



# Modelling the interplay between alcohol use and depressive symptoms in adolescence

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# What is ALSPAC?

- Avon Longitudinal Study of Parents & Children
- Birth Cohort
- South-West England
- ~14,000 children / parents
- E.D.D. between April 1<sup>st</sup> 1991 & Dec 31<sup>st</sup> 1992
- “Study Children” now in early twenties

# Main data sources

- Questionnaire
  - Annual postal questionnaires
  - Mum / Dad / Offspring
- Clinic
  - Hands on assessment
  - Interviews
  - Computer-based questionnaires

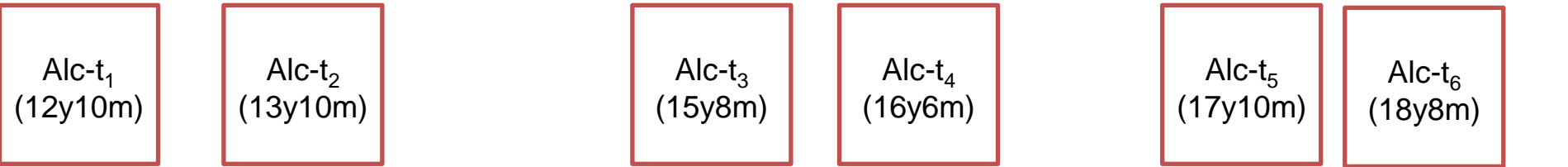
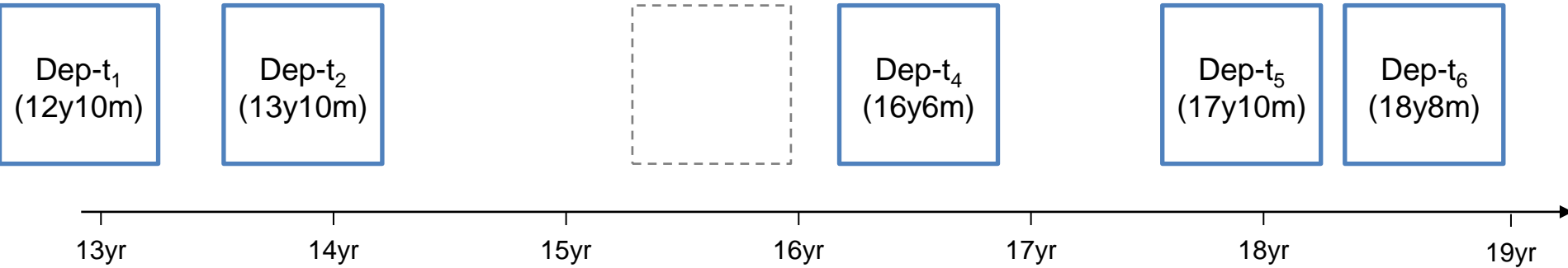


# Current (vague) aim

- Assess the interplay between depressive symptoms and alcohol use through early to late adolescence
- Focus on the girls

# Data availability

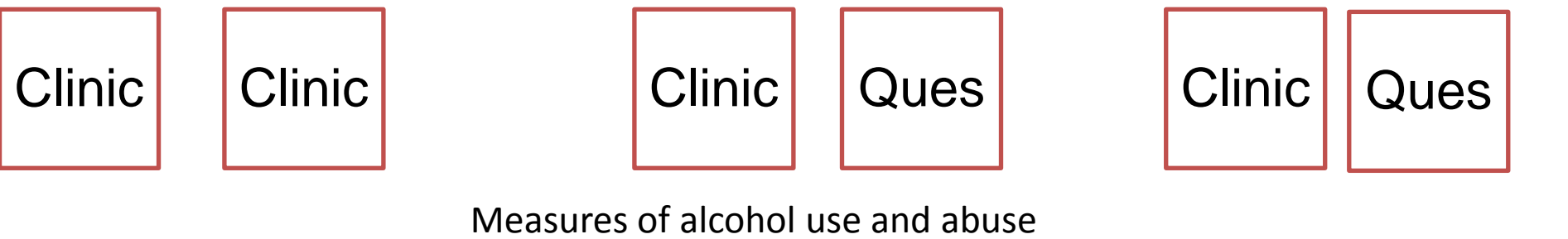
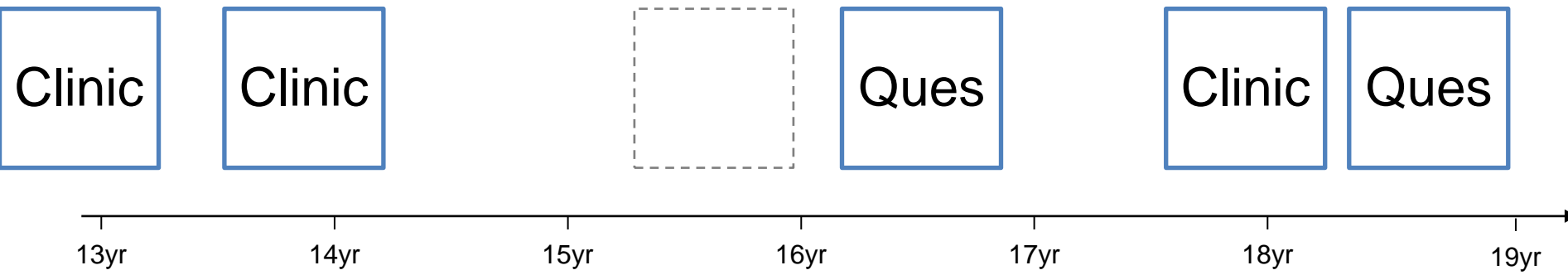
Depressive symptoms (Short-form MFQ)



