

Chapter 4 – Appendix (Tables A1–A7)

The references cited in these tables are all in the reference list of Chapter 4, *Smoking and mental health* report.

Table A1 Characteristics of included studies assessing the association between smoking and developmental and/or emotional disorders

Study	Country/participants	Patients recruited	Length of follow-up	Number of participants	Psychosis assessed by	Main findings
Agrawal 2005 ⁶	Australia M/F F: 30.1 years, M: 30.0 years (mean)	1964–1971	25–36 years	6,257	2+ conduct problems with onset before age 13 years	2+ conduct problems increased the risk of regular cigarette smoking (HR = 1.53, 95 % CI 1.36–1.72) Adjusted for gender, zygosity, member of dizygotic opposite, sex
Barkley 1990 ²⁵	USA M/F Hyperactive: 14.9 years, normal: 13.9 years (mean)	1979–1980	8 years	123 children with hyperactivity 66 children without any psychiatric disorder	Revised Connors Parent Rating Scale and Werry–Weiss–Peters Activity Scale, DSM-III-R	Children with hyperactivity were significantly more likely to report cigarette use (OR = 2.55, 95 % CI 1.32–4.92) Adjusted for no confounders
Blase 2009 ⁷	USA 18+ years College students	2006	18 months	846	Current/prior diagnosis of ADHD by medical/mental health professional. Symptoms based on inattention, hyperactivity–impulsivity	Smoking initiation: 21 % in ADHD versus 5 % in non-ADHD, $\chi^2 = 9.43$, $p < 0.01$ Adjusted for no confounders
Boyle 1993 ⁸	Canada 8–12 years Ontario Child Health Study (OCHS)	1983	1987	872	Parental and teacher assessments of conduct disorder, ADHD and emotional disorders	Parental assessments of conduct disorder (RR = 1.61), attention deficit disorder (RR = 1.10) or emotional disorder (RR = 1.13) were not significantly associated with regular tobacco use Teacher assessments of conduct disorder (RR = 1.55), attention deficit disorder (RR = 0.56) or emotional disorder (RR not estimable) were not significantly associated with regular tobacco use Adjusted for no confounders

continued

Table A1 Characteristics of included studies assessing the association between smoking and developmental and/or emotional disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	Number of participants	Psychosis assessed by	Main findings
Brook 2008 ⁹	USA M/F Mean 14.45 years Community sample of adolescents	1975	25 years	641	Diagnostic Interview Schedule for Children of ADHD and conduct disorder	ADHD was not significantly associated with daily smoking (OR = 1.21, 95% CI 0.81–1.81) Conduct disorder was significantly associated with daily smoking (OR = 2.45, 95% CI 1.28–4.68) Adjusted for parental years of education, family income, age, gender, adolescent smoking, ADHD/conduct disorder
Brown 1996a ²⁴	USA M/F Mean 14–18 years 9 senior high schools	1987	13.8 months (mean)	1,507	Schedule for Affective Disorders for School-age Children (K-SADS)	Disruptive behaviour disorder was not significantly associated with the risk on smoking onset among non-smokers (OR = 2.00, 95% CI 0.86–4.62) Adjusted for parental education, age, gender, number of biological parents in household, other disorders at baseline
Burke 2001 ¹⁰	USA M 7–12 years School students living with at least one biological parents, all had disruptive behaviour disorders	1987	9 years	177	Medical records of children's outpatient services in psychiatric hospital, at least one occurrence of ADHD between 13 and 15 years	Childhood ADHD increased the risk of tobacco use in adolescence (OR = 2.21, $p = 0.052$, $\chi^2 = 3.79$) Childhood conduct disorder increased the risk of tobacco use in adolescence (OR = 1.89, $p = 0.043$, $\chi^2 = 4.11$) Adjusted for no confounders

continued

Table A1 Characteristics of included studies assessing the association between smoking and developmental and/or emotional disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	Number of participants	Psychosis assessed by	Main findings
Burke 2007 ¹¹	USA M Grade 1: 6.4 years Grade 7: 12.9 years Pittsburgh Youth Study, Public Health school students, Grade 1 and Grade 7	1987	6–9 years	Grade 1: 503 Grade 7: 506	Initial screening assessment of antisocial behaviour. Child Behaviour Checklist completed by parents and teachers	Wave to Wave+1 predictions: Grade 1: inattention increased the incidence of tobacco use (IRR = 1.16, 95% CI 1.02–1.33) Grade 7: inattention increased the incidence of tobacco use (IRR = 1.44, 95% CI 1.26–1.65) Grade 1: hyperactivity-impulsivity was not associated with tobacco use (IRR = 1.02, 95% CI 0.92–1.12) Grade 7: hyperactivity-impulsivity was not associated with tobacco use (IRR = 0.96, 95% CI 0.83–1.11) Grade 1: conduct disorder was not associated with tobacco use (IRR = 1.14, 95% CI 0.95–1.36) Grade 7: conduct disorder increased the risk of tobacco use (IRR = 1.35, 95% CI 1.16–1.57) Grade 1: oppositional defiant disorder was not associated with tobacco use (IRR = 1.03, 95% CI 0.78–1.36) Grade 7: oppositional defiant disorder was not associated with tobacco use (IRR = 0.98, 95% CI 0.80–1.18) Adjusted for other psychiatric measures, peer substance use, ethnicity, age, frequency of tobacco use
Clark 2004 ²⁶	USA 10–12 years Categorised by whether biological father had a substance use disorder	Not reported	2, 5, and 8 years	572	DSM-III-R, using Structured Clinical Interview for Diagnosis (CISD), CEDAR version of the K-SADS	ADHD significantly increased the risk of onset of daily cigarette smoking (RR = 3.1, $p < 0.001$) Conduct disorder significantly increased the risk of onset of daily cigarette smoking (RR = 3.8, $p < 0.001$) Oppositional defiant disorder significantly increased the risk of onset of daily cigarette smoking (RR = 2.1, $p = 0.007$) Adjusted for no confounders

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Table A1 Characteristics of included studies assessing the association between smoking and developmental and/or emotional disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	Number of participants	Psychosis assessed by	Main findings
Elkins 2007 ¹²	USA M/F M: 11.7 years, F: 11.7 years (mean) Minnesota Twin Family Study, same sex pairs, reared together	Not reported	11–18 years follow-up	1,512	Interview for Children and Adolescents – Revised, self and maternal reports of ADHD, conduct disorder, based on DSM- III-R and three additional DSM-IV symptoms of ADHD to assess inattention and hyperactivity–impulsivity	Inattention was not associated with tobacco use at age 14 years (OR = 1.09, 95% CI 0.96–1.24) Hyperactivity-impulsivity increased the risk of tobacco use at age 14 years (OR = 1.29, 95% CI 1.12–1.49) ADHD increased the risk of tobacco use at age 14 years (OR = 2.01, 95% CI 1.24–3.28) Conduct disorder increased the risk of tobacco use at age 14 (OR = 1.56, 95% CI 1.12–2.18) Adjusted for gender, other psychiatric measures at baseline
Fuemmeler 2007 ¹³	USA M/F Mean: 15.65 years National Longitudinal Study of Adolescent Health	1995	6–7 years	10,445	Retrospective report or ADHD symptoms experiences between ages of 5–12 years based on DSM-IV of ADHD	Inattentive subtype of ADHD increased was not associated with regular smoking initiation (OR = 1.47, 95% CI 0.84–2.57) Hyperactivity subtype of ADHD increased the risk of regular smoking initiation (OR = 1.90, 95% CI 1.10–3.27) Inattentive and hyperactivity subtype increased the risk of regular smoking initiation (OR = 2.64, 95% CI 1.48–4.72) Adjusted for parental highest education, family receive public assistance at baseline, age, sex, ethnicity, conduct disorder

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Table A1 Characteristics of included studies assessing the association between smoking and developmental and/or emotional disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	Number of participants	Psychosis assessed by	Main findings
Galéra 2005 ¹⁴	France M/F At Follow-up: M: 19.9 years, F: 20.2 years (mean) Gazel Youth Study	1991	8 years	916	Parental completion of Child Behavioural Checklist, syndrome scale for hyperactivity–impulsivity, conduct disorder, oppositional defiant behaviour, cut based on 90th percentile of scale score distribution	<p>Male: hyperactivity–impulsivity was not associated with daily smoking (OR = 1.51, 95% CI 0.73–3.13)</p> <p>Male: conduct disorder increased the risk of daily smoking (OR = 2.95, 95% CI 1.36–6.38)</p> <p>Male: hyperactivity–impulsivity was not associated with lifetime smoking (OR = 1.50, 95% CI 0.76–2.99)</p> <p>Male: conduct disorder was not associated with lifetime smoking (OR = 2.00, 95% CI 0.97–4.11)</p> <p>Female: hyperactivity–impulsivity increased the risk of daily smoking (OR = 1.98, 95% CI 1.04–3.76)</p> <p>Female: conduct disorder was not associated with daily smoking (OR = 1.75, 95% CI 0.91–3.35)</p> <p>Female: oppositional defiant disorder was not associated with daily smoking (results not given)</p> <p>Female: hyperactivity–impulsivity was not associated with lifetime smoking (OR = 0.98, 95% CI 0.44–1.80)</p> <p>Female: conduct disorder increased the risk of lifetime smoking (OR = 3.27, 95% CI 1.52–7.03)</p> <p>Female: oppositional defiant disorder was not associated with lifetime smoking (OR = 1.45, 95% CI 0.73–2.91)</p> <p>Adjusted for parental socioeconomic status, age, sex, activity/shyness, parental smoking</p>

