

**Menopause**

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[Clinical Corner: Invited Review]

Anthropology and the study of menopause: evolutionary, developmental, and comparative perspectives

Sievert, Lynnette Leidy PhD

Author Information

From the Department of Anthropology, University of Massachusetts, Amherst, Amherst, MA.

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Address correspondence to: Lynnette Leidy Sievert, PhD, Department of Anthropology, University of Massachusetts, Amherst, Machmer Hall, 240 Hicks Way, Amherst, MA 01003-9278. E-mail:

leidy@anthro.umass.edu**Abstract**

Objective: This work aims to consider how the discipline of anthropology contributes to the study of menopause through evolutionary, developmental, and comparative perspectives.

Methods: This study was a review of skeletal and ethnographic evidence for menopause and postreproductive life in humans' distant past, hypotheses for the evolution of menopause and long postreproductive life, variation in age at menopause with focus on childhood environments, and the study of variation in symptom experience across populations.

Results: Longevity, rather than capacity for menopause, sets humans apart from other primates. Skeletal evidence demonstrates that some Neanderthals and archaic *Homo sapiens* lived to the age at menopause and that at least one third of women in traditional foraging populations live beyond menopause. The evolutionary reasons for why women experience a long postreproductive life continue to be debated. A developmental perspective suggests that early childhood may be a critical time for the environment to irreversibly influence the number of oocytes or rate of follicular atresia and, ultimately, age at menopause. A comparative perspective examines symptom experience at midlife through participant observation, qualitative interviews, and quantitative instruments to gain a holistic understanding of the meaning, experience, and sociocultural context of menopause.

Conclusions: An evolutionary perspective suggests that menopause is not a recent phenomenon among humans. A developmental perspective focuses on the influence of early childhood on ovarian function. A comparative perspective expands clinical norms and provides knowledge about the range of human variations.

Anthropology is the study of human culture and human biology, past and present. The discipline of anthropology is particularly well suited for the study of menopause. There is variation in age at menopause across populations, in symptom experience, and in the meaning of menopause across cultures. Among hominin ancestors, the capacity for universal female menopause and long postreproductive life is probably a million years old. In all places and for a very long time, menopause has been part of the human experience.

This review aims to consider how the discipline of anthropology contributes to the study of menopause through evolutionary, developmental, and comparative perspectives. Depending on the question posed, an evolutionary perspective extends the point of view back to the beginning of the human species more than 100,000 years ago or to earlier versions of the *Homo* genus about 1.8 million years ago, or as far back as the common ancestors that humans share with all primates, mammals, or other vertebrates. An evolutionary perspective applies the Darwinian arguments of natural selection with contemporary "cautious adaptationism."¹ This cautious adaptationism takes into account physical and developmental constraints, consequences of genetic drift, and alternative pathways to adaptive outcomes. An evolutionary perspective identifies the "hominin blueprint"² that helps humans understand how they, as a species, came to be the way they are now. It is the perspective used when one questions why women experience universal menopause at the midpoint of the maximal potential life span.

The developmental framework and the evolutionary perspective are not mutually exclusive. In humans' evolutionary past, there would have been strong selection in favor of genes that confer advantages early in the life span but weakening selection against genes that display deleterious effects with increasing age.^{3,4} Sometimes the same genes confer positive effects early in the life span and deleterious effects in later life (ie, antagonistic pleiotropy).⁵ As detailed below, some researchers see human menopause as an example of antagonistic pleiotropy.⁶

The developmental origins of health and disease (DOHaD) approach focuses on the evolutionary tradeoffs that occur when environmental factors bring about changes in the phenotype that are adaptive to survival early in the life span but alter disease risk in later life.^{7,8} Phenotypic plasticity in response to the environment is adaptive in early life; however, problems arise when there is a mismatch between the environment of early development and the environment of later life. For example, some DOHaD researchers assert that small size in utero and low birth weight can be adaptive in an environment of low nutritional support⁸; however, the physiological changes associated with low nutritional resources in utero increase the risk of long-term disadvantages such as diabetes or hypertension if the individual encounters a postnatal environment of overnutrition.⁹ A developmental framework has been applied to understand variation in age at menopause and, less frequently, symptom experience at midlife. In addition, the DOHaD approach has relevance to chronic diseases associated with the postreproductive period, such as osteoporosis and heart disease.

