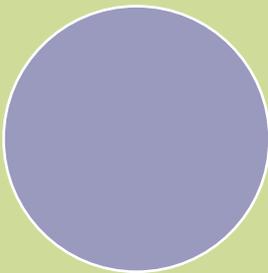
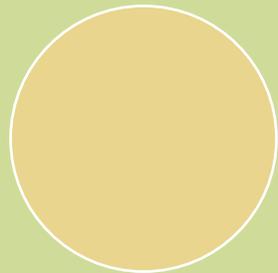




# BETTER SCIENCE WITH SEX AND GENDER

A PRIMER FOR HEALTH RESEARCH



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WOMEN'S HEALTH RESEARCH NETWORK

VANCOUVER, CANADA

## Women's Health Research Network

The Women's Health Research Network (WHRN) is a catalyst for bringing together researchers interested in women's health and gender and health issues. We facilitate research collaborations drawn from academic, health service, policy, and community settings.

The WHRN fosters the generation, application, and mainstreaming of new knowledge, specifically to improve women's health and women's health research. We are interested in increasing the understanding of and capacity for sex- and gender-based analyses and for integrating diverse women's health concerns into other areas of health research.

With an inclusive, multisectoral, and multi-disciplinary approach to research, the WHRN also encourages the brokerage of knowledge regarding the health of girls and women in British Columbia and Canada.

For more information about the WHRN, or about becoming a member, please visit our website at [www.whrn.ca](http://www.whrn.ca)

The WHRN is one of several networks funded by the Michael Smith Foundation for Health Research (MSFHR) in British Columbia, Canada. The MSFHR serves as a catalyst to build British Columbia's capacity for excellence in clinical, biomedical, health services, and population health research.

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## Sex and gender in health research

Sex and gender are increasingly being recognized as important health determinants and essential aspects of health research (Grant & Ballem, 2000; Greaves et al., 1999; Health Canada, 2000). This primer is intended to help researchers understand how sex and gender contribute to health and to suggest ways to incorporate this understanding into their research practices. Incorporating sex and gender into health research contributes to better science and to improving the lives of women and men, boys and girls.

Historically, much health research has assumed a gender-neutral or gender-blind stance, so the impetus to understand the contributions of sex and gender to health has largely arisen within the field of women's health. Today there is an increasing recognition that both biological and socio-cultural factors contribute to health — for women and men. For example, recent research on cardiovascular disease, osteoporosis, and depression has identified significant differences among women and men with respect to the distribution of these conditions. There are also gender-related risks for developing these conditions and in responses to their treatment.

Efforts to incorporate sex and gender into health research have varied from discipline to discipline. While theories about gender have been well developed and debated in the social sciences for at least two decades, the notion of gender as being distinct from sex is still a relatively new concept in medical discourse and research. As a result, gender, which refers to social influences, is still often conflated with the biologically based category of sex (Fischman, Wick, & Koenig, 1999; Spitzer, n.d.). This conflation leads to confusion about the contributions of sex and gender to health, and missed opportunities for developing appropriate medical interventions and policy responses.



## What is this primer for?

This primer provides pragmatic suggestions for how to successfully employ a sex- and gender-based analysis (SGBA) in health research. Specifically, it defines sex and gender, outlines some designs for operationalizing SGBA in health research, and offers numerous illustrations of already-generated knowledge that uses an SGBA approach. This primer is a broad, comprehensive guide that applies to all areas of health research, including the Canadian Institutes of Health Research (CIHR) four pillars of health research — biomedical, clinical, health systems, and social and cultural dimensions of health — as well as areas of health policy.

Incorporating SGBA in health research not only makes for better science by generating more comprehensive evidence, it can also contribute to cost savings for the health care system, provide benefits to families and communities, support economic gains, and enhance social justice (Greaves et al., 1999). For example, research has demonstrated that newly infected women with HIV have lower viral loads than men at the same stage of the disease but progress to AIDS at a similar rate. This finding has led clinicians to change the criterion for beginning antiretroviral therapy (Farzadegan et al., 1998). In so doing, more women will be eligible for antiretroviral treatment at an earlier stage than previously and more women will remain productive members of the community — able to care for their families, contribute to the economy, and help shape their communities.

The greatest benefit of research that includes a sex- and gender-based analysis lies in its potential to save lives. A recent study found that women undergo carotid endarterectomies (the standard treatment for blockage of the carotid artery) less frequently than men despite a similar disease burden (Kapral & Redelmeier, 2000). This analysis has prompted a re-examination of clinical practice — and may mean that more people receive this important intervention to prevent strokes.

## Learning from women's health

Women's health research has expanded tremendously in the last 25 years, from an area of research primarily examining women's reproductive issues to a multidisciplinary, multidimensional field of study that addresses a range of topics. Today, women's health researchers are studying an enormous range of subjects, including but not limited to: chronic diseases, mental health, poverty, violence against women, aging, female cancers, Aboriginal women's health, occupational



Incorporating SGBA in health research not only makes for better science, it also contributes to cost savings for the health care system, benefits families and communities, and enhances social justice.

health, immigrant women's health, the health of women with disabilities and more, in addition to pregnancy and childbirth (Grant & Ballem, 2000).

Over the past three decades, health policy-makers have been addressing women's health as well as the gendered dimensions of health. At the international level, the World Health Organization's Department of Gender, Women, and Health has focused on developing policy tools on issues such as gender-based violence and gendered aspects of HIV/AIDS. Gender concerns are now often integrated into other policy areas, especially at the international level, such as the case with tobacco control or poverty reduction.

At the national level, some countries have developed national women's health policies that incorporate a broad agenda as well. Australia, for example, developed a national women's health policy in the 1980s that addressed not only reproductive health for women but also recognized women as caregivers for children, the elderly, and persons who are sick or have disabilities, as well as women's emotional and mental health problems (Gray, 1998). More recently, Ireland established a Women's Health Council that is mandated to ensure effective and appropriate policy for women's health care. They are working on initiatives across a wide range of women's health issues as well as incorporating gender into health policy in a comprehensive manner, such as gendered approaches to mental health promotion (see <http://www.whc.ie/>). Some municipalities have even prepared women's health policies and plans — notably Glasgow in Scotland and the former Vancouver/Richmond Health Board in British Columbia, Canada.

Canada's federal government released a Women's Health Strategy in 1999 which outlined various health disparities that women experience and stressed the distinct nature of women's health (Health Canada, 1999). The following year, Health Canada issued a policy requiring gender-based analysis (GBA) to be used in developing and analyzing policy, programs, legislation, and research. GBA is a process that uses sex and gender as an organizing principle and as a way of viewing research processes and data. GBA is an important tool to help identify and clarify the differences between women and men, and boys and girls, as well as the ways that gender influences health (Health Canada, 2000). Since then, Health Canada has supported efforts to integrate GBA into its work through the development of a resource guide (Health Canada, 2003), training opportunities, and an infrastructure of GBA "focal points" (i.e., individuals with recognized expertise in gender-based analysis) throughout the organization.



## Two core concepts: Sex and gender

A sex- and gender-based analysis rests on a clear understanding of the two related but distinct concepts of “sex” and “gender.” The complex interconnections of sex and gender affect who we are, what we do, and how we are treated, and have profound effects on our health.

