Chapter 11
General Morbidity and All-Cause Mortality

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Table 11.1S Studies on the association between smoking and all-cause mortality

Study	Design/population	Results (rate ratio 95% CI)			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Sakata et al. 2012	• 27,311 men and 40,662 women born before 1945 who were atomic bomb survivors or residents of Hiroshima and Nagasaki, Japan • Smoking status obtained during 1963–1992 • Mortality status available through 2008	**Years of age started smoking** • Men born <1920: – <20: 1.66 (1.54–1.79) – 20–29: 1.42 (1.34–1.51) – ≥30: 1.17 (1.07–1.29) – Unknown: 2.85 (2.48–3.28) – All ages: 1.46 (1.38–1.54) • Men born 1920–1945: – <20: 2.21 (1.97–2.48) – 20–29: 1.71 (1.53–1.91) – ≥30: 1.48 (1.07–2.05) – Unknown: 2.04 (1.74–2.39) – All ages: 1.89 (1.70–2.10) • Women born <1920: – <20: 1.54 (1.21–1.95) – 20–29: 1.53 (1.38–1.70) – ≥30: 1.26 (1.16–1.36) – Unknown: 1.78 (1.65–1.91) – All ages: 1.51 (1.43–1.58) • Women born 1920–1945: – <20: 2.61 (1.98–3.44) – 20–29: 2.01 (1.79–2.25) – ≥30: 1.40 (1.22–1.62) – Unknown: 1.94 (1.67–2.27) – All ages: 1.81 (1.67–1.96)	**Years of age quit smoking** • Men born <1920: – <25: 1.19 (0.84–1.68) – 25–34: 1.13 (0.94–1.36) – 35-44: 1.09 (0.95–1.24) – 45–54: 1.11 (1.00–1.22) – 55–64: 1.23 (1.12–1.34) – ≥65: 1.45 (1.33–1.59) – Unknown: 1.51 (1.28–1.78) • Men born 1920–1945: – <25: 0.91 (0.58–1.42) – 25–34: 0.83 (0.66–1.05) – 35–44: 1.21 (1.02–1.44) – 45–54: 1.43 (1.23–1.68) – 55–64: 1.73 (1.45–2.06) – ≥65: 1.72 (1.16–2.57) – Unknown: 2.14 (1.70–2.69) • Women born <1920: – <25: 0.89 (0.29–2.75) – 25-34: 1.16 (0.81–1.65) – 35-44: 1.04 (0.80–1.36) – 45-54: 0.93 (0.78–1.11) – 55-64: 1.22 (1.06–1.40) – ≥65: 1.31 (1.15–1.48) – Unknown: 1.45 (1.27–1.66) • Women born 1920–1945: – <25: 1.54 (0.64–3.70) – 25-34: 1.21 (0.81–1.81) – 35-44: 1.27 (0.95–1.70) – 45-54: 1.59 (1.26–2.00) – 55-64: 1.49 (1.15–1.92) – ≥65: 1.94 (1.15–3.29) – Unknown: 1.55 (1.23–1.95)	1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref)	• Risk of death increased with younger age of smoking initiation, irrespective of period of birth or gender • Quitting smoking at earlier age reduced risk of death	Rate ratios presented for current vs. never smokers and for former vs. never smokers, within strata of age started/ quit smoking, period of birth, and gender

Table 11.1*S* Continued

Study	Design/population	Results (rate ratio 95% CI)			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Thun et al. 2013	• CPS-I (1959–1965; 183,060 men, 355,922 women • CPS-II (1982–1988, 293,592 men, 452,893 women) • 5 pooled contemporary cohort studies of NIH–AARP, the ACS CPS-II Nutrition Cohort (a subset of the original CPS-II mortality study), WHI, NHS, and HPFS (2000-2010; 421,702 men, 535,054 women), 55 years of age or older during follow-up	• Men – CPS-I: 1.76 (1.71–1.81) – CPS-II: 2.33 (2.26–2.40) – Contemporary: 2.80 (2.72–2.88) • Women – CPS-I: 1.35 (1.30–1.40) – CPS-II: 2.08 (2.02–2.14) – Contemporary: 2.76 (2.69–2.84)	• Men – CPS-I: 1.28 (1.23–1.34) – CPS-II: 1.42 (1.38–1.45) – Contemporary: 1.47 (1.45–1.50) • Women – CPS-I: 1.33 (1.23–1.43) – CPS-II: 1.33 (1.29–1.37) – Contemporary: 1.45 (1.43–1.48)	1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref) 1.0 (ref)	• Absolute risks of death from smoking continue to increase among female smokers • Increased risks now nearly identical for men and women, as compared with persons who have never smoked	Adjusted for age, race, and educational level

Note: **ACS** = American Cancer Society; **CI** = confidence interval; **CPS** = Cancer Prevention Study; **HPFS** = Health Professional Follow-up Study; **NIH-AARP** = National Institutes of Health-AARP; **NHS** = Nurses' Health Study; **WHI** = Women's Health Initiative.

Table 11.2S Studies on the association between smoking and poor general health

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Johnson and Richter 2002	• 7,844 adolescents 12–17 years of age • United States	Mean self-rated health on a scale of 1 (poor) to 5 (excellent)			• Smokers had worse self-rated health than never smokers ($p < 0.01$)	Adjusted for gender, age, and family income
		• Total: – ≥6 days/month: 3.85 – 1–5 days/month: 3.98	• Total: 4.14	Total: 4.26		
Ostbye et al. 2002	• Health and Retirement Study (7,845 persons 51–64 years of age) • AHEAD (5,037 persons ≥70 years of age) • Longitudinal studies from 1992/1993–1998 • United States	OR (95% CI) for self-reported poor or fair health			• Current smoking—particularly heavy smoking—increases risk of fair or poor health • Former smokers who have quit within the last 15 years also have an increased risk of fair or poor health • Long-term quitters (>15 years) have a risk that's similar to never smokers	Adjusted for exercise, BMI, alcohol consumption, age, race, gender, marital status, and education
		• 51–64 years of age: – Heavy: 2.06 (1.80–2.36) – Light: 1.47 (1.24–1.73) • ≥70 years of age: – 1.55 (1.29–1.87)	• Time since quit: – <3 years: 1.99 (1.60–2.48) – 3–15 years: 1.28 (1.11–1.48) – >15 years: 1.07 (0.91–1.25) – 1.13 (1.01–1.27)	1.0 (ref) 1.0 (ref)		
Arday et al. 2003	• 134,309 elderly (≥65 years of age) and 8,640 disabled (<65 years of age) Medicare managed care enrollees	OR (95% CI) for fair or poor health			• Among disabled, current daily smokers were more likely than never smokers to report fair or poor health • Among elderly, both current and former smokers were more likely than never smokers to report fair or poor health	Adjusted for age, gender, race/ethnicity, and education
		• Disabled: – Daily: 1.58 (1.25–2.00) – Some days: 1.51 (0.97–2.34) • Elderly: – Daily: 1.53 (1.41–1.66) – Some days: 1.40 (1.21–1.63)	• Disabled: – ≤12 months: 1.41 (0.90–2.20) – >12 months: 1.20 (0.97–1.47) • Elderly: – ≤12 months: 2.72 (2.27–3.25) – >12 months: 1.26 (1.20–1.34)	1.0 (ref) 1.0 (ref)		
Strine et al. 2005	• BRFSS • 2001–2002 • 82,918 respondents • ≥18 years of age • United States	OR (95% CI) for fair or poor general health			• Current and former smokers were more likely than never smokers to report fair or poor health	Adjusted for age, gender, race/ethnicity, education, employment status, and marital status
		• Total: 1.7 (1.5–1.9)	• Total: 1.4 (1.3–1.6)	1.0 (ref)		

Table 11.2*S* Continued

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
McClave et al. 2009	• BRFSS • 2006 • 17,800 participants in 4 states • ≥18 years of age • United States	OR (95% CI) for fair or poor general health			• Frequency of fair or poor health did not vary significantly by smoking status	Adjusted for age, race/ethnicity, gender, education, marital status, employment status, chronic disease, and health care coverage
		• Total: – Nonquitter: 1.0 (ref) – Unsuccessful quitter: 1.3 (0.8–2.1)	• Total: 1.1 (0.7–1.7)	1.1 (0.7–1.7)		
Caldeira et al. 2012	• 1,253 U.S. college students	Probability of fair or poor health status			• Compared with those who did not smoke during college, those who smoked at a high, stable level were more likely to report their health as fair or poor ($p < 0.05$)	Adjusted for gender, race, and neighborhood income
		• Total smoked at high level throughout college: 0.28		Did not smoke during college: 0.11		
Wang et al. 2012	• 36,225 adolescents • Mean 15 years of age • Hong Kong	OR (95% CI) for poor self-rated health			• Current and former smokers were more likely than never smokers to report their health as fair or poor	Adjusted for gender, age, parental education, housing type, secondhand smoke exposure, ever drinking, physical activity, illicit drug use, and school clustering effect
		• Total: 1.52 (1.38–1.67) • Boys: 1.31 (1.13–1.53) • Girls: 1.75 (1.53–2.00)	• Total: 1.43 (1.19–1.71) • Boys: 1.43 (1.12–1.83) • Girls: 1.42 (1.08–1.85)	1.0 (ref) 1.0 (ref) 1.0 (ref)		

Note: **AHEAD** = Asset and Health Dynamics among the Oldest Old Survey; **BMI** = body mass index; **BRFSS** = Behavioral Risk Factor Surveillance System; **CI** = confidence interval; **OR** = odds ratio.

