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Diet Quality Is Associated with All-Cause Mortality in Adults Aged 65 Years and Older[1–3]

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Abstract

Diet quality indices assess compliance with dietary guidelines and represent a measure of healthy dietary patterns. Few studies have compared different approaches to assessing diet quality in the same cohort. Our analysis was based on 972 participants of the British Diet and Nutrition Survey of people aged 65 y and older in 1994/1995 and who were followed-up for mortality status until 2008. Dietary intake was measured via a 4-d weighed food record. Three measures of diet quality were used: the Healthy Diet Score (HDS), the Recommended Food Score (RFS), and the Mediterranean Diet Score (MDS). HR for all-cause mortality were obtained using Cox regression adjusted for age, sex, energy intake, social class, region, smoking, physical activity, and BMI. After adjustment for confounders, the MDS was significantly associated with mortality [highest vs. lowest quartile; HR = 0.78 (95% CI = 0.62–0.98)]. Similarly, the RFS was also associated with mortality [HR = 0.67 (95 % CI = 0.52–0.86)]; however, there were no significant associations for the HDS [HR = 0.99 (95% CI = 0.79–1.24)]. The HDS was not a predictor of mortality is this population, whereas the RFS and the MDS were both associated with all-cause mortality. Simple measures of diet quality using food-based indicators can be useful predictors of longevity. J. Nutr. 142: 320–325, 2012.

Introduction

Measures of dietary patterns and diet quality are becoming increasingly used in investigations of diet and longevity in an effort to capture the complex exposure that is dietary intake. Diet quality is usually assessed according to how well individuals comply with dietary guidelines and a range of diet indices have been developed (1). Existing indices assess dietary quality in a variety of ways; some focus on foods or food groups, others focus on nutrients, and some measures combine intakes of foods and nutrients to assess diet quality. Food-based tools offer promise both in terms of their ability to predict disease and also in their application and translation to evaluation and clinical practice. The usefulness of diet quality measures has been assessed against nutrient intakes, biomarkers, and socio-demographic factors (2,3). Studies have also investigated their associations with health and in particular all-cause mortality. However, few studies have compared different diet quality approaches in the same population and their associations with all-cause mortality and this has been identified as a gap in the existing research evidence (4,5).

The RFS[7] is an index based on the frequency of consumption of foods considered consistent with dietary guidelines (6,7). This score has been shown to be associated with all-cause mortality among men and women (7–10), cancer mortality among women (9,11), and cardiovascular disease mortality among men and women (8,9). The RFS is attractive due to its simplicity with respect to calculation and can be used in situations where the dietary assessment method lacks information on quantity or portion size. This measure of healthy dietary patterns has also been shown to be more consistently associated with mortality than a similar score of unhealthy dietary patterns (9). The RFS has also been shown to be associated with biomarkers of diet and disease such as serum vitamins C and E, folate, carotenoids, and C-reactive protein and plasma glucose and hemoglobin A_1C (12). Other existing diet indices have shown mixed or no associations with chronic disease and mortality (5,13–18).

[1] Supported by the Department of Health and the Ministry of Agriculture, Fisheries and Food, whose survey responsibility has since been transferred to the Food Standards Agency. The survey was carried out by the National Centre for Social Research, formerly Social and Community Planning Research in conjunction with the Micronutrient Status Laboratory of the Medical Research Council Dunn Nutrition Unit, now part of Medical Research Council Human Nutrition Research. The survey datasets were obtained from the survey commissioners, the University of Essex Data Archive, and the Social Survey Division of the Office for National Statistics. Funding was also provided by The Medical Research Council. The funders have not influenced this research or its publication. S.A.M. was funded by a (Australian) National Heart Foundation of Australia Fellowship.

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[3] Supplemental Table 1 is available from the "Online Supporting Material" link in the online posting of the article and from the same link in the online table of contents at jn.nutrition.org.