The comparative perspective in anthropology is useful for examining the cessation of reproduction across species and the experience of menopause across cultures. Anthropologists have applied a comparative perspective since the beginning of the discipline. At first, anthropologists gathered information from missionary reports, government records, folklore, and travel books. Eventually, in the words of Bohannan and Glazer,¹⁰ "anthropology found 'the field'—the first of the social sciences to do so" (p. xiv). At that point, anthropologists developed the methods of ethnography and went out to discover for themselves how people lived, what people believed, and how people described their subjective experience. A classic example of comparative ethnography is the Six Culture Study, which systematically compared broad aspects of culture, child-rearing techniques, and the social behavior of children in natural settings in Okinawa, the Philippines, India, Kenya, Mexico, and New England.¹¹ Aging and menopause have similarly been examined, with consistent measures applied across disparate populations.^{12,13}

Although there is overlap across the three perspectives highlighted here, for the purposes of this review, they will be discussed separately to introduce and illustrate the contributions of anthropology to the study of menopause. In addition to the evolutionary, developmental, and comparative perspectives, anthropology embraces the concept of holism. Within that holism, anthropologists study how biology, culture, and environments interact across time to shape the topic of interest. [Figure 1](#) illustrates some of the variables examined in studies of hot flashes in menopause.

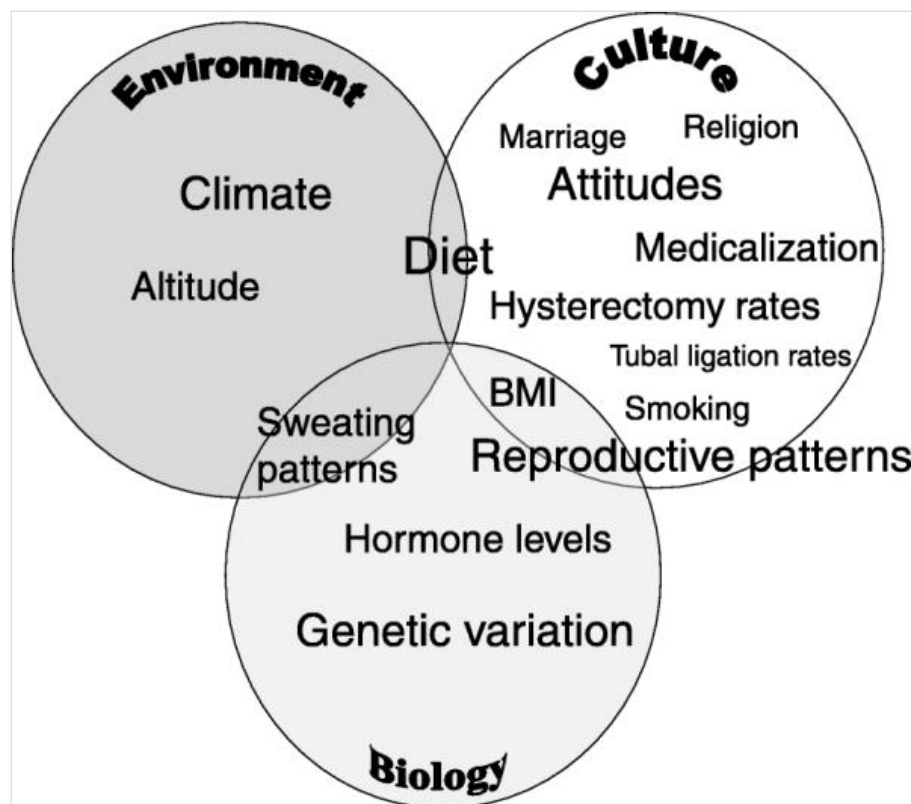


FIG. 1. Some of the variables examined in studies of hot flashes in menopause (adapted from Sievert ⁸⁹ p. 141 with permission of the author. Copyright © 2006, Sievert). Within a biocultural perspective, the physical/social environment influences culture (eg, diet), and culture influences the environment (eg, agricultural practices). Culture influences biology (eg, body mass index [BMI]), and biology influences culture (eg, reproductive parameters). The environment influences biology (eg, sweating patterns altered by acclimatization), and biology influences the environment (eg, fans and air conditioning for hot flashes). Adaptations are themselves works protected by copyright. So in order to publish this adaptation, authorization must be obtained both from the owner of the copyright in the original work and from the owner of copyright in the translation or adaptation.

EVOLUTIONARY PERSPECTIVES

Human females are not unique in demonstrating the capacity to outlive their ability to reproduce.¹⁴ Other female animals, most famously killer whales and short-finned pilot whales, also experience postreproductive life.^{15,16} Humans are, however, evolutionarily more closely related to monkeys than to whales; thus, the search for a nonhuman model of menopause has (unsuccessfully) focused on other primates. For example, a longitudinal study of Japanese macaques found that reproduction ceased after 25 years but that only 3% of the monkeys lived 26 years. Menopause, if it happens in macaques, occurs very close to the end of life.¹⁷

In a study of fertility and mortality among 147 female chimpanzees in five wild chimpanzee populations, 34 were older than 40 years. Of those, 47% produced at least one offspring after 40 years. Because these very old female chimpanzees continued to reproduce, Emery Thompson et al ¹⁸ concluded that menopause is not a typical characteristic of chimpanzee life histories. A long postreproductive life would be even less common.