Table 11.3S Studies on the association between smoking and relative risk of poor functional status

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Ostbye et al. 2002	• Health and Retirement Study • 7,845 persons 51–64 years of age • United States	OR (95% CI) for disability (self-reported limited ability to work because of impairment or health problems)			• Current smokers were more likely than never smokers to report limited ability to work • Former smokers were also at increased risk of limited ability to work, with the exception of long-term (>15 years) quitters	Adjusted for exercise, BMI, alcohol consumption, age, race, gender, marital status, and education
		• Total – Heavy: 2.23 (1.84–2.71) – Light: 1.73 (1.37–2.18)	• Time since quit: – <3 years: 2.45 (1.81–3.33) – 3–15 years: 1.49 (1.21–1.84) – >15 years: 1.07 (0.84–1.37)	1.0 (ref)		
Atkinson et al. 2005	• 558 community-dwelling older women with moderate to severe disability • Mean age at baseline was 78 years • Followed for 3 years • United States	OR (95% CI) for experiencing both cognitive and physical decline. Physical decline based on walking speed. Mental decline based on MMSE			• Compared with never smokers, current smokers had a more than 5-fold increase in risk of cognitive and physical decline • Risk among former smokers was similar to that of never smokers	Adjusted for age, race, education, number of diseases, pulmonary disease, hemoglobin, baseline walking speed, baseline MMSE score, baseline instrumental activities of daily living, and baseline activities of daily living
		• Total: 5.66 (1.49–21.54)	• Total: 1.38 (0.48–4.00)	1.0 (ref)		
Sulander et al. 2005	• 11,793 people between 65–79 years of age • Finland	OR (95% CI) for worse functional status. Functional status scored as 0–5 (higher score reflecting worse status) based on sum of five activities of daily living: use of stairs, walking outside, bathing, dressing, and eating			• Current and former smokers had worse functional status than never smokers	Adjusted for age, alcohol, diet, physical activity, BMI, time period, occupation, and marital status
		• Men: 2.05 (1.62–2.61) • Women: 1.99 (1.47–2.68)	• Men: 1.26 (1.05–1.52) • Women: 1.67 (1.30–2.16)	1.0 (ref) 1.0 (ref)		

Table 11.3*S* Continued

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Myint et al. 2007	• EPIC study • 16,678 participating men and women • 40–79 years of age at baseline (1993–1997)	OR (95% CI) for poor physical functional health (bottom 20% of population)			• Current and former smokers have worse physical and mental function than never smokers	Adjusted for age, BMI, social class, education level, prevalent illness, alcohol intake, and physical activity
		• Men: 1.85 (1.49–2.30) • Women: 1.56 (1.30–1.87)	• Men: 1.18 (1.02–1.35) • Women: 1.16 (1.03–1.30)	1.0 (ref) 1.0 (ref)		
		OR (95% CI) for poor mental functional health (bottom 20% of population)				
		• Men: 1.38 (1.12–1.70) • Women: 1.77 (1.51–2.07)	• Men: 1.18 (1.02–1.35) • Women: 1.16 (1.03–1.30)	1.0 (ref) 1.0 (ref)		
Liao et al. 2011	• Taiwan Longitudinal Study in Aging • 1989–2003 • 3,187 men and women ≥60 years of age without functional disability at baseline	Hazard ratio (95% CI) for functional disability. Functional disability defined as difficulty taking a bath or walking 200–300 meters independently			• Current and former smokers had a higher risk of functional disability than never smokers	Adjusted for alcohol, sleep, exercise, gender, marital status, education, and time-varying disease status
		• Total: 1.45 (1.27–1.65)	• Total: 1.23 (1.05–1.44)	1.0 (ref)		

Table 11.3S Continued

Study	Design/population	Results: Current smoker	Results: Former smoker	Results: Never smoker	Findings	Comments
Vogl et al. 2012	• Health Survey for England data • 13,241 adults ≥16 years of age • 2006 • English general population	OR for problems with mobility			• Compared with never smokers, current heavy smokers scored worse on each of the 5 measures of health-related quality of life • Current moderate smokers scored worse than never smokers on all of the measures except problems with usual activity • Ex-regular smokers scored worse than never smokers on problems with mobility, pain/discomfort, and anxiety depression	Adjusted for age, gender, BMI, cardiovascular disease, number of limiting conditions, alcohol intake, physical activity, ethnicity, marital status, education, economic status, household income and size, and social capital
		• Total – Heavy: 1.67[a] – Moderate: 1.55[a] – Light: 1.13	• Total – Ex-regular: 1.18[a] – Ex-occasional: 0.99	1.00 (ref)		
		OR for problems with self-care				
		• Total – Heavy: 1.70[a] – Moderate: 1.45[a] – Light: 1.25	• Total – Ex-regular: 1.11 – Ex-occasional: 0.88	1.00 (ref)		
		Odds ratio for problems with usual activity				
		• Total – Heavy: 1.42[a] – Moderate: 1.37 – Light: 0.95	• Total – Ex-regular: 1.11 – Ex-occasional: 1.12	1.00 (ref)		
		Odds ratio for problems with pain/discomfort				
		• Total – Heavy: 1.46[a] – Moderate: 1.36[a] – Light: 1.34[a]	• Total – Ex-regular: 1.28[a] – Ex-occasional: 1.07	1.00 (ref)		
		Odds ratio for problems with anxiety/depression				
		• Total – Heavy: 1.86[a] – Moderate: 1.49[a] – Light: 1.43[a]	• Total – Ex-regular: 1.16[a] – Ex-occasional: 1.11	1.00 (ref)		

Note: **BMI** = body mass index; **CI** = confidence interval; **EPIC** = European Prospective Investigation into Cancer; **MMSE** = Mini-mental state examination; **OR** = odds ratio.
[a]Indicates $p<0.05$ relative to never smokers.

Table 11.4*S* Studies on the association between smoking and SF-36 or SF-12 scores[a]

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Mulder et al. 2001	• 9,660 men and women 20–59 years of age without a history of tobacco-related chronic disease • The Netherlands	PCS score			• PCS was higher among never smokers than among former ($p < 0.05$) and current ($p < 0.001$) smokers • MCS was lower among current smokers than among former and never smokers ($p < 0.0001$)	Adjusted for age, gender, education level, and town
		• Total: 51.4	• Total: 51.6	• Total: 52.0		
		MCS score				
		• Total: 46.9	• Total: 49.2	• Total: 49.3		
Arday et al. 2003	• 134,309 elderly (≥65 years of age) and 8,640 disabled (<65 years of age) Medicare managed care enrollees	PCS score			• Compared with never smokers, all smoking groups had worse PCS scores ($p \leq 0.03$) • Among disabled, current smokers—but not former smokers—had worse MCS scores than never smokers ($p \leq 0.01$) • Among elderly, current smokers and more recent quitters had worse MCS scores than never smokers ($p < 0.01$)	Adjusted for age, gender, race, education
		• Disabled • Daily: 29.4 • Some days: 27.5 • Elderly • Daily: 40.4 • Some days: 41.2	• Disabled: • ≤12 months quit: 29.2 • >12 months quit: 29.6 • Elderly • ≤12 months quit: 37.3 • >12 months quit: 40.8	31.8 42.4		
		MCS score				
		• Disabled – Daily: 39.0 – Some days: 40.4 • Elderly – Daily: 51.3 – Some days: 51.3	• Disabled – ≤12 months quit: 43.8 – >12 months quit: 43.9 • Elderly – ≤12 months quit: 49.3 – >12 months quit: 52.8	43.5 53.0		
Borzecki et al. 2005	• 1,242 male veterans • Mean 63 years of age • United States	Regression coefficients for the effect of smoking on PCS score at baseline			• Current smokers did not have statistically significantly worse PCS or MCS than never smokers • Former smokers had worse PCS than never smokers ($p < 0.05$) in the cross-sectional analysis	Adjusted for age, marital status, education, employment, living alone, comorbidity, alcohol use, exercise, BMI, seat belt use, and cholesterol screening
		• Total: -1.40	• Total: -1.52	Ref		
		Regression coefficients for the effect of smoking on MCS score at baseline				
		• Total: -0.49	• Total: 0.84	Ref		

Table 11.4S Continued

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Laaksonen et al. 2006	• 8,970 employees of the city of Helsinki • 40–60 years of age	PCS score			• Heavy current smokers had worse PCS and MCS than never smokers • Former smokers and never smokers had similar PCS and MCS	Adjusted for age and occupational class
		• Men – Heavy: 48.9 – Moderate: 50.1 • Women – Heavy: 47.8 – Moderate: 48.8	• Men: 50.5 • Women: 48.6	• Men: 50.7 • Women: 48.6		
		MCS score				
		• Men – Heavy: 50.3 – Moderate: 50.1 • Women – Heavy: 49.4 – Moderate: 51.4	• Men: 52.1 • Women: 51.8	• Men: 52.0 • Women: 52.1		
Strandberg et al. 2008	• 26-year follow-up study of 1,658 White men • Finland	Compared with men who were never smokers in 1974, men who smoked more than 20 cigarettes/day in 1974 had a statistically significantly worse PCS score in 2000; there was a graded deterioration in PCS score with increasing number of cigarettes smoked daily; the relationship between smoking and the MCS score was not statistically significant			• After 26 years of follow-up, heavy smokers had worse PCS than never smokers	Age-adjusted
Sarna et al. 2008	• Nurses' Health Study cohorts • 158,736 women between 29 and 71 years of age	Regression coefficients (SE) for the effects of smoking on PCS			• Current smokers had worse PCS and MCS than never smokers ($p < 0.001$) • Former smokers had worse MCS than never smokers ($p < 0.001$)	Adjusted for age, BMI, physical activity, living alone, and comorbidity
		• Total: -0.55 (0.06)	• Total: -0.08 (0.05)	Ref		
		Regression coefficients (SE) for the effects of smoking on mental component summary score (MCS)				
		• Total: -2.0 (0.07)	• Total: -0.32 (0.05)	Ref		
Pisinger et al. 2009	• 9,322 men and women between 30 and 60 years of age • Denmark	At baseline, PCS score and MCS score were highest in never smokers and lowest in daily smokers			• Smokers had worse PCS and MCS than never smokers ($p < 0.001$)	Adjusted for gender, age, employment status, and length of vocational training

Note: BMI = body mass index; MCS = mental component summary score; PCS = physical component summary score; SE = standard error.
[a]Measures of functional health and well-being; higher scores indicate better function.

