

ABSENCE OF EXCESS BODY FATNESS

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Table 2.2.17a Cohort studies of measures of body fatness and cancer of the urinary bladder

Reference Cohort Location Follow-up period	Total number of subjects Sex Incidence/mortality	Exposure categories	Exposed cases	Relative risk (95% CI)	Covariates	Comments
Tulinius et al. (1997) Reykjavik Study Iceland Started in 1967	11 366 Women Incidence	BMI per 1 kg/m ²	48	0.92 (0.83–0.99)	Age	
Nagano et al. (2000) Atomic bomb survivors cohort Japan	38 540 Men and women Incidence	BMI < 19 19–21.9 22–24.9 ≥ 25	14 37 37 8	1.00 1.28 (0.70–2.45) 1.50 (0.82–2.90) 1.55 (0.77–3.21)	Age	
Wolk et al. (2001) Swedish registries Sweden 1968–1987	8165 Men Incidence 19 964 Women Incidence	Obese vs non-obese Obese vs non-obese	32 35	SIR: 1.1 (0.8–1.6) SIR: 1.4 (1.0–1.9)		Obesity defined as discharge diagnosis of obesity: ICD-7: 287.00, 287.09; ICD-8: 277.99; ICD-9: 278A
Tripathi et al. (2002) Iowa Women’s Health Study USA 1986–1998	37 459 Women Incidence	BMI ≤ 22.89 22.90–25.02 25.04–27.43 27.46–30.67 ≥ 30.69 [P _{trend}] WC (cm) ≤ 75.9 76.2–82.2 82.6–89.2 91.0–99.1 ≥ 99.4	30 27 21 18 16 25 26 20 23 16	1.00 0.88 (0.52–1.48) 0.66 (0.38–1.16) 0.58 (0.32–1.04) 0.53 (0.29–0.96) [0.06] 1.00 1.03 (0.59–1.78) 0.77 (0.43–1.39) 0.85 (0.48–1.51) 0.64 (0.34–1.20)	Age, smoking, physical activity, diabetes, alcohol consumption, marital status, occupation	

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Calle et al. (2003) Population-based cohort USA 1982–1998	404 576 Men Mortality	BMI 18.5–24.9 25–29.9 ≥ 30 [<i>P</i> _{trend}]	375 421 76	1.00 1.03 (0.89–1.18) 1.14 (0.88–1.46) [0.36]	Age, education level, smoking, physical activity, alcohol consumption, marital status, aspirin use, fat intake, vegetable intake	Similar risk estimates in never- smokers and ever-smokers	
	495 477 Women Mortality	BMI 18.5–24.9 25–29.9 ≥ 30 [<i>P</i> _{trend}]	180 83 34	1.00 1.02 (0.78–1.33) 1.34 (0.91–1.95) [0.21]			Similar risk estimates in never- smokers and ever-smokers
Samanic et al. (2004) United States Veterans cohort 1969–1996	4 500 700 Men Incidence	Obesity			Age, calendar year	Obesity defined as discharge diagnosis of obesity: ICD-8: 277; ICD-9: 278.0	
		Non-obese	White men: 16 260	1.00			
		Obese	1087	1.13 (1.06–1.20)			
		Non-obese	Black men: 1796	1.00			
		Obese	72	0.85 (0.67–1.08)			
Batty et al. (2005) Whitehall Study United Kingdom 1967–1970	18 403 Men Mortality	BMI 18.5–24.9 25–29.9 ≥ 30 [<i>P</i> _{trend}]	144	1.00 1.11 (0.80–1.55) 0.83 (0.30–2.28) [0.80]	Age		
Oh et al. (2005) Korean civil servants and teachers Republic of Korea 1992–2001	781 283 Men Incidence	BMI < 18.5 18.5–22.9 23.0–24.9 25.0–26.7 27.0–29.9 ≥ 30 [<i>P</i> _{trend}]	19 236 202 106 44 3	1.76 (1.09–2.84) 1.00 1.20 (0.99–1.45) 1.12 (0.89–1.41) 1.16 (0.83–1.61) 0.70 (0.22–2.19) [0.629]	Age, smoking status, alcohol consumption, frequency of regular exercise, family history of cancer, residence area		