### Sex

Sex is a multidimensional biological construct that encompasses anatomy, physiology, genes, and hormones that together create a human “package” that affects how we are labelled. Although conceptualizing sex usually relies on the female/male binary, in reality, individuals’ sex characteristics exist on a continuum. Thus, using a binary understanding of male/female cannot account for all of the breadth and variety in human sex characteristics. Still, the majority of people today, researchers included, tend to think of both animals and humans as being made up of two sexes. As our understanding of the complexities of sex increases, we will be better able to address — in both everyday life and in research — the nuances of the continuum of sex.

Sex plays an important role in health because individuals may experience various processes differently based on their biology. For example, male and female bodies respond differently to alcohol, drugs, and therapeutics due to differences in body composition and metabolism, as well as differences in hormones. In fact, the constitution of the female body is inherently different from the male body, from cellular metabolism to blood chemistry. Indeed, some researchers now claim that “every organ in the body — not just those related to reproduction — has the capability to respond differently on the basis of sex” (Gesensway, 2001, p. 935).

There are important sex-based differences at the cellular level arising from chromosomal dissimilarity. While we know that a male liver cell is not the same as a female liver cell, we do not know enough about the exact nature of these differences or whether these differences affect the development of disease or responses to treatment. We do know that male and female cells exist in different environments and respond accordingly. It is increasingly clear, therefore, that these various cellular differences can create different patterns in the progression of disease in men and women and lead to differences in health status.

There are also sex-specific differences in many diseases and conditions that might arise from the influence of sex hormones (Gesensway, 2001). For example, men have



As our understanding of the complexities of sex increases, we will be better able to address — both in everyday life and in research — the nuances of the continuum of sex.

heart attacks at a younger age than women do, largely because pre-menopausal women benefit from the hormonal protection of estrogens. Scientists are currently examining whether disease conditions such as stroke and schizophrenia also have hormonal influences.

These emerging findings emphasize the need to include both female and male animals and women and men in biomedical and clinical research because results from one group cannot be applied to the other. Ignoring the influence of sex in research compromises the validity and generalizability of the findings and can be detrimental not just to the research enterprise but also to the health of individuals.

## Gender

Since gender is a social construct that is culturally based and historically specific, it is constantly changing. Gender refers to the socially prescribed and experienced dimensions of “femaleness” or “maleness” in a society, and is manifested at many levels. Gender, and our experience of it, is always linked to the social world. As such, gender is also intimately connected to social and economic status where maleness is almost universally preferred over femaleness. The valuation of males over females is one way that “gender is a part of all human interactions” and “is a ‘stable’ form of structured inequality” (Ettorre, 2004, p. 329). These experiences and cultural values result in socially prescribed gender roles that dictate behaviours — supporting different interests, expectations, and divisions of labour for the sexes. These gender roles are further reinforced by practices and rules that affect gender identity at the individual level, gender relations at the interpersonal or group level, and institutional gender in the social realm.

**GENDER ROLES** Gender roles are the behavioural norms applied to males and females in societies, which influence individuals’ everyday actions, expectations, and experiences. Gender roles are expressed and enacted in a range of ways, from how we dress or talk, to what we may aspire to do, to what we feel are valuable contributions to make as a woman or a man. In some cultures, these roles are sharply defined and differentiated, allowing and disallowing women (and men) from certain tasks, jobs, opportunities, or spaces. In other cultures, there is more gender equity and the lines between gender roles are more blurred. Either way, gender roles often categorize and control individuals within institutions such as the family, the labour force, or the educational system. For example, in some cultures men are ascribed the “breadwinner” role in the family while women are expected to fulfill



more nurturing and caretaking roles that include domestic chores, child care, and the emotional work of relationships. We still talk about women in “non-traditional jobs,” thereby giving recognition to the fact that there is a pattern in which certain forms of paid employment are seen as “men’s” jobs and others as “women’s.” These differences in gender roles are associated with social status: in almost every society, higher power and prestige is conferred on individuals occupying masculine gender roles.

**GENDER IDENTITY** Our gender identity describes how we see ourselves as female or male (or as a “third gender” or “two-spirited”), and affects our feelings and behaviours. Both women and men develop their gender identity in the face of strong societal messages about the “correct” gendered role for their presenting sex. Gender identities are malleable and actively constructed over time and culture, underpinning “an ongoing process of becoming” (Knaak, 2004, p. 302). Gender identity is linked to our social roles in that our aspirations, social interactions, behaviours, traits, characteristics, and body image are influenced by prescribed gender roles and the extent to which we accept or resist them.

Gender identity is not always stable. For example, an infant presenting with ambiguous genitalia is often assigned a sex and gender by medical personnel, and then socialized accordingly. Some individuals may experience disjunctions between their apparent sex and their identification with the other gender, leading to transgenderism, and sometimes desires for reassignment surgery. Socially, a woman working in a typically masculine environment might see herself, act, and

Research has found that women are more likely to experience depression because of both their sex characteristics and gender roles. Hormones, the activity of the hypothalamic-pituitary-adrenal (HPA) axis in response to stress, and reduced thyroid function have all been posited as important biological factors that make women more likely than men to suffer from depression (Kuehner, 2003). But gender is also associated with different rates

of depression among men and women. Factors such as poverty, low level of education, social isolation, and lack of power can increase the risk for depression, and are often unequally distributed among the genders. Additionally, women’s multiple roles within work and family settings can result in work overload, and can affect women’s mental health (Kuehner, 2003).

Gender affects not only our personal relationships with others, but also guides our interactions within larger social units, such as the family or in the workplace.

dress in a different way than she does at home. Finally, there are cultural differences that either allow or prohibit expressions of gender identity, such as the “hijra” in India who usually act in feminine ways, but who can be male or intersexed, though they are considered neither male nor female.

**GENDER RELATIONS** Gender relations refer to how we interact with or are treated by people in the world around us, based on our ascribed gender. Gender relations affect us at all levels of society and can either restrict or open opportunities for us. Gender relations interact with our “race,” ethnicity, class, and other identities. In most societies, gender relations reflect differential power between women and men and often disadvantage women. Gender affects not only our personal relationships with others, but also guides our interactions within larger social units, such as the family, or in the workplace. For example, the gendered relationships between men and women have been found to influence the interpersonal dynamics related to tobacco reduction in pregnant and postpartum women (Bottorff et al., 2006).

**INSTITUTIONALIZED GENDER** Institutionalized gender reflects the distribution of power between the genders in the political, educational, religious, media, medical, and social institutions in any society. These powerful institutions shape the social norms that define, reproduce, and often justify different expectations and opportunities for women and men and girls and boys, such as social and family roles, job segregation, job limitations, dress codes, health practices, and differential access to resources such as money, food, or political power. These institutions often impose social controls through the ways that they organize, regulate, and uphold differential values for sexes and genders and women and men. These restrictions reinforce each other, creating cultural practices and traditions that are difficult to change and often come to be taken for granted.

