**Supplementary Material for Variation in Global Network Properties Across Risk Factors for Adolescent Internalizing Symptoms: Evidence of Cumulative Effects on Structure and Connectivity**

Table of Contents

[Note on Code and Fake Data 1](#_Toc119929325)

[Supplementary Table 1 2](#_Toc119929326)

[Supplementary Table 2 6](#_Toc119929327)

[Supplementary Table 3 7](#_Toc119929328)

[Supplementary Figure 1 9](#_Toc119929329)

[References 10](#_Toc119929330)

# Note on Code and Fake Data

We were unable to supply the real data since many of the risk factors analyzed cannot be publicly shared at all (linked administrative data), and survey variables will be only shared at the end of the project (the ethics agreement allows participants to opt out until the end of the three-year study). We therefore supply synthetic data so that all the code can be run. Where possible, we also provide the bootstrapped statistics (lists of matrices) that underly actual results so that these can be reproduced.

# Supplementary Table 1

***Description of Risk Factors***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Survey Domain** | **Measure** | ***N* of items** | **(Sample) Item** | **Response Format** | **Risk Group (N)** |
| Age | Year group | 1 | N/A | Year 8 (12-13)/Year 10 (14-15) | Year 10 (16149) |
| Gender identity; linked administrative data: biological sex | Gender Identity survey question developed in consultation with #BeeWell Peer Reviewers and national LGBTQ+ organisations. | 1 | Are you: | Girl (including trans girl), Boy (including trans boy), Non-binary, I describe myself in another way, Prefer not to say; Girl/Boy | Gender minority, drawing on gender and sex data to include trans (4402) |
| Sexual orientation | Developed in consultation with the #BeeWell Peer Reviewers and national LGBTQ+ organisations. | 1 | What best describes you? | Bi/pansexual, Gay/lesbian, Heterosexual/straight, I describe myself in another way, Prefer not say. | Not heterosexual (8316) |
| FSM eligibility; IMD decile | Administrative data | 2 | N/A | Eligible for FSM in the last 6 years; neighbourhood income deprivation decile | Fsm eligible *and* living in a top 10% most deprived area (3719) |
| SEN | Administrative data indicating that a given participant had been identified as having SEN | 1 | N/A | No SEN, SEN | SEN status (4556) |
| Low parent/carer support | Student Resilience Survey (family connection subscale) (Sun & Stewart, 2007). | 4 | At home there is an adult who: Wants me to do my best. | 1-5 scale, with 1 = never, 5 = always. | Score <=8/20 (to approximate selecting the bottom 2 response categories)  (923) |
| Low peer support | Child and Youth Resilience Measure (friendships and social support subscale) (Jefferies, McGarrigle, & Ungar, 2018). | 4 | I get along with people around me. | Not at all, a little, somewhat, quite a bit, a lot | Score <=8/20 (to approximate selecting the bottom 2 response categories)  (1704) |
| Bullying | Items from the Understanding Society and Health Behaviours in Schools Checklist (Brooks, Klemera, Chester, Magnusson, & Spencer, 2018). | 3 | How often do you get physically bullied at school? | Not bullied at all, Not much, Quite a lot, A lot. | 'Quite a lot'/’a lot’ for *any* item (5173) |
| Physical health | Item from the Understanding Society and Health Behaviours in Schools Checklist (Brooks et al., 2018). | 1 | In general would you say your physical health is: | 1-5 scale, with 1 = Excellent, 5 = Poor. | Poor category (1107) |

*Note.* FSM = Free School Meal, IMD = Indices of Multiple Deprivation, SEN = Special Educational Needs. The #BeeWell survey is available in full: <https://gmbeewell.org/wp-content/uploads/2021/09/BeeWell-Questionnaires-Booklet.pdf> .

# Supplementary Table 2

*Results of Recursive Partitioning for Individual Risk Factors*

|  |  |  |
| --- | --- | --- |
| Risk Factor | Statistic | *p* |
| Income deprivation | 54.13 | 0.06 |
| Year group | 135.78 | <.001 |
| SEN | 88.26 | <.001 |
| Gender minority | 104.89 | <.001 |
| Sexual minority | 179.36 | <.001 |
| Bullied | 217.68 | <.001 |
| Poor physical health | 72.36 | .001 |
| Low peer support | 218.71 | <.001 |
| Low parent/carer support | 60.1 | 0.01 |

*Note.* SEN = special educational needs.

