

Integrating a gender dimension in research

an introduction to gender sensitive research

Workshop scientific excellence and ‘sexy’ research
February 26nd, 2007

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Structure of this presentation

- Clarification of concepts gender, sex and gender dimension
- The clinical relevance of sex and gender in life sciences
- Three examples

Gender dimension?

Research that pays attention to the role that gender and sex can play in every phase of the research process.

Research that has adopted a gender dimension we call **sex and gender sensitive**



Sex & gender

Sex refers to biological characteristics that distinguish females and males
dimorphic

Gender refers to the social and cultural influences that lead to differences between men and women

Sex differences in biomedical and health related research

- Females are more likely than males to recover language ability after suffering from a left-hemisphere stroke (Shaywitz et al. 1995)
- Asthma is more prevalent in boys in childhood, but more prevalent in women from puberty on (Wieringa et al., 2005)
- Women are at a 1.2 to 1.7-fold higher risk than men for all major types of lung cancer at every level of exposure to cigarette smoke (Wizemann & Pardue, 2001)
- Location of gastric cancer varies by sex (Wieringa et al, 2005)
- Distribution of patterns of genetic coding or

polymorphisms.

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Gender differences in biomedical and health related research

- Gender influences environmental factors
 - Development of eczema (Mohrenschlager et al., 2006)
 - Occupational hazards (Messing et al., 2006)
- In risk perception women and men: (Gustafson, 1998)
 - Express *different levels of concern* about same risks
 - Perceive *different* risks
 - Attribute different meanings to the same risks
- Impact of gender on perception and reporting of symptoms (Robertson, 2003)

Sex and gender: it's not one or the other

- Take both sex and gender into consideration (if relevant). Examples: (Krieger, 2003)
 - HIV/AIDS (sexually transmitted)
 - Hypospadias
- Not always easy to distinguish (Wizemann & Pardue, 2001) :
 - Bone mass development
 - Melanoma

Clinical relevance of sex and gender sensitive research

Scientific evidence of sex and gender differences has shown that being female or male is an important variable that affects health and illness throughout the life span.

“As long as we can not read a patient’s DNA and the ultimate individualisation of health care is not reached, patients and doctors must continue to rely on the results of studies carefully designed and analysed by patient type – including sex – to obtain the clinical results that are useful and meaningful to the health of both women and men.” (Science, special issue on Women’s Health, 2005)

Clinical relevance of sex and gender sensitive research

(Wizemann & Pardue, 2001)

- Helps explain the differences in aetiology and prognosis of diseases as function of sex.
- Outcomes of diagnostic procedures and of preventive and treatment interventions can be modified by sex and/or gender.
- Differences in health outcomes may be caused by differences in perception between women and men.

Clinical relevance of sex and gender sensitive research

M/F differences and similarities:

- At the societal level.
- At the level of the whole organism.

(Wizemann & Pardue, 2001)

- Now, sex and gender in life sciences should be taken to the next level.

Taking life-science research to the next level

- “*Sex dependent biomarkers?* Should, in a quest for biomarkers for health and disease sex be included as a modifying criterion? While there has been much activity in the last few years in identification of the function of genes and their effect on treatment, research on the effects of sex as a modifier of gene function and response is under-investigated. The sequencing of the human genome allowed researchers to define the role of genetic polymorphisms and pharmacogenomics on development, course, and response to current treatments. However, **the role of confounding factors, including sex, on the function of genes and genetic polymorphisms in disease incidence, course, and response to treatment has been largely ignored.** (NIH, 2005)

The extended role of sex

- Look beyond reproductive system
- Influence of (sex) hormones
- Every cell has a sex!

- “*Every cell has a sex. Whether a cell contains an XX or an XY chromosome may have an impact on everything from regulation of gene expression in a cell line to the efficacy or toxicity of a pharmaceutical in living human.*” (Roerh, 2005)

XX/XY (Wizemann & Pardue, 2001)

- Genes on Y-chromosomes only expressed in males
- Women have two X chromosomes, resulting in X-inactivation
 - Genes responsible for X-inactivation
 - Epigenetic mosaics
 - A higher expression of X-chromosomes for some genes that escaped X-inactivation
 - Hemizyosity
- Expression of some genes likely to be influenced by hormonal differences.
- Sex-biased gene expression on transcriptome level in somatic tissues (Isensee & Ruiz Noppinger, 2007)

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Implications for pharmacodynamics

- Sex in pharmacogenomics (ORWH FY, 2004): :
 - Sex chromosomal differences.
 - Genetic, molecular and cellular bases for action of pharmacological agents that have different effects in women and men.
 - Susceptibility: the interaction of genetic polymorphisms with diet, drugs, or toxins on the architecture or development of reproductive or other organs
- Control for other factors, such as m/f weight and body composition differences
 - But be careful! Differences in body composition explain the differential effect of antipsychotics in men and women (Kaiser, 2005)

The relevance for your research

'patient' 'gene expression' 'neonates'

'embryonic stem cells'

'people' 'inhabitants' 'children'

'Increased risk of health hazards'

'prevention' 'human adipose tissue'

'gene-lifestyle interaction'

'genetic predisposition' 'sickness rate'

'migrants' 'efficiency of vaccines'

Other reasons to conduct gender-sensitive research

- Criterion of *scientific quality*

“Risk factors, biological mechanisms, clinical manifestation, causes, consequences of disease and disorders may differ in men and women. In such cases, diagnosis, prevention, treatment, and management need to be adapted according to sex and gender. Consequences for not doing so impinge on the health of both women and men” (DG RTD, 2003)

- Attention to gender and sex issues is an *innovative enterprise*

- Medical & social relevance

Three examples

- The impact of sex and gender on analysing and interpreting violence statistics
- HEALTHGRAIN (IP)
- GA2LEN (NoE) (European Commission, 2004)

The impact of sex and gender: an example

- **Original:** chapter on violence from a publication of the Finnish Office of Statistics (Heiskanen et al., 1991), investigating the statistical changes in violence between 1980 and 1988.
- **Adaptation:** chapter rewritten by Eichler (1997). It is constructed entirely with information found within the original chapter itself, but pays attention to gender as a significant variable.

