**Supplementary Material**

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## **1. Search Strategy**

**MEDLINE search**

1. exp Cohort Studies/
2. (Cohort analy\* or longitudinal or prospective or retrospective or ((cohort or follow up) adj (study or studies))).ti,ab.
3. 1 or 2
4. Depression/ or exp Depressive Disorder/
5. depress\*.ti,ab.
6. 4 or 5
7. adolescent/ or young adult/ or exp child/ or exp infant/
8. (adolescen\* or “young person” or “young people” or child or children or childhood or infant or “early adult\*” or youth\* or teen\*).ti,ab.
9. 7 or 8
10. exp Cardiovascular Diseases/
11. cardiovascular.ti,ab.
12. 10 or 11
13. exp Risk/
14. risk.ti,ab.
15. 13 or 14
16. 12 and 15
17. ((cardiovascular or CVD or heart disease or cardiometabolic or coronary artery disease or CAD or atherosclerosis) adj3 risk).ti,ab.
18. 16 or 17
19. cholesterol/ or cholesterol, dietary/ or lipoproteins/ or exp lipoproteins, hdl/
20. (“total cholesterol” or cholesterol or “high density lipoprotein\*” or hdl).ti,ab.
21. 15 or 16
22. exp Smoking/ or Smokers/ or Non-Smokers/ or Ex-Smokers/
23. smok\*.ti,ab.
24. 18 or 19
25. body fat distribution/ or adiposity/ or body mass index/ or waist circumference/ or skinfold thickness/ or lipid accumulation product/
26. (BMI or “body mass index” or “body fat distribution” or adiposity or “waist circumference” or WC or “skinfold thickness” or “lipid accumulation product” or LAP).ti,ab.
27. 21 or 22
28. Blood Pressure/
29. (“systolic blood pressure” or “systolic BP” or SBP).ti,ab.
30. 24 or 25
31. 18 or 21 or 24 or 27 or 30
32. 3 and 6 and 9 and 29

**EMBASE search**

1. Longitudinal study/ or Retrospective study/ or Prospective study/ or Cohort analysis/
2. (Cohort analy\* or longitudinal or prospective or retrospective or ((cohort or follow up) adj (study or studies))).ti,ab.
3. 1 or 2
4. exp depression/
5. depress\*.ti,ab.
6. 4 or 5
7. exp adolescent/ or young adult/ or exp child/
8. (adolescen\* or “young person” or “young people” or child or children or childhood or infant or “early adult\*” or youth\* or teen\*).ti,ab.
9. 7 or 8
10. exp cardiovascular risk/ or cardiometabolic risk/
11. ((cardiovascular or CVD or heart disease or cardiometabolic or coronary artery disease or CAD or atherosclerosis) adj3 risk).ti,ab.
12. 10 or 11
13. cholesterol/ or exp high density lipoprotein cholesterol level/ or exp cholesterol blood level/ or total cholesterol level/ or cholesterol level/ or exp high density lipoprotein cholesterol/
14. (“total cholesterol” or cholesterol or “high density lipoprotein\*” or hdl).ti,ab.
15. 13 or 14
16. exp smoking/ or exp adolescent smoking/
17. smok\*.ti,ab.
18. 16 or 17
19. exp obesity/ or exp body mass/ or exp waist circumference/ or exp skinfold thickness/ or exp lipid accumulation product index/
20. (BMI or “body mass index” or “body fat distribution” or adiposity or “waist circumference” or WC or “skinfold thickness” or “lipid accumulation product” or LAP).ti,ab.
21. 19 or 20
22. exp systolic blood pressure/
23. (“systolic blood pressure” or “systolic BP” or SBP).ti,ab.
24. 22 or 23
25. 12 or 15 or 18 or 21 or 24
26. 3 and 6 and 9 and 25

