

Table 1. Descriptive characteristics of n= 9117 British men attending preventive health screening at five UK centers between 2000 and 2009.

BMI Category	Normal Weight (Nw)			Overweight (Ow)			Obese (O)		
% of total sample (n=9117)	22.0%			56.4%			21.6%		
Fitness Category	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
% within BMI Category	14.1%	63.0%	22.9%	21.9%	57.7%	20.6%	21.8%	58.8%	18.4%
Metabolic health	Metabolically Healthy (MH)	Metabolically Unhealthy (MU)	Metabolically Healthy (MH)	Metabolically Unhealthy (MU)	Metabolically Healthy (MH)	Metabolically Unhealthy (MU)			
% within BMI category	84.8%	15.2%	84.5%	15.5%	83.1%	16.9%*			
% of total sample	18.6%	3.4%	47.7%	8.8%	17.9%	3.7%			
Phenotypes	MHNw	MUNw	MHOw	MUOw	MHO	MUO	Main Effect (BMI category)	Main Effect (Metabolic health)	Interaction
Age (years)	48.2 ±8.0	48.4 ±8.5	48.4 ±7.9	49.1 ±7.9	48.7 ±8.2	48.4 ±8.1	F=8.80, p=0.001	F=1.54, p=0.215	F=0.13, p=0.881
Deprivation (EID)	11.6 ±8.9	11.3 ±8.8	11.2 ±8.3	10.9 ±7.6	11.6 ±8.9	11.8 ±8.7	F=1.62, p=0.197	F=1.68, p=0.28	F=0.46, p=0.265
Waist (cm)	84.4 ±8.2	84.5 ±6.3	93.6 ±7.0	93.6 ±6.3	106.5 ±7.8	107.1 ±8.5	F=334, p=0.001	F=3.26, p=0.071	F=2.29, p=0.101
VO _{2peak} (ml·kg ⁻¹ ·min ⁻¹)	37.7 ±9.3†	36.8 ±9.4	37.8 ±9.5 †	36.5 ±9.4	37.9 ±9.0 †	36.0 ±8.9	F=0.95, p=0.901	F=19.5, p=0.001	F=0.96, p=0.36

MVPA (min·week⁻¹)	135 ±97 †	110 ±95	135 ±99 †	115 ±93	137 ±99 †	108 ±96	<i>F</i> =0.46, <i>p</i> =0.626	<i>F</i> =29.3, <i>p</i> =0.001	<i>F</i> =0.28, <i>p</i> =0.750
Alcohol (units·week⁻¹)	14.2 ±10.8	14.6 ±10.5	16.0 ±11.8	15.4 ±11.4	16.4 ±12.8 †	15.1 ±12.6	<i>F</i> =3.35, <i>p</i> =0.030	<i>F</i> =1.08, <i>p</i> =0.304	<i>F</i> =0.98, <i>p</i> =0.376
Smoking (current)	10.5%	11.1%	10.8%*	12.3%	15.3%*	7.6%%	$\chi^2=2.35$, <i>p</i> =0.308	$\chi^2=0.65$, <i>p</i> =0.441	
Physically Active	32.8%*	25.6%	33.3%*	27.0%	33.4%*	23.8%	$\chi^2=0.41$, <i>p</i> =0.815	$\chi^2=29.6$, <i>p</i> =0.001	
Fitness Low	19.6%*	26.3%	19.9%*	28.0%	18.9%*	28.3%	$\chi^2=324$, <i>p</i> <0.001	$\chi^2=155$, <i>p</i> =0.001	
Moderate	58.8%	59.0%	59.6%	54.5%	59.6%	58.3%			
High	21.6%*	14.7%	20.5%	17.5%	21.5%*	13.4%			

BMI - Body Mass Index; Nw – Normal-weight (BMI 18.5-24.9 kg·m⁻²); Ow – Overweight - (BMI 25-29.9 kg·m⁻²); O – Obese (BMI ≥30 kg·m⁻²). Metabolically Healthy (<2 components of the metabolic syndrome (excluding waist circumference) Metabolically Unhealthy: ≥2 components of the metabolic syndrome (excluding waist circumference).

Phenotypes: MHNw – metabolically healthy normal weight; MUNw – metabolically unhealthy normal weight; MHOw – metabolically healthy overweight; MUOw – metabolically unhealthy overweight; MHO – metabolically healthy obese; MUO – metabolically unhealthy obese.