Table 11.5S Studies on the association between smoking and other measures of health and function

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Ostbye et al. 2002	• Health and Retirement Study (845 persons 51–64 years of age) • AHEAD (5,037 persons ≥70 years of age) • Longitudinal studies from 1992/1993–1998 • United States	OR (95% CI) for difficulty walking several blocks • 51–64 years of age – Heavy: 2.37 (2.05–2.74) – Light: 1.68 (1.41–2.00) • ≥70 years of age: – 2.06 (1.69–2.49)	• Time since quit: – <3 years: 2.08 (1.65–2.62) – 3–15 years: 1.34 (1.16–1.56) – >15 years: 1.09 (0.93–1.29) • ≥70 years of age: – 1.30 (1.15–1.48)	1.0 (ref) 1.0 (ref)	• Current smokers were more likely than never smokers to have difficulty walking a short distance • Former smokers were also more likely to report difficulty, although the effect varied with time since quitting; long-term quitters had a risk that was similar to never smokers	Adjusted for exercise, BMI, alcohol consumption, age, race, gender, marital status, and education
Woods et al. 2005	• 28,181 WHI observational study participants • Women 65–79 years of age and free of frailty at baseline • United States • 3 years of follow-up	OR (95% CI) for incident frailty by baseline smoking status Frailty defined as a score of 3 or higher based on the following: poor-self reported physical function (2 points), exhaustion (1 point), low physical activity (1 point), and unintentional weight loss (1 point) • Total: 2.90 (2.35–3.57)	• Total: 1.12 (1.02–1.23)	1.0 (ref)	• Current and former smokers were more likely than never smokers to develop frailty	Adjusted for age, income, education, ethnicity, BMI, alcohol, hormone therapy, self-reported health, disability, living alone, and comorbid conditions
Heikkinen et al. 2008	• 8,028 persons ≥30 years of age • Mean: 51 years of age among men and 54 among women • Survey conducted 2000–2001 • Finland	Overall quality of life Respondents were asked to rate on a scale of 0 (worst) to 10 (best) how good their present life as a whole had been within the last 30 days • Men daily smokers: 7.35 • Women daily smokers: 7.58	• Men daily smokers: 7.66 • Women daily smokers: 7.67	• Men daily smokers: 7.63 • Women daily smokers: 7.75	• Daily smokers reported worse overall quality of life than never smokers among both men ($p < 0.001$) and women ($p = 0.004$) • Former smokers and never smokers had similar quality of life	Adjusted for age, education, and health-related quality of life
McClave et al. 2009	• BRFSS • 2006 • 17,800 participants in 4 states • ≥18 years of age • United States	OR (95% CI) for life dissatisfaction • Total – Nonquitter: 1.0 (ref) – Unsuccessful quitter: 0.7 (0.4–1.3)	• Total: 0.5 (0.3–0.9)	• Total: 0.4 (0.2–0.7)	• Compared with current smokers who have not recently tried to quit, former smokers and never smokers are less likely to report life dissatisfaction	Adjusted for age, race/ethnicity, gender, education, marital status, employment status, chronic disease, and health care coverage

Table 11.5S Continued

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Hardy et al. 2010	• 9,563 community-dwelling Medicare beneficiaries ≥65 years of age	• Current smokers were more likely than never smokers to have difficulty walking ¼ mile or to be unable to walk ¼ mile • Former smokers did not differ statistically significantly from never smokers in their ability to walk a short distance			• Current smokers were more likely than never smokers to have difficulty walking a short distance or to be unable to walk a short distance ($p < 0.05$)	Adjusted for age, gender, race, marital status, income, education, insurance status, chronic conditions, and BMI
Piper et al. 2012	• 1,504 participants in a smoking cessation trial • Average 45 years of age • United States	• During 3 years of follow-up, successful quitters experienced less of a decline in global quality of life than continuing smokers • Mean (SD) change in QOLI total at 3 years was -0.24 (1.40) in quitters and -0.47 (1.40) in continuing smokers			• Smokers who quit reported better quality of life than smokers who did not quit ($p = 0.02$)	
Sabia et al. 2012	• Whitehall II Study • 5,100 men and women 42–63 years of age at baseline • Followed for a median of 16.3 years • Free of cancer, coronary artery disease, and stroke at baseline	OR (95% CI) for successful aging Successful aging defined as good cognitive, physical, respiratory, and cardiovascular functioning, and absence of disability, mental health problems, and chronic disease			• Never smokers were more likely than ever smokers to experience successful aging	Adjusted for alcohol consumption, physical activity, daily consumption of fruits and vegetables, age, gender, education, and marital status
		• Ever-smokers formed the reference group		• Total: 1.29 (1.11–1.49)		

Note: **AHEAD** = Asset and Health Dynamics among the Oldest Old Survey; **BMI** = body mass index; **BRFSS** = Behavioral Risk Factor Surveillance System; **CI** = confidence interval; **MCS** = mental component summary score; **OR** = odds ratio; **QOLI** = Quality of Life Inventory; **SD** = standard deviation; **WHI** = Women's Health Initiative.

Table 11.6S Studies on the association between smoking and hospitalizations

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Robbins et al. 2000	• 87,991 men and women serving on active duty in the U.S. Army during 1987–1998 • Average at baseline was 28.5 years of age	Rate ratio (95% CI) for hospitalization not due to injury or pregnancy			• Among both men and women, current and former smokers were more likely to be hospitalized than never smokers	Adjusted for age, race, military rank, alcohol consumption, exercise frequency, and overweight
		• Men: 1.30 (1.24–1.35) • Women: 1.25 (1.14–1.37)	• Men: 1.20 (1.14–1.26) • Women: 1.13 (1.01–1.26)	1.0 (ref) 1.0 (ref)		
Johnson and Richter 2002	• 7,844 adolescents 12–17 years of age • United States	Mean number of overnight hospital stays			• Frequent smokers reported more overnight hospital stays than less frequent smokers, former smokers, or never smokers ($p < 0.01$)	Adjusted for gender, age, and family income
		• Total – 6 or more days/month: 0.22 – 1–5 days/month: 0.04	• Total: 0.05	0.07		
Ostbye et al. 2002	• Health and Retirement Study (7,845 persons 51–64 years of age) • AHEAD (5,037 persons ≥70 years of age) • Longitudinal studies from 1992/1993–1998 • United States	OR (95% CI) for hospitalization in previous year			• Current smokers and more recent quitters were more likely to be hospitalized than never smokers • Long-term quitters (>15 years) and never smokers had a similar likelihood of hospitalization	Adjusted for exercise, BMI, alcohol consumption, age, race, gender, marital status, and education
		• 51–64 years of age – Heavy: 1.41 (1.24–1.59) – Light: 1.35 (1.16–1.56) • ≥70 years of age: – 1.28 (1.08–1.52)	• Time since quit: – <3 years: 1.46 (1.20–1.78) – 3–15 years: 1.22 (1.08–1.38) – >15 years: 0.96 (0.85–1.09) • ≥70 years of age: – 1.16 (1.04–1.29)	1.0 (ref) 1.0 (ref)		
Kahende et al. 2009	• NHANES • 1999–2004 • 15,332 adults ≥18 years of age • United States	OR for a hospitalization within the last year			• Current smokers, recent quitters (<2 years), and long-term quitters (≥10 years) were each more likely than never smokers to be hospitalized	Adjusted for gender, race/ethnicity, age, education, poverty level, and health insurance
		• Total: 1.20 (1.06–1.37)	• Total: – <2 years since quit: 2.49 (1.86–3.34) – 2–4 years since quit: 1.39 (0.98–1.97 – 5–9 years since quit: 1.17 (0.86–1.59) – ≥10 years since quit: 1.22 (1.02–1.46)	1.0 (ref)		

Table 11.6S Continued

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Woodruff et al. 2010	• 5,503 female U.S. Navy recruits • Mean 19.7 years of age at entry	Percent hospitalized; excludes pregnancy-related hospitalizations			• Likelihood of hospitalization did not vary by smoking status • Duration of hospitalization was longest among current smokers	Adjusted for time in service, education, race, and regular/reserve status
		• Daily smoker: 13	• Former or nondaily smoker: 12	• Never smoker: 14		
		Average duration of hospitalization (days)				
		• Daily smoker: 5.7	• Former or nondaily smoker: 5.1	• Never smoker: 5.2		

Note: **AHEAD** = Asset and Health Dynamics among the Oldest Old Survey; **BMI** = body mass index; **CI** = confidence interval; **NHANES** = National Health and Nutrition Examination Survey; **OR** = odds ratio.

Table 11.7*S* Studies on the association between smoking and outpatient visits

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Borzecki et al. 2005	• 1,397 male veterans • United States	Regression coefficient for the effect of smoking on physician visits			• Current smokers had fewer outpatient visits than never smokers ($p < 0.05$)	Adjusted for age, marital status, education, employment, live alone, other insurance, disability, comorbidity, alcohol, exercise, BMI, seat belt use, and cholesterol screening
		Total: -0.30	Total: -0.05	Ref		
Kahende et al. 2009	• NHANES • 1999–2004 • 15,332 adults ≥18 years of age • United States	OR for at least 1 outpatient visit within the last year			• The frequency of at least 1 outpatient visit was similar in current and never smokers • Current smokers and former smokers were more likely than never smokers to have multiple (≥4) outpatient visits • Multiple outpatient visits were most common among recent quitters	Adjusted for gender, race/ethnicity, age, education, poverty level, and health insurance
		• Total: 0.94 (0.81–1.13)	• <2 years since quit: 1.75 (1.15–2.65) • 2–4 years since quit: 1.15 (0.76–1.75) • 5–9 years since quit: 1.47 (0.90–2.40) • ≥10 years since quit: 1.75 (1.42–2.14)	1.0 (ref)		
		OR for 4 or more outpatient visits within the last year				
		• Total: 1.18 (1.06–1.33)	• <2 years since quit: 1.65 (1.29–2.12) • 2–4 years since quit: 1.59 (1.17–2.18) • 5–9 years since quit: 1.34 (1.02–1.74) • ≥10 years since quit: 1.17 (1.04–1.32)	1.0 (ref)		

Note: **BMI** = body mass index; **NHANES** = National Health and Nutrition Examination Survey; **OR** = odds ratio.

