

## Appendix: Relative Risk assessments

Prepared for the Dynamo-HIA project<sup>1</sup>

This document provides the sources and estimates of the Relative Risk (RR) of defined diseases according to BMI status (given as per BMI unit increase from BMI 22 = 1.0; and per BMI category of Overweight and Obese relative to normal weight). The RR used for the Dynamo-HIA study is given in the last line of each table.

Adjustments for age and smoking are given as multipliers of the differential risk, i.e. as a multiplier of the difference in relative risk from the base (1.0). Thus an adjustment multiplier of x0.95 applied to an RR of 1.20 would lead to an RR of 1.19 (calculated as  $RR' = 1 + A(RR-1)$  where RR is the given relative risk, RR' is the adjusted relative risk and A is the adjustment multiplier).

### Assumptions:

The value chosen for the Dynamo-HIA project was a judgement based on a number of factors:

- The findings of relevant and large-scale studies, shown in the tables;
- The findings of systematic reviews and meta-analyses, shown in the tables;
- Higher priority to data which represented European populations;
- Higher priority to data derived from surveys which used measured, rather than self-reported, heights and weights to obtain BMI;
- Higher priority to reviews conducted in most recent decades, referring to more studies;
- Choosing a conservative approach (i.e. 'the actual risk is likely to be greater than this') rather than a 'worst case' approach (i.e. 'the actual risk could be as high as this').

Due to the limited evidence available for children, a relative risk of one (1.0) is recommended for individuals under the age of 20 years.

For the other age groups, we assumed that the relative risk estimates are the same for all age groups, except where we were able to obtain data by age group. In these cases the relative risks were adjusted to conform with the known effects of age on the association between BMI and disease outcome. The adjustments are shown in the tables and should be used as follows:

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<sup>1</sup> Dynamo-HIA (Dynamic Modelling for Health Impact Assessment) see <http://www.dynamo-hia.eu/>. The project is funded by the EU Public Health Programme 2003-2008 of the European Commission's Directorate General for Health and Consumer Affairs (DG SANCO), with co-financing from the Erasmus Medical Center Rotterdam, the Institute of Public Health and the Environment in the Netherlands, the Catalan Institute of Oncology, the International Obesity task force, the London School for Hygiene and Tropical Medicine, the Haughton Institute in Dublin and the Instituto Tumori in Milan.



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Adjustments for age and smoking are given as multipliers of the differential risk, i.e. as a multiplier of the difference in relative risk from the base (1.0). Thus an adjustment multiplier of x0.95 applied to an RR of 1.20 would lead to an RR of 1.19 (calculated as  $RR' = 1 + A(RR-1)$  where RR is the given relative risk, RR' is the adjusted relative risk and A is the adjustment multiplier).

Excel files containing relative risks for males and females aged 1 to 95 years have been constructed for the Dynamo-HIA project.

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### Summary tables

Tables show the RRs for:

*All-Cause Mortality*

*Incident risk from Ischaemic (Coronary) Heart Disease*

*Incident risk from Stroke*

*Incident risk from Diabetes*

*Incident risk from Lung Cancer*

*Incident risk from Breast Cancer*

*Incident risk from Endometrial Cancer*

*Incident risk from Oesophageal Cancer*

*Incident risk from Kidney Cancer*

*Incident risk from Oral Cancer*

*Incident risk from Colorectal Cancer*

*Incident risk from Gallbladder Cancer*

*Incident risk from COPD*: PLEASE NOTE there was insufficient information on which to construct a table of relative risks.

## RR All-Cause Mortality

**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women	multipliers	multipliers (never smoked = 1.0)	
Moore	m		1.05	x 0.95 from age 65		
Lawlor	m	1.08	1.03			
Rosengren	m	1.09	--			
PSC meta	m + sr	1.06	1.05	x 0.95 from age 60 x 0.85 from age 75	x 0.92 men x 0.99 women	
McGee meta	?	1.02	1.02			
Banegas	sr	1.04			x 0.87	
Adams	sr	1.03	1.04	x 0.95 from age 55 x 0.90 from age 65	x 0.72 men x 0.80 women	
Freedman	sr	1.07	1.03		x 1.67 men x 3.97 women	
Calle	sr	1.04	1.06	x 0.96 from age 65 x 0.90 from age 75		
Stevens	sr	1.07	1.03	x 0.99 per decade		
Yarnell	sr	1.07	-			
<b>Dynamo-HIA</b>		<b>1.07</b>	<b>1.03</b>	<b>x 0.98 from age 50 x 0.95 from age 60 x 0.90 from age 70</b>	<b>inconsistent</b>	

- Moore et al. Past BMI and risk of mortality among women. *Int J Obes*, 2008; 32: 730-739.
- Lawlor et al. Reverse causality and confounding and the associations of overweight and obesity with mortality. *Obesity*. 2006; 14: 2294-2304.
- Rosengren et al. Body weight and weight gain during adult life in men in relation to CHD and mortality. *Eur Heart J*. 1999; 20:268-277.
- PSC = Prospective Studies Collaboration. BMI and cause-specific mortality in 900,000 adults: collaborative analyses of 57 prospective studies. *Lancet*, 2009; 373:1083-1096.

