Phi Coefficient for Two Binary Variables

Predictor variable: sex
Outcome variable: Pass_Status_G3_10

Contingency table:

	Pass	Fail
F	333	50
M	216	50

Phi analysis result:

predictor_variable	outcome_variable	predictor_positive_level	predictor_negative_level	outcome_positive_level
sex	Pass_Status_G3_10	F	M	Pass

outcome_negative_level	a_positive_positive	b_positive_negative	c_negative_positive	d_negative_negative	n
Fail	333	50	216	50	649

phi_coefficient	chi_square_df1	p_value	cramers_v_for_2x2	odds_ratio	risk_positive_for_predictor_level_1
0.0782221	3.971035	0.04628932	0.0782221	1.541667	0.8694517

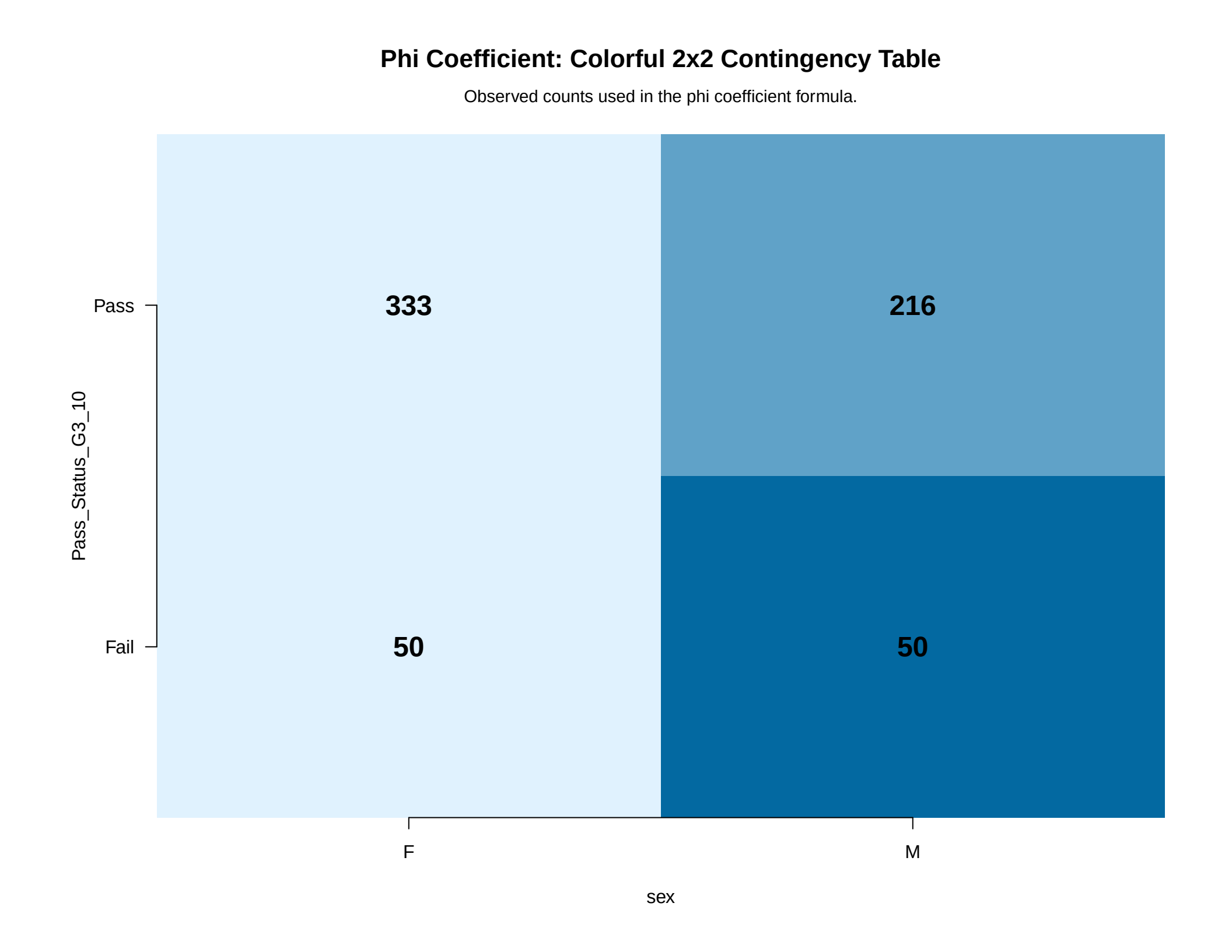
risk_positive_for_predictor_level_2	risk_difference	risk_ratio	effect_size_label
0.8120301	0.05742162	1.070714	Negligible

