Figure 9. Conditional independence

X and Y are conditionally independent given Z if, knowing Z, discovering Y tells you nothing more about X

\[ P(X \mid Y, Z) = P(X \mid Z) \]

- Z = genotype of parents
- X, Y = genotypes of 2 children
- If we know the genotype of the parents, then the children’s genotypes are conditionally independent

The principle illustrated above holds true whether the causal direction is that Z causes both X and Y, as shown, or X → Y → Z, or Z → Y → X. It does not hold if Z is caused by both X and Y, i.e. both arrows point to Z, a situation known as a “collider” (see figure 2).

Conditional independence provides mathematical basis for splitting up large system into smaller components

Diagrams adapted from reference 48.