In another study of fertility and mortality among apes (gorillas and chimpanzees) and new world monkeys (muriquis and capuchins),¹⁹ very few individuals completed fertility before death.* Members of two old world monkeys (baboons and blue monkeys) and a type of prosimian (sifaka) demonstrated measurable reproductive senescence; however, like Japanese macaques and wild chimpanzees, few individuals completed fertility before death. For baboons, blue monkeys, and sifaka, the modal age at fertility completion was beyond the modal age at death, for example, baboons were more likely to die (modal age, 18.6 y) before menopause (modal age, 23.3 y) than to experience any postreproductive life. In contrast, the Dobe !Kung—a hunting/foraging group without access to modern health care—demonstrated a capacity for menopause and a long postreproductive life with a modal age at menopause (41.0 y) well before the modal age at mortality (79.3 y).¹⁹ It is longevity that sets humans apart from other primates.^{4,20,21}

When did human menopause first appear? The capacity for menopause and postreproductive life began long before the turn of the 20th century. Although female life expectancy exceeded 50 years at the beginning of the 1900s, life expectancy at birth—skewed by infant mortality and child mortality—is not a good measure of when menopause appeared in human records.²² In human history, many women, especially among the social elite, have lived to the age of menopause and beyond. For example, female Egyptian mummies aged 40 years or older are not uncommon.²³ Hildegard of Bingen died at age 81 years in the 12th century, and the list goes on.

Using equations developed from extant primates, Smith ²⁴ estimated that hominin longevity exceeded age 50 years more than 1 million years ago, meaning that *Homo ergaster* and early *Homo erectus* shared the capacity for menopause. Fossil remains from Paleolithic Neanderthals suggested that 10% to 24% of the population survived beyond 40 years.^{25,26} Within early *Homo sapiens*, it seemed that 17% of prehistoric foragers survived beyond age 40 years.²⁷ Estimates vary, but ethnographic and paleodemographic evidence indicates that more than one third of hunters and foragers—without easy access to modern medicine—lived beyond age 40 years.^{22,26,28} Menopause and postreproductive life are not new phenomena. Strong evidence indicates that some women outlived their capacity to reproduce during much of humans' historical and evolutionary past.

A number of ideas have been put forward to explain why menopause and postreproductive aging evolved in humans. Anthropologists have argued that menopause may have been selected for to ensure that old eggs are not fertilized.²⁹ In humans, gametes can wait in the ovary for 15 to 50 years before ovulation. This wait decreases the available reserve of primordial follicles and increases the risk of age-related chromosomal abnormalities ³⁰ and fetal loss.³¹ Menopause could have been selected for to prevent the ovulation and fertilization of abnormal oocytes.

Other anthropologists have argued that maternal death threatens the survival of the youngest offspring; therefore, menopause was selected for to ensure that mothers are young enough to survive pregnancy, childbirth, and the infancy of their offspring.³²⁻³⁴ This “mother” hypothesis originated from the work of Williams,⁵ who pointed out that human infants are extremely altricial and require extended maternal care. Using data from preindustrial Quebec, Pavard et al ³⁵ concluded that if maternal mortality, stillbirth, and birth defect probabilities increased markedly with age in the absence of menopause, then menopause could have been selected for in humans' evolutionary past. Shanley et al ³⁶ concluded that the increasing risk of mortality with birth at older ages was not sufficient on its own to select for menopause.

From an evolutionary perspective, the “grandmother hypothesis” is probably the best known contribution of anthropology to the study of menopause. This idea gained visibility from fieldwork among the Hadza of Tanzania.³⁷ The argument is that postreproductive grandmothers provide care and food to their grandchildren.^{22,38,39} Grandmothers may also have been the first midwives to their own daughters when hominins moved from the primate pattern of solo births to the human pattern of assisted births.⁴⁰ The central premise is that postmenopausal grandmothers further increased their own inclusive fitness by investing in their daughters' fertility and their grandchildren's survival rather than continuing to produce children of their own.^{5,29,37,41-43}

There is ethnographic and historical support for the idea that menopause and postreproductive aging were selected for by the evolutionary benefits gained through grandmothering.^{36,43,44} However, some studies showed that although maternal grandmothers had a positive effect on the survival of grandchildren, paternal grandmothers and grandfathers were associated with no effect or an increased risk of infant death.⁴⁵⁻⁴⁷ Other studies did not show a positive effect of maternal grandmothers' longevity on the number of grandchildren.⁴⁸

Finally, there are anthropologists who argue that menopause is an epiphenomenon of other evolutionary processes instead of a direct adaptation.³⁴ In terms of antagonistic pleiotropy, some anthropologists have argued that menopause is a deleterious consequence associated with adaptive processes. Waves of developing follicles produce hormones during prereproductive life. After the initiation of regular cycles, waves of follicular development continue to produce the estrogens, inhibins, and other factors necessary for ovulation. Across mammals, there would have been strong positive selection for the initiation and maintenance of ovulatory cycles; however, the same processes result in the exhaustion of ovarian reserves because humans are a long-lived species.⁶

