Why your friends . . .

Definitions:
Consider sampling \( N \) values \( X_i \) of some variable \( X \).
Then the *expectation value* is the average: \( \mathbb{E}[X] = \frac{1}{N} \sum_i X_i \).
The *variance* is defined as \( \text{Var}[X] = \frac{1}{N} \sum_i (X_i - \mathbb{E}[X])^2 \),
and satisfies \( \text{Var}[X] = \mathbb{E}[X^2] - (\mathbb{E}[X])^2 \).
The *standard deviation* is the square root: \( \text{std}[X] = \sqrt{\text{Var}[X]} \).

Feld 1991:
Node \( i \) has degree \( d_i \), i.e., \( d_i \) friends.

\[
\text{total fof} = \sum_{\text{nodes } i} \sum_{\text{friends } f \text{ of } i} d_f = \sum_i d_i^2
\]
(since each \( d_f \) occurs \( d_f \) times in the first double sum).
Average fof per person = \( \frac{1}{N} \sum_i d_i^2 = \mathbb{E}[d^2] = \text{Var}[d] + (\mathbb{E}[d])^2 \)
The average fof per friend = \( \frac{\mathbb{E}[d^2]}{\mathbb{E}[d]} = \mathbb{E}[d] + \frac{\text{Var}[d]}{\mathbb{E}[d]} \)
The variance is positive, so the above is always greater than \( \mathbb{E}[d] \).

Used: detecting flu, disease innoculation, administrative propaganda.