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1 **The healthy Nordic diet and Mediterranean diet and incidence of disability 10 years later in**  
2 **home-dwelling old adults**

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27  
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40

41 **Conflict of interest**

42 None.

43

44 **The healthy Nordic diet and Mediterranean diet and incidence of disability 10 years later in**  
45 **home-dwelling old adults**

46

47 **Abstract**

48 **Background/Objective:** Diet has a major impact on a person's health. However, limited  
49 information exists on the long-term role of the whole diet on disability. We investigated the  
50 association of the healthy Nordic diet and the Mediterranean diet with incident disability 10 years  
51 later.

52 **Design:** Longitudinal, with a follow-up of 10 years.

53 **Settings/Participants:** A total of 962 home-dwelling men and women from the Helsinki Birth  
54 Cohort Study, mean age 61.6 y, who were free of disability at baseline.

55 **Measurements:** At baseline, 2001-2004, the Nordic diet score (NDS) and modified Mediterranean  
56 diet score (mMDS) were calculated using a validated 128-item food-frequency questionnaire.  
57 Higher scores indicated better adherence to the diet. Participants' incident disability was assessed  
58 during 2011-2013 by a self-reported questionnaire and was based on mobility limitations and  
59 difficulties to perform self-care activities. Analyses were performed using logistic regression and  
60 adjusted for potential confounding factors.

61 **Results:** In total, 94 participants (9.8%) developed mobility limitations and 45 participants (4.7%)  
62 developed difficulties in self-care activities during 10 year follow-up. The likelihood of having  
63 mobility limitations (odds ratio (OR) 0.42, 95% confidence interval (CI) 0.22–0.80) and difficulties  
64 in self-care activities (OR 0.38, 95% CI 0.15–0.94) were lower among those in the highest NDS  
65 tertile than among those in the lowest NDS tertile. Greater mMDS was associated with a lower  
66 disability incidence; however, the association was not statistically significant.

67 **Conclusions/Implications:** Adherence to the healthy Nordic diet predicts 10-year incidence of  
68 mobility limitations and difficulties to perform self-care activities in old age and may thus be  
69 protective against disability in Nordic population.

## 70 **Introduction**

71 World Health Organization identifies disability in old individuals as people's difficulty to  
72 participate in daily activities or activities that are necessary for independent living and integration in  
73 their environment. <sup>(1)</sup> There are several domains of disability, such as mobility limitations and  
74 difficulties in activities of daily living (ADL) or instrumental activities of daily living (IADL) that  
75 are essential for independent life. Studies have shown that mobility limitation is a strong predictor  
76 of ADL and IADL disability. <sup>(2)</sup> It has been estimated that 8–35% of individuals 65 years old or  
77 older have mobility limitations or difficulties in performing ADL tasks. <sup>(2-4)</sup> Mobility limitations  
78 and difficulties to perform self-care activities increase the risk for hospitalization, nursing home  
79 admission and are strong predictors of mortality. <sup>(5, 6)</sup> Therefore, it is important to understand the  
80 processes that cause the progression of disability in order to develop strategies to prevent or delay  
81 disability.

