



Associations Between Body Weight Dissatisfaction and Diet Quality in Women With a Body Mass Index in the Healthy Weight Category: Results From the 2014–2015 Swiss National Nutrition Survey



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ARTICLE INFORMATION

Article history:

Submitted 2 November 2023
Accepted 30 May 2024

Keywords:

Body weight dissatisfaction
Diet quality
Dietary intake
Healthy Eating Index
National nutrition surveys

Supplementary materials:

Tables 1 and 4 are available at www.jandonline.org.

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<https://doi.org/10.1016/j.jand.2024.05.018>

ABSTRACT

Background Few studies have examined whether diet quality is lower in women with body weight dissatisfaction compared with women without body weight dissatisfaction.

Objectives (1) Examine the association between body weight dissatisfaction and diet quality among women (18–65 years old) in the healthy weight body mass index (BMI) category, and (2) explore dietary and behavioral patterns among women with body weight dissatisfaction.

Design Data were extracted from the cross-sectional 2014–2015 Swiss National Nutrition Survey.

Participants/setting Population-based sample of 507 women with BMI ≥ 18.5 and < 25 .

Outcome measures Dietary intakes assessed by registered dietitians using 2 nonconsecutive computer-assisted multi-pass 24-hour dietary recalls. Diet quality was measured with a slightly modified version of the Healthy Eating Index (HEI)-2020.

Statistical analyses performed Multiple linear regressions were performed to test the association between body weight dissatisfaction and total HEI-2020 score. Hierarchical cluster analysis was used to identify subgroups of women with body weight dissatisfaction.

Results Body weight dissatisfaction was not found to be associated with diet quality ($\beta = -1.73$ [$-4.18; 0.71$], $P = .16$). However, women who were dissatisfied with their body weight had lower scores for the HEI-2020 total fruits ($P = .050$) and whole grains ($P = .014$) components than women who were satisfied with their body weight. Four profiles with different dietary patterns were identified among women with body weight dissatisfaction: “Unhealthy diet with dairy,” “Protein and fat,” “Vegetables without protein,” and “Healthier diet without dairy.”

Conclusions Among women with a BMI in the healthy weight category, overall diet quality was not observed to differ between those with or without body weight dissatisfaction. More research is needed to explore the different profiles of dietary intake in women with body weight dissatisfaction.

J Acad Nutr Diet. 2024;124(11):1492–1502.

TO PREVENT CARDIOVASCULAR DISEASE, TYPE 2 diabetes, osteoarthritis, and related premature death, the World Health Organization recommends a diet high in fruits and vegetables and low in fat, sugar, and salt, with sufficient physical activity.¹ Most countries have developed dietary guidelines and strategies for implementing them in their populations.²

Individuals, especially women, frequently experience pressure to maintain a thin body, for health and beauty reasons.^{3,4} First, despite the well-known interactions of multiple individual and environmental factors that explain the rise in obesity, personal responsibility for weight management still predominates.⁵ The message is promoted that lower body weight is associated with fewer health risks.³ Second,

according to sociocultural models of disordered eating behaviors,⁶ the internalization of beauty ideals disseminated in Western society through the media, social networks, and the immediate environment leads to body dissatisfaction, which in turn increases disordered eating.⁷⁻⁹ This phenomenon of thin-ideal internalization and body dissatisfaction affects women of all body sizes¹⁰ and all ages, with negative consequences for their health and eating behavior.¹¹ Weight and shape concerns persist beyond adolescence.^{12,13} With age, weight control behaviors become a habit, and disordered eating behaviors are not disclosed to health professionals, with potentially dramatic and sudden health consequences.¹⁴

Although numerous studies have documented the relationship between body weight dissatisfaction and disordered eating behaviors,^{15,16} few have examined whether diet quality differs among those with and without body weight satisfaction. Studies among adolescents have shown that those who want to lose weight tend to reduce their consumption of nutrient-rich foods, such as fruits and vegetables, dairy products, or whole grains.^{17,18} In adults, the few available studies have produced controversial findings, which may be explained by differences in methodology and population studied.¹⁹⁻²¹ Moreover, body dissatisfaction might lead to different profiles of eaters,²² explaining the difficulty of detecting overall differences. Until now, few studies have examined eating profiles to tailor prevention or treatment interventions.^{22,23} They focused mainly on eating behavior, identifying different types of more or less functional eating profiles.

To look more specifically at the diet quality of women in the healthy weight range, who are usually assumed to have better diet quality than those who are in the overweight or obese categories,²⁴ women with a body mass index (BMI) in the healthy weight category were of particular interest in this study. Although these women tend to be considered healthy, they may be affected by body weight dissatisfaction associated with unhealthy weight control behaviors.²⁵ The first aim of this study was to examine the association between body weight dissatisfaction and diet quality, as assessed by the Healthy Eating Index (HEI)-2020 score and total daily nutrient intake, among women (18–65 years) in the healthy weight BMI category. The second aim was to explore the distinct dietary and behavioral patterns of women with body weight dissatisfaction.

MATERIALS AND METHODS

Population and Study Design

This study was a secondary analysis of the data from the first Swiss National Nutrition Survey menuCH. menuCH is a cross-sectional study consisting of a population-based sample of 2086 adults aged 18 to 75 years.^{26,27} It primarily focused on investigating dietary intakes and anthropometric status among Swiss individuals who could communicate effectively in German, French, or Italian, the 3 main national languages. A representative sample of the Swiss population, randomly selected from the national sampling frame for personal and household surveys,²⁸ received a written invitation to participate in the menuCH survey between January 2014 and February 2015. Those who agreed had a face-to-face interview in 1 of the 10 study centers, followed by a phone interview 2 to 6 weeks later with a registered dietitian (RD)

RESEARCH SNAPSHOT

Research question: Is body weight dissatisfaction associated with diet quality in a population-based sample of women with a body mass index in the healthy weight category?

Key Findings: In this secondary analysis of the 2014–2015 Swiss National Nutrition Survey, including a population-based sample of 507 women, no major associations were found between body weight dissatisfaction and diet quality. Four dietary patterns were identified among women with body weight dissatisfaction: “Unhealthy diet with dairy,” “Protein and fat,” “Vegetables without protein,” and “Healthier diet without dairy.”

trained specifically for the study. Additionally, participants completed a paper questionnaire on sociodemographics, health attitudes, and behaviors. The regional ethics committees approved the national survey (lead committee in Lausanne, Protocol 26/13, approved on February 12, 2013). All participants provided informed consent. For more information about the survey, please visit <https://menuch.iumsp.ch/>.

