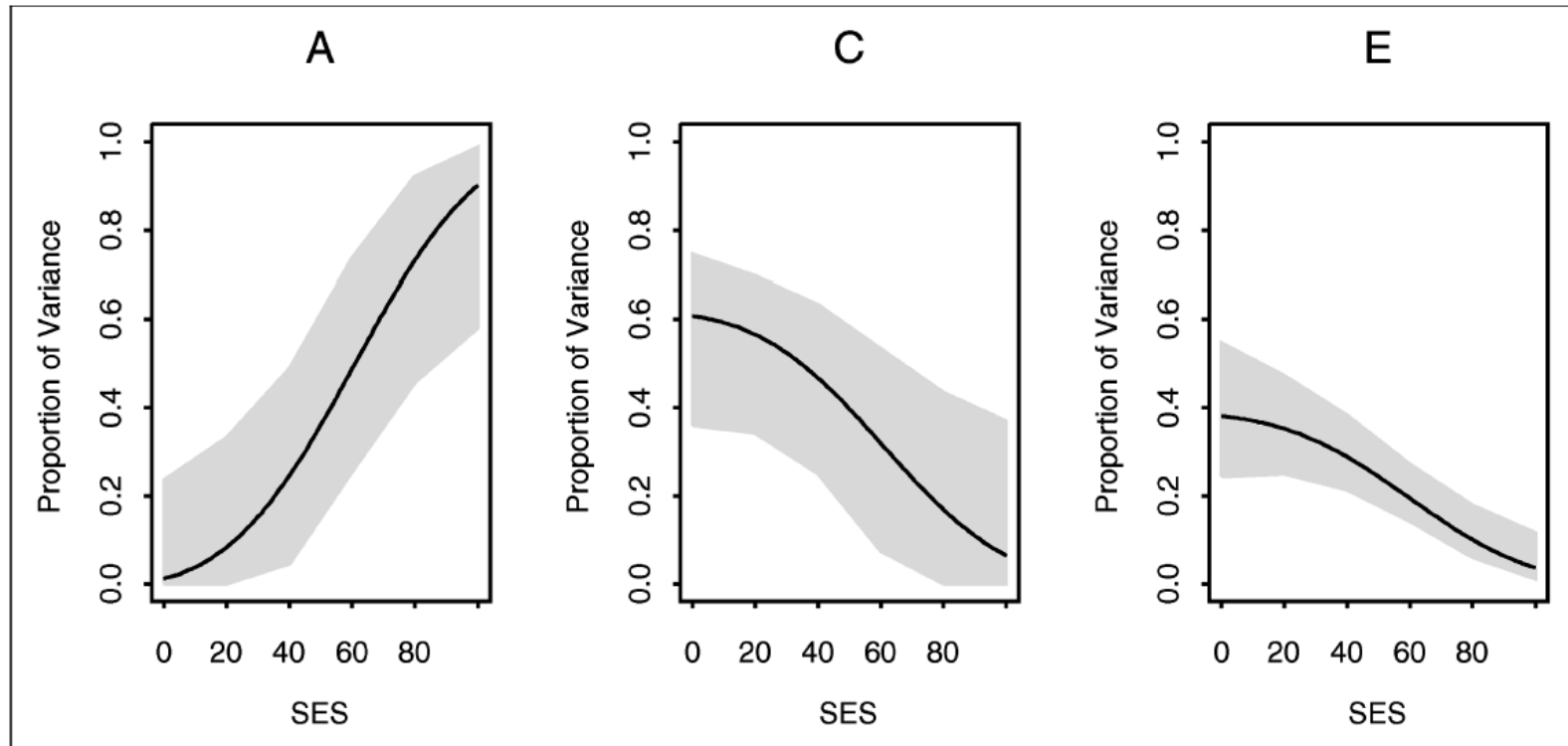


Slides:

[faculty/sanja/Boulder\\_2012/Moderating\\_covariances\\_IQ\\_SES/Slides](#)

Moderating covariances: practical

Turkheimer, E., Haley, A., Waldron, M., D'Onofrio, B., & Gottesman, I.I. (2003). Socioeconomic status modifies heritability of IQ in young children. *Psychological Science*, 14(6), 623-628.



**Fig. 3.** Proportion of total Full-Scale IQ variance accounted for by A, C, and E plotted as a function of observed socioeconomic status (SES). Shading indicates 95% confidence intervals.

Current practical: Does SES modify variance components of IQ in 5 year old children?

