

# Women's Participation in Statistics Discussion

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We have here two interesting and informative papers -- which is not surprising given their authors' identity. Lynne Billard, following her historical review of the early careers of some famous women in statistics (unfortunately, all too few of them available for review), considers the recent progression of women within academic ranks in mathematical and computer sciences. She observes some progress and concludes that "more progress is needed, but the trends do seem to be headed in the right direction, at least as far as initial hiring is concerned and, to a lesser extent, as far as promotion and tenure are concerned."

Dennis Trewin observes that "change will not happen very quickly. It must evolve. However, it is important to ... remove any barriers that exist." He then proceeds to identify four of these: the number of women in the feeder groups; keeping them in statistics; lack of understanding between the way men and women work; and family friendly staffing policies. I certainly agree with this analysis, but would consider adding a fifth one: cultural or attitudinal differences that go beyond the way people work. My comments will mostly deal with this aspect of the problem and are based on an analysis that Statistics Canada carried out of the career progression of our female mathematical statisticians and economists. Our findings can be summarized as follows.

1. At the entry level we have been hiring, in each graduating class, a higher *proportion* of available females than of males. However, the *absolute number* of female graduates in the mathematical sciences has still been lagging that of the males during the most recent period.

2. At each level (called "grade" in our formal classification system) we studied the number of years spent before getting promoted to the next grade. We noticed a significant discrepancy between the success rate of men and women at certain grades, but none at others. Furthermore, contrary to what one might think, this was *not* the simple sex-biased result of longer waiting time for women at the *higher* levels. Indeed, there was no sex difference in waiting times at grades 1, 2, and 4, but there was a significant difference at grades 3 and 5. On investigation, it turned out that at those levels where there was no difference, the promotion was based on the managerial review by a group of managers. In contrast, at the two levels where women seemed to "wait" longer, we had a formal competition, involving a written examination as well as an interview.

3. We then analysed the male and female rates of *application* as well as the rates of *success* in the formal competitions. We found that eligible males applied in considerably higher proportions than females. However, if they applied, women were in fact somewhat more likely to be successful than males. While this vindicates the formal process as not sexist, it begs the real question: why are females less likely to put themselves forward as candidates in a competition?

4. We decided to look into this issue. We surveyed all employees and asked them, if they did not apply in a recent competition, why did they fail to do so? We found clear attitudinal or cultural differences. In effect, the major reason for women not applying was concern about competition-related stress. Women were also more worried about the time needed to adequately prepare for the competition. Since these women were in the prime child bearing and family raising age, and since we know from time use data that women are carrying a much higher share of home responsibilities, one wonders to what extent the unequal distribution of work at home is a factor here. Finally, women had a much higher tendency than men to respond that they only apply for competitions if they feel that their chances of qualifying are good.

Partly as a result of these findings we introduced some significant changes into our competition process.

- There used to be a large number of competitions, each involving a single position. We replaced these large, typically annual competitions for all positions at a given level. This enabled us to pay

much more attention to overall fairness, including employment equity.

- We made the questions used in previous competitions available to all employees (to reduce the stress of the unknown).
- We gave higher weight to experience, somewhat less weight to the examination.
- We provided extensive briefings and coaching to all interested employees.

These measures had an impact. Chart 1 below shows the representation of women in our largest professional category, economists and sociologists. Mathematical statisticians were similarly affected but, because of their smaller numbers, the curves are more jagged.

As can be seen, the top line (representing the recruitment grade) is now approaching 50%. More important, the line below (the first grade where entry requires a formal competition) is now approaching the level of the top line -- meaning that the promotion rate of women, at least at this level, is getting close to their representation in the feeder group. The third line corresponds to a level where most promotions occur on the basis of management review. Its slope has not shown a significant increase yet, but hopefully, this is simply the result of a normal waiting time at the previous level. Finally, the slope of the lowest line, representing the most senior positions, has shown a very sharp increase in recent years. This is the level to which we paid the greatest attention. Its importance, beyond the importance of female role models, lies in the fact that they are the feeder group for the agency's top management positions.

The summary? Our experience, modest though it is, seems to indicate that cultural elements are, indeed, significant to the understanding of the barriers to the advancement of women. We need to understand these and to deal with them because they certainly affect behaviour at the workplace. Beyond that, however, there may well be factors related to the sharing of work at home. While family friendly practices at the workplace may alleviate these, we may not be able to eliminate their effect entirely until the cultural revolution that we are experiencing transforms our home life.

**Figure 1.**