- McGee et al. *Body Mass Index and mortality: a meta-analysis based on person level data from twenty-six observational studies.* *Ann Epidemiol*, 2005; 15:87-97.
- Banegas et al *Mortality attributable to obesity in Europe, EJC*N, 2003; 57:201-208.
- Adams et al. *Overweight, obesity and mortality in a large prospective cohort of persons 50-71 years old.* *NEJM* 2006; 355:763-778.
- Freedman et al. *The mortality risk of smoking and obesity combined.* *Am J Prev Med*, 2006; 31: 355-362.
- Calle et al *BMI and mortality in a prospective cohort of US adults.* *NEJM* 1999; 341:1097-1105.
- Stevens et al, *The effect of age on the association between BMI and mortality.* *NEJM* 1998; 338:1-7.
- Yarnell et al. *Comparison of weight in middle age, weight at 18 and weight change between, in predicting subsequent 14-year mortality and coronary events: Caerphilly Prospective Study.* *J Epidemiol Community Health* 2000; 54: 344-348.

#### RR All-Cause Mortality

##### By BMI category (BMI 22=1.0)

Source	BMI sr=self rep m=measured	RR BMI 25-29.9		RR BMI 30+		age multipliers	current smoking multipliers (never smoked = 1.0)
		men	women	men	women		
Moore	m		1.22		1.60	x 0.95 from age 65	
Lawlor	m	1.38	1.20	2.10	1.76		
Rosengren	m	1.0	1.10	1.39	1.55		
PSC meta	m + sr	1.44	1.27	2.07	1.61	x 0.95 from age 60 x 0.85 from age 75	x 0.92 men x 0.99 women
McGee meta	?	1.0	1.0	1.20	1.28		
Banegas	sr	1.10		1.54			x 0.87
Adams	sr	1.0	1.06	1.35	1.18	x 0.95 from age 55 x 0.90 from age 65	x 0.72 men x 0.80 women
Freedman	sr	0.80	1.20	1.20	1.20		x 1.67 men x 3.97 women
Calle	sr	1.15	1.33	2.05	1.53	x 0.96 from age 65 x 0.90 from age 75	
Stevens	sr	1.28	1.18	1.64	1.35	x 0.99 per decade from age 30	
Yarnell	sr	1.44	-	2.03	-		

<b>Dynamo-HIA</b>		<b>1.20</b>	<b>1.15</b>	<b>1.55</b>	<b>1.50</b>	<b>x 0.98 from age 50 x 0.95 from age 60 x 0.90 from age 70</b>	<b>inconsistent</b>
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- Moore et al. Past BMI and risk of mortality among women. *Int J Obesi*, 2008; 32: 730-739.
- Lawlor et al. Reverse causality and confounding and the associations of overweight and obesity with mortality. *Obesity*. 2006; 14: 2294-2304.
- Rosengren et al. Body weight and weight gain during adult life in men in relation to CHD and mortality. *Eur Heart J*. 1999; 20:268-277.
- PSC = Prospective Studies Collaboration. BMI and cause-specific mortality in 900,000 adults: collaborative analyses of 57 prospective studies. *Lancet*, 2009; 373:1083-1096.
- McGee et al. Body Mass Index and mortality: a meta-analysis based on person level data from twenty-six observational studies. *Ann Epidemiol*, 2005; 15:87-97.
- Banegas et al Mortality attributable to obesity in Europe, *EJCN*, 2003; 57:201-208.
- Adams et al. Overweight, obesity and mortality in a large prospective cohort of persons 50-71 years old. *NEJM* 2006; 355: 763-778.
- Freedman et al. The mortality risk of smoking and obesity combined. *Am J Prev Med*, 2006; 31: 355-362.
- Calle et al BMI and mortality in a prospective cohort of US adults. *NEJM* 1999; 341: 1097-1105.
- Stevens et al, The effect of age on the association between BMI and mortality. *NEJM* 1998; 338: 1-7.
- Yarnell et al. Comparison of weight in middle age, weight at 18 and weight change between, in predicting subsequent 14-year mortality and coronary events: Caerphilly Prospective Study. *J Epidemiol Community Health* 2000; 54: 344-348.

*RR Ischaemic (Coronary) Heart Disease*  
**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women	multipliers	multipliers (never smoked = 1.0)	
<b>Morbidity</b>						
Bogers	m	1.05				
Rosengren	m	1.08	-			
Guh meta	?	1.06	1.12			
UK NAO	?	1.04	1.12			
UK Foresight	?	1.06	1.07	x 0.70 age over 65		
Yarnell	sr	1.08	-			
<b>Mortality</b>						
Lawlor1	m	1.11	1.04			
Lawlor2	m	1.04	-			
Chen	m	1.06	-			
Rosengren	m	1.07	-			
McGee	?	1.04	1.05			
PSC meta	m + sr	1.07				
Freedman	sr	1.07	1.07	x 0.70 age over 65	x 2.50 for current smoker	
<b>Dynamo-HIA</b>		<b>1.07</b>	<b>1.10</b>	<b>x 0.70 over age 65</b>	<b>x 2.50 for current smoker</b>	

