

1 **NATURE TRIPS AND TRADITIONAL METHODS FOR FOOD PROCUREMENT IN**  
2 **RELATION TO WEIGHT STATUS**

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15 Running title: Outdoor activities and weight status

16 Sources of support: Norwegian Research Council

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18

19 **Abstract**

20 Aims

21 The purpose of this study is to assess the relationships between trips in nature, gathering of  
22 wild plants, fishing and hunting and weight status.

23

24 Methods

25 Data from a cross-sectional questionnaire survey of 996 parents of 6<sup>th</sup> and 7<sup>th</sup> graders from 38  
26 randomly chosen schools in two Norwegian counties. All data are self-reported: Weight and  
27 height (participants were considered as overweight if BMI were 25 or higher), family trips in  
28 nature (dichotomised into  $\geq$ once a week vs. less than once a week), gathering of wild  
29 plants/mushrooms, fishing and hunting (all dichotomized into  $\geq$ sometimes vs. never), sex,  
30 family education level and general physical activity level. Multivariate logistic regression  
31 analyses were performed with overweight as the dependent variable

32

33 Results

34 Adjusting for all outdoor activities; those engaging in nature trips (OR=0.52; 95%CI=0.37-  
35 0.75) and those engaging in gathering (OR=0.73; 95%CI=0.55-0.98) were less frequently  
36 overweight, while those fishing (OR=1.83; 95%CI=1.35-2.47) were more frequently  
37 overweight. After also adjusting for sex, family education level and general physical activity  
38 level, nature trips (OR=0.52; 95%CI=0.36-0.75) and fishing (OR=1.53; 95%CI=1.12-2.10)  
39 were still significant, gathering was not. No association between hunting and weight status  
40 was observed.

41

42 Conclusion

- 43 Frequent family trips in nature might be an important behaviour in order to reverse the obesity  
44 epidemic.  
45
- 46 Key words: Outdoor activities, hiking, gathering, overweight, obesity
- 47 Word count abstract: 214
- 48 Word count whole manuscript excluding the abstract, references, figures and tables: 1719

49 **Background**

50 Cordain argues that “the model for human physical activity pattern was not established in  
51 gymnasia, athletic fields, or exercise physiology laboratories, but by natural selection acting  
52 over eons of evolutionary experience” (1). Until the appearance of agriculture just about  
53 10 000 years ago, human ancestors were hunter-gatherers, and food procurement depended  
54 directly upon energy expenditure. As such, man is evolved to engage in physical activity  
55 behaviours related to hunting and gathering; such as walking in nature, gathering of wild  
56 plants, hunting and fishing. However, earlier external constraints such as the availability of  
57 food resources, the travel time between patches of food and the energy costs of hunting,  
58 gathering and processing food have all drastically diminished in most modern environments  
59 (2), and there is no longer a need to engage in these activities in order to get food. The wild  
60 food gathered and hunted are also very nutrient dense (3), and wild food is indeed  
61 recommended in the New Nordic Diet (4). Therefore, activities related to food procurement  
62 have a double health promoting potential in increased energy expenditure and procurement of  
63 healthy foods at the same time. In addition, it has also been suggested that being in a natural  
64 environment may have intrinsic qualities which enhance health or well-being (5).

65

66 In Norway, the Outdoor Recreation Act established the individual's right to roam freely in the  
67 wilderness throughout the year (6). The Norwegian outdoor activity tradition can be seen as a  
68 further development of a natural lifestyle that has existed for a long time. In order to hunt and  
69 fish in lakes a licence is needed, but gathering of wild plants and mushrooms and fishing in  
70 the sea is free of charge for the public and therefore potentially accessible for all. Several  
71 people are using nature for recreational purposes, and still hunting and gathering also remain  
72 rather common. It has been reported that as much as 95% of the Norwegian population take

73 part in some type of outdoor activity (7). However, the gathering activities (fishing, berry-  
74 picking and mushroom-picking) are on the decline (7).

75

76 The world is facing an obesity epidemic. In Norway, the HUNT study showed that the  
77 prevalence of overweight men and women in the county of Nord Trøndelag increased from  
78 43% to 61% among women and from 50% to 75% among men from 1984-86 to 2006-08 (8).

