre la nutrition et la santé

ESPACE MEMBRE
Identifiant: demo3h
Dernière connexion: 12/02/2009 00:11:31

MON COMPTE
Mon mot de passe
Déconnexion

Retour à la liste | Si vous êtes déconnecté ou si vous fermez le questionnaire, vos réponses seront systématiquement sauvegardées

Journée de SAMEDI (17/01/2009) | Aide ❓

petit déjeuner (7 aliments)

Saisissez ici l'aliment recherché ou cliquez sur la famille de l'aliment ci-dessous | Rechercher

déjeuner ❌

12h30' - à domicile

jambon blanc
+ mayonnaise

▶ Eaux et autres boisso...

Cliquez pour faire apparaître les sous-groupes puis les aliments ou boissons

▶ Pains, biscottes, pai...

▶ Hors d'oeuvre, salades diverses, entrées exotiques
▶ Charcuteries
▶ Produits apéritifs
▶ Soupes

▶ Viandes, poissons, oeufs
▶ Pâtes, riz, pommes de terre et légumes secs
▶ Légumes
▶ Plats cuisinés (faits maison ou du commerce)
▶ Fast food, pizzas, sandwichs, tartes et autres

▶ Produits laitiers (laits, yaourts, fromages)
▶ Aliments sucrés (petit déjeuner, goûter, dessert...)
▶ Fruits

▶ Assaisonnements, matières grasses et accompagnements salés
▶ Accompagnements sucrés et farines
▶ Produits diététiques

Aliment non trouvé ❓

🗐 Enregistrer en brouillon | ▶ Toutes mes consommations sont saisies

ÉTUDE
NUTRINET
SANTÉ

500 000 nutrinautes
pour étudier les relations
entre la nutrition et la santé

ESPACE MEMBRE
Identifiant: demo3h
Dernière connexion: 12/02/2009 00:11:31

MON COMPTE
Mon mot de passe
Déconnexion

Retour à la liste   Si vous êtes déconnecté ou si vous fermez le questionnaire, vos réponses seront systématiquement sauvegardées
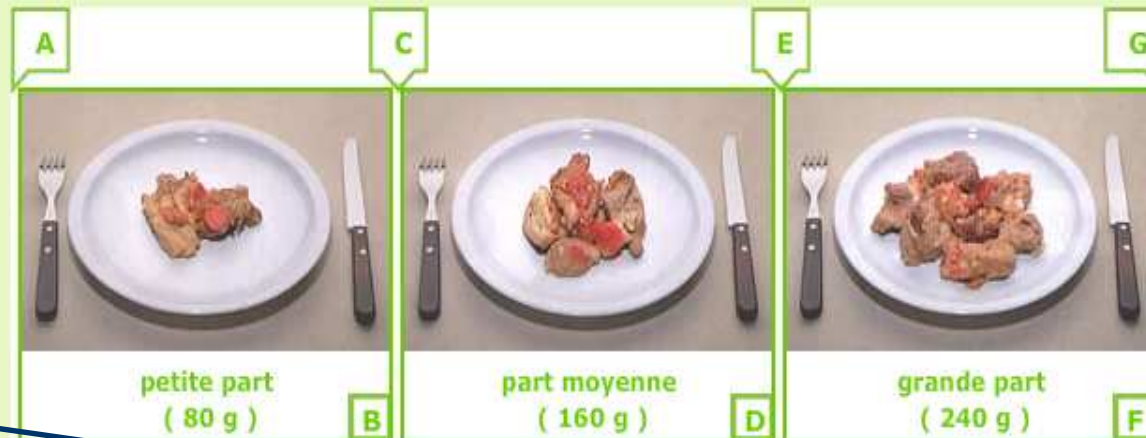
Journée de SAMEDI (17/01/2009)   Aide

petit déjeuner (7 aliments)

déjeuner

jambon blanc (1 tranche moyenne = 50 g)
  + mayonnaise (1 cuillère à café = 5 g)
boeuf bourguignon