- Bogers et al. Association of overweight with increased risk of CHD partly independent of blood pressure and cholesterol levels. Arch Intern Med, 2007; 167: 1720-1728.
- Rosengren et al. Body weight and weight gain during adult life in men in relation to CHD and mortality. Eur Heart J. 1999; 20:268-277.
- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. BMC Public Health 2009; 9:88 doi: 10.1186/1471-2458-9-88.
- UK National Audit Office. Tackling Obesity in England. 2001.  
[http://www.nao.org.uk/publications/0001/tackling\\_obesity\\_in\\_england.aspx](http://www.nao.org.uk/publications/0001/tackling_obesity_in_england.aspx)

- UK Foresight Project. Tackling Obesities: Future Choices. Dept of Innovation, Universities and Skills. 2007. <http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Yarnell et al. Comparison of weight in middle age, weight at 18 and weight change between, in predicting subsequent 14-year mortality and coronary events: Caerphilly Prospective Study. *J Epidemiol Community Health* 2000; 54: 344-348.
- Lawlor et al. Reverse causality and confounding and the associations of overweight and obesity with mortality. *Obesity*. 2006; 14: 2294-2304.
- Chen et al. BMI and mortality from IHD in a lean population: 10 year prospective study of 220,000 adult men. *Int J Epidemiol*, 2006; 35: 141-150.
- McGee et al. Body Mass Index and mortality: a meta-analysis based on person level data from twenty-six observational studies. *Ann Epidemiol*, 2005; 15: 87-97.
- PSC = Prospective Studies Collaboration. BMI and cause-specific mortality in 900,000 adults: collaborative analyses of 57 prospective studies. *Lancet*, 2009; 373: 1083-1096.
- Freedman et al. The mortality risk of smoking and obesity combined. *Am J Prev Med*, 2006; 31: 355-362.

#### RR Ischaemic (Coronary) Heart Disease

##### By BMI category (BMI 22=1.0)

Source		RR BMI 25-29.9		RR BMI 30+		age	current smoking
	sr=self rep m=measured	men	women	men	women	multipliers	multipliers (never smoked = 1.0)
<b>Morbidity</b>							
Bogers	m	1.29		1.72			
Rosengren	m	1.44	-	2.07	-		
Guh meta	?	1.29	1.72	1.80	3.10		
UK NAO	?	-	-	1.50	3.20		
UK Foresight	?	1.35	1.40	1.80	2.00	x 0.70 age over 65	
Yarnell	sr	1.54	-	2.17	-		
<b>Mortality</b>							
Lawlor1	m	1.73	1.23	2.84	1.93		
Lawlor2	m	1.24	-	3.88	-		
Chen	m	1.44	-	-	-		



Rosengren	m	1.13	-	2.05	-		
McGee	--	1.16	1.10	1.51	1.62		
PSC meta	m + sr	1.39		1.73			
Freedman	sr	1.39	1.37	3.76	1.70	x 0.70 age over 65	x 2.50 for current smoker
<b>Dynamo-HIA</b>		<b>1.35</b>	<b>1.35</b>	<b>2.00</b>	<b>2.00</b>	<b>x 0.70 age over 65</b>	<b>x 2.50 for current smoker</b>

- Bogers et al. Association of overweight with increased risk of CHD partly independent of blood pressure and cholesterol levels. *Arch Intern Med*, 2007; 167:1720-1728.
- Rosengren et al. Body weight and weight gain during adult life in men in relation to CHD and mortality. *Eur Heart J*. 1999; 20:268-277.
- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. *BMC Public Health* 2009; 9:88 doi:10.1186/1471-2458-9-88.
- UK National Audit Office. Tackling Obesity in England. 2001.  
[http://www.nao.org.uk/publications/0001/tackling\\_obesity\\_in\\_england.aspx](http://www.nao.org.uk/publications/0001/tackling_obesity_in_england.aspx)
- UK Foresight Project. Tackling Obesities: Future Choices. Dept of Innovation, Universities and Skills. 2007.  
<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Yarnell et al. Comparison of weight in middle age, weight at 18 and weight change between, in predicting subsequent 14-year mortality and coronary events: Caerphilly Prospective Study. *J Epidemiol Community Health* 2000; 54: 344-348.
- Lawlor et al. Reverse causality and confounding and the associations of overweight and obesity with mortality. *Obesity*. 2006; 14: 2294-2304.
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- Freedman et al. The mortality risk of smoking and obesity combined. *Am J Prev Med*, 2006; 31: 355-362.

RR Stroke

**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women	multipliers	multipliers (never smoked = 1.0)	
<b>Morbidity</b>						
Guh meta	?	1.04	1.09			
UK Foresight	?	1.05	1.04	x 0.75 over age 65		
UK NAO	?	1.03	1.03			
<b>Mortality</b>						
Lawlor 1	m	1.04	1.04			
Lawlor 2	m	1.07				
PSC	m + sr	1.07				
<b>Dynamo-HIA</b>		<b>1.04</b>	<b>1.04</b>	<b>x 0.75 over age 65</b>		

- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. *BMC Public Health* 2009; 9:88 doi: 10.1186/1471-2458-9-88.
- UK National Audit Office. *Tackling Obesity in England*. 2001.  
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<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Lawlor et al. Reverse causality and confounding and the associations of overweight and obesity with mortality. *Obesity*. 2006; 14: 2294-2304.
- PSC = Prospective Studies Collaboration. BMI and cause-specific mortality in 900,000 adults: collaborative analyses of 57 prospective studies. *Lancet*, 2009; 373: 1083-1096.

