

# The mental health of young people who are not in employment, education, or training: A systematic review and meta-analysis

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#### **Appendix 1. Example of Medline database search strategy**

exp mental disorders/ OR exp Mental Health/ OR ("psychiatric disorder\* " OR "mental disorder\*" OR "mental illness\*" OR "mental health" OR depression OR depressive OR anxiety OR anxious OR mood OR bipolar OR "substance abuse" OR "substance use" OR "substance misuse" OR "substance dependence" OR "alcohol abuse" OR "alcohol use" OR "alcohol misuse" OR "alcohol dependence" OR addictive OR addiction OR psychotic OR psychosis OR schizo\* OR "personality disorder\*" OR "conduct disorder\*" OR phobia OR phobic OR OCD OR "obsessive compulsive" OR PTSD OR "post-traumatic stress\*" OR "eating disorder\*" OR anorex\* OR bulimi\* OR "self-harm" OR "self-injury" OR "self-mutilat\*" OR suicid\* OR "psychological distress" OR "psychological well-being" OR "mental well-being" OR "subjective well-being" OR "emotional well-being" OR bully\* OR "behavioral problem\*" OR "behavioral problem\*" OR "externalizing problem\*" OR "externalizing disorder\*" OR "internalizing problem\*" OR "internalizing disorder\*" OR "psychological health" OR "psychological symptom\*").ab,ti.

AND

"NEET".ab,ti OR (school\* adj2 work).ab,ti. OR (school\* adj2 employ\*).ab,ti. OR (school\* adj2 unemploy\*).ab,ti. OR (educa\* adj2 work).ab,ti. OR (educa\* adj2 employ\*).ab,ti. OR (educa\* adj2 unemploy\*).ab,ti. OR (training adj2 work) .ab,ti. OR (training adj2 employ\*).ab,ti. OR (training adj2 unemploy\*).ab,ti. OR ((employment/ OR unemployment/) AND (Educational Status/ OR Student Dropouts/))

AND

exp Young Adult/ OR exp Adolescent/ OR (young OR youth\* OR adolescen\* OR teen\*).ab,ti.

## **Appendix 2.** Data extraction form

The data extraction form included the following items.

| <b>ITEMS</b>                    | <b>DETAILS</b>  |
|---------------------------------|---|
| <b>Title</b>                    | Full title of article or report   |
| <b>First author</b>             | Name of first author  |
| <b>Year</b>                     | Publication year  |
| <b>Country</b>                  | Country where study took place  |
| <b>Study design</b>             | Cross-sectional; cohort; case-control; other, specify   |
| <b>Target population</b>        | Population; clinical help-seeking sample from a catchment-area; clinical help-seeking sample from a service   |
| <b>Sample size</b>              | Sample size used in analysis  |
| <b>Sample characteristics</b>   | Age range; specific subpopulation; other details  |
| <b>Date of data collection</b>  | Date; number of time points (if longitudinal study)   |
| <b>NEET measure</b>             | Definition and measurement (age range, variables used, etc.); timeframe (e.g., current, past six months); other details (e.g., excluded military workers) |
| <b>Mental health measure</b>    | Type; instrument or scale; timeframe (e.g., past year, lifetime); type of measure (continuous or binary)  |
| <b>Analysis</b>                 | Type of statistical analysis (e.g., logistic regression, latent class)  |
| <b>Covariates</b>               | List of covariates included in the final analysis   |
| <b>Temporality</b>              | Association between NEET status before, concurrently, or after measure of mental health   |
| <b>Estimates of association</b> | Measure of association (OR, RR, etc.) and 95% confidence intervals or p-value   |
| <b>Comments</b>                 | Any additional comments   |

### **Appendix 3. Quality assessment description and scale**

We used a modified version of the Newcastle–Ottawa Scale (Wells et al.) that we previously developed (Gariépy, Nitka, & Schmitz, 2010; Smith et al., 2013) to critically appraise potential biases and the overall quality of studies. The modified scale includes eight items about comparability, selection bias, information bias, and control of at least three important confounders. We evaluated if the components of the checklist were met (yes; no; not reported) and appraised the overall quality of evidence of the study (poor; moderate; high). High-quality studies had satisfactory ratings on all components and up to one component that was not reported. Medium quality studies had unsatisfactory ratings on up to one component, or up to two components that were not reported. Low quality studies had unsatisfactory rating on more than one component, or more than two components that were not reported.

| ITEMS   | DETAILS  |
|---|--|
| <b>SELECTION</b>                                      |  |
| 1. Representativeness                                 | Were study participants representative of the study base?                                |
| 2. Participation rate                                 | Was the overall participation rate > 60%?  |
| 3. Consistency across groups                          | Were people with different levels of NEET/mental health drawn from the same population?  |
| 4. Minimal risk of selection due to lost to follow-up | Was lost to follow-up unlikely to introduce bias? (Cohort study)                         |
| <b>MEASUREMENT</b>                                    |  |
| 5. NEET measure                                       | Was NEET status assessed using a clear or valid approach?                                |
| 6. Mental health measure                              | Was mental health assessed using a validated instrument?                                 |
| 7. Same measurements across participants              | Were NEET status and mental health assessed in the same way for the entire study sample? |
| <b>CONFOUNDING</b>                                    |  |
| 8. Confounders  | Did the study controlled for at least three important confounders?                       |

### **References**

- Gariépy, G., Nitka, D., & Schmitz, N. (2010). The association between obesity and anxiety disorders in the population: A systematic review and meta-analysis. *International Journal of Obesity*, 34(3), 407-19.
- Smith, K. J., Beland, M., Clyde, M., Gariépy, G., Page, V., Badawi, G., ... Schmitz, N. (2013). Association of diabetes with anxiety: A systematic review and meta-analysis. *Journal of Psychosomatic Research*, 74(2), 89-99.
- Wells, G., Shea, B., O'Connell, D., Peterson, J., Welch, V., Losos, M., & Tugwell, P. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. Retrieved from: [http://www.ohri.ca/programs/clinical\\_epidemiology/oxford.htm](http://www.ohri.ca/programs/clinical_epidemiology/oxford.htm).