82

83 Poor health and physical performance, smoking as well as cognitive impairment are well known  
84 risk factors for disability. <sup>(2, 7)</sup> Diet is also a potential modifiable factor affecting disability.  
85 Observational studies have shown associations between low circulating levels of carotenoids and  
86 vitamin D and B12 <sup>(8, 9)</sup> as well as low intakes of single antioxidant nutrients, fruits and vegetables  
87 <sup>(10, 11)</sup> and mobility limitations and ADL. However, despite the previously described studies  
88 concerning single dietary factors and disability, the role of the whole diet in disablement process is  
89 still mostly unknown. A few studies have shown that adherence to Healthy Eating Index <sup>(12, 13)</sup> and  
90 Japanese diet <sup>(14)</sup> are related to a lower likelihood of mobility limitations. In addition, Mediterranean  
91 diet has been shown to decrease the risk of disability and slow the decline of mobility and walking  
92 speed. <sup>(15-18)</sup> We have recently observed a positive relationship between the healthy Nordic diet and  
93 overall physical performance and muscle strength. <sup>(19, 20)</sup> However, no studies exist in which the  
94 association of the healthy Nordic diet with incidence of disability has been examined. In addition,  
95 previous studies have not been investigated and compared different diet scores in the same cohort  
96 with respect to incidence of disability. Investigating different diet scores may help in identifying  
97 which diet is appropriate for population concerned. Therefore, we investigated whether two diet  
98 scores, the Nordic diet and the modified Mediterranean diet scores, predicts mobility limitations and  
99 difficulties to perform self-care activities 10 years later in initially healthy home-dwelling men and  
100 women aged 61 years on average at baseline.

101

## 102 **Methods**

103 *Design and Study Population*

104 The subjects in this study belong to the Helsinki Birth Cohort Study which originally included 4630  
105 men and 4130 women who were born as singletons at Helsinki University Central Hospital between  
106 1934 and 1944. <sup>(21)</sup> A random sample of 2 902 individuals were invited to participate in a clinical  
107 examination conducted between 2001 and 2004. Of these, 2003 men (n = 928) and women (n =  
108 1075) participated in the examination. From 2011–2013, 1404 subjects were still traceable. Of  
109 these, 1094 participants (478 men and 616 women) attended a clinical examination between 2011  
110 and 2013. <sup>(19)</sup> Those who participated in the follow-up clinical examination had lower rates of  
111 mobility limitations (6.2% v. 16.6%) and difficulties in self-care activities (4.6% v. 12.1%) at  
112 baseline compared to those who did not participate. Participants who had adequate data on diet and  
113 disability, and were free of disability at baseline were included in this study (n = 962).

114

115 This study was conducted according to the guidelines laid down in the Declaration of Helsinki and  
116 all procedures involving human subjects were approved by the Ethics Committee of the Helsinki  
117 and Uusimaa Hospital District. Written informed consent was obtained from all subjects.

118

#### 119 *Dietary Assessment*

120 At the baseline clinical examination, diet was assessed by a validated, self-administered, 128-item  
121 food-frequency questionnaire (FFQ). <sup>(22, 23)</sup> Participants were asked how often, on average, they  
122 consumed each food item in the past year. The frequency responses ranged from “never or seldom”  
123 to “at least six times a day”. The portion size was fixed for each food item or mixed dish (e.g. slice  
124 and glass) based on the national Findiet Study and present the most commonly used portion sizes in  
125 Finland. At the clinic, a research nurse checked the FFQ. The final decision regarding the  
126 completeness of the FFQ was made by a nutritionist. Exclusions were made due to incompletely  
127 filled FFQ and daily energy intake cut-off points corresponding to 0.5% at both ends of the daily  
128 energy intake distributions for men and women. <sup>(24)</sup> The average daily intakes of nutrients and foods  
129 were calculated with the national food composition database Fineli®.

130

131 Details of the Nordic diet score (NDS), which is also known as the Baltic Sea diet score, and the  
132 modified Mediterranean diet score (mMDS) are described in detail elsewhere. <sup>(25, 26)</sup> Briefly, the  
133 NDS is based on 9 components. Favourable food components (Nordic vegetables (excluding  
134 potatoes), Nordic fruits, Nordic cereals, fish, a ratio of polyunsaturated fatty acids to saturated and  
135 trans-fatty acids, and low-fat milk) were assigned values of 0–3 according to ascending sex-specific  
136 quartile ranks, and unfavourable food components (red and processed meat, and intake of total fat)  
137 were assigned values of 0–3 according to descending sex-specific quartile ranks. In addition, men

138 consuming  $\leq 20$  g/day and women consuming  $\leq 10$  g/day of alcohol received 1 point; otherwise, a 0  
139 point was given. The mMDS is based on 9 components. For vegetables (excluding potatoes), fruit  
140 and nuts, cereals, legumes, fish and fish products, and the ratio of monounsaturated and  
141 polyunsaturated to saturated fat, 1 point was given if intake was above the sex-specific median, 0  
142 otherwise. For meat and dairy products, 1 point was given if intake was below the sex-specific  
143 median, 0 otherwise. For alcohol, 1 point was given if intake was between 10–50 g/day in men and  
144 5–25 g/day in women; otherwise, a 0 point was given. The NDS ranged from 0–25 and the mMDS  
145 from 0–9.