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[7] Abbreviations used: HDS, Healthy Diet Score; MDS, Mediterranean Diet Score; RFS, Recommended Food Score.

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The health benefits of the Mediterranean diet have been investigated for some time and a number of scoring systems have been developed to capture adherence to this dietary pattern, although the most commonly used index is that developed by Trichopoulou et al. (19,20). The MDS has consistently been shown to be associated with health. In a meta-analysis of 18 prospective cohort studies, an increase in the MDS was associated with a reduced risk of all-cause mortality, cardiovascular disease, cancer mortality, Parkinson's disease, and Alzheimer's disease (21). However, the associations appear to be a little weaker among studies conducted in non-Mediterranean countries. Questions have been raised about the translation of the Mediterranean diet and whether the results of existing studies can be generalized to other countries and cultures (22).

Few studies have evaluated diet quality in the British population. A HDS was previously adapted for use in the British population and has been shown to be associated with nutrient intakes and socio-demographic factors (23,24). It was adapted from a score previously shown to be associated with all-cause mortality (25); however, the association between the updated index with health outcomes and mortality has not been evaluated. The aim of this study was to investigate whether an existing measure of diet quality used in the British population was associated with the risk of all-cause mortality and to compare this with two other well-established measures of diet quality in a sample of British adults aged 65 y and older.

Methods

Design. This study is based on data from the British Diet and Nutrition Survey of people aged 65 y and older living in the community in mainland Britain (26). The survey included a measure of self-reported food intake, a socio-demographic questionnaire, a fasting blood sample, and anthropometric measures. The survey was carried out in four successive 3-mo waves of fieldwork approximately corresponding to the four seasons, from October 1994 to September 1995. The sample was designed to consist of approximately equal numbers of men and women in the 65–74 y and 74–84 y age groups, although there were fewer men aged ≥85 y, which reflects the general population. The survey response rate was 85%. From the eligible sample of 2172 participants, 72% provided full interview data and 59% provided diet intake data. Participants were followed-up for death using linked National Health Service administrative mortality data (censored 30 September, 2008). Ethical approval for the survey was obtained from the National Health Service Local Research Ethics Committees covering the 80 areas sampled in the survey. Full details of the survey have been described in detail elsewhere (26).

Diet. Dietary intake was measured via a 4-d weighed food record. Trained interviewers assisted with the recording to quantify food consumption. Participants recorded their food and drink consumption on different days of the week in order to span both weekdays and weekends. Food consumed at home was weighed with Quanta digital food scales and details of any food and drink consumed outside was recorded in a separate diary so that interviewers could purchase duplicate items and weigh them.

Covariates. Self-reported physical activity scores were derived from a series of questions asking about activity related to exercise and sports, walking, and gardening. The answers were classified according to the maximum intensity of physical activity for activities they claimed to carry out at least once a fortnight as: vigorous (activities including running or jogging); moderate (cycling, keeping fit, ≥20 min of continuous walking at a brisk or fast pace as reported by participant); light (physiotherapy, dancing, golf, ≥20 min of continuous walking at a slow, steady, or average pace as reported by participant); or inactive (none of the above). Cigarette smoking status was categorized as: nonsmoker; smoke <20 cigarettes/d; or smoke ≥20 cigarettes/d. Social class was coded according to the Registrar General's Classification of Occupations (27). Classifications were based on each person's main job before reaching retirement age. For analysis, the six groups were categorized into manual and nonmanual. Region was categorized into three groups: North (Scotland, North, North West, Yorkshire, and Humberside), Central (Wales, West Midlands, East Midlands, East Anglia, South West), and South (London and the South East) (26).

Height was measured using a portable, digital, telescopic stadiometer. Prior to taking the measurement, participants were asked to remove their shoes and nurses checked that the participant's head was horizontal in the Frankfort Plane. Weight was measured to the nearest 100 g using Soehnle Quantratronic digital personal scales on a hard, level surface. Waist circumference was measured using an insertion tape, and two measurements were taken. Participants were asked to remove shoes and wear light clothing for the measurements and to remove outer layers of clothing or tight garments that might affect the measurements.

