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Trends in age at menarche, sexual debut, and oral contraceptive use among Swedish and Swedish Sámi women

by

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A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
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Chapter One: Introduction

The average age of a girl at menarche (onset of first menstrual period) is decreasing worldwide; women now reach sexual maturity at a significantly younger age than their grandmothers. In the U.S. the average age at menarche dropped from 14 years in 1900 (Chumlea et al. 2003) to 12.8 years currently (Pinyerd and Zipf 2005). Average age at menarche in Israel has declined from 13 to 11 years (Chodick et al. 2005), from 14 to 12 years in Poland (Hulanicka and Waliszko 1991), in Scotland from 13.2 to 12.7 years (Okasha 2001) and, in Northern Europe, age at menarche is about three years earlier than it was 100 years ago (Parent et al. 2003).

Determining the correlates and consequences of this trend is critical, as early menarche has biomedical, emotional, and socio-cultural consequences, including predisposition to cancer and heart disease and early participation in risky behaviors, such as cigarette smoking, alcohol abuse, and sexual activity (Chodick et al. 2005). Addressing this issue is timely and imperative, as it is occurring across populations and may be markedly different between industrialized and non-industrialized populations. For example, in South Korea, a newly-industrialized country, girls reach menarche four years earlier than their grandmothers did (Hwang et al. 2003). In addition, Kiil (1939) reported that even when age at menarche was dropping among Swedish girls living in newly industrialized areas, the age at menarche among Lapp (Sámi) girls living in traditional nomadic cultures had not changed between 1870 and 1930. These studies suggest that environmental and lifestyle factors related to an industrialized lifestyle may be contributing to an earlier age at menarche.

Research Question

To address these urgent issues, I studied a population of Swedish and Swedish Sámi (hereafter referred to as Sámi) women living in Northern Sweden. My research focused on three areas. First, I explored secular trends in age at menarche among and between Swedish and Sámi women in an effort to see if there was a difference in menarcheal age in each group over time and to see if there was a difference between the two groups. For purposes of this research, “secular trend” is considered to be “...a slowly continuing change in growth and development over successive generations living in the same territories” (de Muinck Keizer-Schrama and Mul 2001). I also attempted to explore external factors known to affect the age at menarche, including father absence/stepfather presence in the home, ingestion of artificial hormones in meat and/or milk, exposure to environmental chemicals, low birth weight, stress, exposure to cigarette smoke, divorce of parents, number of siblings, and amount of exercise/physical activity (all of which have been previously correlated to age at menarche, as discussed below). Finally, I addressed the consequences related to earlier age at menarche including age at sexual debut and age at first use of oral contraception.

Significance

Because of the many social, physical, and psychological consequences of an earlier age at menarche, it is imperative that this topic be addressed across populations, especially those that are transitioning from a non-industrialized to industrialized lifestyle. The Sámi are an excellent study population for addressing questions concerning health changes as a result of lifestyle transformations because many families have recently made the transition from nomadic reindeer herding to living and working in industrialized areas (Beach 1988). The

effect of this lifestyle change on Sámi health is likely to be profound, although the exact consequences are unclear. Because of this recent transition to industrialization, Lund et al. (2008) called for further research on Sámi diet and activity levels. Although some data on this topic has been gathered in other regions of the world, very little is known about this issue in Sweden, and even less is known about the subject regarding the Sámi.

Chapter Two: Literature Review and Background

The exact causes of a secular trend toward a changing age at menarche are elusive and multifaceted. Age at menarche is the result of complicated interplay between environmental and social experiences and genetics. If age at menarche was solely biologically determined, young girls everywhere would reach menarche around the same age. However, it is clear this is not the case. Thus, environment and culture influence when a girl begins menstruating. Due to the complex nature of this issue, there are two main components to my research trajectory: first, understanding Sámi female reproductive health; second, understanding the intrinsic and external factors that govern the biological onset of puberty in girls. Considering how the Sámi conceptualize and experience menarche and menstruation while simultaneously focusing on how environmental and genetic factors affect age at menarche is crucial to addressing this issue from a holistic perspective.