The impact of sex and gender on data interpretation

Original: Heiskanen et al., 1991

- 1980: 1 out of 10 persons was the victim of a violent act or threats of violence.
- 1988: 1 out of 12.
- The victim was most likely a **single young man**.
- The relative number of persons who were victims of incidents that resulted in **restricted activity** has also fallen, but only slightly.

The impact of sex and gender on data interpretation

Original: Heiskanen et al., 1991

- Decrease was most accentuated among the **youngest men** and in the category of **street violence**.
- Exception: **work-related violence** experiences became more numerous. It has become more common among women (aged 20-44); the number of such experiences among men has fallen.
- The rate of **family violence** in 1988 remained rather close to the numbers measured in 1980.

The impact of sex and gender on data interpretation

Adaptation: Eichler, 1997

- Although men are slightly more likely to be victims of violence than women, this difference decreased:
 - 1980: 58% were men, 42% women
 - 1988: 53% were men, 47% women
- Typical male victim: street violence
- Typical female victim: family violence

The impact of sex and gender on data interpretation

Adaptation: Eichler, 1997

- Gender differences: gravity of consequences.
- Restricted activity (>1 day) following violence:

	1980	1988
Male	3.4%	2.7%
Female	3.6%	5.1%

à decreased

à increased

Differences?

	Gender insensitive	Gender sensitive
Typical victim	A young man	Male: street violence; female: family violence
Likelihood of restricted activity of victim	Slightly decreased	Decreased for men, increased for women
Likelihood to experience violence in 1988, relative to 1980	Young men less likely	Fewer incidents for both sexes, but proportion of female victims increased
Work-related violence	Increased	Decreased for men, increased for women
Family violence	Remained stable	Increased for both, but experienced by 2.3% of the men and 27.5% of the women.

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HEALTHGRAIN

- Official title: Exploiting the bioactivity of European Cereal Grains for improved nutrition and health benefits
- Aim: to produce health promoting and safe cereal foods and ingredients of high eating quality with scientific evidence of benefit

HEALTHGRAIN

Literature search – sex differences

- Women and men have **different susceptibility** to obesity, hyperlipidaemia and CVD
- Obesity, insulin resistance, and type 2 diabetes may have a **additional adverse effects** on women, such as effects on reproduction, including menstrual disturbances, reduced fertility and increased risk of pregnancy and delivery complications.
- Women and men often have **different acute and chronic responses** to nutrients.
- Women and men are **affected differently** by gene polymorphisms.

HEALTHGRAIN

Literature search – gender differences

- Women have **different motivations and responsibilities** with regard to their own, and their families' nutrition.
- Women and men **process nutrition information differently** and attend to different elements of dietary advice.
- Women and men often have **different barriers** to affecting behaviour change.

HEALTHGRAIN

Considerations in research

- It is evident that nutrition related information should be disseminated using **targeted information**. The methodology for performing the consumer studies will give the gender/sex aspects special attention.
- Data will be specifically handled so as to **interpret results** of relevance for the understanding of gender differences related to consumers' choice of healthy cereal foods, and the gender-specific issues will be considered also in the dissemination module to promote the health of both male and female Europeans.
- Gender issues will be taken into account with regards to **opinion** on whole grain issues and decision power for buying food products.
- Gender issues will also be taken into account when **designing the acute and intervention studies** in the Nutrition and metabolism module. Every effort will be made to ensure that equal numbers of males and females are recruited.
- All **statistical analysis** will examine the effect of gender and its interaction.

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GA2LEN

- Global Allergy and Asthma European Network
- Studies allergy and asthma throughout the course of life.
- Has research areas concerned with environment, nutrition, lifestyle, infections and genetic susceptibility

GA2LEN

Approaching sex and gender

- a) the participation of both sexes in research, education and dissemination programs of the network
- b) the gender issues in different aspects of the diseases allergy and asthma (basic mechanisms, epidemiology, symptoms, diagnosis and treatment)

GA2LEN

Objectives

- To reassess, where available, original data from past studies to explore further effect modification by sex and gender, and to review methods of assessing the effects of gender.
- To develop novel studies to identify the effects of gender on development, persistence and severity of allergic disease.
- To review animal models of sex-specific genetic, regulation and sex hormone influences on the development of allergic responses.
- To assess the effects of gender on management and response to treatment.

GA2LEN

Reanalysing old data

- The extent of gender and/or sex differences in the incidence and prevalence of asthma and allergy at different ages and in different populations across Europe.
- The role of gender-based differential exposure and vulnerability in explaining the observed differences.
- The extent of gender and/or sex differences in the management and burden of asthma and allergy at different ages in different populations across Europe.

To conclude

Sex and gender differences and/or the effects of gender are related to biomedical and health related research.

Therefore, a challenge exists for life science researchers to include a sex and gender dimension in their research activities.

By doing so, the research will be innovative, of high quality and the health care and policies based on the results will be better and more effective.