

Spreading of depressive symptoms over adolescent friendship networks.

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Background

- Depression affects 350 million people worldwide¹.
- It is characterised by a set of symptoms which could be affected by social networks.
- We explore this possibility using a range of statistical methods.

Data

- National Longitudinal Study of Adolescent Health (Add Health) - health behaviours of United States adolescents in 1994-95 and 1996².
- Includes friendship data - friendship network.
- Includes Centre for Epidemiological Studies Depression (CES-D) scale questions - quantised depression score³.

Empirical Data Analysis

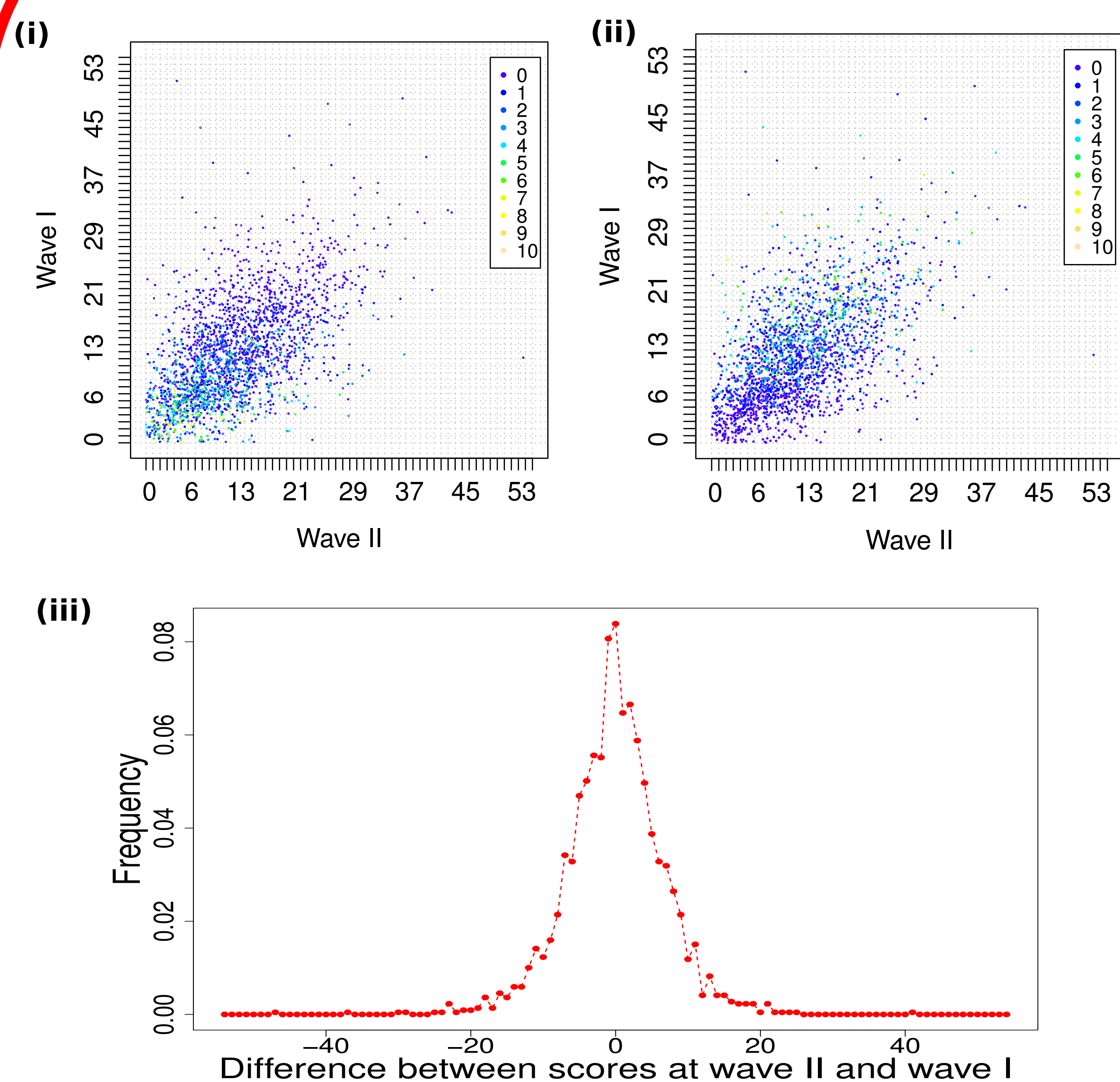


Figure 1: (i) and (ii) - grid plots of CES-D scores at the first time point (wave I) against the second time point (wave II). (i) - coloured by worse off friends. (ii) - coloured by better off friends. (iii) - Empirical distribution of CES-D score change.