**PsycINFO search**

1. DE "Longitudinal Studies" OR DE "Prospective Studies" OR DE "Retrospective Studies" OR DE "Followup Studies" OR DE "Cohort Analysis"
2. MA cohort analy\* OR MA longitudinal OR MA prospective OR MA retrospective OR MA ((cohort or follow up) n (study or studies))
3. 1 OR 2
4. MM "Major Depression" OR MM "Anaclitic Depression" OR MM "Dysthymic Disorder" OR MM "Endogenous Depression" OR MM "Late Life Depression" OR MM "Postpartum Depression" OR MM "Reactive Depression" OR MM "Recurrent Depression" OR MM "Treatment Resistant Depression"
5. MA depress\*
6. 4 OR 5
7. DE "Early Adolescence" OR DE "Emerging Adulthood" OR DE "Postnatal Period" OR DE "Puberty"
8. MA adolescen\* OR MA “young person” OR MA “young people” OR MA child OR MA children OR MA childhood OR MA infant OR “early adulthood” OR youth\* OR MA teen\*
9. 7 OR 8
10. MM "Cardiovascular Disorders" OR MM "Aneurysms" OR MM "Arteriosclerosis" OR MM "Embolisms" OR MM "Heart Disorders" OR MM "Ischemia" OR MM "Thromboses"
11. MA cardiovascular
12. 10 OR 11
13. MM "Risk Factors"
14. MA risk
15. 13 OR 14
16. 12 AND 15
17. (MA cardiovascular OR MA CVD OR MA heart disease OR MA cardiometabolic OR MA coronary artery disease OR MA CAD OR MA atherosclerosis) n3 risk
18. 16 OR 17
19. MM “Cholesterol”
20. MA total cholesterol OR MA cholesterol OR MA high density lipoprotein\* OR MA hdl
21. 19 OR 20
22. MM "Tobacco Smoking" OR MM "Electronic Cigarettes" OR MM "Passive Smoking" OR MM "Smokeless Tobacco"
23. MA smok\*
24. 22 OR 23
25. MM "Body Mass Index" AND MM "Body Weight" OR MM "Overweight" OR MM "Obesity" OR MM "Weight Gain" OR MM "Body Fat"
26. MA BMI OR MA “body mass index” OR MA “body fat distribution” OR MA adiposity OR MA “waist circumference” OR MA WC OR MA “skinfold thickness” OR MA “lipid accumulation product” OR MA LAP
27. 25 OR 26
28. MM "Systolic Pressure"
29. MA “systolic blood pressure” OR MA “systolic BP” OR MA SBP
30. 28 OR 29
31. 18 OR 21 OR 24 OR 27 OR 30
32. 3 AND 6 AND 9 AND 31

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| **S1 Table. Breakdown of Newcastle-Ottawa Scale (NOS) scores for included studies.** |
| **Study** | **Selection** **(out of 4)** | **Comparability** **(out of 2)** | **Outcome** **(out of 3)** | **Total** | **Rating** |
| Albers 2002  | 4 | 2 | 2 | 8 | Good |
| Bares 2014  | 3 | 2 | 2 | 7 | Good |
| Beal 2014  | 2 | 2 | 3 | 7 | Fair |
| Boutelle 2010  | 3 | 1 | 3 | 7 | Good |
| Chaiton 2015  | 3 | 2 | 2 | 7 | Good |
| Chang 2017  | 2 | 2 | 3 | 7 | Fair |
| Choi 1997  | 3 | 2 | 3 | 8 | Good |
| Clark 2007  | 3 | 2 | 2 | 7 | Good |
| Duncan 2005  | 3 | 2 | 1 | 6 | Poor |
| Eitle 2018  | 2 | 2 | 3 | 7 | Fair |
| Frisco 2013  | 4 | 2 | 3 | 9 | Good |
| Gage 2015  | 3 | 1 | 2 | 6 | Good |
| Gomes 2019  | 4 | 1 | 2 | 7 | Good |
| Goodman 2002  | 2 | 2 | 2 | 6 | Fair |
| Hammerton 2014 \* | 3/4 | 0 | 3/2 | 6 | Poor |
| Hammerton 2013 \* | 3/4 | 0 | 3/2 | 6 | Poor |
| Marmorstein 2014  | 3 | 0 | 2 | 5 | Poor |
| Monshouwer 2012  | 3 | 1 | 3 | 7 | Good |
| Perry 2020  | 3 | 1 | 2 | 6 | Good |
| Piumatti 2018  | 1 | 2 | 1 | 4 | Poor |
| Pryor 2016  | 3 | 1 | 2 | 6 | Good |
| Raffetti 2019  | 3 | 1 | 2 | 6 | Good |
| Ranjit 2019a  | 1 | 2 | 2 | 4 | Poor |
| Ranjit 2019b  | 1 | 2 | 1 | 5 | Poor |
| Rhew 2008  | 1 | 1 | 3 | 5 | Poor |
| Roberts 2013  | 4 | 2 | 2 | 8 | Good |
| Rubio 2008  | 2 | 2 | 2 | 6 | Fair |
| Wang 2014  | 3 | 2 | 2 | 7 | Good |
| Zhang 2018  | 3 | 1 | 2 | 6 | Good |
| \*Two scores given because there are two cohorts in these papers |