The Sámi

Although the Sámi population is divided by national boundaries into four countries (Norway, Sweden, Finland, and Russia), they still consider themselves one people and are regulated both by their respective national governments and their own Sámi Parliament within each country (Kuoljok and Utsi 2009). The Sámi are the only group of people recognized by the European Union as aboriginal (Lehtola 2004). In addition, while the Sámi have undergone extensive geographical and economic changes in the past century, Sámi identity has experienced a revival and as a result, the Sámi remain a distinct people.

Unfortunately, there are no accurate censuses of the Sámi (Anderson and Beach 1995), though some estimate there to be about 70,000 Sámi altogether (Kvarfordt et al. 2005).

Scholars have attempted to locate and define Sámi origins, but scholars have proposed that the issue is not from where the Sámi came, but when the people living in what is now northern Scandinavia coalesced into Sámi with Sámi culture and identity (Beach 1988). Archaeological evidence demonstrates that there were people in the northern region of Scandinavia as early as 9000 B.C.E., when the ice from the last Ice Age started to recede and coastal people moved inland (Kvarfordt et al. 2005; Kuoljok and Utsi 2009). An excavated site outside of Arjeplog suggests that these people hunted wild reindeer, fished, and used portable hide tents (Kvarfordt et al. 2005). By 2000 B.C.E., some of the inhabitants turned to sedentary farming, assimilating into Nordic culture; the rest continued living a nomadic life and 2000 years later the two cultures had separated completely (Kuoljok and Utsi 2009). This latter group would eventually become the Sámi. In addition, literary sources suggest that the Sámi *as a culture* were in the geographical area of northern Sweden as early as 1000 C.E. (Beach 1988). Saxo Grammaticus wrote of the “Lapps”, (an outdated term for the Sámi) around 1200 C.E. while Cornelius Tacitus wrote of the “Fenni” of the north in 98 C.E. (Beach 1988). He recorded that the Sámi were hunters, gatherers, and fishers, who occasionally traded wild reindeer (Lehtola 2004).

Nomadic reindeer herding became a consistent subsistence strategy for the Sámi in the late 1500s (Lehtola 2004). Although Sweden and the other Nordic countries were expanding their land ownership at this time, it was not until the end of the 1600s that Swedes were allowed to colonize Sápmi, which covered the northernmost counties in Sweden

(Lehtola 2004). Colonization occurred gradually, and the distinctive language, religion, and subsistence strategies of the Sámi kept them generally distinct from encroaching Swedish people and their culture (Sköld 1997). Many Sámi defected from their traditional lifeways and took advantage of the Swedish government's programs aimed at colonizing Northern Sweden. They became agriculturalists and integrated with Swedish society and people. But a distinct Sámi group and identity remained. By the 1920s, however, it was becoming more and more difficult for Sámi reindeer herders to continue their traditional occupations, as more and more Swedes were settling into Northern Sweden, building infrastructure on the grazing lands for the reindeer (Lantto and Mörkenstam 2008).

Thus, even though the Sámi are best known for herding reindeer, only about 2,500 Sámi are involved in reindeer husbandry in Sweden today (Kvarfordt et al. 2005). Because of these changes, traditional nomadic reindeer-herding has recently fallen out of favor. The rest of the Sámi in Sweden work in ecotourism, hunting, fishing, and create *duodji*, or Sámi handicraft, as well as other industries vital to the Swedish economy. Even herders today often take side jobs during the off season to supplement their herding income. The strain of financing new technologies used to herd reindeer (e.g. snowmobiles, airplanes, and four-wheelers) as well as the limitations and pressures set by the Nordic governments to do profitable reindeer herding without as much land and more restrictions has led to these changes in subsistence strategy.

As is occurring among other circumpolar populations, the change from a traditional lifestyle to an industrialized lifestyle has been associated with rapid and dramatic social, economic, and health changes among the Sámi (Hassler et al. 2005). Deleterious

environmental chemicals from industrialized areas to the south reach the Arctic through the air and water, potentially causing damage to the neural, endocrine, and immune systems of Arctic inhabitants (Parkinson 2006). Researchers have found a rise in chronic diseases such as obesity, hypertension, diabetes, and cardiovascular diseases as a result of this lifestyle transition (Parkinson 2006). Correlations have been found between the change from traditional diet to market or processed foods, lower physical activity levels as a result of modernization, and health problems among the Sámi in Sweden (Ross et al. 2009).

