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Does cultural capital contribute to educational inequalities in food consumption in the Netherlands? A cross-sectional analysis of the GLOBE-2011 survey

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ABSTRACT

Background

The importance of culture for food consumption is widely acknowledged, as well as the fact that culture-based resources ("cultural capital") differ between educational groups. Since current explanations for educational inequalities in healthy and unhealthy food consumption (e.g. economic capital, social capital) are unable to fully explain this gradient, we aim to investigate a new explanation for educational inequalities in healthy food consumption, i.e. the role of cultural capital.

Methods

Data were obtained cross-sectionally by a postal survey among participants of the GLOBE study in the Netherlands in 2011 (N=2953; response 67.1%). The survey measured respondents' highest attained educational level, food-related cultural capital (institutionalized, objectivized and incorporated cultural capital), economic capital (e.g. home ownership, financial strain), social capital (e.g. social support, health-related social leverage, interpersonal relationship network), and frequency of consumption of healthy and unhealthy food products. Two general outcomes (overall healthy food consumption, and overall unhealthy food consumption), and seven specific outcomes were constructed, and prevalence ratios (PR) were estimated in Poisson regression models with robust variance.

Results

Cultural capital was significantly associated with all food outcomes, also when social and economic capital were taken into account. Those with low levels of cultural capital were more likely to have a lower overall healthy food consumption (PR 1.35, 95% CI 1.22-1.49), a lower consumption of whole wheat bread (PR 1.21, 95% CI 1.05-1.38), vegetables (PR 1.55, 95% CI 1.40-1.71), and meat-substitutes and fish (PR 1.74, 95% CI 1.53-1.97), and a higher consumption of fried food (PR 1.59, 95% CI 1.31-1.93). Social capital was positively associated with overall healthy food consumption, whole wheat bread consumption, and the consumption of fish and meat-substitutes, and economic capital with none of the outcomes. The PR of the lowest educational group to have a low overall healthy food consumption decreased from 1.48 (95% CI 1.28-1.73) to 1.22 (95% CI 1.04-1.43) when cultural, social and economic capital were taken into account.

Conclusions

Cultural capital contributed to the explanation of educational inequalities in food consumption in The Netherlands, over and above economic and social capital. The socialization processes through which cultural capital is acquired could offer new entry-points for the promotion of healthy food consumption among low educational groups.

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INTRODUCTION

Studies consistently find a socioeconomic gradient in healthy dietary intakes.[1-6] However, interventions to encourage healthy food consumption have only had small effects, and if so, particularly among high socioeconomic groups.[7, 8] Therefore, there is a high need to identify relevant determinants of healthy food consumption in order to find entry points for developing interventions that may increase healthier food consumption, especially among low socioeconomic groups.

Previous studies have identified explanatory factors that partly explain socioeconomic inequalities in diet. Economic resources, such as an adequate food budget, are typically connected to an individual's socioeconomic position, and to healthy food intakes, as lower-quality diets generally cost less per calorie.[1, 9, 10] Also, social resources, measured through membership in support-providing networks, perceived social support, or perceived social norms, have shown to be associated with healthy food intakes,[11, 12] although their contribution to socioeconomic differences in healthy food consumption is less clear.[1, 13] As measures of economic and social resources cannot fully explain the socioeconomic gradient in healthy food consumption, recently, studies have appeared taking a different angle. These studies have linked cultural resources to health inequalities,[14, 15] and have argued that culture-based activities, knowledge and perceptions present a unique form of health-relevant 'capital'.

Culture can be defined as the culture-based resources that shape and influence people's habits, values, norms, knowledge and preferences, acquired mostly through social learning.[14] Learning conditions vary across socioeconomic groups and milieus, and so culture does as well.[14] Culture, further, is well-known for its important influence on food consumption, as it determines what people consider to be acceptable and preferable foods, and what the amount and combinations of food they choose.[16, 17] Although some research has emerged over the last few years,[18-20] empirical evidence for the role of cultural factors for the explanation of socioeconomic inequalities in food consumption is still limited.

Among the most influential studies regarding the role of culture for daily practices is the work of the French sociologist Pierre Bourdieu (1930-2003).[21] High socioeconomic groups, over their life courses, acquire more capital and 'use' this to develop a taste for specific forms of music, lecture, leisure activities, and foods. Bourdieu defines three types of capital that play a role in this process, namely cultural, economic, and social capital. Cultural capital is a non-material resource that accumulates throughout the life course, acquired through education and life-long socialization, and includes "the distinctive forms of knowledge and ability that people acquire [...] from their training in the cultural disciplines".[21] Through available cultural capital in the family, one is more inclined to 'inherit' cultural resources that can be mobilized to accumulate incorporated cul-

tural capital.[22] Cultural capital emerges in three different states: incorporated cultural capital (e.g. values, skills, cultural participation), objectivized cultural capital (e.g. books, tools) and institutionalized cultural capital (e.g. educational degrees, professional titles). [21] In line with reflections by Abel,[14] we expect incorporated cultural capital to be more important for educational inequalities in food choices than institutionalized and objectivized cultural capital. Also, incorporated cultural capital has the largest potential to be on the causal chain between socioeconomic position and healthy food choices. Incorporated cultural capital, "the form of long-lasting dispositions of the mind and the body", entails socialization, personal effort, and time investment (Bourdieu, 1986, p. 47). [22] It is not possible to convey incorporated cultural capital to someone else, as would be possible with economic capital or objectivized cultural capital. Lareau and Weininger ([23], p. 156) refer to incorporated cultural capital as "the legitimate cultural attitudes, preferences and behaviors [. . .] that are internalized during the socialization process".

Besides cultural capital, Bourdieu also acknowledges the importance of economic and social capital. Economic capital comprises all sources of income (including wealth), as well as the security of having a reliable income. Social capital is defined by Bourdieu as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition". Economic, social and cultural capital are correlated and feed on each other. The different forms of capital can be converted as, for example, personal savings (economic capital) can be used to pay for advanced education (cultural capital).[14] The roles of economic and social capital for inequalities in health and health-behaviors have been studied rather extensively, whereas the role of cultural capital is largely unknown. The aim of this study is to investigate whether cultural capital contributes to the explanation of socioeconomic inequalities in food consumption among adults, over and above social and economic capital.

METHODS

Self-reported data were collected by means of a large-scale postal survey in 2011, administered as a new wave of data collection for the longitudinal GLOBE study.[24] The research was conducted according to the Declaration of Helsinki, and informed consent was obtained from all subjects. No formal approval of the medical ethics committee of the Erasmus University Medical Centre was required for the study. The use of personal data in the GLOBE study is in compliance with the Dutch Personal Data Protection Act and the Municipal Database Act, and has been registered with the Dutch Data Protection Authority (number 1248943).