Analysis. Three previously developed measures of diet quality used to investigate all-mortality were applied (**Supplemental Table 1**). The HDS (23,24) was adapted from the Healthy Diet Indicator of Huijbregts et al. (25), which was previously shown to be associated with all-cause mortality. The HDS was adapted to be consistent with British dietary recommendations and was previously used with the British population (23,24). Currently, no other diet quality index has been developed for use or applied in the British population. The HDS includes indicators of intake of SFA, PUFA, protein, total carbohydrates, dietary fiber, fruit and vegetables, pulses and nuts, total nonmilk extrinsic sugars, cholesterol, fish, red meat and meat products, and calcium.

We compared this with two existing measures of diet quality, the MDS (28,29) and the RFS by Kant et al. (7,9–11), which have been shown to be associated with all-cause mortality. The MDS was based on the most commonly used index by Trichopoulou et al. (19,20,29). The MDS includes vegetables, legumes, fruits and nuts, cereals, fish and seafood, monounsaturated:saturated fats ratio, dairy products, meat and meat products, and alcohol. We used the standard scoring method and calculated sex-specific medians for each of the food groups in the MDS (except for alcohol). For vegetables, legumes, fruits and nuts, cereals, fish and seafood, monounsaturated:saturated fats ratio, participants with an intake above the median were assigned a score of one. For dairy products and meat and meat products, participants whose intake was less than the median were assigned a score of 1. Total score was calculated as the sum of all the components with a higher score reflecting greater compliance with a Mediterranean-style dietary pattern. Alcohol intake was assigned scores based on low, moderate, and high alcohol intake, with those consuming a moderate amount of alcohol assigned a score of 1 (see Supplemental Table 1 for details of the classifications).

The RFS is a food-based score calculated based on the frequency of consumption of a range of foods considered to be consistent with existing dietary guidelines. Previously, this score was calculated based on dietary intake data collected using FFQ data and participants were allocated a score of 1 for each recommended food consumed more than once per week; however, Kant and Graubaud (12) adapted this scoring for use with 24-h recall data such that foods were counted only if they were consumed in at least a minimum amount, with the minimum amount threshold set at 15 g/d for nonbeverages and 30 g/d for beverages. For recommended foods reported more than once, the criterion for minimum amount was applied after summing all mentions of a food and several mentions of a recommended food in a recall contributed only one point to the score. This scoring approach was applied in the current study. To assess comparability with the MDS, an additional scoring approach was used for the RFS based on the use of sex-specific median cutpoints for consumers. Full details of the indicators and the cutoffs used in calculating the scores are shown in Supplemental Table 1.

The analysis was based on 972 participants with complete data on all variables. Participants were grouped according to quartile cutpoints of the dietary quality scores. Associations between the diet quality scores and covariates were investigated using chi-square for proportions (sex, social class, region, smoking, and physical activity) and ANOVA (age, BMI, alcohol intake, and energy intake). Cox proportional hazards

TABLE 1 Characteristics of particpants in the British National Diet and Nutrition Survey aged ≥65 y according to quartile of the dietary quality scores[1]