Inclusion and Exclusion Criteria

For this secondary analysis, the data of adult women aged 18 to 65 years old with a BMI in the healthy weight category (18.5–24.9) were used. Pregnant and lactating women were excluded. Only women were included in this study, because beauty ideals differ between the genders, and each gender responds differently to societal pressure on body shape.²⁹

Assessment of Body Weight Satisfaction

The questionnaire contained a question related to body weight satisfaction (“Are you currently satisfied with your body weight?”) with 4 possible answers: “very satisfied,” “satisfied,” “dissatisfied,” or “very dissatisfied.” Participants were also asked about their weight desire (“Which statement best describes you?”) with 3 possible answers: “I would like to lose weight,” “I would like to maintain my current weight,” or “I would like to gain weight.” The classification was based on 2 variables rather than just 1, to be more robust, because we wanted to study women with sufficient body dissatisfaction to make behavioral changes and likely to have specific weight control practices.²² The women were divided into 2 groups according to the following criteria: (1) body weight dissatisfied, if they were dissatisfied or very dissatisfied with their weight and wanted to lose weight; and (2) body weight satisfied, if they were satisfied or very satisfied with their weight and wanted to maintain their weight. Women dissatisfied with their weight but not wanting to lose weight (maintain or gain) and women satisfied with their weight but wanting to lose or gain weight were excluded from the analysis.

Dietary Intake Assessment

RDs assessed dietary intake of survey participants using 2 computer-assisted multi-pass 24-hour dietary recalls (24HDR), which were facilitated by the validated program GloboDiet (former EPIC-Soft).^{30,31} 24HDRs were nonconsecutive and distributed over all days of the week and seasons.

To aid in quantifying food intake, RDs used a book containing 119 series of 6 graduated portion-size pictures³² and a set of approximately 60 actual household measures. Each food or each ingredient of recipes was then matched to the most suitable option in an expanded research version of the Swiss Food Composition Database,³³ using the FoodCASE software (Premotec GmbH, Winterthur, Switzerland).³⁴ Composition in 30 nutrients was available for 96.3% to 100% of foods, except for retinol activity equivalent (84.7%). Additional information regarding dietary assessment methods and data quality controls, such as misreporting, is available in prior published articles.^{26,27}

Diet Quality Index

Diet quality was assessed using a slightly modified version of the HEI-2020, which is a composite score made up of 13 food and nutrient components.³⁵ The scoring algorithm at the level of individual persons was applied,³⁶ calculating scores for each component using the mean food and nutrient intakes estimated from 2 24HDRs. One-day intakes were used for 7 participants with only 1 24HDR (1.4% of the sample). Each component scored between 0 (worst) and 5 or 10 (optimal diet quality). The maximum possible total HEI-2020 score is 100, which is achieved when intakes of total fruits, whole fruits, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, and fatty acids are adequate and when refined grains, sodium, added sugars, and saturated fats are consumed in moderation. More information about the foods included in food-based components and the scoring system is provided in [Supplementary Table 1](#). The slight modifications from the original score were related to the metric system used by the Swiss Dietary Guidelines³⁷ for portion sizes (in gram equivalents instead of ounce or cup equivalents).

Anthropometric Measurements

RDs measured body weight, height, waist circumference, and hip circumference in accordance with an international protocol.^{38,39} Body weight and height were measured without shoes and heavy clothing, using a calibrated Seca 701 scale equipped with a Seca 220 telescopic measuring rod (Seca GmbH, Hamburg, Germany), to the nearest 0.1 kg and 0.1 cm, respectively. Waist and hip circumferences were measured to the nearest 0.1 cm, using a Gulick I nonstretchable tape (North Coast Medical, CA), and the mean of 3 consecutive measurements was calculated.

Sociodemographic and Health Behaviors Variables

Self-reported information about birthdate, gender (man/woman self-reported), nationality (classified as Swiss/not Swiss), education (highest degree, classified as university: yes/no) was assessed by questionnaire. Participants were classified as having dieting practices if they answered “yes” to the questions “Are you currently on a diet to lose weight?” or “In the last 12 months, have you been on a weight-loss diet?”. They also were asked how many times per day they consumed snacks (solid foods only) between main meals during a standard week (Monday–Sunday). Participants also reported on which days they usually skipped breakfast in a standard week. In the analyses, participants were considered as skippers if they skipped breakfast 2 days or more. Survey

participants also reported on the use of dietary supplements (yes/no), food literacy (knowing the existence of the Swiss Food Pyramid: yes/no), smoking status (never/past/current), and self-reported health (very good/good/medium/bad/very bad). Finally, physical activity level was assessed using the short-form International Physical Activity Questionnaire,^{40,41} and data were converted into metabolic equivalent of task minutes per week. For women who answered “I do not know” for the duration of vigorous-intensity (7.7%), moderate-intensity (15.4%), and walking (17.6%) activities, we imputed the median duration. Language region (German/French/Italian) was defined based on participants’ home residence.

Statistical Analyses

Descriptive results were presented using means (\pm SD) or medians (P25–P75) for continuous variables or percentages for categorical variables. For bivariate analyses, differences in (1) normally distributed continuous variables, (2) skewed continuous and ordinal variables, and (3) categorical variables were tested using independent *t*-tests, Mann-Whitney tests, and χ^2 tests, respectively. To evaluate the association between body weight (dis-)satisfaction and diet quality, assessed by the total HEI-2020 score (normally distributed), multiple linear regressions were computed, using progressive adjustment for covariates for which women with and without body weight dissatisfaction were significantly different ($P \leq .05$ in the previous bivariate analyses). Simple and multiple quantile regressions were used to assess differences in nutrient intakes (skewedly distributed) between these 2 groups. Finally, hierarchical cluster analysis was used to identify groups of women who were dissatisfied with their weight with similar profiles. To this end, variables related to sociodemographics, behaviors including the scores for the 13 HEI-2020 components (not the absolute daily total intake), and anthropometrics were standardized. The Euclidean distance and the Ward’s linkage method were chosen. From the dendrogram, an optimal number of 4 clusters was determined, and then means for each standardized variable studied, by cluster, were calculated. All statistical analyses were carried out using STATA version 16.0.⁴² The significance level was set at $\leq .05$.