Of the respondents to the previous GLOBE survey in 2004, which formed a stratified sample of the 25-75 years old population in the city of Eindhoven and surrounding cities in 2004 (N=4,784), n=249 had died, n=76 had emigrated, and n=14 were lost to follow-up (i.e. no correct address information available), which resulted in a sample of N=4,437 that was sent the 2011-survey. For the total of 2,983 respondents that returned the survey (response 67.2%), missing values for sex (n= 21), age (n=24), and educational level (n=172) could largely be replaced by information from the 2004-questionnaire, resulting in only one case with a missing value for age and 29 cases with missing values for educational level. These 30 respondents were excluded from the analysis, resulting in an analytic sample of N= 2,953.

Educational level as indicator of socioeconomic position, and demographic variables

Educational level has traditionally been the most important indicator of social stratification in Dutch society.[25, 26] It is also an appropriate indicator of socioeconomic position to classify both men and women, in contrast to occupational level and income level (as women are more likely than men to not have a paid job).[27] Respondents indicated their highest attained educational level, which was classified according to the International Standard Classification of Education (ISCED): 1 – primary education (ISCED 0–1), 2 – lower secondary education (ISCED 2), 3 – upper secondary education (ISCED 3–4), 4 – tertiary education (ISCED 5–7). All analyses were adjusted for marital status (married, single/divorced/widowed), ethnic background (native Dutch, other), age and sex.

Food consumption

With a Food Frequency Questionnaire (based on existing questionnaires[28-30]) that was part of the GLOBE 2011-survey, we obtained self-reported information on the frequency with which 26 specific food groups were consumed. Participants indicated the number of days per week a certain food product was consumed. This number was converted to an indicator for 'average daily frequency' by the following formula[31]: never: 0; less than once a week: 0.10; 1-2 days per week: 0.20; 3-4 days per week: 0.50; 5-6 days per week: 0.80; every day: 1.

A 'healthy foods' score was constructed as the sum of the consumption of fruit, cooked vegetables, raw vegetables, whole wheat bread, skimmed milk, low fat cheese, chicken, fish, and meat-substitutes (like tofu). To calculate this score, the average daily frequencies (ranging from 0 till 1, as detailed above) for each of these products were summed. Similarly, an 'unhealthy foods' score was constructed as the sum of the frequencies of consumption of fried food, candy, white bread, soft drinks, whole milk, high fat cheese, and red meat (beef, pork, lamb, mince, and burgers). These indices were considered useful as general measures of healthy and unhealthy eating,[31] since the specific

food products included in these measures are also recognized as typically healthy or unhealthy by authorities, such as the American Heart Foundation , the British Nutrition Foundation and the Netherlands Nutrition Centre.[32-34] For detailed analyses, seven specific food outcomes were analyzed, representing four typically healthy food groups (whole wheat bread, fruits, vegetables, and meat-substitutes & fish) and three typically unhealthy food groups (red meat (beef, pork, mince, and burgers), fried food, and soft drinks). Means and standard deviations for the raw daily frequency scores by educational level are presented in Appendix 2. As these scores had skewed distributions, the variables were dichotomized with the median as cut-off point, i.e. half of the sample was categorized as having a 'low' consumption, and half of the sample as 'high' consumption.

Cultural, social and economic capital

We generated composite variables of cultural, social and economic capital based on the scores of the constituent items chosen for capturing each type of capital. Table 1 lists the variables for cultural, social and economic capital, their categorization for the analyses, and the items that comprised each variable. To construct the variables, several items were combined by means of a factor analyses or a mean score, and these were further divided in tertiles. A detailed description of the measurement and construction of each variable is available in Appendix 1.

Table 1. Measurement and construction of the variables for cultural, social and economic capital

Variables	Measurement in the survey	Categorisation of the variable for the analyses
Family institutionalised cultural capital	Educational level of the respondent's father, mother and partner	1= low, 2= mid, 3= high (tertiles of mean score)
Objectivised cultural capital	Number of cooking-related possessions, i.e. a stove, cook book(s), set of knives, kitchen scale, and juicer (yes/no)	1= low, 2= mid, 3= high (tertiles of sum score)
Incorporated cultural capital	Participation, cooking skills, grocery shopping skills, information seeking and processing skills, nutrition knowledge	1= low, 2= mid, 3= high (tertiles of mean score)
Total cultural capital	Mean score of the variables for family institutionalised, objectivised, and total incorporated cultural capital	1= low, 2= mid, 3= high (tertiles of mean score)
Total social capital	Social support, health-related social leverage, interpersonal relationship network, social participation, perceptions of trust, perceived neighbourhood social capital	1= low, 2= mid, 3= high (tertiles of mean score)
Total economic capital	Household equivalent income, home ownership, crowding, financial strain	1= low, 2= mid, 3= high (tertiles of mean score)

Note: Detailed information on measurement and construction of the variables is available in Web-appendix 1. Information on the development of the cultural capital questionnaire is described elsewhere.[5]

In short, we used an existing questionnaire to measure the three forms of cultural capital in relation to food.[5] This questionnaire has been developed based on a systematic review to identify existing indicators of cultural capital. The indicators that have been used most often in the literature, were translated to food-related indicators.[5]. Objectivized cultural capital was consistently measured in the literature by cultural possessions (e.g. art, books) and we translated this to a list of possessions related to food choice behavior. In the survey, participants reported whether they owned a list of cooking-related possessions, e.g. cook books, kitchen scale, juicer. Scores were summed and the sum score was divided in tertiles (low, medium, high objectivized cultural capital). Incorporated cultural capital was operationalized by items on participation, cooking skills, grocery shopping skills, information seeking skills, and nutrition knowledge. Scores on the different items were summed and the sum score was divided in tertiles (low, medium, high incorporated cultural capital). Institutionalized cultural capital appeared to be most often operationalized by educational level of the respondent.[5] However, since we were interested in understanding educational inequalities (i.e. we used own education level as indicator of socioeconomic position), we focus on the socialization processes in which acquisition of cultural capital takes place, and therefore used educational level of the father, mother and partner of the respondent as indicators of institutionalized cultural capital. Scores were summed and the sum score was divided in tertiles (low, medium, high institutionalized cultural capital).The three types of cultural capital were analyzed as separate variables. A mean score of these three variables was used as indicator of total cultural capital, which was divided into tertiles (low, medium, high total cultural capital).

For social capital, indicators of six dimensions of social capital (e.g. social support, health-related social leverage, interpersonal relationship network) [35] were combined in one score for total social capital, which was divided into tertiles (low, medium, high social capital). Economic capital was measured by four commonly used indicators (e.g. home ownership, financial strain)[36] and their mean score was divided into tertiles (low, medium, high economic capital).