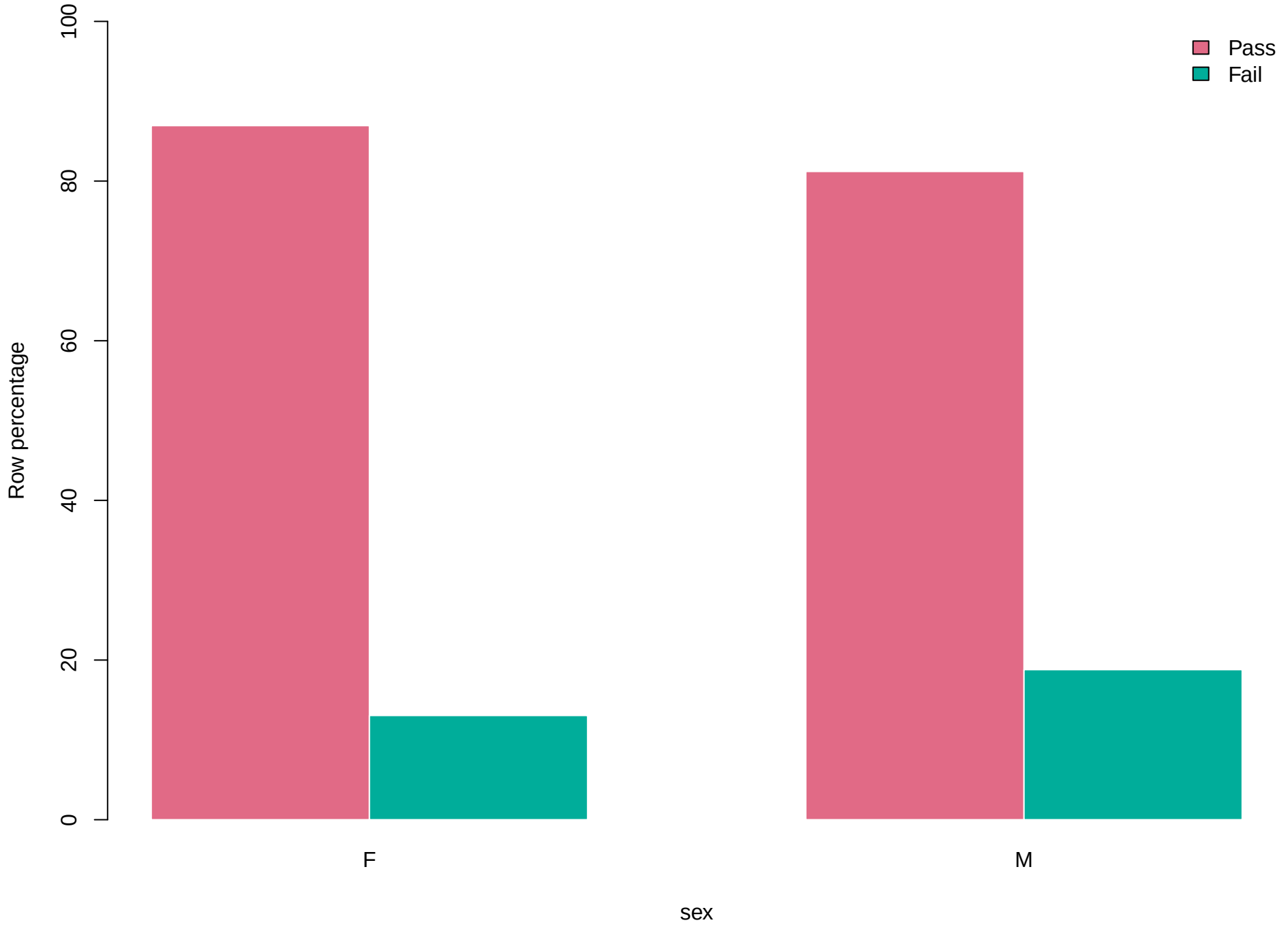
decision_alpha_0_05
Reject H0: variables are associated

method_note
Phi = (ad − bc) / sqrt((a+b)(c+d)(a+c)(b+d)); for 2x2 tables, chi−square = n * phi^2.

