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**Desire to lose weight, dietary intake and psychological correlates  
among middle-aged and older women. The CoLaus study**

**Short title:**

**Desire to lose weight in aging women**

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## **Abstract**

Body dissatisfaction has been regularly associated with negative consequences on health of young women, but less is known regarding middle-aged or older women. However, body dissatisfaction in women has been seen for long as a “normative discontent” (i.e. widespread and chronic dissatisfaction) because of its high prevalence among all age categories. The goal of this study was to explore the relationships between the desire to lose weight, energy intake and psychological health in community-dwelling women issued from the second wave (cross-sectional data) of the cohort study CoLaus (2009-2012, Switzerland), taking age categories (40-59 and 60-80) and body mass index (BMI, normal and overweight/obese) into account. Results showed that the desire to lose weight was common even in women with normal BMI and whatever the age category. Women with normal BMI who wished to lose weight reported lower energy and protein intake per kg of body weight, more signs of depression and less satisfaction with their quality of life than those who did not wish to lose weight in both age groups. The desire to lose weight was similarly associated with psychological health in women with overweight/obesity, in both age categories as well. These results indicate that the desire to lose weight may be associated with an impaired psychological health also in middle-aged and older women, even in those with normal BMI. This should not be considered as normal by health care professionals but as a possible indicator of psychological health and of the capacity to comply with dietary recommendations.

**Keywords:** Body weight; Aging; Women’s health; Diet; Caloric restriction; Energy intake; Depression; Quality of life

## Introduction

As underlined by Derenne and Beresin (2006, 2017), the standard of beauty for women has often been unrealistic across times. Furthermore, currently, images of unrealistically thin and unattainable bodies are disseminated through all types of media. Moreover, the pressure to be and look thin has been reinforced by the stigmatization of obesity via health campaigns messages, community interventions, or health care providers' attitudes (MacLean et al., 2009; Puhl and Heuer, 2009). The internalization of the media ideal of thinness has mainly been studied among young girls, because of its association with eating disorders (Stice and Shaw, 2002). It can lead young people to body dissatisfaction (Rodgers et al., 2015) with consequences on health behavior, such as more dieting, unhealthy weight control behaviors, binge eating, and lower levels of physical activity (Neumark-Sztainer et al., 2006). Besides, an unhealthy body image in childhood and adolescence is associated to a range of psychological negative consequences, such as lowered self-esteem, depression, emotional distress, habitual negative thinking and social anxiety (Rumsey et al., 2015).

Body dissatisfaction seems to persist with age (Tiggemann, 2004). For decades, body dissatisfaction has been qualified as “a normative discontent” because it was so commonly observed among women of all ages (Rodin et al., 1985). Still, far less research has been conducted among middle-aged (40-60 years) and elderly (>60 years) women than among their younger counterparts (Mangweth-Matzek et al., 2014). Among older women (>60 years), controversy exists regarding the impact of body dissatisfaction on psychological health and health behaviors. The importance of body appearance might be counterbalanced by body competences (Reboussin et al., 2000) and by cognitive control that would act as a protective factor of self-esteem (Webster and Tiggemann, 2003). However, a few surveys also showed that a high proportion of aging women wanted to lose weight and even went on low-calorie diets despite a normal body mass index (BMI). This suggests that body shape and weight was still important for them (Allaz et al., 1998; Gagne et al., 2012). This is particularly concerning, as Fey-Yensan and colleagues (2002) highlighted that the consequences of chronic and inappropriate dieting, for example poor physical balance, sarcopenia, osteopenia, or reduced immune functioning, were more important for older than for younger women.

Some recent cross-sectional studies highlighted that this “normative discontent” should not be considered as normal. In a large sample of Australian women aged 18 to 42,

Mond and colleagues (2013) showed that body dissatisfaction, was associated with poorer quality of life, even if reported by most participants. The authors concluded that body dissatisfaction, albeit normative, was not benign, and represented a public health issue in itself. In the same line, Muenning and colleagues (2008) found that the desire to lose weight was a strong predictor of the number of physically or mentally “unhealthy” days per month, particularly for women. Moreover, using data from the 2012 Swiss Health Survey, Richard and colleagues (2016) found that body dissatisfaction, assessed by one single question on body weight satisfaction, was associated with depression in both genders, independently of BMI and age.

To summarize, among women, the wish to lose weight might be associated with impaired psychological health, but also with disturbed dietary intake, that might persevere with age. To our knowledge, no research has studied dietary intake and psychological health of middle-aged and older women and related these variables to their wish to lose weight. In order to explore these associations among middle-aged and older women and to describe differences in groups of women with normal or excessive BMI, we analyzed data extracted from the Swiss cohort study CoLaus. This cohort study explores cardio-vascular risk factors and contains evaluations of dieting, energy intake and psychological health. Even if a longitudinal study specifically dedicated to the potential consequences of unhealthy dieting would be preferable, analyzing these data collected in a representative sample of the community provides support in the design of a more definite study. Our hypotheses were that the desire to lose weight – which was used as a proxy for body dissatisfaction – was frequent among women with overweight or obesity but also among women with normal BMI, and that women who wished to lose weight would report more dieting, lower energy intake, as well as more impaired psychological health and lower quality of life than women who did not, irrespective of age, in the group with normal BMI and in the group with overweight/obesity.. We chose to focus on women because the recent studies highlighting body dissatisfaction among men have shown that their concern was more related to muscularity than to thinness, with distinctive consequences regarding their dieting practices (McCabe and Ricciardelli, 2004).

## Methods

### *Population sampling*

Data from the CoLaus/PsyCoLaus, a prospective study investigating mental disorders and cardiovascular diseases, were used. The sampling details have been published elsewhere (Firmann et al., 2008; Preisig et al., 2009) and an extensive description of the methods (recruitment, questionnaires) can be found online (<http://www.colaus.ch>). Briefly, a simple random sampling of the inhabitants of the city of Lausanne (Switzerland), aged 35 to 75, was performed. The baseline survey was conducted between June 2003 and May 2006 and included 6733 participants. The follow-up was conducted between April 2009 and September 2012, 5.5 years on average after the collection of baseline data, and included 5064 participants, aged 40 to 80, for the cardiovascular part, and 4001 for the psychiatric part.

In the present study, we conducted cross-sectional analyses on the data of the women participating in the follow-up, because these data included a questionnaire on dietary intake and dieting practices, which was not available in the baseline study.

### *Dieting status, desire to lose weight and dietary intake*

Dieting was assessed with two questions about current or previous slimming diet:

- Are you currently on a diet to lose weight? (Possible answers were: “yes” (coded 1), “no” (0)).
- Have you ever been on a diet to lose weight? (Possible answers were “yes” (1), “no” (0)).