79 Although genetic factors may influence the susceptibility of individuals to weight gain (9),  
80 there is consensus that changes in lifestyle behaviours are driving the obesity epidemic (10)  
81 rather than changes in biologic or genetic factors (11). However, there is little evidence about  
82 what specific foods and what types of physical activity (i.e. which specific lifestyle  
83 behaviours) that contributes to the trend. Basic human behaviours, reasoned by evolutionary  
84 biology, such as the physical activity in the procurement of wild food, might be part of the  
85 solution of the overweight/obesity epidemic.

86

## 87 **Aims**

88 The purpose of this study is to assess the relationships between trips in nature, gathering of  
89 wild plants, fishing and hunting and weight status among parents of middle school children.

90

## 91 **Methods**

92 In September 2008, a questionnaire survey was conducted among 6<sup>th</sup> and 7<sup>th</sup> graders and one  
93 of their parents in 27 random schools in two Norwegian counties (Hedmark and Telemark) as  
94 part of the Fruits and Vegetables Make the Marks (FVMM) project (12). The two counties are  
95 rather similar, with scattered villages, no large cities and with easy access to nature for most  
96 inhabitants. Research clearance was obtained from The Norwegian Social Science Data  
97 Services. A total of 996 parents (of 1712 eligible, 58%) participated in the survey, and

98 constitute the study sample for the present study (see (12) for more details about the sample).  
99 Of the study sample, 78% were women, 54 % had higher education, and mean age was 41.1  
100 years.

101  
102 Family trips in nature were assessed with the question. “How often do your family engage in  
103 trips in nature (forest or mountain area)?”. The response alternatives were: Never, less than  
104 once a month, less than once a week, once a week, more than once a week. This item was  
105 dichotomised into  $\geq$ once a week vs. less than once a week. Gathering of wild  
106 plants/mushrooms, fishing and hunting were assessed with the following statements: “I gather  
107 wild plants (e.g. berries) or mushrooms”, “I go fishing”, “I go hunting”. These items had three  
108 response alternatives: Yes often, Yes sometimes, No. They were all dichotomized into  
109  $\geq$ sometimes vs. never. Weight, height, sex, family education level (as a measure of socio  
110 economic position, dichotomized into: one or both parents having higher education vs. none)  
111 and general physical activity level (times/week doing sports or other activities being out of  
112 breath or sweating) were all reported in the parent questionnaire. Participants were considered  
113 as overweight if BMI were 25 or higher.

114  
115 Descriptive analyses of all variables, including bivariate relationships (chi-square), are  
116 presented in Table 1. Multivariate logistic regression analyses were then performed with  
117 overweight as the dependent variable (Table 2). Model 1 included the four behaviours only.  
118 Model 2 included sex and family education level + Model 1. Model 3 included general  
119 physical activity level + Model 2. Sex, family education level and general physical activity  
120 level were included in the models in order to adjust for these potential confounders of the  
121 traditional outdoor activities vs. weight status relationship. Model 3 was then repeated with  
122 obesity ( $BMI \geq 30$ ) as a dependant variable. All analyses were conducted using SPSS 17.

123

## 124 **Results**

125 A total of 42% of the study sample (n=996) was categorised as overweight, 22% were  
126 engaged in family trips in nature at least once a week, and 56%, 42% and 14% were  
127 respectively at least sometimes engaged in gathering of wild plants/mushrooms, fishing and  
128 hunting (Table 1).

129

130 Those engaging in family nature trips and gathering were less frequently overweight than  
131 those respectively not engaging in family nature trips (32 vs. 44% overweight, p=0.002) and  
132 not gathering (39 vs. 45% overweight, p=0.05), and those engaging in fishing were more  
133 frequently overweight than those not fishing (48 vs. 37% overweight, p=0.001) (Table 1). No  
134 significant association between hunting and weight status was observed.

135

136 Adjusting for all outdoor activities; those engaging in nature trips (OR=0.53; 95%CI=0.37-  
137 0.76) and those engaging in gathering (OR=0.73; 95%CI=0.54-0.98) were less frequently  
138 overweight, while those fishing (OR=1.86; 95%CI=1.37-2.51) were still more frequently  
139 overweight (Table 2). After also adjusting for sex and family education level, nature trips  
140 (OR=0.52; 95%CI=0.36-0.76) and fishing (OR=1.56; 95%CI=1.14-2.13) were still  
141 significant, gathering was not.

