SEX AND GENDER IN PALEOPATHOLOGICAL PERSPECTIVE

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Introduction: sex, gender and health status in prehistoric and contemporary populations

GEORGE J. ARMELAGOS

Sex and gender remain concepts wrought with confusion. Even after three decades in which anthropologists have clarified the distinctions between sex and gender, confusion remains. There is a consensus in anthropology that sex is defined by the biological differences between males and females determined at the moment of conception and enhanced in subsequent physiological development. Sexual differences include features of the chromosome, genitalia, and other anatomical structures related to secondary sexual development. There is also agreement that gender is the cultural construct in which individuals are socially classified into categories such as male and female, or masculine and feminine in our culture. Other cultural systems recognize more than two gender classes. As anthropologists clarify the distinctions between the concepts, other disciplines are increasingly substituting the term 'gender' for the term 'sex'. Pearson (1996), a biologist, notes that the substitution of these terms reflects an attempt at political correctness that 'clouds understanding'. In response to Pearson's communication, Carlin (1996:1596) retorted that, 'While social scientists are free to appropriate the word to draw a useful distinction in their field, it is not incumbent on the rest of us to do so.' In a subsequent analysis, Pearson (1997) shows that there has been a linear increase in articles that misuse gender for sex. It is a practice that appears to continue and one that perpetuates biology as the source of variation.

Examples of the misapplication of the terms sex and gender are abundant. For instance, Johnson in a 1995 publication, correctly uses the term sex in describing the separation of the X and Y chromosome and then incorrectly substitutes gender a year later in a discussion of 'gender preselection in mammals' (Johnson 1996). Other instances of the substitution of gender for sex abound (Cizza *et al*. 1996; Hanley *et al*. 1996; Murata and Masuda 1996; Serrat and de Herreros 1996; Aden *et al*. 1997; Botchan *et al*. 1997; Palmer *et al*. 1997). Even when dealing with social groups where gender may be appropriate, the term is often misused (el-Hazmi *et al*. 1994; Fellous 1997). When Carlin (1996) argues that researchers in other fields have no obligation to accept the distinctions that are useful in other disciplines, he overlooks the power of discriminating between a term that emphasizes biology, with one that makes a social distinction. Even more surprising is Paech's (1996) suggestion that since sex and gender are both social constructs, they are interchangeable. Paech appears to be unaware of what is lost by not making the distinction. Gender is a reflection of what the social system believes to be a biological reality. More importantly, the behavioral practices that reflect gender expectation may have biological outcomes.

There are numerous examples that demonstrate the importance of making a distinction between sex and gender. For example, health practitioners' perceptions that they are dealing with a biological problem rather than a behavioral problem may influence their treatment of the condition. The distinction of sex and gender in prehistory remains an area that has been understudied. Gero and Conkey (1991) provided one of the seminal efforts to recognize the importance of gender in interpreting the archaeological record. The cooperation of biological anthropologists is an essential aspect of uncovering information that allows for an understanding of the importance of gender. Bumsted *et al*. (1990) provide an example of the complexity of unraveling gender differences in nutrition. They have the archaeological context of the population, and a technique to reconstruct diet. Bumsted and her colleagues used stable isotopes to determine differences in diet related to gender. In Chapter 10, Grauer and coworkers note that the most basic issue of gender differences depends on our ability to correctly determine the sex of the skeleton. Without an accurate means for sex determination, the discussion of gender differences is meaningless.