Data:

zygosity	socioeconomic status	IQ twin 1	IQ twin 2
<b>zyg</b>	<b>ses</b>	<b>iq1</b>	<b>iq2</b>
1	3	-0.88	-1.36
2	3	0.1	-0.11
2	3	1.14	0.44
2	2	0.1	-0.18
1	3	-0.39	-0.74
1	3	0.1	1.7
...			

N = 430 twin pairs (205 MZ, 225 DZ)

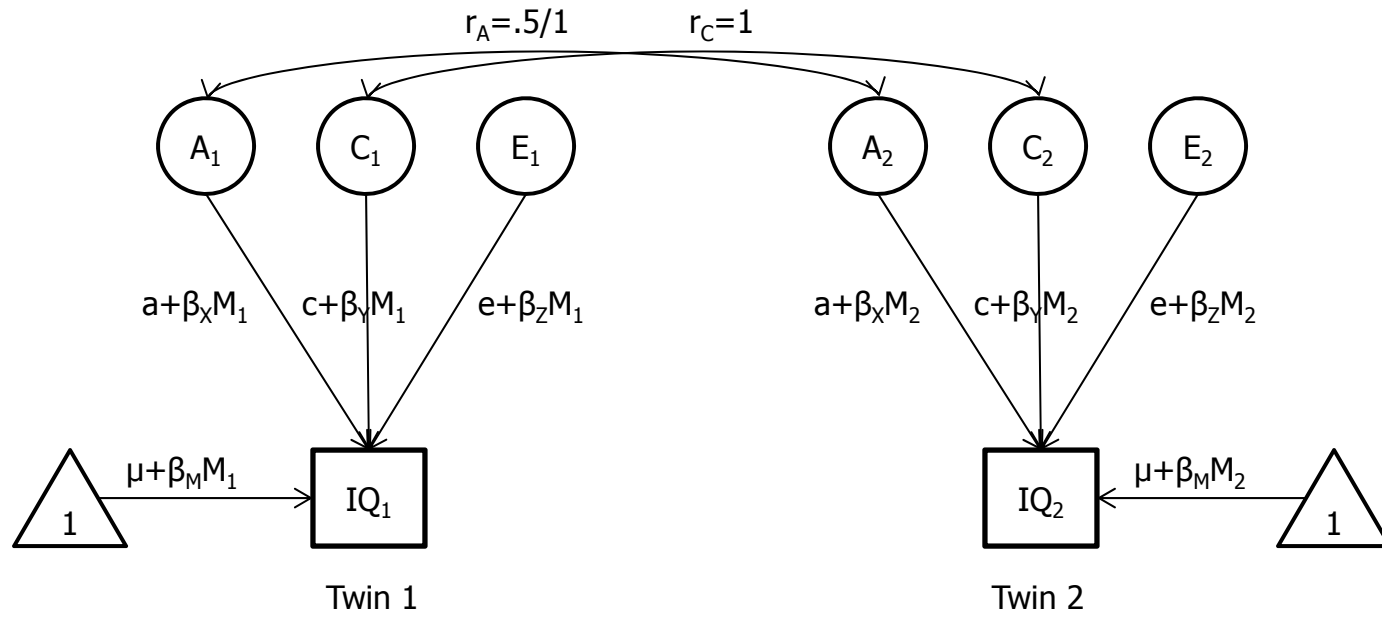
IQ scaled to have mean = 0 and variance = 1

SES measured on a 5-point scale (1 = low, 5 = high)

Is the magnitude of variance components modified by the children's SES?

