

## Breslow-Day Test

Breslow-Day Test  
Import and test-specific preparation

## Dataset Name

### Notes

|                |                |                                                                                     |
|----------------|----------------|-------------------------------------------------------------------------------------|
| Output Created |                | 16-JUL-2026 14:40:18                                                                |
| Comments       |                |                                                                                     |
| Input          | Data           | D:\DATA ANALYSIS\Chi Square and Categorical Data Tests\Breslow Day Test\dataset.csv |
|                | Filter         | <none>                                                                              |
|                | Weight         | <none>                                                                              |
|                | Split File     | <none>                                                                              |
| Syntax         |                | DATASET NAME<br>BreslowDayTestData.                                                 |
| Resources      | Processor Time | 00:00:00.03                                                                         |
|                | Elapsed Time   | 00:00:00.02                                                                         |

### Warnings

The active dataset will replace the existing dataset named  
BreslowDayTestData.

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school into school\_n

| Old Value | New Value | Value | Label |
|-----------|-----------|-------|-------|
|-----------|-----------|-------|-------|

|    |   |    |
|----|---|----|
| GP | 1 | GP |
| MS | 2 | MS |

reason into reason\_n

| Old Value | New Value | Value | Label |
|-----------|-----------|-------|-------|
|-----------|-----------|-------|-------|

|            |   |            |
|------------|---|------------|
| course     | 1 | course     |
| home       | 2 | home       |
| other      | 3 | other      |
| reputation | 4 | reputation |

guardian into guardian\_n

Breslow-Day Test  
Import and test-specific preparation

| Old Value | New Value | Value  | Label |
|-----------|-----------|--------|-------|
| father    | 1         | father |       |
| mother    | 2         | mother |       |
| other     | 3         | other  |       |

#### Breslow-Day stratum diagnostics

>Warning # 2004 on line 6184. Command name: SUBTITLE

>The subtitle given exceeds 60 characters in length. The first 60 characters  
>will be used.

Breslow-Day stratum diagnostics  
Sex by final-pass tables within study-time strata; homogenei

## Crosstabs

| Notes                  |                                |                                                                                                                                                                               |
|------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output Created         |                                | 16-JUL-2026 14:40:20                                                                                                                                                          |
| Comments               |                                |                                                                                                                                                                               |
| Input                  | Data                           | D:\DATA ANALYSIS\I Chi Square and Categorical Data Tests\Breslow Day Test\dataset.csv                                                                                         |
|                        | Active Dataset                 | BreslowDayTestData                                                                                                                                                            |
|                        | Filter                         | <none>                                                                                                                                                                        |
|                        | Weight                         | <none>                                                                                                                                                                        |
|                        | Split File                     | <none>                                                                                                                                                                        |
|                        | N of Rows in Working Data File | 649                                                                                                                                                                           |
| Missing Value Handling | Definition of Missing          | User-defined missing values are treated as missing.                                                                                                                           |
|                        | Cases Used                     | Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.                                               |
| Syntax                 |                                | CROSSTABS<br>/TABLES=sex_bin BY pass3 BY studytime<br>/FORMAT=AVALUE TABLES<br>/STATISTICS=CHISQ CMH RISK<br>/CELLS=COUNT ROW COLUMN EXPECTED RESID SRESID /COUNT ROUND CELL. |
| Resources              | Processor Time                 | 00:00:00.03                                                                                                                                                                   |
|                        | Elapsed Time                   | 00:00:00.04                                                                                                                                                                   |
|                        | Dimensions Requested           | 3                                                                                                                                                                             |
|                        | Cells Available                | 449353                                                                                                                                                                        |

[BreslowDayTestData]

Breslow-Day stratum diagnostics  
Sex by final-pass tables within study-time strata; homogenei

**Case Processing Summary**

|                                                          | Valid |         | Cases Missing |         | Total |         |
|----------------------------------------------------------|-------|---------|---------------|---------|-------|---------|
|                                                          | N     | Percent | N             | Percent | N     | Percent |
| Sex: 0 female, 1 male * G3 pass status at 10 * studytime | 649   | 100.0%  | 0             | 0.0%    | 649   | 100.0%  |