Quartile	*n*	Age, *y*	Sex, *% M*	Region[2], % North	Central	South	Social class, *% nonmanual*	Physical activity[3] Vigorous	Moderate	Light	Inactive	Cigarette smoking None	<20/d	≥20/d	BMI, *kg/m²*	Alcohol, *g ethanol/d*	Energy intake, *MJ/d*	
MDS																		
Q1	337	78.2 (77.3, 79.0)	49.0	36.8	38.0	25.2	41.5	0.0	79.8	19.0	1.2	81.0	13.4	5.6	26.2 (25.7, 26.7)	4.9 (3.3, 6.4)	6.51	(6.32,6.71)
Q2	230	76.0 (75.1, 76.9)	57.4	30.9	43.9	25.2	41.7	0.4	83.5	15.2	0.9	81.3	14.4	4.4	26.4 (25.8, 26.9)	7.5 (5.6, 9.3)	7.14	(6.89,7.39)
Q3	194	75.3 (74.3, 76.3)	51.0	36.1	36.1	27.8	47.4	0.5	88.7	10.8	0.0	88.7	7.7	3.6	26.9 (26.3, 27.5)	6.8 (5.1, 8.5)	7.10	(6.83,7.38)
Q4	211	74.0 (73.0, 74.9)	56.4	25.6	45.0	29.4	61.1	1.0	80.6	18.5	0.0	89.6	8.1	2.4	26.6 (26.0, 27.1)	8.8 (6.7, 10.9)	7.58	(7.30,7.87)
P-value		<0.001	0.2		0.1		<0.001	0.1					0.05		0.2	0.9	<0.001	
RFS[4]																		
Q1	371	77.7 (77.0, 78.5)	51.5	37.5	41.0	21.6	32.1	0.3	77.4	21.8	0.5	76.3	17.5	6.2	26.2 (25.7, 26.7)	6.6 (4.9, 8.2)	6.56	(6.37,6.74)
Q2	224	77.0 (76.0, 78.0)	52.2	33.0	38.0	29.0	45.5	0.0	85.3	13.8	0.9	84.8	11.2	4.0	26.6 (26.0, 27.2)	5.7 (4.1, 7.3)	6.90	(6.67,7.14)
Q3	190	75.3 (74.4, 76.2)	53.2	32.6	39.5	27.9	59.0	1.1	84.2	14.2	0.5	89.5	6.8	3.7	26.6 (26.1, 27.1)	7.3 (5.1, 9.5)	7.19	(6.91,7.46)
Q4	187	73.1 (72.1, 74.0)	56.7	23.5	43.9	32.6	66.3	0.5	88.2	10.7	0.5	95.2	3.7	1.1	26.5 (26.1, 27.0)	7.7 (6.0, 9.4)	7.87	(7.57,8.18)
P-value		<0.001	0.7		0.02		<0.001	0.04					<0.001		0.3	0.5	<0.001	
HDS																		
Q1	348	76.8 (76.1, 77.6)	54.3	37.4	35.1	27.6	45.1	0.0	80.2	19.3	0.6	81.9	12.9	5.2	26.2 (25.8, 26.7)	7.8 (6.1, 9.5)	6.94	(6.75,7.12)
Q2	230	76.4 (75.4, 77.4)	52.6	34.4	42.6	23.0	45.7	0.4	82.2	17.4	0.0	83.0	13.0	3.9	26.7 (26.2, 27.3)	6.7 (5.0, 8.4)	6.954	(6.69,7.21)
Q3	190	76.5 (75.5, 77.5)	47.9	32.6	39.5	27.9	43.2	0.0	83.7	14.7	1.6	85.8	10.0	4.2	26.8 (26.2, 27.4)	5.0 (3.4, 6.6)	6.83	(6.55,7.11)
Q4	204	74.4 (73.5, 75.4)	55.9	23.5	48.5	27.9	55.4	1.5	86.3	11.8	0.5	89.2	7.8	2.9	26.2 (25.7, 26.7)	6.6 (4.4, 8.7)	7.38	(7.07,7.68)
P-value		0.3	0.4		0.01		0.05	0.04					0.4		0.3	0.2	0.025	