Measures of alcohol use and abuse

# Extra complication

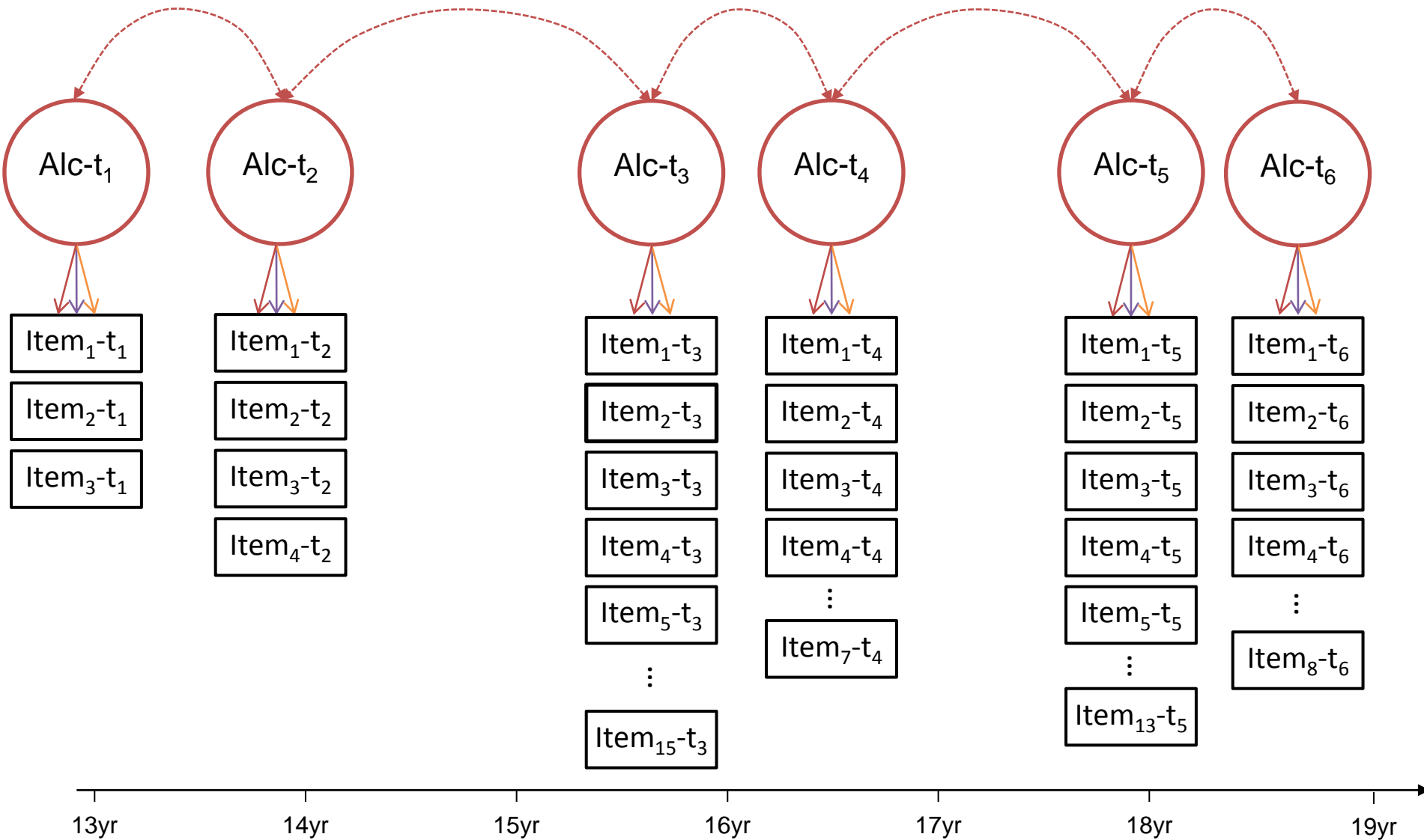
Depressive symptoms (Short form MFQ)



