

# Ready-meal consumption: associations with weight status and cooking skills

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## Abstract

*Objective:* The ready-meal market has grown considerably in recent years. At the same time, a degradation of traditional cooking skills has been observed. Ready meals are often rich in energy, fat and sugar and lack vegetables; however, studies investigating associations between ready-meal consumption, overweight and cooking skills are lacking. The present study examines whether demographic factors, overweight, beliefs about the nutritional value and taste of ready meals and cooking skills are associated with ready-meal consumption.

*Design:* Cross-sectional survey.

*Setting:* Ready-meal consumption, weight status, cooking skills, beliefs about the taste and nutritional value of ready meals and demographic variables were assessed with self-administered questionnaires. Data were analysed with one-way ANOVA and multiple regression analysis.

*Subjects:* A total of 1017 adults from the German-speaking part of Switzerland.

*Results:* Men reported being more positive about ready meals and having fewer cooking skills compared with women. Overweight adults (BMI > 25 kg/m<sup>2</sup>) were more positive about nutrients and vitamins in ready meals compared with normal-weight adults. Ready-meal consumption was associated with cooking skills ( $\beta = -0.192$ ), age ( $\beta = -0.228$ ), overweight ( $\beta = 0.129$ ), nutritional value ( $\beta = -0.131$ ), taste ( $\beta = -0.126$ ), working status ( $\beta = 0.096$ ) and gender ( $\beta = 0.084$ ).

*Conclusions:* Cooking skills were identified as a strong predictor of ready-meal consumption. The importance of cooking skills as a barrier to healthy eating should be explored, as it is plausible that cooking skills will further decrease in the future. Next, the study provided evidence for an association between ready-meal consumption and overweight. Further research should examine the importance of ready meals for the overweight epidemic.

**Keywords**  
Ready meals  
Overweight  
Cooking skills

The ready-meal market has grown considerably in recent years because of an increasing demand for convenience foods, a decrease in families having meals together and a rise in one- and two-person households<sup>(1)</sup>. Ready meals can be defined as complete meals that require few or no extra ingredients, prepared by external procedures, and designed to replace the main course of a homemade main meal<sup>(2)</sup>. Ready meals still require some cooking or heating, whereas with takeaway foods no cooking or heating is needed<sup>(3,4)</sup>. Ready meals are often rich in energy, fat, salt and sugar<sup>(1,5,6)</sup> and lack the recommended servings of vegetables. Therefore, knowledge of factors affecting the use of ready meals is important, especially in light of the increasing prevalence of overweight and obesity in Western countries. From studies examining other categories of convenience foods such as takeaway food and fast food, we know that a high intake of these foods is

likely to be associated with overweight<sup>(7–12)</sup> and with a poorer diet quality<sup>(7,13,14)</sup>. However, studies investigating associations between ready-meal consumption and overweight are lacking.

In other research areas, such as consumer behaviour and marketing, ready-meal consumption and convenience foods have been examined. These studies examined whether socio-economic and demographic determinants such as employment status, household size, income and perceived time pressure explained variation in convenience food consumption<sup>(4,15–17)</sup>. Some earlier studies did not find a positive correlation between employment status of the wife and the purchase of convenience products<sup>(18,19)</sup>. In a more recent study, ready-meal consumption was found to be higher if the person responsible for meal preparation held a paid job. Furthermore, intake was positively associated with how many hours

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that this person was employed<sup>(4)</sup>. Convenience orientation towards meal preparation was found to be stronger for persons from a single household compared with persons from a multi-person household, having more than 30 working hours and the presence of children. However, in the same study, no significant relationship was found between ready-meal consumption and convenience orientation<sup>(20)</sup>. Generally, people have negative attitudes towards ready meals, and a negative image of ready meals regarding taste, nutritional value and healthiness<sup>(3,21,22)</sup>. However, De Boer *et al.*<sup>(23)</sup> found that consumers with a high consumption of ready meals perceive convenience foods as time saving, healthier and as having a better value for money than consumers reporting low consumption of ready meals<sup>(23)</sup>. This was confirmed in a study of Mahon *et al.*<sup>(24)</sup> in which they found attitudes towards ready-meal consumption associated with ready-meal intake<sup>(24)</sup>. In that study, people inclined to buy ready meals had stronger beliefs that ready meals are good value for money, that ready meals are a good backup to have in the home and that ready meals are convenient. Likewise, segmentation studies show that consumer segments that differ in the amount of ready-meal or convenience food consumption differ as well in beliefs about the nutritional value, healthiness and taste of ready meals<sup>(3,25)</sup>.