RESULTS

Study Participants

Of the 2086 original survey participants,²⁶ we excluded 946 men, 154 women aged 66 years and older, 27 pregnant or lactating women, 2 women with missing BMI, and 335 for BMI < 18.5 or ≥ 25 . Of the remaining 622 women, women dissatisfied with their weight but wanting to maintain weight ($n = 7$, 1.1%) or gain weight ($n = 4$, 0.6%) and women satisfied with their weight but wanting to lose ($n = 96$, 15.4%) or gain ($n = 8$, 1.3%) weight were excluded. We therefore included 507 participants for this study. Of these 507 participants, 179 (35.3%) were in the body weight dissatisfaction group, and 328 (64.7%) were in the body weight satisfaction group.

Characteristics of Women With Body Weight Dissatisfaction

Compared with women with body weight satisfaction ([Table 2](#)), women with body weight dissatisfaction were

Table 2. Characteristics of women in the healthy weight category aged 18–65 years, dissatisfied and satisfied with their body weight, Swiss National Nutrition Survey, 2014–2015

	All (N = 507)	Dissatisfied (n = 179)	Satisfied (n = 328)	P-Value ^a
Age (years)				
Mean \pm SD	40.9 \pm 13.3	38.9 \pm 13.2	42.1 \pm 13.3	.010
Language region (%)				
German	67.1%	69.3%	65.9%	
French	22.9%	20.1%	24.4%	
Italian	10.1%	10.6%	9.8%	.545
Nationality (%)				
Swiss	86.2%	87.2%	85.7%	
Foreigner	13.8%	12.8%	14.3%	.644
education (highest degree, %)				
Secondary (eg, apprenticeship)	50.7%	52.5%	49.7%	
Tertiary (eg, university)	49.3%	47.5%	50.3%	.544
Dieting over the last year				
Yes	11.6%	17.9%	8.2%	
No	88.4%	82.1%	91.8%	.001
Snacking (no. of snacks/day)				
Median [P25–P75]	1.71 [1.00–2.43]	1.71 [1.00–2.57]	1.71 [1.00–2.43]	.661
Skipping breakfast (≥ 2 of 7 days, %)				
Yes	19.9%	25.1%	17.1%	
No	80.1%	74.9%	82.9%	.030
Dietary supplements (last 4 weeks) (%)				
Yes	54.2%	52.5%	55.2%	
No	45.8%	47.5%	44.8%	.564
Having heard about Swiss Food Pyramid (%)				
Yes	92.5%	93.3%	92.1%	
No	7.5%	6.7%	7.9%	.617
Smoking status (%)				
Never	47.7%	50.3%	46.3%	
Former smoker	32%	34.1%	30.8%	
Current smoker	20.3%	15.6%	22.9%	.163
Self-reported physical activity (MET min/week)				
Median [P25–P75]	2.30 [1.37–4.05]	2.24 [1.22–3.74]	2.38 [1.41–4.22]	.158
Self-reported health status (%)				
Medium, bad, and very bad	8.1%	14%	4.9%	
Good	50.7%	53.1%	49.4%	
Very good	41.2%	33%	45.7%	<.001
Body mass index				
Mean \pm SD	21.7 \pm 1.7	22.8 \pm 1.4	21.2 \pm 1.6	<.001

(continued on next page)

Table 2. Characteristics of women in the healthy weight category aged 18–65 years, dissatisfied and satisfied with their body weight, Swiss National Nutrition Survey, 2014–2015 (*continued*)

	All (N = 507)	Dissatisfied (n = 179)	Satisfied (n = 328)	P-Value ^a
Waist-to-hip ratio				
Mean ± SD	0.74 ± 0.05	0.76 ± 0.05	0.74 ± 0.04	<.001
Total Healthy Eating Index—2020 score				
Mean ± SD	50.5 ± 13.4	49.4 ± 13.3	51.1 ± 13.5	.165

^aDifferences between dissatisfied and satisfied women assessed using χ^2 tests, Mann-Whitney tests, or independent *t*-tests.

younger ($P = .010$) and were more likely to have dieted in the past year ($P = .001$), to skip breakfast at least twice a week ($P = .030$), to report their health as medium, bad, or very bad ($P < .001$), to have a higher BMI ($P < .001$), and to have a larger waist-to-hip ratio ($P < .001$).

Associations Between Body Weight Dissatisfaction and Diet Quality

No associations were observed between body weight dissatisfaction and diet quality as assessed by the total HEI-2020 score ($\beta_{\text{body weight dissatisfaction}} = -1.73 [-4.18; 0.71]$, $P = .16$; Table 3). No significant association was found between these 2 variables when age ($\beta_{\text{body weight dissatisfaction}} = -0.99 [-3.39; 1.41]$, $P = .42$), age and BMI ($\beta_{\text{body weight dissatisfaction}} = -0.57 [-3.31; 2.17]$, $P = .68$), age, BMI, dieting in the previous year, skipping breakfast, and self-reported health status ($\beta_{\text{body weight dissatisfaction}} = -0.26 [-3.04; 2.51]$, $P = .85$) were included in the regression analyses.

Figure 1 illustrates the differences in dietary intake between the 2 groups of women, dissatisfied and satisfied with their body weight. Both groups were far from meeting the dietary recommendations for most of the 13 components of the HEI-2020. Women who were dissatisfied with their weight had lower scores for the total fruits (median score [P25–P75]: 2.0 [0.7–3.3] vs 2.3 [1.0–3.9], $P = .050$) and whole grains (2.0 [0.0–5.9] vs 2.8 [0.0–6.9], $P = .014$) components than women who were satisfied with their weight.

Comparison of nutrient intakes between women with body weight satisfaction and dissatisfaction showed no difference in energy intake (Supplementary Table 4). Compared with women with body weight satisfaction, women with body

weight dissatisfaction reported lower intakes of dietary fiber ($P = .027$) and iron ($P = .020$) when comparisons were fully adjusted.

Profiles of Women With Body Weight Dissatisfaction

Cluster analysis suggested four clusters among the 179 women with body weight dissatisfaction, which are described in Table 5. Cluster 1, “Unhealthy diet with dairy” ($n = 48$) consisted of younger women (mean ± SD age: 29.9 ± 9.5 years) who were more likely to skip breakfast, report poor health, to have a lower BMI (22.1 ± 1.4) and waist-to-hip ratio, and to have an unhealthier diet (total HEI-2020 score, 37.8 ± 9.3). They had lower scores for the following HEI-2020 components: total and whole fruits, total vegetables, greens and beans, total protein foods, seafood and plant proteins, fatty acids (ie, lower ratio of poly- and monounsaturated fatty acids [PUFAs and MUFAs] to saturated fatty acids [SFAs]), refined grains, sodium, and added sugars (ie, higher intakes). However, they had higher scores for the HEI-2020 dairy component (ie, higher intake, score: 6.7 ± 3.0, ≈1 portion/1000 kcal/day).