Measures of alcohol use and abuse

# Model for alcohol use

# CFA Model for alcohol use





# Indicators of alcohol use/abuse

|                                     | 13 yrs | 14 yrs | 15 yrs | 16 yrs | 18 yrs | 19 yrs |
|-------------------------------------|--------|--------|--------|--------|--------|--------|
| Number of times drinking recently   | ✓      | ✓      | ✓      | ✓      | ✓      | ✓      |
| Freq of 3+ units                    | ✓      | ✓      |        |        |        |        |
| Freq of 4+ units                    | ✓      |        | ✓      |        |        |        |
| Freq of 5+ units                    | ✓      |        | ✓      |        |        |        |
| Freq of 6+ units                    |        |        |        | ✓      | ✓      | ✓      |
| All-day drinking                    | ✓      |        | ✓      |        | ✓      |        |
| Blackouts                           |        | ✓      | ✓      | ✓      | ✓      | ✓      |
| Experienced complaints (fam/frnds)  |        |        | ✓      | ✓      | ✓      | ✓      |
| Complaints from parents             |        | ✓      |        |        |        |        |
| Continued despite problems          | ✓      |        | ✓      |        | ✓      |        |
| Felt the need to cutback            | ✓      | ✓      | ✓      |        | ✓      |        |
| Drinking in dangerous situations    | ✓      | ✓      | ✓      |        |        |        |
| Got into fights                     |        | ✓      | ✓      |        | ✓      |        |
| Gone over limits                    | ✓      | ✓      | ✓      | ✓      | ✓      | ✓      |
| Number of typical drinks            | ✓      | ✓      | ✓      | ✓      | ✓      | ✓      |
| Hurt oneself (or others)            |        | ✓      | ✓      | ✓      | ✓      | ✓      |
| Trouble with police                 |        | ✓      | ✓      |        | ✓      |        |
| Problems keeping up with schoolwork |        |        | ✓      |        | ✓      |        |
| Fail to do what was expected        |        |        | ✓      | ✓      | ✓      | ✓      |

# Response too rare / Items collinear

|                                       | 13 yrs | 14 yrs | 15 yrs | 16 yrs | 18 yrs | 19 yrs |
|---------------------------------------|--------|--------|--------|--------|--------|--------|
| Number of times drinking recently     | ✓      | ✓      | ✓      | ✓      | ✓      | ✓      |
| Freq of 3+ units                      | ✓      | ✓      |        |        |        |        |
| Freq of 4+ units                      | ✓      |        | ✓      |        |        |        |
| Freq of 5+ units                      | ✓      |        | ✓      |        |        |        |
| Freq of 6+ units                      |        |        |        | ✓      | ✓      | ✓      |
| All-day drinking                      | ✓      |        | ✓      |        | ✓      |        |
| Blackouts                             |        | ✓      | ✓      | ✓      | ✓      | ✓      |
| Experienced complaints (family/frnds) |        |        | ✓      | ✓      | ✓      | ✓      |
| Complaints from parents               |        | ✓      |        |        |        |        |
| Continued despite problems            | ✓      |        | ✓      |        | ✓      |        |
| Felt the need to cutback              | ✓      | ✓      | ✓      |        | ✓      |        |
| Drinking in dangerous situations      | ✓      | ✓      | ✓      |        |        |        |
| Got into fights                       |        | ✓      | ✓      |        | ✓      |        |
| Gone over limits                      | ✓      | ✓      | ✓      | ✓      | ✓      | ✓      |
| Number of typical drinks              | ✓      | ✓      | ✓      | ✓      | ✓      | ✓      |
| Hurt oneself (or others)              |        | ✓      | ✓      | ✓      | ✓      | ✓      |
| Trouble with police                   |        | ✓      | ✓      |        | ✓      |        |
| Problems keeping up with schoolwork   |        |        | ✓      |        | ✓      |        |
| Fail to do what was expected          |        |        | ✓      | ✓      | ✓      | ✓      |

# Setting up the latent variable metric

- Anchor scales together using matched items
  - Invariance of loadings and thresholds
- Allow changing means and variances to be estimated
- However
  - Question wording changes
  - Response options change
  - Period of reference changes

# Example 1 - blackouts

- 15 years
  - How many times in the past 2 years have you had a blackout where you couldn't remember things?
  - Numeric response
- 16 years
  - How many times in the past year have you been unable to remember what happened the night before
  - Never / less than monthly / monthly / weekly+

# Example 2 - limit setting

- 16 years

- How many times in the past year have you found you were unable to stop drinking once you had started
- Never / less than monthly / monthly / weekly+

- 18 years

- How many times in the past year have you found you were unable to stop drinking once you had started
- Never / **once or twice** / less than monthly / monthly / weekly+

# Partial anchoring?

- 16 years – unable to stop drinking in last year
  - Never / less than monthly / monthly / weekly+
- 18 years – unable to stop drinking in last year
  - Never / **once or twice** / less than monthly / monthly / wkly+
- Constrain loading and top two thresholds