#### Appendix 4. Detailed summary of findings by study

| Study                            | Mental health measures           | Directionality of association | Results                                  |
|----------------------------------|----------------------------------|-------------------------------|--|
| <b>Baggio et al 2015</b>         | General mental health            | MH<-->NEET                    | Beta coefficient NA, P>0.05              |
|                                  | Depressive symptoms              | MH<-->NEET                    | Beta coefficient NA, P<0.001             |
|                                  | Binge drinking                   | MH<-->NEET                    | Beta coefficient NA, P>0.05              |
|                                  | Cannabis use disorder            | MH<-->NEET                    | Beta coefficient NA, P<0.001             |
|                                  | Depressive symptoms              | NEET-->MH                     | Beta coefficient 0.093, P>0.05           |
|                                  | Binge drinking                   | NEET-->MH                     | Beta coefficient 0.014, P>0.05           |
|                                  | Cannabis use disorder            | NEET-->MH                     | Beta coefficient NA, P>0.05              |
|                                  | General mental health            | NEET-->MH                     | Beta coefficient 0.028, P>0.05           |
|                                  | Depressive symptoms              | MH-->NEET                     | OR 1.11, P<0.001                         |
|                                  | Binge drinking                   | MH-->NEET                     | OR NA, P>0.05                            |
| <b>Bania et al 2019</b>          | Cannabis use disorder            | MH-->NEET                     | OR 1.09, P<0.001                         |
|                                  | General mental health            | MH-->NEET                     | OR 1.11, P<0.001                         |
|                                  | Emotional problems               | MH-->NEET                     | Men: OR 0.88, 95% CI 0.81, 0.97          |
|                                  | Emotional problems               | MH-->NEET                     | Women: OR 1.04, 95% CI 0.97, 1.11        |
| <b>Basta et al 2019</b>          | Conduct problems                 | MH-->NEET                     | Men: OR 1.17, 95% CI 1.07, 1.28          |
|                                  | Conduct problems                 | MH-->NEET                     | Women: OR 1.25, 95% CI 1.17, 1.33        |
|                                  | Psychological distress           | MH<-->NEET                    | All: OR 0.98, 95% CI 0.96, 1.01          |
|                                  | Psychological distress           | MH<-->NEET                    | Men: OR 0.99, 95% CI 0.96, 1.03          |
|                                  | Psychological distress           | MH<-->NEET                    | Women: OR 0.98, 95% CI 0.95, 1.02        |
|                                  | Anxiety symptoms                 | MH<-->NEET                    | All: OR 1.03, 95% CI 0.99, 1.06          |
|                                  | Anxiety symptoms                 | MH<-->NEET                    | Men: OR 1.01, 95% CI 0.96, 1.03          |
|                                  | Anxiety symptoms                 | MH<-->NEET                    | Women: OR 1.05, 95% CI 1.01, 1.10        |
|                                  | Drug use                         | MH<-->NEET                    | All: OR 0.80, 95% CI 0.58, 1.1           |
| <b>Benjet et al 2012</b>         | Drug use                         | MH<-->NEET                    | Men: OR 0.99, 95% CI 0.67, 1.48          |
|                                  | Drug use                         | MH<-->NEET                    | Women: OR 0.52, 95% CI 0.28, 0.94        |
|                                  | Mood disorder                    | MH<-->NEET                    | OR 2.7, 95% CI 1.8, 4.2                  |
|                                  | Anxiety disorder                 | MH<-->NEET                    | OR 1.3, 95% CI 0.9, 1.8                  |
|                                  | Substance use disorder           | MH<-->NEET                    | OR 4.4, 95% CI 2.6, 7.6                  |
|                                  | Behavioral disorder              | MH<-->NEET                    | OR 2.1, 95% CI 1.5, 2.8                  |
|                                  | Any disorder                     | MH<-->NEET                    | OR 1.7, 95% CI 1.3, 2.3                  |
|                                  | Suicidal ideation                | MH<-->NEET                    | OR 1.8, 95% CI 1.1, 2.8                  |
| <b>Bynner &amp; Parsons 2002</b> | Suicidal plan                    | MH<-->NEET                    | OR 2.4, 95% CI 1.4, 4.1                  |
|                                  | Suicidal attempt                 | MH<-->NEET                    | OR 3.6, 95% CI 2.0, 6.4                  |
| <b>Cairns et al 2018</b>         | Psychological distress           | NEET-->MH                     | Men: OR 2.20, P>0.05                     |
|                                  | Psychological distress           | NEET-->MH                     | Women: OR 1.69, P>0.05                   |
| <b>Gariépy &amp; Iyer 2019</b>   | Psychological distress           | MH<-->NEET                    | Beta coefficient 0.03, 96%CI -0.02, 0.07 |
|                                  | History of psychiatric diagnosis | MH<-->NEET                    | Beta coefficient 0.61, 96%CI -0.21, 1.43 |
|                                  | History of drug use              | MH<-->NEET                    | Beta coefficient 1.11, 96%CI 0.32, 1.91  |
| <b>Goldman-Mellor et al 2016</b> | Depressive disorder              | MH<-->NEET                    | OR 1.7, 95% CI 1.1, 2.6                  |
|                                  | Bipolar disorder                 | MH<-->NEET                    | OR 2.3, 95% CI 1.0, 5.5                  |
|                                  | Generalized anxiety disorder     | MH<-->NEET                    | OR 2.6, 95% CI 1.4, 5.1                  |
|                                  | Alcohol use disorder             | MH<-->NEET                    | OR 1.0, 95% CI 0.6, 1.7                  |
|                                  | Cannabis disorder                | MH<-->NEET                    | OR 1.0, 95% CI 0.5, 2.0                  |
|                                  | Drug use disorder                | MH<-->NEET                    | OR 3.2, 95% CI 1.3, 7.8                  |
|                                  | Suicidal ideation                | MH<-->NEET                    | OR 1.8, 95% CI 1.0, 3.1                  |
|                                  | Depressive disorder              | MH<-->NEET                    | OR 1.68, 95% CI 1.33, 2.13               |
|                                  | Generalized anxiety disorder     | MH<-->NEET                    | OR 1.84, 95% CI 1.19, 2.86               |
|                                  | Alcohol dependence               | MH<-->NEET                    | OR 1.42, 95% CI 1.01, 2.01               |