Statistical analyses

Statistical analyses were conducted in SPSS 20.0. Since our outcomes are not rare (i.e. greater than 10%), we follow statistical recommendations to calculate prevalence ratios (PR's) as measure of association, instead of the often-used odds ratios (OR's), as the interpretation of the OR is difficult and often mistakenly interpreted as PR.[37, 38] In Poisson regression models with robust variance, PR's with 95% confidence intervals were calculated for each of the outcomes by educational level, adjusted for age, sex, ethnicity, and marital status. Further, PR's with 95% confidence intervals were calculated for each of the outcomes by each type of capital in separate models, adjusted for educational level, age, sex, ethnicity, and marital status level. In multivariate Poisson regression models,

we included all capital variables simultaneously to observe which types of capital remained significantly associated with food consumption when mutually adjusted, and to observe whether the PR's for the low educational group would attenuate after inclusion of the capital variables, compared to the model with only confounders. This reduction in PR's was interpreted as the contribution of the capital variables to the explanation of educational inequalities in food consumption.

RESULTS

The mean age of the sample was 56.4 years (SD 13.0) and 56.7% was female (Table 2). In general, educational inequalities in healthy food consumption were larger than those in unhealthy food consumption (Table 3). Low educated were more likely to report a low overall healthy food consumption (PR 1.48, 95% CI 1.28-1.73), low whole wheat bread consumption (PR 1.38, 95% CI 1.08-1.76), low vegetable consumption (PR 1.46, 95% CI 1.23-1.73) and a low consumption of meat-substitutes and fish (PR 1.66, 95% CI 1.37-2.02) than high educated. Regarding unhealthy food outcomes, low educational groups were about twice as likely to have a high fried food consumption (PR 2.03, 95% CI 1.44-2.86), but no significant inequalities in overall unhealthy food, red meat, or soft drink consumption were observed. Outcomes for which no educational inequalities were found, were not further analyzed in multivariate models.

Table 2. Study sample characteristics: demographic factors, and cultural, social and economic capital by educational level

		Educational level			
	Total	1- low	2-midlow	3 -midhigh	4- high
	(N=2953)	(n=263)	(n=1041)	(n=678)	(n=971)
	%[b]	%[b]	%[b]	%[b]	%[b]
Sex					
Men	43.3	41.4	32.9	44.5	51.8
Women	56.7	58.6	67.1	55.5	48.2
Marital status					
Married, registered partnership	74.9	63.2	72.4	78.6	76.5
Single, divorced, widowed	24.6	34.6	27.2	21.0	23.2
Missing	0.5	2.2	0.4	0.4	0.3
Ethnic background [c]					
Dutch	84.5	64.9	85.4	87.5	84.9
Other	10.4	17.8	8.5	10.2	10.9
Missing	5.1	17.3	6.0	2.3	4.2
Age, mean, in years (SD)	56.4 (13.0)	66.0 (12.3)	61.8 (10.7)	52.9 (12.2)	52.6 (12.9)

Table 2. (continued)

			Educational level		
	Total	1- low	2-midlow	3 -midhigh	4- high
	(N=2953)	(n=263)	(n=1041)	(n=678)	(n=971)
	%[b]	%[b]	%[b]	%[b]	%[b]
Total cultural capital					
Low	39.1	81.6	53.6	38.3	19.6
Mid	24.4	7.6	27.0	24.2	25.1
High	36.4	10.3	19.3	37.5	55.2
Missing	0.1	0.5	0.1	0.0	0.1
Institutionalised cultural capital					
Low	39.4	53.5	60.9	36.2	20.3
Mid	20.1	1.6	11.4	26.8	26.0
High	30.3	9.2	12.5	30.1	49.8
Missing	10.2	35.7	15.1	6.9	4.0
Objectivised cultural capital					
Low	19.1	52.7	22.2	16.2	12.6
Mid	23.7	17.2	25.8	24.8	22.1
High	56.0	24.2	50.	58.2	64.7
Missing	1.3	5.9	1.6	0.8	0.6
Incorporated cultural capital					
Low	29.9	59.7	35.5	28.4	21.0
Mid	38.4	26.9	42.1	40.4	35.7
High	31.5	12.9	22.2	31.3	43.1
Missing	0.2	0.5	0.2	0.0	0.3
Total social capital					
Low	32.0	53.0	35.0	31.4	26.2
Mid	32.6	28.6	34.0	31.3	33.1
High	35.4	18.4	31.0	37.0	40.8
Missing	0.0	0.0	0.0	0.0	0.0
Total economic capital					
Low	36.5	80.0	50.2	36.7	16.8
Mid	35.3	14.6	31.4	36.2	41.6
High	27.9	5.4	17.8	27.1	41.3
Missing	0.3	0.0	0.5	0.0	0.3

[a] All numbers (N) are unweighted and reflect the actual numbers of participants in the dataset.

[b] All percentages (%) are weighted and thereby represent the prevalence rates as they existed in the population of Eindhoven of 2004, which is the source population. The weight factors were calculated from the distribution of the characteristics in a random sample drawn from the municipal registry in Eindhoven, October 2004.

[c] Dutch: both parents of the respondent were born in the Netherlands (definition by Statistics Netherlands). Other: at least one parent of the respondent was not born in the Netherlands.

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Table 3. Separate poisson regression models for educational level, total cultural capital, three specific types of cultural capital, total social capital, and total economic capital in their association with food consumption (adjusted for confounders[a]).