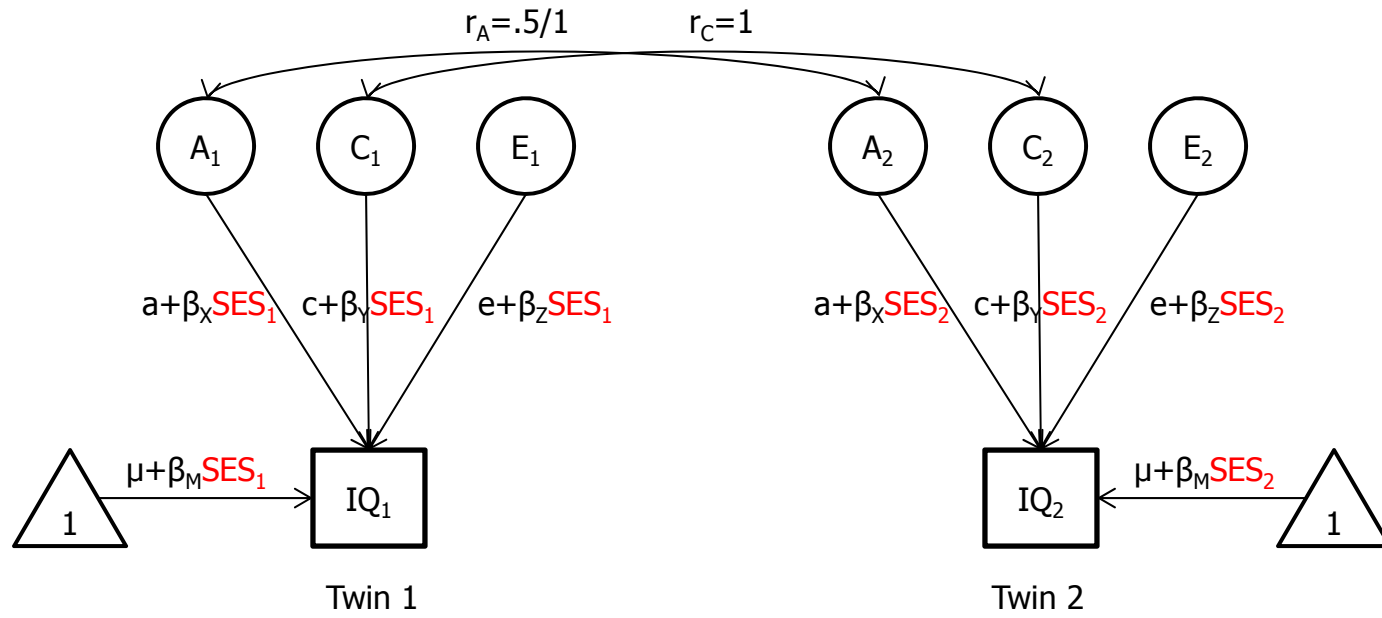
Current practical: Does SES modify variance components of IQ in 5 year old children?

Model:



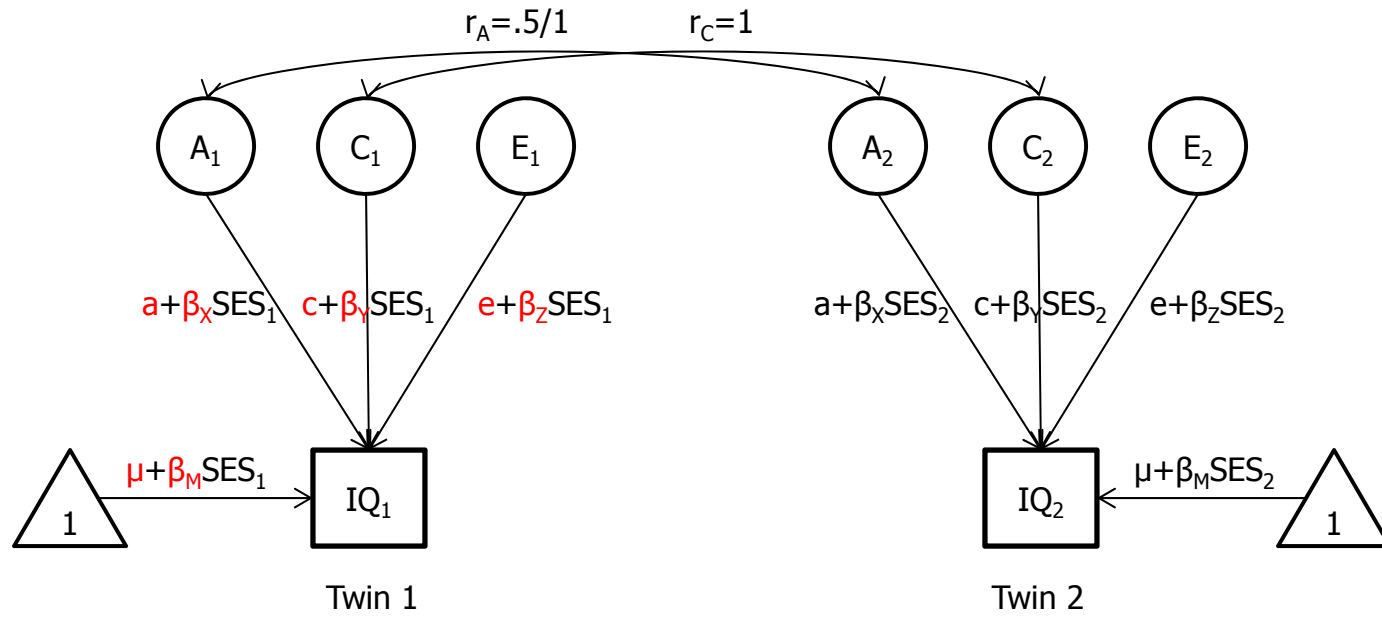
Current practical: Does SES modify variance components of IQ in 5 year old children?