- Empirical data shows an effect from higher and lower scoring friends on the change in CES-D score.
- The score changes appear to follow an exponential distribution.

Parametric Inference - Poor Appetite

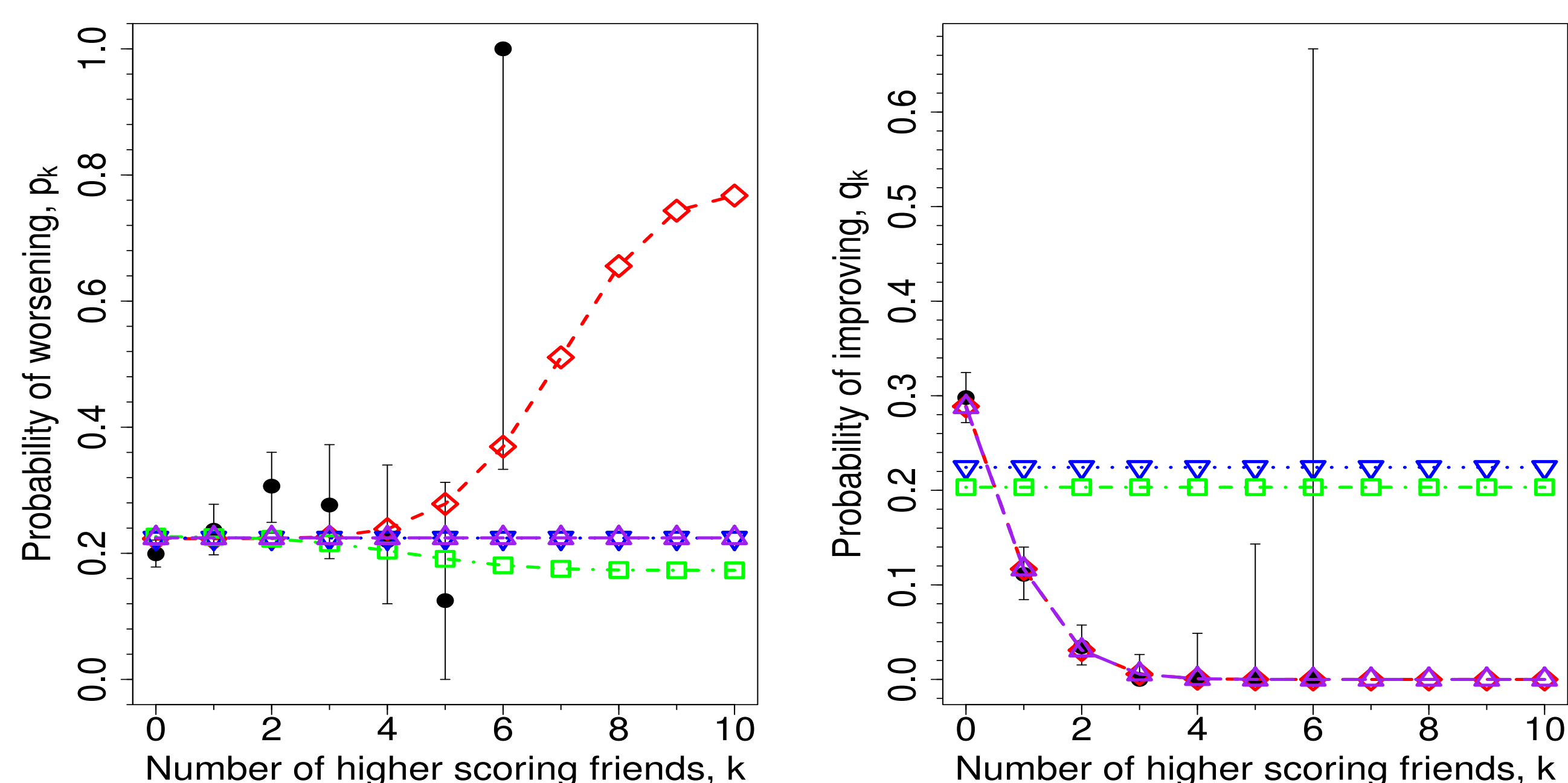
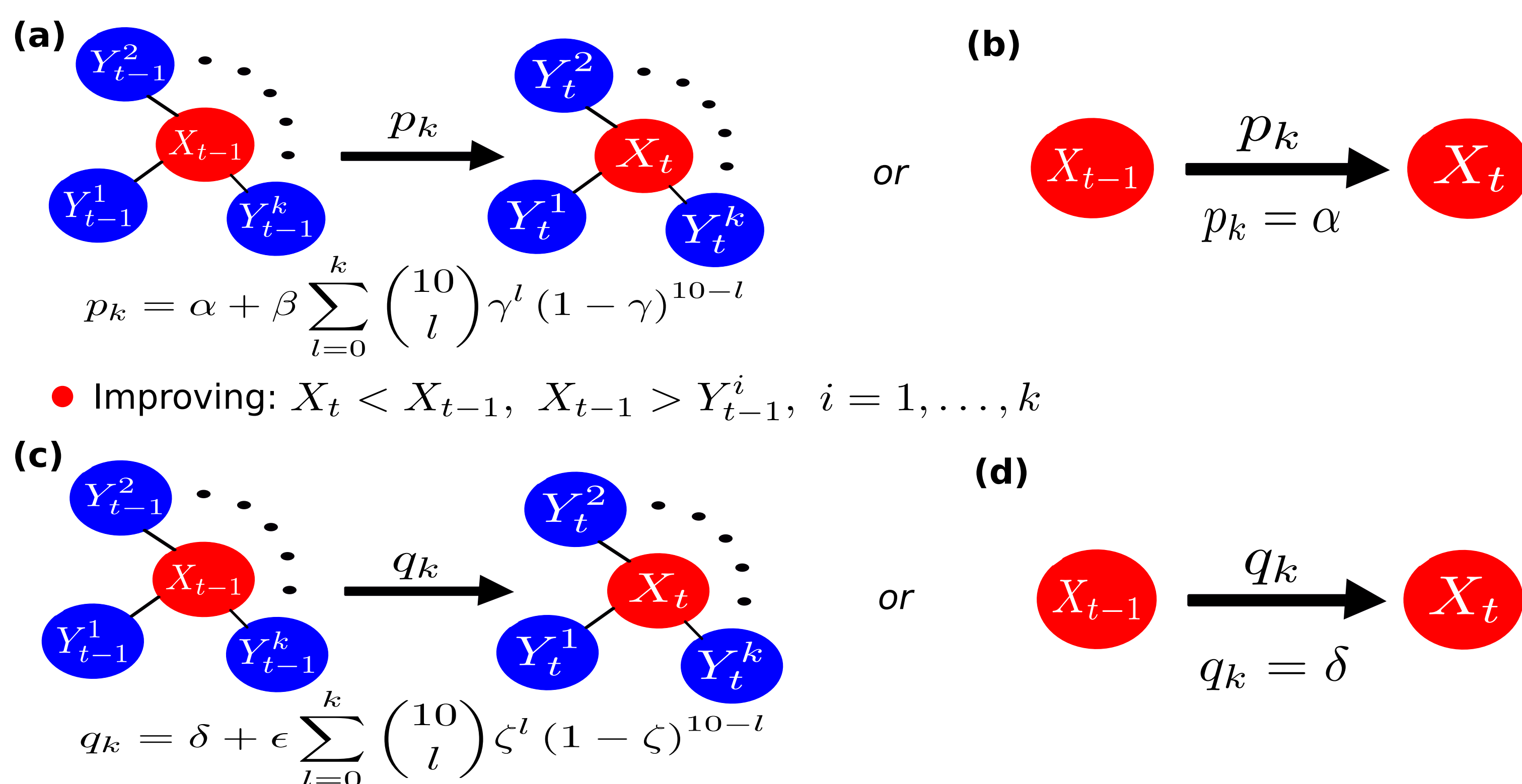