	Sum scores				Specific food outcomes			
	Low overall healthy food consumption		High overall unhealthy food consumption		Low whole wheat bread		Low fruit	
	(n=2947) [b]		(n=2938) [b]		(n=2900) [b]		(n=2902) [b]	
	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)
Educational level								
1 High	1.00		1.00		1.00		1.00	
2	1.18***	(1.07-1.30)	1.01	(0.92-1.12)	1.32***	(1.16-1.49)	1.09*	(1.01-1.17)
3	1.24***	(1.12-1.37)	1.00	(0.90-1.12)	1.40***	(1.22-1.61)	1.04	(0.95-1.14)
4 Low	1.48***	(1.28-1.73)	0.88	(0.71-1.10)	1.38**	(1.08-1.76)	1.12	(0.93-1.34)
Total cultural capital								
High	1.00		1.00		1.00		1.00	
Mid	1.24***	(1.12-.139)	1.09	(0.97-1.22)	1.14	(0.99-1.31)	1.13*	(1.03-1.24)
Low	1.38***	(1.25-1.53)	1.19**	(1.07-1.32)	1.27***	(1.11-1.45)	1.28***	(1.18-1.40)
Institutionalised cultural capital								
High	1.00		1.00		1.00		1.00	
Mid	1.11	(0.99-1.25)	0.97	(0.86-1.09)	1.03	(0.89-1.20)	1.14**	(1.05-1.25)
Low	1.20***	(1.08-1.34)	0.95	(0.85-1.07)	1.26***	(1.09-1.45)	1.12*	(1.02-1.23)
Objectivised cultural capital								
High	1.00		1.00		1.00		1.00	
Mid	1.18***	(1.07-1.29)	1.00	(0.90-1.11)	1.04	(0.92-1.18)	1.10*	(1.02-1.19)
Low	1.21***	(1.10-1.34)	0.97	(0.86-1.09)	1.20**	(1.06-1.37)	1.18***	(1.08-1.29)
Incorporated cultural capital								
High	1.00		1.00		1.00		1.00	
Mid	1.25***	(1.13-1.39)	1.25***	(1.12-1.39)	1.15*	(1.01-1.31)	1.14**	(1.05-1.24)
Low	1.35***	(1.22-1.51)	1.18**	(1.05-1.33)	1.14	(0.99-1.31)	1.30***	(1.19-1.42)
Total social capital								
High	1.00		1.00		1.00		1.00	
Mid	1.03	(0.93-1.13)	0.99	(0.90-1.10)	0.99	(0.87-1.13)	1.04	(0.96-1.13)
Low	1.17***	(1.06-1.28)	1.04	(0.94-1.16)	1.27***	(1.12-1.44)	1.16***	(1.07-1.26)
Total economic capital								
High	1.00		1.00		1.00		1.00	
Mid	1.00	(0.90-1.10)	1.01	(0.91-1.12)	1.12	(0.99-1.28)	0.99	(0.91-1.07)
Low	1.13*	(1.02-1.25)	0.99	(0.88-1.12)	1.16*	(1.00-1.34)	1.10*	(1.01-1.20)

* = p < .050, ** = p ≤ .010, *** = p ≤ .001; PR= prevalence ratio. [a] All models included education and the following confounders: age, sex, ethnic background and marital status. [b] Varying sample sizes due to missing values on the food choice outcomes.

	Specific food outcomes								
Low vegetables		Low fish/meat substitute		High fried food		High red meat		High soft drink	
(n=2934) [b]		(n=2822) [b]		(n=2853) [b]		(n=2906) [b]		(n=2747) [b]	
PR	(95% CI)	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)
1.00		1.00		1.00		1.00		1.00	
1.32***	(1.23-1.73)	1.33***	(1.18-1.50)	1.59***	(1.33-1.90)	1.03	(0.94-1.14)	1.00	(0.91-1.10)
1.38***	(1.25-1.52)	1.36***	(1.21-1.54)	1.60***	(1.30-1.97)	0.93	(0.83-1.03)	1.05	(0.95-1.16)
1.46***	(1.23-1.73)	1.66***	(1.37-2.02)	2.03***	(1.44-2.86)	1.11	(0.92-1.35)	1.16	(0.96-1.41)
1.00		1.00		1.00		1.00		1.00	
1.13**	(1.03-1.24)	1.33***	(1.16-1.52)	1.29*	(1.05-1.58)	0.96	(0.86-1.07)	1.14**	(1.02-1.27)
1.28***	(1.18-1.40)	1.77***	(1.56-2.00)	1.58***	(1.31-1.91)	1.06	(0.96-1.18)	1.30***	(1.18-1.44)
1.00		1.00		1.00		1.00		1.00	
1.10	(0.97-1.23)	0.98	(0.85-1.13)	1.24	(1.00-1.53)	1.07	(0.96-1.19)	1.05	(0.95-1.17)
1.36***	(1.23-1.52)	1.21**	(1.07-1.38)	1.31*	(1.07-1.62)	1.00	(0.90-1.11)	1.09	(0.98-1.21)
1.00		1.00		1.00		1.00		1.00	
1.15**	(1.05-1.25)	1.33***	(1.19-1.48)	0.97	(0.81-1.16)	1.01	(0.93-1.12)	1.00	(0.91-1.10)
1.11*	(1.01-1.23)	1.38***	(1.23-1.56)	0.91	(0.74-1.12)	0.88*	(0.78-0.99)	1.01	(0.91-1.13)
1.00		1.00		1.00		1.00		1.00	
1.26***	(1.14-1.40)	1.33***	(1.17-1.51)	1.42***	(1.16-1.73)	1.11*	(1.01-1.23)	1.18**	(1.06-1.31)
1.52***	(1.37-1.68)	1.74***	(1.53-1.98)	1.76***	(1.44-2.14)	1.06	(0.95-1.19)	1.37***	(1.23-1.52)
1.00		1.00		1.00		1.00		1.00	
0.98	(0.89-1.07)	1.08	(0.96-1.21)	0.94	(0.79-1.12)	1.03	(0.94-1.13)	1.00	(0.91-1.09)
1.08	(0.99-1.18)	1.30***	(1.16-1.46)	0.93	(0.77-1.12)	0.89**	(0.80-0.99)	1.05	(0.96-1.16)
1.00		1.00		1.00		1.00		1.00	
0.96	(0.87-1.06)	0.96	(0.85-1.08)	1.03	(0.86-1.24)	0.90*	(0.81-0.99)	1.02	(0.93-1.12)
1.06	(0.95-1.17)	1.05	(0.93-1.19)	1.07	(0.87-1.31)	0.85**	(0.76-0.95)	0.98	(0.88-1.09)

In univariate models (as presented in Table 3), lower levels of cultural, social and economic capital were in general related to lower healthy food consumption and higher unhealthy food consumption (except for red meat). Incorporated cultural capital was most consistently and strongest associated with the outcomes, compared to institutionalized and objectivized cultural capital. Those with low social capital were more likely to report a low overall healthy food consumption (PR 1.17, 95% CI 1.06-1.28), and a low consumption of whole wheat bread (PR 1.27, 95% CI 1.12-1.44), fruit (PR 1.16, 95% CI 1.07-1.26), and meat-substitutes and fish (PR 1.30, 95% CI 1.16-1.46). A low level of economic capital was associated with low overall healthy food consumption, low whole-wheat bread consumption, low fruit consumption, and low red meat consumption.

In multivariate models including educational level, and cultural, social and economic capital, cultural capital remained significantly associated with all outcomes (Table 4). Having less cultural capital was related to a lower overall healthy food consumption (PR 1.35, 95% CI 1.22-1.49), lower consumption of whole wheat bread (PR 1.21, 95% CI 1.05-

Table 4. Simultaneous adjustment of total cultural, social and economic capital on educational inequalities in food consumption, adjusted for confounders [a].