There are numerous examples of unequal and differential access for women and girls to resources that directly affect health and well-being. For example, girls are less likely than boys to be provided with health care, food, or education in many parts of the world (Choudhury et al., 2000). Women are often malnourished due to the priority of feeding other family members first (Ene-Obong, Enugu, & Uwaegbute, 2001). Even in developed countries, women are less likely than men to have an adequate income, which directly affects their opportunity to achieve good health.



## Changing ideas of sex and gender

Sex and gender are fluid concepts, reflecting culturally specific and temporally influenced factors. In the last century in North America, gender roles have changed considerably, with more women increasing their participation in the paid labour force, sometimes in traditionally male-dominated careers, and some men becoming involved with childcare responsibilities and household chores. However, these shifts in gender roles often vary according to place. For example, Rice and Coates (1995) have observed that gender roles differ between people living in southern and northern states in the United States, where people living in the South tend to hold more traditional and rigid gender expectations of women than people in the North.

Similarly, our ideas about sex change over time. Typically, an individual's sex is determined at birth, according to their visible genitalia. But different cultures identify who is male, female, or intersexed based on their own definitions, traditions, and cultural assumptions. Today, with the advent of new technologies and improved scientific understandings of genes and chromosomes, additional information assists in determining an individual's sex (especially when an individual's presenting genitalia are ambiguous). Research has revealed, for example, that while the "typical" sex chromosomes are XX for females and XY for males, there are many variations in this genetic chromosomal dichotomy, including XXY, XYY, XXX, and XO (no second chromosome). The idea of sex has more permutations today than ever before, now that people can change sex characteristics and sex assignment hormonally and surgically.

Developing more sophisticated understandings and measures of both sex and gender will set the stage for developing more knowledge about the interactions between them. This knowledge will improve our ability to design policies and interventions that address and correct the factors that affect the health of women and men — and will necessitate interdisciplinary and transdisciplinary research. For example, one emerging area of health research investigates the social pathways of disease, such as the effects of poverty or stress on the development of chronic disease. Other approaches, such as the study of the relationship between genetics or epigenetics and disease development or health practices, also rely on interdisciplinary involvement. These and other types of health research will be best informed by integrating sex and gender into the research plan from the outset.



Developing more sophisticated understandings and measures of both sex and gender will set the stage for developing more knowledge about the interactions between them.

## Sex, gender, and health research

Historically, girls and women have experienced restricted opportunities in all dimensions, and restrictions like these have led to different and limited gender identities, unequal gender relations, institutionalized limitations, and exclusions from social and economic life. Such limitations have also affected research practices. For example, until recently, females, especially of reproductive age, were routinely excluded as subjects from medical research due to the complexity of their hormonal activity (Vidaver et al., 2000). Although Canada has since issued guidelines for the inclusion of women in clinical trials (Health Canada, 1997), without further guidelines regarding the robustness of data, adequate presentation and publication of data, and inclusion of women at other stages of the research process, the guidelines are insufficient to redress this history of neglect of women in clinical studies (Lippman, 2006). Such issues can have direct and serious implications for human health.

Gender affects health as a direct result of the different roles, responsibilities, and activities ascribed to individuals according to their gender. For example, masculinity is often associated with “toughness” in our society, which means that masculine individuals (whether they are men or women) may be less likely to seek help for health concerns if they prefer to “tough it out.” On the other hand, femininity is associated with appearing “delicate,” which can discourage girls and women from participating in certain physical activities that might improve their health. Gender roles also create economic and cultural pressures that affect women and men differently, such as access to income or food.

Gender roles affect our health as well. For example, researchers sometimes assume that women don't work in particular jobs and therefore do not experience certain occupational health hazards. Such assumptions ignore the reality of how women's labour force participation has changed many women's work. For instance, an analysis of the 139 deaths of female construction workers in the United States during a 12-year period revealed that women had much higher mortality rates than men did (Ore, 1998). Realities such as these indicate that gender roles are not necessarily “natural,” but are socially determined by the systems and cultures in which we live. This fluidity means that gender roles can be actively challenged and eventually changed in order to address issues of inequity or access to health.

In institutions, individuals experience different access to opportunities based on their presenting gender. There is some suggestion, for example, that health care



institutions tend to treat men more quickly for cardiac symptoms, and that men receive cardiac interventions faster than women do (Barakat et al., 2000; Rosenfeld, 2001). These discrepancies in treatment may be attributable to both a social perception of what a typical “heart patient” looks like, as well as to the fact that symptoms signifying cardiac pathologies may differ between the sexes. Additionally, researchers have noted that women newly diagnosed with atrial fibrillation (a heart condition) are less likely to receive warfarin compared to men of the same age (Humphries et al., 2001). Whether this is an outcome of institutionalized responses such as biases in research practices, or biases related to what kinds of treatments women should receive, is a question for further study.

Sex and gender also interact to affect health and produce health outcomes: biology can affect gender and gender can affect biology. The development and progression of osteoporosis illustrates some of the complex interactions between sex and gender. That is, female bodies are more likely to develop osteoarthritis or osteoporosis due to differences in bone structure, bone density, and hormones (Cenci et al., 2000; Riggs, 2000). At the same time, feminine gender roles do not encourage women to do weight-bearing exercises, which increases women’s risk for developing osteoarthritis and osteoporosis (Fausto-Sterling, 2005). Furthermore, women who diet or restrict their food intake, often to style their bodies in “feminine” ways, increase their risk for developing osteoporosis (Powers, 1999; Turner et al., 2001). In some cultures, gender identity might lead a woman to limit the amount of food she eats in an attempt to shape her body to be a particular size. This in turn can affect her ability to reproduce and her overall physiological state. While these complex patterns may produce a series of behaviours that increase women’s likelihood of developing bone health problems, they also show how sex and gender interact to affect health status and behaviours.

Both sex and gender relations influence the risk of contracting infectious diseases and their outcomes. For example, women face specific sex- and gender-based inequities when it comes to contracting HIV and seeking medical care for HIV infection. First, the vagina is physiologically more susceptible to contracting sexually transmitted infections (STIs) than the

penis is (Darroch & Frost, 1999). In addition, because of gender relations, women usually have less power in and control over sexual relationships, putting them at greater risk of contracting HIV (Amaro & Raj, 2000). Finally, due to gender roles, women may delay seeking treatment for HIV/AIDS due to family and childcare obligations.

Sex and gender interact to affect health and produce health outcomes: biology can affect gender and gender can affect biology.

## Measuring sex and gender

Operationalizing concepts is an important aspect of the research process. It is important that measures of sex and gender are valid and sufficiently sensitive for men and women/males and females. For example, if researching depression, one needs to ensure that the measure selected is not gender biased. The following tables give an overview of some of the available measures of sex and gender. Though limited in scope, these measures serve as a starting place to operationalize sex and gender. We have also included some important considerations to think about to ensure optimal research outcomes.

