

Supplementary material

I. Heuch, I. Heuch, K. Hagen, J-A. Zwart: The importance of body fat mass and fat-free mass in relation to prevalence of chronic low back pain: the HUNT Study

Supplementary Table 1 Descriptive statistics of other risk factors in tertiles of body fat mass^a

Tertile of body fat mass (kg)	Women			Men		
	≤ 21.3	21.4–30.3	≥ 30.4	≤ 18.5	18.6–26.3	≥ 26.4
Number of individuals	6893	6886	6859	5270	5321	5218
Age (year, mean)	49.1	55.3	55.3	51.1	58.7	59.2
Smoking (%)						
Never	51.1	41.7	40.3	51.2	42.8	37.0
Former	26.9	38.2	41.4	27.3	40.7	48.1
Daily	9.2	10.0	9.1	6.7	6.6	6.4
Occasional	12.8	10.1	9.2	14.8	9.9	8.5
Education (%)						
Low	17.8	28.6	30.8	18.7	25.8	28.5
Medium	27.6	28.7	31.7	38.5	37.6	40.2
High	54.6	42.7	37.6	42.8	36.5	31.4
Physical activity (%)						
Low	25.1	30.7	43.3	30.9	37.5	49.3
Moderate	12.6	14.8	15.0	10.6	13.4	12.7
Medium	30.3	31.6	27.3	25.2	25.5	21.1
High	32.0	22.9	14.4	33.4	23.6	16.8
Work activity (%)						
Mostly sitting	21.7	20.5	19.0	25.4	25.6	25.2
Much walking	26.2	21.3	19.5	17.4	15.6	13.3
Heavy labour	21.7	19.6	18.9	27.6	19.4	17.7
Unemployed	30.4	38.6	42.6	29.6	39.4	43.9
HADS score (mean)	7.8	7.6	8.1	7.3	7.1	7.5

Abbreviation: HADS, Hospital Anxiety and Depression Scale

^aAmong individuals with information about body fat mass, smoking, education, physical activity, work activity, HADS

Supplementary Table 2 Correlations between body measures, by sex

	Women				Men			
	Body fat mass	Fat-free mass	Body fat mass index	Percent body fat	Body fat mass	Fat-free mass	Body fat mass index	Percent body fat
Body fat mass	1.00	0.43	0.98	0.92	1.00	0.28	0.98	0.93
Fat-free mass		1.00	0.29	0.09		1.00	0.14	- 0.05
Body fat mass index			1.00	0.95			1.00	0.96
Percent body fat				1.00				1.00

Supplementary Table 3 Associations between body fat mass and prevalence of chronic LBP, by age

Age interval (year)	< 40	40–59	≥ 60
	PR (95% CI) ^a	PR (95% CI) ^{a,b}	PR (95% CI) ^a
Women			
Individuals in analysis	4807	7947	7884
Body fat mass (kg)			
≤ 15.9	1.00 (reference)	1.00 (reference)	1.00 (reference)
16.0–20.1	1.07 (0.88–1.29)	1.06 (0.90–1.24)	0.95 (0.81–1.12)
20.2–23.8	1.19 (0.98–1.44)	1.18 (1.01–1.38)	1.04 (0.89–1.21)
23.9–27.5	1.32 (1.09–1.62)	1.34 (1.16–1.56)	1.10 (0.95–1.28)
27.6–32.0	1.46 (1.20–1.77)	1.50 (1.30–1.74)	1.27 (1.10–1.46)
32.1–38.4	1.52 (1.23–1.87)	1.49 (1.29–1.73)	1.30 (1.13–1.51)
≥ 38.5	1.74 (1.42–2.12)	1.67 (1.45–1.93)	1.65 (1.43–1.91)
<i>P</i> for categorical effect	< 0.001	< 0.001	< 0.001
Men			
Individuals in analysis	2845	5601	7363
Body fat mass (kg)			
≤ 13.7	1.00 (reference)	1.00 (reference)	1.00 (reference)
13.8–17.4	1.15 (0.89–1.49)	1.00 (0.82–1.24)	1.03 (0.83–1.27)
17.5–20.6	0.94 (0.69–1.29)	1.12 (0.92–1.37)	1.08 (0.88–1.32)
20.7–23.9	1.03 (0.74–1.43)	1.09 (0.89–1.34)	1.15 (0.95–1.40)
24.0–27.6	1.25 (0.90–1.72)	1.28 (1.04–1.56)	1.30 (1.07–1.57)
27.7–33.4	1.13 (0.81–1.59)	1.17 (0.95–1.43)	1.47 (1.21–1.78)
≥ 33.5	1.16 (0.86–1.57)	1.27 (1.04–1.55)	1.67 (1.38–2.03)
<i>P</i> for categorical effect	0.70	0.053	< 0.001

Abbreviations: LBP, low back pain; PR, prevalence ratio; CI, confidence interval; HADS, Hospital Anxiety and Depression Scale

^aAdjusted for age, smoking, education, physical activity in leisure time, work activity, HADS, and fat-free mass

^bNot adjusted for HADS, because of non-convergence for complete model including HADS