	Low overall healthy food consumption		Low whole wheat bread		Low vegetable		Low fish & meat-substitutes		High fried food	
	(n=2947) [b]		(n=2900) [b]		(n=2934) [b]		(n=2833) [b]		(n=2853) [b]	
	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)
Educational level										
1 High	1.00		1.00		1.00		1.00		1.00	
2	1.09	(0.98-1.20)	1.23**	(1.08-1.40)	1.20***	(1.09-1.32)	1.18**	(1.05-1.33)	1.42***	(1.18-1.71)
3	1.08	(0.97-1.20)	1.26**	(1.09-1.47)	1.18**	(1.06-1.31)	1.10	(0.97-1.26)	1.35**	(1.08-1.69)
4 Low	1.22*	(1.04-1.43)	1.19	(0.92-1.53)	1.17	(0.98-1.40)	1.23*	(1.00-1.51)	1.66**	(1.15-2.38)
Total cultural capital										
High	1.00		1.00		1.00		1.00		1.00	
Mid	1.23***	(1.11-1.37)	1.13	(0.98-1.30)	1.30***	(1.16-1.45)	1.32***	(1.15-1.51)	1.29*	(1.05-1.59)
Low	1.35***	(1.22-1.49)	1.21**	(1.05-1.38)	1.55***	(1.40-1.71)	1.74***	(1.53-1.97)	1.59***	(1.31-1.93)
Total social capital										
High	1.00		1.00		1.00		1.00		1.00	
Mid	1.01	(0.91-1.11)	0.98	(0.86-1.11)	0.96	(0.87-1.05)	1.05	(0.94-1.18)	0.92	(0.77-1.10)
Low	1.11*	(1.01-1.22)	1.23**	(1.08-1.40)	1.02	(0.93-1.12)	1.21***	(1.08-1.36)	0.87	(0.72-1.05)
Total economic capital										
High	1.00		1.00		1.00		1.00		1.00	
Mid	0.97	(0.87-1.07)	1.09	(0.95-1.24)	0.93	(0.84-1.02)	0.89	(0.79-1.01)	1.00	(0.83-1.21)
Low	1.06	(0.95-1.18)	1.08	(0.93-1.25)	0.98	(0.89-1.09)	0.93	(0.82-1.06)	1.03	(0.83-1.27)

* = p < .050, ** = p ≤ .010, *** = p ≤ .001; PR= prevalence ratio. [a] All models included educational level, total cultural capital, total social capital, total economic capital, and confounders (age, sex, ethnic background and marital status). [b] Varying sample sizes due to missing values on the food outcomes.

1.38), vegetables (PR 1.55, 95% CI 1.40-1.71), and meat-substitutes & fish (PR 1.74, 95% CI 1.53-1.97), and a higher consumption of fried food (PR 1.59, 95% CI 1.31-1.93). Social capital remained associated with overall healthy food consumption, whole wheat bread consumption, and meat-substitutes & fish consumption, but economic capital with none of the outcomes. In these multivariate models, PR's for the low educational group attenuated considerably after inclusion of the capital variables (Table 4), compared to the model with only confounders (Table 3). For instance, the PR of the lowest compared to the highest educational group for having a low overall healthy food consumption decreased from 1.48 (95% CI 1.28-1.73) (when only adjusted for confounders; Table 3) to 1.22 (95% CI 1.04-1.43), when cultural, social and economic capital were taken into account (Table 4). However, educational inequalities in food consumption remained significant for all outcomes.

DISCUSSION

This is the first study to investigate the contributions of cultural, social and economic capital to educational inequalities in food consumption among adults. Educational inequalities in healthy food consumption were larger than those in unhealthy food consumption. Cultural capital contributed to the explanation of educational inequalities in food consumption more so than social and economic capital. Associations between cultural capital and food consumption remained significant when adjusted for social and economic capital.

Our finding that low educational groups consumed less healthy foods is in line with previous empirical studies.[1-5] These results also largely confirm Bourdieu's own observations regarding food consumption, as reported in his book *Distinction: A Social Critique of the Judgement of Taste*.[21] He wrote that individuals from lower classes with a low level of capital tended to prefer 'heavy, fatty, fattening foods, which are also cheap' (Bourdieu, 1984, p. 177) and preferred 'the plentiful' as opposed to 'the light, refined, and delicate foods' valued by high classes with higher levels of capital.[19, 21] Further, he observed that those with high cultural capital seemed to be more inclined towards asceticism and pursue original foods with an abundance of vegetables, whereas those with high economic capital preferred more traditional, rich dishes - a taste that resembles those of lower classes.[19, 21] In line with this, we saw that those with higher economic capital were more likely to consume more of the "traditional, rich" red meat products (e.g. beef, pork, mince, and burgers).

While we found clear positive relations between educational level and healthy food consumption, and between cultural capital and healthy food consumption, fewer associations with unhealthy food consumption were found. Apparently, possessing higher

levels of cultural capital facilitates the choice of healthy foods, but having more cultural capital does not seem to prevent against unhealthy food consumption. This finding may suggest that high educated, with more cultural capital, make healthy food choices for *other* reasons than for reasons of health (because, if the latter was the case, one would expect them to also refrain from unhealthy foods). Following Bourdieu's line of reasoning, one interpretation could be that healthy foods are consumed for reasons of distinction, and that consuming healthy foods is considered a more effective means of ´distinction´, than refraining from unhealthy foods. A reason for this could be that it is often less clear which foods actually *are* unhealthy, whereas healthy food options are more well-known (i.e. vegetables, whole wheat bread). The findings from a study into educational differences in 'super foods' consumption also point to this mechanism of distinction.[39]

Economic capital showed only weak associations with food consumption, and did hardly contribute to the explanation of educational inequalities in healthy and unhealthy food consumption. This could be due to the selection of the specific food products that were analysed, as the unhealthy food options (white bread, fried foods, red meat products) may not necessarily be cheaper than their healthy counterparts. However, also previous research from the Netherlands did not found indications that price considerations are an important barrier for healthy food consumption among low educational groups in the Netherlands.[2, 40, 41]

Our finding that cultural capital adds to explanation of educational inequalities in food choices, over and above economic and social capital, is in line with two previous studies among adolescents.[18, 20] Taking all capital variables into account in multivariate models considerably reduced the educational inequalities in healthy and unhealthy food consumption, but not completely. This indicates that other factors than those covered by cultural, social, and economic capital contribute to the observed gradients. A factor that we did not take into account, and that has found to play a role in the international context (e.g. U.K. and U.S.), is the neighbourhood food environment, i.e. the accessibility and availability of healthy foods.[42, 43] In a compact country like the Netherlands, where the average distance from home to a supermarket (in which, in general, a wide variety of healthy, good-quality food products is available against reasonable prices) is 900 meters,[44] we have no signs of the existence of so-called 'food deserts' [45], nor the existence of large inequalities in food environmental attributes between low and high socioeconomic neighbourhoods.[46]

Methodological considerations

This first large-scale study investigating cultural, social and economic capital in order to quantify their role for explaining educational inequalities in healthy and unhealthy food consumption among adults has some clear strengths. We operationalised all

capital variables in a theory-based way, developed indicators for cultural capital that may be more likely causally related to healthy food consumption than the more classical indicators (e.g. number of books, cultural participation [19,28]), the sample was large with almost 3000 respondents, and multiple outcomes of food consumption were investigated. However, also limitations need to be taken into account when interpreting the results. A first limitation is the measurement of food consumption, which only provided frequency information of food products consumed, not portion sizes. Clearly such a questionnaire can only provide crude estimates of food consumption, and does not allow to calculate whether participants meet recommendations for certain intakes, e.g. fruits and vegetables, nor to calculate a score indicating the overall healthiness of a person's diet. Therefore, this study cannot provide evidence that having more cultural capital leads to an overall more healthy diet – something that should be investigated in future research. However, analysing specific food groups as separate outcomes also has advantages. First, it allows to investigate to what extent certain types of capitals are more or less important for some food outcomes than for others. Secondly, this approach showed that educational inequalities are more pronounced for healthy than unhealthy food outcomes, which would not have become clear from analysing an overall diet score.