142

143 A total of 86 (9% of the study sample) was categorised as obese (BMI $\geq$ 30). In models similar  
144 to model 3 (adjusting for all outdoor activities, sex, family education level and general  
145 physical activity level), the OR for being obese were respectively 0.48 (95%CI=0.24-0.98) for  
146 those engaging in nature trips, 1.02 (95%CI=0.62-1.67) for those gathering, 0.97  
147 (95%CI=0.58-1.63) for those fishing and 1.30 (95%CI=0.65-2.61) for those hunting.

148

149 **Discussion**

150 As far as we know, this is the first study reporting relationships between trips in nature and  
151 traditional methods for food procurement and weight status.

152

153 Bringing your family on frequent trips to nature was associated with a 50% reduction in the  
154 odds of being overweight and obese, also after adjusting for the behaviours gathering, fishing  
155 and hunting, as well as for sex, family education level and general physical activity level.

156 Trips in nature are, at least for the majority of Norwegian, similar to hiking. Hiking has  
157 recently been reported to be related to general subjective physical health, and those not  
158 engaged in hiking had an OR of 2.14 (95%CI=1.47-3.12) for reporting poor subjective  
159 physical health (13). Most Norwegians live close to nature (e.g. forest, sea shore or mountain  
160 area), and therefore have the potential for engaging in trips in nature in their local area.

161 Hiking constitute an important and large part of Norwegians total physical activity level (14).

162

163 Gathering was also related to being less frequently overweight. However, this association was  
164 affected by sex and family education level. Women and those in families with higher  
165 education were both leaner and more engaged in gathering than men and those in families  
166 without higher education. In most cases, gathering of wild plants and mushrooms are energy  
167 demanding, i.e. energy is spent on transportation (walking) and picking, and for some wild  
168 plants (e.g. cloudberry) the travel time between patches is considerable. There are lots of  
169 edible wild plants and mushrooms in Norwegian nature, and the potential for gathering  
170 appears large. It has e.g. been reported that there probably are enough blueberries and  
171 cowberries alone to cover the national Norwegian recommendation for eating fruits (3).

172



173 Fishing was positively related to being overweight. This might be explained by the fact that  
174 some fishing is today not necessarily very energy demanding. Fishing is now often conducted  
175 from motorized boats, and people drive cars to the lake, river or sea. However, fishing in  
176 small lakes on the mountain, only reached by foot, might be energy demanding. A limitation  
177 of the present study is that we are not able to separate energy demanding fishing (and also  
178 hunting) from non energy demanding fishing (and hunting).

179

180 Another limitation with the study is that it includes parents from two of Norway's 19 counties  
181 only, and the results are therefore not necessarily generalizable to adults in Norway in  
182 general. Also, the majority of the participants (78%) were female. Females hunt and fish less  
183 than males and family related questions on hunting and fishing, rather than the individual  
184 based questions used, might have altered the results. The data are cross-sectional, and we  
185 therefore cannot draw any inferences about causality. All measures were self-reported, also  
186 weight and height. Self reported measures are always prone to bias. E.g. the answering  
187 alternative "sometimes" for the questions about gathering, fishing and hunting might have a  
188 different meaning for different people. Also, some people (e.g. women and those overweight)  
189 tend to underreport their weight more than others (15), which might have affected the results.

190 Only a few potential confounding factors were included in the present analysis (outdoor  
191 activities, sex, family education level and general physical activity level). Including other  
192 confounding factors (e.g. distance to nature and eating habits) might have altered the results.

193

## 194 **Conclusions**

195 Frequent family trips in nature might be an important behaviour in order to reverse the obesity  
196 epidemic. However, longitudinal- and intervention studies are needed to further assess the  
197 relationship between these activities and weight status.