**Sex: 0 female, 1 male \* G3 pass status at 10 \* studytime Crosstabulation**

| studytime |                       |        |                                | G3 pass status at 10 |            | Total  |
|-----------|-----------------------|--------|--------------------------------|----------------------|------------|--------|
|           |                       |        |                                | No / fail            | Yes / pass |        |
| 1         | Sex: 0 female, 1 male | Female | Count                          | 18                   | 71         | 89     |
|           |                       |        | Expected Count                 | 21.0                 | 68.0       | 89.0   |
|           |                       |        | % within Sex: 0 female, 1 male | 20.2%                | 79.8%      | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 36.0%                | 43.8%      | 42.0%  |
|           |                       |        | Residual                       | -3.0                 | 3.0        |        |
|           |                       |        | Standardized Residual          | -.7                  | .4         |        |
|           |                       | Male   | Count                          | 32                   | 91         | 123    |
|           |                       |        | Expected Count                 | 29.0                 | 94.0       | 123.0  |
|           |                       |        | % within Sex: 0 female, 1 male | 26.0%                | 74.0%      | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 64.0%                | 56.2%      | 58.0%  |
|           |                       |        | Residual                       | 3.0                  | -3.0       |        |
|           |                       |        | Standardized Residual          | .6                   | -.3        |        |
|           |                       | Total  | Count                          | 50                   | 162        | 212    |
|           |                       |        | Expected Count                 | 50.0                 | 162.0      | 212.0  |
|           |                       |        | % within Sex: 0 female, 1 male | 23.6%                | 76.4%      | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 100.0%               | 100.0%     | 100.0% |
| 2         | Sex: 0 female, 1 male | Female | Count                          | 26                   | 172        | 198    |
|           |                       |        | Expected Count                 | 26.6                 | 171.4      | 198.0  |
|           |                       |        | % within Sex: 0 female, 1 male | 13.1%                | 86.9%      | 100.0% |

Breslow-Day stratum diagnostics  
Sex by final-pass tables within study-time strata; homogenei

**Sex: 0 female, 1 male \* G3 pass status at 10 \* studytime Crosstabulation**

| studytime |                       |        |                                | G3 pass status at 10 |            | Total  |
|-----------|-----------------------|--------|--------------------------------|----------------------|------------|--------|
|           |                       |        |                                | No / fail            | Yes / pass |        |
|           |                       | Male   | % within G3 pass status at 10  | 63.4%                | 65.2%      | 64.9%  |
|           |                       |        | Residual                       | -.6                  | .6         |        |
|           |                       |        | Standardized Residual          | -.1                  | .0         |        |
|           |                       |        | Count                          | 15                   | 92         | 107    |
|           |                       |        | Expected Count                 | 14.4                 | 92.6       | 107.0  |
|           |                       |        | % within Sex: 0 female, 1 male | 14.0%                | 86.0%      | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 36.6%                | 34.8%      | 35.1%  |
|           |                       |        | Residual                       | .6                   | -.6        |        |
|           |                       |        | Standardized Residual          | .2                   | -.1        |        |
|           | Total                 |        | Count                          | 41                   | 264        | 305    |
|           |                       |        | Expected Count                 | 41.0                 | 264.0      | 305.0  |
|           |                       |        | % within Sex: 0 female, 1 male | 13.4%                | 86.6%      | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 100.0%               | 100.0%     | 100.0% |
|           |                       |        |                                |                      |            |        |
| 3         | Sex: 0 female, 1 male | Female | Count                          | 6                    | 69         | 75     |
|           |                       |        | Expected Count                 | 5.4                  | 69.6       | 75.0   |
|           |                       |        | % within Sex: 0 female, 1 male | 8.0%                 | 92.0%      | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 85.7%                | 76.7%      | 77.3%  |
|           |                       |        | Residual                       | .6                   | -.6        |        |
|           |                       |        | Standardized Residual          | .3                   | -.1        |        |
|           |                       | Male   | Count                          | 1                    | 21         | 22     |
|           |                       |        | Expected Count                 | 1.6                  | 20.4       | 22.0   |
|           |                       |        | % within Sex: 0 female, 1 male | 4.5%                 | 95.5%      | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 14.3%                | 23.3%      | 22.7%  |
|           |                       |        | Residual                       | -.6                  | .6         |        |
|           |                       |        | Standardized Residual          | -.5                  | .1         |        |

Breslow-Day stratum diagnostics  
Sex by final-pass tables within study-time strata; homogenei