Menopause can be understood as the byproduct of the highly conserved mammalian pattern of oogenesis and follicular atresia, coupled with a lengthened life span.⁴⁹ In all mammals, many more oogonia are produced than will ever develop and ovulate, and almost all oogonia, oocytes, and follicles are lost through the process of atresia. The patterns of gamete production and follicular loss are the same across mammals. In long-lived species, such as humans or killer whales, the byproduct of this pattern is the eventual depletion of all viable ovarian follicles, resulting in menopause and postreproductive life. This is a neutral, rather than adaptationist, perspective to explain human menopause. Longevity was the trait selected for across time. The selection for longevity resulted in menopause and a long postreproductive life because the mammalian patterns of oogenesis and follicular loss were conserved. Reproduction came to an end, but the somatic life span continued.⁴⁹

Anthropology contributes time breadth and a cross-species perspective to the study of menopause. Anthropologists are interested in when and why menopause and postreproductive life appeared in the evolutionary record.

DEVELOPMENTAL PERSPECTIVES

The developmental perspective considers how early life environments may have later life consequences. For example, a growing body of evidence links early life difficulties with earlier age at menopause.^{50,51} The mechanism—whether adverse environments affect the number of undeveloped eggs in the fetal ovary or the rate of follicular loss during early development—is not clear. Consistent with DOHaD hypotheses, it may be that energy is diverted from developing body organs (including the ovary) to protect the developing brain.^{8,9,52} Low rates of weight gain in utero or during the first year of life may somehow influence oocyte numbers or the rate of loss of ovarian follicles.^{53,54}

A number of studies have suggested that the critical age for an early environmental effect on age at menopause is early childhood. In the Netherlands, severe famine conditions were experienced during the last year of World War II. Elias et al ⁵⁵ created exposure categories from memories of hunger, cold, and weight loss, and found that women who were severely exposed to famine conditions experienced natural menopause, on average, 0.37 years earlier than women who were not exposed. The effects persisted after adjusting for smoking, socioeconomic status, parity, body mass index (BMI), age at menarche, and year of birth. When participants were divided into subgroups according to their age at the start of the famine, women who were severely exposed from ages 7 to 9 years demonstrated a decrease in age at menopause of 1.3 years compared with the unexposed group. Women who were severely exposed from ages 2 to 6 years demonstrated a decrease in age at menopause of 1.8 years. In contrast, moderate exposure to famine conditions after age 9 years had almost no effect at all.⁵⁵ Exposure to hunger, cold, and weight loss had to be severe and early in the life span to affect age at menopause.

Although many late life outcomes have been associated with birth weight,⁹ birth weight has not been associated with age at menopause.^{50,54,56} However, the British National Survey of Health and Development was used to demonstrate a positive relationship between childhood weight at age 2 years and age at menopause, perhaps because of an influence of early postnatal nutrition on ovarian function.⁵⁰

Figure 2 shows the results of recent studies of age at menopause carried out in Bangladesh, Spain, UK, and the United States. In all of the studies, women were assessed as postmenopausal after an absence of menstruation for 12 months. In the Study of Women's Health Across the Nation (SWAN), 1,483 women were followed for 10 years to achieve a prospective mean age at menopause of 52.54 years.⁵⁷ This is the ideal way to determine age at menopause for a population, but few studies are able to follow a substantial cohort of women for such a long period. The other studies in Figure 2 were cross-sectional, and the median ages at menopause were computed by the status quo technique of probit analysis, which is the next best estimate of age at menopause when a prospective design is not possible. Probit analysis does not rely on a recalled age at menopause. Instead, probit analysis determines the point at which 50% of the population has menstruated during the past 12 months and 50% of the population has not.⁵⁸ The results in Figure 2 are highly comparable because the same method of analysis was applied across six samples of similar age ranges.