**TABLE 1. Examples of how sex can be operationalized**

COMPONENT OF SEX	ASPECTS OF THE COMPONENT	MEASURES / OPERATIONALIZATIONS
<b>Anatomy</b>	Body size	Height, bone size, bone density
	Body shape	Weight distribution, bone size/ratios, fat, and/or muscle mass
	Reproductive organs (vagina, uterus, ovaries, penis, testes, prostate) and secondary sex characteristics (e.g., breasts)	Structure and function of measures of reproductive organs (e.g., levels of estrogen)
	Brain structure	Brain size, density, and number of neurons in certain parts of the brain, percentage of grey matter, cortical volume, and glucose metabolism (Hines, 2004)
<b>Physiology</b>	Hormones/endocrine system	Levels of sex hormones, or sex steroids, in the body (i.e., androgens, estrogens, progestogens)
		Activity of the hypothalamic-pituitary-adrenal axis (HPA), particularly in response to stress (Kudielka & Kirschbaum, 2005)
		Coping behaviours, as a response to stressors, are believed to be sex-specific (Taylor et al., 2000). Oxytocin is believed to underpin coping behaviours in women, while men are thought to release adrenalin in order to deal with stress.
	Organ functioning	Lung capacity, intervals of the heart (Chauhan et al., 2002)
	Metabolism	Metabolic rate, levels of enzymes (e.g., rate at which alcohol is metabolized)
<b>Genetics</b>	Sex chromosomes	XX, XY, XO, XXY, etc.

TABLE 2. Examples of how gender can be operationalized

COMPONENT OF GENDER	ASPECTS OF THE COMPONENT	EXAMPLES OF QUANTITATIVE OPERATIONALIZATIONS "Capturing gender empirically requires a multiplicity of intersecting measures" (Knaak, 2004, p. 303)
<p><b>Gender Identity</b></p>	<ul style="list-style-type: none"> <li>• How do we perceive ourselves on the continuum of masculinity and femininity?</li> <li>• How are the following aspects of our person linked to our gender:               <ul style="list-style-type: none"> <li>• Dress</li> <li>• Personality traits</li> <li>• Values</li> <li>• Sexual and relational expressions</li> <li>• Behaviour (e.g., health-promoting behaviours, risk-taking behaviours)</li> </ul> </li> </ul>	<p><b>Bem Sex Role Inventory (BSRI)</b></p> <ul style="list-style-type: none"> <li>• A 40-item scale (Bem, 1981)</li> <li>• Measures gender role perceptions (individual's readiness to use gender as a lens to view the world)</li> <li>• A reasonably valid instrument for assessing traditional gender roles and linking gender personality and ideology</li> <li>• Frequently used in research, however, masculine and feminine gender role perceptions may be weakening, especially in North American/Western cultures</li> </ul> <p>If using this measure, keep in mind that it has been criticized as being too "crude." As a result, the measure is not able to account for the complex nature of "femininity" and "masculinity" (Choi &amp; Fuqua, 2003). Additionally, this measure has been regularly critiqued for using the terms <b>femininity</b> and <b>masculinity</b> incorrectly; thus, instead of measuring these concepts, the BSRI instead measures "instrumental" and "expressive" personality traits (Gill, Stockard, Johnson, &amp; Williams, 1987).</p> <p><b>Personal Attributes Questionnaire (PAQ and EPAQ):</b></p> <ul style="list-style-type: none"> <li>• A 16-item scale (Spence, Helmreich, &amp; Stapp, 1974)</li> <li>• Measures positive instrumental and expressive personality characteristics</li> <li>• Assesses internalization of gender-typed personality traits</li> </ul> <p>If using this measure, keep in mind that like the Bem Sex Role Inventory, this measure has been criticized for overly simplifying the complex terms <b>femininity</b> and <b>masculinity</b>. Similarly, the PAQ scale has been critiqued for containing items that do not belong in either the instrumental or expressive categories. For example, the PAQ's masculinity scale includes items that indicate autonomy rather than instrumentality, and its femininity scale includes both expressive and emotional personality traits (Gill, Stockard, Johnson, &amp; Williams, 1987).</p>

CONTINUED ON NEXT PAGE

		<p><b>Male Role Norms Scale (MRNS)</b></p> <ul style="list-style-type: none"> <li>• A 17-item scale (Thompson, Pleck, &amp; Ferrera, 1992)</li> <li>• Assesses so-called traditional masculine ideology and gender-related attitudes</li> <li>• 11 instruments for assessing beliefs and attitudes about men or masculinity standards (masculinity ideology) and 6 instruments that assess first-person accounts of gender role conflict, stress, or conformity to masculinity ideology. Internally reliable (Cronbach's <math>\alpha = .86</math>)</li> <li>• Note: measures of gender orientation and measures of gender ideologies are independent and have differential correlates.</li> </ul> <p>If using this measure, keep in mind that this scale cannot account for power and economic gender dimensions (Connell, 1987), which may be important aspects of men's self-concepts and experiences.</p> <p>If using any of the above measures, consider reading Koestner and Aube's discussion of gender characteristics, "A Multifactorial Approach to the Study of Gender Characteristics" (1995).</p>
<p><b>Gender Relations</b></p>	<ul style="list-style-type: none"> <li>• How does gender influence relationships with other individuals?</li> <li>• How do individuals respond to socially constructed roles, rights, and responsibilities that are attributed to the genders?</li> <li>• How does gender inform sexual, emotional, and relational expressions?</li> </ul>	<p><b>Sex Role Behaviour Scale (SRBS)</b></p> <ul style="list-style-type: none"> <li>• A 240-item overall scale, organized into three separate scales (Orlofsky, 1981)</li> <li>• Comprehensive and lengthy, organized on basis of sex role stereotypes (Male-valued [M], female-valued [F], and sex-specific [MF] interests and behaviour)</li> <li>• Measures interest and behaviour in four areas: leisure, vocation, primary relationship, and social interactions. Most suitable for specific assessments of the areas mentioned. A short form has been developed for more global assessments of sex-role interests and behaviours.</li> <li>• Some researchers have found these relationship measures to be complex, not stable, and question the reliability, but it has also been used extensively by many.</li> </ul> <p><b>Masculine Gender-Role Stress (MGRS):</b></p> <ul style="list-style-type: none"> <li>• Measures gendered stress appraisal and masculinity, and predicts levels of anger, anxiety, and poor health behaviours for men and women (Eisler, Skidmore, &amp; Ward, 1988).</li> <li>• Measures stress resulting from rigid commitment to gender roles.</li> </ul>