Model:



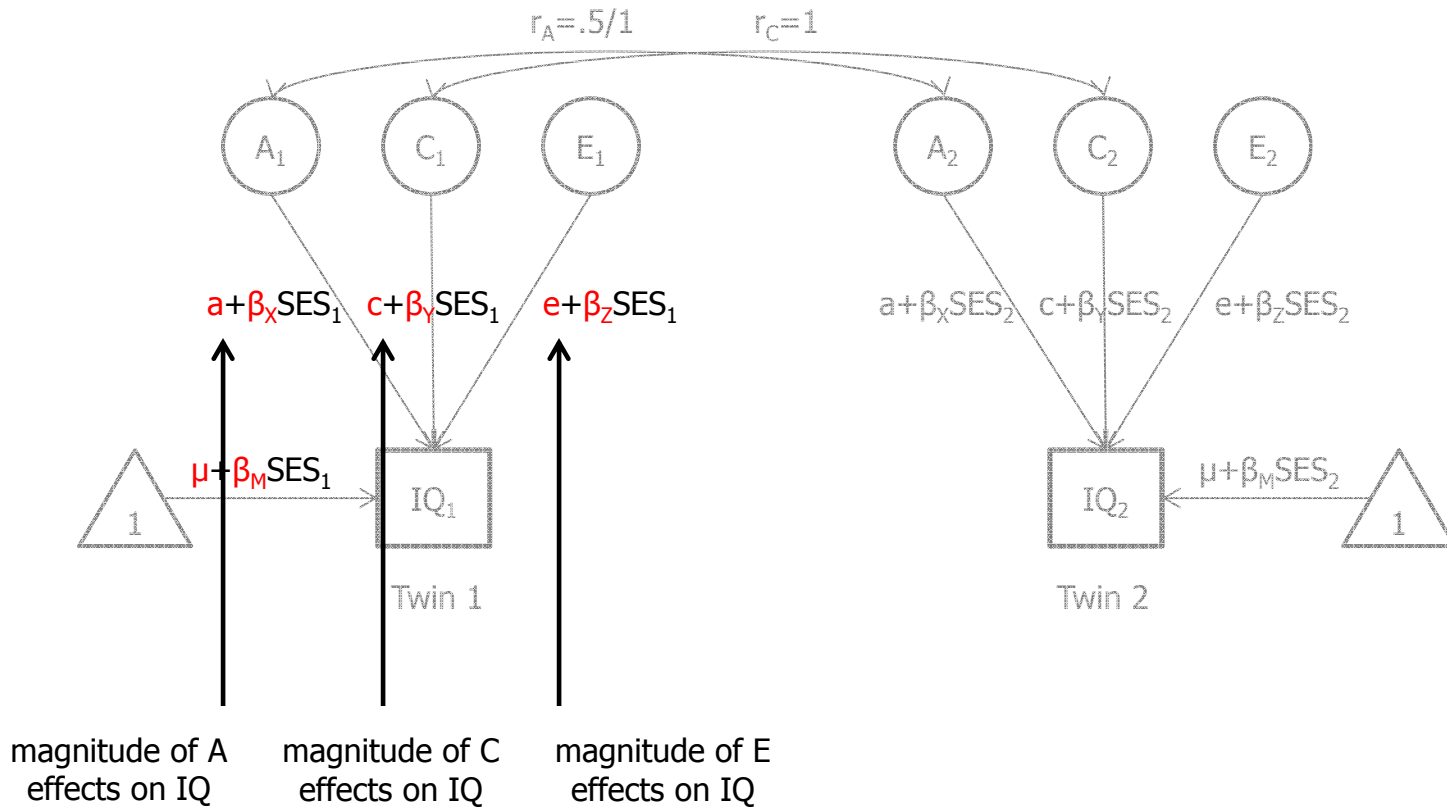
Current practical: Does SES modify variance components of IQ in 5 year old children?

Parameters to estimate:



Current practical: Does SES modify variance components of IQ in 5 year old children?