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Rapp et al. (2005) Population-based cohort Austria 1985–2002	67 447 Men Incidence	BMI 18.5–24.9 25–29.9 30–34.9 [<i>P</i> _{trend}]	78 78 19	1.00 0.81 (0.59–1.11) 0.74 (0.45–1.22) [0.15]	Age, smoking status, occupation	
	78 484 Women Incidence	BMI 18.5–24.9 25–29.9 30–34.9 [<i>P</i> _{trend}]	21 22 11	1.00 1.35 (0.74–2.48) 1.60 (0.76–3.36) [0.19]		
Cantwell et al. (2006) Breast Cancer Detection and Demonstration Project USA 1987–1998	54 308 Women Incidence	BMI < 18.5 18.5–24.9 25.0–29.9 30–34.9 ≥ 35	2 103 42 14 3	0.55 (0.14–2.24) 1.00 1.05 (0.73–1.50) 1.28 (0.73–2.25) 0.83 (0.26–2.63)	Age, year, smoking status	
Samanic et al. (2006) Swedish Construction Worker Cohort Sweden 1971–1999	362 552 Men Incidence	BMI 18.5–24.9 25–29.9 ≥ 30 [<i>P</i> _{trend}]	1066 836 128	1.00 0.94 (0.86–1.03) 0.91 (0.76–1.09) [< 0.21]	Age, year, smoking status	
Fujino et al. (2007) Japan Collaborative Cohort Study for Evaluation of Cancer (JACC) Japan NR	NR Men Mortality	BMI < 18.5 18.5–24.9 25.0–29.9 ≥ 30	6 67 8 1	0.86 (0.37–2.01) 1.00 0.62 (0.29–1.30) 1.31 (0.18–9.53)	Age, area of study	

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Reference Cohort Location Follow-up period	Total number of subjects Sex Incidence/mortality	Exposure categories	Exposed cases	Relative risk (95% CI)	Covariates	Comments
Fujino et al. (2007) (cont.)	NR Women Mortality	BMI < 18.5 18.5–24.9 25.0–29.9 ≥ 30	3 40 11 2	0.96 (0.28–3.20) 1.00 0.65 (0.24–1.70) 1.23 (0.16–9.16)		
Holick et al. (2007) Nurses' Health Study USA 1976–2002	121 700 Women Incidence	BMI 18.0–22.9 23.0–24.9 25.0–26.9 27.0–29.9 ≥ 30 per 1 kg/m ²	166 71 52 34 36	1.0 1.04 (0.78–1.38) 1.23 (0.90–1.69) 1.09 (0.75–1.58) 1.31 (0.91–1.52) 1.02 (0.99–1.04)	Age, pack-years of cigarette smoking, current smoking	
Holick et al. (2007) Health Professionals Follow-Up Study USA 1986–2002	51 529 Men Incidence	BMI 18.0–22.9 23.0–24.9 25.0–26.9 27.0–29.9 ≥ 30 per 1 kg/m ²	76 143 147 102 39	1.0 1.11 (0.84–1.47) 1.14 (0.86–1.51) 1.12 (0.83–1.51) 1.01 (0.68–1.50) 1.00 (0.97–1.03)	Age, pack-years of cigarette smoking, current smoking	
Reeves et al. (2007) Population-based cohort United Kingdom 1996–2001	1.2 million Women Incidence	BMI < 22.5 22.5–24.9 25.0–27.4 27.5–29.9 ≥ 30 per 10 kg/m ²	117 149 147 92 110	0.99 (0.83–1.19) 1.00 1.14 (0.97–1.34) 1.15 (0.93–1.41) 1.07 (0.88–1.30) 1.09 (0.89–1.34)	Age, region, SES, reproductive history, smoking, alcohol consumption, physical activity, HRT use	Stratification by smoking reported similar risk estimates in never-smokers and ever- smokers