**Sex: 0 female, 1 male \* G3 pass status at 10 \* studytime Crosstabulation**

| studytime |                       |        |                                | G3 pass status at 10 |            | Total  |
|-----------|-----------------------|--------|--------------------------------|----------------------|------------|--------|
|           |                       |        |                                | No / fail            | Yes / pass |        |
| Total     |                       |        | Count                          | 7                    | 90         | 97     |
|           |                       |        | Expected Count                 | 7.0                  | 90.0       | 97.0   |
|           |                       |        | % within Sex: 0 female, 1 male | 7.2%                 | 92.8%      | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 100.0%               | 100.0%     | 100.0% |
| 4         | Sex: 0 female, 1 male | Female | Count                          | 0                    | 21         | 21     |
|           |                       |        | Expected Count                 | 1.2                  | 19.8       | 21.0   |
|           |                       |        | % within Sex: 0 female, 1 male | 0.0%                 | 100.0%     | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 0.0%                 | 63.6%      | 60.0%  |
|           |                       |        | Residual                       | -1.2                 | 1.2        |        |
|           |                       |        | Standardized Residual          | -1.1                 | .3         |        |
|           |                       | Male   | Count                          | 2                    | 12         | 14     |
|           |                       |        | Expected Count                 | .8                   | 13.2       | 14.0   |
|           |                       |        | % within Sex: 0 female, 1 male | 14.3%                | 85.7%      | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 100.0%               | 36.4%      | 40.0%  |
|           |                       |        | Residual                       | 1.2                  | -1.2       |        |
|           |                       |        | Standardized Residual          | 1.3                  | -.3        |        |
|           | Total                 |        | Count                          | 2                    | 33         | 35     |
|           |                       |        | Expected Count                 | 2.0                  | 33.0       | 35.0   |
|           |                       |        | % within Sex: 0 female, 1 male | 5.7%                 | 94.3%      | 100.0% |
|           |                       |        | % within G3 pass status at 10  | 100.0%               | 100.0%     | 100.0% |
| Total     | Sex: 0 female, 1 male | Female | Count                          | 50                   | 333        | 383    |
|           |                       |        | Expected Count                 | 59.0                 | 324.0      | 383.0  |



Breslow-Day stratum diagnostics  
Sex by final-pass tables within study-time strata; homogenei

**Sex: 0 female, 1 male \* G3 pass status at 10 \* studytime Crosstabulation**

| studytime |                                | G3 pass status at 10           |            | Total  |
|-----------|--------------------------------|--------------------------------|------------|--------|
|           |                                | No / fail                      | Yes / pass |        |
|           | % within Sex: 0 female, 1 male | 13.1%                          | 86.9%      | 100.0% |
|           | % within G3 pass status at 10  | 50.0%                          | 60.7%      | 59.0%  |
|           | Residual                       | -9.0                           | 9.0        |        |
|           | Standardized Residual          | -1.2                           | .5         |        |
|           | Male                           | Count                          | 50         | 266    |
|           |                                | Expected Count                 | 41.0       | 266.0  |
|           |                                | % within Sex: 0 female, 1 male | 18.8%      | 100.0% |
|           |                                | % within G3 pass status at 10  | 39.3%      | 41.0%  |
|           | Total                          | Residual                       | 9.0        | -9.0   |
|           |                                | Standardized Residual          | 1.4        | -.6    |
|           |                                | Count                          | 100        | 649    |
|           |                                | Expected Count                 | 100.0      | 649.0  |
|           |                                | % within Sex: 0 female, 1 male | 15.4%      | 100.0% |
|           |                                | % within G3 pass status at 10  | 100.0%     | 100.0% |

Breslow-Day stratum diagnostics  
Sex by final-pass tables within study-time strata; homogenei