|                                    |   |            |  |
|------------------------------------|---|------------|--|
|                                    | Cannabis dependence   | MH<-->NEET | OR 3.93, 95% CI 2.31, 6.68   |
|                                    | Conduct disorder  | MH<-->NEET | OR 1.46, 95% CI 1.12, 1.89   |
|                                    | Depressive disorder   | MH-->NEET  | OR 2.57, 95% CI 1.40, 4.72   |
|                                    | Anxiety disorder  | MH-->NEET  | OR 1.38, 95% CI 0.81, 2.37   |
|                                    | Harmful substance use                                       | MH-->NEET  | OR 1.89, 95% CI 1.29, 2.77   |
|                                    | Suicidal behaviors  | MH-->NEET  | OR 3.30, 95% CI 2.07, 5.27   |
| <b>Gutierrez-Garcia et al 2017</b> |   |            | <i>NEET vs those in school only</i>  |
|                                    | Mood disorder   | NEET-->MH  | OR 1.67, 95% CI 1.12, 1.90   |
|                                    | Anxiety disorder  | NEET-->MH  | OR 0.40, 95% CI 0.10, 1.65   |
|                                    | Behavioral disorder   | NEET-->MH  | OR 0.83, 95% CI 0.45, 1.50   |
|                                    | Alcohol use disorder  | NEET-->MH  | OR 1.19, 95% CI 1.14, 1.38   |
|                                    | Drug use disorder   | NEET-->MH  | OR 1.03, 95% CI 0.71, 1.50   |
|                                    | Suicidal ideation   | NEET-->MH  | OR 1.94, 95% CI 1.16, 3.31   |
|                                    | Suicidal plan   | NEET-->MH  | OR 1.18, 95% CI 1.07, 2.38   |
|                                    | Suicidal attempt  | NEET-->MH  | OR 2.40, 95% CI 1.30, 4.31   |
| <b>Gutierrez-Garcia et al 2018</b> |   |            | <i>NEET vs those in school only</i>  |
|                                    | Mood disorder   | MH<-->NEET | OR 0.73, 95% CI 0.39, 1.34   |
|                                    | Anxiety disorder  | MH<-->NEET | OR 0.75, 95% CI 0.35, 1.62   |
|                                    | Behavioral disorder   | MH<-->NEET | OR 0.79, 95% CI 0.37, 1.67   |
|                                    | Alcohol use disorder  | MH<-->NEET | OR 1.38, 95% CI 1.02, 1.45   |
|                                    | Substance use disorder                                      | MH<-->NEET | OR 1.73, 95% CI 1.02, 3.41   |
|                                    | Drug use disorder   | MH<-->NEET | OR 0.90, 95% CI 0.38, 2.16   |
|                                    | Suicidal ideation   | MH<-->NEET | OR 1.17, 95% CI 0.52, 2.65   |
|                                    | Suicidal plan   | MH<-->NEET | OR 0.12, 95% CI 0.01, 1.20   |
|                                    | Suicidal attempt  | MH<-->NEET | OR 2.75, 95% CI 1.79, 4.25   |
| <b>Hale &amp; Viner 2018</b>       | Psychological distress                                      | MH-->NEET  | Men: OR 1.72, 95% CI 1.24, 2.41  |
|                                    | Psychological distress                                      | MH-->NEET  | Women: OR 1.49, 95% CI 1.11, 1.99  |
| <b>Hammerton et al 2019</b>        | Oppositional problem, Brazil                                | MH-->NEET  | OR 1.24, 95% CI 1.04, 1.47   |
|                                    | Conduct problem, Brazil                                     | MH-->NEET  | OR 1.38, 95% CI 1.13, 1.70   |
|                                    | Oppositional problem, UK                                    | MH-->NEET  | OR 1.22, 95% CI 0.78, 1.91   |
|                                    | Conduct problem, UK   | MH-->NEET  | OR 3.04, 95% CI 1.99, 4.65   |
| <b>Henderson et al 2017</b>        | Internalizing disorders                                     | MH<-->NEET | Total: OR 1.15, 95% CI 0.95, 1.38  |
|                                    | Internalizing disorders                                     | MH<-->NEET | Age<18: OR 0.95, 95% CI 0.72, 1.26   |
|                                    | Internalizing disorders                                     | MH<-->NEET | Age≥18: OR 1.33, 95% CI 1.00, 1.75   |
|                                    | Internalizing disorders                                     | MH<-->NEET | Men: OR 1.39, 95% CI 1.08, 1.78  |
|                                    | Internalizing disorders                                     | MH<-->NEET | Women: OR 1.08, 95% CI 0.80, 1.45  |
|                                    | Externalizing disorders                                     | MH<-->NEET | Total: OR 0.90, 95% CI 0.76, 1.08  |
|                                    | Externalizing disorders                                     | MH<-->NEET | Age<18: OR 1.18, 95% CI 0.90, 1.56   |
|                                    | Externalizing disorders                                     | MH<-->NEET | Age≥18: OR 1.13, 95% CI 0.87, 1.46   |
|                                    | Externalizing disorders                                     | MH<-->NEET | Men: OR 0.93, 95% CI 0.73, 1.19  |
|                                    | Externalizing disorders                                     | MH<-->NEET | Women: OR 0.87, 95% CI 0.67, 1.12  |
|                                    | Substance use disorder                                      | MH<-->NEET | Total: OR 1.94, 95% CI 1.63, 2.31  |
|                                    | Substance use disorder                                      | MH<-->NEET | Age<18: OR 1.44, 95% CI 1.21, 1.88   |
|                                    | Substance use disorder                                      | MH<-->NEET | Age≥18: OR 2.19, 95% CI 1.68, 2.84   |
|                                    | Substance use disorder                                      | MH<-->NEET | Men: OR 1.83, 95% CI 1.43, 2.34  |
|                                    | Substance use disorder                                      | MH<-->NEET | Women: OR 2.05, 95% CI 1.58, 2.66  |
| <b>López-López et al 2019</b>      | Depressive symptoms   | MH-->NEET  | <i>Persistent adolescent depression vs low/no</i><br>OR 5.17, 95% CI 1.95, 13.70 |
| <b>Manhica et al 2019</b>          | Alcohol use disorder  | NEET-->MH  | HR 1.30, 95% CI 1.11, 1.51   |
| <b>Nardi et al 2015</b>            | Symptoms of nervousness, mood swings or thoughts of suicide | MH<-->NEET | No significant differences between NEET and non-NEET group                       |

