



## OVERVIEW

How do you know if your results are meaningful—or just chance? This module introduces statistical significance, the tool researchers use to test whether patterns in data are real. Learn what a p-value tells you, how to interpret it, and why real-world impact always matters just as much.

## Definitions

Statistical Significance:

- **Definition:** Determines if a pattern in data is real or due to chance.
- **Threshold:** Typically  $p < 0.05$  (5% probability the result is random).

p-value:

- **Definition:** Probability that observed results occurred by chance.
- **Interpretation:**
  - **$p < 0.05$ :** Statistically significant (unlikely to be random).
  - **$p > 0.05$ :** Not statistically significant (likely due to chance).

## Key Differences

Aspect	Noise	Innaccuracy
Focus	Likelihood results are real vs. random	Real-world impact of the findings
Example	A drug reduces symptoms ( $p < 0.05$ )	The reduction is too small to matter

## Real-World Examples

- **Pierce County Mentorship Program:**
  - 10% reoffending (mentored) vs. 20% (non-mentored).
  - Statistical significance ( $p < 0.05$ ) confirms the program's impact.

- **COVID-19 Vaccine Trial:**
  - 95% efficacy with  $p < 0.0001$ .
  - Highly significant and practically impactful.
- **Public Trust Survey:**
  - 65% → 70% trust increase (2023–2024).
  - Significance depends on sample size; small samples risk false conclusions.

### Common Pitfalls

- **Misinterpreting p-values:** A low p-value does not mean the effect is large or important.
- **Ignoring context:** A statistically significant result (e.g., 0.5% improvement) may lack real-world relevance.
- **Small sample bias:** Increases risk of false positives or missing true effects.

### Key Takeaways

- **Statistical significance ≠ Practical importance:** Always assess the magnitude of the effect.
- **Use thresholds wisely:**  $p < 0.05$  is a guideline, not a guarantee of truth.
- **Combine with real-world analysis:** Pair statistical results with domain expertise.