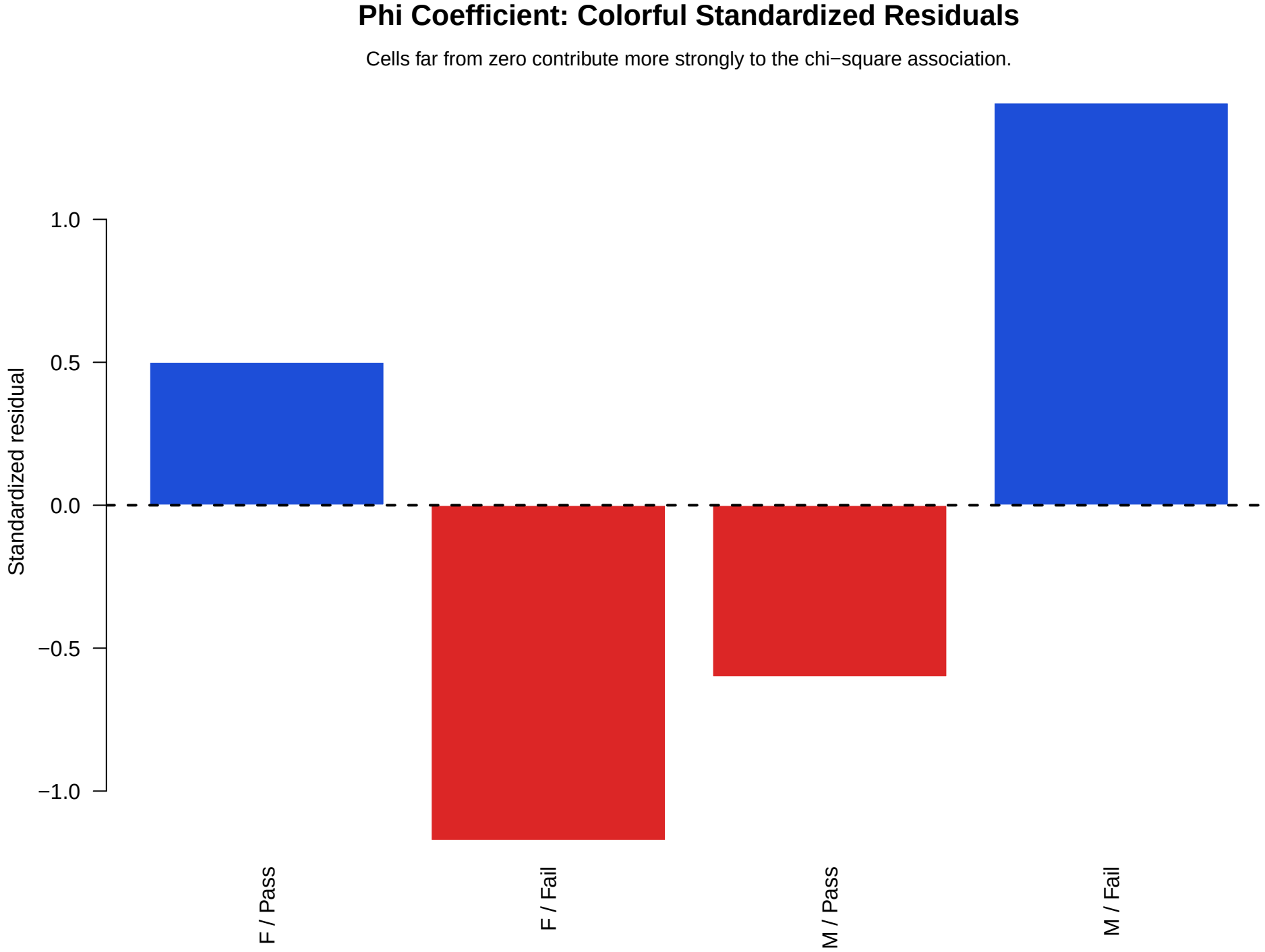
Expected counts and residuals:

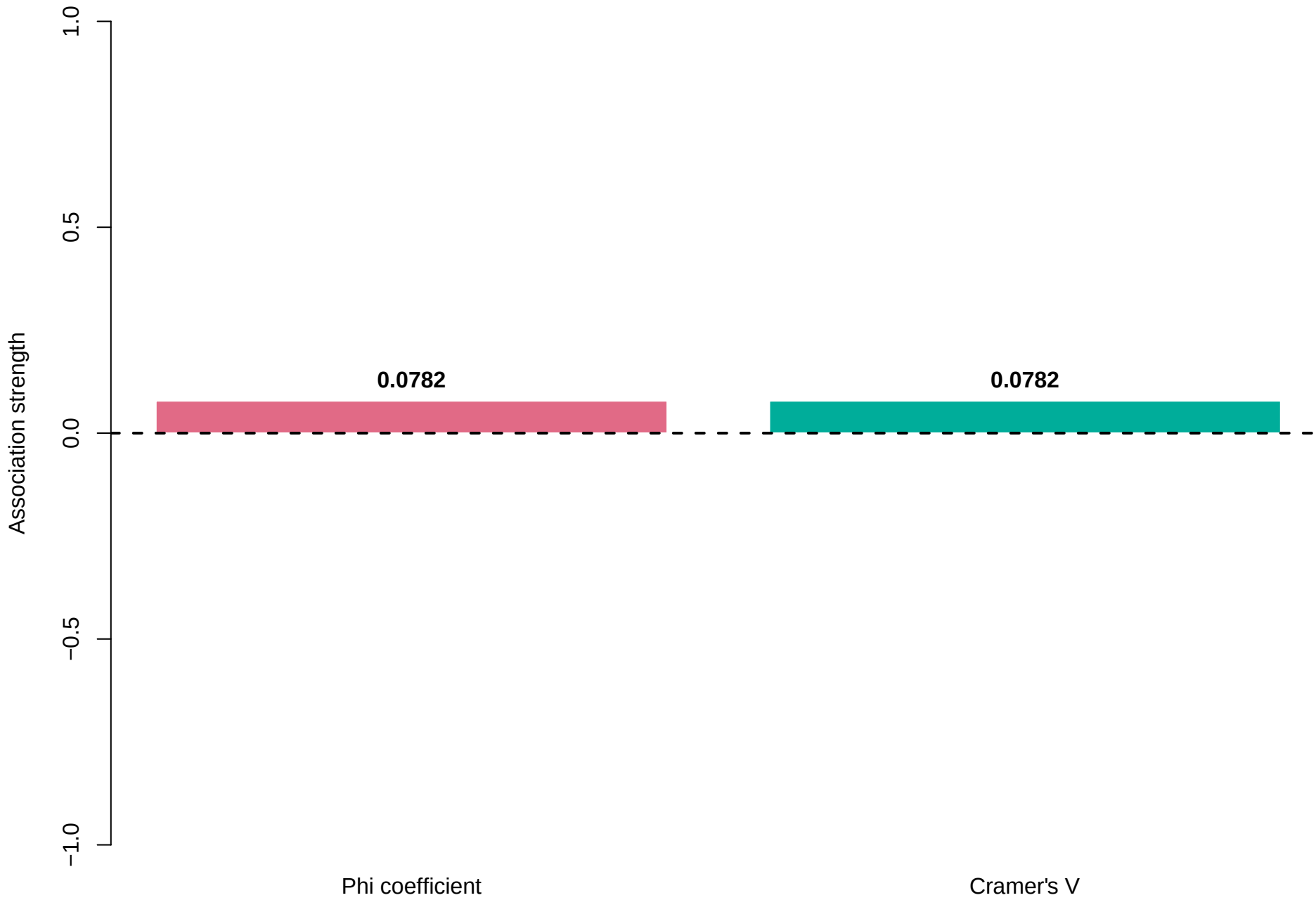
predictor_level	outcome_level	observed_count	expected_count	residual	standardized_residual	chi_square_contribution
F	Pass	333	323.98613	9.013867	0.5007811	0.2507817
F	Fail	50	59.01387	−9.013867	−1.1733677	1.3767918
M	Pass	216	225.01387	−9.013867	−0.6009060	0.3610880
M	Fail	50	40.98613	9.013867	1.4079677	1.9823731


Phi Coefficient: Colorful 2x2 Contingency Table
Observed counts used in the phi coefficient formula.
Pass_Status_G3_10
Pass
Fail
333
216
50
50
F
M
sex


Phi Coefficient: Colorful Row Percent Comparison
The row percentages show practical direction of the binary association.
Pass
Fail
Row percentage
0
20
40
60
80
100
F
M
sex


Phi Coefficient: Colorful Observed vs Expected Counts
Expected counts represent independence between the two binary variables.
Observed
Expected
Count
300
250
200
150
100
50
0
F / Pass
F / Fail
M / Pass
M / Fail


Phi Coefficient: Colorful Standardized Residuals
Cells far from zero contribute more strongly to the chi−square association.
Standardized residual
1.0
0.5
0.0
−0.5
−1.0
F / Pass
F / Fail
M / Pass
M / Fail


Phi Coefficient: Colorful Effect Size Summary
Phi keeps direction; Cramer's V is the absolute association strength for a 2x2 table.
Association strength
1.0
0.5
0.0
−0.5
−1.0
0.0782
0.0782
Phi coefficient
Cramer's V