Supplementary Table 1: Characteristics of the included studies

Study group	Country	Enrollment period, median (range)	Original sample size	Sample size included in analysis[1]	Participation response rates of cases (%)
CAPUA	Spain	2003 (2000-2010)	862	862	91%
CARET	USA	1991 (1985-1994)	2,236	998	80%
ESTHER	Germany	2002 (2001-2004)	201	104	50%
Fudan	China	2012 (2009-2013)	1,913	1,806	95%
Harvard	USA	2004 (1992-2011)	3,411	3,411	83%
Hawaii	USA	1994 (1991-1997)	535	535	67%
Japan	Japan	2004 (1997-2008)	1,512	1,495	98%
Karmanos	USA	2002 (1999-2005)	913	890	52%
LLP	England	2009 (1996-2013)	451	346	80%
Los Angeles	USA	2001 (1999-2003)	610	391	62%
Mayo	USA	2006 (1997-2014)	17,034	12,332	74%
MD Anderson	USA	2010 (2008-2012)	746	745	90%
NIH	USA	2006 (1993-2015)	1,699	1,479	40%
ReSoLuCENT	England	2009 (2001-2013)	545	545	33%
TLC-Moffit	USA	2011 (2001-2013)	744	744	82%
Toronto	Canada	2009 (1974-2013)	2,534	2,534	83%
Total		2006 (1974-2015)	35,946	29,217	

[1]Patients were not included in the analysis if lung cancer type (small cell/non-small cell) or survival data were missing. NA: not available; SD: standard deviation.

Supplementary Table 2: Summary of Clinical Outcomes

| Type of Lung Cancer	Stage	N	Median overall survival		Median Survival Rates used for the 7th Edition AJCC[1]		Median Follow-up Time in years (months) (among censored patients)
			All patients in years (months)	Patients diagnosed since 2000 in years (months)	Pathologic Staging in years (months)	Clinical Staging in years (months)	
Non-small cell lung cancer	All stages	26,430	2.3 (28)	2.3 (28)	Not applicable	Not applicable	3.9 years (47 months)
	1A	5,478	9.2 (110)	9.3 (112)	9.0 (119)	5.0 (60)	4.3 years (52 months)
	1B	2,448	7.1 (85)	7.4 (89)	6.8 (81)	3.6 (43)	4.8 years (58 months)
	2A	1,131	5.3 (63)	5.8 (69)	4.1 (49)	2.8 (34)	3.8 years (46 months)
	2B	1,884	3.3 (40)	3.3 (40)	2.6 (31)	2.8 (18)	4.0 years (48 months)
	3A	3,905	2.3 (28)	2.3 (30)	1.8 (22)	1.2 (14)	3.4 years (41 months)
	3B	2,434	1.4 (17)	1.4 (17)	1.1 (13)	0.8 (10)	3.2 years (28 months)
	4	9,150	0.9 (11)	0.9 (11)	1.4 (17)	0.5 (6)	2.4 years (29 months)
Small cell lung cancer	All stages	2,787	1.0 (12)	1.0 (12)	Not applicable[2]	Not applicable	3.0 years (26 months)
	Limited stage	1,135	1.5 (18)	1.5 (18)	Not applicable[2]	1- 2.5 (12-30) (IIIB-IA)	3.3 years (40 months)
	Extensive stage	1,652	0.8 (9)	0.8 (9)	Not applicable[2]	0.7 (7) (IV)	1.8 years (22 months)

[1]Goldstraw P, Crowley J, Chansky K et al (2007) The IASLC lung cancer staging project: proposals for the revision of the TNM stage groupings in the forthcoming (seventh) edition of the TNM classification of malignant tumours. J Thoracic Oncol 2(8):706–714. [2] Small cell lung cancer patients are generally not resected; thus no pathologic staging is possible.