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Table A1 Characteristics of included studies assessing the association between smoking and developmental and/or emotional disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	Number of participants	Psychosis assessed by	Main findings
Galéra 2010 ¹⁵	France M/F At follow-up: M: 18.9 years F: 19.2 years (mean) Gazel Youth Study	1991	8 years	1,107	Parental completion of child Behavioural checklist, DSM orientated scales for conduct disorder, oppositional defiant behaviour; syndrome scale for hyperactivity-impulsivity, conduct disorder	<p>Male: hyperactivity–impulsivity and conduct disorder increased the risk of age to tobacco initiation (HR = 1.92, 95 % CI 1.03–3.59)</p> <p>Male: conduct disorder only increased the risk of age to tobacco initiation (HR = 1.87, 95 % CI 1.05–3.34)</p> <p>Male: hyperactivity–impulsivity only was not associated with the risk of age to tobacco initiation (HR = 1.58, 95 % CI 0.87–2.84)</p> <p>Female: hyperactivity–impulsivity and conduct disorder increased the risk of age to tobacco initiation (HR = 1.86, 95 % CI 1.14–3.03)</p> <p>Female: conduct disorder only was not associated with the risk of age to tobacco initiation (HR = 1.41, 95 % CI 0.84–3.03)</p> <p>Female: hyperactivity–impulsivity only was not associated with the risk of age to tobacco initiation (HR = 0.66, 95 % CI 0.37–1.19)</p> <p>Adjusted for parental socioeconomic status, temperament, parental psychopathology, parental smoking, parental marital status, parental alcohol use</p>

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Table A1 Characteristics of included studies assessing the association between smoking and developmental and/or emotional disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	Number of participants	Psychosis assessed by	Main findings
Goodman 2010 ¹⁶	Britain M/F 13.2 years British Child and Adolescent Health Surveys (B-CAMHS)	1999 and 2004	3 years	3,607	Parent Strength and Difficulties Questionnaire (SDQ), total difficulty score, internalising and externalising subscales Parent Development and Wellbeing Assessment (DAWBA), diagnoses assigned according to DSM-IV	Clinical diagnoses: internalising disorder increased the risk of regular smoking (OR = 1.65, 95% CI 1.08–2.52) Clinical diagnoses: behavioural disorder increased the risk of regular smoking (OR = 2.83, 95% CI 1.72–4.64) Clinical diagnoses: hyperactivity disorder was not associated with regular smoking (OR = 1.25, 95% CI 0.55–2.82) Clinical diagnoses: smoking was not associated with internalising disorder (OR = 0.77, 95% CI 0.36–1.64) Clinical diagnoses: smoking was not associated with behavioural disorder (OR = 0.83, 95% CI 0.32–2.14) Adjusted for parental education and housing tenure, gender, age, survey year, country, ethnicity, general health, parent General Health Questionnaire, family structure
Lynskey 1995 ¹⁷	New Zealand From birth Christchurch Health and Development Study	Not reported	15 years	927	Rutter's parent and teacher questionnaires of conduct, oppositional and attention deficit/hyperactivity behaviours	Conduct problems were significantly associated with daily tobacco smoking (OR = 1.16 per unit increase in conduct problem – 6-point scale) Adjusted for family social background, marital stability and conflict, residential stability, parental substance use, attitudes to substance use, parental-child interaction, gender, family size
McGee 1998 ¹⁸	New Zealand 5–7 years Dunedin Multidisciplinary Health and Development Study (DMHDS)	1972–1973	15 years	773	Rutter's parent and teacher questionnaires at age 5–7 years, hyperactive, anxious–depressed behaviours, mental disorders according to DSM-III Revised Behaviour Problem checklist (RBPC) by parent at age 13 years, attention deficit disorder with or without hyperactivity, conduct and oppositional disorders, anxiety or depressive disorders	Childhood disorder (age at 5–7 years) was not associated with smoking at age 11 years (OR = 1.32, 95% CI 0.87–2.00) Pre-adolescent disorder (at age 11–13 years) was not associated with daily smoking at age 15 years (OR = 1.53, 95% CI 0.87–2.68) Adjusted for childhood disadvantage (based on family size, socioeconomic status, solo parenting, parental separation, maternal mental health, family social support), gender

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Table A1 Characteristics of included studies assessing the association between smoking and developmental and/or emotional disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	Number of participants	Psychosis assessed by	Main findings
Niemelä 2009 ¹⁹	Finland M 8 years From a Boy to a Man Study, from epidemiological Multicenter child Psychiatric Study	1989–1999	10 years	2,307	Rutter's parent and teacher questionnaires, conduct, hyperactivity, emotional scales	Parent report: conduct problems increased the risk of smoking >10 cigarettes per day (OR = 1.2, 95% CI 1.02–1.4) Parent report: hyperactive problems was not associated with smoking >10 cigarettes per day (OR = 1.1, 95% CI 0.9–1.3) Parent report: Rutter's total score increased the risk of smoking >10 cigarettes per day (OR = 1.2, 95% CI 1.1–1.4) Adjusted for family structure, parental education, school performance
Pine 1997 ²⁰	USA M/F Mean 22 years New York Longitudinal Study	1983	9 years	644	Conduct disorder	Conduct disorder score was significantly correlated with tobacco use (Pearson's correlation = 0.22, $p < 0.005$) Adjusted for no confounders
Rohde 2004 ²¹	USA M/F 14–18 years Oregon Adolescent Depression Project (OADP)	1987	12 years	722	K-SADS, Longitudinal Interval Follow-up Evaluation	ADHD significantly increased the risk of progression to daily smoking (OR = 3.83, 95% CI 1.98–8.03) Adjusted for no confounders
Spein 2004 ²²	Norway M/F Mean 16.9 years North Norwegian Youth Study	1994–1995	3 years	2,718	Youth Self Report (YSR), internalising problems, externalising problems	Externalising problems increased the risk of becoming a regular smoker (OR = 1.07, 95% CI 1.03–1.11) Internalising problems increased the risk of becoming a regular smoker (OR = 1.02, 95% CI 1.00–1.05) Externalising problems was not associated with current smoking initiation (OR = 1.02, 95% CI 0.98–1.06) Internalising problems was not associated with current smoking initiation (OR = 1.02, 95% CI 0.99–1.05) Adjusted for occupational ranking, age, substance abuse, sexual activity, frequent intoxication

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Table A1 Characteristics of included studies assessing the association between smoking and developmental and/or emotional disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	Number of participants	Psychosis assessed by	Main findings
Voorhees 2002 ²³	USA F 8–10 years National Heart, Lung and blood Institute for Growth and Health Study (NGHS)	1987–1988	8–10 years	1,681	Harter Self-Perception Profile for children, behavioural conduct	Behavioural conduct reduced the risk of daily smoking (OR = 0.60, 95 % CI 0.47–0.77) Adjusted for parental education, race, lone parenting, drinking alcohol, drive for thinness, stress

ADHD, attention deficit hyperactivity disorder; CI, confidence interval; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; F, female; HR, hazard ratio; IRR, incidence rate ratio; M, male; OR, odds ratio.

Table A2 Characteristics of included studies assessing the association between smoking and bipolar disorder

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Bipolar disorder assessed by	Main findings
Ajdacic-Gross 2009 ²⁷	Switzerland M/F 20–21 years Zurich study	1979	20 years	381	DSM-IV criteria	Bipolar disorder significantly increased the risk of adolescent onset of heavy smoking (OR = 7.1, 95 % CI 1.9–25.9) Bipolar disorder was not significantly associated with the risk of adult onset of smoking (OR = 0.3, 95 % CI 0.0–3.3) Adjusted for education, sex, parents smoking behaviour, youth problems, conflicts, Freiburg Personality Inventory
Cuijpers 2007 ³	Netherlands 18–64 years The Netherland Mental Health Survey and Incidence Study (NEMESIS)	1996	1 and 3 years	2,726	DSM-III-R	Smoking in the past year was not significantly associated with bipolar disorder onset (IRR = 6.45, 95 % CI 0.55–75.65) Bipolar disorder not significantly associated with smoking onset (data not reported) Adjusted for education, childhood trauma, parental history of psychopathology, somatic illness, locus of control. Neuroticism, gender, age, paid job

CI, confidence interval; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; F, female; IRR, incidence rate ratio; M, male; OR, odds ratio.