RR Stroke

**By BMI category (BMI 22=1.0)**

Source		RR BMI 25-29.9		RR BMI 30+		age multipliers	current smoking multipliers (never smoked = 1.0)
	sr=self rep m=measured	men	women	men	women		
<b>Morbidity</b>							
Guh meta	?	1.23	1.15	1.51	1.49		
UK Foresight	?	1.35	1.25	1.50	1.60	x 0.75 over age 65	
UK NAO	?			1.30	1.30		
<b>Mortality</b>							
Lawlor 1	m	0.90	0.90	1.48	1.52		
Lawlor 2	m	0.94		2.06			
PSC	m + sr	1.39		1.93			
<b>Dynamo-HIA</b>		<b>1.20</b>	<b>1.20</b>	<b>1.50</b>	<b>1.55</b>	<b>x 0.75 over age 65</b>	

- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. BMC Public Health 2009; 9:88 doi: 10.1186/1471-2458-9-88.
- UK National Audit Office. Tackling Obesity in England. 2001.  
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<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
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- PSC = Prospective Studies Collaboration. BMI and cause-specific mortality in 900,000 adults: collaborative analyses of 57 prospective studies. Lancet, 2009; 373: 1083-1096.

## RR Diabetes

**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women		multipliers	multipliers (never smoked = 1.0)
<b>Morbidity</b>						
Decoda Study	m	1.11	1.12			Asian population groups
Meigs	m	1.18				
Hippisley-Cox	m	1.29	1.27	x 0.92 from age 60 x 0.90 from age 75		
Meisinger	m	1.15	1.26			
Guh meta	?	1.20	1.29			
UK Foresight	?	1.20	1.20			
UK NAO	?	1.18	1.29			
Vazquez meta	m + sr	1.13				
Schienkiewitz	sr	1.15	1.11	x 1.04 over age 35		
Carey	sr	-	1.28			
Wang	sr	1.20	-			
<b>Mortality</b>						
PSC	m + sr	1.16				
<b>Dynamo-HIA</b>		<b>1.18</b>	<b>1.22</b>	<b>x 0.92 from age 60</b> <b>x 0.90 from age 75</b>		

- Decoda Study Group (Nyamdorj R, et al). BMI compared with central obesity indicators in relation to diabetes and hypertension in Asians. *Obesity* 2008; 16: 1622-1635.
- Meigs JB et al. BMI, metabolic syndrome and risk of type 2 diabetes or CVD. *J Clin Endocrinol Metab* 2006; 91: 2906-2912.
- Hippisley-Cox et al. Predicting risk of type 2 diabetes in England and Wales: prospective derivation and validation of QDScore. *BMJ* 2009; 338: b880. doi: 10.1136/bmj.b880.
- Meisinger C et al. Body fat distribution and risk of type 2 diabetes in the general population: are there difference between men and women. The MONICA/KORA Augsburg Cohort Study. *Am J Clin Nutr.* 2006; 84: 483-489.

- Guh et al. *The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. BMC Public Health* 2009; 9:88 doi: 10.1186/1471-2458-9-88.
- UK National Audit Office. *Tackling Obesity in England*. 2001.  
[http://www.nao.org.uk/publications/0001/tackling\\_obesity\\_in\\_england.aspx](http://www.nao.org.uk/publications/0001/tackling_obesity_in_england.aspx)
- UK Foresight Project. *Tackling Obesities: Future Choices*. Dept of Innovation, Universities and Skills. 2007.  
<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Vazquez G et al. *Comparison of BMI, WC, WHR in predicting incident diabetes: a meta-analysis. Epub Revs* 2007; doi: 10.1093/epirev/mxm008.
- Schienkiewitz A et al. *BMI history and risk of type 2 diabetes: results from the EPIC-Potsdam Study. Am J Clin Nutr* 2006; 84:427-433.
- Carey VJ et al. *Body fat distribution and risk of NIDDM in women. Am J Epidemiol*. 1997; 145:614-619.
- Wang Y et al. *Comparison of abdominal adiposity and overall obesity in predicting risk of type 2 diabetes among men. Am J Clin Nutr* 2005; 81:555-563.
- PSC = Prospective Studies Collaboration. *BMI and cause-specific mortality in 900,000 adults: collaborative analyses of 57 prospective studies. Lancet*, 2009; 373:1083-1096.

#### RR Diabetes

##### By BMI category (BMI 22=1.0)

Source		RR BMI 25-29.9		RR BMI 30+		age	notes
	sr=self rep m=measured	men	women	men	women	multipliers	
<b>Morbidity</b>							
<i>Decoda Study</i>	<i>m</i>	1.69	1.78	2.86	3.17		<i>Asian population groups</i>
<i>Meigs</i>	<i>m</i>	2.12		5.28			
<i>Hippisley-Cox</i>	<i>m</i>	2.33	2.33	7.17	6.50	x 0.92 from age 60 x 0.90 from age 75	
<i>Meisinger</i>	<i>m</i>	-	-	4.15	10.48		
<i>Guh meta</i>	<i>?</i>	2.40	3.92	6.74	12.41		
<i>UK Foresight</i>	<i>?</i>	2.20	1.65	40.00	14.50		
<i>UK NAO</i>	<i>?</i>	-	-	5.2	12.7		
<i>Vazquez meta</i>	<i>m + sr</i>	1.87		3.50			
<i>Schienkiewitz</i>	<i>sr</i>	2.01	1.69	4.05	2.86		
<i>Carey</i>	<i>sr</i>	-	3.35	-	11.20		