Desire to lose weight was assessed with the question “Would you like to change your weight?”: “yes – lose” (1), “yes – gain” (2) or “no – maintain” (3). The answers were recoded into “desire to lose weight” with 1=1 (yes), 2 and 3=0 (no). For the purpose of the study, we used desire to lose weight as a proxy for body dissatisfaction.

Dietary intake was assessed using a self-administered, semi-quantitative food frequency questionnaire (FFQ, Bernstein et al., 1994) which has been developed and validated in the population of Geneva, which is similar to our study population (Beer-Borst et al., 2009; Bernstein et al., 1994). It assesses the dietary intake during the previous 4 weeks and consists

of 97 different food items accounting for more than 90% of the intake of calories, proteins, fat, carbohydrates, alcohol, cholesterol, vitamin D and retinol, and 85% of fiber, carotene and iron of the reference population. For each item, consumption frequencies ranging from “less than once during the last 4 weeks” to “twice or more per day” were provided, and the participants also indicated the average serving size (smaller, equal or bigger) compared to a reference size. Conversion into nutrients was performed based on the French CIQUAL food composition table taking into account portion size (Agence nationale de sécurité sanitaire alimentation environnement travail (ANSES), 2016). Total energy intake (TEI) was computed including macronutrient intake and alcohol consumption. Protein intake (grams, grams/kg of body weight, % of total energy intake (TEI) without alcohol), carbohydrates intake (grams, % TEI without alcohol) and lipid intake (grams, % TEI without alcohol) were computed to enable a comparison with the Swiss recommendations, which are: 0.8 grams/kg for proteins, 45-55% TEI for carbohydrates and 20-35% TEI for lipid (Société Suisse de Nutrition, 2017).

#### *Height and weight*

Body weight was measured in kilograms to the nearest 0.1 kg with a regularly calibrated scale (Seca® Hamburg, Germany). Height was measured to the nearest 5 mm with a height gauge (Seca® Hamburg, Germany). BMI was calculated using the formula weight (kg) / height (meters) squared, and categorized as underweight or normal ( $<25 \text{ kg/m}^2$ ) or as overweight or obese ( $\geq 25 \text{ kg/m}^2$ ).

#### *Psychological assessment*

Depression was assessed by the Center for Epidemiologic Studies-Depression scale (CES-D, Radloff, 1977), which is a 20-item questionnaire that evaluates the signs and severity of depression that occurred during the week before on a four-point Likert scale. The four subscales – Somatic complaints, Depressed affect, Interpersonal relationships, Positive affect – and the total score were considered. The total score varies between 0 and 60, a higher score indicating a higher severity. The cutoff considered as a sign of high depressive symptoms was 17 (Husaini and Neff, 1980).

Quality of life was assessed by the Manchester Short Assessment of Quality of Life (MANSA, Priebe et al., 1999), which is a 16-item scale that address satisfaction with life

domains. Satisfaction is rated on a seven-point rating scale. A higher score indicates a better quality of life.

### *Demographics*

Age at the time of the interview was categorized into middle-aged (40 to 59 years old) and older (60 to 80 years old). Data on marital status, smoking and education were obtained via questionnaire.

### *Ethics*

The institutional Ethics Committee of the University of Lausanne, which afterwards became the Ethics Commission of Canton Vaud (CER-VD) approved the baseline CoLaus study (reference 16/03); the approval was renewed for the follow-up (reference 33/09). All participants gave their signed informed consent before entering the study.

### *Exclusion criteria*

Participants were excluded if they 1) were older than 80 years; 2) had no BMI data, no body image data or dietary data, and 3) had no psychological assessment. Due to the large number of participants without psychological assessment, a sensitivity analysis for dietary intake was conducted which included these participants (results are shown in **Appendix A**).

### *Statistical analysis*

Statistical analyses were performed using Stata version 14.2 for Windows (Stata Corp, College Station, Texas, USA). Analyses were stratified by BMI category ( $<25$  and  $\geq 25$  kg/m<sup>2</sup>) and age group (40-59 and 60-80 years).

Descriptive analyses were expressed as number and percentage of participants for categorical variables and as mean  $\pm$  standard deviation for continuous variables. Bivariate between-group comparisons were performed using chi-square or Fisher's exact test for categorical variables and student's t-test for continuous variables. Multivariable analyses were conducted using logistic regression for categorical variables and the results were expressed as odds ratio and 95% confidence interval (95% CI). For continuous variables, multivariable analyses were conducted using analysis of variance and the results were expressed as multivariable-adjusted mean  $\pm$  standard error. Multivariable analyses were adjusted on age group (40-59 and 60-80 years) and ever dieting (yes/no), because dieting is known to alter