Table A3 Characteristics of included studies assessing the association between smoking and schizophrenia

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Schizophrenia assessed by	Main findings															
Kristensen 2007 ³²	USA M/F 18.6 years Cognitive Assessment and Risk Evaluation (CARE) programme	Not reported	2 years	48	Psychosis: development of schizophrenia using clinical, familial and vulnerability marker risk assessment	Nicotine use was significantly associated with later conversion to schizophrenia (Fisher's exact test, $p = 0.005$) Adjusted for no confounders															
Riala 2005 ³⁰	Finland M/F Age 16 years	Birth cohort from 1966	Until age 31 years	8,041 healthy controls; 67 schizophrenia; 39 other psychoses; 177 non-psychiatric disorders	Hospital admissions based on DSM-III-R	Crude OR for association between smoking status and schizophrenia/healthy control (cross-sectional analysis): Men 2.30 (95% CI 1.24–4.27) Women 4.94 (95% CI 2.76–8.84) Mean number of years between starting smoking and later onset of disorder: <table border="1"> <thead> <tr> <th></th> <th>Men</th> <th>Women</th> </tr> </thead> <tbody> <tr> <td>Schizophrenia</td> <td>2.2</td> <td>2.6</td> </tr> <tr> <td>Other psychoses</td> <td>8.7</td> <td>8.4</td> </tr> <tr> <td>Non-psychiatric disorders</td> <td>7.8</td> <td>3.5</td> </tr> </tbody> </table>		Men	Women	Schizophrenia	2.2	2.6	Other psychoses	8.7	8.4	Non-psychiatric disorders	7.8	3.5			
	Men	Women																			
Schizophrenia	2.2	2.6																			
Other psychoses	8.7	8.4																			
Non-psychiatric disorders	7.8	3.5																			
Sorensen 2011 ³¹	Denmark F 14–48 years Perinatal cohort	1959–1961	Approximately 47 years	7,926	ICD-8 and ICD-10 criteria, psychiatric admission diagnoses from Central Register	Smoking significantly increased the risk of admission for schizophrenia spectrum disorder (OR = 1.42, 95% CI 1.12–1.80) Smoking significantly increased the risk of admission for affective spectrum disorder (OR = 1.40, 95% CI 1.05–1.86) <table border="1"> <thead> <tr> <th></th> <th>Schizophrenia spectrum</th> <th>Affective spectrum</th> </tr> </thead> <tbody> <tr> <td>0 cig/day</td> <td>Reference</td> <td>Reference</td> </tr> <tr> <td>1–5 cigs/day</td> <td>1.14 (0.71–1.83)</td> <td>2.25 (1.46–3.49)</td> </tr> <tr> <td>6–10 cigs/day</td> <td>1.24 (0.94–1.63)</td> <td>1.20 (0.86–1.67)</td> </tr> <tr> <td>11+ cigs/day</td> <td>1.77 (1.30–2.42)</td> <td>1.25 (0.82–1.89)</td> </tr> </tbody> </table> Adjusted for social class, age, psychopharmacological treatment at baseline		Schizophrenia spectrum	Affective spectrum	0 cig/day	Reference	Reference	1–5 cigs/day	1.14 (0.71–1.83)	2.25 (1.46–3.49)	6–10 cigs/day	1.24 (0.94–1.63)	1.20 (0.86–1.67)	11+ cigs/day	1.77 (1.30–2.42)	1.25 (0.82–1.89)
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1–5 cigs/day	1.14 (0.71–1.83)	2.25 (1.46–3.49)																			
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11+ cigs/day	1.77 (1.30–2.42)	1.25 (0.82–1.89)																			

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Table A3 Characteristics of included studies assessing the association between smoking and schizophrenia – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Schizophrenia assessed by	Main findings
Weiser 2004 ²⁹	Israel M (army recruits) 18 years	Probably 1990s	4–16 years	14,248 (44 new cases)	Hospital admissions	OR for developing schizophrenia among smokers (compared with non-smokers): 1.94 (95% CI 1.05–3.58) Adjusted for any non-psychotic disorder, below normal social/intellectual functioning in adolescence and socioeconomic status
Zammit 2003 ²⁸	Sweden M (army recruits) 18–20 years	1969–70	26 years	48,772 (350 new cases)	Hospital admissions	OR for developing schizophrenia among smokers (compared with non-smokers): 0.80 (95% CI 0.7–1.1) Adjusted for diagnosis at baseline, poor social integration, IQ, drug use, region during childhood, father's occupation, family socioeconomic status, family psychotic history and alcohol problems

CI, confidence interval; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; F, female; IRR, incidence rate ratio; IQ, intelligence quotient; M, male; OR, odds ratio.

Table A4 Characteristics of included studies assessing the association between smoking and anxiety disorders

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants ^a	Anxiety assessed by	Main findings
Brown 1996a ²⁴	USA M/F Mean 14–18 years 9 senior high schools	1987	13.8 months (mean)	1,507	Schedule for Affective Disorders for School-age Children (K-SADS)	Having an anxiety disorder was not significantly associated with smoking onset among non-smokers (OR = 1.34, 95% CI 0.64–2.81) Adjusted for parental education, age, gender, number of biological parents in household, other disorders at baseline
Clark 2004 ²⁶	USA 10–12 years Categorised by whether biological father had a substance use disorder	Not reported	2, 5 and 8 years	572	DSM-III-R, using Structured Clinical Interview for Diagnosis (CISD), CEDAR version of the K-SADS	Daily cigarette smoking was not significantly associated with anxiety disorder (RR = 0.9, <i>p</i> = 0.8). Adjusted for no confounders

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Table A4 Characteristics of included studies assessing the association between smoking and anxiety disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants ^a	Anxiety assessed by	Main findings
Cuijpers 2007 ³	The Netherlands M/F Aged 18–64 years	1996	1 and 3 years	2,726	DSM-III-R	IRR for developing anxiety for smoking in past year: Any anxiety disorder = 1.88 (95% CI 1.15–3.06) Generalised anxiety disorder = 4.57 (95% CI 1.53–13.67) Adjusted for education, childhood trauma, parental history of psychopathology, somatic illness, locus of control, neuroticism, gender, age, having a paid job
Ferdinand 2001 ⁴²	The Netherlands M/F 10–14 years	1983	8 years	787	Achenbach questionnaire and Child Behaviour Checklist	OR for smoking 8 years after presence/absence of anxiety/depression at 12–16 years: 1.13 ($p < 0.05$) There was no statistically significant association with anxiety/depression at 10–14 or 14–18 years. After adjustment for age, sex and other factors, the effect at 12–16 years became non-statistically significant (results not reported)
Isensee 2003 ⁴⁸	Germany M/F 14–24 years Early Developmental Stages of Psychopathology Study	1995	4 years	2,548	Computer assisted version of Munich-composite International Diagnostic, M-CIDI/ DSM-IV diagnostic algorithms	Being a dependent regular smoker significantly increased the risk of developing post-traumatic stress disorder (OR 5.1, 95% CI 1.2 to 21.5) Adjusted for age and sex
John 2004 ⁴⁹	Germany M/F 18–64 years	1996–7	36 months	786	DSM-IV	OR for developing anxiety in relation to baseline smoking status (≥ 11 vs ≤ 10 cigs/day: 1.46 (95% CI 1.15–1.86) adjusted for age and gender
Johnson 2000 ⁵⁰	USA M/F Mean age 16 years	1985–6	Mean 6 years	688	Diagnostic Interview Schedule for Children	OR for developing anxiety in early adulthood for smoking one or more packs/day in adolescence: Generalised anxiety = 5.53 (95% CI 1.84–16.66) Social anxiety = 0.44 (95% CI 0.04–4.62) Adjusted for age, sex, childhood temperament, parents' education, psychopathology, alcohol, drug use, depressive disorders

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Table A4 Characteristics of included studies assessing the association between smoking and anxiety disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants ^a	Anxiety assessed by	Main findings
Johnson 2009 ⁴⁵	USA M/F ≥18 years	2001–2	3 years	21,226 never daily smokers at baseline	DSM-IV	OR for taking up daily smoking at follow-up given anxiety disorder at baseline: 0.62 (95% CI 0.39–0.99) Adjusted for age, gender, marital status and education
Marmorstein 2010 ⁴⁰	USA M Average 6.2 years	1987	14 years	503	Child Behaviour Checklist, Youth Self Report, Teacher Report Form Score	The time to first use of tobacco was quicker among people with high anxiety levels compared with those with low levels, by about 2 years OR for first use of tobacco for an increase in anxiety score from the previous year: Generalised anxiety = 1.09 (95% CI 1.02–1.17) Social anxiety = 1.06 (95% CI 0.99–1.14) Adjusted for delinquency
Patel 2006 ⁴⁶	India F 18–45 years	2001–3	12 months	2,166 (20 new cases)	Scale for Somatic Symptoms and Revised Clinical Interview Schedule (CIS)	OR for developing incident anxiety/depression given tobacco use in the previous 3 months: 3.23 (95% CI 1.0–10.8) adjusted for chronic physical illness, baseline CIS score, household income
Patton 1998 ³⁸	Australia M/F Aged 14–15 years	1992–5	6 months	1,688	CIS	HR for smoking after having a CIS score increase to ≥12 units (most anxious), allowing for previous score: 1.2 (95% CI 0.7–2.1) any smoking 1.6 (95% CI 0.9–2.9) daily smoking HR for taking up daily smoking, high vs low CIS scores: 1.4 (95% CI 0.7–2.9) some peers smoke 2.6 (95% CI 1.3–5.6) most peers smoke