Supplementary Table 4 Associations between body fat mass index and prevalence of chronic LBP

	Total number of individuals	Number of individuals with chronic LBP (%)	PR (95% CI), adjustment for age only	PR (95 % CI), comprehensive adjustment ^a
Women				
Individuals in analysis			22 194	20 638
Body fat mass index (kg/m ²)				
≤ 5.7	3170	612 (19.3)	1.00 (reference)	1.00 (reference)
5.8–7.3	3172	701 (22.1)	1.09 (0.99–1.20)	1.05 (0.95–1.16)
7.4–8.7	3170	781 (24.6)	1.18 (1.07–1.30)	1.13 (1.02–1.24)
8.8–10.1	3170	904 (28.5)	1.35 (1.23–1.48)	1.28 (1.17–1.41)
10.2–11.7	3171	999 (31.5)	1.47 (1.35–1.61)	1.32 (1.21–1.45)
11.8–14.1	3171	1109 (35.0)	1.63 (1.49–1.78)	1.46 (1.33–1.59)
≥ 14.2	3170	1322 (41.7)	1.97 (1.82–2.15)	1.66 (1.52–1.81)
Per standard deviation ^{b,c}			1.22 (1.20–1.24)	1.16 (1.15–1.18) ^d
<i>P</i> for categorical effect			< 0.001	< 0.001
<i>P</i> for linear trend ^c			< 0.001	< 0.001 ^d
<i>P</i> for quadratic effect ^{c,e}			< 0.001	< 0.001 ^d
Men				
Individuals in analysis			16 930	15 809
Body fat mass index (kg/m ²)				
≤ 4.2	2418	378 (15.6)	1.00 (reference)	1.00 (reference)
4.3–5.4	2419	432 (17.9)	1.07 (0.94–1.21)	1.06 (0.93–1.21)
5.5–6.4	2418	473 (19.6)	1.14 (1.01–1.29)	1.11 (0.98–1.27)
6.5–7.5	2421	508 (21.0)	1.21 (1.07–1.37)	1.15 (1.02–1.31)
7.6–8.7	2417	548 (22.7)	1.31 (1.16–1.47)	1.25 (1.10–1.41)
8.8–10.6	2419	585 (24.2)	1.39 (1.23–1.57)	1.31 (1.16–1.48)
≥ 10.7	2418	702 (29.0)	1.69 (1.50–1.89)	1.51 (1.34–1.70)
Per standard deviation ^{c,f}			1.17 (1.14–1.20)	1.13 (1.10–1.16)
<i>P</i> for categorical effect			< 0.001	< 0.001
<i>P</i> for linear trend ^c			< 0.001	< 0.001
<i>P</i> for quadratic effect ^{c,e}			0.053	0.030

Abbreviations: LBP, low back pain; PR, prevalence ratio; CI, confidence interval; HADS, Hospital Anxiety and Depression Scale

^aAdjusted for age, smoking, education, physical activity in leisure time, work activity, and HADS.

^bStandard deviation of body fat mass index for women: 4.01 kg/m²

^cBody fat mass index considered as a continuous variable, using original values measured

^dNot adjusted for HADS, because of non-convergence for complete model including HADS

^eIn model also including linear effect

^fStandard deviation of body fat mass index for men: 3.13 kg/m²

Supplementary Table 5 Associations between percent body fat and prevalence of chronic LBP

	Total number of individuals	Number of individuals with chronic LBP (%)	PR (95% CI), adjustment for age only	PR (95 % CI), comprehensive adjustment ^a
Women				
Individuals in analysis			22 194	20 638
Percent body fat (%)				
≤ 26.0	3190	599 (18.8)	1.00 (reference)	1.00 (reference)
26.1–31.0	3179	675 (21.2)	1.08 (0.98–1.19)	1.05 (0.95–1.16)
31.1–34.5	3246	827 (25.5)	1.27 (1.16–1.39)	1.20 (1.10–1.32)
34.6–37.4	3129	906 (29.0)	1.41 (1.29–1.55)	1.31 (1.20–1.44)
37.5–40.6	3203	1004 (31.3)	1.52 (1.39–1.66)	1.37 (1.25–1.50)
40.7–44.5	3088	1066 (34.5)	1.67 (1.53–1.82)	1.48 (1.35–1.62)
≥ 44.6	3159	1351 (42.8)	2.07 (1.90–2.25)	1.75 (1.61–1.92)
Per standard deviation ^{b,c}			1.28 (1.25–1.30)	1.20 (1.18–1.23)
<i>P</i> for categorical effect			< 0.001	< 0.001
<i>P</i> for linear trend ^c			< 0.001	< 0.001
<i>P</i> for quadratic effect ^{c,d}			0.036	0.30
Men				
Individuals in analysis			16 930	15 809
Percent body fat (%)				
≤ 17.7	2424	386 (15.9)	1.00 (reference)	1.00 (reference)
17.8–21.5	2456	432 (17.6)	1.03 (0.91–1.17)	1.00 (0.88–1.14)
21.6–24.4	2382	470 (19.7)	1.14 (1.00–1.29)	1.11 (0.98–1.27)
24.5–27.2	2479	534 (21.5)	1.23 (1.09–1.38)	1.17 (1.03–1.33)
27.3–30.1	2353	522 (22.2)	1.26 (1.11–1.42)	1.17 (1.03–1.33)
30.2–34.2	2444	597 (24.4)	1.38 (1.23–1.56)	1.31 (1.15–1.48)
≥ 34.3	2392	685 (28.6)	1.64 (1.46–1.84)	1.50 (1.32–1.69)
Per standard deviation ^{c,e}			1.19 (1.15–1.22)	1.15 (1.12–1.19)
<i>P</i> for categorical effect			< 0.001	< 0.001
<i>P</i> for linear trend ^c			< 0.001	< 0.001
<i>P</i> for quadratic effect ^{c,d}			0.28	0.40