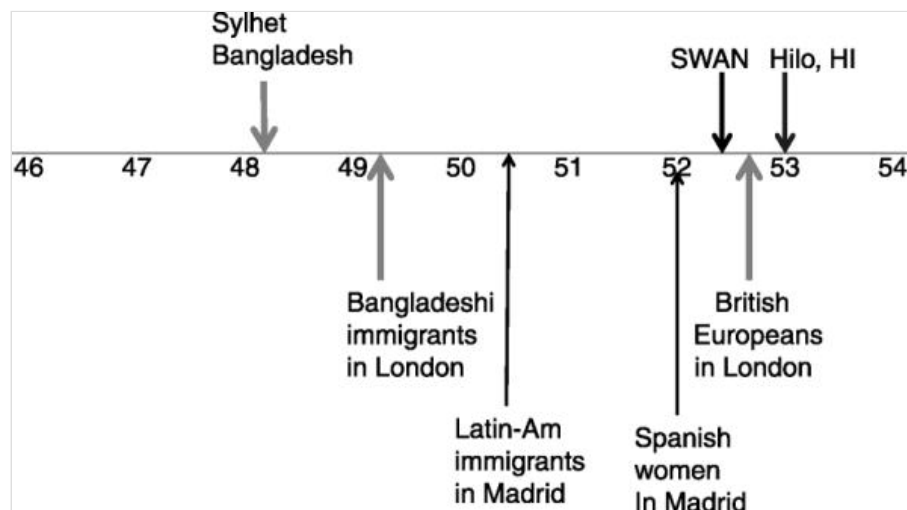


FIG. 2. Median ages at menopause computed by probit analysis in six populations. Study of Women's Health Across the Nation (SWAN) results are prospective and longitudinal and are shown here for a US comparison.^{57,59-61}

SWAN participants came from five sites in the United States. There was no ethnic variation in age at menopause among white, African-American, Chinese, Japanese, or Hispanic women after controlling for socioeconomic, lifestyle, health, reproductive, and anthropometric variables.⁵⁷ The prospective mean of 52.54 years in the SWAN is just a little earlier than the median age of 53.0 years ($n = 898$) in the Hilo Women's Health Study.⁵⁹ Hawaii has the highest life expectancy in the United States; therefore, because life expectancy has been associated with age at menopause, it is not surprising to find a late median age at menopause in Hilo, HI. As in the SWAN, there were no ethnic differences in age at menopause in the Hilo Women's Health Study. This suggests that factors associated with age at menopause were not substantially different across white, Japanese, and mixed-Hawaiian ethnic groups.⁵⁹

The other two studies used a migration design to compare age at menopause among immigrants, their populations of origin, and their new neighbors. Median ages at menopause among women of European descent living in London (52.8 y; $n = 154$)⁶⁰ and Madrid (52.0 y; $n = 274$)⁶¹ were very similar to ages at menopause in the United States. However, in contrast to the lack of ethnic difference in age at menopause in the SWAN and Hilo Women's Health Study, Latin American immigrants in Madrid had a significantly earlier median age at menopause (50.5 y; $n = 301$) than women who were born in Spain (52.0 y; $P < 0.01$).⁶¹ Women who were born in Latin America experienced a different environment during childhood. Although they had lived and worked in Madrid for many years, they demonstrated ages at menopause that were more similar to ages at menopause reported in Latin America⁶² compared with their Spanish neighbors.⁶¹ Among Latin American immigrants, the earliest median ages at menopause were among Bolivians and Dominicans. These two groups had the lowest levels of education and high proportions of participants from rural communities.⁶¹ It seems that the environment of early development, measured as place of birth and level of education, may have set these women on course for an earlier age at menopause compared with women born in Spain.

More dramatic than the Madrid example, Bangladeshi immigrants living in London had a significantly earlier age at menopause (49.2 y; $n = 172$) than their London neighbors (52.8 y; $P < 0.01$). Although they lived in London as adults, their age at menopause was much closer to the age at menopause of the Bangladeshi women still living in the community of origin, Sylhet, Bangladesh (48.1 y; $n = 157$).⁶⁰ There is genetic variation between British and Bangladeshi residents; however, there is also an environmental component contributing to variation in age at menopause. An early age at menopause was significantly more probable among women with a history of three to four infectious diseases (hazard ratio, 1.96; 95% CI, 1.34-2.87) and five or more infectious diseases (hazard ratio, 2.48; 95% CI, 1.53-4.02) than among women with a history of zero to two infectious diseases, after adjusting for study group (white British, Bangladeshi immigrant, and Bangladeshi sedentee), birthplace, parasites, height, financial status, parity, and tobacco use.⁶⁰ Infectious and parasitic diseases occur at relatively high levels in Bangladesh, and diseases in childhood might have had a direct effect on oocyte numbers or rates of follicular atresia. Infectious diseases may divert energy away from the maintenance of follicular stores or may affect ovarian function through a change in the hypothalamic-pituitary-ovarian axis.⁶⁰

Anthropologists have examined early life events in relation to hormone levels. For example, Jasienska et al⁶³ observed a positive relationship between ponderal index at birth (an indicator of nutritional status) and levels of estradiol among women aged 24 to 36 years. Cross-culturally, hormonal variation during the reproductive period has been associated with differences in workload and energy availability across a wide variety of populations.⁶⁴⁻⁶⁶ Using a migration study design, anthropologists Nuñez-de la Mora et al⁶⁷ found that Bangladeshi women who had migrated to London as adults had salivary progesterone profiles as low as the profiles of women still living in the community of origin, Sylhet, Bangladesh. The progesterone profiles of adult migrants were significantly lower than the progesterone profiles of Bangladeshi women who had migrated as children, second-generation British Bangladeshis, and white London women of European origin. These data suggest that childhood most strongly influences later adult reproductive function.⁶⁷

