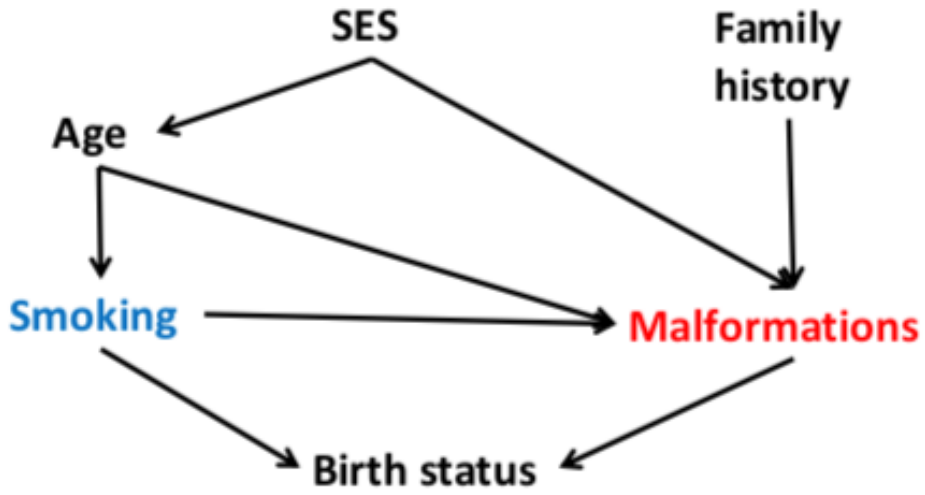
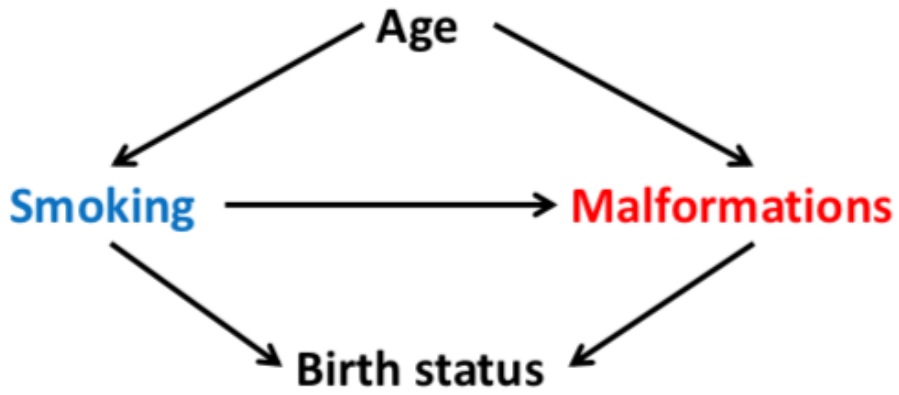
Causal diagrams for the desing and analysis of epidemiological studies

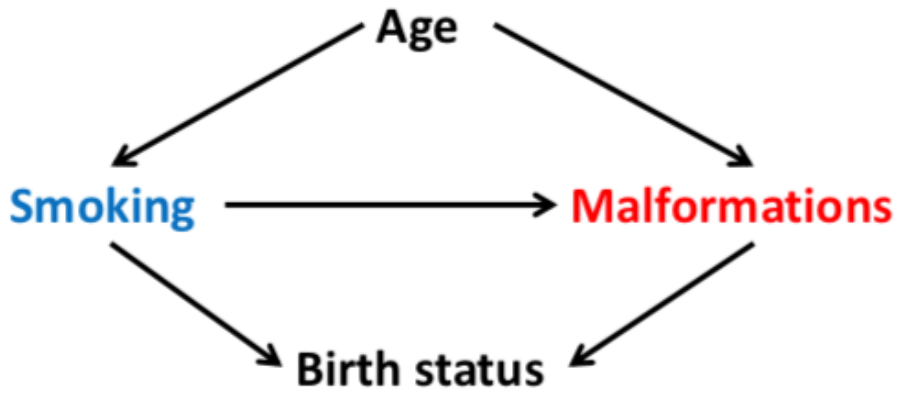
Solutions and notes



1. Collider: Birth status
2. Ancestor of smoking: SES
3. Non causal paths: smoking-age-malformations; smoking-age-SES-malformations, smoking-birth status-malformations
4. Causal paths: smoking-malformations

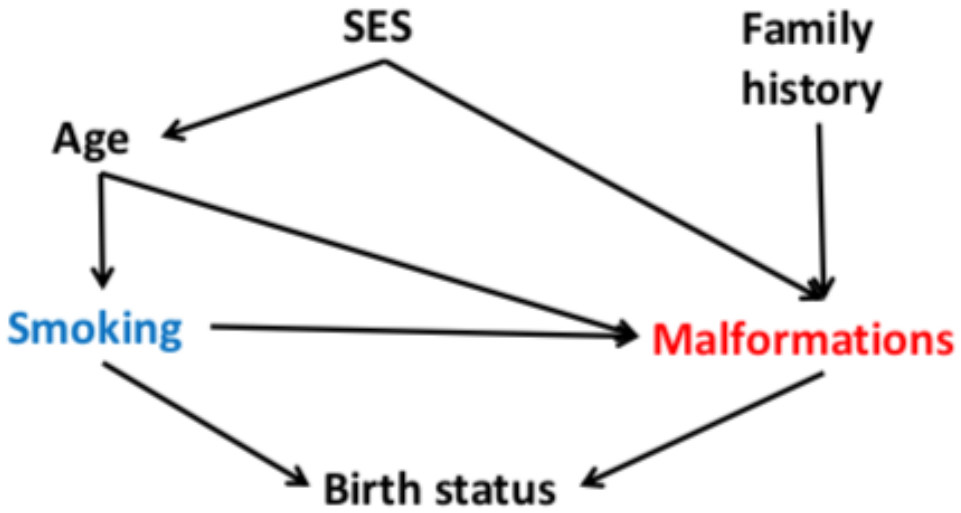


1. Paths: smoking-malformations; smoking-age-malformations; smoking-birth status-malformations
2. Open paths: smoking-age-malformations; smoking-malformations,
3. Blocked paths: smoking-birth status-malformations