Factors related to cooking may also be important for making convenient food choices. Despite the increasing exposure to and apparent interest in fresh and natural food, a degradation of traditional cooking skills is reported<sup>(26)</sup>. Even when prepared at home, most evening meals include processed foods with 36% of dishes being purchased in their finished form or finished entirely to package directions<sup>(27)</sup>. The lack of cooking skills can be an important barrier for food preparation<sup>(28)</sup>. Moreover, a dislike for cooking was found to be associated with less fruit and vegetable intake<sup>(29)</sup> and a higher frequency of fast-food intake<sup>(30)</sup>.

From the above-mentioned studies we can conclude that sociodemographic factors together with valuations regarding taste, healthiness and cooking skills might be important factors associated with ready-meal consumption. Examining specific beliefs about ready-meal intake gives more precise information that is important to the individual when making decisions regarding purchasing and consuming ready meals. Therefore, the objectives of this research are twofold. First, sociodemographic and weight status differences in beliefs about the nutritional value of ready meals, taste and in perceived cooking skills are examined. The second aim is to examine whether ready-meal consumption varies for different sociodemographic groups and weight statuses and to examine whether sociodemographic variables, weight status, beliefs and cooking skills are associated with ready-meal consumption.

## Methods

### *Participants and procedure*

In 2009, a mail survey was sent out to 2323 randomly selected household addresses from the telephone book in the German-speaking part of Switzerland. In each household, the person mainly responsible for buying and preparing food was asked to fill out the questionnaire. Two reminders were sent (after 3 and 6 weeks) to participants who had not responded. Another copy of the questionnaire was included in the second reminder. The response rate was 44% ( $n$  1017). The mean age of the sample was 50.9 (SD 14.5) years with a range from 17 to 93 years, which is similar to the mean age of the Swiss population for that age group, which is 49 years. As we asked for the person responsible for buying and preparing food, the sample consisted mostly of women (69.8%). Compared with data from the Swiss household panel, the sample consisted of fewer single households (22% *v.* 27%), more college/university educated (47% *v.* 31%) and with a higher net income (6500 *v.* 5400 Swiss francs).

### *Measures*

#### *Ready-meal intake*

The dependent measure 'ready-meal intake' was derived from an FFQ assessing seventeen common convenience food items sold in Switzerland's supermarkets. The selection of the seventeen food items was based on an in-store investigation of the variety of convenience food items to assure that the full range of products was considered. The present study focused specifically on ready meals, making a distinction from other convenience products such as takeaway foods and foods that can be eaten for breakfast or lunch. Therefore, we based our selection of items on the following definition: meals that require few or no extra ingredients and are designed to replace the main course of a homemade meal<sup>(2)</sup>. To see whether the convenience food items could be categorized into different groups of products, the seventeen food items were also subjected to a principal component analysis using Varimax rotation. Four groups of convenience food items were identified: highly processed food items (e.g. ready meals), moderately processed food items (e.g. sandwich), single components (e.g. crumbed meat) and salads (e.g. cut and washed salad). As we preferred a good reflection of our definition of ready meals, we included the group of highly processed foods in the ready-meal scale (five items, loadings ranging from 0.51 to 0.70, Cronbach's  $\alpha$  = 0.63). We also included an item of the moderately processed group: chilled or frozen pizza, because pizza is an often-used ready meal. The other items from the moderately processed group (sandwich, fresh pasta, takeaway pizza) were excluded based on our definition of ready meals. The ready-meal

variable consisted of six items, namely: (i) ready meals in a can (ravioli, chilli con carne, etc.); (ii) ready meals chilled/frozen (lasagne, nasi-goreng, etc.); (iii) instant noodles, soup or pasta (in a cup for one person); (iv) instant pasta with sauce (dried, add water, cook); (v) ready soup in bag or can; and (vi) ready pizza chilled/frozen. Participants stated how often they consumed these items on the following 7-point scale: 'daily' (coded as 360), '5–6 times/week' (275), '2–4 times/week' (150), '1 time/week' (50), '1–3 times/month' (25), '6–11 times/year' (10) or 'more rarely or never' (0). Test–retest reliability was examined for five of the six ready meal items (excluding instant pasta with sauce). The results from the 221 respondents who returned both questionnaires showed correlations ranging from  $r=0.61$  for instant noodles, soup or pasta to  $r=0.79$  for ready pizza chilled or frozen. We computed the ready-meal intake variable by taking the mean over the six items (Cronbach's  $\alpha=0.64$ ) indicating the frequency of consumption per year. As the ready-meal data showed a skewed distribution, the data were transformed for regression analyses by taking the square root.