Findings such as these have relevance to symptom experience at midlife if variation in hormone levels during the reproductive period is associated with how fast or how far hormone levels fall during the menopausal transition. Variation in hot flash frequencies at midlife may be associated with nutritional stress during childhood because hormone levels are largely set very early in the life span.^{64,68}

Furthermore, from a developmental perspective, hot flashes may be associated with childhood abuse or neglect.⁶⁹ Among 332 women drawn from SWAN participants in Pittsburgh, women who had experienced any form of childhood abuse or neglect were more likely to report hot flashes (odds ratio, 1.55; 95% CI, 1.10-2.19) in a model adjusted for age, level of education, BMI, race (white or African American), smoking, menopause status, and depressive symptoms. The relationship between negative childhood events and hot flashes may be explained indirectly through adult behaviors associated with past adversities, such as smoking or obesity. However, the effect of abuse or neglect persisted after adjusting for smoking and BMI in the model. Instead, abuse or neglect may have brought about changes in the neuroendocrine systems during childhood,⁷⁰ and the consequences of these changes may include a greater likelihood of hot flashes. A DOHaD perspective would suggest that these changes may be adaptive in childhoods characterized by high levels of stress.⁷¹ Early physiological changes that confer an advantage in a poor nutritional environment may contribute to later insulin resistance. It may be that women who make neuroendocrinological changes to adapt to early childhood stress may be more vulnerable to hot flashes in later adulthood.

COMPARATIVE PERSPECTIVES

Almost every course in anthropology begins with the sentence, "Anthropology is holistic and comparative." When studying symptoms at midlife, a holistic approach means that anthropologists are interested in the effects of the environment (eg, climate), culture (eg, diet, religion, women's roles, attitudes, medical norms, and health-related behaviors), and various levels of biology (eg, genetic variation, hormone levels, reproductive patterns, and sweating patterns). One's understanding of the relationships between the variables in [Figure 1](#) and symptom experience at midlife is enhanced by cross-population and cross-cultural comparisons. Such comparisons can challenge conventional wisdom about what is universally "normal."

The comparative approach is not limited to anthropology, as illustrated by the study of age at menopause in the SWAN.⁵⁷ Nevertheless, anthropologists are uniquely equipped to carry out comparative studies of women at midlife in different cultures because, as Bohannon and Glazer ¹⁰ observed, anthropologists have “the field” and can learn how people live, work, teach, believe, and experience life within their own sociocultural context. Anthropologists often live with the people they study to learn by immersion. This method of research, called participant observation, produces results that are not always quantifiable; however, the method allows researchers to discover the unexpected, to fine-tune research instruments to incorporate cultural nuances, and to understand the emic and the etic. Emic refers to an actor-oriented perspective (ie, how people think and explain their own actions). Emic data are subjective, experiential, and difficult to compare across cultures. Etic data, on the other hand, reflect observer-oriented perspectives that provide an exterior point of view. Etic data are highly comparable because they are collected by standardized instruments, anthropometrics, or clinical measures according to the interests of the investigator.⁷²

Anthropologists were the first to establish that symptoms varied across cultures. In the 1970s, Flint ⁷³ surveyed women of the Rajput caste in the Indian states of Rajasthan and Himachal Pradesh (n = 483). She found “no depressions, dizziness, no incapacitations nor any of the symptoms associated with what we call ‘the menopausal syndrome’” (p. 162). Women experienced no symptoms at midlife, she argued, because menopause was associated with positive role changes and fewer social restrictions. She concluded that “much of what we call ‘menopausal symptomatology’ may well be culturally defined” (p. 163).⁷³ Davis ⁷⁴ found that Newfoundland women viewed menopause as a social/personal problem rather than a biomedical issue. Problems attributed to “the change” included loss of patience, forgetfulness, tiredness, and lack of judgment. Beyene ⁷⁵ compared and contrasted menopause in two farming communities in Greece and Mexico. Similar to the findings of Flint,⁷³ Beyene ⁷⁵ reported an absence of hot flashes in Chichimila, Yucatan, Mexico; however, in contrast to the findings of Flint ⁷³ in India, menopause was not associated with changes in household roles for Mayan women. More recent work has relied less on long periods of fieldwork and more on a combination of qualitative and quantitative methods with an emphasis on comparable instruments and the knowledge gained from key informants.