Wang	sr	2.55	-	6.50	-		
<b>Mortality</b>							
PSC	m + sr	2.16		4.67			
<b>Dynamo-HIA</b>		<b>2.25</b>	<b>2.30</b>	<b>5.50</b>	<b>7.00</b>	<b>x 0.92 from age 60</b> <b>x 0.90 from age 75</b>	

- Decoda Study Group (Nyamdorj R, et al). BMI compared with central obesity indicators in relation to diabetes and hypertension in Asians. *Obesity* 2008; 16: 1622-1635.
- Meigs JB et al. BMI, metabolic syndrome and risk of type 2 diabetes or CVD. *J Clin Endocrinol Metab* 2006; 91:2906-2912.
- Hippisley-Cox et al. Predicting risk of type 2 diabetes in England and Wales: prospective derivation and validation of QDScore. *BMJ* 2009; 338:b880. doi: 10.1136/bmj.b880.
- Meisinger C et al. Body fat distribution and risk of type 2 diabetes in the general population: are there difference between men and women. The MONICA/KORA Augsburg Cohort Study. *Am J Clin Nutr.* 2006; 84:483-489.
- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. *BMC Public Health* 2009; 9:88 doi: 10.1186/1471-2458-9-88.
- UK National Audit Office. Tackling Obesity in England. 2001.  
[http://www.nao.org.uk/publications/0001/tackling\\_obesity\\_in\\_england.aspx](http://www.nao.org.uk/publications/0001/tackling_obesity_in_england.aspx)
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<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Vazquez G et al. Comparison of BMI, WC, WHR in predicting incident diabetes: a meta-analysis. *Epd Revs* 2007; doi: 10.1093/epirev/mxm008.
- Schienkiewitz A et al. BMI history and risk of type 2 diabetes: results from the EPIC-Potsdam Study. *Am J Clin Nutr* 2006; 84:427-433.
- Carey VJ et al. Body fat distribution and risk of NIDDM in women. *Am J Epidemi.* 1997; 145:614-619.
- Wang Y et al. Comparison of abdominal adiposity and overall obesity in predicting risk of type 2 diabetes among men. *Am J Clin Nutr* 2005; 81:555-563.
- PSC = Prospective Studies Collaboration. BMI and cause-specific mortality in 900,000 adults: collaborative analyses of 57 prospective studies. *Lancet*, 2009; 373:1083-1096.

## RR Cancer - Lung

**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women	multipliers	multipliers (never smoked = 1.0)	
<b>Morbidity</b>						
Renehan meta	m + sr	0.96	0.97			
Reeves	sr	-	0.98			
WCRF meta	m + sr	0.98			RR not affected	
<b>Mortality</b>						
PSC meta	m + sr	0.99				
Reeves	sr	-	0.97			
<b>Dynamo-HIA</b>		<b>0.97</b>	<b>0.98</b>			

- Renehan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335: 1134-1144.
- WCRF: Meta-analyses conducted for the 2007 report Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. Second Expert Report. (<http://www.dietandcancerreport.org/>)
- PSC = Prospective Studies Collaboration. BMI and cause-specific mortality in 900,000 adults: collaborative analyses of 57 prospective studies. *Lancet*, 2009; 373:1083-1096.

RR Cancer - Lung

**By BMI category (BMI 22=1.0)**

Source		RR BMI 25-29.9		RR BMI 30+		age	current smoking
	sr=self rep m=measured	men	women	men	women	multipliers	multipliers (never smoked = 1.0)
<b>Morbidity</b>							
Renehan meta	m + sr	0.76	0.80	0.58	0.64		
Reeves	sr	-	0.88	-	0.77		
<b>Mortality</b>							
PSC meta	m + sr	0.98		0.96			
Reeves	sr	-	0.85	-	0.72		
<b>Dynamo-HIA</b>		<b>0.80</b>	<b>0.88</b>	<b>0.65</b>	<b>0.70</b>		

- Renehan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335:1134-1144.
- PSC = Prospective Studies Collaboration. BMI and cause-specific mortality in 900,000 adults: collaborative analyses of 57 prospective studies. *Lancet*, 2009; 373:1083-1096.



## RR Cancer - Breast

**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women	multipliers	multipliers (never smoked = 1.0)	
<b>Morbidity</b>						
Guh meta	?	1.00	1.01	Post-menopausal		
Renahan meta	m + sr	1.00	1.02	"		
UK Foresight	?	1.00	1.02	"		
Reeves	sr	1.00	1.03	"		
WCRF meta		1.00	0.98ns 1.02	Pre-menopause Post-menopause		
<b>Mortality</b>						
Reeves	sr	1.00	1.03	"		
<b>Dynamo-HIA</b>		<b>1.00</b>	<b>1.00 before age 50</b> <b>1.02 over age 50</b>			

- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. *BMC Public Health* 2009; 9:88 doi:10.1186/1471-2458-9-88.
- Renahan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- UK Foresight Project. Tackling Obesities: Future Choices. Dept of Innovation, Universities and Skills. 2007. <http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335: 1134-1144.
- WCRF: Meta-analyses conducted for the 2007 report Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. Second Expert Report. (<http://www.dietandcancerreport.org/>)