[1] Data are means (95% CI), *n*, or percent. HDS, Healthy Diet Score; MDS, Mediterranean Diet Score; RFS, Recommended Food Score.
[2] Details of the regions are as follows: North: Scotland, North, North West, Yorkshire, and Humberside; Central: Wales, West Midlands, East Midlands, East Anglia, and South West; South: London and the South East.
[3] Categories of physical activity are based on self-reported maximum intensity of physical activity for activities that participants claimed to carry out at least once a fortnight and are categorized as: vigorous (activities including running or jogging); moderate (cycling, keep fit, ≥20 min of continuous walking at a brisk or fast pace as reported by participant); light (physiotherapy, dancing, golf, ≥20 min of continuous walking at a slow, steady, or average pace as reported by participant); or inactive (none of the above).
[4] For RFS, the scoring is based on a minimum consumption of 15 g/d for nonbeverages and 30g/d for beverages.

TABLE 2 HR and 95% CI for the MDS, HDS, and RFS and all-cause mortality among adults aged ≥65 y[1]

		Model 1[2]			Model 2[3]			Model 3[4]		
	n	HR	95% CI	*P*-trend	HR	95% CI	*P*-trend	HR	95% CI	*P*-trend
MDS										
Q1	337	1.00		0.001	1.00		0.007	1.00		0.006
Q2	230	1.05	(0.86, 1.28)		1.05	(0.86, 1.28)		1.04	(0.85, 1.27)	
Q3	194	0.71	(0.57, 0.89)		0.77	(0.62, 0.97)		0.77	(0.61, 0.97)	
Q4	211	0.75	(0.60, 0.95)		0.78	(0.62, 0.98)		0.78	(0.62, 0.98)	
RFS[5]										
Q1	371	1.00		<0.001			0.001			0.001
Q2	224	0.87	(0.72, 1.07)		0.90	(0.74, 1.10)		0.90	(0.74, 1.10)	
Q3	190	0.72	(0.58, 0.91)		0.76	(0.61, 0.96)		0.76	(0.61, 0.96)	
Q4	187	0.62	(0.48, 0.79)		0.68	(0.53, 0.87)		0.67	(0.52, 0.86)	
RFS (median)[6]										
Q1	278	1.00		<0.001	1.00		0.003	1.00		0.003
Q2	319	0.75	(0.62, 0.92)		0.78	(0.64, 0.95)		0.78	(0.64, 0.94)	
Q3	203	0.80	(0.64, 1.00)		0.86	(0.68, 1.08)		0.85	(0.68, 1.07)	
Q4	172	0.58	(0.45, 0.76)		0.64	(0.49, 0.83)		0.63	(0.48, 0.83)	
HDS										
Q1	348	1.00		0.6	1.00		0.9	1.00		0.8
Q2	230	1.07	(0.87, 1.30)		1.09	(0.89, 1.34)		1.10	(0.90, 1.35)	
Q3	190	0.96	(0.77, 1.19)		0.98	(0.79, 1.22)		0.98	(0.79, 1.22)	
Q4	204	0.95	(0.76, 1.19)		1.00	(0.80, 1.25)		0.99	(0.79, 1.24)	

[1] HDS, Healthy Diet Score; MDS, Mediterranean Diet Score; RFS, Recommended Food Score.
[2] Model 1: Adjusted for age, sex, energy intake, social class, region.
[3] Model 2: additionally adjusted for physical activity and smoking.
[4] Model 3: additionally adjusted for BMI.
[5] For RFS, the scoring is based on a minimum consumption of 15 g/d for nonbeverages and 30 g/d for beverages.
[6] For RFS (median), the scoring is based on the sex-specific medians calculated based on consumers.

regression was conducted using follow-up time as the time variable. The data were censored to September 2008 in participants who survived. Initial models were adjusted for age, sex, energy intake, social class, and region. Further adjustments were made for smoking, physical activity, and BMI. Statistical analysis was conducted with Stata 10.0 (StataCorp) and significance was set at $P < 0.05$.