146

#### 147 *Disability*

148 Disability was assessed with the Finnish validated version of the RAND 36-Item Health Survey 1.0  
149 (Short Form 36 [SF-36])<sup>(27)</sup> at baseline and follow-up clinical examination. The question on  
150 difficulties in walking 500 m was used to assess mobility limitations and difficulties to perform  
151 self-care activities was assessed with questions on difficulties in dressing or bathing. Response  
152 categories were: no difficulties; little difficulties; many difficulties. Participants were considered to  
153 have mobility limitations if they reported any difficulties in walking 500 m and difficulties to  
154 perform self-care activities if they reported any difficulties in dressing and/or bathing.

155

156 For comparing whether self-reported mobility limitations is valid and identify those with worse  
157 physical performance, participants' physical performance was tested at follow-up clinical  
158 examination with the validated Senior Fitness Test<sup>(28)</sup> and total score was calculated as described  
159 earlier.<sup>(19)</sup>

160

#### 161 *Covariates*

162 During the baseline clinical examination, height was measured to the nearest 0.1 cm and weight to  
163 0.1 kg. BMI was calculated as weight (in kg) divided by height (in m<sup>2</sup>). At the baseline clinical  
164 examinations, the level of educational attainment (elementary school; vocational school; senior high  
165 school and college; university degree), smoking status (never; former; current), presence of main  
166 chronic diseases (cancer; cerebrovascular disease; hypertension; diabetes) were asked using  
167 questionnaire. Energy intake was measured with an FFQ as an average intake (in MJ per day).  
168 Participants' physical activity over the previous 12 months was assessed using a validated exercise  
169 questionnaire.<sup>(29)</sup> Depressive symptoms were assessed using the Beck depression inventory (BDI)  
170<sup>(30)</sup>, and participants with score  $\geq 10$  were classified as having at least mild depression. Cognitive

171 status was assessed by Mini-Mental State Examination (MMSE) <sup>(31)</sup> score (0-30) during 2009-2011,  
172 and participants with a score <24 were classified as having impaired cognition.

173

#### 174 *Statistical Methods*

175 There were no significant interactions for the healthy diet and sex on disability, therefore, men and  
176 women were analysed together. Descriptive characteristics were reported as mean (standard  
177 deviation), proportions, or median (interquartile ranges) values, and the differences of baseline  
178 characteristics across tertiles were tested with one-way ANOVA or Chi-square test. The association  
179 between tertiles of NDS and mMDS and likelihood of having mobility limitations or difficulties to  
180 perform self-care activities were examined by logistic regression models. The relationships between  
181 each of the NDS and mMDS components and self-reported disability were also examined using  
182 logistic regression models. Model 1 was adjusted for age and sex. To investigate whether diet was  
183 independently related to disability, the Model 2 was further adjusted for potential confounding  
184 factors related to disability or diet: BMI, physical activity, smoking status, educational attainment,  
185 energy intake, and presence of chronic diseases and depression. <sup>(2, 32, 33)</sup> Model 3 was further  
186 adjusted for cognitive status and included only those participants whose MMSE test result was  
187 available (n=832). All statistical analyses were done using the SPSS Statistics version 23 for  
188 Windows® (SPSS Inc., Chicago, IL, USA). Significance was defined as P<.05.