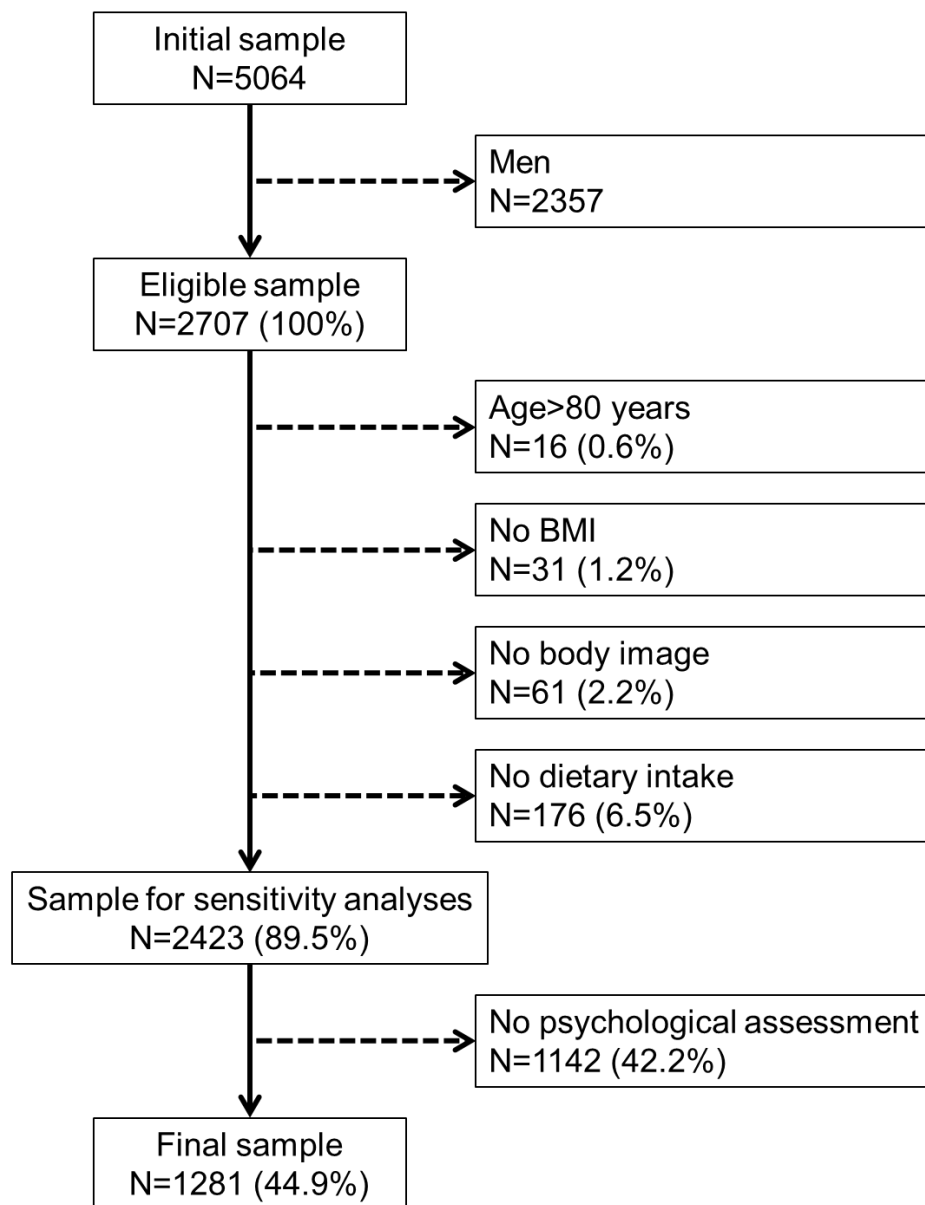
food intake assessment (Johnson et al., 2005). The cutoff for statistical significance was set at a two-sided alpha = .05.

## **Results**

### *Sample selection and characteristics*

Of the initial 2707 women, 2423 (89.5%) had complete data on body weight dissatisfaction and diet, from which 1281 (47.3%) also had data regarding psychological assessment. The exclusion process is summarized in **Figure 1**. The comparison between retained and excluded participants is summarized in **Table A.1**. The comparison between retained participants with and without psychological assessment is summarized in **Table A.2**.

The characteristics of both samples of middle-aged and older women are displayed in **Table 1** (sensitivity analyses **Table A.3**). Among the women with normal BMI, 38.1% of middle-aged women and 26.8% of older women wished to lose weight. Slimming diets had been tried by 30.5% in the middle-aged group and by 19.7% in the older women group with a normal BMI. Among the women who were in the overweight or obese category, 90.3% of middle-aged women and 74.6% of older women wished to lose weight. Slimming diets had been tried by 66% in the middle-aged group and by 48.5% in the older group of women in the overweight or obese category.



**Figure 1** : Selection process

**Table 1** : CoLaus women's characteristics: age, BMI, education, marital status, weight perception, desire to modify weight, dieting

BMI category (kg/m <sup>2</sup> )	40-59 years		60-80 years		ALL		p-value
	<25	≥25	<25	≥25	<25	≥25	
N	430	279	269	303	699	582	
Age (years)	50.4 ± 5.3	51.2 ± 5.5	66.9 ± 4.8	68.2 ± 5.3	56.8 ± 9.5	60.1 ± 10.0	<0.001
BMI (kg/m <sup>2</sup> )	21.8 ± 1.9	29.4 ± 4.3	22.2 ± 1.9	29.3 ± 3.9	22.0 ± 1.9	29.4 ± 4.1	<0.001
Education (%)							<0.001
High	115 (26.7)	47 (16.9)	48 (17.8)	19 (6.3)	163 (23.3)	66 (11.3)	
Middle	141 (32.8)	80 (28.7)	69 (25.7)	71 (23.4)	210 (30)	151 (26)	
Low	174 (40.5)	152 (54.5)	152 (56.5)	213 (70.3)	326 (46.6)	365 (62.7)	
Marital status (%)							0.472
Alone	209 (48.6)	141 (50.5)	157 (58.4)	152 (50.2)	366 (52.4)	293 (50.3)	
Couple	221 (51.4)	138 (49.5)	112 (41.6)	151 (49.8)	333 (47.6)	289 (49.7)	
Smoking status (%)							0.094
Never	182 (42.3)	113 (40.7)	133 (49.6)	151 (50.0)	315 (45.1)	264 (45.5)	
Former	140 (32.6)	106 (38.1)	94 (35.1)	112 (37.1)	234 (33.5)	218 (37.6)	
Current	108 (25.1)	59 (21.2)	41 (15.3)	39 (12.9)	149 (21.4)	98 (16.9)	
Do you consider your current weight (%)							<0.001 §
Too low	7 (1.6)	0 (0)	9 (3.4)	0 (0)	16 (2.3)	0 (0)	
Normal	331 (77.0)	33 (11.8)	221 (82.2)	65 (21.5)	552 (79.0)	98 (16.8)	
Too high	92 (21.4)	246 (88.2)	39 (14.5)	238 (78.6)	131 (18.7)	484 (83.2)	
Currently you would like to (%)							<0.001§
Lose	164 (38.1)	252 (90.3)	72 (26.8)	226 (74.6)	236 (33.8)	478 (82.1)	
Gain	7 (1.6)	0 (0)	7 (2.6)	1 (0.3)	14 (2.0)	1 (0.2)	
Maintain	259 (60.2)	27 (9.7)	190 (70.6)	76 (25.1)	449 (64.2)	103 (17.7)	
Are you currently on a slimming diet (%)	24 (5.6)	62 (22.2)	9 (3.4)	33 (10.9)	33 (4.7)	95 (16.3)	<0.001
Ever tried a slimming diet (%)	131 (30.5)	184 (66.0)	53 (19.7)	147 (48.5)	184 (27.5)	331 (56.9)	<0.001

BMI, body mass index. Results are expressed as number of participants (column percentage) for categorical variables or as mean ± standard deviation for continuous variables. Between-group comparisons (comparing ALL <25 with ALL ≥25) were performed using chi-square or Fisher's exact test (§) for categorical variables and student's t-test or analysis of variance for continuous variables.