## **2. Quality Assessment**

## **3. Characteristics**

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| --- |
| **S2 Table. Summary of characteristics of studies included in the systematic review.** |
| **Characteristic** | **Value** |
| **Cohort type – no. papers (%)**ProspectiveRetrospective | 28 (96.6)1 (3.4) |
| **Location – no. papers (%)** |  |
| North America | 15 (51.7) |
| Europe | 11 (37.9) |
| Asia | 2 (6.9) |
| South America | 1 (3.4) |
| **Sex – no. papers (%)** |  |
| Female and male | 24 (82.8) |
| Female only | 5 (17.2) |
| **Exposure – no. papers (%) \*** |  |
| BMI | 17 (58.6) |
| Smoking | 14 (48.3) |
| Systolic blood pressure | 1 (3.4) |
| Total cholesterol | 0 (0) |
| HDL  | 0 (0) |
| **Mean (SD)** |  |
| Follow-up length (years) | 2.9 (2.1) |
| Sample size (N) | 3208 (3004) |
| **Baseline depression – no. papers (%)**  |  |
| Baseline cases controlled for/excluded | 22 (75.9) |
| No action | 6 (24.1) |
| **Regression type – no. papers (%) \*** |  |
| Logistic | 19 (65.5) |
| Linear | 14 (48.3) |
| **NOS quality rating – no. papers (%)** |  |
| Good | 16 (55.2) |
| Poor | 8 (27.6) |
| Fair | 5 (17.2) |
| \* Some papers are counted in more than one category (percentages add up to more than 100%). |