# Limited anchoring opportunities

|                                     | 13 yrs | 14 yrs | 15 yrs | 16 yrs | 18 yrs | 19 yrs |
|-------------------------------------|--------|--------|--------|--------|--------|--------|
| Number of times drinking recently   | ✓      | ✓      | ✓      | ✓      | ✓      | ✓      |
| Freq of 3+ units                    | ✓      |        |        |        |        |        |
| Freq of 4+ units                    |        |        | ✓      |        |        |        |
| Freq of 5+ units                    | ✓      |        | ✓      |        |        |        |
| Freq of 6+ units                    |        |        |        | ✓      | ✓      | ✓      |
| All-day drinking                    |        |        | ✓      |        | ✓      |        |
| Blackouts                           |        | ✓      | ✓      | ✓      | ✓      | ✓      |
| Experienced complaints (fam/frnds)  |        |        | ✓      | ✓      |        | ✓      |
| Complaints from parents             |        | ✓      |        |        |        |        |
| Continued despite problems          |        |        | ✓      |        | ✓      |        |
| Felt the need to cutback            |        |        | ✓      |        | ✓      |        |
| Drinking in dangerous situations    |        |        | ✓      |        |        |        |
| Got into fights                     |        |        | ✓      |        | ✓      |        |
| Gone over limits                    |        | ✓      | ✓      | ✓      | ✓      | ✓      |
| Number of typical drinks            |        | ✓      | ✓      | ✓      | ✓      | ✓      |
| Hurt oneself (or others)            |        |        | ✓      | ✓      | ✓      | ✓      |
| Trouble with police                 |        |        | ✓      |        | ✓      |        |
| Problems keeping up with schoolwork |        |        |        |        | ✓      |        |
| Fail to do what was expected        |        |        | ✓      | ✓      | ✓      | ✓      |

# Factor definition with loading constraints

```
alc13 by fr3pl13* num6m13 (ld1) fr5pl13;
```

```
alc14 by limit14* num6m14 (ld1) pcomp14 numty14;
```

```
alc15 by numty15 num6m15 (ld1) limit15 fr4pl15 fr5pl15 cutbk15  
      alday15 fail15 cont15 dangr15 hurt15 comp15 fight15  
      polic15 black15
```

```
alc16 by numty16 num16 (ld4) black16 (ld5) limit16 (ld6)  
      hurt16 (ld7) fail16 (ld8) fr6pl16 (ld9);
```

```
alc18 by numty18 alday18 cutbk18 cont18 keep18 fight18 polic18  
      num18 (ld4) black18 (ld5) limit18 (ld6) hurt18 (ld7)  
      fail18 (ld8) fr6pl18 (ld9);
```

```
alc19 by numty19 num19 (ld4) black19 (ld5) limit19 (ld6)  
      hurt19 (ld7) fail19 (ld8) fr6pl19 (ld9) comp19;
```



# Factor definition with loading constraints

alc13 by fr3pl13\* num6m13 (ld1) fr5pl13;

alc14 by limit14\* num6m14 (ld1) pcomp14 numty14;

alc15 by numty15 num6m15 (ld1) limit15 fr4pl15 fr5pl15 cutbk15  
alday15 fail15 cont15 dangr15 hurt15 comp15 fight15  
polic15 black15;

alc16 by numty16 num16 (ld4) black16 (ld5) limit16 (ld6)  
hurt16 (ld7) fail16 (ld8) fr6pl16 (ld9);

alc18 by numty18 alday18 cutbk18 cont18 keep18 fight18 polic18  
num18 (ld4) black18 (ld5) limit18 (ld6) hurt18 (ld7)  
fail18 (ld8) fr6pl18 (ld9);

alc19 by numty19 num19 (ld4) black19 (ld5) limit19 (ld6)  
hurt19 (ld7) fail19 (ld8) fr6pl19 (ld9) comp19;