|                                   |   |            |   |
|-----------------------------------|---|------------|---|
| <b>Nardi et al 2013</b>           | Psychiatric disorders diagnosed by psychiatric services | MH<-->NEET | Significant difference (p < 0.01) between NEET and non-NEET group |
| <b>O'Dea et al 2016</b>           | Depressive disorders                                    | MH-->NEET  | OR 1.11, 95 % CI 1.02, 1.20                                       |
|                                   | Generalized anxiety disorders                           | MH-->NEET  | OR NA, P>0.05   |
|                                   | Depressive disorders                                    | NEET-->MH  | OR 1.94, 95 % CI 0.17, 21.6                                       |
| <b>O'Dea et al 2014</b>           | Generalized anxiety disorders                           | NEET-->MH  | OR NA, P>0.05   |
|                                   | Mood disorder   | MH<-->NEET | OR 1.10, 95% CI 1.05, 1.15  |
|                                   | Anxiety disorder  | MH<-->NEET | OR NA, P>0.05   |
|                                   | Alcohol use disorder                                    | MH<-->NEET | OR NA, P>0.05   |
| <b>Power et al 2015</b>           | Cannabis use disorder                                   | MH<-->NEET | OR 1.22, 95% CI 0.72, 2.05  |
|                                   | Depressive disorder (lifetime)                          | MH<-->NEET | OR NA, P>0.05   |
|                                   | Anxiety disorder (lifetime)                             | MH<-->NEET | OR 2.4, 95% CI 1.0, 5.9   |
|                                   | Alcohol use disorder (lifetime)                         | MH<-->NEET | OR NA, P>0.05   |
|                                   | Drug use disorder (lifetime)                            | MH<-->NEET | OR NA, P>0.05   |
|                                   | Suicidal ideation (lifetime)                            | MH<-->NEET | OR NA, P>0.05   |
|                                   | Suicidal attempts (lifetime)                            | MH<-->NEET | OR 3.1, 95% CI 1.0, 9.3   |
|                                   | Any lifetime disorder                                   | MH<-->NEET | OR 2.9, 95% CI 1.1, 7.2   |
|                                   | Any current disorder                                    | MH<-->NEET | OR NA, P>0.05   |
|                                   | Any diagnosis in childhood                              | MH-->NEET  | OR 4.0, 95% CI 1.7, 9.4   |
| <b>Rodwell et al 2018</b>         | Any diagnosis in adolescence                            | MH-->NEET  | OR 3.1, 95% CI 1.4, 7.0   |
|                                   | Common mental disorders                                 | MH-->NEET  | OR 1.60, 95% CI 1.07, 2.40  |
|                                   | Disruptive behavior disorder                            | MH-->NEET  | OR 1.71, 95% CI 1.15, 2.55  |
|                                   | Cannabis use disorder                                   | MH-->NEET  | OR 1.74, 95% CI 1.10, 2.75  |
| <b>Stea, Abildsnes et al 2019</b> | Heavy binge drinking                                    | MH-->NEET  | OR 0.80, 95% CI 0.48, 1.34  |
|                                   | Psychological distress                                  | MH<-->NEET | Men: OR NA, P>0.05  |
|                                   |   | MH<-->NEET | Women: OR 2.40, 95% CI 1.00, 5.20                                 |
| <b>Stea, de Ridder et al 2019</b> | Cannabis use  | MH<-->NEET | OR 2.20; 95% CI 1.10, 4.30  |
| <b>Symonds et al 2016</b>         |   |            | <i>NEET vs those in school:</i>                                   |
|                                   | Depressive symptoms                                     | MH-->NEET  | Beta coefficient 0.10, P<0.05                                     |
|                                   | Anxiety symptoms  | MH-->NEET  | Beta coefficient 0.07, P>0.05                                     |
|                                   | Positive mental functioning                             | MH-->NEET  | Beta coefficient -0.06, P<0.05                                    |
|                                   |   |            | <i>NEET vs those at work:</i>                                     |
|                                   | Depressive symptoms                                     | MH-->NEET  | Beta coefficient 0.07, P>0.05                                     |
|                                   | Anxiety symptoms  | MH-->NEET  | Beta coefficient 0.08, P<0.05                                     |
|                                   | Positive mental functioning                             | MH-->NEET  | Beta coefficient -0.05, P<0.05                                    |