## **4. Confounders**

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| --- |
| **S3 Table. Number (%) of studies that adjust for various potential confounders in adjusted analysis.**  |
| **Potential confounder** | **No. (%) of studies including confounder**  | **Study References** |
| Sex | 20 (71.4) | (Albers & Biener, 2002; Chaiton et al., 2015; Chang et al., 2017; Choi et al., 1997; Clark et al., 2007; Eitle & Eitle, 2018; Gage et al., 2015; Gomes et al., 2019; Goodman & Whitaker, 2002; Marmorstein et al., 2014; Monshouwer et al., 2012; Perry et al., 2020; Piumatti, 2018; Pryor et al., 2016; Raffetti et al., 2019; Ranjit, Buchwald, et al., 2019; Ranjit, Korhonen, et al., 2019; Rhew et al., 2008; Roberts & Duong, 2013; Wang et al., 2014) |
| Age | 15 (53.6) | (Albers & Biener, 2002; Bares, 2014; Beal et al., 2014; Boutelle et al., 2010; Chang et al., 2017; Choi et al., 1997; Clark et al., 2007; Duncan & Rees, 2005; Eitle & Eitle, 2018; Frisco et al., 2013; Goodman & Whitaker, 2002; Piumatti, 2018; Ranjit, Korhonen, et al., 2019; Roberts & Duong, 2013; Rubio et al., 2008; Wang et al., 2014) |
| Parental education | 13 (46.4) | (Albers & Biener, 2002; Chang et al., 2017; Choi et al., 1997; Duncan & Rees, 2005; Eitle & Eitle, 2018; Frisco et al., 2013; Gage et al., 2015; Gomes et al., 2019; Goodman & Whitaker, 2002; Perry et al., 2020; Raffetti et al., 2019; Ranjit, Korhonen, et al., 2019; Rhew et al., 2008) |
| Race/ethnicity | 11 (39.3) | (Albers & Biener, 2002; Beal et al., 2014; Choi et al., 1997; Clark et al., 2007; Duncan & Rees, 2005; Frisco et al., 2013; Gomes et al., 2019; Goodman & Whitaker, 2002; Perry et al., 2020; Rhew et al., 2008; Rubio et al., 2008) |
| Baseline depression  | 11 (39.3) | (Albers & Biener, 2002; Beal et al., 2014; Boutelle et al., 2010; Chang et al., 2017; Clark et al., 2007; Goodman & Whitaker, 2002; Pryor et al., 2016; Raffetti et al., 2019; Ranjit, Buchwald, et al., 2019; Ranjit, Korhonen, et al., 2019; Rhew et al., 2008) |
| Alcohol use | 9 (32.1) | (Chaiton et al., 2015; Clark et al., 2007; Gage et al., 2015; Gomes et al., 2019; Piumatti, 2018; Raffetti et al., 2019; Ranjit, Buchwald, et al., 2019; Ranjit, Korhonen, et al., 2019; Zhang et al., 2018) |
| Physical health | 7 (25.0) | (Clark et al., 2007; Duncan & Rees, 2005; Frisco et al., 2013; Perry et al., 2020; Ranjit, Buchwald, et al., 2019; Rhew et al., 2008; Zhang et al., 2018) |
| Family/household structure  | 6 (21.4) | (Chang et al., 2017; Duncan & Rees, 2005; Eitle & Eitle, 2018; Frisco et al., 2013; Goodman & Whitaker, 2002; Ranjit, Korhonen, et al., 2019; Rubio et al., 2008) |
| Family/household income | 6 (21.4) | (Bares, 2014; Choi et al., 1997; Frisco et al., 2013; Gomes et al., 2019; Piumatti, 2018; Rhew et al., 2008; Roberts & Duong, 2013) |
| Academic performance | 6 (21.4) | (Choi et al., 1997; Eitle & Eitle, 2018; Piumatti, 2018; Ranjit, Buchwald, et al., 2019; Ranjit, Korhonen, et al., 2019; Rubio et al., 2008) |
| Weight/BMI | 5 (17.9) | (Clark et al., 2007; Gomes et al., 2019; Hammerton et al., 2013; Piumatti, 2018; Zhang et al., 2018) |
| Physical activity  | 5 (17.9) | (Choi et al., 1997; Frisco et al., 2013; Perry et al., 2020; Roberts & Duong, 2013; Zhang et al., 2018) |
| Socioeconomic status | 5 (17.9) | (Beal et al., 2014; Clark et al., 2007; Duncan & Rees, 2005; Perry et al., 2020; Wang et al., 2014) |
| Pubertal timing  | 4 (14.3) | (Beal et al., 2014; Boutelle et al., 2010; Chang et al., 2017; Pryor et al., 2016) |
| Parental smoking  | 4 (14.3) | (Albers & Biener, 2002; Bares, 2014; Beal et al., 2014; Gomes et al., 2019; Ranjit, Korhonen, et al., 2019) |
| Cigarette smoking  | 4 (14.3) | (Clark et al., 2007; Gomes et al., 2019; Piumatti, 2018; Zhang et al., 2018) |
| Drug use | 3 (10.7) | (Clark et al., 2007; Gage et al., 2015; Rubio et al., 2008) |
| Parental depression | 3 (10.7) | (Monshouwer et al., 2012; Perry et al., 2020; Wang et al., 2014) |
| Peer victimisation | 3 (10.7) | (Chang et al., 2017; Gage et al., 2015; Pryor et al., 2016) |
| Cannabis use | 2 (7.1) | (Gage et al., 2015; Piumatti, 2018) |
| Family functioning | 2 (7.1) | (Monshouwer et al., 2012; Pryor et al., 2016) |
| Urban dwelling | 2 (7.1) | (Duncan & Rees, 2005; Gage et al., 2015) |
| Parental BMI | 2 (7.1) | (Gomes et al., 2019; Goodman & Whitaker, 2002) |
| Birthplace | 2 (7.1) | (Frisco et al., 2013; Raffetti et al., 2019) |
| Parenthood | 2 (7.1) | (Gomes et al., 2019; Rubio et al., 2008) |
| Diet | 1 (3.6) | (Roberts & Duong, 2013) |
| Maternal age | 1 (3.6) | (Gomes et al., 2019) |
| Availability of social support | 1 (3.6) | (Choi et al., 1997) |
| Family economic stress | 1 (3.6) | (Chang et al., 2017) |
| Other mental health problems | 1 (3.6) | (Gage et al., 2015) |
| Maternal mental health  | 1 (3.6) | (Gomes et al., 2019) |
| Family history of depression | 1 (3.6) | (Gage et al., 2015) |
| Alcoholic parent | 1 (3.6) | (Duncan & Rees, 2005) |
| Impulsivity  | 1 (3.6) | (Chaiton et al., 2015) |
| Rebelliousness | 1 (3.6) | (Choi et al., 1997) |
| Stressful life events | 1 (3.6) | (Chang et al., 2017) |
| IQ | 1 (3.6) | (Gage et al., 2015) |
| Ever pregnant | 1 (3.6) | (Frisco et al., 2013) |
| Tiredness | 1 (3.6) | (Monshouwer et al., 2012) |
| Sleep problems | 1 (3.6) | (Chang et al., 2017) |
| Peer smoking | 1 (3.6) | (Bares, 2014) |
| Interleukin-6 levels | 1 (3.6) | (Perry et al., 2020) |
| Other | 3 (10.7) | (Duncan & Rees, 2005; Ranjit, Buchwald, et al., 2019; Wang et al., 2014) |