Choisissez la quantité pour "boeuf bourguignon"

A   C   E   G

petite part
(80 g)   B

part moyenne
(160 g)   D

grande part
(240 g)   F

Portion size

Sélectionnez la portion : ○ A ○ B ○ C ○ D ○ E ○ F ○ G

Number of portions

Sélectionner le nombre de portions: [▼]

Si les portions proposées ne conviennent pas à votre
consommation, vous pouvez préciser la quantité exacte : [   ] g

Quantity in gram or volume

Annuler   ◄ Précédent   Terminer

24h recall carried out by a dietitian = "reference"

This phone interview (24h recall) evaluated what was eaten <u>on the same day</u> as the self-administered record, and was <u>conducted by a trained dietitian</u> using the same computerised interface.

After completing the two dietary assessments, participants were requested to fill in a web-based "satisfaction" questionnaire

11

Statistical analyses

Measurement of agreement between the 2 methods:

- **Foods**: Intraclass correlation coefficient (ICC)

  1) among consumers only

  2) among all subjects (considering consistently null consumption of a food item in the two methods as being concordant per se)

- **Nutrients**: log transformation ➔ Pearson correlation coefficients

  1) non-adjusted

  2) energy-adjusted (residual method)

+ ICCs and Pearson correlations **stratified** by age group, education level and self-estimated computer knowledge (Wilcoxon signed-rank sum test)

+ Non-parametric Spearman correlations for foods and nutrients

12

All analyses were stratified by gender

Results

13

Characteristics of the study population (n=147)

	Men (n=60)		Women (n=87)		P*
	Mean	*SD*	*Mean*	*SD*	
Age (years)	64.3	4.2	58.4	5.9	<0.0001
	n	*%*	*n*	*%*	
Education level					0.02
Elementary school					
Secondary school	20	33.9	44	53.0	
University or equivalent	26	44.1	32	38.6	
Occupational category[†]					0.0004
Managerial staff	27	45.8	17	21.8	
Self-employed, farmers	5	8.5	1	1.3	
Intermediate professions, employees	24	40.7	49	62.8	
Manual workers	3	5.1	2	2.6	
Never employed	0	0.0	9	11.5	
Self-evaluated computer knowledge					0.02
Novice or inexperienced	7	13.0	21	30.0	
Experienced or expert					
Self-evaluated web knowledge					0.4
Novice or inexperienced					
Experienced or expert					
Type of connection					0.3
<512 k	12	22.2	19	27.1	
≥512 and <1024 k	17	31.5	28	40.0	
≥1024 k	22	40.7	17	24.3	
Do not know	3	5.6	6	8.6	

Age range: 48-75 years ➔ mature age

Relatively high level of education / socio-professional category

23% novice/inexperienced with computers

5 missing data for education level and 10 for occupational category. 124 subjects returned the satisfaction questionnaire

14

Agreement between the two methods : foods

	Men							Women						
	Interview			Web			ICC (95% CI)	Interview			Web			ICC (95% CI)
	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	
Fruits	54	306.5	209.7	54	286.5	246.1	0.89 (0.82, 0.94)	84	326.9	210.5	83	309.5	187.9	0.89 (0.83, 0.93)
Vegetables	59	369.3	218.1	56	363.1	238.3	0.82 (0.72, 0.89)	84	324.0	185.6	84	313.4	190.6	0.78 (0.68, 0.85)
Meat, poultry, offal	52	130.8	66.3	51	125.2	66.6	0.90 (0.84, 0.94)	61	108.6	70.2	62	105.3	60.6	0.73 (0.59, 0.83)
Fish, seafood	19	140.0	104.8	20	144.5	83.9	0.76 (0.48, 0.90)	30	106.2	56.2	30	95.8	65.7	0.69 (0.45, 0.83)
Bread, toasts	58	151.1	62.1	59	159.3	76.5	0.59 (0.40, 0.74)	83	100.8	59.0	84	103.9	66.4	0.67 (0.53, 0.77)
Potatoes	28	154.2	82.3	28	132.8	95.2	0.60 (0.32, 0.79)	34	116.8	60.6	29	103.7	74.8	0.80 (0.64, 0.90)
Pulses	5	79.8	100.7	3	53.8	109.8	0.93 (0.53, 0.99)	13	95.5	93.8	12	88.0	90.0	0.94 (0.81, 0.98)
Pasta, rice, semolina	26	130.0	97.1	28	115.0	88.0	0.75 (0.53, 0.87)	42	112.1	58.1	42	119.1	76.8	0.58 (0.35, 0.75)
Milk, dairy products	58	260.8	162.1	58	261.1	149.1	0.75 (0.61, 0.84)	85	234.7	138.0	83	238.1	156.0	0.53 (0.36, 0.67)
Fats and sauces	59	43.3	27.9	56	34.2	22.1	0.51 (0.29, 0.67)	85	33.2	22.2	82	37.5	30.3	0.52 (0.35, 0.66)