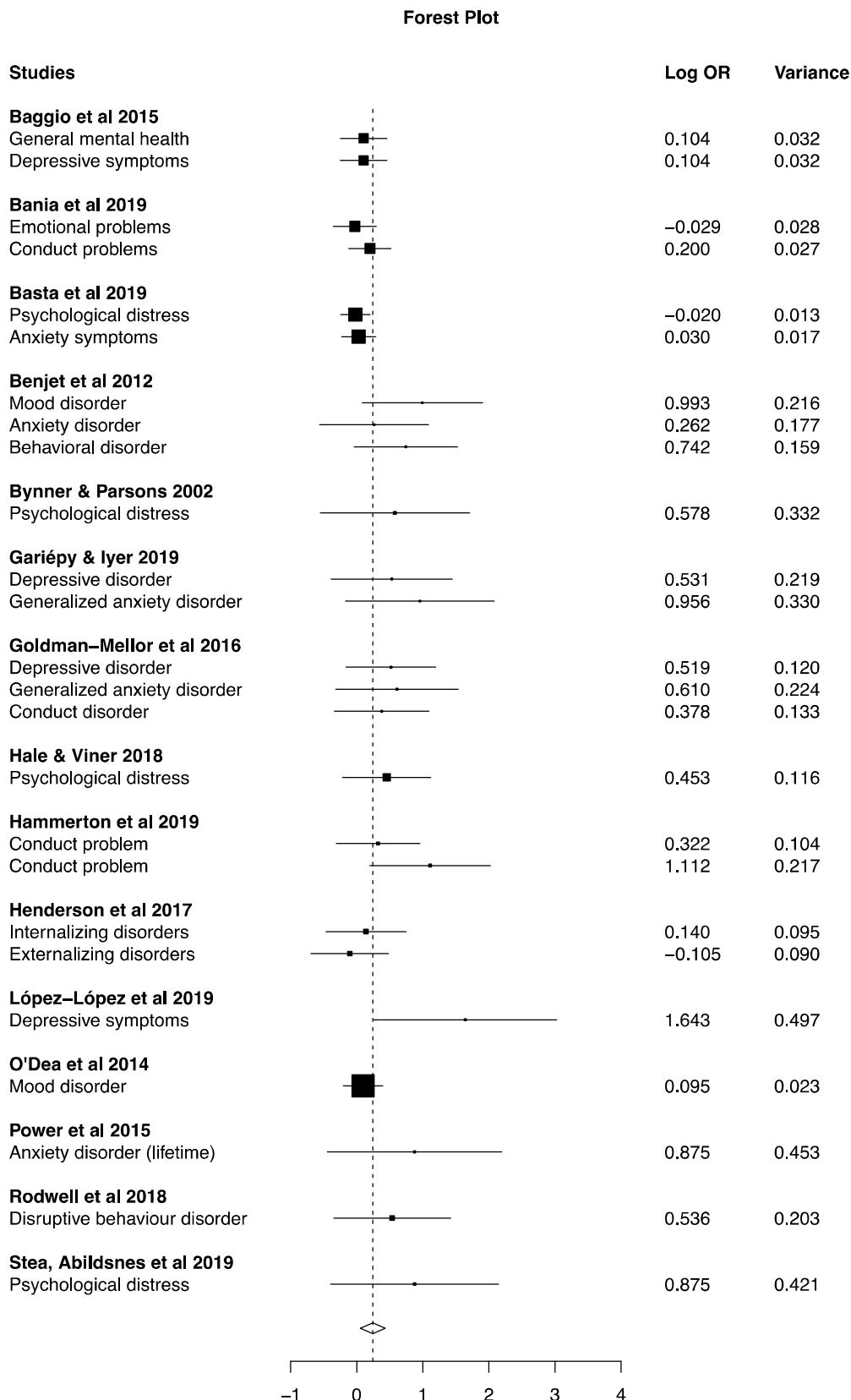
NEET: Not in education, employment, or training; MH: Mental health; NA data was not available