189

#### 190 **Results**

191 The basic characteristics of the study population for men (n=439) and women (n=523) are seen in  
192 **Table 1** and daily intakes of NDS and mMDS components in **Appendix Table 1**. The correlation  
193 between NDS and mMDS was 0.56 (P<.001). Incident mobility limitation was more common than  
194 self-care dependence. During a 10-year follow-up, 94 participants (9.8%) developed mobility  
195 limitations and 45 participants (4.7%) developed difficulties to perform self-care activities. Senior  
196 Fitness Test total score was significantly smaller among those with mobility limitations (32.9  
197 points, SD 15.1) than those with no limitations (47.9 points, SD 16.6).

198

199 After adjusting for age, BMI, educational attainment, physical activity, smoking status, energy  
200 intake, and the presence of chronic disease and depression the likelihood of having difficulties to  
201 walk 500 m were lower among those in the highest NDS tertile than among those in the lowest  
202 NDS tertile (odds ratio (OR) 0.42, 95% confidence interval (CI) 0.22– 0.80) (**Table 2**). In addition,  
203 individuals with the highest adherence to a healthy Nordic diet at baseline had lower likelihood of  
204 developing difficulties to perform self-care activities compared with those with the lowest



205 adherence (OR 0.38, 95% CI 0.15–0.94). In total, 832 participants had completed MMSE test  
206 results. Including cognitive status to the model, the likelihood of having disability were lower  
207 among those with high NDS, however, only the association between the NDS and mobility  
208 limitations remained significant.

209

210 After adjusting for age and sex the likelihood of having mobility limitation (OR 0.65, 95% CI 0.35–  
211 1.22) and difficulties to perform self-care activities (OR 0.59, 95% CI 0.26–1.35) was lower among  
212 those who had the highest mMDS compared to those who had the lowest mMDS, however, the  
213 associations did not reach statistical significance (**Table 2**). Adjusting for further potential  
214 confounders did not have a major effect on the results.

215

216 When investigating the associations between NDS and mMDS components and disability, we found  
217 statistical significant associations of greater intake of fat and smaller intake of cereals with  
218 increased likelihood of having difficulties to perform self-care activities (**Table 3**). Greater intake of  
219 alcohol was significantly related to lower likelihood of having mobility limitations.

220

## 221 **Discussion**

222 In our study of 962 home-dwelling ageing men and women, we observed that the healthy Nordic  
223 diet is a strong predictor of two states of disability; mobility limitations and difficulties to perform  
224 self-care activities, even after adjusting for potential confounding factors including physical  
225 activity, chronic diseases and depression. Adherence to the Mediterranean diet was also related to  
226 lower likelihood of being disabled, however, the association was not statistically significant. To our  
227 knowledge, there are no previous studies that have compared different healthy diets within the same  
228 cohort for disability outcomes. Our findings extend the relevance of a healthy diet to target mobility  
229 limitations and difficulties to perform self-care activities and support the importance of diet in the  
230 pathogenesis of disability in old age.

231

232 Our results support the previous findings in which the protective effect of healthy diet, including the  
233 Healthy Eating Index, Japanese diet and Mediterranean diet, on disability has been observed. <sup>(12-16)</sup>  
234 Even though these diets vary in food and nutrient components, they all capture essential elements of  
235 a high-quality diet including high consumption of fruits, vegetables, and fish and low consumption  
236 of red and processed meat. When we investigated single food components of NDS and mMDS, we  
237 observed that only intake of fat, alcohol and cereals were related to disability. Based on our results,  
238 we suggest that the whole diet is a stronger predictor of disability in old age than single foods or

239 nutrients. Therefore, the findings in our study extend the previous results and suggest that healthy  
240 diet, which include high amounts of fruit, vegetables, and fish, moderate intake of alcohol, and  
241 small amounts of red meat and fat, help to prevent disability in old age.