## RR Cancer - Breast

**By BMI category (BMI 22=1.0)**

Source		RR BMI 25-29.9		RR BMI 30+		age	
	sr=self rep m=measured	men	women	men	women	multipliers	
<b>Morbidity</b>							
Guh meta	?	1.00	1.08	1.00	1.13	Post-menopausal	
Renahan meta	m + sr	1.00	1.12	1.00	1.25	"	
UK Foresight	?	1.00	1.12	1.00	1.25	"	
Reeves	sr	1.00	1.17	1.00	1.37	"	
<b>Mortality</b>							
Reeves	sr	1.00	1.17	1.00	1.36	"	
<b>Dynamo-HIA</b>		<b>1.00</b>	<b>1.00 before age 50 1.12 over age 50</b>	<b>1.00</b>	<b>1.00 before age 50 1.25 over age 50</b>		

- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. BMC Public Health 2009; 9:88 doi:10.1186/1471-2458-9-88.
- Renahan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. The Lancet 2008; 371:569-578.
- UK Foresight Project. Tackling Obesities: Future Choices. Dept of Innovation, Universities and Skills. 2007.  
<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. BMJ 2007; 335: 1134-1144.

RR Cancer - Endometrium / uterus / womb

**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women	multipliers	multipliers (never smoked = 1.0)	
<b>Morbidity</b>						
Bjorge 2007	m		1.08			
Guh meta	?		1.10			
Renehan meta	m + sr		1.10			
Bergstrom meta	m + sr		1.10			
UK Foresight	?		1.10			
Reeves	sr		1.12			
<b>Mortality</b>						
Reeves	sr		1.09			
<b>Dynamo-HIA</b>			<b>1.10</b>			

- Bjørge T et al size in relation to cancer of the uterine corpus in 1 million Norwegian women. *Int J Cancer*. 2007; 120:378-83.
- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. *BMC Public Health* 2009; 9:88 doi:10.1186/1471-2458-9-88.
- Renehan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- Bergstrom et al. Overweight as an avoidable cause of cancer in Europe. *Int J Cancer* 2001; 91:421-430.
- UK Foresight Project. Tackling Obesities: Future Choices. Dept of Innovation, Universities and Skills. 2007. <http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335:1134-1144.

RR Cancer - Endometrium / uterus / womb

**By BMI category (BMI 22=1.0)**

Source		RR BMI 25-29.9		RR BMI 30+		age	current smoking
	sr=self rep m=measured	Men	women	men	women	multipliers	multipliers (never smoked = 1.0)
<b>Morbidity</b>							
Bjorge 2007	m		1.36		2.51		
Guh meta	?		1.53		3.22		
Renahan meta	m + sr		1.59		2.53		
Bergstrom meta	m + sr		1.59		2.52		
UK Foresight	?		1.59		2.52		
Reeves	sr		1.72		2.97		
<b>Mortality</b>							
Reeves	sr		1.57		2.46		
<b>Dynamo-HIA</b>			<b>1.50</b>		<b>2.50</b>		

- Bjørge T et al size in relation to cancer of the uterine corpus in 1 million Norwegian women. *Int J Cancer*. 2007; 120:378-83.
- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. *BMC Public Health* 2009; 9:88 doi:10.1186/1471-2458-9-88.
- Renahan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- Bergstrom et al. Overweight as an avoidable cause of cancer in Europe. *Int J Cancer* 2001; 91:421-430.
- UK Foresight Project. Tackling Obesities: Future Choices. Dept of Innovation, Universities and Skills. 2007. <http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335:1134-1144.

*RR Cancer - Oesophagus*  
**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	<i>sr</i> =self rep <i>m</i> =measured	<i>men</i>	<i>women</i>	<i>multipliers</i>	<i>multipliers (never smoked = 1.0)</i>	
<b>Morbidity</b>						
Engeland 2004	<i>m</i>	<i>Ad</i> 1.12 <i>Sq</i> 0.96	<i>Ad</i> 1.08 <i>Sq</i> 0.90			
Reheman meta	<i>m + sr</i>	<i>Ad</i> 1.09 <i>Sq</i> 0.96	<i>Ad</i> 1.09 <i>Sq</i> 0.88			
Reeves	<i>sr</i>	-	<i>Ad</i> 1.08 <i>Sq</i> 0.88			
WCRF meta	<i>m + sr</i>	<i>Ad</i> 1.11 <i>Sq</i> 0.98				
<b>Mortality</b>						
Reeves	<i>sr</i>	-	<i>Ad</i> 1.08 <i>Sq</i> 0.86			
<b>Dynamo-HIA</b>		<b><i>Ad</i> 1.10 <i>Sq</i> 0.96</b>	<b><i>Ad</i> 1.08 <i>Sq</i> 0.89</b>			

*Ad* = Adenocarcinoma of the oesophagus

*Sq* = Squamous cell cancer of the oesophagus

- Engeland A, Tretli S, Bjørge T. Height and body mass index in relation to esophageal cancer; 23-year follow-up of two million Norwegian men and women. *Cancer Causes Control*. 2004; 15: 837-43.
- Reheman A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335: 1134-1144.
- WCRF: Meta-analyses conducted for the 2007 report Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. Second Expert Report. (<http://www.dietandcancerreport.org/>)