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Table A4 Characteristics of included studies assessing the association between smoking and anxiety disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants ^a	Anxiety assessed by	Main findings
Pedersen 2009 ⁴³	Norway M/F 13 years	1992	13 years	1,501	'Kandel and Davies' derived from Hopkins Symptom Checklist	OR for a non-smoker at age 13 becoming a smoker at age 15, if had anxiety at age 13: 1.06 (95% CI 0.97–1.17) Smoking at ages 20–27 years as a risk factor for having anxiety at age 27 Regression coefficient: 0.38 ($p > 0.05$): non-dependent smokers 0.78 ($p < 0.05$): nicotine-dependent smokers Positive coefficient (adjusted for age, sex and mental health scores at age 20 years) indicates smoking status associated with having later higher anxiety scores
Rohde 2004 ²¹	USA M/F 14–18 years Oregon Adolescent Depression Project (OADP)	1987	12 years	722	Schedule for Affective Disorders and Schizophrenia for School-age Children (K-SADS), Longitudinal Interval Follow-up Evaluation	Anxiety was not significantly associated with the risk of progression to daily smoking (OR 1.23, $P > 0.05$) Adjusted for no confounders
Sonntag 2000 ³⁹	Germany M/F Aged 14–24 years	1995	4–5 years	3,021 (490)	DSM-IV	Among baseline non-smokers: OR of later having a dependence on tobacco smoke if previously had anxiety = 3.85 (95% CI 1.34–11.0) OR for taking up regular tobacco use = 0.77 (95% CI 0.37–1.57)
Swendsen 2010 ⁴¹	US M/F 15–54 years	2001–3	10 years	5,001	DSM-III-R/WHO Composite Diagnostic Interview	OR for becoming a daily smoker during follow-up given anxiety at baseline (among non-daily users at baseline): Anxiety disorder: 1.9 (95% CI 1.3–2.8) Adjusted for age, sex, race, education, marital status, number of children, region and employment status
Van der Velden 2007 ⁴⁷	The Netherlands M/F Disaster victims 45.1 years, control 44.6 years Firework disaster cohort	2001	18 months and 4 years	Victims: 662 Controls: 526	DSM-IV, self-rating scale	Victims: smoking significantly increased the risk of severe anxiety (OR = 2.32, 95% CI 1.19–4.53) Controls: smoking was not significantly associated with the risk of severe anxiety (OR = 1.64, 95% CI 0.73–3.68) Adjusted for hostility symptoms and other mental illnesses at baseline, stressful life events 2–5 years before follow-up

continued

Table A4 Characteristics of included studies assessing the association between smoking and anxiety disorders – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants ^a	Anxiety assessed by	Main findings																		
Voorhees 2002 ²³	USA F 9–10 years	1987–8	10 years	2,379	Harter Self Perception Profile for children	<p>Mean anxiety scores among those aged 11–12 years, in relation to smoking status age 18–19 years:</p> <table border="1"> <thead> <tr> <th></th> <th>Daily smoker</th> <th>Never smoker</th> <th><i>p</i></th> </tr> </thead> <tbody> <tr> <td>Blacks</td> <td>13.2</td> <td>10.9</td> <td><0.004</td> </tr> <tr> <td>Whites</td> <td>11.8</td> <td>10.5</td> <td><0.02</td> </tr> </tbody> </table> <p>Association between anxiety score and smoking status not statistically significant in a multivariate analyses (data not shown)</p>		Daily smoker	Never smoker	<i>p</i>	Blacks	13.2	10.9	<0.004	Whites	11.8	10.5	<0.02						
	Daily smoker	Never smoker	<i>p</i>																					
Blacks	13.2	10.9	<0.004																					
Whites	11.8	10.5	<0.02																					
Woodward 2010 ⁴⁴	New Zealand M/F 14–16 years	Birth cohort from 1977	Average 4–5 years (aged 16–21 years)	964	Diagnostic Interview Schedule for Children/DSM-III-R	<p>Percentage who developed nicotine dependence at age 16–21 years given anxiety disorder at age 14–16 years:</p> <table border="1"> <thead> <tr> <th colspan="6">Number of anxiety disorders</th> </tr> <tr> <th></th> <th>0</th> <th>1</th> <th>2</th> <th>≥3</th> <th><i>p</i> value</th> </tr> </thead> <tbody> <tr> <td>%</td> <td>27.4</td> <td>26.4</td> <td>25.4</td> <td>30.4</td> <td>0.60</td> </tr> </tbody> </table> <p>Adjusted for childhood sexual abuse, alcohol, parental changes and deviant peers</p>	Number of anxiety disorders							0	1	2	≥3	<i>p</i> value	%	27.4	26.4	25.4	30.4	0.60
Number of anxiety disorders																								
	0	1	2	≥3	<i>p</i> value																			
%	27.4	26.4	25.4	30.4	0.60																			

^aNumber of cases with anxiety in brackets if available.
CI, confidence interval; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; F, female; HR, hazard ratio; M, male; OR, odds ratio.

Table A5 Characteristics of included studies assessing the association between smoking and eating disorders

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Eating disorders assessed by	Main findings
Field 2002 ⁵¹	USA M/F 10–15 years Growing Up Today Study (GUTS)	1996	1 year	11,358	McKnight Risk Factor Survey Purging = laxatives or vomiting at least monthly to control weight Binge eating = at least monthly eating of a very large amount of food in a short time and feeling out of control during the eating episode	Females: smoking was not significantly related to purging (OR = 0.9, 95% CI 0.3–2.5) or binge eating (OR = 1.4, 95% CI 0.6–3.0) Males: binge eating or purging was not significantly related to beginning to smoke (OR = 0.7, 95% CI 0.1 to 4.1) Females: binge eating (OR = 1.8, 95% CI 0.9–3.5) or purging (OR = 2.0, 95% CI 0.8–4.9) were not significantly related to beginning to smoke Adjusted for age, weight status, mother smoking, number of friends who smoke, willingness to use tobacco promotional products
French 1994 ⁵³	USA M/F Grade 7–10 students	1999	4 years	1,705	Restrained Eating Scale	Females: high eating disorder symptoms score was significantly associated with and increase in risk of smoking initiation (OR = 2.15, 95% CI 1.16–3.97) Males: high eating disorder symptoms score was not significantly associated with smoking initiation (OR = 1.67, 95% CI 0.91–3.07) Adjusted for grade at school, body mass index
Stice 2003 ⁵²	USA F 11–15 years	Not reported	1 year	403	Eating pathology = Eating Disorders Examination (DSM-IV-Mental Disorders). Body dissatisfaction = satisfaction and dissatisfaction with the Body Parts Scale	Body dissatisfaction and/or eating pathology was significantly associated with an increase in the risk of onset of smoking Adjusted for negative affectivity

CI, confidence interval; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; F, female; M, male; OR, odds ratio.

Table A6 Characteristics of included studies assessing the association between smoking and depression

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
Ajdacic-Gross 2009 ²⁷	Switzerland M/F 20–21 years	1979	20 years	381	SPIKE – major depression and anxiety	Major depression was significantly associated with adolescent onset of heavy smoking (OR = 6.0, 95% CI 2.3–18.7) Major depression was not significantly associated with adolescent onset of light/moderate smoking (OR = 1.2, 95% CI 0.6–2.5) Major depression was not significantly associated with adult onset of smoking (OR = 1.6, 95% CI 0.6–4.5) Adjusted for education, sex, parents smoking behaviour, youth problems, conflicts, Freiburg Personality Inventory
Albers 2002 ⁶¹	USA M/F 12–15 years Massachusetts Tobacco Survey of Youth	1993	4 years	522	Depressive symptoms, six-item scale	Ever smoking was not significantly associated with high depressive symptoms (OR = 1.74, 95% CI 0.97–3.14) Adjusted for parental education, household smoking, rebelliousness, race, gender, age
Batterham 2009 ⁶²	Australia M/F 20–64 years PATH through life cohort	1999–2002	4 years	6,605	Major depressive disorder using Patient Health Questionnaire	Being a current smoker was significantly associated with major depressive disorder (OR = 2.51, 95% CI 1.94–3.24) Adjusted for no confounders
Breese McCoy 2006 ⁹¹	USA F 34% <21 years Three sites	2001–3	4 weeks postnatal	209	Edinburgh Postnatal Depression Scale (EPDS)	Cigarette smoking was significantly associated with postpartum depression (OR = 2.21, 95% CI 1.20–4.09) Adjusted for no confounders
Breslau 1998 ⁷⁷	USA M/F 21–30 years Members of large health maintenance organisation	1989	5 years	974	Major depression measured using National Institute of Mental Health Diagnostic Interview Schedule (NIMH-DIS)	History of major depression was significantly associated with progression to daily smoking (OR = 3.0, 95% CI 1.10–8.19) History of major depression was significantly associated with daily smoking (OR = 1.91, 95% CI 1.10–3.36) Adjusted for sex