Supplementary Table 3: Sensitivity Analyses

Variable		Total Study Cohort	Exclusion of trial with no staging data	Exclusion of trials with SEER staging data	Exclusion of the single largest dataset	Exclusion of Asian trials	Exclusion of patients with no cumulative smoking data[b]	Exclusion of Patients diagnosed before the year 2000
Non-Small Cell Lung Cancer								
No. of patients[a]	N	22,950	22,599	21,671	12,073	19,667	15,489	14,065
BMI at diagnosis, continuous variable	HR (95%CI); p-value	0.98 (0.98-0.99) p<0.001	0.98 (0.98-0.99) p<0.001	0.98 (0.98-0.99) p<0.001	0.98 (0.97-0.98) p<0.001	0.98 (0.98-0.99) p<0.001	0.98 (0.98-0.99) p<0.001	0.98 (0.98-0.99) p<0.001
Underweight vs Normal BMI; at diagnosis		1.56 (1.4-1.7) p<0.001	1.57 (1.4-1.7) p<0.001	1.52 (1.4-1.7) p<0.001	1.47 (1.3-1.6) p<0.001	1.58 (1.4-1.7) p<0.001	1.62 (1.5-1.8) p<0.001	1.57 (1.4-1.7) p<0.001
Overweight vs Normal BMI; at diagnosis		0.89 (0.85-0.93) p<0.001	0.89 (0.85-0.93) p<0.001	0.89 (0.85-0.93) p<0.001	0.87 (0.83-0.92) p<0.001	0.89 (0.85-0.93) p<0.001	0.89 (0.85-0.94) p<0.001	0.90 (0.85-0.94) p<0.001
Obese vs Normal BMI; at diagnosis		0.88 (0.83-0.92) p<0.001	0.88 (0.84-0.93) p<0.001	0.88 (0.83-0.93) p<0.001	0.83 (0.78-0.89) p<0.001	0.88 (0.84-0.92) p<0.001	0.89 (0.84-0.94) p<0.001	0.89 (0.84-0.95) p<0.001
BMI at young adulthood, continuous variable		1.00 (0.99-1.01) p=0.83	1.00 (0.99-1.01) p=0.73	1.00 (1.00-1.01) p=0.32	1.00 (0.99-1.01) p=0.83	1.00 (0.99-1.01) p=0.83	1.00 (0.99-1.01) p=1.00	1.00 (0.99-1.01) p=0.63
Underweight vs Normal BMI; in young adulthood		1.15 (1.0-1.31) p=0.042	1.14 (0.99-1.3) p=0.07	1.09 (0.94-1.25) p=0.25	1.15 (1.0-1.31) p=0.04	1.15 (1.0-1.31) p=0.04	1.24 (1.04-1.48) p=0.02	1.04 (0.9-1.21) p=0.59
Overweight vs Normal BMI; in young adulthood		0.98 (0.9-1.07) p=0.69	0.99 (0.91-1.08) p=0.82	0.96 (0.88-1.06) p=0.43	0.98 (0.9-1.07) p=0.69	0.98 (0.9,1.07) p=0.69	0.97 (0.87-1.07) p=0.49	0.95 (0.86-1.04) p=0.25
Obese vs Normal BMI; in young adulthood		1.09 (0.96-1.24) p=0.20	1.1 (0.96-1.25) p=0.16	1.14 (0.99-1.3) p=0.07	1.09 (0.96-1.24) p=0.20	1.09 (0.96,1.24) p=0.20	1.06 (0.92-1.22) p=0.43	1.12 (0.97-1.29) p=0.13