### *Dieting and dietary intake*

The women with normal BMI who wished to lose weight were more likely to be dieting at the time of the evaluation (OR=25.2, CI 95%=5.86-108,  $p < 0.001$ ) (**Table 2a**). Total energy intake per kg of body weight ( $26.9 \pm 0.7$  vs  $29.8 \pm 0.5$ ,  $p < 0.001$ ) and protein intake per kg of body weight ( $1.0 \pm 0.03$  vs  $1.1 \pm 0.02$ ,  $p = 0.001$ ) were significantly lower for those who wished to lose weight compared to those who did not. The women with normal weight who wished to lose weight also reported lower percentages of carbohydrates intake ( $47.7 \pm 0.6$  vs  $49.0 \pm 0.4$ ,  $p = 0.073$ ) and higher percentages of lipid intake ( $36.7 \pm 0.5$  vs  $35.6 \pm 0.3$ ,  $p = 0.063$ ). These differences turned out to be significant in the sensitivity analyses (**Table A.4**).

In women with overweight or obesity (**Table 2b**), those who wished to lose weight were more likely to be dieting at the time of the study (OR=18.5, IC 95%=2.53–136,  $p = 0.004$ ). No significant difference of energy or macronutrient intakes emerged between women with overweight or obesity who wished to lose weight and those who did not. At a descriptive level, women with overweight or obesity declared similar total energy intake as those with normal BMI. This resulted in a lower dietary intake per kg of body weight:  $22.5 \text{ kcal/kg} \pm 0.9$  (adjusted mean  $\pm$  standard error) for women with overweight or obesity who did not wish to lose weight and  $21.9 \text{ kcal/kg} \pm 0.4$  for those who did, vs  $29.8 \text{ kcal/kg} \pm 0.5$  and  $26.9 \text{ kcal/kg} \pm 0.7$  for women with normal BMI. Sensitivity analyses provided the same results (**Table A.5**).

**Table 2a:** Descriptive statistics by groups (number of participants and percentages or mean and standard deviation) and multivariate comparisons adjusted for age category and ever dieting (adjusted means and standard error) for energy intake, including **only women with normal BMI**.

Wish to lose weight	40-59 years		60-80 years		No	ALL ‡	p-value
	No	Yes	No	Yes		Yes	
N	266	164	197	72	463	236	
Current dieting (%)	1 (0.4)	23 (14)	1 (0.5)	8 (11.1)	1 (ref.)	25.2 (5.86 - 108)	<0.001
Total energy intake	1700 ± 572	1647 ± 570	1682 ± 552	1663 ± 606	1694 ± 27	1648 ± 38	0.327
Per weight (kcal/kg)	30.0 ± 10.7	26.6 ± 10.2	29.6 ± 10.0	27.2 ± 10.6	29.8 ± 0.5	26.9 ± 0.7	<0.001
Excluding alcohol	1646 ± 576	1584 ± 533	1627 ± 550	1613 ± 606	1640 ± 26	1589 ± 37	0.269
Protein intake							
Grams	64.7 ± 28.0	63.1 ± 22.5	62.5 ± 23.4	61.0 ± 23.0	64.1 ± 1.2	61.7 ± 1.7	0.247
Grams/kg	1.1 ± 0.5	1.0 ± 0.4	1.1 ± 0.4	1.0 ± 0.4	1.1 ± 0.02	1.0 ± 0.03	0.001
% TEI without alcohol	15.8 ± 3.7	16.2 ± 3.4	15.6 ± 3.4	15.4 ± 2.9	15.9 ± 0.2	15.8 ± 0.2	0.888
Carbohydrates intake							
Grams	201.0 ± 83.0	189.4 ± 76.2	204.1 ± 82.4	195.3 ± 86.8	202.1 ± 3.8	191.7 ± 5.4	0.119
% TEI without alcohol	48.5 ± 8.2	47.4 ± 9.3	49.8 ± 8.5	47.9 ± 8.6	49.0 ± 0.4	47.7 ± 0.6	0.073
Lipid intake							
Grams	65.4 ± 24.5	64.2 ± 25.4	62.7 ± 24.0	65.6 ± 27.6	64.4 ± 1.2	64.3 ± 1.7	0.974
% TEI without alcohol	36.1 ± 6.7	36.6 ± 8.1	34.8 ± 7.1	36.9 ± 7.9	35.6 ± 0.3	36.7 ± 0.5	0.063
Alcohol intake (grams)	6.9 ± 9.0	8.5 ± 14.8	7.4 ± 12.1	6.9 ± 11.3	7.1 ± 0.5	8.0 ± 0.8	0.367

TEI: Total energy intake. Results are expressed as number of participants (column percentage) for categorical variables or as mean ± standard deviation for continuous variables. Multivariable analyses (comparing ALL No with ALL Yes) were performed using logistic regression for categorical variables and results were expressed as odds ratio and (95% confidence interval); for continuous variables, multivariable analyses were performed using analysis of variance and results were expressed as multivariable-adjusted average ± standard error. ‡ Multivariable analyses were adjusted for age group (40-59 and 60-80 years) and ever dieted (yes/no).

**Table 2b:** Descriptive statistics by groups (number of participants and percentages or mean and standard deviation) and multivariate comparisons adjusted for age category and ever dieting (adjusted means and standard error) for energy intake, including **only women with overweight or obesity**

Wish to lose weight	40-59 years		60-80 years		ALL ‡		p-value
	No	Yes	No	Yes	No	Yes	
N	27	252	77	226	104	478	
Current dieting (%)	1 (3.7)	61 (24.2)	0 (0)	33 (14.6)	1 (ref.)	18.5 (2.53 - 136)	0.004
Total energy intake (kcal)							
Total energy intake	1631 ± 582	1677 ± 730	1609 ± 561	1678 ± 681	1606 ± 69	1679 ± 31	0.340
Per weight (kcal/kg)	23.3 ± 9.9	21.7 ± 9.3	22.6 ± 9.0	21.9 ± 9.2	22.5 ± 0.9	21.9 ± 0.4	0.578
Excluding alcohol	1561 ± 618	1637 ± 730	1573 ± 562	1625 ± 657	1563 ± 68	1633 ± 31	0.353
Protein intake							
Grams	65.4 ± 31.1	68.7 ± 41.0	62.2 ± 24.4	64.6 ± 28.9	63.9 ± 3.4	66.6 ± 1.6	0.492
Grams/kg	0.93 ± 0.5	0.89 ± 0.5	0.88 ± 0.4	0.85 ± 0.4	0.83 ± 0.05	0.87 ± 0.02	0.613
% TEI without alcohol	17.3 ± 5.5	16.8 ± 3.5	15.9 ± 2.8	15.9 ± 3.5	16.6 ± 0.4	16.3 ± 0.2	0.453
Carbohydrates intake							
Grams	181.1 ± 88.9	197.5 ± 91.2	193.2 ± 82.2	196.9 ± 89.2	188.1 ± 8.9	197.1 ± 4.1	0.420
% TEI without alcohol	45.8 ± 10.1	48.2 ± 8.2	48.6 ± 7.0	48.3 ± 8.7	47.7 ± 0.8	48.3 ± 0.4	0.566
Lipid intake							
Grams	64.4 ± 28.9	63.9 ± 33.7	61.4 ± 21.4	65.0 ± 30.9	61.4 ± 3.1	64.6 ± 1.4	0.362
% TEI without alcohol	37.8 ± 8.7	35.1 ± 6.9	35.6 ± 6.0	36.0 ± 7.3	36.0 ± 0.7	35.6 ± 0.3	0.587
Alcohol intake (grams)	9.1 ± 11.3	5.3 ± 10.1	5.0 ± 6.9	7.1 ± 13.0	5.9 ± 1.1	6.2 ± 0.5	0.803

