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Novometrics *vs.* Yule's Q: Voter Turnout and Organizational Membership

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A popular legacy index of association for 2x2 tables that is based on the odds ratio (OR), Yule's Q=(OR–1)/(OR+1). Yule's Q ranges between -1.00 and 1.00, with the value 0 indicating no association. Prior research[1] assessing the association between voting behavior (0=not a voter; 1= voter) and the number of one's organizational memberships (0=no memberships; 1=at least one membership) reported that Q=0.434, and "…the odds of voting among persons belonging to organizations (is) more than 2.5 times greater than the voting odds among those respondents without memberships" (p. 11). These data were analyzed using exploratory novometrics, treating voting behavior as a class variable and number of organizational memberships as an ordered attribute.[2-4]

Data analyzed herein are presented in Table 1.

Table 1: Study Data[1]

	Number of Organizational Memberships	
Voting Behavior	None	One or More
Voted	298	689
Did not Vote	254	232

For these data a single optimal model emerged: if number of memberships=none, then predict did note vote; otherwise predict voted: relatively weak ESS=22.01, D=7.09, $p<0.001$. Reversing the direction of the optimal model yields ESS= -22.07 (i.e., relatively weakly worse than is expected by chance).[2]

Table 2 is the confusion matrix for the optimal model, which correctly classified the behavior of 7 in 10 of the actual voters, *vs.* 1 in 2 of the actual non- voters (50% is expected by chance for each of the class categories[2]).

Table 2: Confusion Matrix for Optimal Model

		Predicted		
		Voter	Non-Voter	
Actual	Voter	689	298	69.8%
	Non-Voter	232	254	52.3%
		74.8%	46.0%	

The confusion matrix also shows that in making point-predictions of voting behavior of individual observations, the model was correct 3 in 4 times it predicted a subject voted, *vs.* 1 in 2 times it predicted a subject did not vote.

Like kappa, phi, and numerous other legacy measures of association, Yule's Q is

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susceptible to analytic anomalies if one of the "not voted" or "negative" cells is empty, inducing division by zero in methods involving manipulation of the OR.[1,2,5]

References

[1]Knoke D, Burke PJ (1980). *Log-linear models*. Beverly Hills, CA: Sage (pp. 8-11).

[2]Soltysik RC, Yarnold PR (2010). Automated CTA software: Fundamental concepts and control commands. *Optimal Data Analysis, 1*, 144-160.

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[5]Yarnold PR (2016). ODA *vs*. π and κ: Paradoxes of kappa. *Optimal Data Analysis, 5*, 160-161.

Author Notes

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