Increase in BMI vs Decrease in BMI		0.81 (0.75-0.87) p<0.001	0.81 (0.75-0.88) p<0.001	0.78 (0.72-0.84) p<0.001	0.81 (0.75-0.87) p<0.001	0.81 (0.75-0.87) p<0.001	0.82 (0.75-0.90) p<0.001	0.77 (0.71-0.84) p<0.001
Small Cell Lung Cancer								
No. of patients[a]	N	2,787	2,748	2,646	975	2,773	2,340	1,159
BMI at diagnosis, continuous variable	HR (95%CI); p-value	1.00 (0.99-1.01) p=0.52	1.00 (0.99-1.01) p=0.63	1.00 (0.99-1.01) p=0.5	1.01 (0.99-1.02) p=0.43	1.00 (0.99-1.01) p=0.52	1.00 (0.99-1.01) p=0.52	1.00 (0.99-1.01) p=0.88
Underweight vs Normal BMI; at diagnosis		1.17 (0.88-1.6) p=0.27	1.17 (0.88-1.6) p=0.27	1.2 (0.88-1.6) p=0.25	1.18 (0.75-1.9) p=0.48	1.17 (0.88-1.6) p=0.27	1.17 (0.88-1.6) p=0.27	1.20 (0.85-1.7) p=0.31
Overweight vs Normal BMI; at diagnosis		0.96 (0.86-1.1) p=0.44	0.95 (0.85-1.1) p=0.44	0.95 (0.85-1.1) p=0.39	0.91 (0.76-1.1) p=0.28	0.96 (0.86-1.1) p=0.44	0.96 (0.86-1.1) p=0.44	0.96 (0.84-1.1) p=0.60
Obese vs Normal BMI; at diagnosis		1.07 (0.94-1.2) p=0.33	1.07 (0.93-1.2) p=0.40	1.07 (0.93-1.2) p=0.35	1.1 (0.88-1.4) p=0.41	1.07 (0.94-1.2) p=0.33	1.07 (0.94-1.2) p=0.33	1.02 (0.88-1.2) p=0.76
BMI at young adulthood, continuous variable		1.01 (0.98-1.03) p=0.72	1.00 (0.97-1.03) p=1	1.01 (0.98-1.04) p=0.63	1.01 (0.98-1.03) p=0.72	1.01 (0.98-1.03) p=0.72	1.01 (0.98-1.03) p=0.72	1.01 (0.97-1.04) p=0.68
Underweight vs Normal BMI; in young adulthood		1.44 (0.87-2.39) p=0.16	1.43 (0.84-2.41) p=0.18	1.15 (0.58-2.3) p=0.69	1.44 (0.87-2.39) p=0.16	1.44 (0.87-2.39) p=0.16	1.44 (0.87-2.39) p=0.16	1.14 (0.57-2.27) p=0.71
Overweight vs Normal BMI; in young adulthood		1.10 (0.82-1.49) p=0.52	1.03 (0.75-1.42) p=0.84	1.12 (0.78-1.59) p=0.54	1.10 (0.82-1.49) p=0.52	1.10 (0.82-1.49) p=0.52	1.10 (0.82-1.49) p=0.52	1.07 (0.75-1.55) p=0.70
Obese vs Normal BMI; in young adulthood		1.23 (0.80-1.91) p=0.35	1.21 (0.78-1.87) p=0.40	1.25 (0.79-1.99) p=0.34	1.23 (0.80-1.91) p=0.35	1.23 (0.80-1.91) p=0.35	1.23 (0.8-1.91) p=0.35	1.22 (0.77-1.94) p=0.39
Increased/Stable BMI vs Decreased BMI		0.86 (0.65-1.1) p=0.28	0.89 (0.66-1.2) p=0.42	0.85 (0.61-1.2) p=0.33	0.86 (0.65-1.1) p=0.28	0.86 (0.65-1.1) p=0.33	0.86 (0.65-1.1) p=0.28	0.88 (0.63-1.2) p=0.48