# Threshold constraints

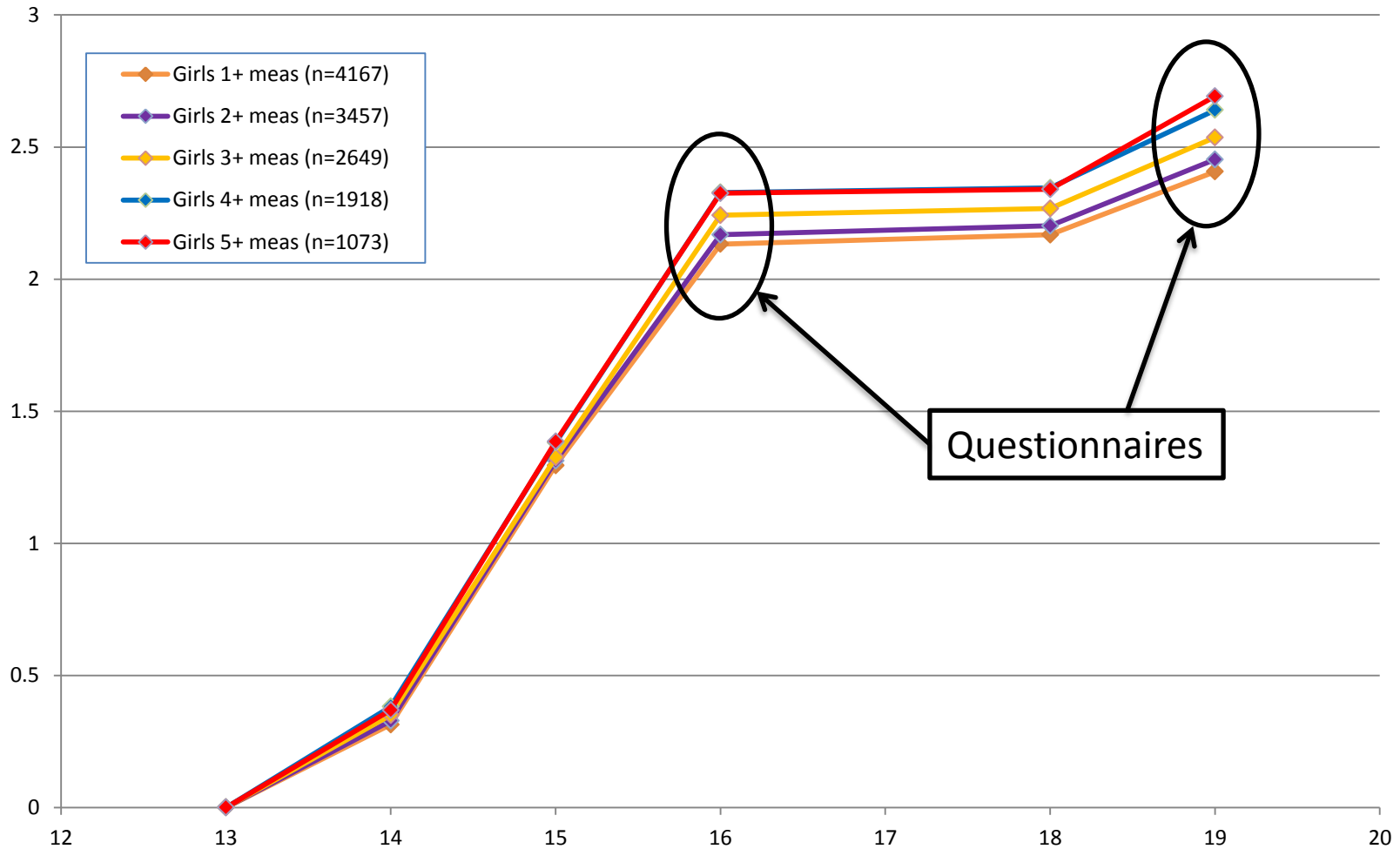
## [1] Well behaved item

[numty15\$1] (th3a) [numty16\$1] (th3a) [numty18\$1] (th3a) [numty19\$1] (th3a);  
[numty15\$2] (th3b) [numty16\$2] (th3b) [numty18\$2] (th3b) [numty19\$2] (th3b);  
[numty15\$3] (th3c) [numty16\$3] (th3c) [numty18\$3] (th3c) [numty19\$3] (th3c);  
[numty15\$4] (th3d) [numty16\$4] (th3d) [numty18\$4] (th3d) [numty19\$4] (th3d);  
[numty15\$5] (th3e) [numty16\$5] (th3e) [numty18\$5] (th3e) [numty19\$5] (th3e);

