In the U.S., women currently get about 29% of PhDs in mathematics. But, in PhD-granting mathematics departments only 13% of the faculty members are women.

Does this mean that women are dropping out between PhD and first job? No!

Does this mean that women are not getting hired in proportion to their share of PhDs? No!

The evidence is discussed in this article, called “The Pipeline and the Trough.”

The 29% and 13% are examples of what I call (respectively) “pipeline” and “trough” statistics. Relative to the “PhD pipeline,” a collection of tenured and tenure-track positions (e.g., positions in a math department) is like a trough. Periodically, the PhD pipeline feeds a few new PhDs into the trough, and periodically a few faculty members leak out, due to death or retirement. In general, the composition of the trough is slow to change.

A similar consideration occurs in the Nelson Diversity Survey for 2007. Women were 13% of all ranks in the top 100 mathematics departments. In their February 2012 Scientific American article, Williams and Ceci apparently conclude from Diversity Survey statistics that women are “not progressing through graduate school and ultimately earning full professorships.” These statistics do not support that conclusion.

For further commentary and analysis of other aspects of Ceci and Williams’s writings on women in STEM, see:

- Listings for 2011 and 2010 events of interest at the Policy and Advocacy section of the Association for Women in Mathematics web site.
- Association for Women in Science Newsletter for February 2011.
- Sections 1 and 3 of “Rumors of Our Rarity Are Greatly Exaggerated,” Journal of Humanistic Mathematics, 2011. Section 1 of this article notes that the talent searches that involved identifying “mathematical ability” by administering the mathematics portion of the SAT to middle school students did not use random sampling. Thus, the ratios of males to females scoring 700 and above need to be understood as reports about nonrandom samples. This limitation is not always noted. (A recent example is Stoet and Geary’s “Can Stereotype Threat Explain the Gender Gap in Mathematics Performance and Achievement?” Like Ceci and Williams, Stoet and Geary rely on findings from longitudinal studies of talent search samples.)
Section 3 of the article documented instances of mislabeled statistics from the 2002 and 2007 Nelson Diversity Surveys.

“Statistical Trends in Women’s Participation in Science: Commentary on Valla and Ceci (2011),” Perspectives on Psychological Science. The prepublication ms is here. This article analyzes statistics from the 2007 Nelson Diversity Survey and makes the point that the percentage of assistant professors in top mathematics departments who are female is close to the percentage of women among recent mathematics PhDs.

Note that the American Scientist article has (apparently) responded to some of the criticism of 2011.

The 4-to-1 talent search ratio is described as occurring in “nonrandom samples,” but they are supposedly samples of men and women, not middle school students, and are discussed with respect to college admissions. However, the references include an article on recent talent search ratios (Wai et al. 2010) and those discussing the top 1 percent of these scorers (work of Lubinski, Benbow, and colleagues). There seem to be no references that report SAT scores of high school students.

The labeling of findings from Nelson’s 2007 Diversity Survey has changed from that used earlier. (The labeling used in Figure 2 of the American Scientist article may still mislead. As Nelson has told me repeatedly, the surveys collected information about tenured and tenure-track positions, but did not collect information about correlations between rank and tenure status, and, moreover, that different disciplines and departments have different customs with respect to these correlations.)

An interesting omission occurs in the following sentence of the American Scientist article: “[Women] receive many teaching and service awards and do as well as men in winning grants.” The beginning of the sentence appears to be a reference to work of Leboy and colleagues. However, this work notes that women’s proportion of awards for research is less than might be expected from their proportions as tenured faculty at top departments. Statistics for 2001 to 2010 are here.

In the second part of the sentence, the discussion of “winning grants” is similar to an earlier claim criticized earlier. The studies cited by Ceci and Williams examined odds ratios rather than details of the proposals submitted. This does not rule out the possibility of gender bias. As Marie Vitulli and I said in 2011, “selection bias can also explain why, in the presence of gender discrimination, female scientists might still fare as well as their male colleagues in some respects if their work was better on average than that of their male peers.”

We also noted that:

Publicity related to articles like the PNAS article [by Ceci and Williams] creates a situation in which scientists may often perceive only two choices:

• do not respond to colleagues or the public about the article;

• formulate an accurate response, by taking the time to read the article and the studies it cites.

More care in writing and refereeing articles like “Understanding current causes of women...
underrepresentation in science” would reduce the burden of the second choice, which is likely to fall disproportionately on women.