Table 2

Associations between tumour type, grade, ER, cyclin D_1, cyclin E, p27 and proliferation (Ki67)

	Tumour grading	Nucleus grade	ER	Cyclin D_1	Cyclin E	p27	Ki67
Tumour type[a]	(<0.001**)	(<0.001**)	(0.01*)	(0.11)	(0.10)	(0.67)	(0.009**)
Tumour grading	1 (-)	0.789 (<0.001**)	-0.374 (<0.001**)	0.082 (0.155)	0.339 (<0.001**)	-0.271 (<0.001**)	0.530 (<0.001**)
Nucleus grade		1 (-)	-0.369 (<0.001**	0.050 (0.391)	0.323 (<0.001**)	-0.188 (0.001)	0.448 (<0.001**)
ER			1 (-)	0.154 (0.007**)	-0.540 (<0.001**)	0.291 (<0.001**)	-0.282 (<0.001**)
Cyclin D_1				1 (-)	0.024 (0.674)	0.262 (<0.001**)	0.288 (<0.001**)
Cyclin E					1 (-)	-0.094 (0.099)	0.395 (<0.001**)
p27						1 (-)	-0.211 (<0.001**)
Ki67							1 (-)

P values are given in parentheses. [a]For tumour type (ductal, lobular, tubular), the χ^2 test was used. Otherwise, Pearson's correlation test was used. *$P < 0.05$, **$P < 0.01$. ER, oestrogen receptor.

Smoking status, alcohol habits and physical activity were not associated with any specific subgroup of breast cancer (data not shown).

Discussion

We found that low intakes of energy and total fat (especially PUFA), and high BMI were associated with more malignant breast cancer.

Some methodological issues must be addressed. Dietary assessment may be biased because of measurement error, for instance over- and under-reporting. The validity of dietary data in the MDCS has been examined using 18 days of weighed food records collected over 1 year in a subgroup of MDCS participants (126 men and 115 women) and validity was found to be high [22,23].

Whether energy-adjusted variables should be used when analyzing any relation between dietary intake and disease is a matter of controversy among nutritional researchers [26,27], and in this study we present results using the total, as well as energy-adjusted, intake of macronutrients.

A prevalent or subclinical breast cancer may affect anthropometric measurements and dietary habits. All data concerning objective body measurements were gathered between 0.2 and 10.4 (mean 4.3) years before breast cancer diagnosis, and the values were therefore most likely unaffected by disease. Supporting this interpretation is the lack of relation between BMI and time to diagnosis ($P = 0.526$, $r = -0.021$ [Spearman's correlation test]). Similar results were obtained for energy intake and time to diagnosis ($P = 0.208$, $r = -0.060$).

Tumour classification with regard to type and grade was performed according to current classification systems. The tissue microarray (TMA) technique used in this study is now a well documented method for high-throughput tissue screening, with two tissue cores considered a sufficient sampling amount [28,29]. The distribution of the immunohistochemical markers was in accordance with earlier studies [16], thus validating the assessments.

The participation rate in the MDCS was about 40% of the potential participant population. The participants did have a higher incidence of breast cancer compared with the source population [21] and were most likely a selected group in terms of socioeconomic factors. Nevertheless, the distribution of histological type and grade within the incident breast tumours in this study was similar to that in other studies [11,30]. Even if our breast cancer population were different from the background population, it would still be possible to make internal comparisons between different tumour groups in terms of dietary and anthropometric measurements.

Because several methodological factors in the MDCS may affect dietary measurements, all analyses were adjusted for diet assistant, period of data collection, diet methodology and past food habit change, as well as for total energy intake when stated. Hence, these factors ought not to have confounded dietary assessments. It was decided not to adjust the present analysis for established risk factors for breast cancer or factors that affect true dietary intake (for example socioeconomic index), because the main objective was to conduct perform a descriptive and exploratory analysis of dietary intake in different groups of breast cancer as defined by pathological and biological properties.

The present study includes a large number of comparisons, and *P* values should be interpreted with caution. Because no previous study has addressed the same issue using our methodology, we consider the present analyses as a first, hypothesis-generating study. Our findings need confirmation in future studies including healthy control individuals.