Cluster 2, “Protein and fat” ($n = 45$) consisted of older women (44.4 ± 11.9 years old), who were more likely to be Swiss and to know the Swiss food pyramid. They were more likely to smoke, to exercise, to report good health, and to have a higher BMI (23.6 ± 0.9) and waist-to-hip ratio. They were less likely to have dieted in the previous year. Their scores were lower for the HEI-2020 components of total and whole fruits, whole grains, fatty acids (ie, lower ratio of PUFAs and MUFAs to SFAs) and saturated fats (ie, higher intake), and higher for the components of total protein foods (ie, higher

Table 3. Associations between the total Healthy Eating Index-2020 score and body weight dissatisfaction, Swiss National Nutrition Survey, 2014–2015

	Satisfaction (n = 328)	Dissatisfaction (n = 179)	P-Value ^a
	β	β [95% CI]	
Crude	0 (ref)	−1.73 [−4.18; 0.71]	0.16
Model 2 (age)	0 (ref)	−0.99 [−3.39; 1.41]	0.42
Model 3 (age and body mass index)	0 (ref)	−0.57 [−3.31; 2.17]	0.68
Model 4 (age, body mass index, dieting, skipping breakfast, and self-reporting health status)	0 (ref)	−0.26 [−3.04; 2.51]	0.85

^aDifferences between dissatisfied and satisfied women assessed using simple (crude model) and multiple linear regressions (adjusted models).

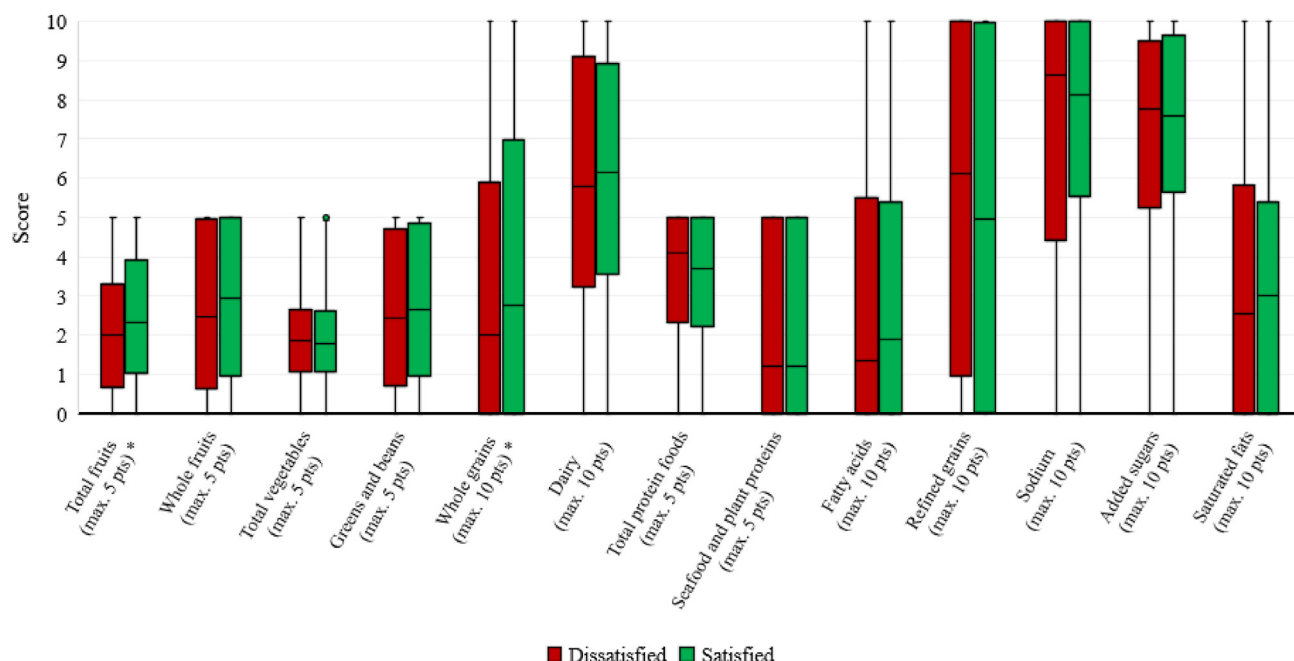


Figure 1. Box plots^a of the total Healthy Eating Index-2020 score in women dissatisfied and satisfied with body weight, by component. ^aDifferences between dissatisfied and satisfied women were assessed using Mann-Whitney *U* test (**P* ≤ .05; more details in [Supplementary Table 1](#)).

intake) and refined grains (ie, lower intake) (total HEI-2020 score, 45.9 ± 8.9).

Cluster 3, “Vegetables without protein” (*n* = 11), consisted of moderately older women (42.4 ± 9.5 years old) with a higher education, who were more likely to be non-Swiss, not to have heard of the Swiss food pyramid, to have dieted in the past year, not to exercise, and to have a higher waist-to-hip ratio. They were more likely to skip breakfast and to have higher scores for the HEI-2020 components of total vegetables (ie, higher intakes), sodium, and added sugars (eg, lower intakes) but lower scores for greens and beans, total protein foods, seafood and plant proteins (ie, lower intakes) (total HEI-2020 score, 50.7 ± 15.9).

Cluster 4, “Healthier diet without dairy” (*n* = 75), had a mean HEI-2020 score (±SD) of 58.7 ± 10.4. This was the highest score of all clusters, but still corresponds to a low-quality diet, rated F.⁴³ They were less likely to skip breakfast, to smoke, or to exercise. Except for a lower score for the HEI-2020 dairy component (ie, lower intake, score: 4.9 ± 3.2, ≈0.7 portion/1000 kcal/day), their scores were higher for the following components: total and whole fruits, total vegetables, greens, and beans, whole grains, total protein foods, seafood and plant proteins, fatty acids (ie, higher ratio of PUFAs and MUFAs to SFAs), but also refined grains, added sugars, and saturated fats (ie, lower intakes).

DISCUSSION

In this secondary analysis of the data from the Swiss National Nutrition Survey, diet quality was compared between women who were dissatisfied and satisfied with their weight, while being in the healthy weight BMI category. Although the links between body dissatisfaction and disordered eating have

been documented,^{15,16} the associations with diet quality are much less understood.