continued

Table A6 Characteristics of included studies assessing the association between smoking and depression – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
Brook 2002 ⁶³	USA M/F 14 years (mean) Children in the Community Study	1975	14 years	736	Major Depressive Disorder, DSM-IV criteria	Tobacco use was not significantly associated with major depressive disorder (OR = 1.08, 95% CI 0.96–1.21) Adjusted for parental education, age, sex, family income
Brook 2004 ⁸⁴	USA M/F 14 years (mean) Children in the Community Study	1983	13 years	688	Hopkins Symptoms Checklist	Cigarette smoking was significantly associated with high depressive symptoms (OR = 1.29, 95% CI 1.07–1.55) Depressive symptoms were not significantly associated with cigarette smoking (OR = 1.00, 95% CI 0.77–1.28) Adjusted for parental education, age, sex
Brown 1996a ²⁴	USA M/F 16.6 years (mean) Nine senior high schools	1987	13.8 months (mean)	1,507	Major depressive disorder using Schedule for Affective Disorders and Schizophrenia for School-age Children (K-SADS) and Longitudinal Interval Follow-up Evaluation	Smoking was significantly associated with incidence of major depressive disorder (OR = 1.89, 95% CI 1.04–3.45) Major depressive disorder was significantly associated with smoking onset (OR = 2.04, 95% CI 1.16–3.60) Adjusted for parental education, age, gender, number of biological parents in household, other disorders
Brown 1996b ⁶⁴	USA M/F 25–74 years First NHANES Epidemiological Study	1975	7–9 years	1,317	Centre for Epidemiologic Studies – Depression (CES-D) Scale	Highly active: smoking was not significantly associated with high depressive symptoms (OR = 0.9, 95% CI 0.5–1.7) Low-to-moderate activity: smoking was significantly associated with high depressive symptoms (OR = 1.8, 95% CI 1.1–3.1) Adjusted for age, race, sex, alcohol, health status, physical activity, smoking and physical activity interaction

continued

Table A6 Characteristics of included studies assessing the association between smoking and depression – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
Choi 1997 ⁵⁴	USA M/F 12–18 years Teenage Attitudes and Practices Survey (TAPS I)	1989	4 years	6,863	Depressive symptoms	Males: current established smoking significantly increased the risk of high depressive symptoms (OR = 1.86, 95% CI 1.18–2.92) Females: current established smoking significantly increased the risk of depressive symptoms (OR = 2.05, 95% CI 1.39–3.04) Adjusted for household income, adult education, age, school performance, social support, rebelliousness, organised sport participation, race/ethnicity
Clark 2004 ²⁶	USA 10–12 years Categorised by whether biological father had a substance use disorder	Not reported	2, 5 and 8 years	572	DSM-III-R, using Structured Clinical Interview for Diagnosis (CISD), CEDAR version of the K-SADS	Daily cigarette smoking was not significantly associated with depressive disorder (RR = 1.0, <i>p</i> = 0.9). Adjusted for no confounders
Clark 2006 ⁶⁵	UK M/F 11–14 years Research with East London Adolescent: Community Health Survey (RELACHS)	Not reported	2 years	1,513	Short Mood and Feeling Questionnaire (SMFQ)	Tried or regular smoking was not significantly associated with depressive symptoms (OR = 1.29, 95% CI 0.96–1.72) Adjusted for free school meals, age, gender, age and gender interaction, ethnicity, general health status, longstanding illness, overweight, alcohol, drug use
Cuijpers 2007 ³	The Netherlands M/F Aged 18–64 years	1996	1 and 3 years	2,726	DSM-III-R	Smoking was not significantly associated with the risk of major depression (IRR = 1.28, 95% CI 0.76–2.16) Adjusted for education, childhood trauma, parental history of psychopathology, somatic illness, locus of control, neuroticism, gender, age, having a paid job
Duncan 2005 ⁵⁵	USA M/F 11–21 years National Longitudinal Adolescent Health Survey	1995	10.9 months (mean)	13,068	Center for Epidemiologic Studies – Depression (CES-D) Scale	Males: smoking was not significantly associated with high depressive symptoms (OR = 1.05, 95% CI 0.77–1.43) Females: smoking was significantly associated with increased risk of high depressive symptoms (OR = 1.79, 95% CI 1.33–2.39) Adjusted for age

continued

Table A6 Characteristics of included studies assessing the association between smoking and depression – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
Escobedo 1998 ⁷⁸	USA M/F 12–18 years Teenage Attitudes and Practices Survey (TAPS)	1988–9	4 years	7,885	Depressive symptoms scale based on symptoms of depression or dysthymia in the DSM-III	Depressive symptoms were significantly associated with smoking initiation (OR = 1.3, 95% CI 1.1–1.6) Adjusted for race, school performance, risk taker, others in household who smoke, region
Fleming 2002 ⁷⁹	USA M/F 10 public schools	1993–4	4–5 years	810	Depressive symptoms	Depression was significantly associated with increased risk of smoking initiation (OR = 2.57, 95% CI 1.30–5.07) Adjusted for low income, single parent family, parent, sex, ethnicity, academic skills, antisocial behaviour, commitment to schooling, antisocial behaviour of peers, cohort
Flensburg-Madsen 2011 ⁵⁶	Denmark M/F 20+ years Copenhagen City Heart Study (CCHS)	1976–8	16–18 years	17,814	ICD diagnosis of depression using ICD-8 or ICD-10	In women: There was no significant association between being an ex-smoker (HR = 0.75, 95% CI 0.52–1.07) or smoking 1–10g tobacco daily (HR 0.90, 95% CI 0.64–1.28) and the risk of depression Smoking 11–20 g (HR = 1.72, 95% CI 1.27–2.33) or >20 g (HR = 2.33, 95% CI 1.49–3.65) of tobacco per day was significantly associated with the risk of depression In men: There was no significant association between being an ex-smoker (HR = 1.00, 95% CI 0.53–1.91), smoking 1–10 g (HR = 0.65, 95% CI 0.29–1.44), or 11–20 g (HR = 1.72, 95% CI 0.93–3.19) of tobacco daily and the risk of depression Smoking >20 g of tobacco per day was significantly associated with the risk of depression (HR = 2.14, 95% CI 1.11–4.13) Adjusted for income, education, marital status, age, alcohol, number of children, living at home, leisure time, physical activity

continued

Table A6 Characteristics of included studies assessing the association between smoking and depression – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
Georgiades 2007 ⁶⁶	Canada M/F 4–16 years Ontario Child Health Study (OCHS)	1983	18 years	1,282	12-month prevalence of major depressive disorder using Composite International Diagnostic Interview – short form (CIDI-SF)	Tobacco use in adolescence was not significantly associated with depression in adulthood (OR = 0.69, 95% CI 0.26–1.85) Adjusted for family income, parental years of education, occupation prestige, single parent home, family functioning, sex, age, grade failure, medical condition, general health
Gilpin 2004 ⁶⁷	USA M/F 12–15 years California Tobacco Surveys	1993 and 1996	3 years	Cohorts: 1,764 (from 1993) 2,119 (from 1996)	Significant depressive symptoms, not further specified	Significant depressive symptoms were significantly associated with any smoking (OR = 1.46, 95% CI 1.04–2.05) Adjusted for age, gender, race/ethnicity, cohort, susceptible to smoking, rebelliousness, familial smoking, best friend smoking, peer anti-smoking norms, favourite cigarette advert, ease of getting cigarettes
Goodman 2000 ⁸⁰	USA M/F 15.5 years (mean) Add Health cohort, grades 7–12	1994–5	1 year	Cohorts: 8,704 (non-depressed) 6,947 (non-smokers)	CES-D Scale	Smoking was significantly associated with increased risk of high depressive symptoms (OR = 1.85, 95% CI 1.41–2.42) High depressive symptoms was not significantly associated with smoking onset for at 1 pack/week (OR = 1.72, 95% CI 0.78–3.81) Adjusted for parental education, age, gender, race
Kandel 2004 ⁹³	USA M/F 14–18 years Add Health cohort, grades 7–12	1994–5	12–16 months	14,736	CES-D Scale	Depression was not significantly associated with smoking initiation (OR = 0.99, 95% CI 0.96–1.01 per unit increase in depression score) Depression was not significantly associated with daily smoking initiation (OR = 1.01, 95% CI 0.99–1.02 per unit increase in depression score)