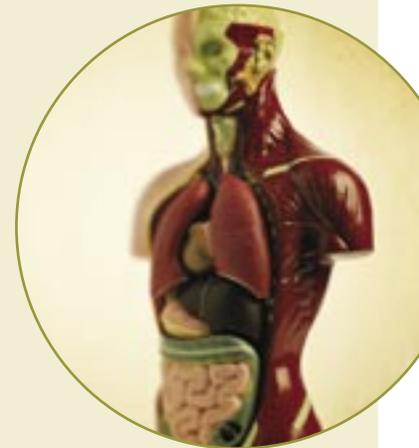
		<p><b>Feminine Gender-Role Stress (FGRS):</b></p> <ul style="list-style-type: none"> <li>• “The assessment of FGRS appraisal and coping style in women provides useful information for devising treatment strategies to improve women’s health through promotion of adaptive coping” (Gillespie &amp; Eisler, 1992, p. 426)</li> </ul> <p><b>Multicultural Masculinity Ideology Scale (MMIS)</b></p> <ul style="list-style-type: none"> <li>• Measures adaptation and internalization of culture’s norms about how men should act (Doss &amp; Hopkins, 1998)</li> <li>• Can be used for projects relating to culture and masculinity</li> </ul>
<p><b>Institutional Gender</b></p>	<ul style="list-style-type: none"> <li>• How do institutions respond to individuals according to their gender?</li> <li>• What are the connections between gender and power or influence?</li> <li>• What opportunities are afforded to the genders? (e.g., economic, structural, employment opportunities)</li> <li>• How does gender relate to positions in society (e.g., race, class, and social hierarchies)</li> </ul>	<p><b>Women’s Empowerment: Measuring the Global Gender Gap</b></p> <ul style="list-style-type: none"> <li>• This report measures the degree to which women have achieved equality with men in 58 countries around the world (World Economic Forum, 2005). Equality is measured in five ways: economic participation, economic opportunity, political empowerment, educational attainment, and health and well-being</li> </ul> <p><b>Kobe Women’s Health Indicators</b></p> <ul style="list-style-type: none"> <li>• Over 1,000 indicators are listed that measure women’s level of empowerment at the individual, community, and national levels, and a core set of indicators was identified for reporting (Women and Health Programme, 2005).</li> </ul> <p><b>A Gender Coefficient?</b></p> <ul style="list-style-type: none"> <li>• Susan Phillips argues that while currently there is no gender coefficient similar to the Gini coefficient (which measures income and wealth inequalities), indicators of human rights, income, income distribution, and access to education or health care may be proxy coefficients for measuring gender in women’s health (Phillips, 2005).</li> <li>• She also argues that a coefficient could be based on a conflation of sex and gender.</li> </ul> <p>If using any of the above measures, consider reading Miers’ paper, “Developing an Understanding of Gender Sensitive Care: Exploring Concepts and Knowledge,” which describes how gendered social relations have been institutionally embedded (2002, p. 70).</p>

Sex and gender are multidimensional concepts, which means that individuals are affected by many health factors, including genetics, physiological characteristics, gender identity, gender relations, institutionalized gender, and more.

## The application of a sex- and gender-based analysis to health research

As we have seen, sex and gender are multidimensional concepts, which means that any given individual is affected by multiple factors, including genetics, physiological characteristics, physical characteristics, gender identity (individual), gender relations (interpersonal/group), and institutional gender (institution and social realms). Regardless of discipline, when a health researcher is planning research or analyzing and writing about findings, s/he needs to take into account the key influences experienced by the person or group that s/he is studying.

When looking at women's experiences of substance use or mental health, for example, acknowledging how their physiology, brain structure, metabolism, genes, hormonal activity, and so on might affect them is only part of an appropriate approach. If researchers also investigate the ways in which women's gender identities can encourage them to view their bodies or life circumstances differently, and how the gender relations within families, work settings, and social circles can add additional stressors that may compromise their health, they will be getting a much fuller picture of the interactions between the social and the biological. Such a researcher might also explore how women experience institutional gender barriers wherein medical systems, or other institutions, do not respond to their specific gendered health needs, leading to substance use, poor mental health, or stigma.



## Three ways to incorporate a sex- and gender-based analysis into health research

There are many ways to incorporate an SGBA into research, but the following basic approaches serve as starting points. These approaches apply to all four pillars of health research: biomedical, clinical, health systems, and social/cultural, as well as health policy.

1. Revisit an original study by applying an SGBA, reanalyzing, or performing a secondary analysis (with no changes made to the research design since data are already collected).
2. Augment an existing research plan with an SGBA (which calls for minor additions to the research design).
3. Incorporate an SGBA from the outset (i.e., use a sex and gender perspective throughout, following one of the three research design options).

## Revisit an original study by applying an SGBA, reanalyzing the data, or performing a secondary analysis

This option involves critiquing and reanalyzing research to examine how sex and gender are relevant to, or may further explain any findings. A component of this option includes performing a secondary analysis, whereby the researcher disaggregates previously collected data. It does not involve changing the original research question or design, and therefore can act as a complementary stage of analysis after the research has taken place. For example, “revisiting” can entail asking additional questions of data that have already been collected or conducting further analyses to explore the sex and gender influences and differences in the project. This exercise provides a new analytical dimension and would be useful for studies that did not originally differentiate by sex or gender.

**APPLY A SEX- AND GENDER-BASED ANALYSIS** Using a sex- and gender-based analysis is possible even when researchers are in the latter stages of their research project if they critique the research — from the questions, literature, and theories they used, to the ways they collected and analyzed their data. A researcher can challenge the way that sex and gender are theorized and operationalized and ensure that these terms have not been confused. This is often called doing gender-based analysis (GBA), and incorporates questions that apply to research, policy formation, or program development (Health Canada, 2003). For researchers, asking the following questions of any work is particularly pertinent (Eichler, 2000):

- Does the research question take one sex or gender as the norm, rather than stating explicitly who the research is applicable to? Make sure to avoid generalizing the findings to groups other than the one being studied.
- Does the research question assume that women and men are uniform within their sex/gender groups? If so, consider that there are multiple differences between individuals of the same sex or gender and be mindful when reporting the findings to acknowledge the differences among groups of women or groups of men.
- Revisit the literature review and examine how sex and gender are used in these studies. Are the terms **sex** and **gender** used accurately? How can your study present a more precise portrayal of sex and gender? If inaccuracies or omissions exist in the literature, make note of this in your own research to avoid perpetuating the confusion.
- Are your measures for both sex and gender appropriate?



A researcher can challenge the way that sex and gender are theorized and operationalized to ensure that these terms are not confused.

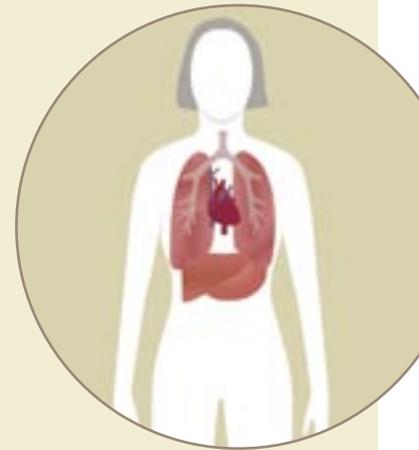
- How were your data collected and how does this affect your results?
- Does your analysis account for differences between the sexes and genders, and also within these groups? If not, reconsider how you can analyze the findings to account for these differences.

### EXAMPLE

Critique your instruments and measures to make sure that each item is being asked in a way that is relevant to both women and men equally. For example, a study on depression might use a scale that includes an item related to “crying spells,” such as the CES-D depression scale (Radloff, 1977). Research has demonstrated that despite the level of underlying depression, women are more likely to respond positively to this item than men. A proposed solution to this problem is the removal of this gender-biased item (Cole et al., 2000). Modifying the research instrument will ensure that the measures you are using account for the effects of gender.