#### *Sociodemographic variables and weight status*

In the questionnaire, the following sociodemographic variables were assessed: gender, age, number of persons living in the household aged  $\geq 16$  years, income, education and working status. The number of persons living in the household was used to create a single household variable (yes/no). Weight and height were self-reported in the questionnaire. The BMI was calculated and used to create the weight status variable (overweight =  $\text{BMI} > 25 \text{ kg/m}^2$ , not overweight  $\text{BMI} \leq 25 \text{ kg/m}^2$ ).

#### *Beliefs about ready meals and cooking skills*

Beliefs about the nutritional value of ready meals were assessed with eight items on a semantic differential 6-point scale: 'I think that ready meals contain in general a little (1) to a lot (6) of fat, salt, sugar, calories, flavour enhancer, vitamins, nutrients and additives'. Cronbach's  $\alpha$  for the nutritional value scale was 0.82. One item assessed taste: 'I think that a self-prepared warm meal always tastes better than a ready meal'. Participants indicated how much the statement applied to them on a 6-point scale ranging from 1 = 'does not apply at all' to 6 = 'applies very much'.

Cooking skills were assessed with seven items: 'I can cook complicated multi-course meals'; 'I can prepare a lot of meals even without a recipe'; 'I can prepare gratin potatoes'; 'I can prepare a soup'; 'I can prepare a sauce'; 'I can bake a cake'; 'I can bake bread'. Participants indicated how much the statements applied to them on a 6-point scale ranging from 1 = 'does not agree at all' to 6 = 'agree very much'. The Cronbach's  $\alpha$  for the cooking skills scale was 0.88.

#### *Data analysis*

Respondents with  $>50\%$  missing on the scales (ready-meal intake, nutritional value and cooking skills) were deleted. For the rest of the participants, the values were estimated using the expectation-maximization procedure in the missing value analysis of the SPSS statistical software package version 17.0 (SPSS Inc., Chicago, IL, USA). The final sample size was  $n 903$ . As some respondents had missing data for some demographic variables, the sample size differs slightly among the different analyses.

Sociodemographic differences were examined in beliefs about the nutritional value and taste of ready meals and cooking skills. The differences were analysed for the various items instead of using the scales. Significant differences between groups were analysed with univariate general linear models (uni-ANOVA) examining the variable of interest while adding the other sociodemographic variables as covariates to the model. Subsequently, sociodemographic and weight status differences were examined in ready-meal intake. Finally, we examined the correlates of ready-meal intake with regression analysis. First, possible multicollinearity was examined and not found (all independent variables had correlations below  $r=0.45$ ) and the SPSS's collinearity diagnostic indicated that the data were suitable for multiple regression analysis. As the ready-meal intake variable was positively skewed, we conducted a square-root transformation. The sociodemographic variables, weight status, the scales of nutritional value and cooking skills and the taste item were used as independent variables in the multiple linear regression analysis. Next to this, we checked for interaction effects of gender with cooking skills, gender with nutritional value of ready meals and gender with taste. None of these interaction terms turned out to be significant ( $P > 0.05$ ).

## **Results**

Sociodemographic differences in beliefs about the nutritional value of ready meals, cooking skills and taste are presented in Table 1. Significant gender differences were found for all items showing that men were more positive about the nutritional value and taste of ready meals compared with women. Furthermore, men reported having fewer cooking skills compared with women. Almost no significant age differences were found in beliefs about the nutritional value, cooking skills and taste of ready meals. Cooking skills were also found to differ significantly between living alone or in a multi-person household: single living respondents reported having fewer cooking skills. The results regarding overweight showed that compared with normal-weight respondents, respondents who were overweight perceive ready meals as containing more vitamins, nutrients and fat. Almost no differences were found for income, educational level and working status (data not presented).