242

243 Even though the healthy Nordic and Mediterranean diet were related to lower likelihood of  
244 disability, only the association of healthy Nordic diet with disability was significant. The healthy  
245 Nordic diet contains locally grown healthy Nordic foods whereas the widely investigated  
246 Mediterranean diet contains foods familiar in the Mediterranean area such as seeds, nuts and olive  
247 oil. Therefore, adherence to the healthy Nordic diet may be easier in Nordic population. The major  
248 difference between these diets is that dairy products are beneficial in the NDS, whereas they are  
249 detrimental in the mMDS. In addition, as these diet scores are based on study specific cut-offs for  
250 each food components, the absolute intake of each component may differ between studies even  
251 though diet scores are identical. Indeed, we observed that the median consumption of food  
252 components included in the mMDS, such as fruits and vegetables, were in part lower than observed  
253 in previous studies <sup>(15, 18)</sup>, suggesting that the diet of our study population is not as healthy than in  
254 the Mediterranean area. Furthermore, it should be noted that there are several different versions of  
255 Mediterranean diet score, which make it difficult to compare the results. Moreover, the range of the  
256 MDS is much smaller (0-9) compared to the NDS (0-25) which may limit the statistical power.  
257 Therefore, we propose that these could partly explain why we did not observe as strong associations  
258 between Mediterranean diet and disability as with healthy Nordic diet.

259

260 Strong evidence exist that mobility limitations are the results of physical impairments, such as  
261 decreased muscle strength <sup>(34, 35)</sup>. Several diseases and changes in body homeostasis also affect  
262 muscle strength and thus mobility. Previously, it has been demonstrated that adherence to the  
263 healthy Nordic and Mediterranean diet predicts greater muscle strength and thus better overall  
264 physical performance. <sup>(16, 18-20)</sup> In addition, both of these diets have been found to be associated with  
265 a lower risk of several diseases, such as diabetes and cardiovascular disease, and changes in body  
266 homeostasis including insulin resistance and inflammation. <sup>(36-39)</sup> Therefore, we suggest that  
267 plausible explanations for the observed associations between the healthy diet and disability are  
268 multifactorial, including beneficial effects of diet on muscle strength and on risk factors of chronic  
269 diseases. In addition, adherence to the healthy diet may also be linked with overall healthy lifestyles  
270 practices including increased physical activity, which associates with disability.

271

272 A significant strength of our study is its longitudinal study design that provides opportunity to  
273 investigate long-term influences of diet on disability. In addition, our study included a large study  
274 population consisting of both men and women. A further strength of our study is that we measured  
275 two states of disability; difficulties to perform self-care activities, which is more serious and  
276 mobility limitations, which are more common. Our study also has some limitations as discussed  
277 earlier. <sup>(20)</sup> Firstly, we adjusted for a multitude of covariates, including physical activity,  
278 socioeconomic status and chronic diseases; however, potential unmeasured and residual  
279 confounding cannot be excluded. Secondly, diet was measured by a validated FFQ <sup>(22, 23)</sup> only at  
280 baseline; therefore changes in the diet were not captured. Thirdly, the disability status of  
281 participants was self-reported, which may cause misclassification of disability status. <sup>(3)</sup> However, it  
282 has been shown that self-reported difficulties in walking reflect people's physical performance  
283 status and is able to identify those with worse physical performance. <sup>(40, 41)</sup> Therefore, it is valid and  
284 has clinical significance. We also observed that those who reported mobility limitations had  
285 significantly poorer physical performance than those with no limitations. In addition, we measured  
286 only one of the ADL components, difficulty to bath and dress, which may underestimate the  
287 difficulties in self-care activities. However, difficulty to bath is the most common ADL disability  
288 and it represents the first ADL in which most persons become disabled. Therefore, we suggest that  
289 it is a good indicator of ADL. Further, as reported earlier, those individuals who participated in the  
290 follow-up clinical examination had lower rates of disability, were younger, thinner, more educated,  
291 and had healthier diet at baseline compared with those who did not participate. <sup>(19)</sup> Those with  
292 unhealthy lifestyle habits may have died at earlier ages or developed disability and were, therefore,  
293 excluded from the study. Selective survival may thus have influenced the association between the  
294 healthy diet and disability. In addition, the incidence of disability was low during a 10-year follow-  
295 up which may limit the statistical power. Thus, participants may not be fully representative of all  
296 older people living in Finland.

