

Hellenic Complex Systems Laboratory

# Inferences about the Difference between Two Proportions

Technical Report XVIII

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# Inferences about the Difference between Two Proportions

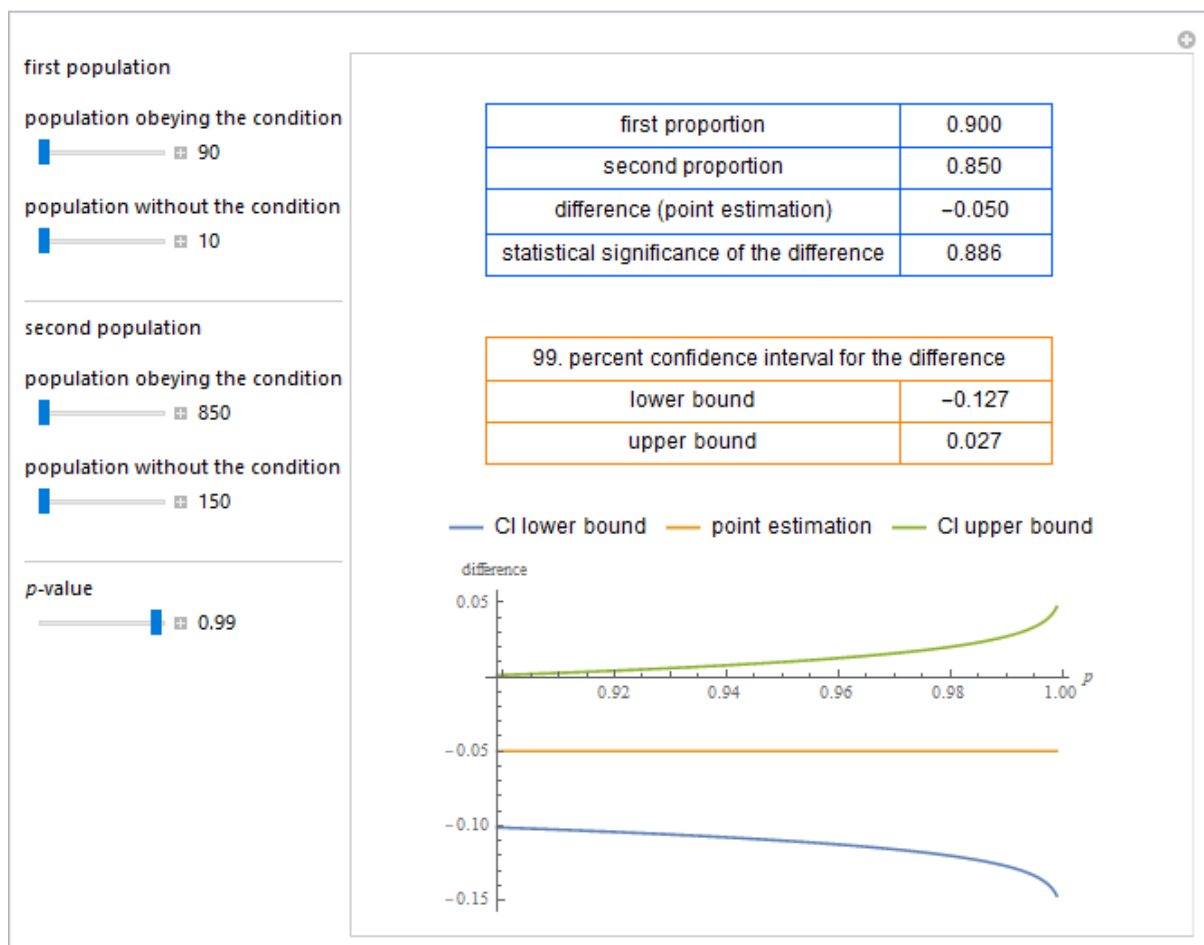