**Table 1** Sociodemographic differences in beliefs about ready meals and cooking skills (*n* 807)

|  | Gender |        | Age (years)       |                     |                       | Single household |       | Overweight |       |
|--|--------|--------|-------------------|---------------------|-----------------------|------------------|-------|------------|-------|
|  | Male   | Female | 17–39             | 40–64               | ≥65                   | Yes              | No    | Yes        | No    |
| Nutritional value ‘I think that ready meals contain in general... a little (1) – a lot of (6)’ |        |        |                   |                     |                       |                  |       |            |       |
| Fat  | 4.62   | 5.04*  | 4.96              | 4.87                | 4.95                  | 4.80             | 4.94  | 4.97       | 4.88* |
| Salt   | 4.57   | 5.03*  | 4.93              | 4.89                | 4.84                  | 4.77             | 4.92  | 4.83       | 4.92  |
| Sugar  | 4.71   | 5.17*  | 5.08              | 5.03                | 4.95                  | 4.94             | 5.05  | 4.98       | 5.05  |
| Energy   | 4.55   | 5.04*  | 5.02              | 4.83                | 4.89                  | 4.78             | 4.92  | 4.83       | 4.92  |
| Flavour enhancer   | 5.15   | 5.43*  | 5.46 <sup>b</sup> | 5.36 <sup>a,b</sup> | 5.14 <sup>*,a</sup>   | 5.22             | 5.38  | 5.29       | 5.37  |
| Vitamins   | 2.99   | 2.68*  | 2.64              | 2.82                | 2.84                  | 2.67             | 2.81  | 3.01       | 2.67* |
| Nutrients  | 3.23   | 2.90*  | 2.96              | 2.97                | 3.10                  | 3.02             | 2.99  | 3.26       | 2.88* |
| Additives  | 5.05   | 5.32*  | 5.28              | 5.27                | 5.09                  | 5.19             | 5.25  | 5.12       | 5.30  |
| Cooking skills   |        |        |                   |                     |                       |                  |       |            |       |
| I can cook complicated multi-course meals  | 3.81   | 4.29*  | 4.07              | 4.27                | 3.82                  | 3.45             | 4.34* | 4.08       | 4.17  |
| I can prepare a lot of meals even without a recipe   | 4.16   | 4.86*  | 4.43              | 4.71                | 4.69                  | 4.03             | 4.82* | 4.55       | 4.68  |
| I can prepare gratin potatoes  | 4.69   | 5.52*  | 5.07 <sup>a</sup> | 5.36 <sup>b</sup>   | 5.21 <sup>*,a,b</sup> | 4.78             | 5.41* | 5.09       | 5.35  |
| I can prepare a soup   | 5.41   | 5.69*  | 5.47              | 5.63                | 5.69                  | 5.42             | 5.65* | 5.54       | 5.63  |
| I can prepare a sauce  | 4.98   | 5.58*  | 5.37              | 5.39                | 5.44                  | 5.00             | 5.51* | 5.31       | 5.44  |
| I can bake a cake  | 4.42   | 5.63*  | 5.26              | 5.29                | 5.15                  | 4.81             | 5.39* | 5.07       | 5.34  |
| I can bake bread   | 4.01   | 5.18*  | 4.91 <sup>b</sup> | 4.94 <sup>b</sup>   | 4.28 <sup>*,a</sup>   | 4.07             | 5.03* | 4.64       | 4.90  |
| Taste  |        |        |                   |                     |                       |                  |       |            |       |
| I think that a self-prepared meals always taste better than a ready meal                       | 5.27   | 5.57*  | 5.47              | 5.48                | 5.48                  | 5.28             | 5.54* | 5.40       | 5.51  |

The uni-ANOVA analyses were conducted for the variable of interest, including the other sociodemographic variables as covariates. Sociodemographic variables included in the analyses are gender, age, single household, overweight, income, education and working status.

<sup>a,b</sup>Mean values within a column with unlike superscript letters were significantly different using the Bonferroni *post hoc* test ( $\alpha = 0.05$ ).

\* $P < 0.05$ .