continued

Table A6 Characteristics of included studies assessing the association between smoking and depression – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
Kang 2010 ⁶⁸	Korea M/F 20+ years Korea Welfare Panel	2006	1 year	Cohorts: 10,125 (non-depressed) 10,624 (non-smokers)	Depression based on CESD Scale	Smoking <0.5 pack/day or ≥2 packs/day were significantly associated with the onset of depression (OR = 1.50, 95 % CI 1.17–1.92, OR = 5.83, 95 % CI 1.68–20.28, respectively) Smoking <1 pack/day or <2 packs per day were not significantly associated with the onset of depression (OR = 1.26, 95 % CI 0.99–1.61, OR = 0.89, 95 % CI 0.50–1.59, respectively) Depression was not significantly related to smoking (OR = 1.00, 95 % CI 0.99–1.02) Adjusted for educational level, religion, marital status, residential region, household income, economic activities, age, gender, baseline CESD, health condition, self-esteem, major life events
Killen 1997 ⁹²	USA M/F 15 years (mean) Three high schools	Not reported	2–3 years	1,026	CES-D Scale	Males: high depression symptoms significantly associated with increase in onset of smoking (HR = 1.03, <i>p</i> <0.01) Females: high depression symptoms not significantly associated with onset of smoking (no data reported) Adjusted for confounders, but factors not stated
Klungøy 2006 ⁹⁴	Norway M/F 18+ years Population survey	1989–91	11 years	1,190	First depressive episode based on Composite International Diagnostic Interview (DICI)	Quitting or light smoking were not significantly associated with first depressive episode (quit ≤5 years: HR = 1.46, 95 % CI 0.70–3.03; quit >5 years: HR = 1.49, 95 % CI 0.75–2.96; current ≤10 cigs/day: HR = 1.29, 95 % CI 0.74–2.25). Smoking 11–20 cigs/day or >20 cigs/day were significantly associated with first depressive episode (HR = 2.01, 95 % CI 1.17–3.43, HR = 4.34, 95 % CI 1.85–10.18, respectively) Adjusted for education level, age, gender, alcohol index, life events, somatic disease restraint

continued

Table A6 Characteristics of included studies assessing the association between smoking and depression – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
Korhonen 2007 ⁵⁷	Finland M/F 18+ years Finnish Twin Cohort	1975	15 years	12,502	Depressive symptoms using Beck Depression Inventory (BDI)	Quitting smoking was significantly associated with depressive symptoms (Men: OR = 1.68, 95% CI 1.17–2.42; Women: OR = 1.38, 95% CI 1.01–1.87). Persistently smoking between 1975 and 1981 was significantly associated with depressive symptoms in men (OR = 1.42, 95% CI 1.07–1.89), but not women (OR = 0.95, 95% CI 0.75–1.21) Adjusted for social class, age, sex, marital status, alcohol use, physical activity, somatic disease, social network, emotional support, life events, life satisfaction, neuroticism
Koster 2006 ⁶⁹	Netherlands M/F 55–85 years Longitudinal Aging Study Amsterdam (LASA)	1992–3	9 years	1,691	CES-D Scale	Smoking was not significantly associated with incident depression (HR = 1.27, 95% CI 0.95–1.69) Former smoking was not significantly associated with incidence of depression (HR = 0.93, 95% CI 0.72–1.20) Adjusted for age and sex
Lam 2005 ⁷⁰	Hong Kong M/F 12.7 years Secondary schools evaluating primary prevention programmes	2001–2	12 months	1,894	Depressive symptoms, not standardised scale	High depressive symptoms in never smokers was significantly associated with increase in risk of ever smoking (OR = 1.48, 95% CI 1.07–2.05) Ever smoking in individuals with low depression scores was significantly associated with increased risk of high depressive symptoms (OR = 2.17, 95% CI 1.40–3.36) Adjusted for age and sex
Luijendijk 2008 ⁷¹	The Netherland	1997	5 years	2,931	Depression based on CES-D	Being a former or current smoker was not significantly associated with depression (former: OR = 1.22, 95% CI 0.70–2.24; current OR = 1.89, 95% CI 0.91–3.92) Adjusted for education, income, age, sex, disability, cognitive function

continued

Table A6 Characteristics of included studies assessing the association between smoking and depression – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
McCoy 2008 ⁹⁰	USA F 35% < 21 years Three state university physician clinics	2003	1 year	588	Postpartum depression based on medical records	Smoking was significantly associated with postnatal depression (OR = 2.42, 95% CI 1.26–4.65) Adjusted for no confounders
McKenzie 2010 ⁸⁵	Australia M/F 14.9 years (mean) Two secondary schools	1992	10 years	854	Self-reported symptoms of depression and anxiety using revised Clinical Interview Schedule (CIS-R)	High depression was not significantly associated with adult daily tobacco use (OR = 1.7, 95% CI 0.9–3.4) Adjusted for gender, alcohol, cannabis use
Melchior 2009 ⁷²	France M/F 35–50 years GAZEL adult cohort	1996	3 years	7,391	CES-D Scale	Tobacco smoking was significantly associated with an increase in onset of depression (OR = 1.33, 95% CI 1.12–1.57) Adjusted for no confounders
Murphy 2003 ⁷³	Canada	1952	40 years	575	Depression, not specified	Smoking was not significantly associated with depression (RR = 1.33, 95% CI 0.90–1.95) Adjusted for no confounders
Otten 2009 ⁸¹	The Netherlands M/F 11–16 years 33 schools	2002	22–24 months	5,938	Depressive Mood List	Depressed mood was significantly associated with increased risk of lifetime smoking onset (OR = 1.44, 95% CI 1.14–1.82) Depressed mood was significantly associated with increased risk of lifetime regular smoking onset (OR = 1.98, 95% CI 1.31–3.00)
Paffenbarger 1994 ⁵⁸	USA M 35–74 years Alumni from college	1962	26 years	10,201	Depression diagnosed by physician	Smoking more than 1 pack/day was significantly associated with an increase in the risk of depression (OR = 1.43, 95% CI 1.11–1.83) Adjusted for no confounders
Park 2009a ⁸⁸	USA M/F 15.4 years (mean)	1994–5	1 year	4,903	Depression, CES-D Scale	Depression was significantly associated with temporary daily smoking (OR = 1.46, 95% CI 1.01–2.11). Depression was not significantly associated with continued daily smoking (OR = 0.89, 95% CI 0.50–1.60) Adjusted for no confounders

continued

Table A6 Characteristics of included studies assessing the association between smoking and depression – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
Park 2009b ⁷⁴	Korea M/F 13–14 years Korea Youth Panel Survey (KYPS)	2003	4 years	Non-smokers: 2,368 Non-depressed: 1,742	Depressive symptoms, DSM-M-IV	Depression was significantly associated with increased risk in daily smoking (OR = 2.41, 95% CI 1.13–5.14) Daily smoking was not significantly associated with depression (OR = 0.91, 95% CI 0.29–2.89) Adjusted for income, parents education, gender, intact family, family-related factors, school-related factors, friend-related factors, problem behaviours, self-esteem, risk-taking tendency, stress, life satisfaction, academic performance
Pasco 2008 ⁵⁹	Australia F 39 years (median)	Not reported	Not reported	671	Depression, not specified	Smoking was significantly associated with depression (OR = 2.52, 95% CI 1.28–4.96) Adjusted for age
Rohde 2004 ²¹	USA M/F 16.6 years (mean) Oregon Adolescent Depression Project (OADP)	1987	12 years	722	Disorder using K-SADS and Longitudinal Interval Follow-up Evaluation	Progression to daily smoking was significantly associated with major depressive disorder (OR = 1.48, 95% CI 1.01–2.19) Adjusted for no confounders
Rubio 2008 ⁷⁶	USA F Cohort 1: 23 years Cohort 2: 24 years (mean)	Not reported	5–9 months	Cohort 1: 278 Cohort 2: 209	Depression based on CES-D and Edinburgh Postnatal Depression Scale	Cohort 1: Smoking was not significantly associated with postnatal depression (OR = 1.36, 95% CI 0.63–2.91) Cohort 2: smoking was significantly associated with postnatal depression (OR = 2.31, 95% CI 1.22–4.39) Adjusted for marital status, age, race, parity
Sihvola 2008 ⁸⁹	Finland M/F 14.2 years (mean)	1994	6.5 years	1,852	Depression based on CESD	Depression was not significantly associated with experimentation (OR = 1.28, 95% CI 0.82–2.02) or smoking occasionally (OR = 1.27, 95% CI 0.68–2.36) Depression was significantly associated with daily smoking (OR = 2.14, 95% CI 1.33–3.45) Adjusted for other substance use, shared genes, family structure, age, sex

continued

Table A6 Characteristics of included studies assessing the association between smoking and depression – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
Strawbridge 2002 ⁷⁵	USA M/F 50–94 years Alameda County Study	1994	5 years	1,947	Major depressive episode using DSM-IV	Current smoking was significantly associated with incident major depressive episode (OR = 2.23, 95% CI 1.33–3.74). Being a former smoker was not significantly associated with incident major depressive episode (OR = 0.84, 95% CI 0.53–1.35) Adjusted for no confounders
Tanaka 2011 ⁶⁰	Japan M/F	1993	7 years	9,201	Depression based on DSM-12D	In men: being a past smoker was not significantly associated with depression (OR = 0.84, 95% CI 0.34–2.09). Current smoking was not significantly associated with depression (OR = 1.01, 95% CI 0.50–2.05) In women: being a past smoker was not significantly associated with depression (OR = 2.65, 95% CI 0.61–11.59). Current smoking was not significantly associated with depression (OR = 2.09, 95% CI 0.97–4.51) Adjusted for education, occupation, age, area, social network
Van der Velden 2007 ⁴⁷	The Netherlands M/F Disaster victims 45.1 years, control 44.6 years Firework disaster cohort	2001	18 months and 4 years	Victims: 662 Controls: 526	DSM-IV, self-rating scale	Victims: smoking was not significantly associated with the risk of severe depression (OR = 1.05, 95% CI 0.60–1.21). Smoking was significantly associated with the risk of post-traumatic stress disorder (OR = 2.64, 95% CI 1.05–6.62) Controls: smoking was not significantly associated with the risk of severe depression (OR = 1.16, 95% CI 0.60–2.23) Adjusted for hostility symptoms and other mental illnesses at baseline, stressful life events 2–5 years before follow-up
Van Gool 2003 ⁸²	The Netherlands 69.3 years (mean)	1992	6 years	1,280	Depression based on CES-D	Depression was not significantly associated with smoking initiation (emerging depression: OR = 0.53, 95% CI 0.07–4.18; remitted depression: OR = 2.20, 95% CI 0.46–10.54; persistent depression: OR = 1.34, 95% CI 0.14–12.44) Adjusted for no confounders

continued

Table A6 Characteristics of included studies assessing the association between smoking and depression – *continued*