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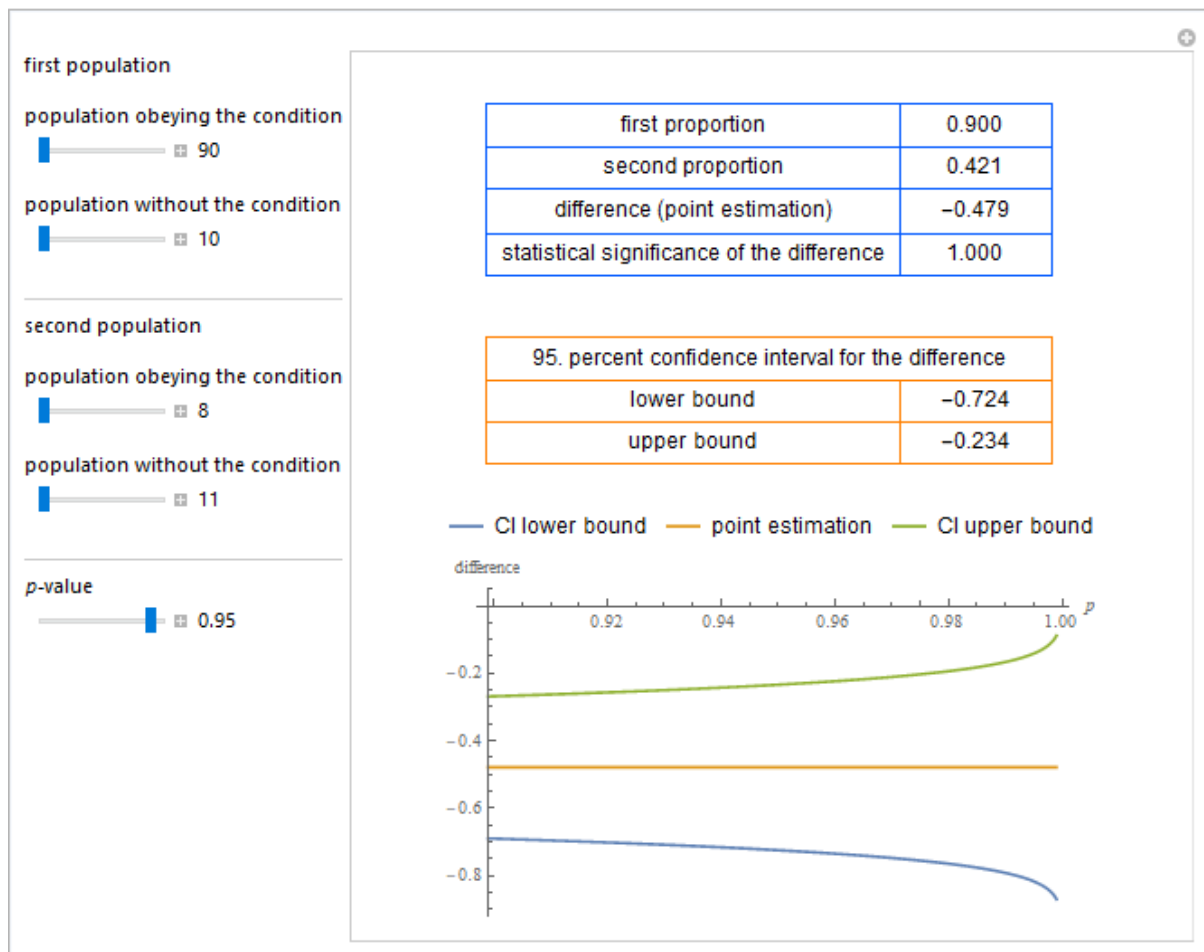
**Search Terms:** proportions, difference between proportions, confidence interval, inference, critical ratio statistic, statistical significance, statistics