Secondly, the measures of cultural capital were developed in a systematic way,[5] however, these were framed specifically in relation to food consumption. Being more proximal to the outcome of interest may have contributed to the stronger associations of cultural capital with food consumption, compared to the more generally-framed economic and social capital measures. Thirdly, the inequalities in food consumption we report are likely an underestimation of the true inequalities, for two reasons: 1) replacement of missing values on the educational level variable in the GLOBE-2011 survey data with information from the GLOBE-2004 survey may have introduced a small bias, as participants' highest attainted educational level could have increased over time, and 2) the response to the GLOBE-2011 was relatively good (67.2%), but lower among low educated (55.5%). Lastly, this cross-sectional study cannot show insight in the direction of the associations between educational level, capital and food consumption. Acknowledging these limitations, the paper represents a novel contribution to the existing literature on educational inequalities in food consumption.

Recommendations for policy and future research

Cultural capital offers new entry-points for the promotion of healthy food consumption among low educational groups. The strong association between cultural capital and healthy food consumption implies that deeply rooted cultural resources acquired over a lifelong socialization period are relevant for food consumption. In order to improve healthy food consumption it may be important to start early in life and make healthy diets part of this socialization process, in order to, for instance, develop the broad range

of skills needed for a healthy diet. Future research should investigate the specific (and causal) underlying mechanisms between educational level, cultural capital and healthy food consumption, which is needed for the development of evidence-based interventions. Especially, a better understanding is needed in the socio-cultural processes through which cultural capital is acquired, and qualitative studies are likely necessary to gain such insights. Recent work from our group (Oude Groeniger et al., under review) points to the importance of cultural signifiers (asceticism, refinement, reflexivity) as mechanisms between cultural capital and maintaining a healthy weight. Further detailed insights in the underlying mechanisms is useful for the translation into policies and interventions.

Conclusion

Cultural capital is related to healthy food consumption and contributes to the explanation of educational inequalities in healthy food consumption, over and above economic and social capital. The socialisation processes through which cultural capital is acquired could offer new entry-points for the promotion of healthy food consumption among low educational groups.

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APPENDIX 1. MEASUREMENT AND CONSTRUCTION OF VARIABLES FOR CULTURAL, SOCIAL, AND ECONOMIC CAPITAL

In this appendix, the survey questions that were used to measure cultural, social and economic capital are detailed (see Table A1.1 below). In the text, the questionnaire items are described and the construction of the variables for the analyses is explained. At the end of this appendix, a reference list is included with the sources on which the questionnaire items were based.

Cultural capital

Questions to measure institutionalized, objectivized and incorporated cultural capital were based on often used indicators for cultural capital that came forth from a systematic review into existing measures (Kamphuis et al, 2015).

Family institutionalized cultural capital was operationalized by educational level of the respondent's father, mother and partner (each with four categories, i.e. 1= no education or primary education; 2= lower vocational and intermediate general education; 3= intermediate vocational and higher general education; and 4= higher professional education and university).[1] The Cronbach's alpha for these three items was .762. We calculated the mean score of these three items as overall measure of family institutionalized cultural capital. For n=713 respondents, this mean value was based on less than three items, due to missing values. Respondents with missing values on all three items (n=394) received a missing value for family institutionalized cultural capital. Two variables for *family institutionalized cultural capital* were created: one variable by dividing the mean score into quintiles with 1= low and 5= high (which was used to compute total cultural capital, see below), and a second variable by dividing the mean score into tertiles with 1= low and 3= high (which was used in further analysis, as presented in Tables 1 and 2).

Objectivized cultural capital was consistently measured in the literature by cultural possessions[1] and we translated this to a list of possessions related to food choice behavior. We asked respondents whether they owned several cooking-related possessions, i.e. a stove, cook book(s), set of knives, kitchen scale, and juicer (yes/no) (Cronbach's alpha: .545). A sum score for objectivized cultural capital was created. Two variables for *objectivized cultural capital* were created: one variable by dividing the mean score into quintiles with 1= low and 5= high (which was used to compute total cultural capital, see below), and a second variable by dividing the mean score into tertiles with 1= low and 3= high (which was used in further analysis, as presented in Tables 1 and 2).

From the measures of *incorporated cultural capital* that came forth from the literature review, we selected the main underlying themes, i.e. participation in cultural activities, skills, and knowledge, and searched the literature to find existing questionnaires to measure these in relation to food choices. [1] *Participation* was measured with two

items, for which participants could indicate a frequency, namely: "In the last month, how many times have you met with people in a public place to have some food?" (Grootaert 2004), and "In the last month, how many times have people visited you in your home to have dinner, or have you visited people for dinner in their home?".[2] Both frequencies were summed in one variables, and the sum was divided in quintiles, with 1= low and 5= high food-related participation. For food choice-related skills we distinguished three types: *cooking skills* [3-4], *grocery shopping skills*,[5] and *skills to find and process information* about nutrients and food preparation (adapted from Chew et al. (2004)[6]). We created variables for each group of skills, based on multiple items from the questionnaire (Kamphuis et al., 2015). Variables were divided in quintiles, with 1= low skill level, vs. 5= high skill level. *Nutrition knowledge* was measured with an existing questionnaire including 16 items (Cronbach's alpha: .519), namely four different questions (e.g. Do these products contain high or low levels of added sugar? Do these products contain high or low levels of protein?), that were asked with regard to four products each (e.g. bananas, chicken, chocolate, red meat) (three answer categories: high, low, don't know). [7-8] A sum score of all correct answers was made (ranging from 0-16), and divided in quintiles, with 1=low and 5=high nutrition knowledge. *Total incorporated cultural capital* was measured by the mean score of the participation, skills and knowledge variables. Two variables for *total incorporated cultural capital* were created: one variable by dividing the mean score into quintiles with 1= low and 5= high (which was used to compute total cultural capital, see below), and a second variable by dividing the mean score into tertiles with 1= low and 3= high (which was used in further analyses, as presented in Tables 1 and 2).