Overall, compliance with dietary guidelines was low for the whole sample, as in other studies.^{44,45} Concerning the first aim of the study, overall diet quality was not significantly different between the two groups. However, women who were dissatisfied with their body weight had lower scores for the HEI-2020 total fruits and whole grains components than those satisfied with their body weight (crude/unadjusted association). They consumed less dietary fiber, which is quite consistent with lower intakes in fruit or whole grains, and also had lower intake of iron (adjusted association). These differences should be confirmed in further research, because the HEI-2020 component analyses were not adjusted.

In the current study, women who were dissatisfied with their weight were more likely to have dieted in the past year and to skip breakfast at least 2 days per week than women who were satisfied with their weight. There was no difference in physical activity or energy intake observed between the 2 groups, although women in the body weight dissatisfaction group had a higher BMI. Underreporting may be an explanation, because data from the National Health and Nutrition Survey 2007–2012 showed that weight perception and weight dissatisfaction were predictors of underreporting of energy intake, particularly for the participants who were not in the BMI category of obesity.⁴⁶

The study showed that 96 women within the healthy weight BMI category and satisfied with their body weight still wanted to lose weight. There may be reasons other than body dissatisfaction that lead people to want to change their weight. However, the internalization of the thin-beauty ideal and the equation of thinness with youthfulness encourage women to follow restrictive diets throughout their lives,^{6,47}

Table 5. Profiles^a of women dissatisfied with body weight (n = 179), defined by hierarchical cluster analysis, Swiss National Nutrition Survey, 2014–2015

	Cluster 1 "Unhealthy diet with dairy"	Cluster 2 "Protein and fat"	Cluster 3 "Vegetables without protein"	Cluster 4 "Healthier diet without dairy"
n	48	45	11	75
Total Healthy Eating Index-2020 score (mean ± SD)	37.8 ± 9.3	45.9 ± 8.9	50.7 ± 15.9	58.7 ± 10.4
Older	−0.676 ^b	0.415	0.264	0.145
Swiss nationality	−0.300	0.317	−0.972	0.145
Higher education	−0.116	0.028	0.686	−0.043
Having been on a diet over the last year	0.185	−0.350	0.481	0.021
Snacking often	−0.134	0.068	−0.211	0.076
Skipping breakfast	0.284	−0.016	0.467	−0.241
Taking dietary supplements	−0.050	−0.206	−0.141	0.176
Having heard about Swiss Food Pyramid	0.184	0.267	−3.720	0.267
Smoking	−0.011	0.410	−0.023	−0.236
High self-reported physical activity	0.181	0.306	−0.290	−0.257
Good self-reported health	−0.256	0.285	−0.150	0.015
Diet high in total fruits	−0.498	−0.435	0.036	0.574
Diet high in whole fruits	−0.594	−0.323	0.087	0.562
Diet high in total vegetables	−0.452	−0.130	0.397	0.309
Diet high in greens and beans	−0.631	−0.074	−0.231	0.482
Diet high in whole grains	−0.170	−0.343	−0.002	0.315
Diet high in dairy	0.287	0.165	−0.029	−0.279
Diet high in total protein foods	−0.445	0.282	−0.585	0.202
Diet high in seafood and plant proteins	−0.504	0.032	−0.336	0.353
Diet high in unsaturated acids	−0.389	−0.435	0.094	0.496
Diet low in refined grains	−0.675	0.346	−0.086	0.237
Diet low in sodium	−0.281	0.146	0.382	0.036
Diet low in added sugars	−0.537	0.092	0.475	0.219
Diet low in saturated fats	0.037	−0.744	0.055	0.415
High body mass index	−0.512	0.533	0.068	−0.002
High waist-to-hip ratio	−0.401	0.223	0.619	0.032

^aGreen means proximity to the features on the left, and red means distance from these features; the greener, the closer, the redder, the farther.

^bMeans of standardized variable for each cluster. Patterns were defined by hierarchical cluster analysis using Euclidean distance.

without regard for their health. Dieting has been observed for years among women with a healthy weight, and paradoxically, the main reason given for this behavior was health improvement.⁴⁸ Weight stigma may promote the development of weight control even among women who are not dissatisfied with their body weight.⁵

Regarding the second aim of the study, the cluster analysis showed four different profiles of women dissatisfied with their body weight. Although the women selected for the analyses were all in the healthy weight category according to their BMI, the characteristics and behaviors between the four

groups were quite different. The largest cluster, Cluster 4, "Healthier diet without dairy," consisted of women whose age, BMI, and waist-to-hip ratio were close to the average of the body-dissatisfied group. They were not physically active but ate a healthier diet, despite lower scores for dairy intake. Particular attention should be paid to bone health and calcium intake, with a potential need for supplements in this cluster. The dietary intakes in this large cluster seem produced by a focus on health rather than motivated by rapid weight loss, and may be related to flexible control, with successful self-regulatory strategies.⁴⁹ Dietary restraint has

been divided into “rigid control,” an extreme dichotomous control that can lead to disordered eating, and “flexible control,” a more adaptive approach associated with effective weight management.⁵⁰ These women seemed to adequately self-regulate their food intake despite their dissatisfaction with their body weight and desire to lose weight. Supporting a positive body image for these women may help them mitigate body weight concerns and achieve better psychological health, while cultivating an intuitive eating style.^{51,52} As emphasized by Monthuy-Blanc et al,²² who also identified such a cluster of individuals with body dissatisfaction not engaged in dysfunctional eating attitudes, the presence of body dissatisfaction could be an alarm signal, given that body dissatisfaction has been regularly associated with the onset of disordered eating behaviors.⁵³

In contrast to Cluster 4, Cluster 1, “Unhealthy diet with dairy,” and Cluster 3, “Vegetables without protein,” reported unhealthy diets that seemed to be driven by the desire to lose weight, supported by more rigid control, although in a different way. Cluster 1 was composed of the youngest women, with the lowest BMI and waist-to-hip ratio of the group of body weight–dissatisfied women. They reported eating a particularly unhealthy diet, highlighting the fact that thinness does not necessarily equate to a healthy diet. Even though these young women had heard of the Swiss Food Pyramid, their diets appeared to be highly restrictive, with possible cravings for processed foods high in added sugars and refined grains. To lose weight, these young women may rely on information found on the Internet and social media, which are used regularly by most young people.⁵⁴ A recent systematic review showed that social media use was associated with higher body dissatisfaction, dieting and food restriction, overeating, and making unhealthy food choices,⁵⁵ which may explain the diets of the young women in Cluster 1.