Although much research has been conducted concerning changes in circumpolar health, few scholars have explored the state of female reproductive health among the Sámi. From an ethnographic perspective, Sámi mythology includes belief in a goddess, Sáráhkka, who was thought to help women during menstruation, pregnancy, and childbirth (Kuoljok and Utsi 2009). Beyond this, data concerning menarche and menstruation among the Sámi is lacking. We know little about what onset of menstruation means to contemporary Sámi women, and how the rapid lifestyle and environmental change experienced by Sámi women has affected timing of menarche.

Factors Contributing to Age at Menarche

It is imperative to identify the sources that contribute to age at pubertal onset in order to understand what contributes to normal development and what contributes to abnormal development. Both intrinsic (i.e. genetic, hormonal) and external (i.e. environmental) factors are known to affect the age at menarche. Although scholars do not know what exactly triggers puberty in humans, we do know the process starts in the brain in connection to the endocrine system. A change in the hypothalamus (the part of the brain that communicates

between the external environment and the internal environment) triggers activation of the hypothalamic-pituitary gonadal (HPG) axis, which causes an increase in secretion of GnRH (gonadotropin-releasing hormone) and, as a consequence, an increase in secretion of LH (luteinizing hormone) (Susman and Dorn 2009). The LH comes from the anterior pituitary drive and prompts the rest of the endocrine changes that cause puberty.

Because humans mature slowly, live a long time, and invest greatly in parenting only a few progeny, our bodies require internal systems that are highly sensitive to the geographic and cultural environment (Gluckman and Hanson 2006; Susman and Dorn 2009). The life history approach is used in an attempt to explain how events occurring during childhood affect health and resiliency later in life. Draper and Harpending (1982) and Ellis and Essex (2007) suggested that humans have evolved to be especially sensitive to the external environment during childhood because development during this time affects reproductive success later. Belsky et al. (1991) suggested that even societal factors affect timing of puberty because children are socialized to be sensitive to availability and reliability of resources, both biological and emotional. Thus, the HPG axis is an internal monitor, and is very sensitive to disruptions, which can trigger the premature release of estrogen in girls (Steingraber 2007). Therefore, the relationship between the brain and the external environment is a crucial element in the onset of puberty.

While Deleamarre-van de Waal (2005) suggests that environmental factors could outweigh the influence genetics has on timing of menarche, a consideration of genetic predisposition to timing of menarche still needs to be considered. Genetics are an important intrinsic factor in a girl's age at menarche, as it has been found that between mothers and

daughters and sibling pairs, age at menarche is similar (Meyer et al. 1991). It has been suggested by some that genetics accounts for about half of the variance in timing of menarche, but no single gene has been found that controls timing of puberty (Towne et al. 2005; Susman and Dorn 2009). After all, if genetics alone directed age at menarche, then girls would reach menarche around the same age as their mothers and maternal grandmothers. However, it is clear this is not the case; therefore, external factors must be examined.

Intrinsic factors such as maternal age at menarche are not the only determinates of age at menarche for a girl. Some external factors that have been correlated to an earlier age at menarche include: father absence/stepfather presence in the home; ingestion of artificial hormones in milk; exposure to environmental chemicals, low birth weight; stress (psychosocial); exposure to cigarette smoke; divorce of parents; number of siblings; and amount of exercise/physical activity (discussed in detail below).

Many studies (Ellis et al. 1999, Hoier 2003; Maestripieri 2004; Matchock and Susman 2006), have found that father absence in the home is consistent with an earlier age at menarche. Moffitt et al. (1992) reported that the longer the absence of the father, the earlier the first menstruation. It is thought that father absence in the home accelerates menarche in two ways: First, without the presence of a genetically-related adult male, the evolutionary mechanism for incest avoidance, which causes a later menarcheal age, does not activate (as seen in rodents) (Macleod 2007): Second, the absence of a father in the home can be perceived by the brain as an unstable environment, which may trigger the organism to commence with puberty in order to ensure reproductive success (Ellis and Garber 2000).