**REANALYZE THE DATA** Reanalyzing data can greatly refine a researcher’s findings and improve claims about the applicability of research results. Many researchers begin by scanning the data collected for appropriate measures or markers of sex differences or gender influences. They also consider asking supplementary questions of data they have already collected. For example, in a study on cardiovascular disease in women in which sex differences were found in treatment-seeking, one can make an effort to explain how gender roles may contribute to this difference (e.g., do women with dependent family members delay seeking treatment?). How might “femininity” affect women’s health behaviours? These are the sorts of questions that were asked by researchers who found that women’s multiple roles within families may prevent them from taking time for themselves and seeking care for health problems (Rosenfeld, Lindauer, & Darney, 2005).

Even when investigators are researching a phenomenon where sex and gender do not at first seem relevant, these types of assumptions still need to be interrogated. For example, while at first the topic of SARS transmission might not seem to be a matter for gender consideration, after careful analysis it appeared that women workers in a recent Toronto outbreak were at higher risk because of their role as nurses and cleaning staff, providing front-line care to patients (Varia et al., 2003). Recognizing this gendered pattern of exposure has important practical, policy, and health implications.



It may be similarly relevant to review findings to probe for differences and similarities across and within the categories of sex and gender. That is, research can benefit from paying attention to the differences among groups of men and women, reflecting and accounting for diversity. The categories of “women” and “men” are far from homogeneous and research needs to be cognizant of the ways that “race”, place, ethnicity, socio-economic status, sexuality, ability, age, etc. impact the health of individuals differently.

The questions we have suggested here will go a long way toward ensuring that any research questions, framework, and analysis are using the concepts of sex and gender correctly. These measures will help researchers to produce more accurate, relevant, and rigorous scientific results.

**SECONDARY ANALYSIS** Performing a secondary analysis can be an opportunity to incorporate concepts of sex and gender. A secondary analysis uses previously collected data in a new study, this time with different organizations of data, different statistical analyses, different research questions, or different perspectives on the original research question (Burns and Grove, 2001). As Burns and Grove explain, it can entail “examining dimensions previously unexamined, or redirecting the focus of the data to allow comparison with data from other studies” (2001, p. 277). Research that conducts a secondary SGBA allows for a re-examination of data from studies that previously did not consider these concepts. A secondary SGBA differs from the “reanalyzing” option here in that a secondary analysis can go much further, by adopting a sex and gender perspective throughout the analytic process.

One excellent way to launch a secondary SGBA is to have research assistants, graduate students, or trainees analyze national publicly available data sets. The Statistics Canada website, for example, lists details about data sets available for analysis, including the Aboriginal People’s Survey, the National Population Health Survey, the National Longitudinal Study of Children and Youth, the Canadian Community Health Survey, and many others. In general, large surveys present many opportunities to apply SGBA retroactively so that important sex and gender effects can be explored.

### Augment an existing research plan with an SGBA

This option is designed to help researchers add additional samples and measures to their study, to enable more rigorous analyses of how sex and gender operate in their



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research, and to specifically help them research girls' and women's health issues. This option also suggests mixing methods — for example, using both qualitative and quantitative methods to research a health issue. Or one may consider using a comparison group of men in a women's health study to determine the differences across the categories of sex and gender.

This option is ideal for projects that are in the initial stages of research when minor alterations and additions are reasonable. This option may also suit researchers who are currently studying health issues with respect to one sex or gender and are looking to extend or replicate their study to include other dimensions of sex or gender, possibly by adding an additional sample.

Because health research has historically tended to centre on males and men's bodies, there is still a paucity of research conceptualized around women's health. Now that new research is revealing vast physiological differences between males and females, it is vital to conduct research on female bodies and women's health to guarantee thorough, beneficial health strategies for the entire population. Studies that focus on women exclusively are valuable for the way they enhance the diagnosis, treatment, and prevention of disease in women. However, women are not a homogeneous population, so research needs to be diverse, recognizing the multiplicity of women's experiences and differences. Adopting an SGBA is helpful in examining the diversity among women. For example, researching immigrant women's experiences, or women's experiences in Northern communities, or poor women's experiences with respect to health are important contributions. Equally, researching differences between groups of women with respect to propensity for certain diseases or conditions, or different responses to drugs or treatments, is a critical under-researched area.

**ADD TO OR DIVIDE THE SAMPLE** Add a sample of women to a study on men, or divide a sample into men and women, rather than studying an issue without differentiating the sexes. This immediately makes for more comprehensive health research. Youth samples divided into girls and boys for data collection, reporting, and analysis are more useful than studies that collect and report aggregate data on "youth" only. Adding or dividing a sample in this way enables researchers to comment on the differences between the biological sexes. Additionally, this ensures that research on one sex or gender is not mistakenly applied to other sexes or genders. Although science has yet to determine the full implications of every cell in



the body being “sexed” (Institute of Medicine, 2001) or how cells respond to their sex-specific environments in male and female bodies, we know it is important to involve both men and women in health research in order to produce accurate, useful results.

Similarly, because every animal cell is sexed (Gesensway, 2001), the inclusion of female animals in preclinical research is also necessary and appropriate. Excluding female animals for any reason neglects the important health ramifications of sex and will lead to incomplete science. Although sex-restricted studies still occur for reasons such as the desire to control for hormonal variations in experiments, researchers have to find ways to incorporate these hormonal variations instead of simply ignoring them, or to study them directly, specifically using female animals, to learn about their important influences. Some significant advances in health research have been made by actively studying male and female animals. Using a canine model, for example, researchers determined that the smooth muscle reactivity of the coronary arteries responds differently to androgens and estrogens (Karanian & Ramwell, 1996).

**ADD MEASURES** Health research often measures health status or quality of life using scales, tests, and questionnaires. Incorporating measures on sex and gender — for example, measures on gender identity and gender roles, sexuality, or attitudes towards gender role issues — are useful in further analyzing complexities in research. Other measures would incorporate an international perspective and remain sensitive to the finer points of sex and gender. (Of course, any new measures need to be assessed and revisited in light of recent theoretical and clinical progress made on sex and gender in health research.)

**MIX METHODS** Generally speaking, qualitative research focuses on attaining “depth” in a subject, while quantitative research produces “breadth.” Rather than collecting and analyzing numerical data, qualitative methodologies typically focus on the collection and analysis of experience, understanding, or meaning. Using both qualitative and quantitative methods can highlight the significant contributions of both.

A qualitative researcher could consider incorporating quantitative methods in her or his study, whereas someone who typically relies on quantitative methodologies might try using qualitative techniques in their current work. Some studies begin with quantitative methods, such as large-scale surveys or clinical tests, and then follow up with qualitative interviews or focus groups. For example, to gain a better



Because every animal cell is sexed, the inclusion of female animals in preclinical research is necessary. Excluding female animals neglects the important health ramifications of sex and leads to incomplete science.

sense of what was happening to women who were enrolled in a clinical trial related to smoking cessation in the post-partum period, Bottorff et al. (2000) followed up with a qualitative study about women's experiences to gain a better sense of why the intervention failed for particular types of women.

Other researchers begin with qualitative studies to bring issues to the surface that will underpin future quantitative studies. Both of these are valid approaches to health research, but there are many other ways that both quantitative and qualitative methods can complement each other. For example, physician-patient interviews can help to highlight an area that requires large-scale study. Or community-based groups might identify experiences that require larger studies, or explain existing survey results. Research projects could simultaneously use grounded theory, critical theory, statistical analysis, and discourse analysis to probe the factors that influence access to care. Clearly, there are many options for mixing methods — the approach is limited only by the creativity of the researcher.