Abbreviations: LBP, low back pain; PR, prevalence ratio; CI, confidence interval; HADS, Hospital Anxiety and Depression Scale

^aAdjusted for age, smoking, education, physical activity in leisure time, work activity, and HADS

^bStandard deviation of percent body fat for women: 8.32

^cPercent body fat considered as a continuous variable, using original values measured

^dIn model also including linear effect

^eStandard deviation of percent body fat for men: 7.52

Supplementary Table 6 Associations between fat-free mass and prevalence of chronic LBP, by age

Age interval (year)	< 40	40–59	≥ 60
	PR (95% CI) ^a	PR (95% CI) ^{a,b}	PR (95% CI) ^a
Women			
Individuals in analysis	4807	7947	7884
Fat-free mass (kg)			
≤ 40.5	1.00 (reference)	1.00 (reference)	1.00 (reference)
40.6–43.2	0.85 (0.69–1.04)	0.90 (0.79–1.04)	0.97 (0.88–1.07)
43.3–45.3	0.82 (0.67–1.00)	0.87 (0.76–1.00)	0.99 (0.89–1.10)
45.4–47.3	0.73 (0.60–0.90)	0.89 (0.78–1.01)	0.96 (0.86–1.07)
47.4–49.6	0.78 (0.64–0.95)	0.89 (0.78–1.01)	0.95 (0.85–1.07)
49.7–52.8	0.58 (0.46–0.72)	0.89 (0.78–1.01)	0.97 (0.87–1.10)
≥ 52.9	0.72 (0.59–0.89)	0.90 (0.80–1.02)	0.88 (0.76–1.01)
<i>P</i> for categorical effect	<0.001	0.58	0.62
Men			
Individuals in analysis	2845	5601	7363
Fat-free mass (kg)			
≤ 56.0	1.00 (reference)	1.00 (reference)	1.00 (reference)
56.1–59.8	1.02 (0.71–1.45)	1.04 (0.82–1.30)	0.92 (0.81–1.05)
59.9–62.9	0.74 (0.51–1.07)	0.96 (0.76–1.20)	0.92 (0.80–1.07)
63.0–65.7	0.87 (0.61–1.24)	1.12 (0.91–1.37)	1.01 (0.88–1.17)
65.8–68.9	0.75 (0.52–1.07)	0.92 (0.74–1.15)	0.94 (0.81–1.10)
69.0–73.3	0.77 (0.55–1.09)	0.93 (0.75–1.15)	0.82 (0.69–0.98)
≥ 73.4	1.10 (0.80–1.52)	0.98 (0.79–1.21)	0.93 (0.77–1.11)
<i>P</i> for categorical effect	0.030	0.26	0.27

Abbreviations: LBP, low back pain; PR, prevalence ratio; CI, confidence interval; HADS, Hospital Anxiety and Depression Scale

^aAdjusted for age, smoking, education, physical activity in leisure time, work activity, HADS, and body fat mass

^bNot adjusted for HADS, because of non-convergence for complete model including HADS

Supplementary Table 7 Prevalence of chronic LBP in women, with PR (95% CI) depending on combinations of body fat mass and fat-free mass^a

Tertile of fat-free mass (kg)	≤ 44.0	44.1–48.9	≥ 49.0
Number of individuals	6904	6969	6765
Body fat mass (kg)			
≤ 15.9	1.00 (reference)	0.80 (0.68–0.94)	0.78 (0.63–0.96)
16.0–20.1	0.98 (0.86–1.11)	0.87 (0.74–1.01)	0.86 (0.71–1.05)
20.2–23.8	1.09 (0.96–1.23)	0.92 (0.80–1.07)	1.00 (0.84–1.18)
23.9–27.5	1.08 (0.95–1.23)	1.12 (0.98–1.27)	1.12 (0.96–1.29)
27.6–32.0	1.29 (1.14–1.46)	1.25 (1.11–1.41)	1.22 (1.07–1.40)
32.1–38.4	1.36 (1.19–1.55)	1.28 (1.13–1.45)	1.16 (1.02–1.31)
≥ 38.5	1.44 (1.25–1.67)	1.53 (1.36–1.71)	1.46 (1.31–1.62)

Abbreviations: LBP, low back pain; PR, prevalence ratio; CI, confidence interval; HADS, Hospital Anxiety and Depression Scale

^aAdjusted for age, smoking, education, physical activity in leisure time, work activity, and HADS