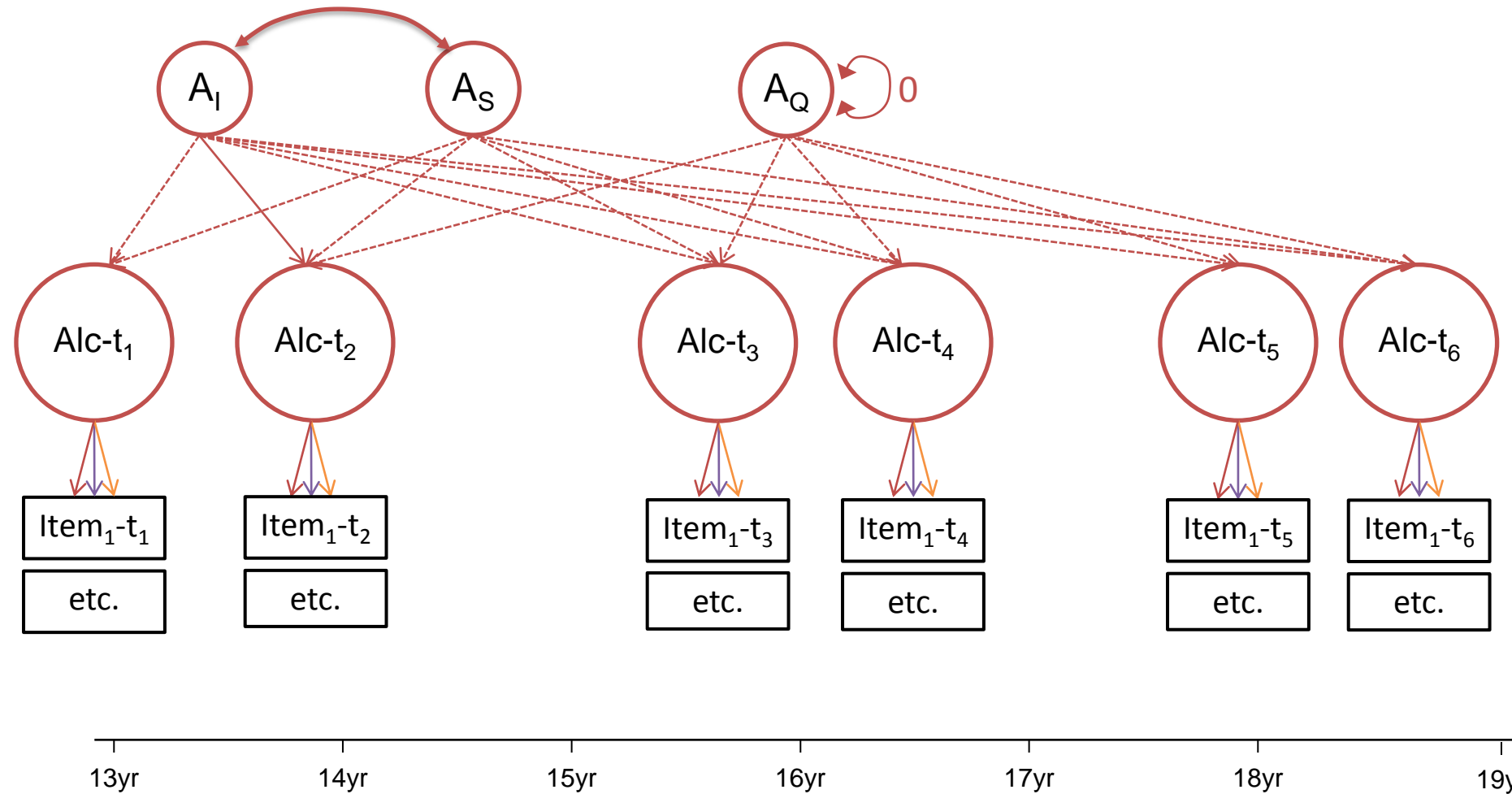
## [2] Less well behaved items

[black16\$2] (th5a) [black18\$3] (th5a) [black19\$3] (th5a);  
[black16\$3] (th5b) [black18\$4] (th5b) [black19\$4] (th5b);  
  
[limit16\$2] (th6a) [limit18\$3] (th6a) [limit19\$3] (th6a);  
[limit16\$3] (th6b) [limit18\$4] (th6b);

# Alcohol CFA means



# Alcohol - 2<sup>nd</sup> order growth model



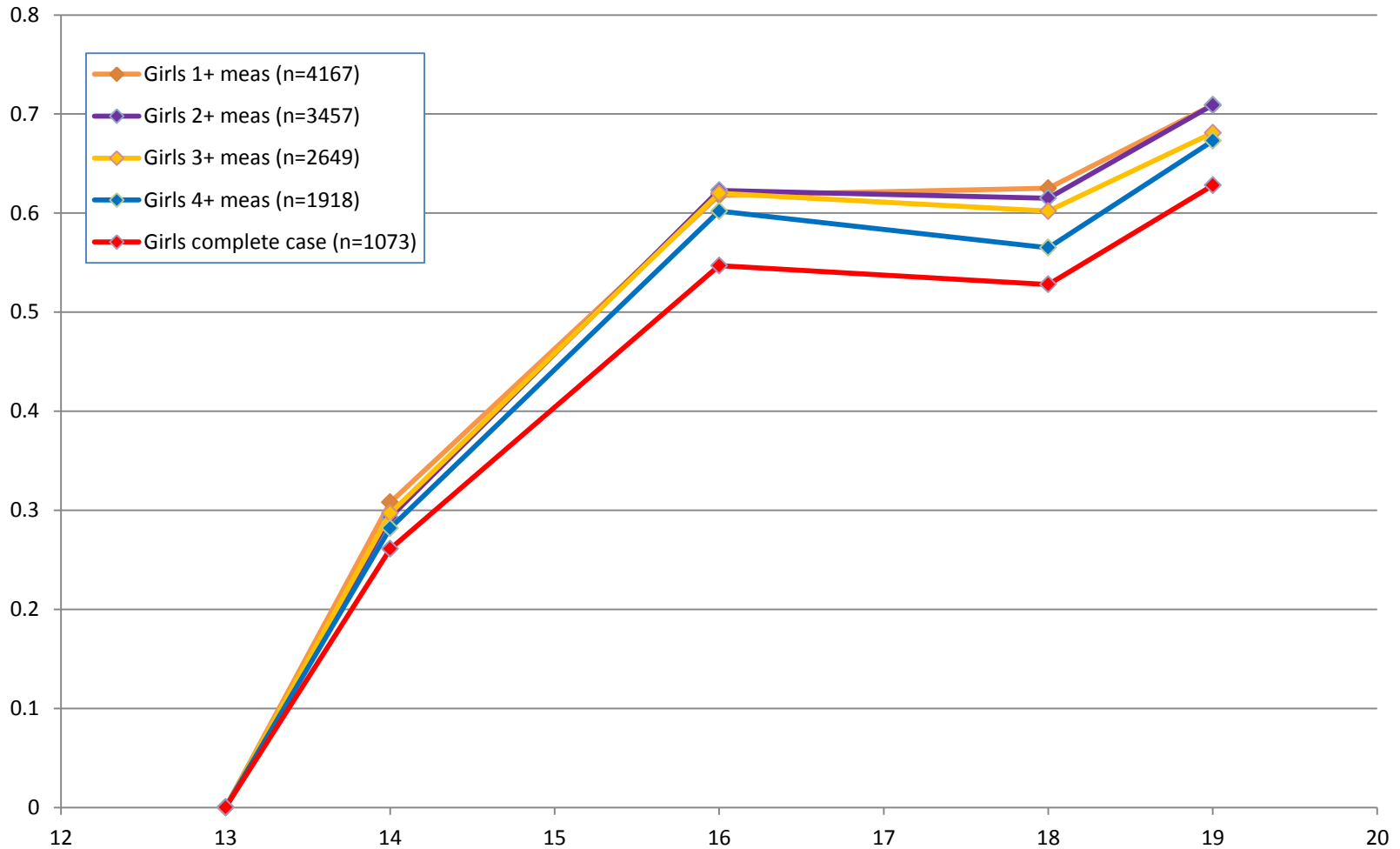
# Alcohol - 2<sup>nd</sup> order growth model