Cluster 3, “Vegetables without protein,” composed of older women, appeared to be users of restrictive diets that favored vegetables and suppressed protein sources. Of note, the Swiss Dietary Guidelines recommend eating plenty of vegetables, but also at least 1 daily portion of foods rich in proteins to maintain a good health in the long term.³⁷ Although their BMI was in the healthy category, their higher waist-to-hip ratio may lead them to negative comparisons with the beauty ideal conveyed in Western society, which emphasizes low fat mass⁵⁶ and may result in unhealthy restrictive diets.⁵⁷ Clusters based on food restrictions have been found in previous studies; for example, Tribble and Resch²³ identified a profile of “professional dieters,” and Monthuy-Blanc et al²² identified 2 clusters with high dietary restraint and different levels of body dissatisfaction.²² Health and nutrition education interventions should be provided to this subgroup of women, who are putting their health at risk with unhealthy habits that they may think are healthy. Because nutrition knowledge is necessary but not sufficient to bring about behavior change, motivation and self-efficacy are factors that should also be addressed to increase the likelihood of change.⁵⁸ Research is needed to develop effective interventions for this subgroup of women.

Finally, Cluster 2, “Protein and fat,” included women who did not appear to restrict or monitor their diet to lose weight or maintain health. Rather, they relied on physical activity. Their dietary intake, higher in protein foods and lower in whole grains

and also refined grains, may be based on the recommendation to eat a higher-protein diet to lose weight while maintaining muscle mass.⁵⁹ Because they are physically active, they may rely on the recommendations for athletes to focus on protein intake and avoid carbohydrates to manage their weight.⁶⁰ This type of weight loss recommendation is also common on social media.⁶¹ Similar to Cluster 3, women in Cluster 2 may benefit from nutritional counseling to achieve a more balanced diet. This cluster also included women who were smokers and who may be reluctant to quit smoking because of their weight concerns and the belief that smoking is effective in maintaining weight.⁶² Supporting them in consuming a healthful diet may help them overcome fears of gaining weight and encourage them to consider quitting smoking.

These explorations of the potential mechanisms underlying each cluster warrant further research. All of these women had a BMI in the healthy weight category, and yet they may benefit from tailored professional counseling to explore their dietary intake, eating behaviors, and their body image to support healthy behaviors. Women who are in the healthy BMI category according to the World Health Organization classification are more likely to be considered “healthy” by health professionals.⁶³ By not disclosing their body weight concerns or disordered eating behaviors, they risk not being screened and never receiving the nutritional and psychological counseling they need.⁶⁴

Given the importance of diet for health, well-being, and successful aging,⁶⁵ identifying factors that influence adherence to dietary guidelines may provide avenues for intervention by health professionals, particularly dietitians. In addition to the factors already associated with diet quality, such as gender, age, BMI, education, or being on a diet,⁴⁴ body weight dissatisfaction and the desire to lose weight also may be indicators of various patterns of unbalanced dietary intake.

Strengths and Limitations

This study has several limitations. The data collection was cross-sectional, which prevents any causal interpretation. The selection of the 2 subgroups, with or without body weight dissatisfaction, was based on 2 questions reduced to 2 categories, whereas body dissatisfaction is generally assessed by multiple items rated on a Likert scale. Because only 2 options, “male” or “female,” were provided for reporting gender on the questionnaire, individuals completing the questionnaire who identified as “nonbinary” or had other gender identities would have been misclassified and may have felt excluded from completing the questionnaire. The HEI-2020 was slightly modified to fit the local context, which prevented us from comparing with studies assessing diet quality using the original scoring algorithm, and it was computed from 2-day intake, which is insufficient to reflect the usual diet quality of study participants. In addition, the different clusters may be associated with different levels of body dissatisfaction in terms of severity. Finally, the likelihood of a type I error may have been increased by the use of multiple comparison tests.

As strengths, these data came from a national survey with a recruitment strategy based on stratified random population-based sampling. Dietary intake assessment was carried out by RDs with 2 computer-assisted multi-pass 24HDRs, using the validated program GloboDiet.^{30,31} Finally, little research has

been done on how body dissatisfaction is related to dietary intake, especially among women who fall within the healthy BMI category.

CONCLUSION

In this study of women within the healthy BMI category, there was no observed difference in overall diet quality between those who were satisfied and those who were dissatisfied with their body weight. However, differences in scores for the HEI-2020 total fruits and whole grain components as well as total daily fiber and iron intakes were found. The study also revealed a diversity of dietary profiles among women with body weight dissatisfaction who may benefit from personalized dietary counseling. Further research is needed to explore the different profiles of dietary intake in women with body weight dissatisfaction who are in a healthy weight category, and also extended to women and men of different weight ranges.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

FUNDING/SUPPORT

The Swiss National Nutrition Survey, menuCH, was co-funded by the Swiss Federal Food Safety and Veterinary Office and the Federal Office of Public Health. The work related to this publication received no funding. This article is based on the results of a master thesis conducted within the joint Master of Science (MSc) in Health Sciences of HES-SO (University of Applied Sciences and Arts Western Switzerland) and University of Lausanne (UNIL), major in Nutrition and Dietetics, at HES-SO Master.

AUTHOR CONTRIBUTIONS

A. C. took part in the data collection, trained the field dietitians, and conducted field quality controls; A. C., A. B., A. G., and I. C. conceived the secondary analysis plan; A. C. analyzed the data; I. C., A. C., S. B. D. T., and C. J. wrote the first draft, and all authors reviewed and approved the final submission. The whole dataset and relevant documents (eg, questionnaires, weighting strategy) are accessible in the data repository: <https://menuch.iumsp.ch>

Supplementary Table 1. Components and scoring method of the Healthy Eating Index 2020^a and scores in women dissatisfied and satisfied with body weight, mean of 2 24-hour dietary recalls, Swiss National Nutrition Survey, 2014–2015