Study	Country/participants	Patients recruited	Length of follow-up	No. of participants	Depression assessed by	Main findings
Van Gool 2006 ⁸⁶	The Netherlands M/F 24–81 years Maastricht Aging Study	1993–1995	6 years	1,169	Depression based on self-reported symptoms	Current smoking was not significantly associated with depression at follow-up (RR = 1.49, 95% CI 0.92–2.44) compared with never smoking Former smoking was not significantly associated with depression at follow-up (RR = 0.88, 95% CI 0.56–1.40) compared with current smoking
Wang 1999 ⁸³	USA M/F 12–18 years Teenage Attitudes and Practices Survey (TAPS I)	1989	4 years	7,960	Depressive symptoms, not specified	Depression was not significantly associated with adolescent smoking initiation (OR = 0.98, 95% CI 0.89–1.08) Depression was significant associated with an increase in adult smoking initiation (OR = 1.15, 95% CI 1.00–1.33) Depression was significantly associated with adolescent regular smoking (OR = 1.22, 95% CI 1.07–1.39) Depression was significantly associated with adult regular smoking (OR = 1.29, 95% CI 1.06–1.59) Adjusted for attitudes, beliefs, liking school, school performance, days of missing school, parent smoking behaviour, friends smoking behaviour, teacher smoking behaviour, friends approval, physical fights, nights out, race, gender
Wu 1999 ⁸⁷	USA M/F 8–9 years First graders from 19 elementary schools	1985–6	9 years	1,731	Presence of depressed mood, screening questions	Tobacco smoking was significantly associated with an increase in the risk of depressed mood (HR = 1.66, 95% CI 1.28–2.16) Depressed mood was not significantly associated smoking initiation (HR = 1.06, 95% CI 0.74–1.51) Adjusted for sex, ethnicity, prior alcohol use

CI, confidence interval; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; F, female; HR, hazard ratio; IRR, incidence rate ratio; M, male; OR, odds ratio; RR, relative risk.

Table A7 Summary of the main findings of large prospective studies (>20 000 participants) or meta-analyses of the association between two major causes of mortality (cardiovascular disease and cancer, both smoking-related) and mental health disorders

Study	Design	Mental health illness and mortality	Main findings								
Albert 2005 ¹¹⁰	US cohort study (72,359 women including 1,294 with fatal/non-fatal cardiovascular disease)	Phobic anxiety and cardiovascular disease	Adjusted relative risk for the following disorder among women with a phobic index of 4+ compared with <4 (allowing for age, smoking, alcohol, family history and others): <table border="1"> <thead> <tr> <th colspan="2">Relative risk (95% CI)</th> </tr> </thead> <tbody> <tr> <td>Sudden cardiac death</td> <td>1.52 (1.01–2.30)</td> </tr> <tr> <td>Fatal coronary heart disease</td> <td>1.30 (1.02–1.67)</td> </tr> <tr> <td>Non-fatal myocardial infarction</td> <td>0.88 (0.76–1.01)</td> </tr> </tbody> </table>	Relative risk (95% CI)		Sudden cardiac death	1.52 (1.01–2.30)	Fatal coronary heart disease	1.30 (1.02–1.67)	Non-fatal myocardial infarction	0.88 (0.76–1.01)
Relative risk (95% CI)											
Sudden cardiac death	1.52 (1.01–2.30)										
Fatal coronary heart disease	1.30 (1.02–1.67)										
Non-fatal myocardial infarction	0.88 (0.76–1.01)										
Bresee 2010 ¹²²	Canadian cohort study (2.3 million participants, including 394,927 with cardiovascular disease)	Schizophrenia and cardiovascular disease	Adjusted OR (allowing for age, sex, socioeconomic status) for cardiovascular disease among those with schizophrenia is 1.76 (95% CI 1.72–1.81)								
Carney 2004 ¹⁰⁹	US cohort study (722,139 subjects)	Mental health (outpatient or inpatient) and cancer	Age-adjusted OR for developing any cancer among those with a disorder, compared with those without: Males = 1.10 (95% CI 0.97–1.24) Females = 1.03 (95% CI 0.95–1.12) But statistically significant increased risks for central nervous system (ORs 2.12 females and 2.09 males) and respiratory cancers (OR = 1.57 females and 1.52 males)								
Catts 2008 ¹¹⁸	Meta-analysis of 8 studies	Schizophrenia and cancer	Standardised incidence ratio for cancer (schizophrenia compared with general population): Males = 0.98 (95% CI 0.83–1.15) Females = 1.08 (95% CI 0.97–1.21)								
Dalton 2005 ¹¹¹	Danish cohort study (22,766 participants including 1,394 with cancer)	Schizophrenia and cancer	Adjusted incidence ratio for cancer among those with schizophrenia compared with the general population (allowing for age, sex and calendar time): Males = 0.85 (95% CI 0.78–0.93) Females = 1.03 (95% CI 0.96–1.11) But statistically significant increased risk for oesophageal cancer in males (2.28) and breast cancer in females (1.20)								
Goldacre 2007 ¹¹⁴	UK cohort record linkage study (577,546 participants including 2,178 with cancer)	Anxiety or depression, and cancer	Adjusted rate ratio for cancer among those with anxiety/depression (allowing for sex, age, calendar time and region): Depression = 1.04 (95% CI 0.98–1.10) Anxiety = 1.05 (95% CI 0.99–1.11) But statistically significant increased risk for lung cancer (1.36 depression 1.29 anxiety), and brain cancer (1.74 depression and 1.46 anxiety)								

continued

Table A7 Summary of the main findings of large prospective studies (>20 000 participants) or meta-analyses of the association between two major causes of mortality (cardiovascular disease and cancer, both smoking-related) and mental health disorders – *continued*

Study	Design	Mental health illness and mortality	Main findings		
Hippisley-Cox 2007 ¹¹³	UK nested case-control study within cohort from general practice (4.04 million participants including 40,441 incident cancers)	Schizophrenia and bipolar disorder, and cancer	Adjusted OR for cancer, schizophrenia/bipolar compared with neither disorder (allowing for many factors including smoking, obesity, socioeconomic status):		
				Schizophrenia	Bipolar disorder
			Breast	1.52 (1.10–2.11)	1.21 (0.86–1.71)
			Colon	2.90 (1.85–4.57)	0.95 (0.51–1.76)
			Rectal	0.78 (0.36–1.66)	0.99 (0.40–2.43)
			Gastro-oesophageal	1.06 (0.58–1.93)	0.98 (0.47–2.05)
			Prostate	0.59 (0.33–1.05)	0.87 (0.51–1.49)
			Respiratory	0.53 (0.34–0.85)	1.21 (0.79–1.85)
Iso 2002 ¹⁰⁸	Japanese cohort study (73,424 participants, including 1,421 with cardiovascular disease)	Stress and cardiovascular disease	Adjusted relative risks (95% CI) for developing cardiovascular disease among those with high compared with low stress scores (allowing for several factors including smoking, body mass index, alcohol and psychological variables):		
				Males	Females
			Stroke	1.12 (0.78–1.61)	2.24 (1.52–3.31)
			Coronary artery disease	1.08 (0.59–1.97)	2.28 (1.17–4.43)
			All cardiovascular	1.09 (0.85–1.40)	1.64 (1.25–2.16)
Janszky 2010 ¹²⁴	Swedish cohort study (49,321 men, including 1,894 with coronary heart disease)	Anxiety or depression, and coronary heart disease	Adjusted HRs (95% CI) for heart disease among those with depression/anxiety compared with those who did not (allowing for smoking, alcohol, physical activity and others):		
				Depression	Anxiety
			Coronary heart disease	1.04 (0.70–1.54)	2.17 (1.28–3.67)
			Acute myocardial infarction	1.03 (0.65–1.65)	2.51 (1.38–4.55)
Kroenke 2005 ¹¹²	US cohort study (81,612 women including 400 colorectal cancers)	Depression and colorectal cancer	Relative risk for developing colorectal cancer among women with the highest depression scores compared with the lowest: 1.43 (95% CI 0.97–2.11), adjusted for many factors including smoking, family history, alcohol		

continued

Table A7 Summary of the main findings of large prospective studies (>20 000 participants) or meta-analyses of the association between two major causes of mortality (cardiovascular disease and cancer, both smoking-related) and mental health disorders – *continued*