|                    | 5+ measures   | 4+ measures   | 3+ measures   | 2+ measures   | 1+ measures   |
|--------------------|---------------|---------------|---------------|---------------|---------------|
| <b>n</b>           | 1073          | 1918          | 2649          | 3457          | 4167          |
| <b>Means</b>       |               |               |               |               |               |
| ALC_I              | 0*            | 0*            | 0*            | 0*            | 0*            |
| ALC_S              | 0.75 (0.028)  | 0.76 (0.022)  | 0.73 (0.019)  | 0.73 (0.018)  | 0.72 (0.017)  |
| ALC_Q              | -0.05 (0.003) | -0.06 (0.003) | -0.05 (0.003) | -0.05 (0.002) | -0.05 (0.002) |
|                    |               |               |               |               |               |
| <b>Variances</b>   |               |               |               |               |               |
| ALC_I              | 0.74 (0.049)  | 0.67 (0.037)  | 0.62 (0.033)  | 0.61 (0.030)  | 0.62 (0.030)  |
| ALC_S              | 0.02 (0.002)  | 0.02 (0.002)  | 0.02 (0.001)  | 0.02 (0.001)  | 0.02 (0.001)  |
| ALC_Q              | 0*            | 0*            | 0*            | 0*            | 0*            |
|                    |               |               |               |               |               |
| <b>Correlation</b> |               |               |               |               |               |
| ALC_I WITH ALC_S   | -0.67 (0.027) | -0.66 (0.022) | -0.64 (0.022) | -0.62 (0.022) | -0.63 (0.022) |