TEI: Total energy intake. Results are expressed as number of participants (column percentage) for categorical variables or as mean ± standard deviation for continuous variables. Multivariable analyses (comparing ALL No with ALL Yes) were performed using logistic regression for categorical variables and results were expressed as odds ratio and (95% confidence interval); for continuous variables, multivariable analyses

were performed using analysis of variance and results were expressed as multivariable-adjusted mean  $\pm$  standard error. ‡ Multivariable analyses were adjusted for age group (40-59 and 60-80 years) and ever dieted (yes/no).

### *Psychological health*

In women with normal BMI (**Table 3a**), those who wished to lose weight exhibited poorer psychological health than those who did not, whatever the age group as shown by the higher scores obtained on the CES-D subscales and the total score ( $12.6 \pm 0.5$  vs  $10.2 \pm 0.4$ ,  $p < 0.001$ ), indicating the presence of more signs of depression among this population (all  $p < .05$ ). Multivariate comparisons confirmed that women with normal BMI who wished to lose weight were more likely to be classified as being depressed than those who did not (OR=1.67, IC 95% = 1.09-2.54,  $p=0.018$ ). The score of quality of life assessed by the MANSA was higher in women who did not wish to lose weight, revealing that they assessed their quality of life as significantly better than the women who wished to lose weight ( $5.5 \pm 0.03$  vs  $5.4 \pm 0.04$ ,  $p=0.012$ ).

Among women with overweight or obesity (**Table 3b**), the psychological health of those who wished to lose weight was also poorer than that of those who did not, controlling for age groups, as shown by the higher scores obtained on the CES-D subscales and total score (subscales: all  $p < .05$  except Positive affect, total score:  $12.2 \pm 0.4$  vs  $9.5 \pm 0.9$ ,  $p=0.008$ ). Women with overweight or obesity who wished to lose weight were more likely to be classified as depressed on the CES-D scale, than those who did not (OR = 2.7, IC 95% = 1.04-6.98,  $p=0.04$ ). Women with overweight or obesity who wished to lose weight also exhibited a less satisfying quality of life on the MANSA total score ( $5.4 \pm 0.1$  vs  $5.5 \pm 0.1$ ,  $p=0.019$ ).



**Table 3a:** Descriptive statistics by groups (number of participants and percentages or mean and standard deviation) and multivariate comparisons adjusted for age category and ever dieting (adjusted means and standard error) for psychological variables, including **only women with normal BMI**

<b>Wish to lose weight</b>	<b>40-59 years</b>		<b>60-80 years</b>		<b>No</b>	<b>ALL ‡</b>	<b>p-value</b>
	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>			
<b>Depression CES-D scores (N)</b>	266	164	197	72	463	276	
Somatic complaints	4.0 ± 3.0	4.7 ± 3.6	3.8 ± 3.1	5.2 ± 3.5	3.9 ± 0.2	4.8 ± 0.2	0.002
Depressed affect	2.5 ± 2.9	3.2 ± 3.5	2.5 ± 3	3.8 ± 3.6	2.5 ± 0.1	3.4 ± 0.2	<0.001
Interpersonal relationships	0.42± 0.80	0.63± 1.07	0.47± 0.89	0.61± 0.93	0.44± 0.04	0.63± 0.06	0.011
Positive affect	3.3 ± 2.7	3.5 ± 2.8	3.4 ± 2.8	4.3 ± 2.5	3.3 ± 0.1	3.8 ± 0.2	0.036
CES-D total score	10.2 ± 7.6	12 ± 9.2	10.2 ± 8	13.9 ± 8.7	10.2 ± 0.4	12.6 ± 0.5	<0.001
Depression (%)	37 (13.9)	34 (20.9)	28 (14.5)	15 (21.1)	1 (ref.)	1.67 (1.09-2.54)	0.018
<b>MANSA (N)</b>	266	164	197	72	463	236	
Total score	5.5 ± 0.6	5.4 ± 0.7	5.6 ± 0.6	5.4 ± 0.7	5.5 ± 0.03	5.4 ± 0.04	0.012

Results are expressed as number of participants (column percentage) for categorical variables or as mean ± standard deviation for continuous variables. Multivariable analyses (comparing ALL No with ALL Yes) were performed using logistic regression for categorical variables and results were expressed as odds ratio and (95% confidence interval); for continuous variables, multivariable analyses were performed using analysis of variance and results were expressed as multivariable-adjusted mean ± standard error. ‡ Multivariable analyses were adjusted for age group (40-59 and 60-80 years) and ever dieted (yes/no).