† - Significantly different to metabolically unhealthy group within the same BMI category (*p*=0.05); * - Significantly different to metabolically unhealthy group within the same BMI category (χ^2 -test *p*<0.05)

Table 2. Predictors of metabolic health in normal weight, overweight and obese men attending preventive health screening at one of five UK centers between 2000 and 2009.

	Model ₁		Model ₂		Model ₃	
Obese	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)
Moderately Fit	1.52	(1.07-2.15)	1.65	(1.11-2.45)	1.64	(1.11-2.44)
Highly Fit	2.23	(1.51-3.30)	2.42	(1.37-4.20)	2.43	(1.39-4.24)
Physically Active	1.50	(1.14-1.98)	1.73	(1.15-2.58)	1.60	(1.09-2.60)
Overweight						
Moderately Fit	1.50	(1.27-1.75)	1.61	(1.25-2.06)	1.60	(1.25-2.06)
Highly Fit	1.57	(1.25-1.98)	1.67	(1.21-2.31)	1.66	(1.31-2.31)
Physically Active	1.29	(1.09-1.53)	1.23	(0.97-1.55)	1.22	(0.97-1.53)
Normal weight						
Moderately Fit	1.31	(1.01-2.02)	1.26	(0.86-1.85)	1.24	(0.85-1.84)
Highly Fit	1.87	(1.26-2.77)	1.86	(1.11-3.17)	1.87	(1.17-3.16)
Physically Active	1.34	(1.02-1.77)	1.60	(1.09-2.35)	1.59	(1.07-2.34)

Legend.

Model₁. Adjusted for age (years). Model₂ adjusted for: age, smoking status and alcohol consumption (units week) and **BMI (kg·m⁻²)**. Model₃ adjusted for: age, smoking status and alcohol consumption (units week) **BMI (kg·m⁻²) and waist circumference (cm)**. **Collinearity diagnostics derived from separate linear regression based on Model₃ show modest collinearity between BMI and waist circumference: Variance Inflation Factors (VIFs) as follows. Normal Weight, VIF=1.31; Overweight, VIF =1.48; Obese, VIF = 2.24.** Fitness – Cardiorespiratory Fitness (estimated VO_{2peak}). **Low Fitness defined as ≤20th age referenced percentile, Moderately Fit – ≥20th - <80th percentile; Highly Fit - ≥80th percentile.** Physically Active defined as ≥150 min·week⁻¹ self-reported moderate-to-vigorous physical activity (MVPA).

Table 3. Associations between cardiorespiratory fitness, physical activity, BMI category and metabolic health in ($n=9177$) men attending preventive health screening at one of five UK centers between 2000 and 2009.

	Model ₁		Model ₂		Model ₃	
	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)
Moderately Fit	1.45	(1.27-1.66)	1.52	(1.26-1.83)	1.51	(1.26-1.83)
Highly Fit	1.76	(1.47-2.10)	1.84	(1.44-2.35)	1.83	(1.44-2.36)
Physically Active	1.35	(1.19-1.53)	1.40	(1.18-1.67)	1.39	(1.17-1.67)
Overweight	1.00	(0.87-1.15)	0.95	(0.79-1.16)	0.90	(0.63-1.30)
Normal Weight	1.11	(0.94-1.32)	1.10	(0.87-1.38)	1.05	(0.81-1.36)

Legend.

Model₁. Adjusted for age (years) only. Model₂ adjusted for: age, smoking status and alcohol consumption (units per week). Model₃ adjusted for: age, smoking status and alcohol consumption (units week) **and waist circumference (cm). Collinearity diagnostics show modest collinearity between BMI categories and waist circumference (Model₃, VIF=2.35).** Fitness – Cardiorespiratory Fitness. **Low Fitness defined as $\leq 20^{\text{th}}$ age referenced percentile, Moderately Fit: $\geq 20^{\text{th}}$ to $< 80^{\text{th}}$ percentile; Highly Fit: $\geq 80^{\text{th}}$ percentile.** Physically Active defined as ≥ 150 min \cdot week⁻¹ self-reported moderate-to-vigorous physical activity (MVPA). Normal-weight (BMI 18.5-24.9 kg \cdot m⁻²); Overweight - (BMI 25-29.9 kg \cdot m⁻²); Obese (BMI ≥ 30 kg \cdot m⁻²). OR - Odds Ratios expressed as relative likelihood of being metabolically healthy (≤ 2 components of metabolic syndrome) from multivariate logistic regression using referent groups: Physically Inactive, Low Fitness and Obese.