**Table 2** Sociodemographic differences in intake of ready meals (mean intake/year; one-way ANOVA)

|  | <i>n</i> | Mean              | SD   | <i>F</i> test | <i>P</i> value |
|--|----------|-------------------|------|---------------|----------------|
| Gender                                   |          |                   |      |               |                |
| Male                                     | 261      | 11.1              | 15.9 | 33.84         | 0.000          |
| Female                                   | 604      | 6.3               | 8.3  |               |                |
| Age (years)                              |          |                   |      |               |                |
| 17–39                                    | 206      | 10.4 <sup>a</sup> | 15.9 | 7.45          | 0.001          |
| 40–64                                    | 493      | 6.8 <sup>b</sup>  | 9.0  |               |                |
| ≥65                                      | 165      | 7.2 <sup>b</sup>  | 10.4 |               |                |
| Living in a single household             |          |                   |      |               |                |
| Yes                                      | 189      | 10.0              | 16.0 | 8.50          | 0.004          |
| No                                       | 664      | 7.3               | 9.9  |               |                |
| Income (Swiss francs)                    |          |                   |      |               |                |
| High (≥8001)                             | 299      | 7.8               | 11.3 | 2.44          | 0.087          |
| Middle (5001–8000)                       | 310      | 6.8               | 8.7  |               |                |
| Low (0–5000)                             | 267      | 8.8               | 13.7 |               |                |
| Weight status                            |          |                   |      |               |                |
| Overweight (BMI > 25 kg/m <sup>2</sup> ) | 271      | 9.7               | 13.4 | 3.03          | 0.003          |
| Normal weight                            | 578      | 6.9               | 10.3 |               |                |
| Working status                           |          |                   |      |               |                |
| Full time                                | 296      | 8.8               | 12.0 | 1.87          | 0.155          |
| Part time                                | 308      | 7.1               | 10.2 |               |                |
| Not working                              | 258      | 7.5               | 12.3 |               |                |
| Education                                |          |                   |      |               |                |
| High                                     | 476      | 7.0               | 8.6  | 4.65          | 0.031          |
| Low                                      | 400      | 8.6               | 13.8 |               |                |

The ready-meal variable consisted of meals that require few or no extra ingredients, and designed to replace the main course of a homemade meal: ready meals in a can, ready meals chilled or frozen, instant noodles, soup or pasta (in a cup for one person), instant pasta with sauce (dried, add water, cook), soup in bag or can, and pizza chilled or frozen.

<sup>a,b</sup>Mean values within a column with unlike superscript letters were significantly different using the Scheffé *post hoc* test ( $\alpha = 0.05$ ).

ANOVA showed that the intake of ready meals differed significantly for sociodemographic factors (Table 2). Compared with women (mean 6.3 (SD 8.3)), men (mean

11.1 (SD 15.9)) had a higher intake of ready meals ( $F(1863) = 33.84, P < 0.001$ ). Ready-meal intake differed significantly by age group ( $F(2861) = 7.45, P = 0.001$ ). *Post hoc* analyses using the Scheffé *post hoc* criterion for significance indicated that the intake of ready meals was significantly higher in the youngest age group (17–39 years; mean 10.4 (SD 15.9)) than in the other two age categories (40–64 years old: mean 6.8 (SD 9.0); ≥65 years old: mean 7.2 (SD 10.4)). Respondents living in a single household (mean 10.0 (SD 16.0)) had a higher intake than respondents living in a multi-person household (mean 7.3 (SD 9.9),  $F(1851) = 8.50, P = 0.004$ ). Overweight respondents (mean 9.7 (SD 13.4)) had a higher ready-meal intake compared with the normal-weight respondents (mean 6.9 (SD 10.3),  $F(1847) = 3.03, P = 0.003$ ). Highly educated respondents (mean 7.0 (SD 8.6)) had a lower intake compared with low educated respondents (mean 8.6 (SD 13.8),  $F(1874) = 4.65, P = 0.031$ ). No significant differences were found for income and working status.

Table 3 gives an overview of the results of the multiple linear regression analysis with ready-meal intake as the dependent variable. Seven variables showed a significant effect, and the model accounted for 17.5 % of the variance in ready-meal consumption. Age was the strongest predictor ( $\beta = -0.228, P < 0.001$ ) followed by cooking skills ( $\beta = -0.192, P < 0.001$ ). Respondents with fewer cooking skills and of younger age were more likely to consume ready meals. Beliefs about the nutritional value of ready meals ( $\beta = -0.131, P < 0.001$ ) and weight status were also found to be significantly associated with