## Appendix 5. Quality assessment of the selected studies

| Study                              | Participants representative of study base | Participation rate > 60% | Participants drawn from the same population | Clear NEET measure | Valid mental health measure | Outcome assessed the same across sample | Minimal risk of selection due to lost to follow-up | Controlled for ≥ three confounders | Overall quality |
|------------------------------------|---|--------------------------|---|--------------------|-----------------------------|---|--|------------------------------------|-----------------|
| <b>Baggio et al 2015</b>           | Yes                                       | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | Yes  | Yes                                | High            |
| <b>Bania et al 2019</b>            | Yes                                       | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | Yes  | Yes                                | High            |
| <b>Basta et al 2019</b>            | Not reported                              | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | Not applicable                                     | Yes                                | High            |
| <b>Benjet et al 2012</b>           | Yes                                       | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | Not applicable                                     | Yes                                | High            |
| <b>Bynner &amp; Parsons 2002</b>   | Not reported                              | Not reported             | Yes   | Yes                | Yes                         | Yes                                     | Yes  | Yes                                | Moderate        |
| <b>Cairns et al 2018</b>           | Not reported                              | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | Not applicable                                     | Yes                                | High            |
| <b>Gariépy &amp; Iyer 2019</b>     | Yes                                       | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | Not applicable                                     | Yes                                | High            |
| <b>Goldman-Mellor et al 2016</b>   | Yes                                       | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | Yes  | Yes                                | High            |
| <b>Gutierrez-Garcia et al 2017</b> | No  | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | No   | Yes                                | Low             |
| <b>Gutierrez-Garcia et al 2018</b> | No  | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | Not applicable                                     | Yes                                | Moderate        |
| <b>Hale &amp; Viner 2018</b>       | Yes                                       | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | No   | No                                 | Moderate        |
| <b>Hammerton et al 2019</b>        | Yes                                       | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | No   | Yes                                | Moderate        |
| <b>Henderson et al 2017</b>        | Not reported                              | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | Not applicable                                     | No                                 | Moderate        |
| <b>López-López et al 2019</b>      | Yes                                       | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | No   | Yes                                | Moderate        |
| <b>Manhica et al 2019</b>          | Yes                                       | Yes                      | Yes   | Yes                | Yes                         | Yes                                     | Yes  | Yes                                | High            |

|                                   |     |              |     |     |     |              |                |     |          |
|-----------------------------------|-----|--------------|-----|-----|-----|--------------|----------------|-----|----------|
| <b>Nardi et al 2015</b>           | No  | Not reported | No  | No  | No  | Not reported | Not applicable | No  | Low      |
| <b>Nardi et al 2013</b>           | Yes | Yes          | Yes | No  | Yes | Yes          | Not applicable | No  | Low      |
| <b>O'Dea et al 2016</b>           | Yes | Not reported | Yes | Yes | Yes | Yes          | No             | Yes | Moderate |
| <b>O'Dea et al 2014</b>           | Yes | Not reported | Yes | Yes | Yes | Yes          | Not applicable | Yes | High     |
| <b>Power et al 2015</b>           | Yes | No           | Yes | No  | Yes | No           | Yes            | No  | Low      |
| <b>Rodwell et al 2018</b>         | Yes | Not reported | Yes | Yes | Yes | Yes          | Yes            | Yes | High     |
| <b>Stea, Abildsnes et al 2019</b> | Yes | Not reported | No  | Yes | Yes | Yes          | Not applicable | No  | Low      |
| <b>Stea, de Ridder et al 2019</b> | Yes | Not reported | No  | Yes | Yes | Yes          | Not applicable | Yes | Moderate |
| <b>Symonds et al 2016</b>         | Yes | Not reported | Yes | Yes | Yes | Yes          | No             | Yes | Moderate |