The psychosocial acceleration theory, an addition to the life history approach, was used by Belsky et al. (1991) and Ellis and Essex (2007) to suggest that stress from low parental involvement, family conflict, and father absence is internalized, causing metabolism levels to decrease (an evolutionary trade-off designed to ration metabolic resources in order to sustain vital functions), which leads to weight gain and accelerates menarche. Stepfather presence in the home, on the other hand, has been both correlated to earlier age at menarche (Ellis and Garber 2000) and no effect at all on age at menarche (Bogaert 2005). However, the effects and/or non-effects of a male stranger on female puberty has been documented in many species, including field mice, voles, lemmings, rats, pigs, cows, and monkeys (Vanderbergh 1983).

Much research has been conducted on the effects of artificial hormones in meat and milk on human puberty. However, no substantial evidence linking hormones in meat to earlier puberty exists. But, artificial hormones in milk are thought to possibly contribute to early menarcheal age. Cows treated with rBGH produce higher levels of insulin-like growth factor-1 (IGF-1) which is identical in structure to human IGF-1, thereby tricking the endocrine system into thinking growth hormones have been released in the body (Steingraber 2007). However, the link between artificial hormones in milk and early menarcheal age is weak (Steingraber 2007).

Explanations for linking exposure to environmental chemicals (many of which are endocrine disruptors) to altered pubertal timing are detailed and extensive, and cannot be explored to the fullest extent here. It should be noted that some scholars have found that children exposed to deleterious environmental chemicals have had delayed puberty, but the

majority of studies have found that such exposure is correlated with earlier pubertal development. In fact, exposure to environmental chemicals may be the most likely factor contributing to an earlier age at menarche (McLachlan 1985; Kuhl et al. 2005). Animal studies have shown that fetal exposure to deleterious environmental chemicals is associated with low birth weight, which has been consistently correlated to early puberty development (Sagiv et al. 2007). Because many natural and synthetic chemicals resemble steroids in structure, once in the body they can bind to steroid receptors and alter steroid action (McLachlan 1985). Other compounds such as PCB's and DDT have been found to interfere with the immature brain's conversion of testosterone into estrogen (Kuhl et al. 2005). As with all potential factors affecting the age at menarche, however, Kaplowitz (2006) and Susman and Dorn (2009) point out that linking early puberty to endocrine disruptors is difficult because onset of puberty may occur many years after exposure to the deleterious chemical. Because of this, few studies have been conducted on healthy children's exposure to endocrine disrupting chemicals and their effects (Susman and Dorn 2009).

Low birth weight (defined as birth before 37 weeks and/or birth weight of less than 5.5 pounds at 40 weeks, according to Steingraber 2007) has been consistently correlated to earlier age at menarche and is a known predetermining factor for adult onset diseases (Behrman and Butler 2006). The possible causes of low birth weight are numerous and include such things as fetal exposure to cigarette smoke and maternal exposure to chemicals such as wood preservatives, alcohol, air pollution, and drinking water contaminants (Ritz and Yu 1999). Low birth weight usually leads to "compensatory catch-up growth." This phenomenon can be explained by the Barker Hypothesis, which states that:

...fetuses respond to prenatal stress by diverting resources to the developing brain at the expense of other tissues. This leads to low birth weight and “fetal programming” for adult-onset diseases [such as] diabetes [and] heart disease (Steingraber 2007).

Basically, compensatory catch-up growth in early childhood leads to obesity, which then signals to the body that the organism can handle pregnancy, and therefore initiates menarche.

Exposure to tobacco smoke in utero often contributes to a lower birth weight, which in turn leads to a younger age at menarche. Mothers who smoked a pack of cigarettes a day during pregnancy gave birth to girls who experienced significantly earlier menarche than those whose mothers did not smoke (Steingraber 2007). A girl’s exposure to second hand smoke during early childhood decreases menarcheal age by about four months (Windham 2004).