297

## 298 **Conclusions**

299 Our study indicates that adherence to the healthy Nordic diet decreased the likelihood of mobility  
300 limitations and difficulties to perform self-care activities in old age. In addition, Mediterranean diet  
301 may also have a beneficial impact on disability. Our results may have important clinical  
302 implications. As disability is common among older age and restricts a person's independence as  
303 well as affects overall health, it is important try to prevent dis ability. Our results indicates that  
304 adherence to healthy diet provide one opportunity to prevent or delay disability. In addition, it is  
305 well known that adherence to healthy diet has several other health benefits as well. Therefore,

306 adhering to a healthy diet may have major beneficial effect on people's health. However, future  
307 intervention studies as well as longitudinal studies, that compare different diet scores with incidence  
308 of disability, are critically needed.  
309

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416 **Table 1.** Characteristics of the subjects by adherence to the diet score tertile

	Nordic diet score							modified Mediterranean diet score						
	Low (0-11)		Middle (12-15)		High (16-25)		P	Low (0-3)		Middle (4-5)		High (6-9)		P
n (men %)	366	(48.4)	308	(42.2)	288	(45.8)	.28	284	(45.8)	423	(44.7)	255	(47.1)	.83
Age (years) *	61.0	2.7	61.3	2.8	61.4	2.7	.25	61.3	2.9	61.2	2.8	61.2	2.5	.81
Body mass index (kg/m <sup>2</sup> ) *	26.9	3.9	26.9	3.8	26.9	4.0	.97	27.0	3.8	26.9	3.9	26.7	3.9	.60
Current smokers (%) *,†	26.6		16.3		10.2		<.001	25.0		17.7		11.9		.003
University degree (%) *	22.2		27.0		29.5		.28	21.8		25.1		31.8		.015
Physical activity (MET h/week) *	34.9	23.4	38.7	29.0	42.1	24.3	<.001	36.5	26.4	36.8	23.8	42.9	27.6	.004
Energy intake (MJ) *	8.5	2.9	9.4	3.3	10.0	3.1	<.001	8.1	2.7	9.2	3.1	10.5	3.4	<.001
Chronic diseases (%) *,‡	37.5		41.0		41.3		.50	38.4		40.1		40.8		.34
Depressed (%) *,§	14.9		11.4		14.4		.36	12.0		15.9		11.8		.20
Impaired cognition (%) *	2.3		3.2		1.6		.47	2.5		2.4		2.3		.99
Mobility limitations (%)	12.3		10.7		5.6		.013	9.9		11.6		6.7		.11
Self-care dependence (%)   ,¶	5.7		5.5		2.4		.097	6.0		4.5		3.5		.39

417 MET, metabolic equivalent.

418 Data are expressed as mean values (with standard deviations) for continuous values or percentages for categorical values. The differences  
 419 between the diet score groups were tested with one-way ANOVA for continuous variables and Chi-square test for categorical variables.

420 \* At baseline clinical examination.

421 † Smoking one or more cigarettes per day.

- 422 ‡ Presence of at least 1 chronic disease.
- 423 § Having at least mild depression.
- 424 || At follow-up clinical examination.
- 425 ¶ Difficulties to perform self-care activities.
- 426

427 **Table 2.** Odds ratios of mobility limitations and difficulties to perform self-care activities  
 428 over 10-year follow-up for baseline adherence to Nordic and Mediterranean diet among  
 429 Helsinki Birth Cohort Study participants (n=962)