[a]After the exclusion of patients with missing data for the base multivariable model; [b]in this model, pack-years has been added to the model as a continuous predictor variable.

Supplementary Figure 1: Lung Cancer-Specific Survival: The hazard ratio of lung cancer free survival based on penalized smoothing spline by body mass index (BMI, kg/m^2) at lung cancer diagnosis for non-small cell lung cancer

Spline for BMI INT cont
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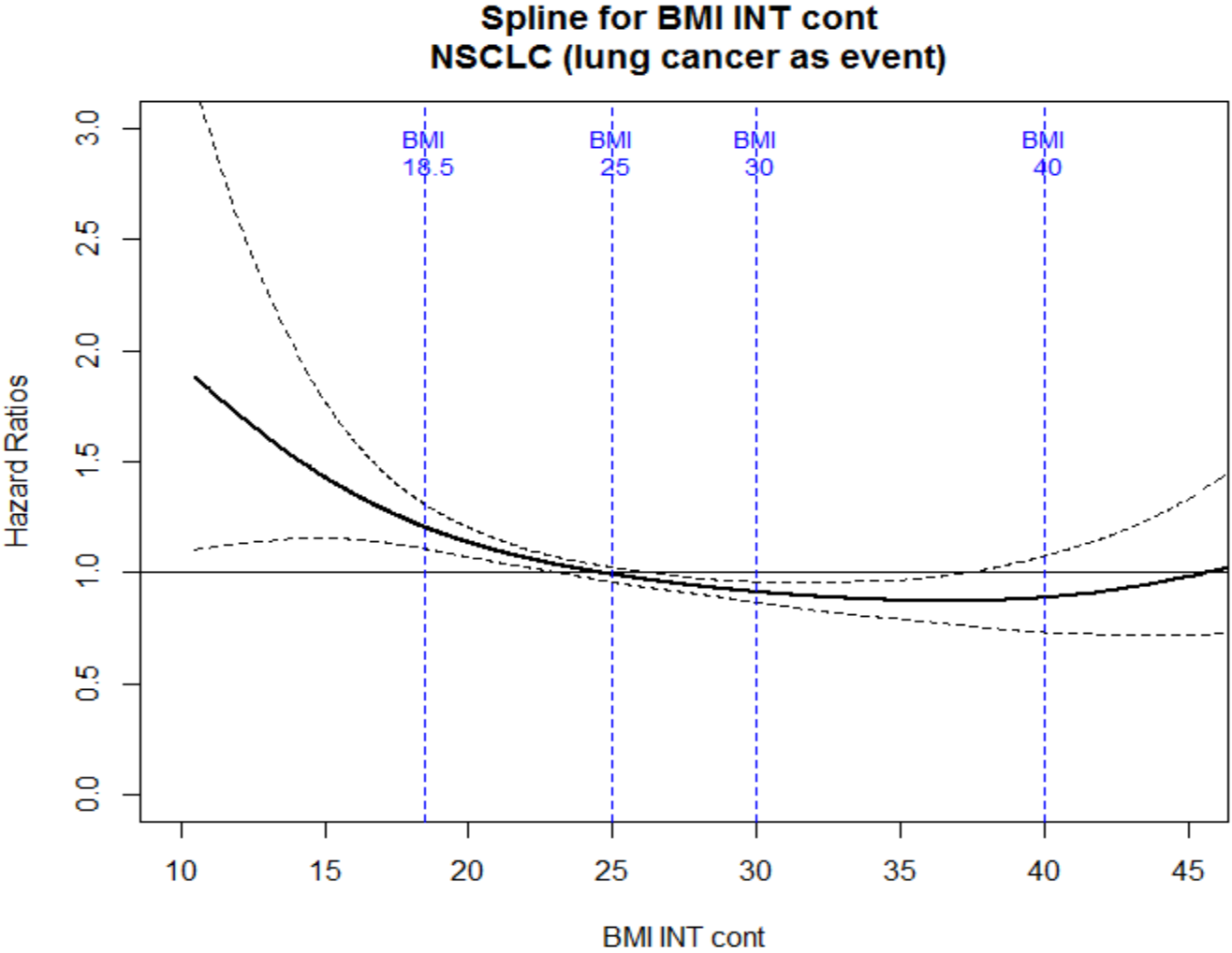
Supplementary Figure 2: BMI at diagnosis (divided into categories) versus overall survival in subsets of patients defined by clinico-demographic characteristics.
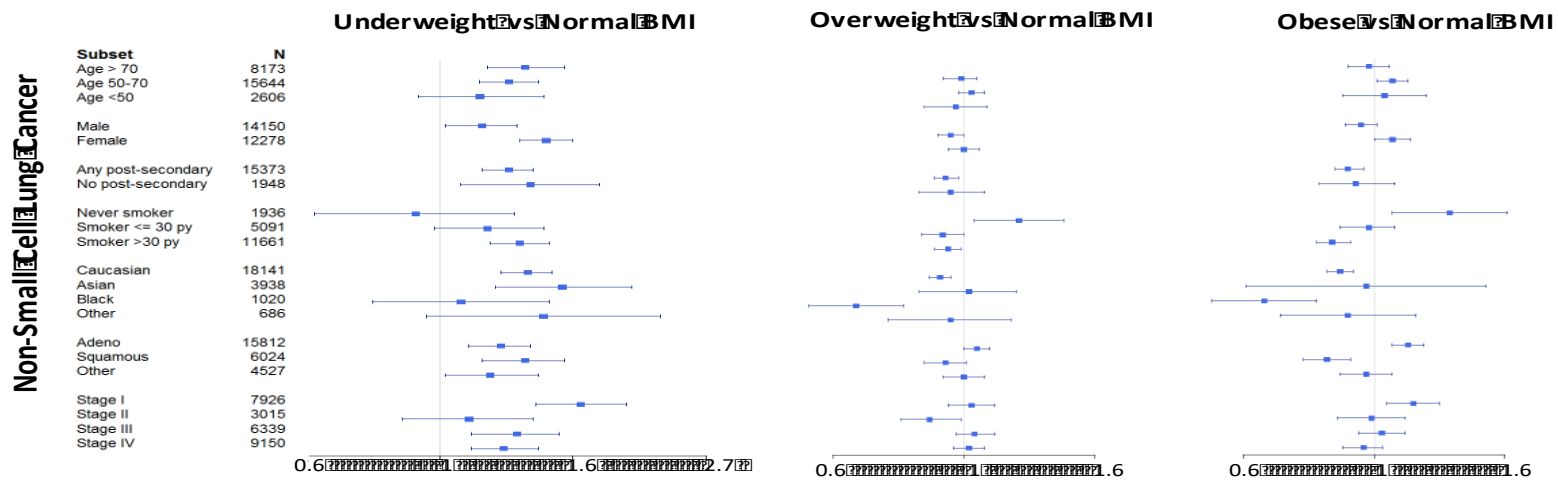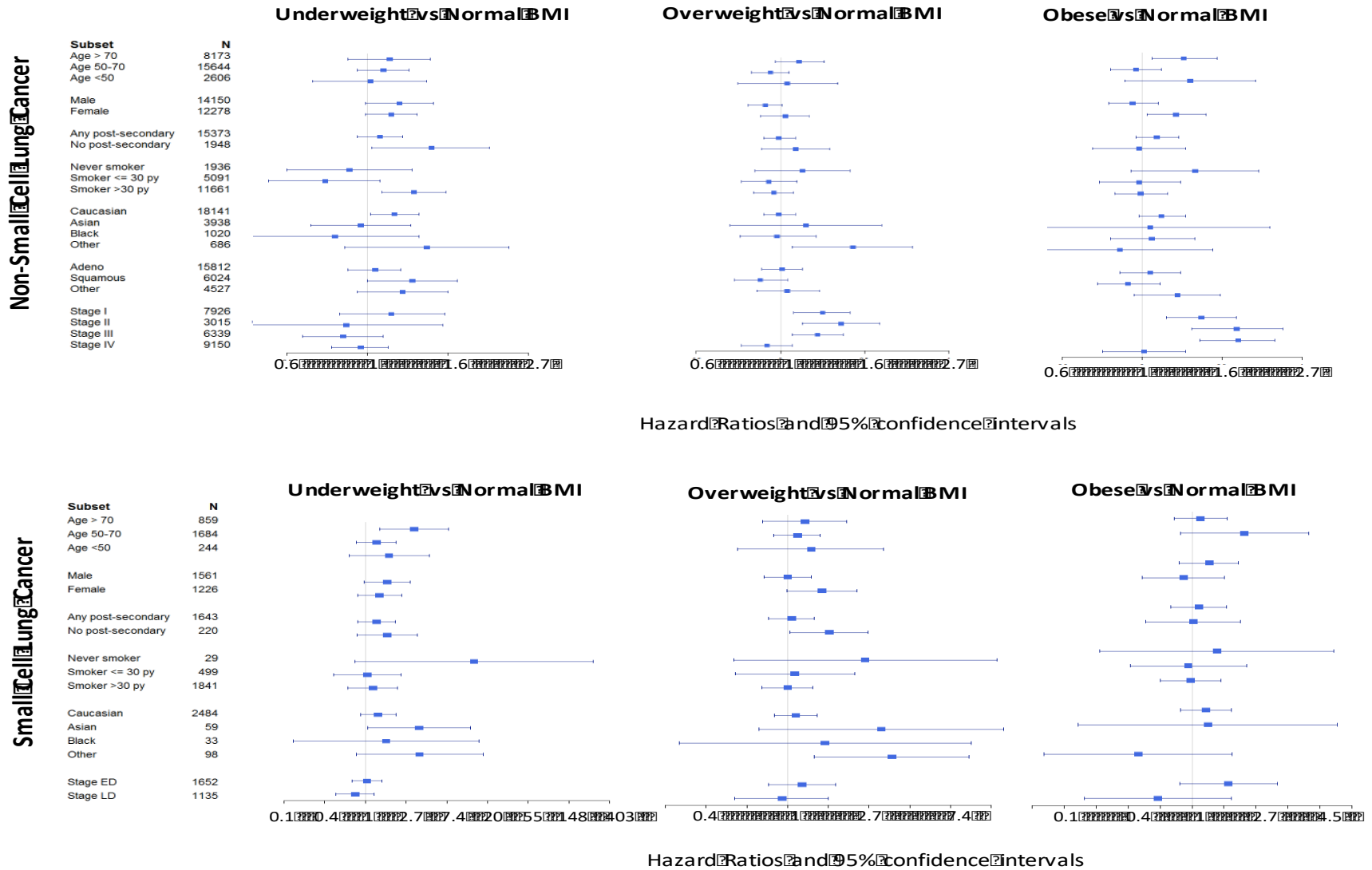