# Supplementary Table 3

*Fit for Networks Estimated in the Full Sample Individual Groups*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | DF | Χ2 | *p* | CFI | RMSEA | AIC | BIC |
| Year group: 8 | 2 | 8.653 | 0.013 | 1 | 0.013 | 241479.7 | 241808 |
| Year group: 10 | 2 | 0.237 | 0.888 | 1 | 0 | 215048.2 | 215370.9 |
| Not SEN | 2 | 3.234 | 0.199 | 1 | 0.005 | 387399 | 387747 |
| SEN | 5 | 14.923 | 0.011 | 0.999 | 0.021 | 62107.08 | 62356.93 |
| Gender majority | 2 | 2.538 | 0.281 | 1 | 0.003 | 374690 | 375036.9 |
| Gender minority | 3 | 7.125 | 0.068 | 1 | 0.018 | 61258.26 | 61519.45 |
| Sexual majority | 2 | 3.446 | 0.179 | 1 | 0.005 | 310508.3 | 310848.1 |
| Sexual minority | 3 | 3.756 | 0.289 | 1 | 0.006 | 116524.8 | 116812.5 |
| Not bullied | 2 | 2.136 | 0.344 | 1 | 0.002 | 356260.3 | 356605.9 |
| Bullied | 4 | 13.505 | 0.009 | 0.999 | 0.021 | 73748.74 | 74010.15 |
| Fair-excellent physical health | 2 | 5.855 | 0.054 | 1 | 0.008 | 419975.4 | 420327.1 |
| Poor physical health | 9 | 21.488 | 0.011 | 0.996 | 0.035 | 16432.95 | 16605.93 |
| Medium-high peer support | 2 | 2.436 | 0.296 | 1 | 0.003 | 398096.1 | 398445.7 |
| Low peer support | 10 | 31.243 | 0.001 | 0.996 | 0.035 | 25148 | 25331.56 |
| Medium-high parent/carer support | 2 | 4.301 | 0.116 | 1 | 0.006 | 416046.6 | 416397.6 |
| Low parent/carer support | 13 | 50.746 | 0 | 0.991 | 0.056 | 13127.11 | 13274.54 |
| Not income deprived | 2 | 2.684 | 0.261 | 1 | 0.003 | 383364.7 | 383712.1 |
| Income deprived | 4 | 9.556 | 0.049 | 0.999 | 0.019 | 49720.18 | 49968.13 |
| CR = 0 | 1 | 2.252 | 0.133 | 1 | 0.012 | 104739.7 | 105043.2 |
| CR = 1 | 2 | 0.215 | 0.898 | 1 | 0 | 172722.1 | 173037.6 |
| CR = 2 | 4 | 9.358 | 0.053 | 1 | 0.014 | 97925.72 | 98200.49 |
| CR = 3 | 6 | 17.836 | 0.007 | 0.999 | 0.025 | 45735.82 | 45965.44 |
| CR = 4 | 14 | 83.865 | 0 | 0.982 | 0.063 | 18687.31 | 18840.19 |
| CR = 5 | 12 | 21.712 | 0.041 | 0.996 | 0.036 | 8789.584 | 8928.31 |

*Note.* DF = degrees of freedom; CFI = confirmatory fit index; rmsea = root mean square error of approximation; AIC = Akaike information criterion; BIC = Bayesian information criterion. CR = cumulative risk.

# Supplementary Figure 1

*Recursive Partitioning for Cumulative Risk*



# References

Brooks, F., Klemera, E., Chester, K., Magnusson, J., & Spencer, N. (2018). Health Behaviour in School-Aged Children (HBSC): World Health Organization Collaborative Cross National Study: Findings from the 2018 HBSC Study for England.

Jefferies, P., McGarrigle, L., & Ungar, M. (2018). The CYRM-R: A Rasch-Validated Revision of the Child and Youth Resilience Measure. *J Evid Based Soc Work (2019)*, 1-23. doi:10.1080/23761407.2018.1548403

Sun, J., & Stewart, D. (2007). Development of population‐based resilience measures in the primary school setting. *Health Education, 107*(6), 575-599. doi:10.1108/09654280710827957