198

199 **Acknowledgements**

200 The FVMM project is funded by the Research Council of Norway. The authors declare no  
201 conflict of interest.

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Table 1 Description of the variables and the unadjusted relationship between all variables assessed and weight status/outdoor activities (proportion of total sample, chi-square statistics).

|                                        |                | N   | Weight status<br>(%BMI≥25) | Family trips in nature<br>(%≥once/week) | Gathering<br>(%≥sometimes) | Fishing<br>(%≥sometimes) | Hunting<br>(%≥sometimes) |
|----------------------------------------|----------------|-----|----------------------------|-----------------------------------------|----------------------------|--------------------------|--------------------------|
|                                        |                |     | 42                         | 22                                      | 56                         | 42                       | 14                       |
| Weight status                          | Not overweight | 541 |                            | 25                                      | 60                         | 37                       | 13                       |
|                                        | Overweight     | 387 |                            | 17                                      | 53                         | 48                       | 15                       |
|                                        | p-value        |     |                            | 0.002                                   | 0.05                       | 0.001                    | 0.32                     |
| Family trips in nature<br>(≥once/week) | No             | 765 | 44                         |                                         | 51                         | 38                       | 10                       |
|                                        | Yes            | 211 | 32                         |                                         | 78                         | 56                       | 25                       |
|                                        | p-value        |     | 0.002                      |                                         | <0.001                     | <0.001                   | <0.001                   |
| Gathering<br>(≥sometimes)              | No             | 426 | 45                         | 11                                      |                            | 27                       | 6                        |
|                                        | Yes            | 550 | 39                         | 30                                      |                            | 53                       | 20                       |
|                                        | p-value        |     | 0.05                       | <0.001                                  |                            | <0.001                   | <0.001                   |
| Fishing<br>(≥sometimes)                | No             | 572 | 37                         | 16                                      | 46                         |                          | 5                        |
|                                        | Yes            | 405 | 48                         | 29                                      | 72                         |                          | 26                       |
|                                        | p-value        |     | 0.001                      | <0.001                                  | <0.001                     |                          | <0.001                   |
| Hunting<br>(≥sometimes)                | No             | 847 | 41                         | 19                                      | 52                         | 35                       |                          |
|                                        | Yes            | 134 | 46                         | 40                                      | 82                         | 80                       |                          |
|                                        | p-value        |     | 0.33                       | <0.001                                  | <0.001                     | <0.001                   |                          |
| Sex                                    | Males          | 210 | 63                         | 25                                      | 56                         | 61                       | 28                       |
|                                        | Females        | 760 | 35                         | 20                                      | 56                         | 36                       | 10                       |
|                                        | p-value        |     | <0.001                     | 0.15                                    | 0.90                       | <0.001                   | <0.001                   |
| Parents with higher education          | None           | 373 | 49                         | 18                                      | 45                         | 39                       | 10                       |
|                                        | One or both    | 611 | 37                         | 24                                      | 64                         | 43                       | 16                       |
|                                        | p-value        |     | <0.001                     | 0.025                                   | <0.001                     | 0.18                     | 0.005                    |

Table 2 Logistic regression showing OR of being overweight (BMI  $\geq 25$ ) in relation to the traditional activities, sex and family education level

|                                 |                       | Model I |              | Model II |              | Model III |              |
|---------------------------------|-----------------------|---------|--------------|----------|--------------|-----------|--------------|
|                                 |                       | OR      | CI (95%CI)   | OR       | CI (95%CI)   | OR        | CI (95%CI)   |
| Nordic outdoor activities       | Trips in nature vs NO | 0.53    | (0.37, 0.76) | 0.52     | (0.36, 0.76) | 0.54      | (0.37, 0.79) |
|                                 | Gathering vs NO       | 0.73    | (0.54, 0.98) | 0.85     | (0.63, 1.16) | 0.86      | (0.63, 1.17) |
|                                 | Fishing vs NO         | 1.86    | (1.37, 2.51) | 1.56     | (1.14, 2.13) | 1.55      | (1.13, 2.12) |
|                                 | Hunting vs NO         | 1.24    | (0.83, 1.96) | 1.03     | (0.66, 1.62) | 1.06      | (0.67, 1.66) |
| Sex                             | Women vs men          |         |              | 0.32     | (0.22, 0.45) | 0.32      | (0.22, 0.46) |
| Parents with higher education   | One or both vs NO     |         |              | 0.63     | (0.47, 0.85) | 0.65      | (0.48, 0.87) |
| General physical activity level | Times/week            |         |              |          |              | 0.93      | (0.86, 1.01) |

Model I - only containing the traditional activities as independent variables

Model II – contains model I + sex + family education level

Model III – contains model II + general physical activity level