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Scientific research must take gender into account

From car design to drug discovery, the failure to acknowledge sex differences can be costly and even lethal, argues **Londa Schiebinger**.

In Madrid a couple of years ago, I was interviewed for Spanish newspapers. When I later ran the text through Google Translate, I got a shock: I was referred to repeatedly as "he".

Like much science and technology, Google Translate has a male default. When I drive a car, the seatbelt is not designed to accommodate breast tissue. Any medicines I take are more likely to have been tested on male than on female animals. There are moral issues here: women pay taxes and buy products and should not be short-changed. But scientific objectivity is at stake, too. Because medical research is done mainly in males, there is a male bias in, for example, the choice of drug targets. Science is halving the potential field of innovation.

This is not about active discrimination; the bias is largely unconscious. Google Translate defaults to the masculine pronoun because 'he' is more commonly found on the Web than 'she'. Yet that is changing: an analysis of American-English texts in Google Books shows that the ratio of masculine to feminine pronouns has fallen to around 2:1, from a peak of 4:1 in the 1960s.

In the summer of 2012, I invited Google and several language-processing experts to a Gendered Innovations workshop at Harvard University in Cambridge, Massachusetts. They listened to the problem for about 20 minutes, then said: "We can fix that!" Although it is complicated, the search for solutions is on. Fixing the problem is great, but constantly retrofitting for women is not the best road forwards.

A better way is to include gender at all relevant phases of research — when setting priorities, gathering and analysing data, evaluating results, developing patents and, finally, transferring ideas to markets. Science and technology should take into account the biological and social needs of both women and men.

Unconscious sex and gender bias can be socially harmful and expensive. In automotive engineering, short people (many women, but also many men) are classed as 'out-of-position' drivers and often ignored. This leads to greater injury in accidents. In medicine, osteoporosis has long been defined as a disease mainly of post-menopausal women — an assumption that has shaped screening, diagnosis and treatment. Yet after the age of 75, men account for nearly one-third of osteoporosis-related hip fractures. And in basic biomedical research, the failure to use female cells, tissues and animals can lead to greater health risks for women. Of the ten drugs withdrawn from the US market between 1997 and 2000, eight posed greater threats to women than to men. Developing a drug costs billions of dollars, and failure can cause human suffering and death — with stakes this high, why ignore half of the population?

In December last year, the European Commission took a historic step towards ending this unconscious bias. Applicants to its newly opened Horizon 2020 funding scheme are now asked to include gender analysis in their projects — for example, to assess whether the research will have different implications for women and men. The commission identified dozens of science areas that could benefit from gender analysis: computer hardware and architecture, biodiversity, ecology, biophysics, oceanography, geosciences, organic chemistry, aeronautics, space medicine and some 40 others, including nanotechnology (astrophysics did not make the cut).

Since 2006, the Canadian Institutes of Health Research has required scientists across its 13 institutes to analyse sex and gender (when appropriate); and since 2008, the philanthropic Bill & Melinda Gates Foundation has required gender analysis for its agricultural research grants. The European Commission's move with Horizon 2020 is the most significant in terms of scope.

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Resistance sometimes comes from those who ask: won't including females in animal studies increase costs? For an individual laboratory, it probably will. But removing bias from science will cost society less in the long run — and save lives. How can we safely include women in phase III human trials (as required by US law since 1993) if drugs are not first tested in female laboratory animals?

Many of these problems have been discussed before. But there are signs that more people are taking the issue of gender analysis seriously. Publishers, for example, are catching on and insisting that published work accounts for gender. *Clinical Orthopaedics and Related Research* recommends that studies be sufficiently powered to analyse sex and gender, and in 2012, each of the American Physiological Society's 14 journals required that authors report and analyse sex effects. More journals should follow.

Including gender analysis in research can save us from life-threatening errors… and can lead to new discoveries. Gender analysis has led to better treatments for heart disease in women. Identifying the genetic mechanisms of ovarian determination has enhanced knowledge about testis development. Analysing how sex affects donor–recipient matching is improving stem-cell therapies. And exploring how sex-specific biological factors and gender-specific behaviours interact has helped researchers to understand how nutrients trigger cell functions, and may assist in the fight against obesity.

Can we afford to ignore such opportunities? ■

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