

How incorporating sex and gender aspects in biomedical and health research will lead to a better health care.

For a long time sex and gender factors have been neglected in biomedicine because there was one ideal study object and that was the 75 kilo white western male. Specificities and particularities of other groups - women, the elderly, children, people of non-white background - have not been taken into account. Everyone was treated according to the male model. This 'one size fits all model' has become under severe scrutiny and can no longer be regarded as good science.

The specificities concerned include sex differences - that are differences related to biology - genes, chromosomes, physiology, anatomy - that are effective at a very basic level (genes), in pharmacology, drug research, clinical treatment and prevention. Next to sex differences we have gender factors that are factors related to socio-cultural processes of becoming a man or woman in a certain society. To consider the so called gender roles and relationships next to biological factors is very important for understanding health outcomes in women and men.

The one size fits all model has had detrimental impacts on human health and has led to inadequate healthcare and bad health outcomes. A telling example are adverse drug effects in women because the medication had not been tested in women. In 8 out of 10 drugs that - in recent years - were withdrawn from the market, adverse effects in women were implicated. Also animal research has been criticized: how strange to study a disease with a higher prevalence in women (such as rheumatoid arthritis) in just male rats!

In the last decades a wealth of new knowledge has been produced concerning the biological (sex) and socio-cultural (gender) factors that influence individual health and healthcare of women and men. This innovative science field is known by the catchword Gender Medicine. Gender Medicine is an innovative research area that seeks to integrate sex and gender factors in biomedical research, clinical practice and health care. The expectations are high: it promises to innovate drug development and therapies by taking account of sex differences, to unravel 'stereotypical' gender roles that impede proper health preventive behaviour and to redress the neglect of the other sex if a disease becomes labelled as a 'female' (osteoporosis) or 'male' (coronary heart) disease.

And there is some good news: In the June 2010 issue of the highly influential biomedical journal *Nature* an editorial was published addressing the persistent sex bias in biomedical clinical and basic research and the detrimental impacts on human health. This sex bias takes the form of excluding female human subjects, and the total exclusion of pregnant female subjects, in clinical research and/or failing to analyze sex differences between male and female subjects. Sex bias is also prevalent in animal research, which means that female animal models are not used in the development of numerous disease treatments. The need to address sex bias in biomedical research has become even more imperative as researchers discover various sex differences in disease onset, prevalence, and symptoms. The concept of 'sex' has traditionally been defined as biological characteristics that distinguish males and females. In human beings, sex differences, such as differences in reproductive organs, body size and shape and the different levels of hormones circulating in the body, are thought to

derive from basic chromosomal differences in which females have two X chromosomes and males have one X and one Y. Thinking in only two groups, men and women, has been the prevailing way of thought in biomedicine, actually biological variation in chromosome composition is a reality.

Feminist researchers have documented how sex and gender are often used interchangeably and how the meaning of gender is conflated with the meaning of sex in mainstream biomedical and health research. Subsequently, the impacts of the gendered social environment are under researched and differences in health outcomes are assumed to derive from biological differences between men and women, foreclosing an analysis of the social causes of health differences. Feminist health researchers have demonstrated that a sex analysis is insufficient for understanding differences in health and illness between men and women. The concept of gender directs researchers attention to how men and women's lives and health are shaped by multiple and unequal gender relations and, in doing so, provides contributing factors that explain sex differences in various diseases. Hence, incorporating gender in biomedical research requires the adoption of a new paradigm for scientific inquiry that is based on an alternative conception of the biological body, as shaped by complex interactions with the social environment. A telling example is osteoporosis: In the actual resulting bone mass in women and men, sex differences play a role but important influences stem from factors like exercise and nutrition, life style behaviours that are deeply gendered. Thus a gender analysis expands understandings of mechanisms that cause differences in disease symptoms, outcomes, and susceptibility with the aim of producing more focused and accurate treatment. Gender operates at various levels, namely the individual, institutional and policy levels, to shape men and women's health behaviours and exposures to illness.

So gender is not something that you have but rather something that you do. In relation to the health system notions of masculinity and femininity are relevant. Health behaviours of men and women are ways of 'doing gender'. Taking care of health and engaging in preventive behaviour have been labeled as feminine behaviours that men will try to avoid in order to maintain their masculinity. This often results in risk taking behaviour (postponing a visit to the doctor until complaints can no longer be ignored, alcohol abuse), for fear of being labeled feminine.

The actual challenge in biomedicine now is to move beyond critique and to provide scientific researchers with the conceptual and practical tools to effectively consider sex and gender in biomedical and health research projects. In the next two years a collaboration between the EU and Stanford University in the US will develop so called 'gendered innovations' in science, medicine and technology. Londa Schiebinger and Ineke Klinge will lead a group of experts to create tools and examples for biomedical and health researchers to spark their creativity and to contribute to scientific excellence.

To ensure that the utility of the sex and gender concepts will not continue to be ignored, leadership is required on the part of funding agencies, journals, and curriculum developers to ensure that these concepts are considered in all biomedical and health research activities. The persistence of sex bias in biomedical and health research can be brought to an end, and new innovative lines of research can be opened, if

researchers are required to work collaboratively to integrate the concepts of sex and gender in their work.