# Model for depressive symptoms



# Depression CFA means



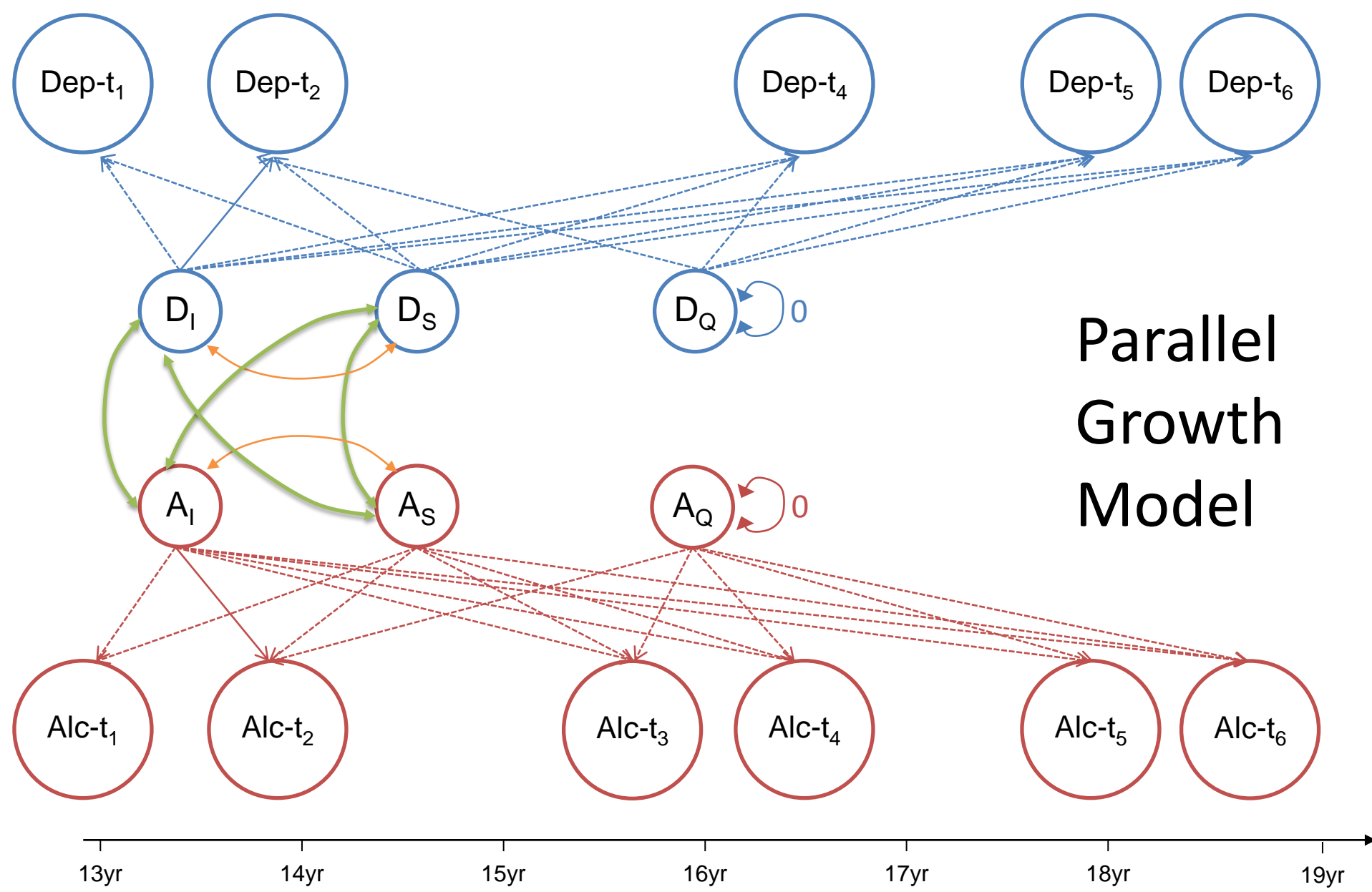


# Depression - 2<sup>nd</sup> order growth model

|                    | 5+ measures   | 4+ measures   | 3+ measures   | 2+ measures   | 1+ measures   |
|--------------------|---------------|---------------|---------------|---------------|---------------|
| <b>n</b>           | 1073          | 1918          | 2649          | 3457          | 4167          |
| <b>Means</b>       |               |               |               |               |               |
| DEP_I              | 0*            | 0*            | 0*            | 0*            | 0*            |
| DEP_S              | 0.20 (0.032)  | 0.23 (0.027)  | 0.24 (0.025)  | 0.24 (0.024)  | 0.24 (0.024)  |
| DEP_Q              | -0.02 (0.006) | -0.02 (0.005) | -0.02 (0.004) | -0.02 (0.004) | -0.02 (0.004) |
|                    |               |               |               |               |               |
| <b>Variances</b>   |               |               |               |               |               |
| DEP_I              | 0.67 (0.059)  | 0.69 (0.045)  | 0.69 (0.040)  | 0.73 (0.038)  | 0.73 (0.037)  |
| DEP_S              | 0.02 (0.003)  | 0.03 (0.002)  | 0.03 (0.002)  | 0.03 (0.002)  | 0.03 (0.002)  |
| DEP_Q              | 0*            | 0*            | 0*            | 0*            | 0*            |
|                    |               |               |               |               |               |
| <b>Correlation</b> |               |               |               |               |               |
| DEP_I WITH DEP_S   | -0.05 (0.070) | -0.01 (0.055) | 0.02 (0.051)  | 0.02 (0.049)  | 0.03 (0.049)  |

# Bring two processes together

A parallel second-order growth model



Parallel  
Growth  
Model

# Correlations from parallel model

|                         | 5+ measures   | 4+ measures   | 3+ measures   | 2+ measures   | 1+ measures   |
|-------------------------|---------------|---------------|---------------|---------------|---------------|
| <b>n</b>                | 1073          | 1918          | 2649          | 3457          | 4167          |
| <b>DEP_I WITH ALC_I</b> | 0.22 (0.050)  | 0.27 (0.038)  | 0.31 (0.035)  | 0.32 (0.032)  | 0.31 (0.031)  |
| <b>DEP_S WITH ALC_S</b> | 0.22 (0.061)  | 0.25 (0.052)  | 0.29 (0.052)  | 0.29 (0.055)  | 0.29 (0.055)  |
| <b>DEP_I WITH ALC_S</b> | -0.20 (0.057) | -0.21 (0.046) | -0.25 (0.043) | -0.25 (0.041) | -0.25 (0.041) |
| <b>DEP_S WITH ALC_I</b> | -0.09 (0.052) | -0.12 (0.045) | -0.12 (0.045) | -0.12 (0.045) | -0.12 (0.045) |

# Summary of main problem

- Inconsistent measures sometimes inevitable
- ALSPAC does not have **a single consistent alcohol item**
- Lack of availability of adolescent measure
  - Measures chosen arbitrarily
  - Risk factors for later adult alcoholism
- Age appropriate
- Mishaps at design stage
- Underestimation of importance

# Closing thoughts

- Has this been successful?
  - CFA model results have some face validity
  - Diagnostics difficult
  - Invariance has been assumed rather than tested
  - Ideas?
- Concern about questionnaire measures
  - Likely a possible developmental explanation
  - There always is 😊
- Results appear robust to sample chosen
  - Lack of social patterning of alcohol in UK

# Not forgetting the question!!!

- Rather modest association
- Alcohol and depressive symptoms develop together
- Suggestion that early depressive symptoms may buffer against advancement of alcohol use
  - Adolescent drinking is a social activity
  - Underage alcohol acquisition requires social networks
- Perhaps not the best model → work in progress

# Acknowledgements / thanks

- University of Bristol
- Medical Research Council
- Wellcome Trust
  
- ALSPAC staff
- ALSPAC participants