Skeletal biologists who specialize in paleopathology are becoming more sensitive to the issue of sex and gender. There is a plethora of publications that discuss the use of skeletal features for determining the sex of the individual under study. As paleopathologists have begun to understand how behavior affects the risk of pathology, and how gender influences behavior, it has become a more frequent topic of interest. The distinctions between sex and gender are becoming more implicit and explicit in these studies. Paleopathologists are now able to raise more sophisticated issues related to gender and pathology, and to use the data to test hypotheses. It is not surprising that gender continues to come to the forefront as a relevant issue in paleopathology (e.g., Grauer 1991). The pattern of pathology is not a matter of chance but reflects the adaptation of populations. Behavioral differences that are gender-based can affect the pathological profile of a population. In addition, differential access to resources based on gender is a critical factor in producing pathology. One of the difficulties that we have in measuring biological outcomes is how to differentiate results of physiological sex differences from the social aspects of gender. William Stini (1985) discussed this issue in his analysis of the impact of nutritional deficiencies on sexual dimorphism in human stature. From a theoretical perspective, females should be able to resist nutritional deficiencies because of the buffering impact of the hormonal system. Stini (1985) argues that if all things are equal and that males and females are equally subjected to nutritional stress, there should be a greater reduction in the stature of males than females. However, if females are subjected to greater nutritional stress because of differential access to food, then they may suffer a greater percentage reduction in stature than the males (see Storey, Chapter 9, for the application of this hypothesis to an archaeological population). Ortner (Chapter 6) raises a similar issue with respect to the greater immune reactivity in women than in men. He presents empirical evidence to test the hypothesis and offers an evolutionary explanation for the differences. Ortner suggests that gender-related differences in immunity may be related to differential selection because of the women's role in child bearing and nurturing. This would represent a period of increased vulnerability to infection. There is evidence that hormonal differences in males and females affect immunological competence (Sapolsky 1994). In the examination of life tables constructed for prehistoric and ancient populations, women show a pattern of increased mortality during child-bearing years (Green *et al*. 1974; Moore *et al*. 1975). However, women show a decrease in mortality in the later years and experience greater longevity. It is interesting to note that these differences are apparent in most life tables constructed for populations until the beginning of the twentieth century, when they begin to show decreased differences. Recent changes in the lifestyle of women have further reduced these differences.

A comparative method may be used to test hypotheses of gender differences in lifestyle, status, nutrition, and workload. In fact, paleopathology as a science depends on the development of scientific methodologies based on comparative methods. The delayed scientific development of paleopathology is due to the lack of problem-oriented research and a reliance on the newest technology to drive research agendas. Skeletal biologists, using the most advanced medical technology, assume that they are at the forefront of science (Armelagos *et al*. 1982). Substantive research questions are often secondary to the technology applied. The criticism of technology-driven paleopathology should not be interpreted as an argument for rejecting technological advances. Paleopathology would be well served if the new technology were used in conjunction with a methodology that permits the exclusion of alternative hypotheses. Platt (1964) suggests the use of an inductive approach that he calls ‘strong inference’ as a means for hypothesis testing in science. In spite of the long history of inductive inference, it has not penetrated the methodology of paleopathology; yet it could be an effective means for transforming paleopathology into a true science. While strong inference is most effectively applied to sciences with experimental possibilities, it can be useful in non-experimental sciences, although the application to the latter does require modification. Since there is no possibility of carrying out experiments within the field of paleopathology, the researcher must rely on comparative analysis for ‘natural’ experiments.

Larsen has used such an approach in his analysis of prehistoric foragers who lived in what is now coastal Georgia and Northern Florida, USA (Larsen and Ruff 1993; Larsen and Harn 1994; Larsen, Chapter 11). In earlier publications, he showed the impact of the shift to agriculture on health and notes the impact of European contact on these populations (Larsen and Milner 1993). In the pre-contact period, females have a higher prevalence of dental caries and periostitis that he believes is related to relative access to maize. After contact, the social, political, and economic changes are so great that it affects both males and females, and sex differences disappear. Larsen also provides some intriguing analysis of bone architecture that suggests that after contact the Europeans were using women as the bearers of burden.

Osteoporosis and osteopenia (Weaver, Chapter 3) illustrate the interplay between sex and gender in an analysis of a problem. Osteoporosis (the loss of bone mass with age) is one of the most serious health problems facing the elderly living in the developed nations. In the United States, 1.5 million women are afflicted with osteoporosis, a condition that increases their risk for fractures of the hip and vertebra. In 1996 it was reported that 300,000 women suffered hip fractures, and the problem will continue to grow as the nation’s population ages. Medical and nursing costs have reached 10–20 billion dollars a year in the United States, with projected costs of 240 billion dollars in the next 50 years (Lindsay 1995). From an evolutionary perspective, osteoporosis became a health problem as longevity in humans increased. The increase in life span, with a greater number of individuals reaching these older ages, has created one of the most significant health problems in the world today.

Studies conducted on prehistoric populations, primarily from Sudanese Nubia, North Africa, document the patterning of bone loss and maintenance (Dewey *et al.* 1969a,b). Prehistoric populations living from 10,000 to 1000 years ago experienced two distinct types of bone loss. Many women between their twentieth and thirtieth year lose a significant amount of bone (osteopenia) that appears to be related to the demands of pregnancy, lactation, and a diet that is poor in calcium (Martin *et al*. 1981). The production of milk during lactation extracts calcium from the bone, and in the presence of under-nutrition, this calcium may not be replaced as women grow older (Martin and Armelagos 1985). While these women do not show the clinical problems of bone fractures, it indicates that diet is an important component of bone health in younger women. The examination of children by Van Gerven *et al*. (1985), and Armelagos *et al*. (1982), shows that their bone development and maintenance are also affected. While they show a relatively slight decrease in long bone growth and a significant deficit in cortical wall development, the indications of increased bone resorption and a lack of mineralization are part of the process. The dietary aspect of the problem focuses attention towards gender as a relevant factor in access to resources.