	Model 1 *			Model 2 †			Model 3 ‡		
	OR	95% CI	P §	OR	95% CI	P §	OR	95% CI	P §
<b>Mobility limitations</b>									
<b>NDS tertiles</b>									
Low	Ref.			Ref.			Ref.		
Middle	0.86	0.54–1.39		0.88	0.53–1.48		0.81	0.46–1.40	
High	0.42	0.23–0.76	.005	0.42	0.22–0.80	.010	0.42	0.21–0.84	.014
<b>mMDS tertiles</b>									
Low	Ref.			Ref.			Ref.		
Middle	1.21	0.74–1.97		1.15	0.68–1.98		1.15	0.65–2.01	
High	0.65	0.35–1.22	.12	0.69	0.34–1.37	.26	0.61	0.28–1.30	.16
<b>Difficulties to perform self-care activities</b>									
<b>NDS tertiles</b>									
Low	Ref.			Ref.			Ref.		
Middle	0.92	0.47–1.78		0.89	0.45–1.79		0.87	0.41–1.86	
High	0.39	0.16–0.93	.039	0.38	0.15–0.94	.039	0.45	0.17–1.16	.087
<b>mMDS tertiles</b>									
Low	Ref.			Ref.			Ref.		
Middle	0.75	0.38–1.47		0.60	0.30–1.23		0.60	0.28–1.27	
High	0.59	0.26–1.35	.21	0.51	0.21–1.25	.17	0.45	0.17–1.21	.12

430 OR, odds ratio; CI, confidence interval; NDS, Nordic diet score; mMDS, modified

431 Mediterranean diet score; Ref., referent value.

432 \* Model 1, adjusted for sex and age.

433 † Model 2, adjusted for Model 1 plus body mass index, educational attainment, smoking  
 434 status, physical activity, energy intake, presence of chronic diseases and depression.

435 ‡ Model 3, adjusted for Model 2 plus impaired cognitive function (n=832).

436 § P for a linear trend.

437

438 **Table 3.** Association between sex specific tertiles of Nordic and Mediterranean diet score components and risk of mobility limitations and  
 439 difficulties to perform self-care activities during a 10 year follow-up of old adults (n=962) \*

Component (g/d)	Mobility limitations					Difficulties in self-care activities				
	1	2	3	1	2	3	1	2	3	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<b>NDS component</b>										
Nordic vegetables	Ref.	0.95	0.53–1.70	0.76	0.39–1.47	Ref.	0.64	0.28–1.47	0.99	0.42–2.35
Nordic fruits	Ref.	0.94	0.52–1.71	0.94	0.49–1.78	Ref.	1.26	0.56–2.82	1.30	0.53–3.21
Nordic cereals	Ref.	0.62	0.34–1.12	0.77	0.42–1.44	Ref.	0.91	0.42–1.97	0.64	0.27–1.50
Fat intake (E%)	Ref.	2.12	1.11–4.05	1.93	0.94–3.97	Ref.	3.52	1.21–10.24	4.13	1.33–12.84 †
Fat ratio ‡	Ref.	1.03	0.57–1.88	1.14	0.60–2.18	Ref.	0.98	0.45–2.13	0.65	0.26–1.62
Low-fat milk	Ref.	1.80	1.02–3.20	1.03	0.54–1.94	Ref.	2.36	1.02–5.45	1.59	0.63–4.00
Fish	Ref.	1.00	0.57–1.76	0.74	0.38–1.47	Ref.	0.50	0.22–1.16	0.68	0.28–1.65
Red meat	Ref.	1.16	0.62–2.16	1.09	0.54–2.19	Ref.	2.58	1.01–6.60	1.28	0.44–3.72
Alcohol §	Ref.	0.77	0.45–1.35	0.48	0.25–0.91 †	Ref.	1.21	0.54–2.70	1.02	0.42–2.45
<b>mMDS component</b>										
All vegetables	Ref.	0.53	0.29–0.98	0.80	0.42–1.51	Ref.	0.46	0.18–1.17	1.82	0.79–4.19
All fruits and nuts	Ref.	0.71	0.39–1.30	0.55	0.29–1.05	Ref.	1.38	0.61–3.15	0.88	0.36–2.15
All cereals	Ref.	0.66	0.35–1.25	0.74	0.36–1.49	Ref.	0.54	0.24–1.22	0.26	0.09–0.73 †