**Chi-Square Tests**

| studytime |                                    | Value              | df | Asymptotic<br>Significance (2-<br>sided) | Exact Sig. (2-<br>sided) |
|-----------|------------------------------------|--------------------|----|------------------------------------------|--------------------------|
| 1         | Pearson Chi-Square                 | .961 <sup>c</sup>  | 1  | .327                                     |                          |
|           | Continuity Correction <sup>b</sup> | .667               | 1  | .414                                     |                          |
|           | Likelihood Ratio                   | .972               | 1  | .324                                     |                          |
|           | Fisher's Exact Test                |                    |    |                                          | .413                     |
|           | Linear-by-Linear<br>Association    | .956               | 1  | .328                                     |                          |
|           | N of Valid Cases                   | 212                |    |                                          |                          |
|           |                                    |                    |    |                                          |                          |
| 2         | Pearson Chi-Square                 | .047 <sup>d</sup>  | 1  | .828                                     |                          |
|           | Continuity Correction <sup>b</sup> | .002               | 1  | .967                                     |                          |
|           | Likelihood Ratio                   | .047               | 1  | .829                                     |                          |
|           | Fisher's Exact Test                |                    |    |                                          | .861                     |
|           | Linear-by-Linear<br>Association    | .047               | 1  | .829                                     |                          |
|           | N of Valid Cases                   | 305                |    |                                          |                          |
|           |                                    |                    |    |                                          |                          |
| 3         | Pearson Chi-Square                 | .303 <sup>e</sup>  | 1  | .582                                     |                          |
|           | Continuity Correction <sup>b</sup> | .007               | 1  | .935                                     |                          |
|           | Likelihood Ratio                   | .334               | 1  | .563                                     |                          |
|           | Fisher's Exact Test                |                    |    |                                          | 1.000                    |
|           | Linear-by-Linear<br>Association    | .300               | 1  | .584                                     |                          |
|           | N of Valid Cases                   | 97                 |    |                                          |                          |
|           |                                    |                    |    |                                          |                          |
| 4         | Pearson Chi-Square                 | 3.182 <sup>f</sup> | 1  | .074                                     |                          |
|           | Continuity Correction <sup>b</sup> | 1.083              | 1  | .298                                     |                          |
|           | Likelihood Ratio                   | 3.849              | 1  | .050                                     |                          |
|           | Fisher's Exact Test                |                    |    |                                          | .153                     |
|           | Linear-by-Linear<br>Association    | 3.091              | 1  | .079                                     |                          |
|           | N of Valid Cases                   | 35                 |    |                                          |                          |
|           |                                    |                    |    |                                          |                          |
| Total     | Pearson Chi-Square                 | 3.971 <sup>a</sup> | 1  | .046                                     |                          |
|           | Continuity Correction <sup>b</sup> | 3.543              | 1  | .060                                     |                          |
|           | Likelihood Ratio                   | 3.918              | 1  | .048                                     |                          |

Breslow-Day stratum diagnostics  
Sex by final-pass tables within study-time strata; homogenei

**Chi-Square Tests**

| studytime |                                    | Exact Sig. (1-sided) |
|-----------|------------------------------------|----------------------|
| 1         | Pearson Chi-Square                 |                      |
|           | Continuity Correction <sup>b</sup> |                      |
|           | Likelihood Ratio                   |                      |
|           | Fisher's Exact Test                | .208                 |
|           | Linear-by-Linear Association       |                      |
|           | N of Valid Cases                   |                      |
|           |                                    |                      |
| 2         | Pearson Chi-Square                 |                      |
|           | Continuity Correction <sup>b</sup> |                      |
|           | Likelihood Ratio                   |                      |
|           | Fisher's Exact Test                | .479                 |
|           | Linear-by-Linear Association       |                      |
|           | N of Valid Cases                   |                      |
|           |                                    |                      |
| 3         | Pearson Chi-Square                 |                      |
|           | Continuity Correction <sup>b</sup> |                      |
|           | Likelihood Ratio                   |                      |
|           | Fisher's Exact Test                | .499                 |
|           | Linear-by-Linear Association       |                      |
|           | N of Valid Cases                   |                      |
|           |                                    |                      |
| 4         | Pearson Chi-Square                 |                      |
|           | Continuity Correction <sup>b</sup> |                      |
|           | Likelihood Ratio                   |                      |
|           | Fisher's Exact Test                | .153                 |
|           | Linear-by-Linear Association       |                      |
|           | N of Valid Cases                   |                      |
|           |                                    |                      |
| Total     | Pearson Chi-Square                 |                      |
|           | Continuity Correction <sup>b</sup> |                      |
|           | Likelihood Ratio                   |                      |

Breslow-Day stratum diagnostics  
Sex by final-pass tables within study-time strata; homogenei

**Chi-Square Tests**

| studytime                       | Value | df | Asymptotic<br>Significance (2-<br>sided) | Exact Sig. (2-<br>sided) |
|---------------------------------|-------|----|------------------------------------------|--------------------------|
| Fisher's Exact Test             |       |    |                                          | .060                     |
| Linear-by-Linear<br>Association | 3.965 | 1  | .046                                     |                          |
| N of Valid Cases                | 649   |    |                                          |                          |

**Chi-Square Tests**

| studytime                       | Exact Sig. (1-<br>sided) |
|---------------------------------|--------------------------|
| Fisher's Exact Test             | .030                     |
| Linear-by-Linear<br>Association |                          |
| N of Valid Cases                |                          |

- a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 40.99.
- b. Computed only for a 2x2 table
- c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 20.99.
- d. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.38.
- e. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.59.
- f. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .80.