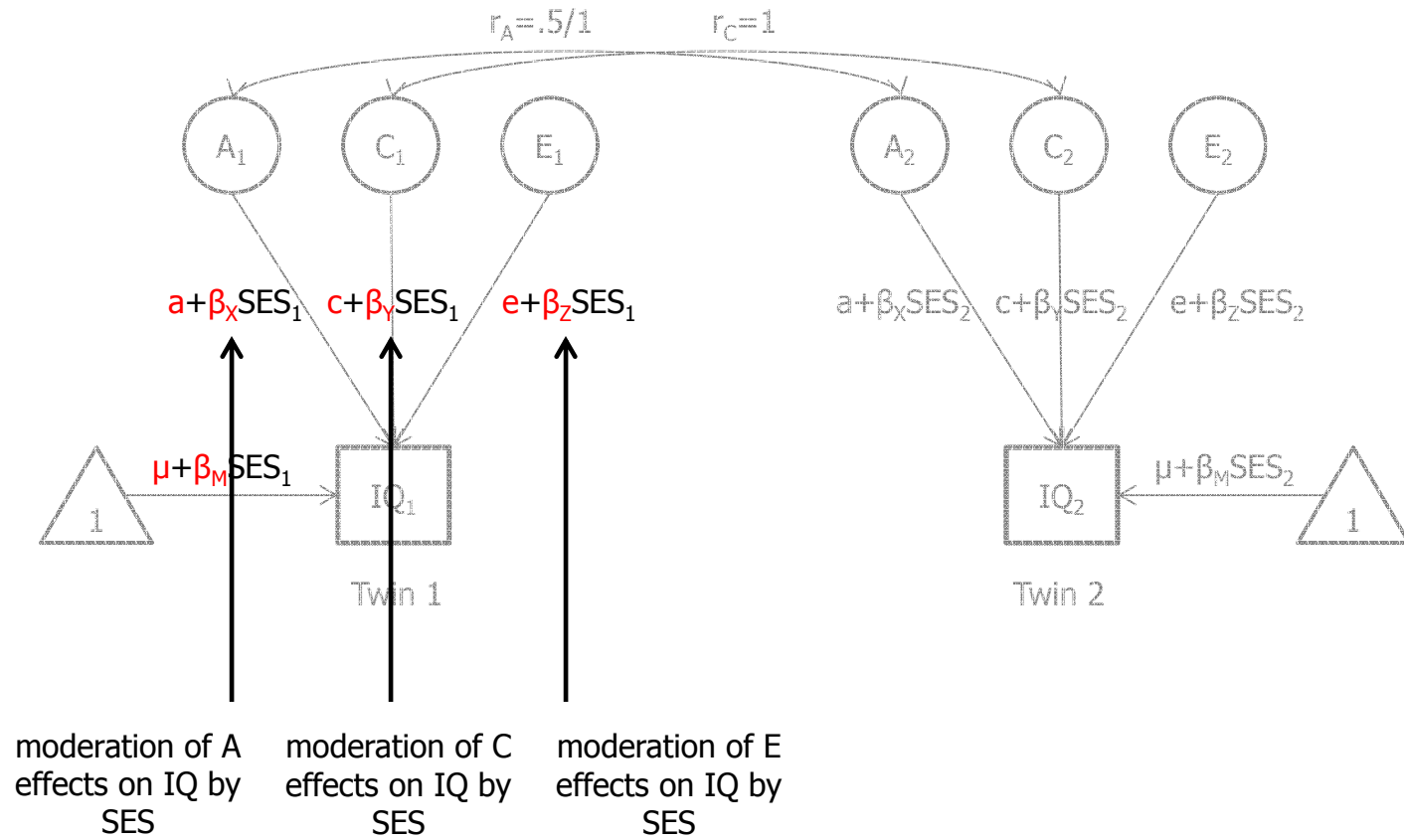
Parameters to estimate:





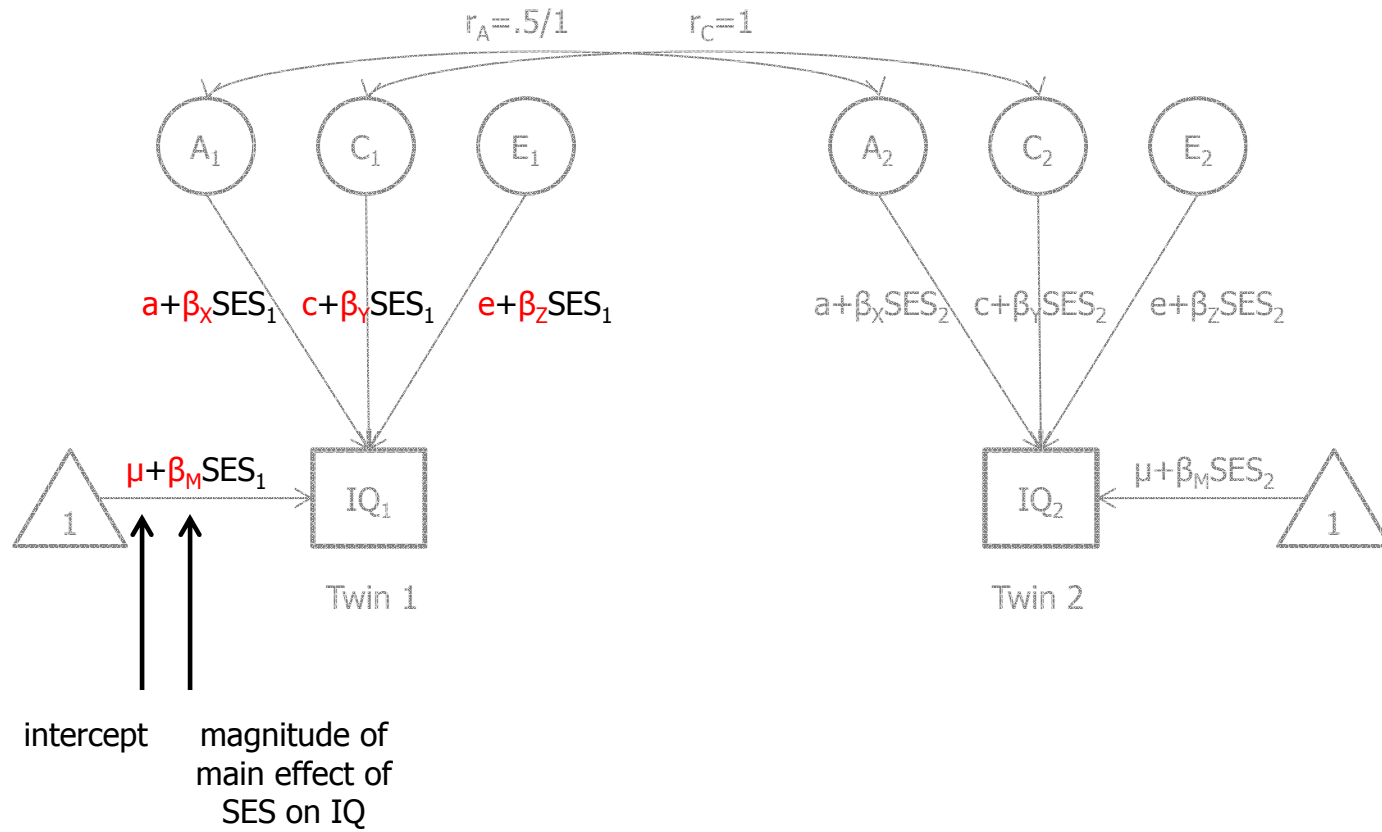
Current practical: Does SES modify variance components of IQ in 5 year old children?

Parameters to estimate:



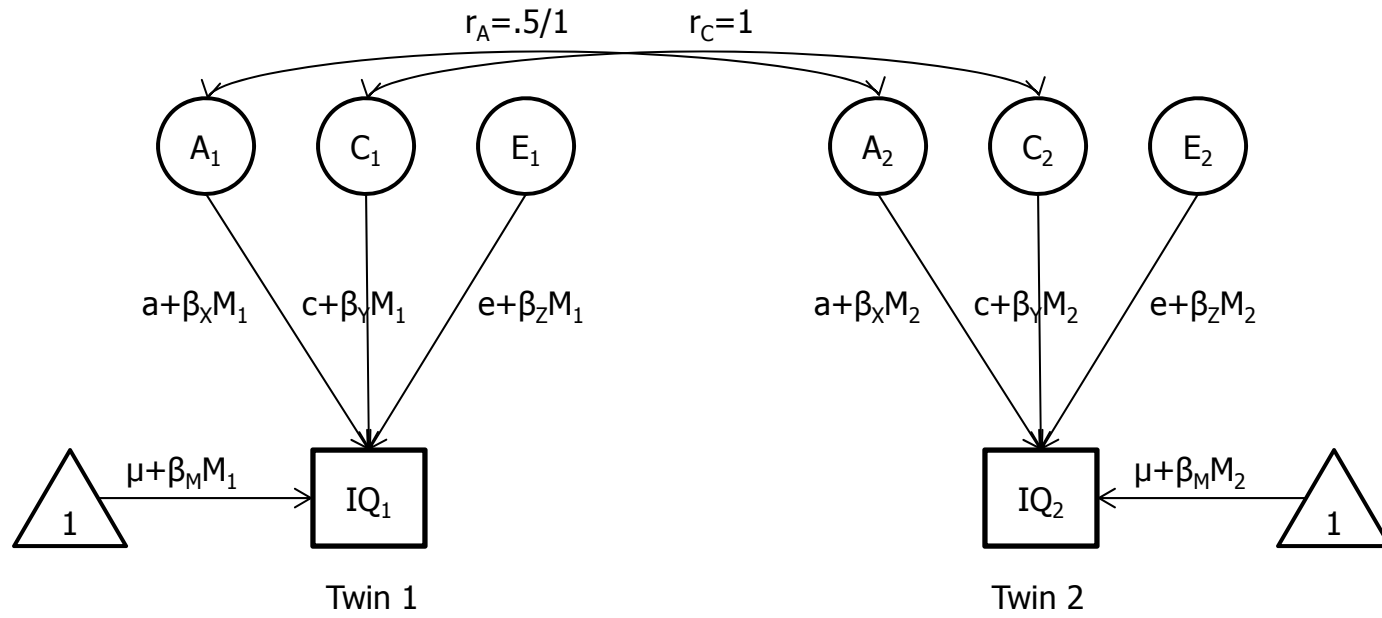
Current practical: Does SES modify variance components of IQ in 5 year old children?

Parameters to estimate:



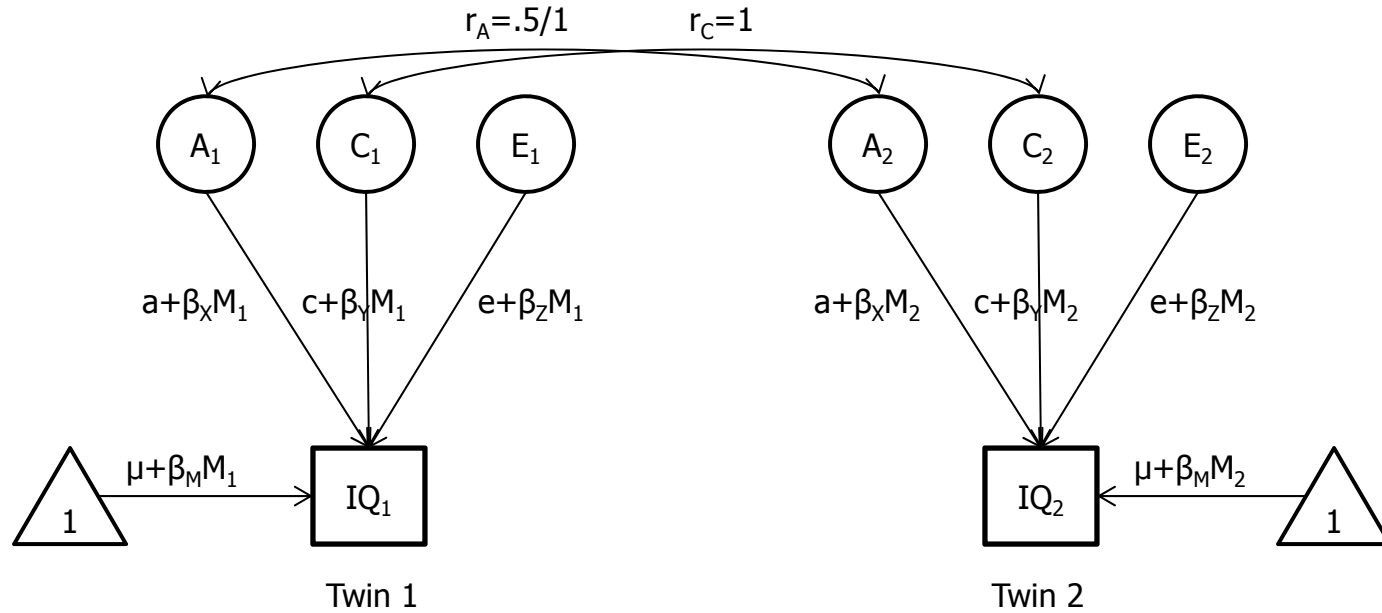
Current practical: Does SES modify variance components of IQ in 5 year old children?

Model:



Current practical: Does SES modify variance components of IQ in 5 year old children?