Finding the right language to talk about menopause and hot flashes in other cultures requires extensive conversations. For example, in an ongoing study of menopause among the Toba—an indigenous group living in the city of Formosa, Argentina—anthropologists struggled to find a word that meant menopause.⁷⁶ Nonaboriginal women spoke of menopause as a marked life transition; however, the Toba did not separate menopause from the normal passage of time and aging. Menopause was described as a social transition that simply followed the last birth. When one woman was asked what occurred during the menopause, “*ella respondió secamente: ‘Dejó de bajarme la menstruación [n’ayapec]’* [she responded dryly, the menstruation stopped]” (p. 276).⁷⁶

When Lock ⁷⁷ studied menopause in Japan in 1984, she encountered difficulty in translating the term “hot flash”:

The Japanese language makes particularly fine distinctions among various bodily states, much more than English does, but, surprisingly, has no single word that unequivocally represents a hot flash. One term, *nobose*, usually translates as a “rush of blood to the head” or a “hot fit” and applies to vertigo or dizziness. But it is both an everyday and a medical term and can also describe a person who is “hotheaded,” easily excited, or infatuated with someone. A second term, *hoteri*, can simply translate as feeling hot or flushed and most often expresses the East Asian propensity for becoming flushed when drinking alcohol. ...A few women also refer to *kyu na nekkan* (a sudden feeling of heat). In the questionnaire we include all the terms, *nobose*, *hoteri*, and *kyu na nekkan*, together to gloss the meaning of a hot flash (p. 32).

Based on qualitative interviews that lasted 90 minutes to several hours, Zeserson ⁷⁸ found that Japanese women used an onomatopoeic expression, *kaa to suru*, to describe hot flashes:

This informal, rather emotionally conveyed mimetic expression... led me to wonder if flushing might be more common among Japanese women than surveys had suggested, because it is my impression that this sort of expression would be almost impossible to pick up on a written survey (p. 191). ...It is difficult to translate appropriately because this mimetic expression was accompanied generally by a certain gesture: both hands cupping the air space under the jaws, palms upward, pushing jerkily, conveying the idea of energy rising (p. 192). ...Nevertheless, when a middle-aged woman, who is not bathing, drinking sake, or otherwise ill, fans herself while uttering “*Kak-kak-kak-ka shite im!* [Whew, I am heating up!],” there is little doubt that she is experiencing some variation of what in English is called *hot flush* (emphasis in original, p. 194).

Melby ⁷⁹ carried out surveys in Japan using the following five terms to denote hot flashes: *kaa*, *hoteri*, *nobose*, *atsuku naru* (to become hot), and *kyu na nekkan*. Hot flash prevalence ranged from 3% to 17%, depending on which term was used. When all terms were combined, the prevalence of any type of hot flash was 22% (vs the 12% reported by Lock ⁷⁷). Melby ⁷⁹ found that *atsuku naru* had an imprecise definition and a low response rate, perhaps because of its generality. *Kaa* was used to describe sensations of heat followed by the experience of a chill or sweating that occurred on the face and, secondarily, over the entire body. *Hoteri* was a more superficial symptom used for feelings of heat in the face and, secondarily, hands and feet. *Nobose* was described as dizzy and woozy and was primarily used for the head and, secondarily, the face.⁷⁹

In an ongoing study in Campeche, Mexico, similar language difficulties have been discovered because the word most often used to describe hot flashes in other parts of Mexico (*bochorno*) is not as commonly used in Campeche. Instead, women in the state of Campeche often use the word *calor*, which means “heat.” This is a general and imprecise word. When women were asked to describe what they meant by *calor*, women described hot flashes but also heat associated with infections, fever, changes in blood pressure, and the transition in temperature from air conditioning to the street.⁸⁰ Finding the correct language is critical to the comparison of symptom frequencies across cultures. When subjective symptom reports are compared, differences in how women notice symptoms, label symptoms, and report symptoms are also compared.^{81,82}

In order to compare menopause across cultures, comparable or consistent data need to be collected.⁸³ The Stages of Reproductive Aging Workshop + 10 stages have provided a way for all researchers to consistently fine-tune the categories of premenopause, perimenopause, and postmenopause.⁸⁴ It has been more difficult to achieve comparability across studies in the measurements of symptoms at midlife.⁸³ The first explicitly cross-cultural study of menopause was carried out in Massachusetts, Canada, and Japan by an epidemiologist, a sociologist, and an anthropologist. These investigators worked together to make their results comparable.⁸⁵ Questions about symptom frequencies were asked in the same way using very similar symptom lists. The [Table](#) presents examples of survey results.

	Hot flashes	Joint pain	Source
Manitoba, Canada	31	31	85
Kobe, Kyoto, and Nagano, Japan	12	15	
Massachusetts, United States	35	39	
Beirut, Lebanon	48	44	13
Rabat, Morocco	61	54	
Madrid, Spain	46	56	
Massachusetts, United States	57	54	

Data are expressed in percentages.

TABLE Examples of symptom frequencies from studies comparing symptoms across cultures

A more recent cross-cultural comparison was The Decisions At Menopause Study carried out by Obermeyer et al [13](#) in Lebanon, Morocco, Spain, and the United States. Questions about symptom frequencies were asked in the same way using very similar symptom lists ([Table](#)).

