Statistics show no evidence of gender bias in the public's hurricane preparedness

Jung et al. (1) make the bold claim that a storm's assigned gender (traditionally masculine vs. feminine name) predicts its destructive potential, such that a hypothetical Hurricane Eloise would have three times the expected death toll compared with a hypothetical Hurricane Charley, by 41 deaths to 15 deaths. They say that feminine names and pronouns are perceived by the public to be less threatening, resulting in lax preparations and fewer evacuations. Their conclusion was widely reported in the popular press.

During 30+ years on the Gulf Coast, my hurricane evacuations show no gender bias (Andrew, Lili, Rita, and Gustav). I am skeptical that sexism explains the noted effect.

Ninety-four hurricanes made landfall in the United States during the study period from 1950 to 2012; Hurricanes Audrey (1957) and Katrina (2005) were excluded as outliers. As the authors correctly observe, there is "...no effect of masculinity-femininity of name for less severe storms." Among the less severe storms (all with <100 deaths), those with male names averaged more deaths (mean, 14.5 deaths; $n = 29$; range, 0–84 deaths) than those with female names (mean, 12.7 deaths; $n = 59$; range, 0–75 deaths). Inclusion of four storms with more than 100 deaths raises the average death toll for all female storms by 85%, to 23.5 ($n = 63$ deaths; maximum, 256 deaths). Hurricanes Diane (1955), Camille (1969), Agnes (1972), and Sandy (2012) collectively accounted for 732, or 38.5%, of 1,900 total deaths in the study. Virtually all of the statistical difference between the deadliness of female vs. male storms is explained by the inclusion of these four events.

Surprisingly, of those 732 deaths, at least 327 (45%) occurred well inland, mostly due to flooding and landslides in the mountain valleys of the Appalachians as the largely spent storms dropped torrential rains. Diane's deluge hit a region already rain soaked from Hurricane Connie a mere 5 d before. An estimated 101 of her 184 deaths occurred in Pennsylvania. Nearly half of Camille's deadly toll (113 of 256) struck western Virginia. Agnes made landfall in the Florida panhandle as a weak hurricane, killing nine people. Continuing to the northeast, her rains devastated the Eastern Seaboard, causing 113 additional deaths, including 50 in Pennsylvania (2).

If one considers that there are six, not two, outliers in this population, the statistical difference between the male and female subsets becomes negligible.

Setting aside the issue of outliers, what are the odds that the six deadliest hurricanes of the study period would all bear feminine names?

If all of the names had been assigned randomly or alternately, the correct answer would be 1 in 2^6, or about 1.6%.

However, four of the six storms occurred during a period (1953–1978) when only female names were assigned. Only Katrina and Sandy had a chance to be "male." The chance that two randomly chosen hurricanes would both have female names is 1 in 2^2, or 25%: that's not bias, it's a coincidence, and not a strong one at that.

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1 Jung K, Shavitt S, Viswanathan M, Hilbe JM (2014) Female hurricanes are deadlier than male hurricanes. *Proc Natl Acad Sci USA* 111(24):8782–8787.
2 National Hurricane Center (2012) Hurricanes in History. Available at www.nhc.noaa.gov/outreach/history. Accessed August 13, 2014.