**Table 3b:** Descriptive statistics by groups (number of participants and percentages or mean and standard deviation) and multivariate comparisons adjusted for age category and ever dieting (adjusted means and standard error) for psychological variables, including **only women with overweight or obesity**

<b>Wish to lose weight</b>	<b>40-59 years</b>		<b>60-80 years</b>		<b>No</b>	<b>ALL ‡</b>	<b>p-value</b>
	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>			
<b>Depression CES-D scores (N)</b>	27	252	77	226	104	478	
Somatic complaints	3.8 ± 2.8	4.9 ± 3.7	3.5 ± 3.3	4.3 ± 3.0	3.8 ± 0.3	4.6 ± 0.2	0.032
Depressed affect	1.9 ± 2.2	3.5 ± 3.7	2.2 ± 3.1	3.2 ± 3.4	2.2 ± 0.3	3.4 ± 0.2	0.003
Interpersonal relationships	0.44± 0.75	0.69± 1.02	0.34± 0.75	0.55 ± 0.95	0.40± 0.10	0.62± 0.04	0.039
Positive affect	2.7 ± 2.7	3.8 ± 3.0	3.2 ± 2.7	3.4 ± 2.9	3.1 ± 0.3	3.6 ± 0.1	0.140
CES-D total score	8.8 ± 6.4	13.0± 10.0	9.3 ± 8.2	11.5 ± 8.2	9.5 ± 0.9	12.2 ± 0.4	0.008
Depression (%)	0 (0)	42 (16.8)	5 (6.6)	23 (10.2)	1 (ref.)	2.7 (1.04-6.98)	0.040
<b>MANSA (N)</b>	27	252	77	226	104	478	
Total score	5.6 ± 0.6	5.2 ± 0.8	5.6 ± 0.6	5.5 ± 0.7	5.5 ± 0.1	5.4 ± 0.1	0.019

Results are expressed as number of participants (column percentage) for categorical variables or as mean ± standard deviation for continuous variables. Multivariable analyses (comparing ALL No with ALL Yes) were performed using logistic regression for categorical variables and results were expressed as odds ratio and (95% confidence interval); for continuous variables, multivariable analyses were performed using analysis of variance and results were expressed as multivariable-adjusted average ± standard error. ‡ Multivariable analyses were adjusted for age group (40-59 and 60-80 years) and ever dieted (yes/no).

## **Discussion**

### *Desire to lose weight*

The large percentages of women who wished to lose weight, whatever BMI category, confirmed the normative discontent with body weight widely observed among women (Rodin et al., 1985). The lower percentage of older women who wished to lose weight compared to middle-aged women might be the sign that cognitive reappraisal is happening in some of them, or might be related to a generational difference, since they also reported less dieting during their lifetime. Still, one in four older women with normal BMI wished to lose weight, whereas inappropriate slimming diets entail negative somatic consequences, particularly when age is increasing (Fey-Yensan et al., 2002). In parallel, three quarter of the group of older women with overweight or obesity reported a desire to lose weight. The risk to engage in dangerous procedures for their age could be high for this group as well, while particular precautions should be taken to lose weight at an older age (Gill et al., 2015).

### *Dieting, dietary intake*

Women with normal BMI who wished to lose weight were more likely to state that they were dieting at the time of the study and their reported energy consumption per kilo of body weight was lower than those who did not. This difference was significant even when controlling for age and for the slimming diets ever undertaken, suggesting that dietary restraint was constant. This is of concern because dietary restraint and dieting may bring potential adverse effects such as disordered eating and mood disorders, particularly demonstrated among young women (Stice and Bearman, 2001; Stice and Shaw, 2002). In both age groups of women with normal BMI, the dietary restraint of women who wished to lose weight resulted in a slight imbalance of macronutrients in their diet compared to that of the women who did not wish to lose weight: They consumed less protein per kg of weight, less carbohydrates and more lipids in percentages of total energy intake. Even if the mean values they reported were within the recommendations, it suggests that a subgroup of these women might consume an unbalanced diet because of their wish to lose weight, whereas their weight was normal, with potential consequences for their somatic health while ageing, such as sarcopenia. The healthy or unhealthy nature of the slimming diet reported by the women in this study was not assessed. It should be taken into account in a further study, to be able to consider properly the potential consequences of different types of diet on women's health.

Women with overweight or obesity reported similar energy intake per kg of body weight regardless of their wish to lose weight. Even if a larger proportion of those who wished to lose weight said that they were dieting, compared to those who did not, nutritional intakes were similar between groups. The remarkably lower reported energy intake of the women with overweight or obesity compared to that of the normal BMI group can be interpreted in several ways. First, there is a difficulty to assess adequately dietary intake related with overweight, dietary restraint, and previous dieting (Johnson et al., 2005; Murakami and Livingstone, 2015). Second, dietary restraint can be operating even in the group of women who did not wish to lose weight, because maintaining weight is already a challenge for people who are prone to gain weight (Lindvall et al., 2010), resulting in equivalent intake in both groups. And finally, dietary restraint can be compensated by disinhibition when the control on food is too rigid, also resulting in underreporting in both groups, and ultimately in excess weight (Hays and Roberts, 2008; Westenhoefer et al., 1999).

#### *Psychological health*

Among women with normal BMI, the desire to lose weight was associated with more depressive symptoms in middle-aged and older women, and with a lower quality of life. The same results were found among women with overweight or obesity who wished to lose weight in comparison with those who did not. An association between the desire to lose weight and the risk of being depressed was observed among both categories of BMI, but no assumptions can be made about causality because data were cross-sectional. These results corroborate the association found in adults between body dissatisfaction and depression, independent of BMI, sex and age (Richard et al., 2016). A correlation found between depression and unhealthy weight loss practices among adolescents of both genders underlines the vicious circle in which persons with overweight or obesity can be trapped when they wish to lose weight (Davila et al., 2014), depression jeopardizing weight loss attempts by preventing them from adopting healthy behaviors necessary for weight loss. Moreover, signs of depression might also prevent women with normal BMI from adopting a healthy diet, as well as they might result from inappropriate dietary restraint. The results suggest that a subgroup of women might be at risk of being trapped in such vicious circles. The desire to lose weight can be considered as one indicator necessitating further corroborating evidence to be used appropriately as a sign of impaired psychological health.

#### *Strength and limitations*

The main strength of the study is the use of data from an unbiased community sample, since the participants were recruited for a study on cardio-vascular risk factors. Studies dedicated to body image may provoke a selection bias and select people particularly interested in the topic. Other strengths include the sample size, allowing for the stratification of the analyses by age and BMI, and the use of the FFQ that enabled comparisons of energy and macronutrients intakes between groups, which has rarely been carried out in studies on this topic. The main limit is the cross-sectional design of the study; consequently no causality can be inferred between the desire to lose weight and correlates. Moreover, the assessment of the number of kilos that each woman wished to lose might have moderated the results and would have stressed if a subgroup was particularly at risk. Finally, the desire to lose weight was assessed with only one question, representing only one facet of body dissatisfaction whereas evaluating body image in all its complexity (Cash, 2004) would necessitate the use of validated tools encompassing diverse aspects of the construct (Fiske et al., 2014).