Table 11.8S Studies on the association between smoking and nursing home stays

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Ostbye et al. 2002	• AHEAD (5,037 persons ≥70 years of age) • Longitudinal study from 1993–1998 • United States	OR (95% CI) for stay in a nursing home, convalescent home, or other long-term care health facility in the previous year			• Current smokers were more likely than never smokers to have a stay in a nursing home, convalescent home, or other long-term care facility	Adjusted for exercise, BMI, alcohol consumption, age, race, gender, marital status, and education
		• ≥70 years of age: – 1.68 (1.08–2.63)	• ≥70 years of age: – 1.16 (0.85–1.58)	1.0 (ref)		
Valiyeva et al. 2006	• NHANES I Epidemiologic Follow-up Study (NHEFS) • 6,462 people who were 45–74 years of age at baseline (1971–1975) • Followed until 1992	RR (95% CI) of a nursing home admission			• Current smokers were more likely than people who did not smoke at baseline to be admitted to a nursing home	Adjusted for age, gender, race, BMI, major diagnoses at baseline, physical activity, blood pressure, cholesterol level, and diabetes
		• 45–65 years of age at baseline: – 1.56 (1.23–1.99)	Reference group did not smoke at baseline			
		• 65–74 years of age at baseline: – 1.32 (1.08–1.61)	Reference group did not smoke at baseline			

Note: **AHEAD** = Asset and Health Dynamics among the Oldest Old Survey; **BMI** = body mass index; **CI** = confidence interval; **NHANES** = National Health and Nutrition Examination Survey; **OR** = odds ratio; **RR** = relative risk.

Table 11.9S Studies on the association between smoking and costs

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
CBO 2012	• Medical Expenditure Panel Survey Data for 2000–2008 from the • 1998–2007 from the National Health Interview Survey • ≥18 years of age	Annual per capita spending on health care (in 2008 dollars) for former smokers, by time since quit			• Spending tended to be highest among former smokers followed by current smokers. • Never smokers had the lowest spending in each age group except the oldest	
		• 18–24 years of age: 2,010 • 25–44 years of age: 2,850 • 45–64 years of age: 5,540 • 65–74 years of age: 7,940 • ≥75 years of age: 8,750	• 18–24 years of age: – <5 years: 2000 – 5–14 years: NA – ≥15 years: NA • 25–44 years of age: – <5 years: 3,090 – 5–14 years: 2,920 – ≥15 years: 3,330 • 45–64 years of age: – <5 years: 7,650 – 5–14 years: 6,580 – ≥15 years: 6,290 • 65–74 years of age: – <5 years: 11,250 – 5–14 years: 9,760 – ≥15 years: 9,330 • ≥75 years of age: – <5 years: 15,530 – 5–14 years: 12,280 – ≥15 years: 11,770	1,870 2,570 5,040 7,790 9,810		

Note: **CBO** = Congressional Budget Office; **NA** = not available.

Table 11.10*S* Annual per capita spending on health care, by smoking status and age group (2008 dollars*)

	18–24 years	25–44 years	45–64 years	65–74 years	≥75 years
People who have never smoked	1,870	2,570	5,040	7,790	9,810
Current or former smokers	2,010	2,940	6,170	9,230	11,580
Current smokers	2,010	2,850	5,540	7,940	8,750
Former smokers					
For <5 years	2,000	3,090	7,650	11,250	15,530
For 5–14 years	n.a.	2,920	6,580	9,760	12,280
For ≥15 years	n.a.	3,330	6,290	9,330	11,770

Source: Congressional Budget Office 2012.
Note: **n.a.** = not available (because of a lack of data to produce precise estimates). Based on data for 2000 to 2008 from the Medical Expenditure Panel Survey and for 1998 to 2007 from the National Health Interview Survey.
*The numbers shown here are rounded to the nearest $10.

Table 11.11*S* Studies on the association between smoking and workplace absenteeism (days absent)*

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Halpern et al. 2001	• 292 U.S. airline employees • Mean ranged from 37 years of age among never smokers to 44 years of age among former smokers	Mean (SD) absenteeism days caused by sickness during 4-month study period			• Absenteeism varied by smoking status (p = 0.0001)	
		• Total: 3.99 (4.86)	• Total: 2.40 (3.54)	• Total: 1.33 (2.20)		
Tsai et al. 2003	• 2,203 employees of a U.S. chemical and refinery facility • Ages ranged from <30 to >60	Mean number of days lost per employee/year			• Current smokers missed more days than never smokers (p-value NR)	
		• Total: 6.4	• Total: 4.8	• Total: 3.5		
Tsai et al. 2005	• 2,550 regular employees at U.S. petrochemical facility • Average 46 years of age at end of study	Mean number of days lost per employee/year			• Among both men and women, current smokers lost almost twice as many days as never smokers (p <0.05)	
		• Men: 13.3 • Women: 23.3 • Total: 14.3	• Men: 8.7 • Women: 12.5 *Time since quitting* – 1–9 years: 11.0 – 10–19 years: 8.8 – ≥20 years: 7.9	• Men: 7.0 • Women: 12.3 • Total: 7.6		

Note: **NR** = not reported; **SD** = standard deviation.

*Absenteeism includes any absence during a specified time period, any short-term absence, any long-term absence, or total days lost.

Table 11.12S Studies on the association between smoking and relative risk (RR) of workplace absenteeism*

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Morikawa et al. 2004	• 2,504 male Japanese factory workers, 35–55 years of age • 6,290 male British civil service workers, 35–55 years of age	HR (95% CI) for first long-term (>7 days) sickness absence			• Current and former smokers were each more likely than never smokers to have a long-term sickness absence	Age-adjusted
		• Japan: 1.43 (1.17–1.75) • Britain: 1.51 (1.35–1.67)	• Japan: 1.39 (1.07–1.80) • Britain: 1.11 (1.02–1.21)	1.0 (ref) 1.0 (ref)		
Sindelar et al. 2005	• 383,778 full-time U.S. workers • 18–64 years of age	OR for absence in the last week			• Current and former smokers were each more likely than never smokers to have an absence ($p = 0.000$ for each group) • Although risk of an absence appeared to be highest among recent quitters, each group of former smokers was more likely than never smokers to have an absence ($p < 0.05$ for each group)	Adjusted for age, education, race, ethnicity, marital status, number of children, occupation, industry, metropolitan statistical area, state, and month and year
Labriola et al. 2006	• 3,792 Danish employees • 18–64 years of age at start of study	OR for >6 days of absence of previous year			• Current and former smokers were each more likely than never smokers to have more than 6 days of absence in the previous year	Adjusted for age, gender, health status, BMI, and employer and job characteristics
		• Total: 1.61 (1.32–1.96)	• Total: 1.32 (1.03–1.68)	1.0 (ref)		
Christensen et al. 2007	• 5,020 Danish employees • 18–69 years of age	HR for long-term sickness absence (8 consecutive weeks)			• Among current smokers, only heavy smoking significantly increased risk of long-term absence • Former smoking increased risk of a long-term absence among women only	Adjusted for age, family status, SES, education, work environment, and diagnosed disease; adjustment for diagnosed disease may lead to underestimation of the smoking effect
		• Men – ≥15 cigarettes: 1.55 (1.00–2.40) – <15 cigarettes: 0.92 (0.50–1.73)	• Men: 1.36 (0.85–2.19)	1.0 (ref)		
		• Women – ≥15 cigarettes: 2.05 (1.36–3.08) – <15 cigarettes: 1.21 (0.74–1.98)	• Women: 1.61 (1.07–2.42)	1.0 (ref)		

Table 11.12*S* Continued

Study	Design/population	Results			Findings	Comments
		Current smoker	Former smoker	Never smoker		
Laaksonen et al. 2009	• 5,470 female and 1,464 male Finnish city employees • 40–60 years of age	RR for 1–3 day sickness absence			• Heavy current smoking increased the risk of both short- and longer-term absences in men and women • Lighter current smoking was linked with short-term absences in women, and with longer-term absences in men and women • The increase in absences among former smokers was only statistically significant in women	Adjusted for age and occupational class
		• Men – >20 cigarettes: 1.71 (1.39–2.11) – ≤20 cigarettes: 1.63 (1.34–1.98)	• Men: 1.12 (0.94 to 1.33)	1.0 (ref)		
		• Women – >20 cigarettes: 1.50 (1.37–1.64) – ≤20 cigarettes: 1.23 (1.13–1.34)	• Women: 1.18 (1.10–1.27)	1.0 (ref)		
		RR for ≥4 day sickness absence				
		• Men – >20 cigarettes: 1.66 (1.31–2.10) – ≤20 cigarettes: 1.23 (0.96–1.57)	• Men: 1.10 (0.90–1.34)	1.0 (ref)		
		• Women: – >20 cigarettes: 1.49 (1.34–1.65) – ≤20 cigarettes: 1.32 (1.20–1.46)	• Women: 1.18 (1.08–1.29)	1.0 (ref)		

Note: **BMI** = body mass index; **CI** = confidence interval; **HR** = hazard ratio; **OR** = odds ratio; **SES** = socioeconomic status.
*Absenteeism includes any absence during a specified time period, any short-term absence, any long-term absence, or total days lost.