Hazard Ratios and 95% confidence intervals
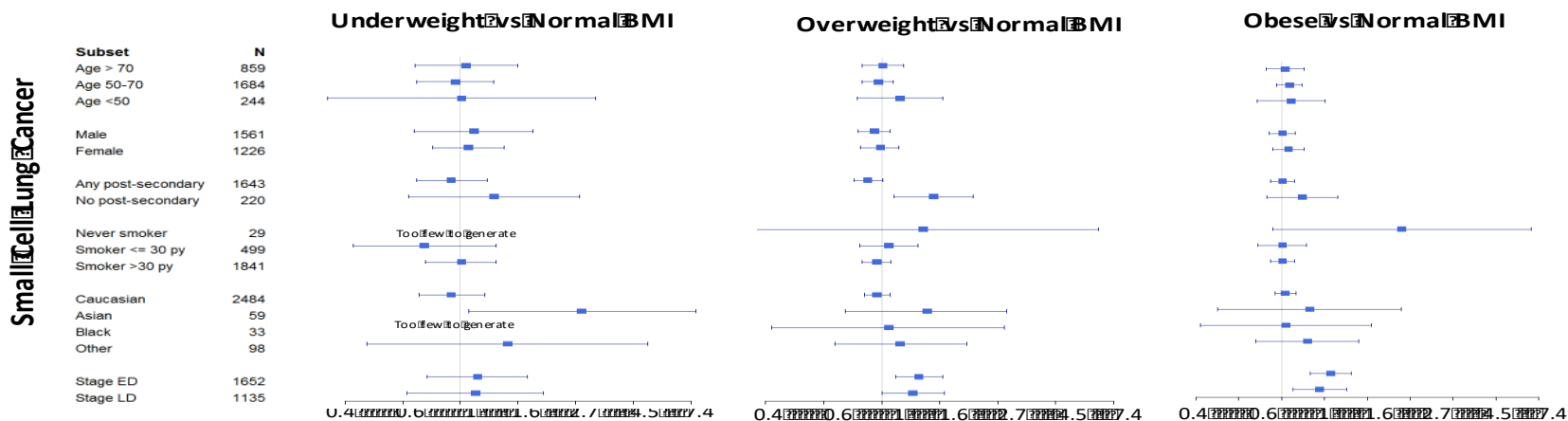
Hazard Ratios and 95% confidence intervals

Supplementary Figure 3: BMI in young adulthood (divided into categories) versus overall survival in subsets of patients defined by clinico-demographic characteristics.

Hazard Ratios and 95% confidence intervals

Supplementary Figure 4: Change in BMI from young adulthood until time of diagnosis versus overall survival in subsets of patients defined by clinico-demographic characteristics.

Decrease in BMI from young adulthood to diagnosis vs No change/increase in BMI from young adulthood to diagnosis