## **5. Meta-Analyses of Unadjusted Results**

**S1 Fig. Meta-analysis of longitudinal association between high BMI at baseline and subsequent depression in young people.**

**S2 Fig. Meta-analysis of longitudinal association between smoking at baseline and subsequent depression in young people.**



## **6. Meta-Analysis of Adjusted Results for Depressive Symptoms**

**S3 Fig. Meta-analysis of longitudinal association between high BMI/smoking at baseline and subsequent depressive symptoms in young people.**

## **7. Sensitivity Analysis for Adjusted Results**

**S4 Fig. Meta-analysis, after poor quality studies removed, of longitudinal association between smoking at baseline and subsequent depression in young people.**



**S5 Fig. Meta-analysis, after female or male only studies removed, of longitudinal association between high BMI/smoking at baseline and subsequent depressive symptoms in young people.**



**S6 Fig. Meta-analysis, after poor quality studies removed, of longitudinal association between high BMI/smoking at baseline and subsequent depressive symptoms in young people.**

## **8. Publication Bias**

**S7 Fig.** **Adjusted odds ratios (standard error) of longitudinal association between high BMI at baseline and subsequent depression in young people.**

Egger’stestP-value = 0.17.

**S8 Fig.** **Adjusted odds ratios (standard error) of longitudinal association between smoking at baseline and subsequent depression in young people.**

Egger’stestP-value = 0.80.

**S9 Fig.** **Adjusted standardised mean difference (standard error) of longitudinal association between high BMI at baseline and subsequent depressive symptoms in young people.**

Egger’stestP-value = 0.35.

**S10 Fig. Adjusted standardised mean difference (standard error) of longitudinal association between smoking at baseline and subsequent depressive symptoms in young people.**

Egger’stestP-value = 0.01.

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