Appended Table 11.1*S* Studies on the association between smoking and all-cause mortality

Study	Design/population	Definition of results	Results	Findings	Comments
Sakata et al. 2012	• 27,311 men and 40,662 women born before 1945 who were atomic bomb survivors or residents of Hiroshima and Nagasaki, Japan • Smoking status obtained during 1963–1992 • Mortality status available through 2008	Results (rate ratio 95% CI)	**Never smoker:** • Referrent: 1.0 **Current smoker (years of age started smoking):** • Men born <1920: – <20: 1.66 (1.54–1.79) – 20–29: 1.42 (1.34–1.51) – ≥30: 1.17 (1.07–1.29) – Unknown: 2.85 (2.48–3.28) – All ages: 1.46 (1.38–1.54) • Men born 1920–1945: – <20: 2.21 (1.97–2.48) – 20–29: 1.71 (1.53–1.91) – ≥30: 1.48 (1.07–2.05) – Unknown: 2.04 (1.74–2.39) – All ages: 1.89 (1.70–2.10) • Women born <1920: – <20: 1.54 (1.21–1.95) – 20–29: 1.53 (1.38–1.70) – ≥30: 1.26 (1.16–1.36) – Unknown: 1.78 (1.65–1.91) – All ages: 1.51 (1.43–1.58) • Women born 1920–1945: – <20: 2.61 (1.98–3.44) – 20–29: 2.01 (1.79–2.25) – ≥30: 1.40 (1.22–1.62) – Unknown: 1.94 (1.67–2.27) – All ages: 1.81 (1.67–1.96)	• Risk of death increased with younger age of smoking initiation, irrespective of period of birth or gender • Quitting smoking at earlier age reduced risk of death	Rate ratios presented for current vs. never smokers and for former vs. never smokers, within strata of age started/quit smoking, period of birth, and gender

Appended Table 11.1*S* Continued

Study	Design/population	Definition of results	Results	Findings	Comments
Sakata et al. 2012 (continued)			**Former smoker (years of age started smoking):** • Men born <1920: – <25: 1.19 (0.84–1.68) – 25–34: 1.13 (0.94–1.36) – 35–44: 1.09 (0.95–1.24) – 45–54: 1.11 (1.00–1.22) – 55–64: 1.23 (1.12–1.34) – ≥65: 1.45 (1.33–1.59) – Unknown: 1.51 (1.28–1.78) • Men born 1920–1945: – <25: 0.91 (0.58–1.42) – 25–34: 0.83 (0.66–1.05) – 35–44: 1.21 (1.02–1.44) – 45–54: 1.43 (1.23–1.68) – 55–64: 1.73 (1.45–2.06) – ≥65: 1.72 (1.16–2.57) – Unknown: 2.14 (1.70–2.69) • Women born <1920: – <25: 0.89 (0.29–2.75) – 25–34: 1.16 (0.81–1.65) – 35–44: 1.04 (0.80–1.36) – 45–54: 0.93 (0.78–1.11) – 55–64: 1.22 (1.06–1.40) – ≥65: 1.31 (1.15–1.48) – Unknown: 1.45 (1.27–1.66) • Women born 1920–1945: – <25: 1.54 (0.64–3.70) – 25–34: 1.21 (0.81–1.81) – 35–44: 1.27 (0.95–1.70) – 45–54: 1.59 (1.26–2.00) – 55–64: 1.49 (1.15–1.92) – ≥65: 1.94 (1.15–3.29) • Unknown: 1.55 (1.23–1.95)		

Appended Table 11.1*S* Continued

Study	Design/population	Definition of results	Results	Findings	Comments
Thun et al. 2013	• CPS I (1959–1965; 183,060 men, 355,922 women) • CPS II (1982–1988, 293,592 men, 52,893 women) • 5 pooled contemporary cohort studies of NIH–AARP, the ACS CPS II Nutrition Cohort (a subset of the original CPS II mortality study), WHI, NHS, and HPFS (2000–2010; 421,702 men, 535,054 women), 55 years of age or older during follow-up	Results (rate ratio 95% CI)	**Never smoker:** • Referrent: 1.0 **Current smoker (men):** • CPS I: 1.76 (1.71–1.81) • CPS II: 2.33 (2.26–2.40) • Contemporary: 2.80 (2.72–2.88) **Current smoker (women):** • CPS I: 1.35 (1.30–1.40) • CPS II: 2.08 (2.02–2.14) • Contemporary: 2.76 (2.69–2.84) **Former smoker (men):** • CPS I: 1.28 (1.23–1.34) • CPS II: 1.42 (1.38–1.45) • Contemporary: 1.47 (1.45–1.50) **Former smoker (women):** • CPS I: 1.33 (1.23–1.43) • CPS II: 1.33 (1.29–1.37) • Contemporary: 1.45 (1.43–1.48)	• Absolute risks of death from smoking continue to increase among female smokers • Increased risks now nearly identical for men and women, as compared with persons who have never smoked	Adjusted for age, race, and educational level

Note: **ACS =** American Cancer Society; **CI =** confidence interval; **CPS =** Cancer Prevention Study; **HPFS =** Health Professional Follow-up Study; **NIHAARP =** National Institutes of Health-AARP; **NHS =** Nurses' Health Study; **WHI =** Women's Health Initiative.

Appended Table 11.2*S* Studies on the association between smoking and poor general health

Study	Design/population	Definition of results	Results	Findings	Comments
Johnson and Richter 2002	• 7,844 adolescents 12–17 years of age • United States	Mean self-rated health on a scale of 1 (poor) to 5 (excellent)	**Current smoker:** • ≥6 days/month: 3.85 • 1–5 days/month: 3.98 **Former smoker:** • Total: 4.14 **Never smoker:** • Total: 4.26	• Smokers had worse self-rated health than never smokers ($p < 0.01$)	Adjusted for gender, age, and family income
Ostbye et al. 2002	• Health and Retirement Study (7,845 persons 51–64 years of age) • AHEAD (5,037 persons ≥70 years of age) • Longitudinal studies from 1992/1993–1998 • United States	OR (95% CI) for self-reported poor or fair health	**Never smoker:** • Referent: 1.0 **Current smoker:** • 51–64 years of age: – Heavy: 2.06 (1.80–2.36) – Light: 1.47 (1.24–1.73) • ≥70 years of age: 1.55 (1.29–1.87) **Former smoker (time since quit):** • <3 years: 1.99 (1.60–2.48) • 3–15 years: 1.28 (1.11–1.48) • >15 years: 1.07 (0.91–1.25) • 1.13 (1.01–1.27)	• Current smoking—particularly heavy smoking—increases risk of fair or poor health • Former smokers who have quit within the last 15 years also have an increased risk of fair or poor health • Long-term quitters (>15 years) have a risk that's similar to never smokers	Adjusted for exercise, BMI, alcohol consumption, age, race, gender, marital status, and education
Arday et al. 2003	• 134,309 elderly (≥65 years of age) and 8,640 disabled (<65 years of age) Medicare managed care enrollees	OR (95% CI) for fair or poor health	**Never smoker:** • Referrent: 1.0 **Current smoker (disabled):** • Daily: 1.58 (1.25–2.00) • Some days: 1.51 (0.97–2.34) **Current smoker (elderly):** • Daily: 1.53 (1.41–1.66) • Some days: 1.40 (1.21–1.63) **Former smoker (disabled):** • ≤12 months: 1.41 (0.90–2.20) • >12 months: 1.20 (0.97–1.47) **Former smoker (elderly):** • ≤12 months: 2.72 (2.27–3.25) • >12 months: 1.26 (1.20–1.34)	• Among disabled, current daily smokers were more likely than never smokers to report fair or poor health • Among elderly, both current and former smokers were more likely than never smokers to report fair or poor health	Adjusted for age, gender, race/ethnicity, and education
Strine et al. 2005	• BRFSS • 2001–2002 • 82,918 respondents • ≥18 years of age • United States	OR (95% CI) for fair or poor general health	**Never smoker:** • Referrent: 1.0 **Current smoker:** • Total: 1.7 (1.5–1.9) **Former smoker:** • Total: 1.4 (1.3–1.6)	• Current and former smokers were more likely than never smokers to report fair or poor health	Adjusted for age, gender, race/ ethnicity, education, employment status, and marital status

Appended Table 11.2*S* Continued

Study	Design/population	Definition of results	Results	Findings	Comments
McClave et al. 2009	• BRFSS • 2006 • 17,800 participants in 4 states • ≥18 years of age • United States	OR (95% CI) for fair or poor general health	**Never smoker:** • Referrent: 1.1 (0.7–1.7) **Current smoker:** • Nonquitter (referrent): 1.0 • Unsuccessful quitter: 1.3 (0.8–2.1) **Former smoker:** • Total: 1.1 (0.7–1.7)	• Frequency of fair or poor health did not vary significantly by smoking status	Adjusted for age, race/ethnicity, gender, education, marital status, employment status, chronic disease, and health care coverage
Caldeira et al. 2012	• 1,253 U.S. college students	Probability of fair or poor health status	**Current smoker:** • Total smoked at high level throughout college: 0.28 **Never smoker:** • Did not smoke during college: 0.11	• Compared with those who did not smoke during college, those who smoked at a high, stable level were more likely to report their health as fair or poor ($p < 0.05$)	Adjusted for gender, race, and neighborhood income
Wang et al. 2012	• 36,225 adolescents • Mean 15 years of age • Hong Kong	OR (95% CI) for poor self-rated health	**Never smoker:** • Referrent: 1.0 **Current smoker:** • Total: 1.52 (1.38–1.67) • Boys: 1.31 (1.13–1.53) • Girls: 1.75 (1.53–2.00) **Former smoker:** • Total: 1.43 (1.19–1.71) • Boys: 1.43 (1.12–1.83) • Girls: 1.42 (1.08–1.85)	• Current and former smokers were more likely than never smokers to report their health as fair or poor	Adjusted for gender, age, parental education, housing type, secondhand smoke exposure, ever drinking, physical activity, illicit drug use, and school clustering effect

Note: **AHEAD =** Asset and Health Dynamics among the Oldest Old Survey; **BMI =** body mass index; **BRFSS =** Behavioral Risk Factor Surveillance System; **CI =** confidence interval; **OR =** odds ratio.