A second pattern of bone loss is related to the aging process. People who lived in the prehistoric period began to lose bone following their thirtieth year. In this pattern of loss, the prehistoric populations are similar to living populations. In both living and extinct populations, males and females experience a decrease in bone mass, but the process is quite different between the sexes. Females, because they have less bone than males as they approach middle age, are especially at risk. In addition, after menopause, the rates of loss may increase because of a decrease in the production of estrogen (a hormone essential for maintaining bone in women). In this instance, hormonal differences related to sex are the focus of attention. There is, however, a major difference in the amount of bone that modern and prehistoric women lose. By 50 years of age, ancient Nubians had lost about 15% of their bone mass, however, they did not suffer from the debilitating fractures that plague modern women. In Nubia, only 4% of the women reached 50 years of age and most died soon after.

Today, women over the age of 50 appear to be at greater risk for bone loss as menopause results in a decrease in estrogen. As more women are living longer they are therefore losing more bone. In the United States, 75% of the population reaches their sixtieth year, 29% their eightieth year, and 6% reach their ninetieth year. It may seem a paradox, but the improvement in living conditions that increases longevity in modern nations has created one of women's most significant health problems.

Much of the research has involved the impact of the subsistence shift to primary food production. For example, the premature loss of bone in women during the reproductive period in prehistoric Nubians and the impact on the growth and development of the children suggest that there is a differential impact of dietary change. The reduction of birth spacing to meet the increase in mortality and the economic importance of children that characterize Neolithic populations suggest that women and children were bearing the cost of this transformation. It is a pattern that is played out in many of the peasant populations that live in the Third World. Weaver (Chapter 3) is correct in stating that osteopenia is not a problem that affects only women. Martin *et al*. (1987) and Rose (1985) showed in their studies of post emancipation populations from Ceder Grove Arkansas, USA that both women and men were seriously affected by premature bone loss. In this case, the stresses associated with the adaptation of these populations had a significant affect on both sexes.

Given the importance of distinguishing between sex and gender in prehistory, it is not surprising that the distinction will be useful in a contemporary setting. There is, for example, a concern for the occurrence of osteoporosis (Anonymous 1996) and breast cancer in men (Seeman 1995; Memon and Donohue 1997). The analysis of the archaeological record provides a means for examining differences in sex and gender from an evolutionary perspective. Changes in men's health (Sabo and Gordon 1995) and women's life expectancy (Williamson and Boehmer 1997) can be investigated. Recently, it has been asserted that mortality differences in rheumatoid arthritis have a gender and age component (Anderson 1996). Differences in depression (Compas *et al*. 1997) must also consider the issue of gender. In education (Field and Lennox 1996; Zelek *et al*. 1997), training (Wilson and Boulter 1997), and practice (Wiggins 1996), gender has become an issue for health care professions. The role of men in nursing (Evans 1997), gender in doctor–patient relationships (Greatrex 1997; Kerssens *et al*. 1997), and recruiting women physicians for specialties such as gastroenterology (Wolf 1997) have entered the debate. The role of gender in international health (Sargent and Brettell 1996) has surfaced as one of the most critical issues of this decade. Women's access to health care facilities in India (Buckshee 1997; Roberts, Chapter 7), violence against children in Barbados (Handwerker 1996), excess female mortality in Somalia (Aden *et al*. 1997), and access to nutritional resources (Backstrand *et al*. 1997) have brought gender to the forefront of international health issues. International health care providers are now beginning to consider the issues raised by the distinction between sex and gender (Wijeyaratne 1994; Pfannenschmidt *et al*. 1997). Anthropology, with its biocultural perspective, initiated and championed the distinction between sex and gender. The importance of discriminating between these concepts and their application to problems in contemporary and prehistoric populations is now well established in anthropology. The trend toward distinguishing between sex and gender in the fields of medicine and international public health suggests the importance of making the distinction in other disciplines. It is now incumbent for others to follow this advancement.

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