### *Conclusion*

The results of this study highlighted that the desire to lose weight was associated with reduced nutritional intake, poorer psychological health and quality of life in middle-aged and older women. Health care providers should be cautious when they communicate about weight and corpulence with their patients, refraining from valorizing thinness, and promoting adequate weight loss programs when appropriate. They should be informed that the desire to lose weight persists with age and may be associated with psychological impairment in a subgroup of women, across all BMI strata, which can prevent them from adopting a healthy diet. Moreover, these findings corroborates the observation that body dissatisfaction is a public health issue (Mond et al., 2013) and raise the question of how to devise public health campaigns so that they reach their goal without adverse side-effects (Walls et al., 2011).

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## Appendix A

**Table A.1** Comparison between women retained for the sensitivity analysis and women excluded

	<b>Retained</b>	<b>Excluded</b>	<b>P-value</b>
Sample size	2423	268	
Age (years)	57.9 ± 10.3	60.1 ± 10.8	0.001
Age categories (%)			0.023
35-59	1387 (57.2)	134 (50.0)	
60-80	1036 (42.8)	134 (50.0)	
BMI (kg/m <sup>2</sup> )	25.5 ± 4.9	26.0 ± 5.5	0.109
BMI categories (%)			0.421
<25	1293 (53.4)	120 (50.6)	
≥25	1130 (46.6)	117 (49.4)	
Educational level (%)			0.004
High	441 (18.2)	32 (11.9)	
Middle	663 (27.4)	63 (23.5)	
Low	1318 (54.4)	173 (64.6)	
Marital status (%)			<0.001
Living alone	1212 (50.0)	169 (63.1)	
Living in couple	1211 (50.0)	99 (36.9)	
Smoking status (%)			0.009
Never	1111 (45.9)	112 (48.1)	
Former	822 (34.0)	59 (25.3)	
Current	486 (20.1)	62 (26.6)	

BMI: body mass index. Results are expressed as number of participants (column percentage) for categorical variables or as mean ± standard deviation for continuous variables. Between-group comparisons performed using chi-square for categorical variables and student's t-test for continuous variables.

**Table A.2** Comparison between women retained for analysis, according to presence or absence of psychological data

	<b>Presence</b>	<b>Absence</b>	<b>P-value</b>
Sample size	1281	1142	
Age (years)	58.3 ± 9.9	57.5 ± 10.8	0.060
Age categories (%)			0.046
35-59	709 (55.4)	678 (59.4)	
60-80	572 (44.7)	464 (40.6)	
BMI (kg/m <sup>2</sup> )	25.3 ± 4.8	25.6 ± 5.0	0.123
BMI categories (%)			0.209
<25	699 (54.6)	594 (52.0)	
≥25	582 (45.4)	548 (48.0)	
Educational level (%)			0.630
High	229 (17.9)	212 (18.6)	
Middle	361 (28.2)	302 (26.5)	
Low	691 (53.9)	627 (55.0)	
Marital status (%)			0.138
Living alone	659 (51.4)	553 (48.4)	
Living in couple	622 (48.6)	589 (51.6)	
Smoking status (%)			0.280
Never	579 (45.3)	532 (46.6)	
Former	452 (35.4)	370 (32.4)	
Current	247 (19.3)	239 (21.0)	

BMI: body mass index. Results are expressed as number of participants (column percentage) for categorical variables or as mean ± standard deviation for continuous variables. Between-group comparisons performed using chi-square for categorical variables and student's t-test for continuous variables.

**Table A.3** CoLaus women's characteristics: age, BMI, education, marital status, weight perception, desire to modify weight, dieting, sensitivity sample

BMI category (kg/m <sup>2</sup> )	40-59 years		60-80 years		ALL		p-value
	<25	≥25	<25	≥25	<25	≥25	
N	816	571	479	570	1295	1141	
Age (years)						59.8 ±	<0.001
	49.9 ± 5.3	50.8 ± 5.5	67.6 ± 5.2	68.8 ± 5.7	56.4 ± 10.0	10.6	
BMI (kg/m <sup>2</sup> )	21.9 ± 1.9	29.5 ± 4.2	22.1 ± 1.9	29.4 ± 3.9	21.9 ± 1.9	29.5 ± 4.1	<0.001
Education (%)							<0.001
High	221 (27.1)	105 (18.4)	84 (17.5)	31 (5.4)	305 (23.6)	136 (11.9)	
Middle	249 (30.5)	149 (26.1)	138 (28.8)	131 (23.0)	387 (29.9)	280 (24.6)	
Low	346 (42.4)	316 (55.4)	257 (53.7)	408 (71.6)	603 (46.6)	724 (63.5)	
Marital status (%)							0.473
Alone	391 (47.9)	267 (46.8)	268 (56)	297 (52.1)	659 (50.9)	564 (49.4)	
Couple	425 (52.1)	304 (53.2)	211 (44.1)	273 (47.9)	636 (49.1)	577 (50.6)	
Smoking status (%)							<0.001
Never	339 (41.5)	250 (43.9)	246 (51.6)	282 (49.6)	585 (45.2)	532 (46.7)	
Former	249 (30.5)	202 (35.4)	154 (32.3)	223 (39.2)	403 (31.2)	425 (37.3)	
Current	228 (27.9)	118 (20.7)	77 (16.1)	64 (11.3)	305 (23.6)	182 (16.0)	
Do you consider your current weight (%)							<0.001 §
Too low	20 (2.5)	0 (0)	17 (3.6)	0 (0)	37 (2.9)	0 (0)	
Normal	607 (74.4)	75 (13.1)	395 (82.4)	145 (25.4)	1002 (77.4)	220 (19.3)	
Too high	189 (23.2)	496 (86.9)	67 (14.0)	425 (74.6)	256 (19.8)	921 (80.7)	
Currently you would like to (%)							<0.001 §
Lose	333 (40.8)	513 (89.8)	120 (25.1)	424 (74.4)	453 (35)	937 (82.1)	
Gain	22 (2.7)	0 (0)	14 (2.9)	2 (0.4)	36 (2.8)	2 (0.2)	
Maintain	461 (56.5)	58 (10.2)	344 (72.0)	144 (25.2)	805 (62.2)	202 (17.7)	
Are you currently on a slimming diet (%)	48 (5.9)	125 (21.9)	12 (2.5)	60 (10.5)	60 (4.6)	185 (16.2)	<0.001
Ever tried a slimming diet (%)	249 (30.5)	359 (62.9)	95 (19.8)	277 (48.6)	344 (26.6)	636 (55.7)	<0.001

BMI: body mass index. ‡ adjusting for age group and ever dieted. Results are expressed as number of participants (column percentage) for categorical variables or as mean ± standard deviation for continuous variables. Between-group comparisons

(comparing ALL <25 with ALL $\geq$ 25) were performed using chi-square or Fisher's exact test (§) for categorical variables and student's t-test or analysis of variance for continuous variables.