Appended Table 11.3*S* Studies on the association between smoking and relative risk of poor functional status

Study	Design/population	Definition of results	Results	Findings	Comments
Ostbye et al. 2002	• Health and Retirement Study • 7,845 persons 51–64 years of age • United States	OR (95% CI) for disability (self-reported limited ability to work because of impairment or health problems)	**Never smoker:** • Referent: 1.0 **Current smoker:** • Heavy: 2.23 (1.84–2.71) • Light: 1.73 (1.37–2.18) **Former smoker (time since quit):** • <3 years: 2.45 (1.81–3.33) • 3–15 years: 1.49 (1.21–1.84) • >15 years: 1.07 (0.84–1.37)	• Current smokers were more likely than never smokers to report limited ability to work • Former smokers were also at increased risk of limited ability to work, with the exception of long-term (>15 years) quitters	Adjusted for exercise, BMI, alcohol consumption, age, race, gender, marital status, and education
Atkinson et al. 2005	• 558 community-dwelling older women with moderate to severe disability • Mean age at baseline was 78 years • Followed for 3 years • United States	OR (95% CI) for experiencing both cognitive and physical decline. Physical decline based on walking speed. Mental decline based on MMSE	**Never smoker:** • Referent: 1.0 **Current smoker:** • 5.66 (1.49–21.54) **Former smoker:** • 1.38 (0.48–4.00)	• Compared with never smokers, current smokers had a more than 5-fold increase in risk of cognitive and physical decline • Risk among former smokers was similar to that of never smokers	Adjusted for age, race, education, number of diseases, pulmonary disease, hemoglobin, baseline walking speed, baseline MMSE score, baseline instrumental activities of daily living, and baseline activities of daily living
Sulander et al. 2005	• 11,793 people between 65–79 years of age • Finland	OR (95% CI) for worse functional status. Functional status scored as 0–5 (higher score reflecting worse status) based on sum of five activities of daily living: use of stairs, walking outside, bathing, dressing, and eating	**Never smoker:** • Referent: 1.0 **Current smoker:** • Men: 2.05 (1.62–2.61) • Women: 1.99 (1.47–2.68) **Former smoker:** • Men: 1.26 (1.05–1.52) • Women: 1.67 (1.30–2.16)	• Current and former smokers had worse functional status than never smokers	Adjusted for age, alcohol, diet, physical activity, BMI, time period, occupation, and marital status

Appended Table 11.3*S* Continued

Study	Design/population	Definition of results	Results	Findings	Comments
Myint et al. 2007	• EPIC study • 16,678 participating men and women • 40–79 years of ageat baseline (1993–1997)	OR (95% CI) for poor physical and mental functional health (bottom 20% of population)	**Never smoker:** • Referent: 1.0 **Current smoker, physical functional health:** • Men: 1.85 (1.49–2.30) • Women: 1.56 (1.30–1.87) **Former smoker, physical functional health:** • Men: 1.18 (1.02–1.35) • Women: 1.16 (1.03–1.30) **Current smoker, mental functional health:** • Men: 1.38 (1.12–1.70) • Women: 1.77 (1.51–2.07) **Former smoker, mental functional health:** • Men: 1.18 (1.02–1.35) • Women: 1.16 (1.03–1.30)	• Current and former smokers have worse physical and mental function than never smokers	Adjusted for age, BMI, social class, education level, prevalent illness, alcohol intake, and physical activity
Liao et al. 2011	• Taiwan Longitudinal Study in Aging • 1989–200 • 3,187 men and women ≥60 years of age without functional disability at baseline	Hazard ratio (95% CI) for functional disability. Functional disability defined as difficulty taking a bath or walking 200–300 meters independently	**Never smoker:** • Referent: 1.0 **Current smoker:** • 1.45 (1.27–1.65) **Former smoker:** • 1.23 (1.05–1.44)	• Current and former smokers had a higher risk of functional disability than never smokers	Adjusted for alcohol, sleep, exercise, gender, marital status, education, and time-varying disease status

Appended Table 11.3*S* Continued

Study	Design/population	Definition of results	Results	Findings	Comments
Vogl et al. 2012	• Health Survey for England data • 13,241 adults ≥16 years of age • 2006 • English general population	OR for problems with mobility, self-care, usual activity, pain/ discomfort, and anxiety/depression	**Never smoker:** • Referent: 1.0 **Problems with mobility:** • Current smoker: – Heavy: 1.67[a] – Moderate: 1.55[a] – Light: 1.13 • Former smoker: – Ex-regular: 1.18[a] – Ex-occasional: 0.99 **Problems with self-care:** • Current smoker: – Heavy: 1.70[a] – Moderate: 1.45[a] – Light: 1.25 • Former smoker: – Ex-regular: 1.11 – Ex-occasional: 0.88 **Problems with usual activity:** • Current smoker: – Heavy: 1.42[a] – Moderate: 1.37 – Light: 0.95 • Former smoker: – Ex-regular: 1.11 – Ex-occasional: 1.12 **Problems with pain/discomfort:** • Current smoker: – Heavy: 1.46[a] – Moderate: 1.36[a] – Light: 1.34[a] • Former smoker: – Ex-regular: 1.28[a] – Ex-occasional: 1.07 **Problems with anxiety/depression:** • Current smoker: – Heavy: 1.86[a] – Moderate: 1.49[a] – Light: 1.43[a] • Former smoker: – Ex-regular: 1.16[a] – Ex-occasional: 1.11	• Compared with never smokers, current heavy smokers scored worse on each of the 5 measures of health-related quality of life • Current moderate smokers scored worse than never smokers on all of the measures except problems with usual activity • Ex-regular smokers scored worse than never smokers on problems with mobility, pain/discomfort, and anxiety/ depression	Adjusted for age, gender, BMI, cardiovascular disease, number of limiting conditions, alcohol intake, physical activity, ethnicity, marital status, education, economic status, household income and size, and social capital

Note: **BMI** = body mass index; **CI** = confidence interval; **EPIC** = European Prospective Investigation into Cancer; **MMSE** = Mini-mental state examination; **OR** = odds ratio.
[a]Indicates $p<0.05$ relative to never smokers.

Appended Table 11.4*S* Studies on the association between smoking and SF-36 or SF-12 scores[a]

Study	Design/population	Definition of results	Results	Findings	Comments
Mulder et al. 2001	• 9,660 men and women 20–59 years of age without a history of tobacco-related chronic disease • The Netherlands	Total PCS score and MCS score	**PCS score:** • Current smoker: 51.4 • Former smoker: 51.6 • Never smoker: 52.0 **MCS score:** • Current smoker: 46.9 • Former smoker: 49.2 • Never smoker: 49.3	• PCS was higher among never smokers than among former ($p < 0.05$) and current ($p < 0.001$) smokers • MCS was lower among current smokers than among former and never smokers ($p < 0.0001$)	Adjusted for age, gender, education level, and town
Arday et al. 2003	• 134,309 elderly (≥65 years of age) and 8,640 disabled (<65 years of age) Medicare managed care enrollees	PCS score and MCS score	**PCS score, disabled:** • Current smoker: – Daily: 29.4 – Some days: 27.5 • Former smoker: – ≤12 months quit: 29.2 – >12 months quit: 29.6 • Never smoker: 31.8 **PCS score, elderly:** • Current smoker: – Daily: 40.4 – Some days: 41.2 • Former smoker: – ≤12 months quit: 37.3 – >12 months quit: 40.8 • Never smoker: 42.4 **MCS score, disabled:** • Current smoker: – Daily: 39.0 – Some days: 40.4 • Former smoker: – ≤12 months quit: 43.8 – >12 months quit: 43.9 • Never smoker: 43.5 **MCS score, elderly:** • Current smoker: – Daily: 51.3 – Some days: 51.3 • Former smoker: – ≤12 months quit: 49.3 – >12 months quit: 52.8 • Never smoker: 53.0	• Compared with never smokers, all smoking groups had worse PCS scores ($p \leq 0.03$) • Among disabled, current smokers—but not former smokers—had worse MCS scores than never smokers ($p \leq 0.01$) • Among elderly, current smokers and more recent quitters had worse MCS scores than never smokers ($p < 0.01$)	Adjusted for age, gender, race, education

Appended Table 11.4*S* Continued

Study	Design/population	Definition of results	Results	Findings	Comments
Borzecki et al. 2005	• 1,242 male veterans • Mean 63 years of age • United States	Regression coefficients for the effect of smoking on PCS and MCS scores at baseline	**Effect on PCS scores:** • Current smoker: -1.40 • Former smoker: -1.52 • Never smoker: 1.0 (referrent) **Effect on MCS scores:** • Current smoker: -0.49 • Former smoker: 0.84 • Never smoker: 1.0 (referrent)	• Current smokers did not have statistically significantly worse PCS or MCS than never smokers • Former smokers had worse PCS than never smokers ($p < 0.05$) in the cross-sectional analysis	Adjusted for age, marital status, education, employment, living alone, comorbidity, alcohol use, exercise, BMI, seat belt use, and cholesterol screening
Laaksonen et al. 2006	• 8,970 employees of the city of Helsinki • 40–60 years of age	PCS and MCS scores	**PCS scores, men:** • Current smoker: – Heavy: 48.9 – Moderate: 50.1 • Former smoker: 50.5 • Never smoker: 50.7 **PCS scores, women:** • Current smoker: – Heavy: 47.8 – Moderate: 48.8 • Former smoker: 48.6 • Never smoker: 48.6 **MCS scores, men:** • Current smoker: – Heavy: 50.3 – Moderate: 50.1 • Former smoker: 52.1 • Never smoker: 52.0 **MCS scores, women:** • Current smoker: – Heavy: 49.4 – Moderate: 51.4 • Former smoker: 51.8 • Never smoker: 52.1	• Heavy current smokers had worse PCS and MCS than never smokers • Former smokers and never smokers had similar PCS and MCS	Adjusted for age and occupational class

Appended Table 11.4*S* Continued

Study	Design/population	Definition of results	Results	Findings	Comments
Strandberg et al. 2008	• 26-year follow-up study of 1,658 White men • Finland	—	• Compared with men who were never smokers in 1974, men who smoked more than 20 cigarettes/day in 1974 had a statistically significantly worse PCS score in 2000; there was a graded deterioration in PCS score with increasing number of cigarettes smoked daily; the relationship between smoking and the MCS score was not statistically significant	• After 26 years of follow-up, heavy smokers had worse PCS than never smokers	Age-adjusted
Sarna et al. 2008	• Nurses' Health Study cohorts • 158,736 women between 29 and 71 years of age	Regression coefficients (SE) for the effects of smoking on PCS and MCS	**PCS:** • Current smoker: -0.55 (0.06) • Former smoker: -0.08 (0.05) • Never smoker (referrent) **MCS:** • Current smoker: -2.0 (0.07) • Former smoker: -0.32 (0.05) • Never smoker (referrent)	• Current smokers had worse PCS and MCS than never smokers ($p < 0.001$) • Former smokers had worse MCS than never smokers ($p < 0.001$)	Adjusted for age, BMI, physical activity, living alone, and comorbidity
Pisinger et al. 2009	• 9,322 men and women between 30 and 60 years of age Denmark	—	• At baseline, PCS score and MCS score were highest in never smokers	• Smokers had worse PCS and MCS than never smokers ($p < 0.001$)	Adjusted for gender, age, employment status, and length of vocational training

Note: **BMI =** body mass index; **MCS =** mental component summary score; **PCS =** physical component summary score; **SE =** standard error.
[a]Measures of functional health and well-being; higher scores indicate better function.