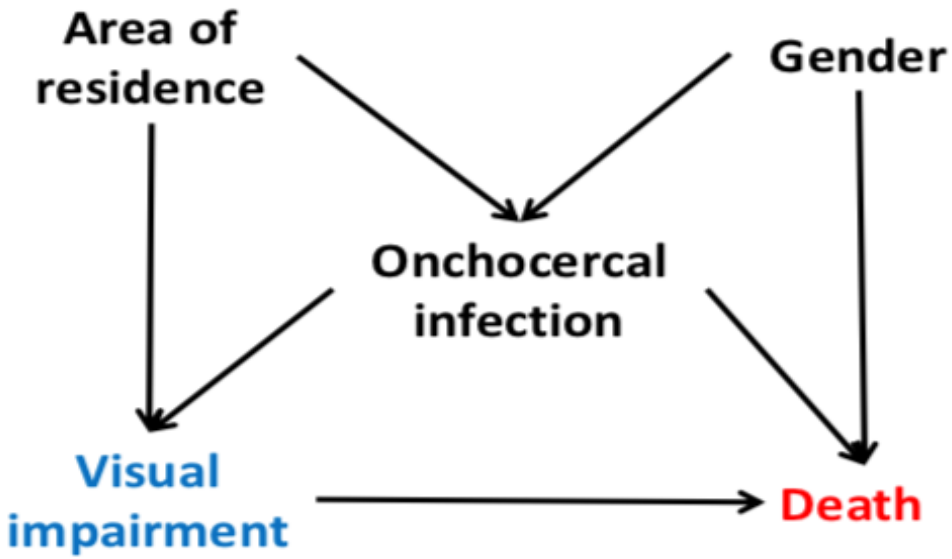
To estimate the causal effect of smoking on malformation, which variable should we control for?

- **Age**



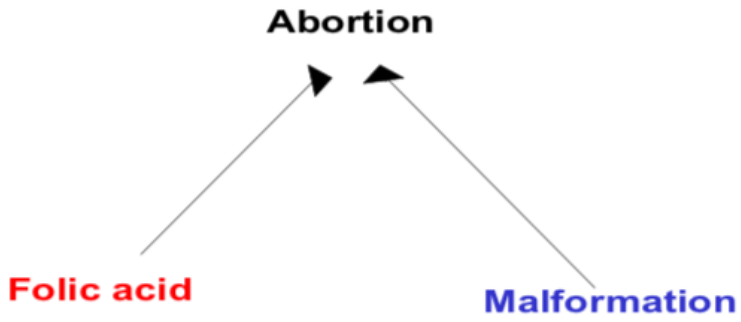
To estimate the causal effect of smoking on malformation, which variable should we control for?

- **Age** is still sufficient, as it blocks both the smoking-age-malformations path and the smoking-age-SES-malformations path

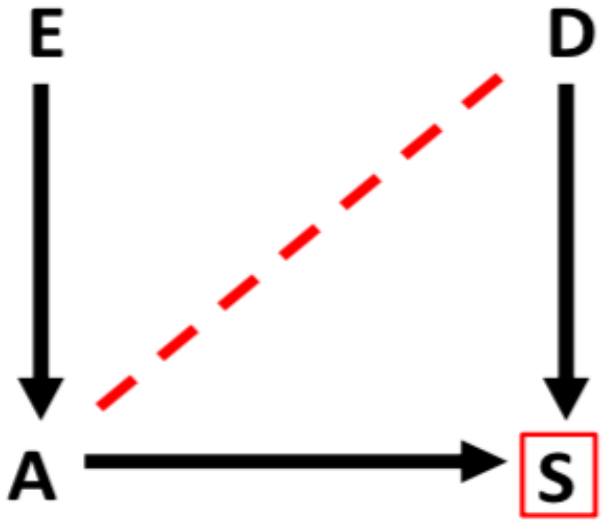


To estimate the causal effect of visual impairment on death, which variable should we control for?

- We need to control for **onchocercal infection** to block the visual impairment-infection-death path.
- However infection is a collider in the visual impairment-area of residence-infection-gender-death path, and therefore controlling for it we induce a spurious association between area of residence and gender
- Therefore we need to control for **area of residence OR gender as well** as onchocercal infection



- **Abortion** is a collider not a confounder
- It means that the estimate derived from the study carried out among live births is biased, as it was implicitly conditioned abortion (study popoluation did not include pregnancy ended up in a therapeutic abortion)



- Postmenopausal esyrogens(exposure of interest) increases the risk of hip fracture
- Controls are selected among patients with hip fractures, thus are not from the same population of the cases
- When we conduct the study (condition on S) we induce an association A and D. Since E cause D we open a path from E to D through A