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Reference Cohort Location Follow-up period	Total number of subjects Sex Incidence/mortality	Exposure categories	Exposed cases	Relative risk (95% CI)	Covariates	Comments
Reeves et al. (2007) (cont.)	1.2 million Women Mortality	BMI				Age, region, SES, reproductive history, smoking, alcohol consumption, physical activity, HRT use
		< 22.5	38	1.16 (0.84–1.60)		
		22.5–24.9	41	1.00		
		25.0–27.4	49	1.35 (1.02–1.78)		
		27.5–29.9	24	1.03 (0.69–1.54)		
≥ 30	34	1.12 (0.79–1.57)				
		per 10 kg/m ²	186	1.00 (0.68–1.45)		
Jee et al. (2008) National Health Insurance Cooperation Study Republic of Korea 1992–2006	770 556 Men Incidence	BMI				Age, smoking status
		< 20.0	233	0.84 (0.68–1.04)		
		20.0–22.9	743	0.91 (0.78–1.05)		
		23.0–24.9	604	1.00		
		25.0–29.9	529	1.19 (1.01–1.40)		
	≥ 30	19	1.02 (0.52–1.97)			
	443 273 Women Incidence	BMI				
		< 20.0	26	0.57 (0.31–1.03)		
		20.0–22.9	99	0.74 (0.49–1.11)		
		23.0–24.9	84	1.00		
25.0–29.9		94	1.10 (0.75–1.62)			
≥ 30	8	0.74 (0.27–2.06)				
Koebnick et al. (2008) NIH-AARP cohort USA 1995–2003	287 941 men 183 819 women Incidence	BMI				Age, sex, smoking status and intensity, race/ethnicity, education level, marital status, family history of cancer, diet, alcohol consumption; for women, additionally adjusted for HRT use, parity
		18.5–24.9	479	1.00		
		25.0–29.9	845	1.16 (1.03–1.29)		
		30.0–34.9	301	1.23 (1.06–1.43)		
		≥ 35	94	1.30 (1.04–1.63)		

When stratifying by sex,
significant only in men;
stratification by smoking
yielded inconsistent results
across smoking categories

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Reference Cohort Location Follow-up period	Total number of subjects Sex Incidence/mortality	Exposure categories	Exposed cases	Relative risk (95% CI)	Covariates	Comments
Larsson et al. (2008) Cohort of Swedish men Sweden 1998–2007	45 906 Men Incidence	BMI				Age, education level, smoking status, pack- years of smoking
		18.0–24.9	176	1.0		
		25.0–29.9	177	0.98 (0.79–1.20)		
		30.0–34.9	31	0.92 (0.62–1.34)		
		≥ 35	4	0.79 (0.29–2.14)		
		WC (cm)				
		< 90	62	1.00		
90–94	83	1.22 (0.88–1.70)				
95–101	102	1.12 (0.82–1.54)				
≥ 102	89	1.00 (0.72–1.39)				
Prentice et al. (2009) Women’s Health Initiative USA 1993–2005	80 816 Women Incidence	BMI per 10 kg/m ²	99	0.74 (0.34–1.60)	Age, energy intake	
Andreotti et al. (2010) Agricultural workers USA 1993–2005	39 628 Men Incidence	BMI			Age, smoking, alcohol consumption	
		< 18.5	0	–		
		18.5–24.9	34	1.0		
		25.0–29.9	66	1.16 (0.75–1.81)		
		30–34.9	28	1.41 (0.82–2.41)		
		≥ 35	3	–		
		per 1 kg/m ²		1.01 (0.96–1.05)		
28 319 Women Incidence	BMI			Age, exercise		
	< 18.5	1	–			
	18.5–24.9	7	1.0			
	25.0–29.9	6	0.97 (0.32–2.89)			
	30–34.9	2	–			
	≥ 35	1	–			
per 1 kg/m ²		0.93 (0.83–1.05)				

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Reference Cohort Location Follow-up period	Total number of subjects Sex Incidence/mortality	Exposure categories	Exposed cases	Relative risk (95% CI)	Covariates	Comments
Parr et al. (2010) Pooled analysis Asia	424 519 Men and women Mortality	BMI < 18.5 18.5–24.9 25.0–29.9 ≥ 30		1.48 (0.75–2.92) 1.0 1.06 (0.77–1.46) 0.53 (0.23–1.20)	Age, smoking	
Häggström et al. (2011) Metabolic Syndrome and Cancer Project (Me-Can) Austria, Norway, and Sweden	289 866 Men Incidence	BMI, quintiles Q1 Q2 Q3 Q4 Q5 [<i>P</i> _{trend}]	269 302 316 303 334	1.00 1.06 (0.89–1.28) 1.06 (0.88–1.26) 0.97 (0.80–1.16) 1.13 (0.94–1.35) [0.35]	Smoking, year of birth, age	
	288 834 Women Incidence	BMI, quintiles Q1 Q2 Q3 Q4 Q5 [<i>P</i> _{trend}]	51 60 70 56 72 30	1.00 1.00 (0.66–1.51) 1.00 (0.67–1.50) 0.67 (0.44–1.03) 0.87 (0.58–1.32) [0.34]		
Bhaskaran et al. (2014) Clinical Practice Research Datalink United Kingdom 1987–2012	5.24 million Men and women Incidence	BMI per 5 kg/m ²	7976	1.03 (0.99–1.06)	Age, sex, year, diabetes, alcohol consumption, smoking, SES	Stratification by smoking showed similar association in never-smokers and ever- smokers
Roswall et al. (2014) EPIC study European countries 1992–2008 (varying by cohort)	141 152 Men Incidence	BMI ≤ 24.52 > 24.52–26.45 > 26.45–28.96 > 28.96 [<i>P</i> _{trend}] per 2 kg/m ²	1018	1.00 1.20 (1.01–1.43) 1.11 (0.93–1.33) 1.25 (1.04–1.50) [0.0009] 1.05 (1.01–1.08)	Smoking status and intensity, duration of smoking, alcohol intake	Stratified analysis by country also reported