Appended Table 11.5*S* Studies on the association between smoking and other measures of health and function

Study	Design/population	Definition of results	Results	Findings	Comments
Ostbye et al. 2002	• Health and Retirement Study (845 persons 51–64 years of age) • AHEAD (5,037 persons ≥70 years of age) • Longitudinal studies from 1992/1993–1998 • United States	OR (95% CI) for difficulty walking several blocks	**Current smoker:** • 51–64 years of age – Heavy: 2.37 (2.05–2.74) – Light: 1.68 (1.41–2.00) • ≥70 years of age: 2.06 (1.69–2.49) **Former smoker (time since quit):** • <3 years: 2.08 (1.65–2.62) • 3–15 years: 1.34 (1.16–1.56) • >15 years: 1.09 (0.93–1.29) **Former smoker (age):** • ≥70 years of age: 1.30 (1.15–1.48) **Never smoker (referent): 1.0**	• Current smokers were more likely than never smokers to have difficulty walking a short distance • Former smokers were also more likely to report difficulty, although the effect varied with time since quitting; long-term quitters had a risk that was similar to never smokers	Adjusted for exercise, BMI, alcohol consumption, age, race, gender, marital status, and education
Woods et al. 2005	• 28,181 WHI observational study participants • Women 65–79 years of age and free of frailty at baseline • United States • 3 years of follow-up	OR (95% CI) for incident frailty by baseline smoking status. Frailty defined as a score of 3 or higher based on the following: poor-self reported physical function (2 points), exhaustion (1 point), low physical activity (1 point), and unintentional weight loss (1 point)	• Current smoker (total): 2.90 (2.35–3.57) • Former smoker (total): 1.12 (1.02–1.23) • Never smoker (referent): 1.0	• Current and former smokers were more likely than never smokers to develop frailty	Adjusted for age, income, education, ethnicity, BMI, alcohol, hormone therapy, self-reported health, disability, living alone, and comorbid conditions
Heikkinen et al. 2008	• 8,028 persons ≥30 years of age • Mean: 51 years of age among men and 54 among women • Survey conducted 2000–2001 • Finland	Overall quality of life. Respondents were asked to rate on a scale of 0 (worst) to 10 (best) how good their present life as a whole had been within the last 30 days	**Current smoker:** • Men daily smokers: 7.35 • Women daily smokers: 7.58 **Former smoker:** • Men daily smokers: 7.66 • Women daily smokers: 7.67 **Never smoker:** • Men daily smokers: 7.63 • Women daily smokers: 7.75	• Daily smokers reported worse overall quality of life than never smokers among both men ($p < 0.001$) and women ($p = 0.004$) • Former smokers and never smokers had similar quality of life	Adjusted for age, education, and health-related quality of life

Appended Table 11.5*S* Continued

Study	Design/population	Definition of results	Results	Findings	Comments
McClave et al. 2009	• BRFSS • 2006 • 17,800 participants in 4 states • ≥18 years of age • United States	OR (95% CI) for life dissatisfaction	**Current smoker:** • Nonquitter: 1.0 (referrent) • Unsuccessful quitter: 0.7 (0.4–1.3) **Former smoker: 0.5 (0.3–0.9)** **Never smoker: 0.4 (0.2–0.7)**	• Compared with current smokers who have not recently tried to quit, former smokers and never smokers are less likely to report life dissatisfaction	Adjusted for age, race/ethnicity, gender, education, marital status, employment status, chronic disease, and health care coverage
Hardy et al. 2010	• 9,563 community-dwelling Medicare beneficiaries ≥65 years of age	—	• Current smokers were more likely than never smokers to have difficulty walking ¼ mile or to be unable to walk ¼ mile • Former smokers did not differ statistically significantly from never smokers in their ability to walk a short distance	• Current smokers were more likely than never smokers to have difficulty walking a short distance or to be unable to walk a short distance ($p < 0.05$)	Adjusted for age, gender, race, marital status, income, education, insurance status, chronic conditions, and BMI
Piper et al. 2012	• 1,504 participants in a smoking cessation trial • Average 45 years of age • United States	—	• During 3 years of follow-up, successful quitters experienced less of a decline in global quality of life than continuing smokers • Mean (SD) change in QOLI total at 3 years was -0.24 (1.40) in quitters and -0.47 (1.40) in continuing smokers	• Smokers who quit reported better quality of life than smokers who did not quit ($p = 0.02$)	—
Sabia et al. 2012	• Whitehall II Study • 5,100 men and women 42–63 years of age at baseline • Followed for a median of 16.3 years • Free of cancer, coronary artery disease, and stroke at baseline	OR (95% CI) for successful aging. Successful aging defined as good cognitive, physical, respiratory, and cardiovascular functioning, and absence of disability, mental health problems, and chronic disease	• Ever-smokers formed the reference group • Never smoker: 1.29 (1.11–1.49)	• Never smokers were more likely than ever smokers to experience successful aging	Adjusted for alcohol consumption, physical activity, daily consumption of fruits and vegetables, age, gender, education, and marital status

Note: **AHEAD =** Asset and Health Dynamics among the Oldest Old Survey; **BMI =** body mass index; **BRFSS =** Behavioral Risk Factor Surveillance System; **CI =** confidence interval; **MCS =** mental component summary score; **OR =** odds ratio; **QOLI =** Quality of Life Inventory; **SD =** standard deviation; **WHI =** Women's Health Initiative.

Appended Table 11.6*S* Studies on the association between smoking and hospitalizations

Study	Design/population	Definition of results	Results	Findings	Comments
Robbins et al. 2000	• 87,991 men and women serving on active duty in the U.S. Army during 1987–1998 • Average at baseline was 28.5 years of age	Rate ratio (95% CI) for hospitalization not due to injury or pregnancy	**Current smoker:** • Men: 1.30 (1.24–1.35) • Women: 1.25 (1.14–1.37) **Former smoker:** • Men: 1.20 (1.14–1.26) • Women: 1.13 (1.01–1.26) **Never smoker (referent): 1.0**	• Among both men and women, current and former smokers were more likely to be hospitalized than never smokers	Adjusted for age, race, military rank, alcohol consumption, exercise frequency, and overweight
Johnson and Richter 2002	• 7,844 adolescents 12–17 years of age • United States	Mean number of overnight hospital stays	**Current smoker:** • 6 or more days/month: 0.22 • 1–5 days/month: 0.04 **Former smoker: 0.05** **Never smoker: 0.07**	• Frequent smokers reported more overnight hospital stays than less frequent smokers, former smokers, or never smokers ($p < 0.01$)	Adjusted for gender, age, and family income
Ostbye et al. 2002	• Health and Retirement Study (7,845 persons 51–64 years of age) • AHEAD (5,037 persons ≥70 years of age) • Longitudinal studies from 1992/1993–1998 • United States	OR (95% CI) for hospitalization in previous year	**Current smoker:** • 51–64 years of age – Heavy: 1.41 (1.24–1.59) – Light: 1.35 (1.16–1.56) • ≥70 years of age: 1.28 (1.08–1.52) **Former smoker (time since quit):** • <3 years: 1.46 (1.20–1.78) • 3–15 years: 1.22 (1.08–1.38) • >15 years: 0.96 (0.85–1.09) **Former smoker (age):** • ≥70 years of age: 1.16 (1.04–1.29) **Never smoker (referent): 1.0**	• Current smokers and more recent quitters were more likely to be hospitalized than never smokers • Long-term quitters (>15 years) and never smokers had a similar likelihood of hospitalization	Adjusted for exercise, BMI, alcohol consumption, age, race, gender, marital status, and education
Kahende et al. 2009	• NHANES • 1999–2004 • 15,332 adults ≥18 years of age • United States	OR for a hospitalization within the last year	**Current smoker: 1.20 (1.06–1.37)** **Former smoker (time since quit):** • <2 years: 2.49 (1.86–3.34) • 2–4 years: 1.39 (0.98–1.97 • 5–9 years: 1.17 (0.86–1.59) • ≥10 years: 1.22 (1.02–1.46) **Never smoker (referent): 1.0**	• Current smokers, recent quitters (<2 years), and long-term quitters (≥10 years) were each more likely than never smokers to be hospitalized	Adjusted for gender, race/ethnicity, age, education, poverty level, and health insurance

Appended Table 11.6*S* Continued

Study	Design/population	Definition of results	Results	Findings	Comments
Woodruff et al. 2010	• 5,503 female U.S. Navy recruits • Mean 19.7 years of age at entry	Percent hospitalized and average duration of hospitalization	**Percent hospitalized (excludes pregnancy-related hospitalizations):** • Current smoker (daily): 13 • Former smoker (or nondaily smoker): 12 • Never smoker: 14 **Average duration of hospitalization (days)** • Current smoker (daily): 5.7 • Former smoker (or nondaily smoker): 5.1 • Never smoker: 5.2	• Likelihood of hospitalization did not vary by smoking status • Duration of hospitalization was longest among current smokers	Adjusted for time in service, education, race, and regular/reserve status

Note: **AHEAD =** Asset and Health Dynamics among the Oldest Old Survey; **BMI =** body mass index; **CI =** confidence interval; **NHANES =** National Health and Nutrition Examination Survey; **OR =** odds ratio.