For consumers only:
✓ Median of ICCs = **0.8 (M) / 0.7 (W)**
✓ Range: 0.5 for fats/sauces (M / W), BC, cakes/biscuits/pastries and dairy (W)
    to 0.9 for fruits, pulses (M / W), BC, alcoholic drinks and meat (M)

15

Agreement between the two methods : foods

- For all subjects: median of ICCs = 0.9 (M / W), range: 0.7-1.0

- Mean ICC did not vary across categories of age, education or computer knowledge (P>0.2)

- Spearman correlations: similar results. Median for both genders: 0.7 for consumers only and 0.8 for all subjects

16

Agreement between the two methods : nutrients

	Men (n=60)					Women (n=87)				
	Interview		Web			Interview		Web		
	Mean	SD	Mean	SD	Pearson correlation*	Mean	SD	Mean	SD	Pearson correlation *
Energy (kcal)	2151.4	546.9	2116.7	617.9	0.86 (0.77, 0.91)	1718.1	497.5	1723.5	590.3	0.85 (0.78, 0.90)
Protein (g)	93.3	29.5	95.5	30.6	0.77 (0.64, 0.86)	76.9	27.9	77.9	28.2	0.82 (0.73, 0.88)
Carbohydrate (g)	223.8	68.5	227.1	84.3	0.87 (0.79, 0.92)	186.8	73.4	191.0	82.5	0.85 (0.78, 0.90)
Fat (g)	85.0	28.4	80.0	32.0	0.77 (0.64, 0.86)	66.4	25.5	64.7	29.6	0.81 (0.72, 0.87)
Vitamin C (mg)	129.7	84.8	131.3	88.3	0.83 (0.73, 0.90)	123.4	73.1	128.9	82.4	0.90 (0.85, 0.93)
Folate (µg)	385.0	167.7	393.2	173.3	0.80 (0.69, 0.88)	352.0	124.5	360.9	147.7	0.85 (0.78, 0.90)
Calcium (mg)	1004.5	389.2	1027.6	400.5	0.82 (0.71, 0.89)	932.6	346.8	899.0	382.4	0.70 (0.57, 0.79)
Iron (mg)	16.2	8.8	16.7	10.6	0.84 (0.74, 0.90)	14.4	8.9	15.4	11.5	0.89 (0.83, 0.93)

* Adjusted for energy intake (without alcohol) from the residual method (except for energy)

Median of energy-adjusted Pearson correlations: **0.8 (M/W)**
✓ Range: 0.6 for polyunsaturated fat, retinol, vitamin E and sodium (W) to 0.9
✓ Lowest coefficients: rather small variations between the two methods in the quantity of foods containing high amounts of the nutrient (e.g., liver and camembert for retinol)

17

Agreement between the two methods : nutrients

- <u>Mean Pearson correlation</u>:

✓higher in subjects ≤60y (P=0.02)

✓higher in subjects "experienced/expert" with computers (P=0.0003)

✓no difference according to education level (P=0.12)

