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Reply to Maley: Yes, appropriate modeling of fatality counts confirms female hurricanes are deadlier

Madhu Viswanathan
Loyola Marymount University, madhubalan.viswanathan@lmu.edu

LETTER

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We report that, for severe hurricanes, name femininity predicts more fatalities (1). Maley (2) argues that outliers drive this effect and that their inland fatalities are not relevant. These arguments reflect misunderstandings about hurricane impacts and their analysis.

Maley examines main effects of male/female names. However, our hypothesis addresses the interaction between name femininity (continuous) and hurricane severity (normalized damage). Maley uses deaths as the indicator of storm severity; however, deaths are the outcome and not a predictor. He concludes that only four hurricanes were severe, noting that they accounted for many deaths.

This distribution of observations is actually typical of count data. Enumerated events (e.g., measles cases per county), or counts, are nearly always right skewed, with most counts clustered near lower values (0, 1, 2. . .) and increasingly fewer numbers with higher values. Arbitrarily designating high counts as outliers is inappropriate (3) and reflects a common misapplication of Gaussian assumptions. Gaussian models assume that the variance is constant. Count models are based on the probability distributions appropriate to count data, e.g., Poisson and negative binomial, for which the variance increases with the mean (3, 4). The negative binomial model is commonly used to adjust for overdispersion when modeling count data such as hurricane deaths (4), as in our data, and was used to construct a well-fitted model (1). In short, Maley's approach is inappropriate to modeling overdispersed count data.

Maley calls the heavy inland tolls of three hurricanes surprising, implying that they drive the effect. If one accepts that these inland deaths are irrelevant, then one can exclude them. Although that is not the case (see below), we nonetheless remodeled the data after removing the inland fatalities he cited—Camille, 113; Diane, 101; and Agnes, 50. The focal interaction persists ($P = 0.016$): For highly damaging storms, name femininity predicts more deaths.

Our original analysis (1) included inland casualties because they are typical and relevant to storm preparedness. It is well established that >50% of US deaths by tropical cyclones occur inland (4, 5). A total of 89% of Hurricane Floyd's 56 deaths were from inland flooding (1999). So were 33% of Hurricane Ike's 84 deaths throughout the Ohio Valley (2008). Many such deaths occur because motorists believe they can drive through hurricane flooding (5), pointing to risk perceptions as a factor. Inland flood advisories were issued as Hurricane Diane advanced, and flood forecasts in Pennsylvania spurred evacuations from Hurricane Agnes (dubbed "Hurricane Agony" by the governor).

All this underscores our main point. In response to varied hurricane threats, risk perceptions influence decisions (not) to take protective action. Gendered storm names are among the inputs to these perceptions. In the context of damaging storms, the resulting actions can be vital to survival.

Finally, Maley miscalculates the conditional probability that the six deadliest hurricanes since 1950 would be female named—it is 10%. With no significant time component in any model (1), whether a female hurricane occurred pre- or post-1979 is irrelevant. Nonetheless, this is not our focus. Our results address the interaction of name femininity and storm severity across 92 hurricanes, and not binary gender probabilities of specific storms. Across historical periods and methods of analysis, they consistently show that name femininity predicts fatalities for highly damaging storms (1).

Kiju Jung[a,1], Sharon Shavitt[a,b,1], Madhu Viswanathan[a], and Joseph M. Hilbe[c]

[a]Department of Business Administration and [b]Department of Psychology, Institute of Communications Research, and Survey Research Laboratory, University of Illinois at Urbana–Champaign, Champaign, IL 61820; and [c]Department of Statistics, T. Denny Sanford School of Social and Family Dynamics, Arizona State University, Tempe, AZ 85287

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The authors declare no conflict of interest.

[1]To whom correspondence may be addressed. Email: kjung4@illinois.edu or shavitt@illinois.edu.