### Incorporate an SGBA from the outset

This option helps investigators adopt concepts of sex and gender in their research from the outset by encouraging the refocusing and reconceptualizing of their study. Studies in this category assume three forms: studies on females/women, comparison studies on females/women and males/men, and multilevel studies that examine multiple layers of sex and gender, that is, the individual, group, institutional, and social layers of sex and gender.

**WOMEN/FEMALE-ONLY STUDIES** After identifying the research as a women-only/female-only study, ensure that the theoretical framework and methodology are suitable for studying females. Choosing research methodologies and theories is important because they frame the types of questions that can be asked, the ways the data will be collected, and the manner in which the findings are given over to analysis. Also, one should pay attention to how differences among females will be measured with respect to diversity, since this is a critical dimension of single-sex studies and remains an under-researched area.

When performing a quantitative study on females only, researchers should ensure that their sample is representative of the population about which they are generalizing their results. For example, in order to make claims about women who are economically disadvantaged, a study needs to make sure that low-income women



are appropriately represented. It is also important to pay attention to sampling techniques if an investigator intends to generalize results to large groups of women, particularly when studying biological factors in health issues. In human studies, remember to investigate the effects of gender in biological health studies — what is it about women’s experiences that make their health issues distinct?

**EXAMPLE 1.** WOMEN AND CARDIOVASCULAR DISEASE (CVD)

When examining women’s experiences with cardiovascular disease, there are many aspects of sex and gender that can and should be addressed. Some of these include asking questions such as:

- Does gender influence the timely treatment of CVD? If so, in what ways? Do women’s gender identities or gendered relations affect women’s treatment-seeking behaviour? How do institutions respond to women’s CVD needs?
- How do gender interactions in the emergency room affect women’s experiences of CVD?
- Are there differences between premenopausal and postmenopausal women’s experiences of CVD? Are there differences in rates of CVD between these groups?
- How does gender influence other related health-behaviours and disease conditions? For example, how does gender influence smoking rates among women? Does tobacco smoke interact with sex hormones to increase women’s rate of ischaemic heart disease more than men’s (Prescott et al., 1998)?

**EXAMPLE 2.** WOMEN AND BONE HEALTH

Women’s bone health provides an excellent example of the ways that sex and gender interact to produce specific health outcomes. As we have seen, women’s bone health is a product of both their sex and gender (Fausto-Sterling, 2005). Powerful gendered influences encourage or discourage healthy behaviours, which

Sex and gender interact to produce melanoma. Men tend to get melanoma (skin cancer) on their backs, while women get melanoma on the backs of their legs. Sex-linked genetic factors can predict anatomic locations of melanoma

(Autier et al., 2004). However, gender roles dictate different bathing suit styles for women and men that expose different areas of the body to the sun (Gesensway, 2001).

Research on smoking trends over the past 20 years has revealed changes between men and women's smoking habits, and stark differences in vulnerability to tobacco use, particularly among Aboriginal people, youth, and low-income people.

then affect women's gender identity and how individual women see themselves, which in turn, affects their bone health. For example, stress perception affects the hormones regulating bone breakdown in women — which is confounded by the negative health behaviours that may be adopted by women who are at particular risk of osteoporosis — such as smoking and caffeine intake (Rapuri et al., 2001; Ward & Klesges, 2001). Further, diversity matters to bone health. Among veiled women, for example, vitamin D deficiency contributes to poorer bone health and the development of osteoporosis (Allali et al., 2006). Hence, a variety of factors, both social and biological, affect the development and maintenance of bone health for women.

**WOMEN/FEMALE AND MEN/MALE COMPARISON STUDIES** Because women and men have different health outcomes and behaviours, comparison studies can illuminate the differences between the groups, especially when there is variability among men and women with respect to age, income, ability, socio-economic status, geography, ethnicity, and so on.

Longitudinal or historical approaches to health research are valuable ways of comparing populations. Investigating trends and patterns over time to find gaps and differences is also important. For example, research on smoking trends among subgroups of women and men over the past 20 years has revealed changes between men and women's smoking habits and stark differences in vulnerability to tobacco use among some groups, particularly Aboriginal people, youth, and low-income people (Greaves, Johnson, Bottorff, Kirkland, et al., 2006). These types of findings are useful in helping to refocus health policies and funding. For example, upon finding that girls' or women's smoking rates may have increased (or even stayed the same) despite government policies designed to prevent and reduce smoking, alternative policies and prevention campaigns can be developed and implemented.

**MULTILEVEL STUDIES** Multilevel studies enable the examination of many layers of sex and gender. For example, research that examines the interplay between genes and the environment and how this affects the health of individuals would be a multilevel study. Other multilevel studies look at the relative contributions and interplays between sex, gender, and diversity variables, taking into account that women and men are heterogeneous.



Multilevel studies could include, but are not limited to:

- Studies on the many levels, pathways, and causes of healthy and unhealthy behaviours, particularly with respect to sex and gender.
- Studies on the effects of new technological developments on women and men's health and development.
- Multimethod and multimeasure studies examining aspects of sex, gender and health.
- Studies on the risks and protective factors involved in individuals, families, and cultures with respect to women's and men's health.
- Studies on the ways that gender affects sex hormones, bone density, stress, lung capacity, and other biological entities.
- Studies that identify how and where women experience health issues.

**EXAMPLES OF MULTILEVEL STUDIES** This type of research is important as we discover ecological and other group-level health determinants and their links with individual factors. Hierarchical linear models (HLM) are an excellent approach to multilevel analyses in health research. Such models simultaneously analyze both group-level and individual-level health factors and offer a comprehensive understanding of health and disease determinants (Diez-Roux, 2000). This approach views individuals or animals as nested within groups. An HLM might group humans according to racial background, socio-economic class status, or occupation, or have animals grouped according to size, sex, etc. Researchers can then investigate if health outcomes for individuals or animals within groups are correlated.

**EXAMPLE 1.** BREAST CANCER

Consider a multilevel study that investigates the sex, gender, and environmental causes of breast cancer in women. This research project could study why some women are more biologically prone to breast cancer (sex effects), how women's life experiences, exposures to toxins, work situations, gendered relationships, etc. might contribute to breast cancer (possible gender role effects), and how access to treatments or experiences within health care systems and educational cancer settings might affect women's chances of developing breast cancer, as well as their experiences in living with cancer (institutionalized gender).



Research on animals has underscored the importance of the estrous (menstrual) cycle on the way that females react and respond to various diseases, treatments, and social contexts.

**EXAMPLE 2.** ENDOCRINE-DISRUPTING CHEMICALS

Hood (2005) has raised important questions about the effects of endocrine-disrupting chemicals (EDCs) that are becoming more prevalent in our environment and which have been linked to reproductive and developmental abnormalities in various animal species. Hood questions whether EDCs are leading to the “feminization” of species as evidenced by skewed sex ratios, sex reversals, and lower levels of hormones within the sexes. A multilevel study could investigate how these environmental and possible sex and gender changes could affect health behaviours, health outcomes, and gender and sex roles. For example, studies could consider whether sex changes at the population level affect health status or behaviour across groups of males and females. Other investigations could consider the role of genetic factors in EDC disruption, or how genetic and environmental factors interact to produce specific health outcomes for individuals with respect to EDC-linked reproductive and developmental abnormalities.