## RR Cancer - Oesophagus

**By BMI category (BMI 22=1.0)**

Source		RR BMI 25-29.9		RR BMI 30+		age	current smoking
	sr=self rep m=measured	men	women	men	women	multipliers	multipliers (never smoked = 1.0)
<b>Morbidity</b>							
Engeland 2004	m	Ad 1.80 Sq 0.72	Ad 1.64 Sq 0.52	Ad 2.58 Sq 0.68	Ad 2.06 Sq 0.43		
Reinehan meta	m + sr	Ad 1.52 Sq 0.71	Ad 1.51 Sq 0.57	Ad 2.31 Sq 0.50	Ad 2.28 Sq 0.32		
Reeves	sr		Ad 1.44 Sq 0.56		Ad 2.09 Sq 0.31		
<b>Mortality</b>							
Reeves	sr		Ad 1.50 Sq 0.47		Ad 2.46 Sq 0.22		
<b>Dynamo-HIA</b>		Ad 1.60 Sq 0.72	Ad 1.50 Sq 0.53	Ad 2.45 Sq 0.55	Ad 2.15 Sq 0.30		

Ad = Adenocarcinoma of the oesophagus

Sq = Squamous cell cancer of the oesophagus

- Engeland A, Tretli S, Bjørge T. Height and body mass index in relation to esophageal cancer; 23-year follow-up of two million Norwegian men and women. *Cancer Causes Control*. 2004; 15:837-43.
- Reinehan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335:1134-1144.
- WCRF: Meta-analyses conducted for the 2007 report Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. Second Expert Report. (<http://www.dietandcancerreport.org/>)

## RR Cancer - Kidney

**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women	multipliers	multipliers (never smoked = 1.0)	
<b>Morbidity</b>						
Bjorge 2004	m	1.05	1.05		Current smoker lower risk, x 0.60	
Bergstrom meta	m + sr	1.06				
Renehan meta	m + sr	1.04	1-.06			
UK Foresight	?	1.06	1.06			
Reeves	sr	-	1.05			
<b>Mortality</b>						
Reeves	sr	-	1.05			
<b>Dynamo-HIA</b>		<b>1.05</b>	<b>1.05</b>		<b>Smokers x 0.60</b>	

- Bjørge T, Tretli S, Engeland A. Relation of height and body mass index to renal cell carcinoma in two million Norwegian men and women. *Am J Epidemiol.* 2004; 160: 1168-76.
- Bergstrom et al. Overweight as an avoidable cause of cancer in Europe. *Int J Cancer* 2001; 91: 421-430.
- Renehan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371: 569-578.
- UK Foresight Project. Tackling Obesities: Future Choices. Dept of Innovation, Universities and Skills. 2007.  
<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335: 1134-1144.

## RR Cancer - Kidney

**By BMI category (BMI 22=1.0)**

Source		RR BMI 25-29.9		RR BMI 30+		age	current smoking
	sr=self rep m=measured	men	women	men	women	multipliers	multipliers (never smoked = 1.0)
<b>Morbidity</b>							
Bjorge 2004	m	1.18	1.32	1.55	1.85		Current smoker lower risk, x 0.60
Bergstrom meta	m + sr	1.36		1.84			
Renahan meta	m + sr	1.24	1.34	1.54	1.80		
UK Foresight	?	1.36	1.36	1.84	1.84		
Reeves	sr	-	1.25	-	1.56		
<b>Mortality</b>							
Reeves	sr	-	1.28	-	1.65		
<b>Dynamo-HIA</b>		<b>1.24</b>	<b>1.32</b>	<b>1.55</b>	<b>1.80</b>		<b>Smokers x 0.60</b>

- Bjørge T, Tretli S, Engeland A. Relation of height and body mass index to renal cell carcinoma in two million Norwegian men and women. *Am J Epidemiol.* 2004; 160: 1168-76.
- Bergstrom et al. Overweight as an avoidable cause of cancer in Europe. *Int J Cancer* 2001; 91: 421-430.
- Renahan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371: 569-578.
- UK Foresight Project. *Tackling Obesities: Future Choices.* Dept of Innovation, Universities and Skills. 2007.  
<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335: 1134-1144.



RR Cancer - Oral

**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women	multipliers	multipliers (never smoked = 1.0)	
<b>Morbidity</b>						
WCRF meta	m + sr	0.89				
<b>Mortality</b>						
<b>Dynamo-HIA</b>		<b>0.97</b>	<b>0.98</b>			

- WCRF: Meta-analyses conducted for the 2007 report Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. Second Expert Report. (<http://www.dietandcancerreport.org/>)

RR Cancer - Oral

**By BMI category (BMI 22=1.0)**

Source		RR BMI 25-29.9		RR BMI 30+		age	current smoking
	sr=self rep m=measured	men	women	men	women	multipliers	multipliers (never smoked = 1.0)
<b>Morbidity</b>							
WCRF meta	m + sr	0.56		0.31			
<b>Mortality</b>							
<b>Dynamo-HIA</b>		<b>0.80</b>	<b>0.88</b>	<b>0.65</b>	<b>0.70</b>		

- WCRF: Meta-analyses conducted for the 2007 report Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. Second Expert Report. (<http://www.dietandcancerreport.org/>)