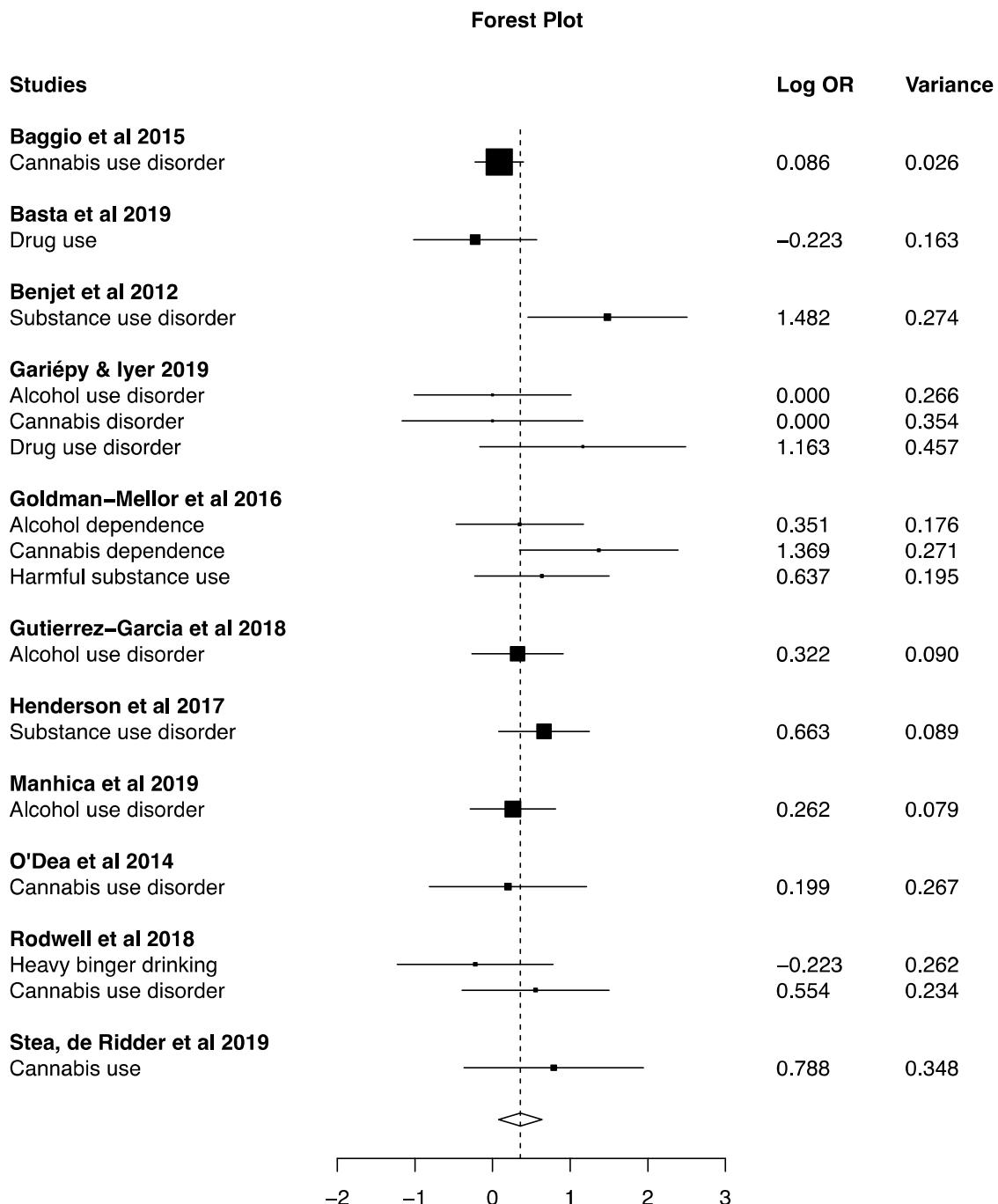
## Appendix 6. Forest plot: NEET status and the aggregate group of mental-ill health measures



The size of the box around the estimates represents the relative sample size of the study. The bars represent the 95% confidence intervals of the estimate

Hammerton et al. 2019 includes two Conduct problem samples, one from the UK and the other from Brazil.

## Appendix 7. Forest plot: NEET status and the aggregate group of substance use problems



The size of the box around each estimates represents the relative sample size of the study. The bars represent the 95% confidence intervals of the estimate.

## Appendix 8. Subgroup analyses with aggregate groups

| <b>Analysis</b>            | <b>k</b> | <b>n</b> | <b>Estimate; 95% CI</b> | <b>df</b> |
|----------------------------|----------|----------|-------------------------|-----------|
| <b>Mental health</b>       |          |          |                         |           |
| Directionality: MH -> NEET | 8        | 12       | 1.33; CI 1.01, 1.74     | 4.66      |
| Directionality: NEET -> MH | 3        | 5        | 1.32; CI 0.20, 8.50     | 1.53      |
| Age: <18                   | 4        | 8        | 1.20; CI 0.60, 2.42     | 1.64      |
| Age: ≥18                   | 7        | 13       | 1.28; CI 0.88, 1.86     | 2.85      |
| Gender: girl               | 6        | 9        | 1.12; CI 0.80, 1.55     | 1.98      |
| Gender: boy                | 5        | 8        | 1.07; CI 0.75, 1.53     | 1.75      |
| <b>Substance use</b>       |          |          |                         |           |
| Directionality: MH -> NEET | 3        | 4        | 1.16; CI 0.39, 3.49     | 1.23      |
| Directionality: NEET -> MH | 2        | 3        | 1.22; CI 0.45, 3.32     | 1         |
| Age: <18                   | 2        | 2        | 2.34; CI 0.00, 2670.44  | 1         |
| Age: ≥18                   | 5        | 9        | 1.40; CI 0.78, 2.51     | 3         |
| Gender: girl               | 2        | 2        | 1.10; CI 0.00, 6438.17  | 1         |
| Gender: boy                | 2        | 2        | 1.43; CI 0.03, 65.37    | 1         |
| <b>All measures</b>        |          |          |                         |           |
| Directionality: MH -> NEET | 9        | 19       | 1.39; CI 1.03, 1.86     | 5.41      |
| Directionality: NEET -> MH | 4        | 9        | 1.34; CI 0.92, 1.96     | 1.66      |
| Age: <18                   | 4        | 12       | 1.33; CI 0.65, 2.75     | 2.2       |
| Age: ≥18                   | 7        | 27       | 1.32; CI 0.83, 2.12     | 2.78      |
| Gender: girl               | 6        | 11       | 1.19; CI 0.89, 1.61     | 2.7       |
| Gender: boy                | 5        | 10       | 1.16; CI 0.80, 1.68     | 2.59      |

*k* = number of studies, *n* = number of estimates, *df* = degrees of freedom. Note: results are not reliable when *df*<4.