Figure 3: Results for Poor Appetite dependent on worse off friends. Model to line correspondence is the same as **figure 2**. Unlike with all other symptoms, model 4 is preferred.

Parametric Inference

- Considered total CES-D score and 7 component symptoms - anhedonia, poor appetite, poor concentration, dysphoria, helplessness, tiredness, and worthlessness.
- Worsening: $X_t > X_{t-1}$, $X_{t-1} < Y_{t-1}^i$, $i = 1, \dots, k$



- Model 1 - (a) and (c). Model 2 - (b) and (d). Model 3 - (a) and (d). Model 4 - (b) and (c).
- Model parameters - inferred from data using maximum likelihood estimation.
- Models were compared using their Akaike Information Criterion.

Parametric Inference - Example Results

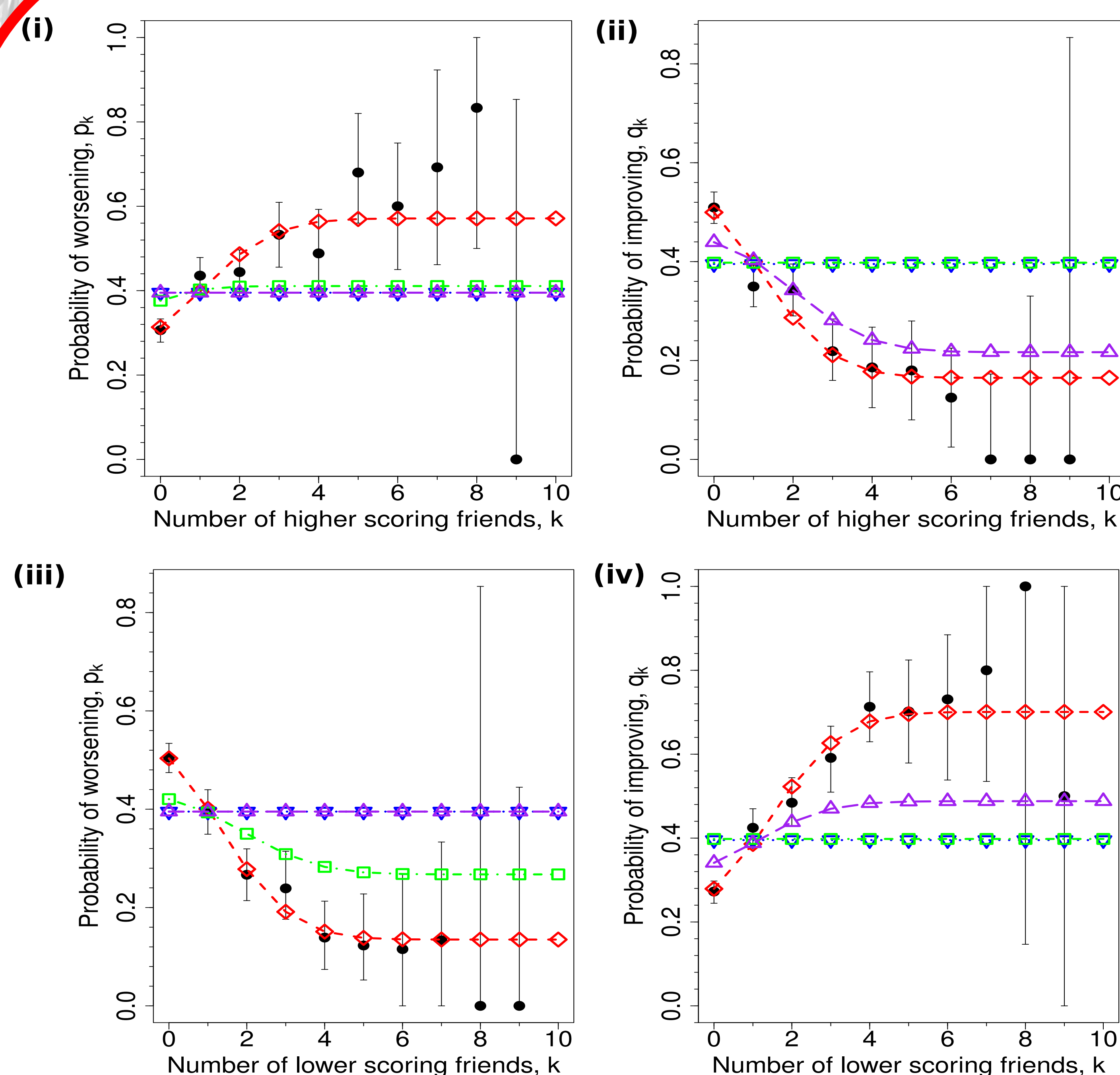


Figure 2: Results for Helplessness. Red - model 1. Blue - model 2. Green - model 3. Purple - model 4. Black - observed frequencies. (i) and (ii) depend on worse off friends, (iii) and (iv) on better off friends. Model 1 is preferred for all symptoms except poor appetite.

Conclusions

- For most symptoms, the emotional state of friends can have both a positive or negative effect on the state of an individual.
- This effect only occurs for smaller numbers of friends.
- These symptoms reflect the total CES-D score.
- Appetite is the only symptom to not follow this pattern.
- Empirical findings suggest that the change in symptoms occurs progressively between time points - more testing is needed.