## Applying an SGBA to animal studies

Research on animals is important because it can investigate relationships between and among disease conditions, coping mechanisms, responses to treatments, and developmental factors, among other variables, which can be more complicated to study in humans (Kerr, Hundal, Silva, Emerman, & Weinberg, 2001; Kosten, Zhang, & Kehoe, 2006). Models of disease are often established in animals to identify the mechanisms involved in various disorders in humans. Furthermore, animal models and cell lines are first used to identify compounds that possess beneficial biopharmaceutical and pharmacokinetic properties in humans. Such animal models have been very useful in revealing key differences between male and female bodies (Blum, 1999).

A great deal of knowledge about sex differences comes from laboratory animal research. In the field of drug research, preclinical studies have shown that important differences exist between males and females in their behavioural, neurological, and pharmacological responses and sensitivities to drugs of abuse, and in their tendency to relapse following drug cessation (Damaj, 2001; Lynch, 2006; Lynch, Roth, & Carroll, 2002). Research on animals has underscored the importance of the estrous (menstrual) cycle on the way that females react and respond to various diseases, treatments, and social contexts (Kippin et al., 2005; Palanza, Gioiosa, & Parmigiani, 2001; Roberts, Bennett, & Vickers, 1989).



Hormonal fluctuations due to the estrous cycle have been found to affect an array of behaviours. For example, the estrous cycle in rats has been shown to interact with stress and memory in learning situations (Cahill, 2006). The estrous cycle has also been found to influence brain responsiveness to addictive drugs, such as cocaine (Cahill, 2006). However, given the obvious differences between females of the same species, physiological differences that exist between females of different species are an even greater challenge to overcome. Also, rodents are poor models of human reproduction or the biology of aging. Animal studies on the influence of the menstrual cycle in diseases affected by sex steroids, such as autoimmune disorders like lupus or multiple sclerosis, have shed some light on how sex-based influences affect disease progression and regression.

A group of Canadian researchers from the University of Calgary recently showed how pregnancy often brings with it a remission of the symptoms associated with multiple sclerosis (Gregg et al., 2007). Using a murine (rodent) model of the disease, they found that prolactin, a hormone produced in greater quantities during pregnancy, had a regenerative effect on the myelin sheath, the protective fatty layer that coats nerve cells and which is attacked by one's own immune cells in this neurodegenerative disease (Gregg et al., 2007). This is one of many successes in establishing both cellular and animal models that take into account sexual dimorphism. Such basic science approaches continue to illustrate the necessity of integrating sex variables into health research using animal models.

Adding a sex analysis to preclinical research increases the rigour and validity of the results and contributes to our knowledge of the differences between males and females with respect to health. Preclinical research is an important area in which to ensure that science responds to the developments made in other disciplines, which have repeatedly affirmed the extensive biological differences between males and females. This is why there are real, detrimental consequences to studying male animals exclusively. Results from these types of studies can limit the development of scientific knowledge about females and, if clinical practices are based on these findings, create the potential for unsafe or inadequate health care for women.

Although all of the ideas and suggestions in this primer apply to both human and animal health research, there is much less development of the idea that gender applies to animals in the way that sex does. Having said this, there are elements of social life that can be manipulated in animal research, such as social isolation, housing density, stress, access to maternal bonding and grooming, or deprivation



Introducing sex and gender in a comprehensive manner into health research heralds a new era — one that holds great promise for increasing our understanding of the origins of health and illness.

of food or exercise. Manipulating these factors can help us in understanding the parallel human experiences that are gendered. Animals can be made more socially vulnerable through experimentation and selective breeding (Kaffman & Meaney, 2007), which points to the opportunity for developing more complex health research that integrates both social and biological factors as well as sex-specific questions.

## Conclusion: A new era in health research

The ideas in this primer are an introduction to and overview of the current landscape regarding sex and gender in health and will undoubtedly shift as more research is done in these areas. We have suggested three main ways to use sex and gender in health research as a catalyst and starting point to help researchers think about these concepts in relation to their own work and interests.

Introducing sex and gender in a comprehensive manner into health research heralds a new era — one that holds great promise for increasing our understanding of the origins of health and illness. We expect new developments in our understandings of sex and gender as research continues in these areas and more attention is paid to questions of research design and the measurement of sex and gender. We look forward to the articulation of more complex theories and measures of diversity as well, and growing insights into how these elements interact to produce health.

Many exciting research opportunities lie ahead for researchers using sex- and gender-based analyses. Indeed, as we incorporate new knowledge regarding the impact of sex and gender on a wide range of health issues, more and more research questions emerge. The fact that using an SGBA raises more provocative questions is an indication of its vitality. Above all, recognizing sex and gender in health research is a necessity, in order to produce more accurate, rigorous, and valid results. Incorporating sex and gender into health research equals better science.



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# Evaluation sheet

Thank you for your interest in **Better Science with Sex and Gender: A Primer for Health Research**. This primer is an initiative of the Women's Health Research Network (WHRN), which is dedicated to fostering and promoting research on the health of girls and women in British Columbia. Please visit us at [www.whrn.ca](http://www.whrn.ca) for more information about the network, our goals, and our activities.

We are interested in determining who has used the primer, and if/how it has been useful. We are also interested in improving the primer, by adding examples or clarifying points. Hence, we would appreciate it if you would please fill out the following evaluation form and return it in one of the following ways:

BY MAIL: Women's Health Research Network,  
201-601 West Broadway, Vancouver BC, V5Z 4C2 Canada

ONLINE at: <http://www.surveymonkey.com/s.asp?u=986383445635>,  
where you can submit the form directly

BY EMAIL to: [sdixon@whrn.ca](mailto:sdixon@whrn.ca)

All responses are anonymous. The results from this evaluation sheet will be used to plan future initiatives of the WHRN.

1. **Where did you first learn about the primer, *Better Science with Sex and Gender*?**

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2. **Which part(s) of the primer have you read?**

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3. **Which part(s) of the primer did you find most useful?**

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4. **How are you using, or how do you intend to use the primer? (e.g. grant-writing, teaching, writing, to support research, etc.)**

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5. How satisfied are you with the content and material in the primer?

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6. How could this primer be improved? Are there any examples or changes you could suggest to improve the primer?

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7. Where do you live (city, province, and country)?

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8. What is your occupation?

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9. Are you a member of the Women's Health Research Network of British Columbia, Canada?

Yes       No

10. Any other comments or suggestions?

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THANK YOU!

WOMEN'S HEALTH RESEARCH NETWORK  
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The Women's Health Research Network (WHRN) is based in British Columbia, Canada, and brings researchers together who are interested in women's health, and gender and health issues. The WHRN fosters the generation, application, and mainstreaming of new knowledge to improve women's health and women's health research and encourages the brokerage of knowledge regarding the health of girls and women in British Columbia and Canada.

For more information about the network, please visit our website at [www.whrn.ca](http://www.whrn.ca)

