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A response to two papers critiquing the total consumption model by Kari Poikolainen

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Running head: Response to Kari Poikolainen

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Dear Editor,

In two recent articles in *Alcohol and Alcoholism*, Kari Poikolainen critiques the total consumption model, an influential theory within alcohol control policy, particularly in Northern Europe. We argue that Poikolainen's critiques are likely to mislead rather than inform readers given the low quality research designs, flawed statistical analyses and implausible results.

In simple terms, the total consumption model posits a consistent relationship between a population's average level of alcohol consumption and its level of problem drinking. This suggests an important conclusion for policymakers – policies which reduce average consumption will necessarily reduce alcohol-related harm. Poikolainen challenges this position in his first paper which concludes that the strictness of alcohol control policies is not statistically associated with levels of alcohol consumption and that neither is associated with levels of alcohol-related harm (Poikolainen, 2015). His second paper further concludes that levels of alcohol dependence in the population determine average consumption rather than vice versa as, in Poikolainen's view, would be suggested by the total consumption model (Poikolainen, 2016).

The two papers rely on correlations and regressions of cross-sectional national-level data for approximately 30 countries. Both papers have many flaws although detecting these can be challenging as basic methodological information is often absent such as the specific type of regression analyses used and what exactly is being regressed on what. Other information is inaccurately reported. For example, in paper two, 28 countries are included in the analysis not 29 (unless the data tables are inaccurate instead). Rather than listing every fault, we focus on three major critiques below.

1. Robust causal inferences cannot be drawn from small-scale (N≈30) cross-sectional datasets.

Such data are poorly-suited to addressing the first paper's interest in causality and wholly unsuited to addressing the second paper's interest in the direction of causal relationships. Many of the estimated correlation and regression coefficients are of moderate strength and in a direction which supports the total consumption model but are dismissed by the author for non-significance. For example, in paper one, a correlation of -0.27 is found between the strength of a country's alcohol policy and per capita alcohol consumption but the p-value is 0.2, presumably largely due to the small sample size. Nonetheless, the author concludes "the total consumption model fails". This is a classic case of misinterpreting non-significance as evidence that the hypothesis is false rather than as a lack of evidence that the hypothesis is true.

2. The variables entered into the regression models have high collinearity.

This is seen in both papers. For example, in paper two where the author predicts the total litres of alcohol consumed by a population as a function of the numbers (not rates) of abstainers and dependent drinkers in the population and the population size. As a larger population size necessitates either a larger number of abstainers or a larger number of drinkers of certain kinds or both, all of these variables are inevitably very highly correlated (and were found to be when we checked the data used). High collinearity means the estimated size and significance of coefficients for individual predictors in a regression equation cannot be considered robust (Farrar and Glauber, 1967). Therefore, the same applies to Poikolainen's conclusions which hang entirely on the significance test results for those predictors.

3. The reported R-squared values are demonstrably flawed.

A by-product of this high collinearity and its extension to the dependent variable (which is also driven by population size) is the extremely high R-squared values obtained for the regressions which are reported to range between 0.96 and 0.99. Very high R-squared values should be a red flag to readers but can be immediately dismissed in this instance by consulting Table 4 in the second paper. This provides the percentage difference (wrongly calculated in many cases) between the observed values and the expected values estimated from the regression coefficients. Despite an R-squared of 0.99, these percentage differences are reported to vary between –25% and +356%. That is an awful lot of error to pack into 1% of unexplained variance and suggests a model which has rather less explanatory power than is claimed.

Readers of this letter may wonder how these and other methodological flaws were not detected during peer review. We cannot answer this question but do note that revisions to the second paper were submitted just 10 days after first submission and the entire review process from first submission to acceptance took just 36 days.

The total consumption model provides a useful and easy to communicate summary of broad trends within the alcohol policy literature. It is not without flaws and should be subject to critique and investigation where appropriate. However, scientists and journals should focus their efforts on critiques which advance our understanding rather than those which introduce misleading and obviously incorrect results into public debate.

Conflicts of interest

The authors were collaborators on a recent project commissioned by Systembolaget, the Swedish government-owned alcohol retail monopoly.

References

FARRAR, D. E. & GLAUBER, R. R. 1967. Multicollinearity in regression analysis: The problem revisited. *The Review of Economics and Statistics,* 49**,** 92-107.

POIKOLAINEN, K. 2015. The weakness of stern alcohol control policies. *Alcohol and Alcoholism*. DOI: 10.1093/alcalc/agv081

POIKOLAINEN, K. 2016. Does the tail wag the dog? Abstainers, alcohol dependence, heavy episodic drinkers and total alcohol consumption. *Alcohol and Alcoholism*. DOI: 10.1093/alcalc/agw083