Breslow-Day stratum diagnostics  
Sex by final-pass tables within study-time strata; homogenei

**Risk Estimate**

| studytime |                                                      | Value | 95% Confidence Interval |        |
|-----------|------------------------------------------------------|-------|-------------------------|--------|
|           |                                                      |       | Lower                   | Upper  |
| 1         | Odds Ratio for Sex: 0 female, 1 male (Female / Male) | .721  | .374                    | 1.389  |
|           | For cohort G3 pass status at 10 = No / fail          | .777  | .467                    | 1.293  |
|           | For cohort G3 pass status at 10 = Yes / pass         | 1.078 | .930                    | 1.250  |
|           | N of Valid Cases                                     | 212   |                         |        |
| 2         | Odds Ratio for Sex: 0 female, 1 male (Female / Male) | .927  | .468                    | 1.837  |
|           | For cohort G3 pass status at 10 = No / fail          | .937  | .519                    | 1.690  |
|           | For cohort G3 pass status at 10 = Yes / pass         | 1.010 | .920                    | 1.110  |
|           | N of Valid Cases                                     | 305   |                         |        |
| 3         | Odds Ratio for Sex: 0 female, 1 male (Female / Male) | 1.826 | .208                    | 16.035 |
|           | For cohort G3 pass status at 10 = No / fail          | 1.760 | .224                    | 13.850 |
|           | For cohort G3 pass status at 10 = Yes / pass         | .964  | .861                    | 1.079  |
|           | N of Valid Cases                                     | 97    |                         |        |
| 4         | For cohort G3 pass status at 10 = Yes / pass         | 1.167 | .942                    | 1.445  |
|           | N of Valid Cases                                     | 35    |                         |        |
| Total     | Odds Ratio for Sex: 0 female, 1 male (Female / Male) | .649  | .423                    | .995   |
|           | For cohort G3 pass status at 10 = No / fail          | .695  | .485                    | .995   |
|           | For cohort G3 pass status at 10 = Yes / pass         | 1.071 | .999                    | 1.148  |
|           | N of Valid Cases                                     | 649   |                         |        |

Breslow-Day stratum diagnostics  
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### Tests of Homogeneity of the Odds Ratio

|             | Chi-Squared | df | Asymptotic<br>Significance (2-<br>sided) |
|-------------|-------------|----|------------------------------------------|
| Breslow-Day | 3.442       | 3  | .328                                     |
| Tarone's    | 3.442       | 3  | .328                                     |

### Tests of Conditional Independence

|                 | Chi-Squared | df | Asymptotic<br>Significance (2-<br>sided) |
|-----------------|-------------|----|------------------------------------------|
| Cochran's       | .938        | 1  | .333                                     |
| Mantel-Haenszel | .725        | 1  | .394                                     |

Under the conditional independence assumption, Cochran's statistic is asymptotically distributed as a 1 df chi-squared distribution, only if the number of strata is fixed, while the Mantel-Haenszel statistic is always asymptotically distributed as a 1 df chi-squared distribution. Note that the continuity correction is removed from the Mantel-Haenszel statistic when the sum of the differences between the observed and the expected is 0.