## Abstract

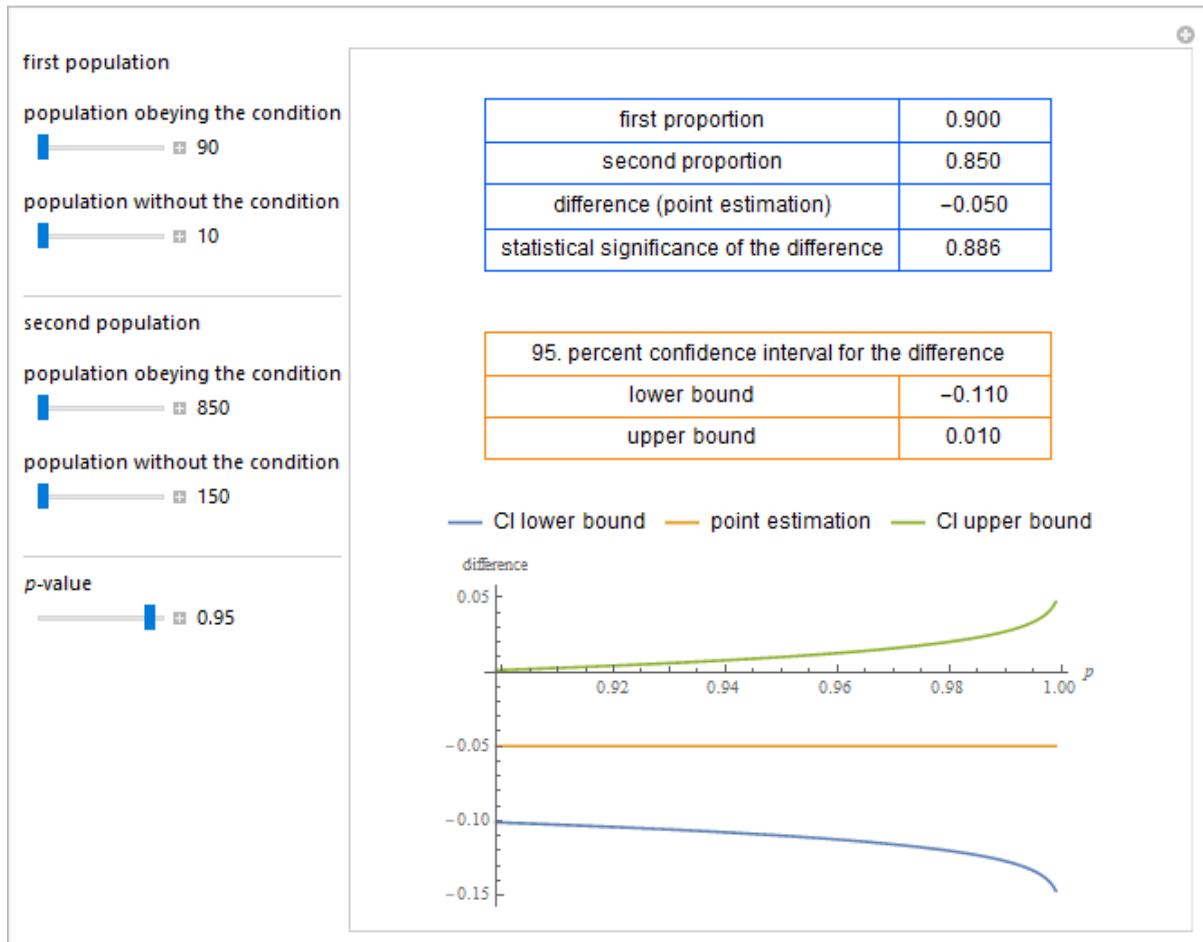
This Demonstration explores statistical inferences regarding the difference between two proportions of populations obeying a condition (or trait). It calculates the statistical significance and the confidence intervals for the difference and plots the confidence intervals versus  $p$ -value. This is done for differing populations obeying a condition or without the condition and for differing  $p$ -values for the estimation of the confidence intervals.