## RR Cancer - Colorectal

**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women		multipliers	
<b>Morbidity</b>						
Engeland 2005	m	1.04	1.01	x 0.90 over age 45		
Guh meta	?	1.07	1.05			
Renahan meta	m + sr	1.04	1.02			
UK Foresight	?	1.05	1.05			
Reeves	sr	-	0.99	All over age 50		
WCRF meta	m + sr	1.04	1.02			
<b>Mortality</b>						
Reeves	sr	-	0.99	All over age 50		
WCRF meta	m + sr	1.02	1.02			
<b>Dynamo-HIA</b>		<b>1.04</b>	<b>1.02</b>	<b>x 0.90 over age 45</b>		

- Engeland A et al. Height and body mass index in relation to colorectal and gallbladder cancer in two million Norwegian men and women. *Cancer Causes Control*. 2005 Oct; 16(8):987-96.
- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. *BMC Public Health* 2009; 9:88 doi:10.1186/1471-2458-9-88.
- Renahan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- UK Foresight Project. Tackling Obesities: Future Choices. Dept of Innovation, Universities and Skills. 2007. <http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335: 1134-1144.
- WCRF: Meta-analyses conducted for the 2007 report Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. Second Expert Report. (<http://www.dietandcancerreport.org/>)

## RR Cancer - Colorectal

**By BMI category (BMI 22=1.0)**

Source		RR BMI 25-29.9		RR BMI 30+		age multipliers	current smoking multipliers (never smoked = 1.0)
	sr=self rep m=measured	men	women	men	women		
<b>Morbidity</b>							
Engeland 2005	m	1.21	1.03	1.49	1.07	x 0.90 over age 45	
Guh meta	?	1.51	1.45	1.95	1.66		
Renehan meta colon	m + sr	1.24	1.09	1.54	1.19		
Renehan meta rectal only	m + sr	1.09	1.00	1.19	1.0		
UK Foresight	?	1.15	1.33	1.15	1.33		
Reeves	sr	-	0.99	-	0.99	All over age 50	
WCRF meta	m + sr	-	-	1.46	1.19		
<b>Mortality</b>							
Reeves	sr	-	0.99	-	0.99	All over age 50	
WCRF meta	m + sr			1.65	1.43		
<b>Dynamo-HIA</b>		<b>1.20</b>	<b>1.08</b>	<b>1.40</b>	<b>1.10</b>	<b>x 0.90 over age 45</b>	

- Engeland A et al. Height and body mass index in relation to colorectal and gallbladder cancer in two million Norwegian men and women. *Cancer Causes Control*. 2005 Oct; 16(8):987-96.
- Guh et al. The incidence of co-morbidities related to obesity and overweight : a systematic review of the literature. *BMC Public Health* 2009; 9:88 doi: 10.1186/1471-2458-9-88.
- Renehan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- UK Foresight Project. Tackling Obesities: Future Choices. Dept of Innovation, Universities and Skills. 2007. <http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>
- Reeves et al. Cancer incidence and mortality in relation to BMI in the Million Women Study. *BMJ* 2007; 335: 1134-1144.
- WCRF: Meta-analyses conducted for the 2007 report Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. Second Expert Report. (<http://www.dietandcancerreport.org/>)

RR Cancer - Gallbladder

**Per unit BMI** above BMI 22

Source	BMI	RR	RR	age	current smoking	notes
	sr=self rep m=measured	men	women	multipliers	multipliers (never smoked = 1.0)	
<b>Morbidity</b>						
Engeland 2005	m	1.03	1.06	x 1.17 age over 45 men x 0.80 age over 45 women		
Rehenan meta	m + sr	1.02	1.10			
Bergstrom meta	m + sr	1.06				
<b>Mortality</b>						
<b>Dynamo-HIA</b>		<b>1.02</b>	<b>1.06</b>	<b>x 1.17 age over 45 men x 0.80 age over 45 women</b>		

- Engeland A et al. Height and body mass index in relation to colorectal and gallbladder cancer in two million Norwegian men and women. *Cancer Causes Control*. 2005 Oct; 16(8): 987-96.
- Renehan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- Bergstrom et al. Overweight as an avoidable cause of cancer in Europe. *Int J Cancer* 2001; 91:421-430.

RR Cancer - Gallbladder

**By BMI category (BMI 22=1.0)**

Source		RR BMI 25-29.9		RR BMI 30+		age	current smoking
	sr=self rep m=measured	men	women	men	women	multipliers	multipliers (never smoked = 1.0)
<b>Morbidity</b>							
Engeland 2005	m	1.00	1.38	1.27	1.88	x 1.17 age over 45 men x 0.80 age over 45 women	
Rehenan meta	m + sr	1.09	1.59	1.19	2.53		
Bergstrom	m + sr	1.34		1.78			
<b>Mortality</b>							
<b>Dynamo-HIA</b>		<b>1.05</b>	<b>1.35</b>	<b>1.25</b>	<b>1.85</b>	<b>x 1.17 age over 45 men x 0.80 age over 45 women</b>	

- Engeland A et al. Height and body mass index in relation to colorectal and gallbladder cancer in two million Norwegian men and women. *Cancer Causes Control*. 2005 Oct; 16(8): 987-96.
- Renehan A, et al. BMI and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008; 371:569-578.
- Bergstrom et al. Overweight as an avoidable cause of cancer in Europe. *Int J Cancer* 2001; 91:421-430.