		Minimum Score		Maximum Score		Dissatisfied (n = 179)			Satisfied (n = 328)			p-	
Components	Included food items	Pts	Criteria	Pts	Criteria	Median ^b	P25	P75	Median ^b	P25	P75	Value ^b	
Adequacy:													
1	Total fruits ^c	All fruits (including 100% fruit juices).Exceptions: fruit nectars, fruit jams, and candied fruits.	0	No fruit	5	≥2 portions/ 1000 kcal	2.0	0.7	3.3	2.3	1.0	3.9	.050
2	Whole fruits ^d	Fresh fruits.Exceptions: dried or cooked fruits, fruit juices or purees, fruit nectars, fruit jams, and candied fruits.	0	No whole fruit	5	≥1 portion/ 1000 kcal	2.5	0.6	5.0	2.9	1.0	5.0	.056
3	Total vegetables ^e	All vegetables: leafy vegetables, sprouts, green beans, green peas, sweet corn, root vegetables, cabbages, avocadoes, mushrooms, onions, garlic, seaweeds, homemade vegetable soups, vegetable sauce (eg, tomato sauce), vegetable juices, and dried vegetables, etc.Exceptions: potatoes, potato products, olives, and herbs.	0	No vegetables	5	≥2.5 portions/ 1000 kcal	1.8	1.1	2.7	1.8	1.1	2.6	.844
4	Greens and beans ^f	All dark green vegetables (eg, broccoli, kale, all lettuces, spinach, green beans, green peas, green asparagus).All legumes (eg, lentils, beans, peas, chickpeas).	0	No dark green vegetables/ legumes	5	≥0.5 portion/ 1000 kcal	2.5	0.7	4.7	2.7	1.0	4.9	.429
5	Whole grains	All whole grain bread products, whole grain breakfast cereals, and natural muesli, cereal flakes, and brans, whole grain pasta and rice, and other cereal grains (eg, quinoa, barley), usually with a carbohydrate-to-fiber ratio smaller than 10:1.	0	No whole grains	10	≥43 g (1.5 oz)/ 1000 kcal	2.0	0.0	5.9	2.8	0.0	6.9	.014
6	Dairy ^g	All dairy products: milk, fermented milk, fortified soy beverages, kefir, yogurt, fresh cheese, spread cheese, soft cheese, and hard cheese, etc.	0	No dairy	10	≥1.5 portion/ 1000 kcal	5.8	3.2	9.1	6.1	3.6	8.9	.854

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Supplementary Table 1. Components and scoring method of the Healthy Eating Index 2020^a and scores in women dissatisfied and satisfied with body weight, mean of 2 24-hour dietary recalls, Swiss National Nutrition Survey, 2014–2015 (*continued*)

Components	Included food items	Minimum Score		Maximum Score		Dissatisfied (n = 179)			Satisfied (n = 328)			p- Value ^b
		Pts	Criteria	Pts	Criteria	Median ^b	P25	P75	Median ^b	P25	P75	
7	Total protein foods	0	No protein foods	5	≥71 g (2.5 oz)/ 1000 kcal	4.1	2.3	5.0	3.7	2.2	5.0	.201
	All types of meat: fresh meat of mammals, poultry, offal, wild meat, sausages, cold cuts, smoked and cured meat, etc. All types of seafood: fish, seafood, processed fish (eg, fish in crumbs), and seafood products (eg, surimi), etc. Eggs. Nuts and seeds. Soy products other than beverages (eg, tofu) and meat substitutes. All legumes (eg, lentils, beans, peas, chickpeas).											
8	Seafood and plant proteins	0	No seafood or plant proteins	5	≥23 g (0.8 oz)/ 1000 kcal	1.2	0.0	5.0	1.2	0.0	5.0	.462
	All types of seafood: fish, seafood, processed fish (eg, fish in crumbs), and seafood products (eg, surimi), etc. Nuts and seeds. Soy products other than beverages (eg, tofu) and meat substitutes. All legumes (eg, lentils, beans, peas, chickpeas).											
9	Fatty acids ^h	0	(PUFAs + MUFAs)/ SFAs ≤1.2	10	(PUFAs + MUFs)/SFAs ≥2.5	1.4	0.0	5.5	1.9	0.0	5.4	.450
	Moderation:											
10	Refined grains	0	≥122 g (4.3 oz)/1000 kcal	10	≤51 g (1.8 oz)/ 1000 kcal	6.1	1.0	10.0	5.0	0.0	9.9	.329
	All bread products, flours, breakfast cereals (eg, cornflakes), pasta, rice, spätzle, and other refined cereal products (eg, pizza dough), usually with a carbohydrate-to-fiber ratio larger than 10:1.											
11	Sodium	0	≥2.0 g/1000 kcal	10	≤1.1 g/1000 kcal	8.7	4.4	10.0	8.1	5.6	10.0	.748
	Not applicable											

(continued on next page)

Supplementary Table 1. Components and scoring method of the Healthy Eating Index 2020^a and scores in women dissatisfied and satisfied with body weight, mean of 2 24-hour dietary recalls, Swiss National Nutrition Survey, 2014–2015 (*continued*)

Components	Included food items	Minimum Score		Maximum Score		Dissatisfied (n = 179)			Satisfied (n = 328)			p- Value ^b	
		Pts	Criteria	Pts	Criteria	Median ^b	P25	P75	Median ^b	P25	P75		
12	Added sugars	All sugars added to foods during preparation, processing, or at the table, and incl. sugars from nondiluted fruit juices.	0	≥26% of energy	10	≤6.5% of energy	7.8	5.3	9.5	7.6	5.7	9.6	.771
13	Saturated fats	Not applicable	0	≥16% of energy	10	≤8% of energy	2.6	0.0	5.8	3.0	0.0	5.4	.511
Total (mean ± SD) ^b			0		100		49.4	±	13.3	51.1	±	13.5	.165

^aAdapted from Shams-White³⁵ (detailed in Krebs-Smith et al⁴³). Portion sizes are derived from the recommendation of the Swiss food pyramid.³⁷

^bFor each component of the HEI-2020 score, the median [P25-P75] scores are presented. For total HEI-2020 score, the mean (±SD) score is presented. Differences between dissatisfied and satisfied women assessed using Mann-Whitney *U* tests (score of each component) and independent *t*-tests (total score), respectively.

^cOne portion was equal to 120 g raw or cooked fruits, 30 g dried fruits, or 200 g 100% fruit juices.

^dOne portion was equal to 120 g raw fruits.

^eOne serving was equal to 120 g raw or cooked vegetables, 250 g homemade vegetable soup, 120 g vegetable sauces, 200 g vegetable juices, 30 g dried vegetables, or 80 g cooked legumes.

^fOne serving was equal to 120 g raw or cooked vegetables.

^gOne serving was equal to 200 g milk, 175 g yogurt or fresh cheese, 60 g soft cheese, or 30 g hard cheese.

^hPUFAs = polyunsaturated fatty acids; MUFAs = monounsaturated fatty acids; SFAs = saturated fatty acids.

