

Causality vs. Association

- Sir Austin Bradford Hill (1897-1991)
 - arguably the most important person in the development of Epidemiology research methods
 - developed a list of criteria for potential causality that continues to be used today.

The Bradford Hill Criteria

- **Strength of Association.** The stronger the relationship between the independent variable and the dependent variable, the less likely it is that the relationship is due to an extraneous variable.
- **Temporality.** It is logically necessary for a cause to precede an effect in time.
- **Consistency.** Multiple observations, of an association, with different people under different circumstances and with different measurement instruments increase the credibility of a finding.
- **Theoretical Plausibility.** It is easier to accept an association as causal when there is a rational and theoretical basis for such a conclusion.
- **Coherence.** A cause-and-effect interpretation for an association is clearest when it does not conflict with what is known about the variables under study and when there are no plausible competing theories or rival hypotheses. In other words, the association must be coherent with other knowledge.
- **Specificity.** In the ideal situation, the effect has only one cause. In other words, showing that an outcome is best predicted by one primary factor adds credibility to a causal claim.
- **Dose Response Relationship.** There should be a direct relationship between the risk factor (i.e., the independent variable) and people's status on the disease variable (i.e., the dependent variable).
- **Experimental Evidence.** Any related research that is based on experiments will make a causal inference more plausible.
- **Analogy.** Sometimes a commonly accepted phenomenon in one area can be applied to another area.