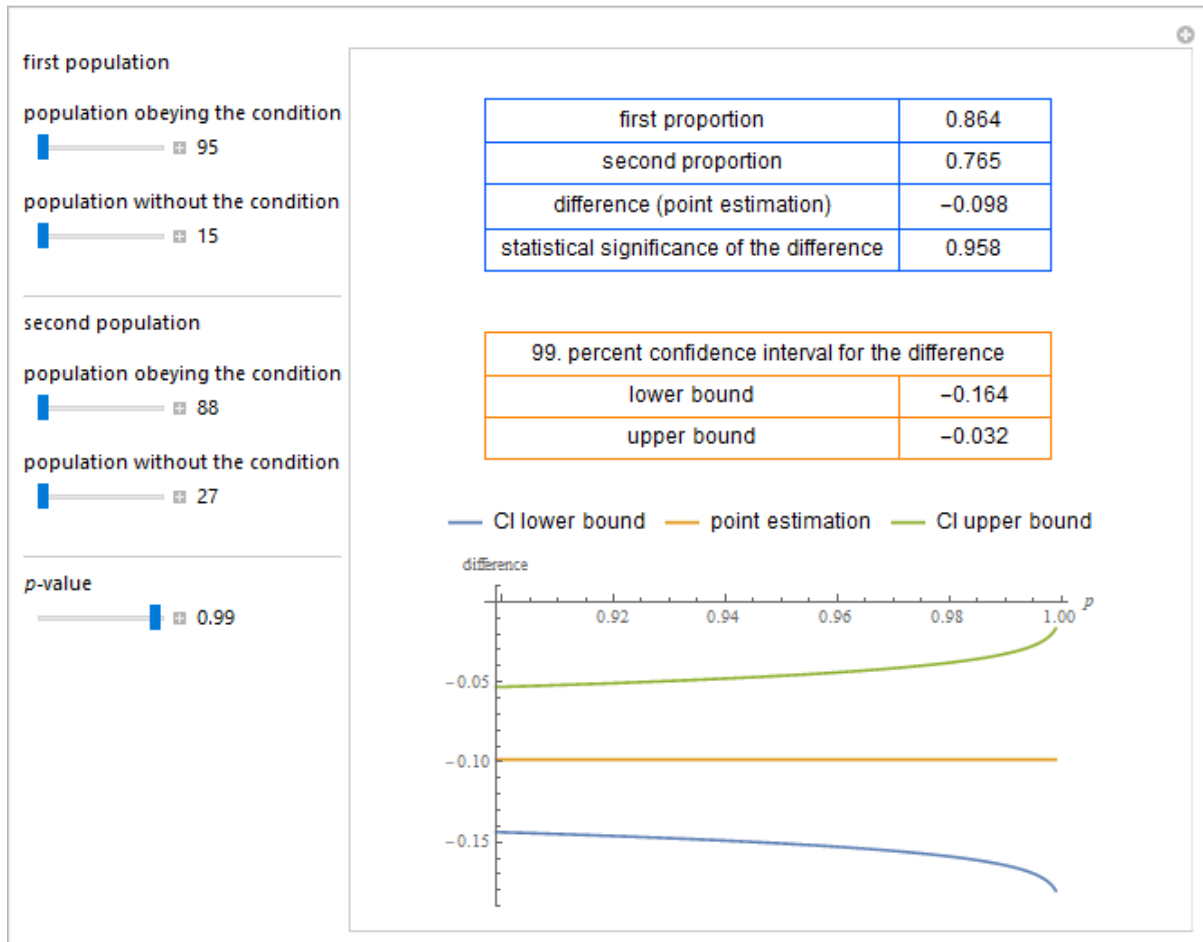
**Figure 1:** Point estimation and 99% confidence interval for the difference of two proportions of populations obeying a condition, as well as their plots versus  $p$ -value. First population obeying and violating the condition: 90 and 10 respectively, second population obeying and violating the condition: 850 and 150 respectively.



**Figure 2:** Point estimation and 95% confidence interval for the difference of two proportions of populations obeying a condition, as well as their plots versus  $p$ -value. First population obeying and violating the condition: 90 and 10 respectively, second population obeying and violating the condition: 8 and 11 respectively.



**Figure 3:** Point estimation and 95% confidence interval for the difference of two proportions of populations obeying a condition, as well as their plots versus  $p$ -value. First population obeying and violating the condition: 90 and 10 respectively, second population obeying and violating the condition: 850 and 150 respectively.



**Figure 4:** Point estimation and 99% confidence interval for the difference of two proportions of populations obeying a condition, as well as their plots versus  $p$ -value. First population obeying and violating the condition: 95 and 15 respectively, second population obeying and violating the condition: 88 and 27 respectively.

## Details

The statistical significance of the difference between the two proportions is assessed by means of the z-score (or critical ratio statistic) [1]. The confidence interval for the difference between the proportions is calculated as in [2].

## References

[1] J. L. Fleiss, B. Levin and M. C. Paik. Methods for Generating a Fourfold Table. *Statistical Methods for Rates and Proportions*, 3rd ed., Hoboken, NJ: J. Wiley, 2003 pp. 51–52.

[2] J. L. Fleiss, B. Levin and M. C. Paik. A Simple Confidence Interval for the Difference between Two Independent Proportions. *Statistical Methods for Rates and Proportions*, 3rd ed., Hoboken, NJ: J. Wiley, 2003 pp. 60–61.

## Source Code

The updated Wolfram Mathematica® source code is available at:

<https://www.hcsl.com/Tools/InferencesAboutTheDifferenceBetweenTwoProportions-author.nb>

## Permanent Citation:

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<http://demonstrations.wolfram.com/InferencesAboutTheDifferenceBetweenTwoProportions/>

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