The Decisions At Menopause Study applied qualitative and quantitative methods; thus, the results could be understood within a larger cultural context.⁸⁶ For example, a study of symptom clusters highlighted the importance of tiredness, anxiety, nervousness, and depression in reference to “war and insecurity in Beirut, poverty and unemployment in Rabat, and family worries and burdens in all sites” (p. 143). The qualitative responses also allowed for nuanced analyses of the phenomenology of symptom descriptions. For example, in Beirut, gastrointestinal problems were situated in the throat, “at the entrance,” “at the top,” and “in the corner” of the stomach, in the intestine, and in the colon. Women talked about “laziness” in the digestive system so that “food stays and stagnates on the top of my stomach.” Women envisioned their stomachs as “nervous,” “fragile,” “sensitive,” “tight,” “stressed,” and “with no fluid.”⁸⁶

A comparison of menopausal experience between Tunisia and France also used qualitative [87](#) and quantitative [88](#) methods to understand how cultural context influences symptom frequencies at midlife. Tunisian women were more likely to report somatic symptoms, depressed mood, anxiety, and vasomotor symptoms compared with French women, but there were within-country differences as well. Analyses suggested that social class, cultural constraints, and gender inequality, along with national wealth, explained both intercountry and intracountry differences.^{87,88}

Within the holism of the biocultural perspective, anthropologists use quantitative and qualitative methods, include anthropometric measures and hormonal assays, and measure hot flashes by objective ambulatory measures.^{68,89} Many disciplines study menopause among contemporary women in the United States, Europe, and Australia. Anthropologists are committed to the study of humans in all places and at all times. This leads anthropologists to work in sometimes difficult conditions, with relatively small sample sizes. These findings broaden what is known about clinical norms and provide knowledge about the range of human variations. These are two of the ways in which anthropologists can contribute to collaborative research with biomedical investigators and practitioners.

CONCLUSIONS

Multiple disciplines contribute to the study of menopause. The purpose of this review was to consider how the discipline of anthropology contributes to the study of menopause through evolutionary, developmental, and comparative perspectives. Not every study cited in this review was carried out by an anthropologist; however, all of the studies were cited with the intention of demonstrating these three perspectives.

Anthropology applies broad frameworks to understand the human condition in all places and at all times. There is fearlessness in the breadth of anthropology that sets it apart from other disciplines. In the 1940s, Malinowski [90](#) famously wrote that “The ‘Study of Man’ is certainly a somewhat presumptuous, not to say preposterous, label when applied to academic anthropology” (p. 3). Seventy years later, anthropology remains a presumptuous discipline. What other discipline encourages its practitioners to live for months or years in other countries to understand human variation in culture and biology? What other fields of study are interested in humans from today back 65 million years to the start of the primate order? In fact, to understand the evolution of menopause, one should go back to the reptilian ancestor that shifted from continued oogenesis to the mammalian and avian pattern of limited egg production at the start of the life span.⁴⁹

An evolutionary perspective helps clinicians understand the hows and whys of human menopause and postreproductive life.¹ A developmental perspective gives clues about a possible critical window, when environmental effects are most likely to influence oocyte numbers or rates of follicle loss. A comparative perspective challenges conventional thinking about the normal menopausal transition. Culture and ethnicity influence lifestyle characteristics that modify biology and determine age at menopause and the symptoms that women notice and associate with menopause. A multidisciplinary perspective on menopause enriches one’s knowledge about this important transition in all women’s lives.

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*Completed fertility was defined as a final birth followed by at least 2 SDs of the interbirth interval for that population. [\[Context Link\]](#)

Key Words: Evolution; Developmental origins of health and disease; Age at menopause; Hot flashes; Cross-cultural

IMAGE GALLERY

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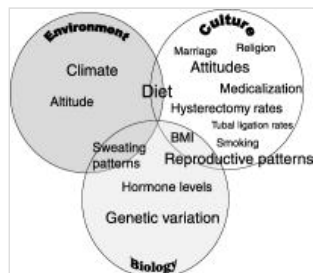


Fig. 1

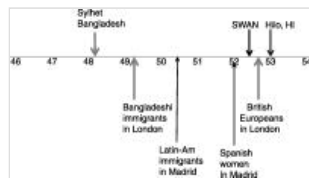


Fig. 2

	Hot flashes	Joint pain	Sources
Manitoba, Canada	31	31	87
Kobe, Kyoto, and Nagano, Japan	12	15	
Massachusetts, United States	25	39	
Beirut, Lebanon	48	44	11
Rabat, Morocco	61	54	
Madrid, Spain	46	56	
Massachusetts, United States	57	54	

Data are expressed in percentages.

TABLE Examples of sy...

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