Legumes	Ref.	0.58	0.32–1.07	0.94	0.52–1.70	Ref.	1.21	0.56–2.60	0.59	0.24–1.43
All dairy products	Ref.	0.78	0.43–1.42	0.81	0.44–1.50	Ref.	1.11	0.48–2.53	1.07	0.46–2.49
Fat ratio ‖	Ref.	0.74	0.40–1.36	0.99	0.53–1.87	Ref.	0.63	0.28–1.41	0.49	0.20–1.21
Fish ¶	Ref.	1.76	0.99–3.10	0.94	0.48–1.86	Ref.	1.10	0.50–2.41	0.91	0.36–2.25
Meat **	Ref.	1.31	0.71–2.43	1.13	0.56–2.27	Ref.	3.11	1.24–7.78	2.29	0.80–6.61
Alcohol §	Ref.	0.74	0.43–1.28	0.45	0.24–0.85 †	Ref.	1.14	0.52–2.50	0.78	0.33–1.85

440 OR, odds ratio; CI, confidence interval; NDS, Nordic diet score; mMDS, modified Mediterranean diet score; Ref., referent value.

441 \* Adjusted for sex, age, body mass index, educational attainment, smoking status, physical activity, energy intake, presence of chronic diseases  
442 and depression, and mutually adjusted for the diet score components.

443 † P for a linear trend <.05.

444 ‡ A ratio of polyunsaturated fatty acids to saturated and trans-fatty acids.

445 § Both diet scores included alcohol, calculated as 100% ethanol.

446 ‖ A ratio of unsaturated fatty acids to saturated fatty acids.

447 ¶ All fish and fish products.

448 \*\* All meat and meat products.

449

450 **Appendix Table 1.** Daily intakes of healthy Nordic diet score and modified Mediterranean  
 451 diet score components by sex in 962 Helsinki Birth Cohort Study participants

Component (g/day)	Men	Women	
NDS component			452
Nordic vegetables	179 (121, 268)	231 (160, 331)	453
Nordic fruits	84 (30, 161)	116 (58, 207)	454
Nordic cereals	58 (31, 81)	54 (30, 75)	455
Fat intake (E%)	33 (29, 36)	32 (29, 36)	456
Fat ratio *	0.4 (0.4, 0.5)	0.4 (0.3, 0.5)	457
Low-fat milk	153 (13, 412)	86 (11, 221)	458
Fish	45 (29, 64)	33 (21, 45)	459
Red and processed meat	128 (87, 178)	80 (54, 119)	460
Alcohol †	11 (4, 19)	3 (2, 7)	461
mMDS component			462
All vegetables	217 (149, 324)	275 (191, 392)	463
All fruits and nuts	206 (93, 331)	263 (147, 428)	464
All cereals	151 (108, 198)	131 (97, 164)	465
Legumes	9 (4, 14)	8 (4, 12)	466
All dairy products	394 (250, 695)	442 (270, 652)	467
Fat ratio ‡	1.4 (1.2, 1.6)	1.4 (1.1, 1.6)	468
Fish and fish products	53 (36, 77)	39 (25, 53)	469
All meat and meat products	168 (114, 222)	117 (82, 162)	470
Alcohol †	11 (4, 19)	3 (2, 7)	471

476 NDS, Nordic diet score; E%, percent of energy intake, mMDS, modified Mediterranean diet  
 477 score. Values are medians (interquartile ranges).

478 \* A ratio of polyunsaturated fatty acids to saturated and trans-fatty acids.

479 † Both diet scores included alcohol, calculated as 100 % ethanol.

480 ‡ A ratio of unsaturated fatty acids to saturated fatty acids.

481

482