Model:



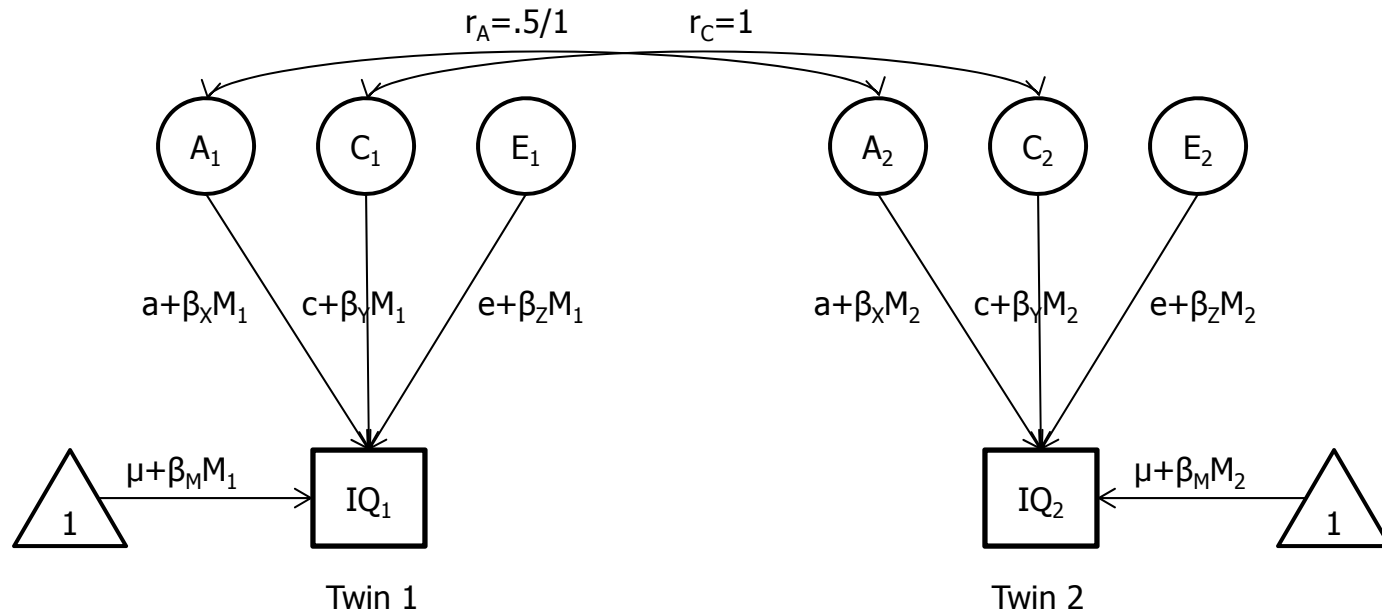
Expectations for means (conditional on the level of the moderator  $M_i$ ):

$$\begin{aligned} \text{mean}(IQ_i | M_i) &= (a + \beta_x M_i) * \text{mean}(A_i) + (c + \beta_y M_i) * \text{mean}(C_i) + (e + \beta_z M_i) * \text{mean}(E_i) + (\mu + \beta_M M_i) * 1 \\ &= (a + \beta_x M_i) * 0 + (c + \beta_y M_i) * 0 + (e + \beta_z M_i) * 0 + (\mu + \beta_M M_i) * 1 \\ &= \mu + \beta_M M_i \end{aligned}$$

for  $i = 1, 2$  (twin 1, twin 2)

Current practical: Does SES modify variance components of IQ in 5 year old children?

Model:



Expectations for variances (conditional on the level of the moderator  $M_i$ ):

$$\begin{aligned} \text{var}(IQ_i | M_i) &= (a + \beta_X M_i)^2 \text{var}(A_i) + (c + \beta_Y M_i)^2 \text{var}(C_i) + (e + \beta_Z M_i)^2 \text{var}(E_i) + (\mu + \beta_M M_i)^2 \cdot 0 \\ &= (a + \beta_X M_i)^2 \cdot 1 + (c + \beta_Y M_i)^2 \cdot 1 + (e + \beta_Z M_i)^2 \cdot 1 + 0 \\ &= (a + \beta_X M_i)^2 + (c + \beta_Y M_i)^2 + (e + \beta_Z M_i)^2 \end{aligned}$$

for  $i = 1, 2$  (twin 1, twin 2)

Practical:

faculty/sanja/Boulder\_2012/Moderating\_covariances\_IQ\_SES/Practical