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Reference Cohort Location Follow-up period	Total number of subjects Sex Incidence/mortality	Exposure categories	Exposed cases	Relative risk (95% CI)	Covariates	Comments
Roswall et al. (2014) (cont.)	249 726 Women Incidence	BMI ≤ 22.77 > 22.77–25.00 > 25.00–28.02 > 28.02 [P _{trend}] per 2 kg/m ²	373	1.00 1.07 (0.80–1.43) 0.97 (0.73–1.30) 0.91 (0.68–1.23) [0.34] 0.98 (0.93–1.03)		Stratified analysis by country also reported
	141 152 Men Incidence	WC (cm) ≤ 90.0 > 90.0–96.0 > 96.0–102.5 > 102.5 [P _{trend}] per 5 cm	1018	1.00 1.14 (0.96–1.37) 1.15 (0.96–1.39) 1.21 (1.01–1.46) [0.02] 1.04 (1.01–1.08)	Height, smoking status and intensity, duration of smoking, alcohol intake	Analysis stratified by sex and country also reported
	249 726 Women Incidence	WC (cm) ≤ 73.0 > 73.0–80.0 > 80.0–89.5 > 89.5 [P _{trend}] per 5 cm	373	1.00 0.80 (0.59–1.08) 0.81 (0.60–1.09) 0.96 (0.70–1.32) [0.85] 1.01 (0.96–1.06)		Analysis stratified by sex and country also reported
Song et al. (2014) FINRISK study Finland 1972–2008	54 725 Men and women Incidence	Polynomial plots of risk vs BMI	Men: 192 Women: 40	Null association for men and women	Baseline smoking status, leisure-time physical activity, area	[The risk estimates by BMI category reported in the supplemental material do not match the plots reported in the main article]

BMI, body mass index (in kg/m²); CI, confidence interval; EPIC, European Prospective Investigation into Cancer and Nutrition; HRT, hormone replacement therapy; NIH-AARP, National Institutes of Health–AARP Diet and Health Study; NR, not reported; SES, socioeconomic status; SIR, standardized incidence ratio; WC, waist circumference

Table 2.2.17b Case-control studies of measures of body fatness and cancer of the urinary bladder

Reference Study location Period	Total number of cases Total number of controls Sex Source of controls	Exposure categories	Exposed cases	Relative risk (95% CI)	Covariates Comments
Pelucchi et al. (2002) Italy 1985–1992	110 298 Women Hospital	BMI, tertiles < 23.75 23.75–27.24 ≥ 27.25	53 33 24	1.00 0.76 (0.43–1.34) 0.61 (0.33–1.14)	Age, study centre, cigarette smoking
Lin et al. (2010) USA Started in 1999	803 803 Hospital controls (healthy individuals seen at the clinic for annual physical exams)	BMI Normal Overweight Obese	236 367 177	1.0 0.95 (0.73–1.23) 0.79 (0.59–1.07)	Age, sex, tobacco smoking, energy intake, physical activity
MacKenzie et al. (2011) USA 1998–2001	331 263 New Hampshire State Department of Health and Human Services' Cancer Registry	BMI Comparison of means		Cases: 28.0 (4.8) Controls: 27.0 (5.0) <i>P</i> = 0.07	None
Attner et al. (2012) Sweden 2005–2007	Urinary tract and bladder cancer: 1093 8043 Men and women Population register	Obese vs non-obese 90–1460 days before diagnosis 1461–3650 days before diagnosis	1.9%	0.75 (0.38–1.45) 1.20 (0.46–3.13)	Age, sex, diabetes, abnormal blood lipids Obesity defined as discharge diagnosis (ICD-10: E66), obtained from health-care registries

BMI, body mass index (in kg/m²); CI, confidence interval; ICD, International Classification of Diseases

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