**Table 3** Summary of multiple linear regression analysis for variables predicting intake of ready meals (*n* 812)

|                                  | B      | SE B  | $\beta$ | P value |
|----------------------------------|--------|-------|---------|---------|
| Constant                         | 7.406  | 0.571 |         | 0.000   |
| Age                              | -0.025 | 0.004 | -0.228  | 0.000   |
| Cooking skills                   | -0.304 | 0.059 | -0.192  | 0.000   |
| Nutritional value of ready meals | -0.295 | 0.077 | -0.131  | 0.000   |
| Weight status (overweight)       | 0.441  | 0.113 | 0.129   | 0.000   |
| Taste                            | -0.199 | 0.055 | -0.126  | 0.001   |
| Working status                   |        |       |         |         |
| Not working <i>v.</i> full time  | 0.339  | 0.159 | 0.096   | 0.033   |
| Part time <i>v.</i> full time    | 0.116  | 0.137 | 0.035   | 0.399   |
| Gender (male)                    | 0.290  | 0.134 | 0.084   | 0.031   |
| Education (high)                 | -0.195 | 0.104 | -0.061  | 0.061   |
| Living in a single household     | 0.100  | 0.138 | 0.026   | 0.468   |
| Income                           | -0.015 | 0.024 | -0.022  | 0.536   |

$R^2 = 0.175$ .

Coding for weight status: normal weight = 0, overweight (BMI > 25 kg/m<sup>2</sup>) = 1; coding for gender: female = 0, male = 1; coding for education: low education = 0, high education = 1.

ready-meal intake. Overweight respondents were more likely to consume ready meals compared with normal-weight respondents ( $\beta = 0.129$ ,  $P < 0.001$ ). Other significant factors were beliefs about taste ( $\beta = -0.126$ ,  $P < 0.001$ ), not working compared with having a full-time job ( $\beta = 0.096$ ,  $P < 0.05$ ) and gender ( $\beta = 0.084$ ,  $P < 0.05$ ). These results suggest that people who perceive ready meals to be unhealthy and who are convinced that ready meals do not match the taste of a self-prepared meal are less likely to consume ready meals compared with people who perceive ready meals as healthy and like the taste. Living in a single household, education and income were not associated with ready-meal intake.

## Discussion

To the best of our knowledge, the present study is the first one that examines associations between weight status, cooking skills and ready-meal consumption. One of the most interesting findings of the study is that ready-meal consumption was found to be significantly associated with being overweight. No other studies have examined this association, but similar findings are demonstrated in studies conducted on other categories of convenience foods, such as takeaway and fast-food consumption<sup>(7–12)</sup>. Another interesting finding of the study was that overweight people not only have a higher intake of ready meals, but have different beliefs about the nutritional value of ready meals as well. They perceived ready meals as containing more vitamins and nutrients compared with normal-weight respondents. Having more positive beliefs about the nutritional value of ready meals was also found to be significantly associated with intake. We found similar results for items assessing general attitudes about convenience foods, showing that overweight respondents considered convenience foods as being

more positive and healthy (data not presented). The more positive beliefs about ready meals and convenience foods may also be a result of cognitive dissonance. If eating unhealthy ready meals leads to dissonance, such as guilt or shame, changing beliefs about ready meals to more positive ones might reduce it. It might also be that some people lack knowledge about the nutritional value of ready meals. In a Dutch study, nutritional knowledge was found to be inversely related to convenience food usage<sup>(15)</sup>. However, public health messages aimed to educate people about the unhealthiness of ready meals might not be very successful as we found a clear association between a lack of cooking skills and ready-meal consumption. This is according to the study by Dave *et al.*<sup>(30)</sup> in which an association was found between a dislike for cooking and frequency of fast-food consumption<sup>(30)</sup>. Therefore, lack of cooking skills might be a barrier to preparing healthy homemade meals. Although cooking is very popular, indicated by the popularity of television cooking shows and the number of cookbooks and magazines, this does not mean that individuals apply the cooking skills they watch or read about. As lack of time is an important barrier for cooking and healthy eating<sup>(28,31)</sup>, it is very likely that cooking is often perceived as a duty instead of a pleasure. Time pressure, measured by the working status of the person responsible for meal preparation, was found to have a significant and positive relationship with ready-meal consumption<sup>(4)</sup>. In a study among women from disadvantaged areas, it was reported that planning and preparing meals in advance is necessary to avoid the temptation of less healthy food choices. Working women with children struggle to make time-efficient and nutritious meals<sup>(32)</sup>. Convenience and pre-cooked meals are then key strategies to preparing family meals<sup>(32)</sup>. Convenience foods have been incorporated into daily life and cooking is made easier and quicker by the use of convenience products<sup>(33)</sup>.