**Table A.4** Descriptive statistics by groups (number of participants and percentages or mean and standard deviation) and multivariate comparisons adjusted for age category and ever dieting (adjusted means and standard error) for energy intake, including **only women with normal BMI, sensitivity sample**

Wish to lose weight	40-59 years		60-80 years		ALL ‡		p-value
	No	Yes	No	Yes	No	Yes	
N	483	333	358	120	841	453	
Current dieting (%)	3 (0.6)	45 (13.5)	1 (0.3)	11 (9.2)	1 (ref.)	18.9 (6.71 - 53.1)	<0.001
Total energy intake (kcal)							
Total energy intake	1687 ± 573	1646 ± 611	1668 ± 565	1610 ± 565	1678 ± 20	1637 ± 28	0.245
Per weight (kcal/kg)	29.8 ± 10.7	26.7 ± 10.7	29.6 ± 10.9	26.4 ± 9.8	29.7 ± 0.4	26.8 ± 0.5	<0.001
Excluding alcohol	1637 ± 576	1590 ± 594	1615 ± 556	1558 ± 564	1627 ± 20	1582 ± 28	0.204
Protein intake							
Grams	64.4 ± 27.3	63.6 ± 25.7	61.5 ± 23.0	60.5 ± 22.5	63.6 ± 0.9	62.0 ± 1.2	0.302
Grams/kg	1.1 ± 0.5	1.0 ± 0.4	1.1 ± 0.4	1.0 ± 0.4	1.1 ± 0.02	1.0 ± 0.02	<0.001
% TEI without alcohol	15.7 ± 3.6	16.3 ± 3.8	15.4 ± 3.3	15.8 ± 3.0	15.8 ± 0.1	15.9 ± 0.2	0.503
Carbohydrates intake							
Grams	198.6 ± 81.1	190.3 ± 84.2	204.9 ± 83.7	187.0 ± 79.6	200.4 ± 2.9	191.0 ± 4.0	0.060
% TEI without alcohol	48.3 ± 8.3	47.4 ± 9.1	50.2 ± 8.5	47.7 ± 8.9	48.9 ± 0.3	47.8 ± 0.4	0.029
Lipid intake							
Grams	65.4 ± 25.4	64.2 ± 26.4	61.6 ± 23.8	63.3 ± 26.4	63.9 ± 0.9	63.8 ± 1.2	0.955
% TEI without alcohol	36.2 ± 7.0	36.6 ± 7.6	34.6 ± 7.2	36.7 ± 8.0	35.6 ± 0.3	36.5 ± 0.4	0.037
Alcohol intake (grams)	6.6 ± 9.4	7.4 ± 11.4	7.1 ± 13.2	7.2 ± 10.5	6.8 ± 0.4	7.4 ± 0.5	0.408

TEI: Total energy intake. Results are expressed as number of participants (column percentage) for categorical variables or as mean ± standard deviation for continuous variables. Multivariable analyses (comparing ALL No with ALL Yes) were performed using logistic regression for categorical variables and results were expressed as odds ratio and (95% confidence interval); for continuous variables, multivariable analyses were performed using analysis of variance and results were expressed as multivariable-adjusted mean ± standard error. ‡ Multivariable analyses were adjusted for age group (40-59 and 60-80 years) and ever dieted (yes/no).

**Table A.5** Descriptive statistics by groups (number of participants and percentages or mean and standard deviation) and multivariate comparisons adjusted for age category and ever dieting (adjusted means and standard error) for total energy intake, including **only women with overweight or obesity, sensitivity sample**

Wish to lose weight	40-59 years		60-80 years		ALL ‡		p-value
	No	Yes	No	Yes	No	Yes	
N	58	513	145	424	203	937	
Current dieting (%)	4 (6.9)	121 (23.6)	0 (0)	60 (14.2)	1 (ref.)	8.34 (3.03 - 23.0)	<0.001
Total energy intake (kcal)							
Total energy intake	1620 ± 502	1664 ± 759	1519 ± 554	1631 ± 708	1547 ± 51	1650 ± 23	0.070
Per weight (kcal/kg)	22.6 ± 8.3	21.6 ± 9.9	21.9 ± 9.3	21.4 ± 9.4	21.7 ± 0.7	21.6 ± 0.3	0.858
Excluding alcohol	1563 ± 515	1627 ± 757	1476 ± 555	1581 ± 693	1502 ± 51	1606 ± 23	0.064
Protein intake							
Grams	62.7 ± 25.6	66.7 ± 39.5	58.1 ± 23.9	63.0 ± 31.3	60.1 ± 2.5	64.9 ± 1.1	0.085
Grams/kg	0.9 ± 0.4	0.9 ± 0.5	0.8 ± 0.4	0.8 ± 0.4	0.85 ± 0.03	0.85 ± 0.2	0.949
% TEI without alcohol	16.3 ± 4.4	16.5 ± 3.8	15.8 ± 2.8	16.1 ± 3.8	16.2 ± 0.3	16.3 ± 0.1	0.759
Carbohydrates intake							
Grams	188.4 ± 77.2	197.3 ± 97.4	182.1 ± 79.4	191.5 ± 91.9	183.7 ± 6.7	194.8 ± 3.0	0.134
% TEI without alcohol	47.8 ± 9.3	48.2 ± 8.9	49.0 ± 7.5	48.3 ± 8.9	48.4 ± 0.6	48.3 ± 0.3	0.841
Lipid intake							
Grams	62.6 ± 24.7	63.7 ± 34.2	57.5 ± 22.3	62.8 ± 31.7	58.9 ± 2.3	63.3 ± 1.0	0.078
% TEI without alcohol	36.4 ± 7.9	35.5 ± 7.4	35.4 ± 6.4	35.8 ± 7.5	35.7 ± 0.5	35.6 ± 0.2	0.845
Alcohol intake (grams)	7.6 ± 9.7	5.0 ± 9.4	5.8 ± 10.4	6.9 ± 12.0	6.0 ± 0.8	5.9 ± 0.3	0.918

TEI: Total energy intake. Results are expressed as number of participants (column percentage) for categorical variables or as mean ± standard deviation for continuous variables. Multivariable analyses (comparing ALL No with ALL Yes) were performed using logistic regression for categorical variables and results were expressed as odds ratio and (95% confidence interval); for continuous variables, multivariable analyses were performed using analysis of variance and results were expressed as multivariable-adjusted mean ± standard error. ‡ Multivariable analyses were adjusted for age group (40-59 and 60-80 years) and ever dieted (yes/no).