Total cultural capital was created by computing the mean score of the quintile-variables for family institutionalized, objectivized, and total incorporated cultural capital, which was grouped into tertiles, with 1= low total cultural capital, and 3= high total cultural capital.

Social capital

Social capital is seen as a multidimensional concept, although there is little consensus on its measurement. In our survey, we selected commonly used indicators to measure six dimensions of social capital: social support, health-related social leverage, interpersonal relationship network, social participation, perceptions of trust, and perceived neighborhood social capital.[9]

Social support was measured with 9 items.[10] Respondents were asked how often they could turn to someone, e.g. for having a nice day out, for love and affection, for advice, etc. (answers a 5-point Likert scale ranging from always to never). Based on these 9 items, a mean score was created, which was divided in quintiles with 1=low social support, 5=high social support.

Health-related social leverage was measured with questions asking the respondents to whom they could turn for advice [11] about five health-related topics (more than one answering option could be ticked: nobody, partner/family member, friend, colleague, acquaintance), e.g. to lose weight, to get more physical activity. For each of the five topics, a sum score was calculated of the total number of people that could potentially help. These five sum scores were summed and divided by 5, to calculate the overall mean score for social leverage. This score was divided in quintiles with 1=low, and 5=high health-related social leverage.

The size of the respondent's *interpersonal relationship network* was measured with one item asking respondents to indicate the number of good friends and family members (including their partner) they have. The answers to this open question ranged from 0 to 100, with a median of 10.0, which were divided in quintiles with 1=small, and 5=large interpersonal relationship network.

Social participation was measured with a question asking respondents to indicate, for six social organizations (e.g. sports club, political party, church), whether they were involved in such an organization (e.g. by being a member, attending meetings, doing voluntary work). [2] Answers to these six items were summed, and divided into quintiles with 1=low, and 5=high social participation.

Perceptions of trust were measured with three standard items [12] on a 10-point Likert scale, e.g. "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" (You can't be too careful – Most people can be trusted), "Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?" (Most people would try to take advantage of me – Most people would try to be fair), "Would you say that most people deserve your trust or that only very few deserve your trust?" (Very few people deserve my trust - Most people deserve my trust). The mean scores on these three items ranged from 1 to 10, with a median of 7.3, and were divided in quintiles with 1= low, and 5= high general trust.

Perceived neighborhood social capital was measured with four commonly-used statements, e.g. "People in this neighborhood are willing to help each other"; "If I get the chance, I move out of this neighborhood" (with answers on a 5-point Likert scale, from 1= totally disagree, to 5= totally agree).[13] The four items were recoded in such a way that a higher score meant: more positive perception of neighborhood social capital. A mean score was created based on these items, and divided in quintiles with 1=low neighborhood social capital, and 5=high neighborhood social capital.

Total social capital was created by computing the mean score of social support, health-related social leverage, interpersonal relationship network, social participation, perceptions of trust, and neighborhood social capital, which was divided into tertiles, with 1= low social capital, and 3= high social capital.

Economic capital

Four indicators of economic capital were measured in our survey: household equivalent income, home ownership, crowding, and financial strain.[14] *Household equivalent income* was calculated by dividing the total household income per month by the square-root of the number of people living from this income. This variable was subsequently divided into quintiles, with 1= low, and 5= high household equivalent income. *Home ownership* was categorized as, 1= renter, 5= homeowner. *Crowding* was calculated as the number of rooms in the house, divided by the number of persons living in the household, and divided in quintiles with 1=high, and 5=low crowding. *Financial strain* was measured with one question asking whether respondents had experienced any difficulties in paying bills, e.g. for food, rent, and electricity, during the preceding year (response categories: 'no difficulties', 'some difficulties' and 'big difficulties'). This variable was divided into 1= at least some financial strain, 5= no financial strain.

   Total economic capital was created by computing the mean score of the variables for household equivalent income, crowding, homeownership, and financial strain, which was divided into tertiles with 1= low economic capital and 3= high economic capital.

Table A1.1. Questionnaire items used to measure cultural capital (related to food choices), social capital and economic capital

Variables	Questionnaire items	Answering categories	Adapted from existing questionnaire (reference)
Family institutionalised cultural capital			
Highest educational credentials of the respondent's father, mother, and (if applicable) partner	(3 items) Please indicate the highest level of education that has been achieved by: a) your father, b) your mother, c) your partner.	1 = No education or primary education; 2= Lower vocational education or higher general secondary education; 3 = Intermediate vocational education or higher general secondary education; 4= higher professional education or university;	[1]
Objectivised cultural capital			
Cooking equipment	(5 items) Could you please indicate whether you own the following cooking objects? a) Oven, b) Cookery book(s), c) Set of knives , d) Kitchen scales, e) Fruit juicer	Yes, no.	-
Incorporated cultural capital			

Participation	(2 items) a)"In the last month, how many times have you met with people in a public place to have some food?", b) "In the last month, how many times have people visited you in your home to have dinner, or have you visited people for dinner in their home?"	Open question	[2]
Cooking skills	(3 items) Below you may find three statements about cooking. Please indicate for each of the following statements whether you agree or disagree. a) I know several ways to prepare fish. b) I can prepare a lot of meals even without a recipe. c) I know several ways to prepare vegetables.	Answers on a 5-point Likert scale, from 1= Totally disagree, to 5= Totally agree; and 'Don't know'.	[3-4]
Grocery shopping skills	(2 items) Below you may find two statements about grocery shopping. Please indicate for both statements how often this applies to you. a) Before I go shopping for food, I make a list of everything I need. b) Usually I do not decide what to buy until I am in the shop.	Always; Usually; Sometimes; Seldom; Never.	[5]
Food information skills	(4 items) Below are some questions about food information. Please indicate for each question how often this applies to you. A) Do you read the nutrition information and information about ingredients on food packages? b) Do you use the information about nutritional value on food packages to decide what foods you buy? c) Do you look up information about foodstuffs on the internet? (For instance on the website of the Nutrition information centre?) d) Do you use recipes from cookery books, from the internet, or from magazines?	Always; Usually; Sometimes; Seldom; Never.	[6]
Nutrition knowledge	(16 items) Please indicate for the following four food items whether they are high or low in added sugar: a) Bananas, b) Unflavoured yoghurt, c) Ice-cream, d) Tomato ketchup. Please indicate for the following four food items whether they are high or low in protein: a) Chicken, b) Cheese, c) Fruit, d) Broccoli. Please indicate for the following four food items whether they are high or low in fibre. a) Eggs, b) Nuts, c) Chicken, d)Broccoli. Please indicate for the following four food items whether they are high or low in saturated fat? a) Olive oil, b) Nuts, c)Red meat (pork, mutton), d)Chocolate	High; Low; Don't know	[7-8]
Social capital			