### Mantel-Haenszel Common Odds Ratio Estimate

|                                       |                       |             |       |
|---------------------------------------|-----------------------|-------------|-------|
| Estimate                              |                       |             | .800  |
| ln(Estimate)                          |                       |             | -.223 |
| Standard Error of ln(Estimate)        |                       |             | .229  |
| Asymptotic Significance (2-sided)     |                       |             | .331  |
| Asymptotic 95%<br>Confidence Interval | Common Odds Ratio     | Lower Bound | .510  |
|                                       |                       | Upper Bound | 1.254 |
|                                       | ln(Common Odds Ratio) | Lower Bound | -.673 |
|                                       |                       | Upper Bound | .226  |

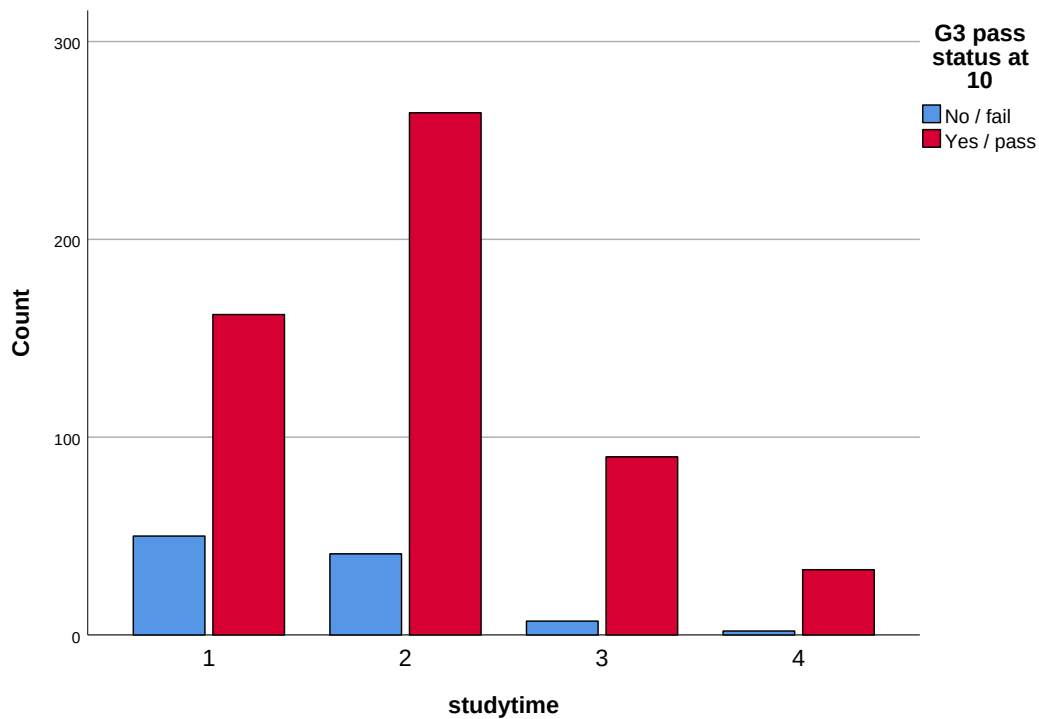
The Mantel-Haenszel common odds ratio estimate is asymptotically normally distributed under the common odds ratio of 1.000 assumption. So is the natural log of the estimate.

## Graph

Breslow-Day stratum diagnostics  
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**Notes**

|                |                                |                                                                                      |
|----------------|--------------------------------|--------------------------------------------------------------------------------------|
| Output Created |                                | 16-JUL-2026 14:40:20                                                                 |
| Comments       |                                |                                                                                      |
| Input          | Data                           | D:\DATA ANALYSIS\ Chi Square and Categorical Data Tests\Breslow Day Test\dataset.csv |
|                | Active Dataset                 | BreslowDayTestData                                                                   |
|                | Filter                         | <none>                                                                               |
|                | Weight                         | <none>                                                                               |
|                | Split File                     | <none>                                                                               |
|                | N of Rows in Working Data File | 649                                                                                  |
| Syntax         |                                | GRAPH /BAR(GROUPED)<br>=COUNT BY studytime<br>BY pass3.                              |
| Resources      | Processor Time                 | 00:00:00.77                                                                          |
|                | Elapsed Time                   | 00:00:00.56                                                                          |



Breslow-Day stratum diagnostics  
Sex by final-pass tables within study-time strata; homogenei

```
=====
=====
BRESLOW-DAY TEST
=====
=====
Formula:  $BD = \sum_h (a_h - E[a_h \mid \text{common OR}])^2 / \text{Var}(a_h \mid \text{common OR})$ 
Variables: sex, G3 >= 10, studytime
breslow_day_statistic = 3.441983431321326
common_odds_ratio = 0.7999116499170076
degrees_of_freedom = 3
p_value = 0.3283649950738907
tarone_p_value = 0.32838150935376664
tarone_statistic = 3.441858706530288
Cross-check status: pass
=====
=====
```