Supplementary Table 4. Median [P25–P75] total daily nutrient intakes^a of women dissatisfied and satisfied with body weight, Swiss National Nutrition Survey, 2014–2015

	National DRV ^b	All (N = 507)			Dissatisfied (n = 179)			Satisfied (n = 328)			P-Value ^c	P-Value ^d
		Median	P25	P75	Median	P25	P75	Median	P25	P75		
Energy (kcal)	1861–2147	1833	1557	2227	1806	1536	2189	1875	1586	2250	.212	.308
Proteins (g)	42–58 ^e	65.3	52.5	78.4	64.3	52.0	77.2	66.7	53.7	79.8	.267	.888
Carbohydrates (g)	225–300 (45%–60% TEI ^f)	199.1	153.1	241.9	184.9	138.1	232.5	204.1	159.7	245.5	.020	.355
Added sugars (g)	≤50 (≤10% TEI)	51.7	32.2	73.8	49.4	30.9	71.9	52.4	33.5	76.8	.390	.845
Dietary fiber (g)	≥30	18.8	14.0	24.2	16.9	12.8	21.3	20.2	15.0	25.4	<.001	.027
Total fat (g)	44–78 (20%–35% TEI)	77.6	60.7	96.3	76.6	58.5	94.3	77.6	61.5	96.5	.728	.171
Saturated fat (g)	<22 (<10% TEI)	28.4	21.6	36.8	26.8	21.3	36.2	29.0	21.7	36.9	.091	.264
Mono-unsaturated fat (g)	22–33 (10%–15% TEI)	28.8	21.5	37.3	28.6	20.8	36.0	28.8	21.6	38.8	.872	.782
Poly-unsaturated fat (g)	10 (4.5% TEI)	11.1	8.1	14.7	11.3	8.0	13.9	11.1	8.1	15.1	.744	.280
Cholesterol (mg)	Undefined	240.6	165.3	346.2	241.1	177.7	336.9	240.3	158.0	346.7	.975	.446
Alcohol (g)	0	0.7	0.0	12.9	0.2	0.0	10.7	1.3	0.0	13.7	.346	.596
Vitamin A (retinol, RAE, μg-RE ^g)	650	600.3	435.9	888.2	568.5	392.3	849.1	624.8	447.2	912.7	.123	.490
Vitamin B1 (thiamine, mg)	0.8	0.9	0.7	1.1	0.9	0.7	1.1	0.9	0.7	1.1	.437	.849
Vitamin B2 (riboflavin, mg)	1.6	1.2	1.0	1.5	1.2	0.9	1.5	1.2	1.0	1.6	.153	.838
Vitamin B3 (PP, niacin, mg-NE ^h)	13.4	11.4	8.8	14.7	11.2	8.1	14.4	11.5	9.0	14.8	.573	.252
Vitamin B5 (pantothenic acid, mg)	5.0	4.0	3.2	4.8	3.9	3.1	4.8	4.0	3.3	4.9	.176	.729
Vitamin B6 (pyridoxine, mg)	1.6	1.2	1.0	1.5	1.2	1.0	1.5	1.3	1.0	1.6	.258	.228
Vitamin B9 (folate, μg-DFE ⁱ)	330	236.2	187.8	294.0	218.0	172.2	276.1	246.1	194.2	308.7	.001	.100
Vitamin B12 (cobalamin, mcg)	4.0	2.5	1.7	3.9	2.6	1.7	3.9	2.5	1.7	3.9	.601	.528
Vitamin C (ascorbic acid, mg)	95	101.5	65.8	141.7	92.2	61.6	129.5	107.1	68.2	148.0	.037	.138
Vitamin D (calciferol, μg ^j)	15	2.0	1.2	3.2	2.0	1.2	3.0	2.1	1.2	3.3	.476	.706
Vitamin E (alpha-tocopherol, mg-aTE ^k)	11	13.5	9.4	17.8	12.9	8.5	17.5	13.6	9.9	18.0	.384	.578
Calcium (mg)	950	827	627	1079	779	599	1066	839	654	1083	.134	.991
Phosphorus (mg)	550	1094	910	1306	1042	869	1261	1130	934	1330	.003	.531

(continued on next page)

Supplementary Table 4. Median [P25–P75] total daily nutrient intakes^a of women dissatisfied and satisfied with body weight, Swiss National Nutrition Survey, 2014–2015 (*continued*)

		All (N = 507)			Dissatisfied (n = 179)			Satisfied (n = 328)			P-Value ^c	P-Value ^d
	National DRV ^b	Median	P25	P75	Median	P25	P75	Median	P25	P75		
Magnesium (mg)	300	274.0	227.5	334.7	259.7	218.3	310.7	281.7	233.5	346.5	.027	.305
Sodium (mg)	2000	2309	1790	2934	2230	1685	2934	2325	1809	2936	.312	.663
Chloride (mg)	3100	3450	2690	4349	3320	2507	4419	3541	2784	4333	.091	.700
Potassium (mg)	3500	2556	2111	3112	2456	2042	2922	2615	2166	3215	.056	.516
Iron (mg)	16	8.4	6.8	10.8	8.0	6.6	9.9	8.8	7.0	11.2	.022	.020
Zinc (mg)	7.5–12.7	8.4	6.7	10.6	8.0	6.5	10.1	8.6	6.9	10.8	.031	.198
Iodine (μg)	150	83.5	63.4	108.3	80.8	59.5	103.1	86.1	63.7	110.1	.205	.976

^aExcluding intake from dietary supplements.
^bDRV = Swiss Dietary Reference Values for adult women (<https://www.blv.admin.ch/blv/fr/home/lebensmittel-und-ernaehrung/ernaehrung/empfehlungen-informationen/naehrstoffe/naehrstoffzufuhr-dynamische-tabelle.html>)
^cDifferences between dissatisfied and satisfied women assessed using simple quantile regressions.
^dDifferences between dissatisfied and satisfied women assessed using multiple quantile regressions adjusted for total energy intake (except for energy), age, body mass index, dieting, skipping breakfast, physical activity, and self-reporting health status.
^eFor a body weight of 50–70 kg (Population Reference Intake [PRI], also known as Recommended Dietary Allowances, RDA): 0.83 g/kg body weight).
^fTEI = Total energy intake. Estimates if TEI = 2000 kcal.
^gRAE = retinol activity equivalents: 1 × retinol (μg) + 1/12 × beta carotene equivalent (μg-BCE). 1 International Unit (IU) ≈ 0.3 μg-RE or 1 μg-RE ≈ 3.3 IU.
^hNE = niacin equivalents.
ⁱDFE = dietary folate equivalents (DFE).
^jTotal vitamin D activity (Vitamin D₂ [ergocalciferol], vitamin D₃ [cholecalciferol], 25[OH] vitamin D₃). 1 International Unit (IU) ≈ 0.025 μg or 1 μg ≈ 40 IU.
^kaTE = alpha-tocopherol equivalents. 1 International Unit (IU) ≈ 0.67 mg or 1 mg ≈ 1.49 IU.