Appended Table 11.7*S* Studies on the association between smoking and outpatient visits

Study	Design/population	Definition of results	Results	Findings	Comments
Borzecki et al. 2005	• 1,397 male veterans • United States	Regression coefficient for the effect of smoking on physician visits	• Current smoker: -0.30 • Former smoker: -0.05 • Never smoker (referrent)	• Current smokers had fewer outpatient visits than never smokers ($p < 0.05$)	Adjusted for age, marital status, education, employment, live alone, other insurance, disability, comorbidity, alcohol, exercise, BMI, seat belt use, and cholesterol screening
Kahende et al. 2009	• NHANES • 1999–2004 • 15,332 adults ≥18 years of age • United States	OR for at least 1 outpatient visit within the last year or 4 or more outpatient visits within the last year	**At least 1 outpatient visit within the last year:** • Current smoker: 0.94 (0.81–1.13) • Former smoker (time since quit): – <2 years: 1.75 (1.15–2.65) – 2–4 years: 1.15 (0.76–1.75) – 5–9 years: 1.47 (0.90–2.40) – ≥10 years: 1.75 (1.42–2.14) • Never smoker (referent): 1.0 **Four or more outpatient visits within the last year:** • Current smoker: 1.18 (1.06–1.33) • Former smoker (time since quit): – <2 years: 1.65 (1.29–2.12) – 2–4 years: 1.59 (1.17–2.18) – 5–9 years: 1.34 (1.02–1.74) – ≥10 years: 1.17 (1.04–1.32) • Never smoker (referent): 1.0	• The frequency of at least 1 outpatient visit was similar in current and never smokers • Current smokers and former smokers were more likely than never smokers to have multiple (≥4) outpatient visits • Multiple outpatient visits were most common among recent quitters	Adjusted for gender, race/ethnicity, age, education, poverty level, and health insurance

Note: **BMI =** body mass index; **NHANES =** National Health and Nutrition Examination Survey; **OR =** odds ratio.

Appended Table 11.8*S* Studies on the association between smoking and nursing home stays

Study	Design/population	Definition of results	Results	Findings	Comments
Ostbye et al. 2002	• AHEAD (5,037 persons ≥70 years of age) • Longitudinal study from 1993–1998 • United States	OR (95% CI) for stay in a nursing home, convalescent home, or other long-term care health facility in the previous year	• Current smoker (≥70 years of age): 1.68 (1.08–2.63) • Former smoker (≥70 years of age): 1.16 (0.85–1.58) • Never smoker (referrent): 1.0	• Current smokers were more likely than never smokers to have a stay in a nursing home, convalescent home, or other long-term care facility	Adjusted for exercise, BMI, alcohol consumption, age, race, gender, marital status, and education
Valiyeva et al. 2006	• NHANES I Epidemiologic Followup Study (NHEFS) • 6,462 people who were 45–74 years of age at baseline (1971–1975) • Followed until 1992	RR (95% CI) of a nursing home admission	• Current smoker: – 45–65 years of age at baseline: 1.56 (1.23–1.99) – 65–74 years of age at baseline: 1.32 (1.08–1.61) • Reference group did not smoke at baseline	• Current smokers were more likely than people who did not smoke at baseline to be admitted to a nursing home	Adjusted for age, gender, race, BMI, major diagnoses at baseline, physical activity, blood pressure, cholesterol level, and diabetes

Note: **AHEAD =** Asset and Health Dynamics among the Oldest Old Survey; **BMI =** body mass index; **CI =** confidence interval; **NHANES =** National Health and Nutrition Examination Survey; **OR =** odds ratio; **RR =** relative risk.

Appended Table 11.9*S* Studies on the association between smoking and costs

Study	Design/population	Definition of results	Results	Findings	Comments
CBO 2012	• Medical Expenditure Panel Survey Data for 2000–2008 from the • 1998–2007 from the National Health Interview Survey • ≥18 years of age	Annual per capita spending on health care (in 2008 dollars) for former smokers, by time since quit	**Current smoker:** • 18–24 years of age: 2,010 • 25–44 years of age: 2,850 • 45–64 years of age: 5,540 • 65–74 years of age: 7,940 • ≥75 years of age: 8,750 **Former smoker:** • 18–24 years of age: – <5 years: 2,000 – 5–14 years: NA – ≥15 years: NA • 25–44 years of age: – <5 years: 3,090 – 5–14 years: 2,920 – ≥15 years: 3,330 • 45–64 years of age: – <5 years: 7,650 – 5–14 years: 6,580 – ≥15 years: 6,290 • 65–74 years of age: – <5 years: 11,250 – 5–14 years: 9,760 – ≥15 years: 9,330 • ≥75 years of age: – <5 years: 15,530 – 5–14 years: 12,280 – ≥15 years: 11,770 **Never smoker:** • 18–24 years of age: 1,870 • 25–44 years of age: 2,570 • 45–64 years of age: 5,040 • 65–74 years of age: 7,790 • ≥75 years of age: 9,810	• Spending tended to be highest among former smokers followed by current smokers • Never smokers had the lowest spending in each age group except the oldest	—

Note: **CBO =** Congressional Budget Office; **NA =** not available.

Appended Table 11.11*S* Studies on the association between smoking and workplace absenteeism (days absent)*

Study	Design/population	Definition of results	Results	Findings	Comments
Halpern et al. 2001	• 292 U.S. airline employees • Mean ranged from 37 years of age among never smokers to 44 years of age among former smokers	Mean (SD) absenteeism days caused by sickness during 4-month study period	• Current smoker: 3.99 (4.86) • Former smoker: 2.40 (3.54) • Never smoker: 1.33 (2.20)	• Absenteeism varied by smoking status (p = 0.0001)	—
Tsai et al. 2003	• 2,203 employees of a U.S. chemical and refinery facility • Ages ranged from <30 to >60	Mean number of days lost per employee/ year	• Current smoker: 6.4 • Former smoker: 4.8 • Never smoker: 3.5	• Current smokers missed more days than never smokers (p-value NR)	—
Tsai et al. 2005	• 2,550 regular employees at U.S. petrochemical facility • Average 46 years of age at end of study	Mean number of days lost per employee/ year	**Current smoker:** • Men: 13.3 • Women: 23.3 • Total: 14.3 **Former smoker:** • Men: 8.7 • Women: 12.5 • Time since quitting: – 1–9 years: 11.0 – 10–19 years: 8.8 – ≥20 years: 7.9 **Never smoker:** • Men: 7.0 • Women: 12.3 • Total: 7.6	• Among both men and women, current smokers lost almost twice as many days as never smokers (p <0.05)	—

Note: **NR =** not reported; **SD =** standard deviation.
*Absenteeism includes any absence during a specified time period, any short-term absence, any long-term absence, or total days lost.

Appended Table 11.12*S* Studies on the association between smoking and relative risk (RR) of workplace absenteeism*

Study	Design/population	Definition of results	Results	Findings	Comments
Morikawa et al. 2004	• 2,504 male Japanese factory workers, 35–55 years of age • 6,290 male British civil service workers, 35–55 years of age	HR (95% CI) for first long-term (>7 days) sickness absence	**Current smoker:** • Japan: 1.43 (1.17–1.75) • Britain: 1.51 (1.35–1.67) **Former smoker:** • Japan: 1.39 (1.07–1.80) • Britain: 1.11 (1.02–1.21) **Never smoker (referrent): 1.0**	• Current and former smokers were each more likely than never smokers to have a long-term sickness absence	Age-adjusted
Sindelar et al. 2005	• 383,778 full-time U.S. workers • 18–64 years of age	—	• OR for absence in the last week	• Current and former smokers were each more likely than never smokers to have an absence (p = 0.000 for each group) • Although risk of an absence appeared to be highest among recent quitters, each group of former smokers was more likely than never smokers to have an absence (p <0.05 for each group)	Adjusted for age, education, race, ethnicity, marital status, number of children, occupation, industry, metropolitan statistical area, state, and month and year
Labriola et al. 2006	• 3,792 Danish employees • 18–64 years of age at start of study	OR for >6 days of absence of previous year	• Current smoker: 1.61 (1.32–1.96) • Former smoker: 1.32 (1.03–1.68) • Never smoker (referrent): 1.0	• Current and former smokers were each more likely than never smokers to have more than 6 days of absence in the previous year	Adjusted for age, gender, health status, BMI, and employer and job characteristics
Christensen et al. 2007	• 5,020 Danish employees • 18–69 years of age	HR for long-term sickness absence (8 consecutive weeks)	**Men:** • Current smoker: – ≥15 cigarettes: 1.55 (1.00–2.40) – <15 cigarettes: 0.92 (0.50–1.73) • Former smoker: 1.36 (0.85–2.19) • Never smoker (referrent): 1.0 **Women:** • Current smoker: – ≥15 cigarettes: 2.05 (1.36–3.08) – <15 cigarettes: 1.21 (0.74–1.98) • Former smoker: 1.61 (1.07–2.42) • Never smoker (referrent): 1.0	• Among current smokers, only heavy smoking significantly increased risk of long-term absence • Former smoking increased risk of a long-term absence among women only	Adjusted for age, family status, SES, education, work environment, and diagnosed disease; adjustment for diagnosed disease may lead to underestimation of the smoking effect

Appended Table 11.12*S* Continued

Study	Design/population	Definition of results	Results	Findings	Comments
Laaksonen et al. 2009	• 5,470 female and 1,464 male Finnish city employees • 40–60 years of age	RR for 1–3 days sickness absence and 4 or more days sickness absence	**Men (1–3 days sickness absence):** • Current smoker: – >20 cigarettes: 1.71 (1.39–2.11) – ≤20 cigarettes: 1.63 (1.34–1.98) • Former smoker: 1.12 (0.94–1.33) • Never smoker (referrent): 1.0 **Women (1–3 days sickness absence):** • Current smoker: – >20 cigarettes: 1.50 (1.37–1.64) – ≤20 cigarettes: 1.23 (1.13–1.34) • Former smoker: 1.18 (1.10–1.27) • Never smoker (referrent): 1.0 **Men (4 or more days sickness absence):** – Current smoker: – >20 cigarettes: 1.66 (1.31–2.10) – ≤20 cigarettes: 1.23 (0.96–1.57) • Former smoker: 1.10 (0.90–1.34) • Never smoker (referrent): 1.0 **Women (4 or more days sickness absence):** • Current smoker: – >20 cigarettes: 1.49 (1.34–1.65) – ≤20 cigarettes: 1.32 (1.20–1.46) • Former smoker: 1.18 (1.08–1.29) • Never smoker (referrent): 1.0	• Heavy current smoking increased the risk of both short- and longer-term absences in men and women • Lighter current smoking was linked with short-term absences in women, and with longer-term absences in men and women • The increase in absences among former smokers was only statistically significant in women	Adjusted for age and occupational class

Note: **BMI =** body mass index; **CI =** confidence interval; **HR =** hazard ratio; **OR =** odds ratio; **SES =** socioeconomic status.
*Absenteeism includes any absence during a specified time period, any short-term absence, any long-term absence, or total days lost.