**Appendix 9.** Summary table of significant findings by directionality of association and type of mental or substance use disorder or symptoms

| STUDY                       | Mood                                   | Anxiety                  | Behavioral                | Alcohol Use                          | Cannabis Use                          | Drug Use    | Any Disorder              | Suicidal Behaviors | Psychologica I Distress               |
|-----------------------------|--|--------------------------|---------------------------|--------------------------------------|---------------------------------------|-------------|---------------------------|--------------------|---------------------------------------|
| Baggio et al 2015           | MH<-->NEET*<br>MH-->NEET<br>NEET-->MH* |                          |                           | MH<-->NEET<br>MH-->NEET<br>NEET-->MH | MH<-->NEET<br>MH-->NEET*<br>NEET-->MH |             |                           |                    | MH<-->NEET<br>MH-->NEET*<br>NEET-->MH |
| Bania et al 2019            |  |                          | MH-->NEET*                |                                      |                                       |             |                           |                    | MH-->NEET                             |
| Basta et al 2019            |  |                          |                           |                                      |                                       |             |                           |                    | MH<-->NEET                            |
| Benjet et al 2012           | MH<-->NEET *                           | MH<-->NEET               | MH<-->NEET*               |                                      | MH<-->NEET *                          |             | MH<-->NEET*               | MH<-->NEET*        |                                       |
| Bynner & Parsons 2002       |  |                          |                           |                                      |                                       |             |                           |                    | NEET-->MH                             |
| Cairns et al 2018           |  |                          |                           |                                      | MH<-->NEET*                           | MH-->NEET   |                           |                    | MH<-->NEET                            |
| Gariépy & Iyer 2019         | MH<-->NEET*                            | MH<-->NEET*              |                           | MH<-->NEET                           | MH<-->NEET                            | MH<-->NEET* |                           | MH<-->NEET*        |                                       |
| Goldman-Mellor et al 2016   | MH<-->NEET*<br>MH-->NEET*              | MH<-->NEET*<br>MH-->NEET | MH<-->NEET*<br>MH-->NEET* | MH<-->NEET*                          | MH<-->NEET*                           | MH-->NEET*  |                           | MH-->NEET*         |                                       |
| Gutierrez-Garcia et al 2017 | NEET-->MH*                             | NEET-->MH                | NEET-->MH                 | NEET-->MH*                           |                                       | NEET-->MH*  |                           | NEET-->MH*         |                                       |
| Gutierrez-Garcia et al 2018 | MH<-->NEET                             | MH<-->NEET               | MH<-->NEET                | MH<-->NEET                           |                                       | MH<-->NEET  |                           | MH<-->NEET         |                                       |
| Hale & Viner 2018           |  |                          |                           |                                      |                                       |             |                           |                    | MH-->NEET*                            |
| Hammerton et al 2019        |  |                          | MH-->NEET*                |                                      |                                       |             |                           |                    |                                       |
| Henderson et al 2017        |  |                          | MH<-->NEET                |                                      | MH<-->NEET*                           |             |                           | MH<-->NEET         |                                       |
| López-López et al 2019      | MH-->NEET*                             |                          |                           |                                      |                                       |             |                           |                    |                                       |
| Manhica et al 2019          |  |                          |                           | NEET-->MH*                           |                                       |             |                           |                    |                                       |
| Nardi et al 2015            | MH<-->NEET                             | MH<-->NEET               |                           |                                      |                                       |             | MH<-->NEET                |                    |                                       |
| Nardi et al 2013            |  |                          |                           |                                      |                                       |             | MH<-->NEET*<br>MH-->NEET* |                    |                                       |

|                                  |                          |                          |                      |            |                          |                          |                          |
|----------------------------------|--------------------------|--------------------------|----------------------|------------|--------------------------|--------------------------|--------------------------|
| O'Dea et al<br>2016              | <b>MH--&gt;NEET*</b>     | MH-->NEET<br>NEET-->MH   |                      |            |                          |                          |                          |
| O'Dea et al<br>2014              | <b>MH&lt;--&gt;NEET*</b> | MH<-->NEET               | MH<-->NEET           | MH<-->NEET |                          |                          |                          |
| Power et al<br>2015              | MH<-->NEET               | <b>MH&lt;--&gt;NEET*</b> | MH<-->NEET           | MH<-->NEET | MH<-->NEET               | <b>MH&lt;--&gt;NEET*</b> |                          |
| Rodwell et al<br>2018            |                          |                          | <b>MH--&gt;NEET*</b> | MH-->NEET  | <b>MH--&gt;NEET*</b>     |                          | <b>MH--&gt;NEET*</b>     |
| Stea,<br>Abildsnes et<br>al 2019 |                          |                          |                      |            |                          |                          | <b>MH&lt;--&gt;NEET*</b> |
| Stea, de<br>Ridder et al<br>2019 |                          |                          |                      |            | <b>MH&lt;--&gt;NEET*</b> |                          |                          |
| Symonds et al<br>2016            | <b>MH--&gt;NEET*</b>     | <b>MH--&gt;NEET*</b>     |                      |            |                          |                          | <b>MH--&gt;NEET*</b>     |

**Legend.** Bold and \* indicates statistically significant association ( $p>0.05$ ). MH: mental health; NEET: not employed, in education, or training; MH<-->NEET: cross-sectional association between a mental health (MH) measure and being not employed, in education, or training (NEET); MH-->NEET: longitudinal association between a MH measure and a later NEET status; NEET-->MH: longitudinal association between a NEET status and a later MH measure.