As a population emerges that is unsure of specific cooking techniques and has a lack of confidence in cooking<sup>(26)</sup>, cooking skills should be integrated in public health interventions as they might have a positive effect on food choice<sup>(34)</sup>. Cooking skills, however, do not guarantee the preparation of meals from basic ingredients without the use of convenience products, as they are only one component of assembling a meal. For instance, ideas, knowledge and menu planning are also important to preparing a healthy meal. Women who used forward planning, organized their meals and liked to shop for meals and meal preparation were found to have higher intake of fruit and vegetables<sup>(29)</sup>. Interventions seeking to decrease ready-meal intake and improve healthy eating should, therefore, focus on strategies that increase the convenience of eating healthy foods regarding shopping, preparation and cleaning up.

These findings also have important policy implications. For example, if in coming years the consumption of ready

meals and other convenience foods, such as fast food and other pre-prepared foods, is increasing, while cooking skills and preparing homemade meals are decreasing, then it may be important to increase the proportion of healthy ready meals and convenience foods that provide enough vegetables to enable individuals to create a quick and healthy meal.

Other variables that were found to be important for ready-meal intake were gender, age, working status and taste. Especially men and young adults were more positive about ready meals and had a higher ready-meal intake. Older people might be more used to cooking their own meals and less familiar with ready meals and other convenience products. When they were younger, convenience food products were not available to such an extent as today and they might not be willing to give up their habits of cooking. This was confirmed in a study among seniors aged >65 years who generally do not think positively about the consumption of convenience foods; they did not feel the need for consuming these products<sup>(22)</sup>. Young adults often have rushed lives and are more used to convenience foods and speed eating<sup>(35)</sup>.

In a study on cooking, a huge gender difference in the frequency of cooking meals was found. A total of 68% of women said that they cooked every day, compared with only 18% of men. In another study, 12.7% of men (and 5.4% of women) cited to not knowing how to cook food as a factor limiting food choice<sup>(26)</sup>. We found a higher intake of ready meals for men, and men also reported having fewer cooking skills even when they are mainly responsible for buying and preparing food in the household. Compared with non-working respondents, respondents with a full-time working status were less likely to consume ready meals, which is not completely in line with the existing literature in which a positive association is reported between working status and intake or convenience orientation<sup>(4,20)</sup>. It could, however, be the case that full-time employed people take the option of consuming a warm meal in the work canteen, a restaurant or bistro, which is very convenience oriented, but decreases the intake of ready meals at home.

The findings of the present study are limited by the cross-sectional design that does not allow identification of causality, which is of specific importance for the overweight-ready-meal association. In addition, weight status and ready-meal consumption were based on self-reported data and are therefore both likely to be underestimated. The present study addressed perceptions of cooking skills; therefore, an objective measurement of cooking skills, including how often these cooking skills were used, was not made. Further research is required that examines both subjective and objective measures of cooking skills. The items assessing cooking skills and beliefs about the nutritional value of ready meals were not tested on reliability and reproducibility. Finally, as only the person who prepares the food knows for certain whether

convenience products were used or not, we had to limit our study to the person responsible for buying and cooking food, and therefore had a majority of women in our sample. The present sample is somewhat biased regarding household structure, income and education, mainly because people who respond to a survey are typically better educated and have higher incomes than the general population. The explained variance in ready-meal intake was 17.5%. However, next to the examined predictors, other factors that were not included in the present study – such as social influence, intention and habit – are likely to have an influence on food decisions. This was shown in the study by Mahon *et al.*<sup>(24)</sup> in which habit was the most important predictor of the intention to consume ready meals and increased the  $R^2$  from 0.22 to 0.35. Therefore, a 17.5% explained variance could be considered as reasonable and shows that the examined factors are relevant.

Ready meals and other convenience food products are an important part of the Western diet. As the present study provides first evidence for an association between ready-meal consumption and overweight, further research should confirm the importance of ready meals and convenience foods to the overweight epidemic. Our results suggest that interventions targeting cooking skills might be an effective strategy to promote healthy eating. The importance of cooking skills as a barrier to healthy eating should be further explored, as well as other aspects, such as convenience, meal planning and time, as it is plausible that cooking skills will further decrease in the future.

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