Results

After 13,608 person-years of follow-up, there were 654 deaths (mean follow-up was 14 y). With respect to socio-demographic factors, the MDS and the RFS were significantly associated with age, with higher scores associated with younger age, whereas there were no significant associations between sex and any of the diet quality scores (**Table 1**). There were significant associations between the MDS and social class and smoking. There were significant associations between the RFS and region, social class, physical activity, and smoking. The HDS was significantly associated with region, social class, and physical activity. All three diet quality scores were significantly associated with energy intake and only the HDS showed significant differences in alcohol intake.

For the MDS, a higher score was associated with decreased risk of mortality [model 1; adjusted for age, sex, energy intake, social class, region; *P*-trend < 0.001] (**Table 2**). This relationship remained significant even after adjustment for physical activity and smoking (model 2) and BMI [model 3; HR = 0.77 (95% CI = 0.61–0.97); *P*-trend = 0.005]. A higher RFS was also associated with a decreased risk of mortality that remained significant after adjustment for age, sex, energy intake, social class, region, physical activity, smoking, and BMI [model 3; HR = 0.67 (95% CI = 0.52–0.86); *P*-trend = 0.001]. Similar results were shown for the RFS using median cutpoints. However, there were no significant associations for the HDS [model 3; HR = 0.99 (95% CI = 0.79–1.24); *P*-trend = 0.87]. Further adjustment for self-rated health and waist circumference did not alter the results (data not shown). Because the RFS did not include alcohol, we investigated further adjustment for alcohol intake and the results were unchanged (data not shown).

Discussion

This study compared the ability of three existing measures of diet quality to predict risk of mortality in a British population of adults aged >65 y. We found that the MDS and RFS measures of diet quality were significantly inversely associated with all-cause mortality, whereas there were no significant associations for the HDS.

The HDS was based on a previous Healthy Diet Indictor by Huijbregts et al. (25) Our results are in contrast to the finding by Huijbregts et al. (25), who showed inverse associations with all-cause mortality in populations from The Netherlands, Italy, and Finland. However, their study included only men, was a somewhat younger population (50–70 y), and had a longer, 20-y follow-up. Although the HDS was shown to be associated with nutrient intake patterns and socio-demographic factors (30), it had not previously been investigated with respect to health outcomes in the British population. Possible reasons for the null findings for the HDS include lack of sufficient variation in this population in the nutrients and foods included in the HDS and too few people consuming a diet considered healthy according to this index.

Our results for the MDS and RFS are consistent with previous findings concerning all-cause mortality in other populations. In a meta-analysis of 9 prospective cohort studies, an increase in MDS was associated with reduced risk of all-cause mortality, with a pooled RR of 0.92 (95% CI = 0.90–0.94) (21). Our results are also consistent with studies of the MDS in older populations (19,31,32). Knoops et al. (32) conducted a pooled analysis of participants aged 70–90 y from three prospective studies covering 11 countries and found that risk of all-cause mortality was reduced by 23% among those who more closely followed a Mediterranean diet. Although studies of dietary patterns have shown Mediterranean-style dietary patterns to be present in the U.K. population (33–36), in a recent cross-country and time-trend comparison (37), the UK in the 1960s ranked 39th of 41 counties in terms of adherence to the dietary pattern and although their ranking and absolute score had increased in the early 2000s, the country still ranked in the bottom tertile of countries. The current study has shown that the MDS is associated with increased longevity in non-Mediterranean populations and in countries that are not normally associated with a Mediterranean-style eating pattern. This is consistent with the findings of Mitrou et al. (38) that demonstrated a protective effect of the Mediterranean dietary pattern for all-cause mortality in a cohort of U.S. adults. The results are also consistent with a previous analysis of dietary patterns in this sample in which a Mediterranean-type dietary pattern emerged and was significantly inversely associated with all-cause mortality (34).