Study	Design	Mental health illness and mortality	Main findings																
Melchior 2010 ¹²³	French cohort study (19,962 participants including 1,144 deaths)	Any psychiatric disorder and all-cause mortality	<p>Adjusted HR for dying from the following disorder among those who had absence from work due to psychiatric illness, compared with those who had none (allowing for age, sex, smoking, alcohol and other factors):</p> <table border="1"> <thead> <tr> <th>Deaths</th> <th>Hazard ratio (95% CI)</th> </tr> </thead> <tbody> <tr> <td>All causes</td> <td>1.70 (1.38–2.08)</td> </tr> <tr> <td>Cardiovascular</td> <td>1.59 (0.95–2.66)</td> </tr> <tr> <td>All cancer</td> <td>0.91 (0.66–1.27)</td> </tr> <tr> <td>Smoking-related cancers</td> <td>1.31 (0.85–2.03)</td> </tr> </tbody> </table>	Deaths	Hazard ratio (95% CI)	All causes	1.70 (1.38–2.08)	Cardiovascular	1.59 (0.95–2.66)	All cancer	0.91 (0.66–1.27)	Smoking-related cancers	1.31 (0.85–2.03)						
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Mykletun 2007 ¹¹⁵	Norwegian cohort study (61,349 participants, including 2,309 deaths)	Anxiety or depression, and mortality	<p>Adjusted ORs (95% CI) for the following disorders among people with anxiety/depression, compared with those who did not (allowing for age, smoking and other factors):</p> <table border="1"> <thead> <tr> <th></th> <th>Anxiety</th> <th>Depression</th> <th>Both anxiety and depression</th> </tr> </thead> <tbody> <tr> <td>Cardiovascular</td> <td>0.89 (0.67–1.16)</td> <td>1.36 (1.12–1.64)</td> <td>0.84 (0.64–1.09)</td> </tr> <tr> <td>All other causes</td> <td>1.00 (0.80–1.26)</td> <td>1.39 (1.16–1.68)</td> <td>1.17 (0.94–1.45)</td> </tr> <tr> <td>Cancer</td> <td>0.99 (0.74–1.33)</td> <td>1.33 (1.05–1.69)</td> <td>0.90 (0.66–1.22)</td> </tr> </tbody> </table>		Anxiety	Depression	Both anxiety and depression	Cardiovascular	0.89 (0.67–1.16)	1.36 (1.12–1.64)	0.84 (0.64–1.09)	All other causes	1.00 (0.80–1.26)	1.39 (1.16–1.68)	1.17 (0.94–1.45)	Cancer	0.99 (0.74–1.33)	1.33 (1.05–1.69)	0.90 (0.66–1.22)
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Nabi 2010 ¹²⁰	Finnish cohort study (23,282 participants, including 203 with coronary heart disease and 129 stroke)	Depression and coronary heart disease/stroke	<p>Adjusted HRs for heart disease/stroke among those with depression (allowing for sex, age, education and other factors):</p> <p>Coronary heart disease = 1.47 (95% CI 1.08–1.99)</p> <p>Stroke = 0.87 (95% CI 0.57–1.32)</p>																
Nabi 2010 ¹¹⁹	Finnish cohort study (24,128 participants, including 209 with cardiovascular disease)	Anxiety and cardiovascular disease	<p>Adjusted HR (95% CI) for fatal/non-fatal cardiovascular disease for increase in anxiety symptom score of 1 unit (allowing for age, alcohol, smoking and other factors):</p> <table border="1"> <thead> <tr> <th></th> <th>Males</th> <th>Females</th> </tr> </thead> <tbody> <tr> <td>Somatic symptoms</td> <td>1.15 (0.92–1.44)</td> <td>1.47 (1.04–2.06)</td> </tr> <tr> <td>Psychological symptoms</td> <td>0.93 (0.75–1.14)</td> <td>1.24 (0.91–1.70)</td> </tr> </tbody> </table>		Males	Females	Somatic symptoms	1.15 (0.92–1.44)	1.47 (1.04–2.06)	Psychological symptoms	0.93 (0.75–1.14)	1.24 (0.91–1.70)							
	Males	Females																	
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Psychological symptoms	0.93 (0.75–1.14)	1.24 (0.91–1.70)																	

continued

Table A7 Summary of the main findings of large prospective studies (>20 000 participants) or meta-analyses of the association between two major causes of mortality (cardiovascular disease and cancer, both smoking-related) and mental health disorders – *continued*

Study	Design	Mental health illness and mortality	Main findings																										
Osborn 2007 ¹¹⁶	UK retrospective cohort study (46,136 people with serious mental illness (SMI) and 300,426 without) Number of deaths: 2,293 CHD, 1199 stroke and 1,658 cancer	SMI and cardiovascular disease/cancer	<p>HR for dying from the following disorders among those with an SMI compared with those without, adjusted for age, sex, calendar period, smoking status and social deprivation</p> <table border="1"> <thead> <tr> <th>Cause of death, age group</th> <th>Adjusted HR (95% CI)</th> </tr> </thead> <tbody> <tr> <td colspan="2">Cardiovascular heart disease</td> </tr> <tr> <td>18–49</td> <td>2.88 (1.77–4.70)</td> </tr> <tr> <td>50–75</td> <td>1.76 (1.54–2.01)</td> </tr> <tr> <td>≥75</td> <td>1.04 (0.91–1.18)</td> </tr> <tr> <td colspan="2">Stroke</td> </tr> <tr> <td>18–49</td> <td>2.39 (0.92–6.17)</td> </tr> <tr> <td>50–75</td> <td>1.83 (1.45–2.31)</td> </tr> <tr> <td>≥75</td> <td>1.33 (1.16–1.52)</td> </tr> <tr> <td colspan="2">Cancer (respiratory, colorectal, breast, prostate, stomach, oesophagus, pancreas)</td> </tr> <tr> <td>18–49</td> <td>1.04 (0.60–1.82)</td> </tr> <tr> <td>50–75</td> <td>1.10 (0.93–1.29)</td> </tr> <tr> <td>≥75</td> <td>0.89 (0.73–1.07)</td> </tr> </tbody> </table>	Cause of death, age group	Adjusted HR (95% CI)	Cardiovascular heart disease		18–49	2.88 (1.77–4.70)	50–75	1.76 (1.54–2.01)	≥75	1.04 (0.91–1.18)	Stroke		18–49	2.39 (0.92–6.17)	50–75	1.83 (1.45–2.31)	≥75	1.33 (1.16–1.52)	Cancer (respiratory, colorectal, breast, prostate, stomach, oesophagus, pancreas)		18–49	1.04 (0.60–1.82)	50–75	1.10 (0.93–1.29)	≥75	0.89 (0.73–1.07)
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Scherrer 2010 ¹²¹	US cohort study (355,999 participants)	Anxiety and major depression, and myocardial infarction	<p>Adjusted HR for myocardial infarction among those with anxiety or major depression, compared with those who did not (allowing for age):</p> <p>Major depression = 1.39 (95% CI 1.34–1.45) Anxiety disorder = 1.44 (95% CI 1.37–1.53) Generalised anxiety disorder = 1.28 (95% CI 1.18–1.38)</p> <p>HRs adjusted for age, smoking, alcohol and other factors:</p> <p>Anxiety disorder, no major depression = 1.33 (95% CI 1.21–1.47) Anxiety disorder, with major depression = 1.11 (95% CI 1.03–1.30)</p>																										
Van der Kooy 2007 ¹¹⁷	Meta-analysis of 28 studies (80,000 participants)	Depression and cardiovascular disease	<p>Risk ratio for developing the following disorders among those with depression, compared with those without:</p> <table border="1"> <thead> <tr> <th></th> <th>Risk ratio (95% CI)</th> </tr> </thead> <tbody> <tr> <td>Myocardial infarction</td> <td>1.60 (1.34–1.92)</td> </tr> <tr> <td>Coronary artery disease</td> <td>1.48 (1.29–1.69)</td> </tr> <tr> <td>Stroke</td> <td>1.43 (1.17–1.75)</td> </tr> <tr> <td>All cardiovascular</td> <td>1.63 (1.26–2.12)</td> </tr> </tbody> </table>		Risk ratio (95% CI)	Myocardial infarction	1.60 (1.34–1.92)	Coronary artery disease	1.48 (1.29–1.69)	Stroke	1.43 (1.17–1.75)	All cardiovascular	1.63 (1.26–2.12)																
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CI, confidence interval; HR, hazard ratio; OR, odds ratio.