- <u>Spearman correlations</u>: similar results: median: 0.8 (M/W)

18

Comparison of Completion Time and Satisfaction Between the Web-Based Self-Administered 24h Dietary Record and the Interview by a Dietitian (n=124)

	Interview		Web		$P^{\dagger}$
	n	%	n	%	
Completion time					0.02
≤10 min	11	8.9	24	19.4	
11-20 min	38	30.6	36	29.0	
21-30 min	44	35.5	25	20.2	
31-40 min	19	15.3	10	8.1	
>40 min	12	9.7	29	23.4	
Completion time acceptable ?					0.1
Agree	116	93.5	121	97.6	
Disagree	8	6.5	3	2.4	
Completion					0.4
Agree	115	92.7	118	95.2	
Disagree	9	7.3	6	4.8	
Quantifying the amounts of food consumed easy ?					0.06
Agree	121	97.6	116	93.5	
Disagree	3	2.4	8	6.5	

Median completion time similar between the two methods : 25 min

But more heterogeneous in the web-based method

19

Satisfaction questionnaire

<u>Web-based 24h record</u> prefered by the majority of the users (66%)

- 63.7% filled out the web-based 24h record in one sitting
- 92.7% juged the web-based interface user-friendly
- 2/3 consulted the "help" section and 88.6% of them were satisfied
- For 80.7%, the "supervisor" enabled to correct/complete the record

33.9%

66.1%

20

Discussion

- Completion of the first method (i.e. the record) may have influenced completion of the second (i.e. the recall), by reducing memory bias during the interview ➔ potential overestimation of agreement between the two methods

- Comparison and not validation study: correlation coefficients observed in our study should not be interpreted as correlations between the web-based assessment and true intake, which are probably lower

- Judgment bias could potentially increase the risk of conscious or unconscious food omisson and underestimates of portion sizes for sweet/fatty items (and in contrast, overestimates of healthy foods)
  - Several subjects declared being uncomfortable with the idea of describing their diet to the dietitian
  - Among women, the declared intake of cakes/biscuits/pastries was higher using the web-based method

➔ Limited contact with the interviewer may encourage reporting of more food items

21

Conclusion

- Good agreement between the two methods

- The web-based tool had substantial logistic and cost advantages

- Online dietary surveys are able to access wide and diversified populations and achieve quick returns

- In practice, it is possible to use repeatedly (several records per year) this web-based 24h record, in association with a FFQ or propensity questionnaire

- This will advance our understanding of the relationship between nutrition and health outcome

- The web also promises a new generation of tools for dietary improvement, including nutritional education and counseling

22

Publications on the NutriNet-Santé study

The NutriNet-Santé Study:

Hercberg S, Castetbon K, Czernichow S et al. **The Nutrinet-Sante Study: a web-based prospective study on the relationship between nutrition and health and determinants of dietary patterns and nutritional status.** *BMC Public Health 2010;10:242.*

Comparison studies:

✓Touvier M, Méjean C, Kesse-Guyot E, Pollet C, Malon A, Castetbon K, Hercberg S. **Comparison between web-based and paper versions of a self-administered anthropometric questionnaire.** *Eur J Epidemiol. 2010, 25:287–296*

✓Touvier M, Kesse-Guyot E, Méjean C, Pollet C, Malon A, Castetbon K, Hercberg S. **Comparison between an interactive web-based self-administered 24h dietary record and an interview by a dietitian for large-scale epidemiological studies.** *Brit J Nutr. 2010, 2011;105:1055-64*

✓Vergnaud AC, Touvier M, Méjean C, Kesse-Guyot E, Pollet C, Malon A, Castetbon K, Hercberg S. **Agreement between web-based and paper versions of a self-administered socio-demographic and economic questionnaire: results from the NutriNet-Santé cohort study.** *Int J Public Health. 2011, 56: 407-17*

Thank you for your attention!

http://info.etude-nutrinet-sante.fr/en/node/2

In French and English