Social support	(9 items) Sometimes people need other people as company, for advice, or help. Could you indicate for each of the following types of support how often this is available to you, if you need it? a) Someone to give you love and affection; b) Someone to have a nice day out with; c) Someone you trust, to talk about personal problems; d) Someone to spend leisure time with; e) Someone who cooks for you if you cannot do that yourself; f) Someone who cares for you if you are ill; g) Someone with whom you can share your most personal worries and fears; h) Someone that gives you advice how to handle personal problems; i) Someone who loves you and gives you the feeling that you are a valuable person.	Always; Usually; Sometimes; Seldom; Never.	[10]
Health-related social leverage	(5 items) If you would need advice or help with one of the following topics, would you have someone you could easily turn to? (you may tick more than one box) Do you know someone to turn to if you would want: a) to lose weight? b) to be more physically active? c) to quit smoking? d) to consume fewer alcoholic drinks? e) medical advice, in case you are not satisfied with your doctor?	Nobody, partner/family member, friend, colleague, acquaintance (more than one answer could be ticked)	[11]
Size of interpersonal relationship network	(1 item) How many good friends and close family members do you have?	Open question	
Social participation	(6 items) With which of the following organisations do you feel involved? (which means that you are a member, or attending meetings, or do voluntary work) You may tick more than one answer.	Sports club; leisure association; trade union; political party; church; neighbourhood association; none of these organisations; another organisation, namely…	[2]
Perceptions of trust	(3 items) a) Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?"; b) "Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?"; c) "Would you say that most people deserve your trust or that only very few deserve your trust?".	Answers on a 10-point Likert scale ranging, per item, from: a) You can't be too careful – Most people can be trusted b) Most people would try to take advantage of me – Most people would try to be fair c) Very few people deserve my trust - Most people deserve my trust	[12]

Perceived neighbourhood social capital	(4 items) Below you may find four statements about people living in your neighbourhood. Please indicate to what extent you agree with each statement: a) I often feel lonely in this neighbourhood; b) If I get the chance, I move out of this neighbourhood; c) People in this neighbourhood treat each other well; d) People in this neighbourhood are willing to help each other.	Answers on a 5-point Likert scale, from 1= Totally disagree, to 5= Totally agree	[13]
Economic capital			
Household equivalent income	(2 items) a) Could you indicate your total net household income per month? b) How many people in total (in and outside your household) live from this income? Household equivalent income was calculated by the square-root of the number of people living from this income.	a) about 0-1200 euro per month; 1200-1800 euro per month; 1800-2600 euro per month; 2600-4000 euro per month; more than 4000 euro per month; I don't know, or I don't want to tell. b) Open question	[14]
Home ownership	(1 item) Are you a home owner, or do you rent a house?	renter, home owner	[14]
Crowding	(2 items) How many people in total live in your house? (including yourself) How many rooms has your house? (do not count the garage, basement, kitchen, toilet, bathroom) Crowding was calculated by number of rooms in the house, divided by the number of persons living in the household.	Open questions.	[14]
Financial strain	(1 item) Did you experience any difficulties in paying bills last year, e.g. for food, rent, and electricity?	No difficulties; some difficulties; big difficulties.	[14]

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APPENDIX 2

Table A2.1. Means and standard deviations (SD) for the daily frequency scores[a] of the food consumption outcomes, by educational level.

Educational level		Overall healthy food consumption	Overall unhealthy food consumption	Whole wheat bread	Fruit	Vegetables	Fish/meat substitute	Fried food	Red meat	Soft drink
1 - Low	Mean	3.38	1.38	0.78	0.69	0.98	0.16	0.11	0.41	0.20
	SD	1.34	0.88	0.36	0.37	0.47	0.19	0.09	0.31	0.31
2	Mean	3.79	1.36	0.81	0.72	1.10	0.16	0.10	0.39	0.16
	SD	1.10	0.80	0.32	0.35	0.36	0.15	0.06	0.26	0.28
3	Mean	3.62	1.44	0.77	0.67	1.09	0.19	0.11	0.40	0.17
	SD	1.16	0.79	0.35	0.34	0.37	0.18	0.08	0.24	0.27
4 - High	Mean	3.90	1.41	0.83	0.70	1.19	0.22	0.10	0.39	0.16
	SD	1.05	0.73	0.31	0.33	0.38	0.19	0.08	0.23	0.26
Total	Mean	3.76	1.40	0.80	0.70	1.12	0.19	0.10	0.39	0.16
	SD	1.13	0.78	0.33	0.34	0.38	0.18	0.08	0.25	0.27

a Daily frequency scores were calculated as follows. In the food frequency questionnaire, participants indicated the number of days per week each food product was consumed. This number was converted to an indicator for 'average daily frequency' by the following formula (Pollard et al. *J Biosoc Sci*. 1998 Apr;30(2):165-79): never: 0; less than once a week: 0.10; 1-2 days per week: 0.20; 3-4 days per week: 0.50; 5-6 days per week: 0.80; every day: 1. The scores for 'overall healthy food consumption' and 'overall unhealthy food consumption' are higher than 1, as these are the sum of daily frequency scores of multiple food products. An 'overall healthy food consumption' score was constructed as the sum of the consumption of fruit, cooked vegetables, raw vegetables, whole wheat bread, skimmed milk, low fat cheese, chicken, fish, and meat-substitutes (like tofu). To calculate this score, the average daily frequencies (ranging from 0 till 1, as detailed above) for each of these products were summed. Similarly, an 'overall unhealthy food consumption' score was constructed as the sum of the frequencies of consumption of fried food, candy, white bread, soft drinks, whole milk, high fat cheese, and red meat (beef, pork, lamb, mince, and burgers).

Table A2.2. Prevalences of high/low scores on the food outcomes for the total sample, and within the groups with high and low overall healthy food consumption.

			Overall healthy food consumption	
		Total (%)	High (%)	Low (%)
Overall unhealthy food consumption	High	47.7	41.3	53.6
	Low	52.3	58.7	46.4
Whole wheat bread	High	63.4	81.4	46.3
	Low	36.6	18.6	53.7
Fruit	High	43.4	64.9	23
	Low	56.6	35.1	77
Vegetables	High	47.5	66.8	29.3
	Low	52.5	33.2	70.7
Fish/meat substitute	High	55.7	65.6	46.4
	Low	44.3	34.4	53.6
Fried food	High	21.5	16.9	25.7
	Low	78.5	83.1	74.3
Red meat	High	50.3	49.9	50.6
	Low	49.7	50.1	49.4
Soft drink	High	50.4	42.7	57.6
	Low	49.6	57.3	42.4

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