Previous studies have shown the RFS to be associated with mortality (7–11). Kant et al. (7) demonstrated that women in the top quartile had a 30% lower risk of all-cause and cause-specific mortality compared to women in the lowest quartile. Other diet quality scores have shown mixed results with all-cause mortality and mortality from major chronic diseases. For example, McCullough et al. (13–15) showed associations between the United States Healthy Eating Index and major chronic disease among men but not women. Similarly, less convincing results have generally been demonstrated for other diet quality indices and cancer mortality. For example, Harnack et al. (17) found no association between their dietary guideline index and all-sites cancer incidence over a 13-y follow-up.

In this study, two approaches to scoring intakes for the RFS were used. The RFS has most often been calculated from dietary intake data based on FFQ estimates, with consumption of recommended foods more than once per week rewarded. However, this approach does not apply to food record or recall data and has been adapted by Kant and Graubaud (12) with minimum intake levels set at 15 g/d for nonbeverages and 30 g/d for beverages. A second approach, comparable to the scoring used with the MDS, was also applied, namely the use of sex-specific median cutpoints. Both approaches led to similar results and were consistent with previous analyses investigating the RFS and all-cause mortality using the once per week frequency cutpoint (7–11). Although the are a number of different indices for the Mediterranean diet, there is a lack of consensus in regards to quantitative cutoffs for scoring and the majority of indices use scoring methods based on median intakes of the population under study. This avoids problems associated with a potential lack of variation in population dietary intakes and too few participants consuming an "optimal" diet based on set cutoffs, which results in an inability to detect associations with health outcomes. However, it also leads to difficulties in interpretation across studies, because scoring highly on the MDS may reflect different dietary intake profiles in different population groups and different definitions of compliance.

This study suggests that diet quality measures predominantly focused on food-based indicators may be better at predicting mortality and longevity than indicators based predominantly around nutrient intakes. The potential advantages of food-based dietary indices over those based on nutrient intakes were previously highlighted (3). Food-based indices retain the complexity of food intake and indirectly assess intakes of nutrient and non-nutrient components in food. Food-based diet indices also reflect the move toward food-based dietary guidelines (39) and are most similar to the other data-driven methods of assessing dietary patterns (40). In addition, developing a food-based score may lend itself to adaptation to short methods of dietary assessment that focus on food intakes rather than detailed measures of dietary intake and therefore may be particularly relevant for use in monitoring and surveillance activities and clinical applications. (4,41). In particular, the RFS is a simple measure of diet quality that lends itself to use in dietary interventions and screening tools.

An important issue facing diet quality research is comparability across studies. Few existing studies compare the different diet quality indicators in the same population and a strength of this study is that multiple indices were evaluated simultaneously. Further strengths of this study include the detailed dietary assessment method used and the prospective study design. Most population studies of diet quality have used FFQ rather than food diaries. In the current study, dietary intake was measured using a weighed food record, which provides detailed information regarding the types of food and beverages consumed. However, a 4-d food diary may not provide an adequate measure of infrequently consumed foods. A further limitation of the study is the reliance on a single measure of dietary intake during adult life.

A further strength is the completeness of methods of outcome ascertainment. All deaths are required to be registered with the local authority within 5 d of occurrence in England, Wales, and Northern Ireland and within 8 d in Scotland. We also investigated a range of potential confounding factors, such as sociodemographic factors (age, sex, social class, and region of residence), health behaviors (smoking and physical activity), biomedical risk factors (BMI), and energy intake. Associations for the MDS and RFS remained significant after adjustment. However, we cannot rule out the possibility of residual confounding due to other factors that were not measured in this study or to the presence of measurement error in the measured confounders.

This study indicates that simple measures of diet quality focusing on food-based indicators can be useful predictors of mortality. It also highlights that Mediterranean-type dietary patterns can be protective among non-Mediterranean populations and populations where absolute intakes of the components of the Mediterranean diet are lower. Further, the study shows that diet quality is an important predictor of longevity among older adults. With the ageing population worldwide, the role of diet quality in improving functional status and quality of life becomes increasingly important and further research is required on the role of diet in these aspects of ageing.

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