Multiple studies have found strong correlations between number of siblings and age at menarche (Roberts et al. 1971; Clegg 1980; Dann and Roberts 1984). The presence of half and stepbrothers accelerated age at menarche, while presence of sisters is correlated with a later age at menarche (Matchock and Susman 2006). Okasha (2001) found that girls with four or more siblings reached menarche six months earlier than girls with no siblings. The effect of brothers versus sisters was not discussed in this study. In rodent studies, researchers found that puberty was delayed when a young female was quartered with other females, and was accelerated when quartered with males, especially unrelated adult males (Agosta 1992). Again, some scholars believe girls may be receiving pheromones from their fathers and brothers in an evolutionary effort to inhibit incest (Steingraber 2007).

The final external factor correlated with earlier age at menarche I will address is the amount of exercise/physical activity. Exercise can delay early puberty, but in ways scholars do not fully understand (Steingraber 2007). Grumbach and Styne (2003) found that, on average, bedridden girls reached puberty earlier than female athletes, who generally reach puberty and menarche later. It is hard, however, to differentiate between stress of competitive sport exercise and daily physical activity.

No single factor alone contributes to earlier age at menarche; multiple contributors are at work, and genetic variation must be taken into account (Susman and Dorn 2009). Genetic predisposition will also affect the way in which children react to environmental stimuli (Susanne and Bodzsar 1998). Thus, scholars must generate scientific hypotheses to determine the factors correlated with an earlier age at menarche. The consequences of an early age at menarche may, however, be more measurable than the correlates.

The effects of early menarche are numerous and may include such consequences as: higher risk for ischaemic heart disease (Cooper et al. 1998); earlier age at participation in first risky behavior, including first cigarette use (Chodick et al. 2005), and negative body image resulting in depression and suicide (Pinyerd and Zipf 2005); a mismatch between biological puberty and psychosocial maturity (Gluckman and Hanson 2006); and last but definitely not least, a higher risk of breast cancer (Cooper et al. 1998; Dunger et al. 2005; Nichols et al. 2006; Steingraber 2007).

Chodick et al. (2005) posit that girls who are physically mature for their age may associate with adults and mimic their behavior and that menarche at a young age may present

a serious psychological stressor, resulting in early participation in risky behaviors. Several studies have suggested that hormonal changes accompanying menarche may directly contribute to changes in behavior (Susman et al. 1987; Warren et al. 1989). The maturational deviance hypothesis, also known as the off-time hypothesis, suggests that those adolescents who mature earlier or later than the majority of their peer groups will have more stress and adjustment issues than their on-time peers (Brooks-Gunn et al. 1985; Caspi and Moffitt 1991; Petersen and Taylor 1980; Tschann et al. 1994). These hormonal changes, when occurring “off time” can be a detriment to adolescents. Because the basal rhythms of the HPA (hypothalamic-pituitary-adrenal axis, which works in conjunction with the HPG axis) are sensitive to early childhood experiences, those children with early stress and early pubertal timing have actually been found to have an altered HPA axis in adolescence, causing them to respond to stress differently than expected (Tarullo and Gunnar 2006). If the parts of the brain designed to help humans cope with stress are not developing at the same rate as the parts of the brain that are triggering puberty, a mismatch will occur. Early developing girls will have bodies that look more mature, but brains that are not developed enough to deal with the stress that comes with it (Susman and Dorn 2009).

Thus, early maturing girls often have negative views of themselves in comparison to others. Ge et al. (2001) found that seventh-grade girls who had reached menarche at an earlier age than the majority of their peers had higher levels of depressive symptoms. To add fuel to the fire, adolescents who develop early are likely to be shorter (Golub et al. 2008). In addition, they are at a higher risk for sexual abuse by older boys and men (Golub et al. 2008). In a similar vein, one consequence, on a societal level, is that there may be a mismatch

between biological puberty and psychosocial maturity. Gluckman and Hanson (2006) suggest that humans would have evolved so that biological and psychosocial maturity occurred around the same time; now, especially in Western societies, girls often reach biological maturity before psychosocial maturity, creating a societal mismatch between what is happening to a girl's body and what is expected of her socially.

The last consequence of an early age at menarche, an increased risk for breast cancer, has received much scholarly attention and may be the most justifiable reason for studying a decline in age at menarche. If a girl reaches menarche before the age of 12, she is 50% more likely to get breast cancer later in life (Steingraber 2007). The correlation between early menarche and breast cancer is strong, and is attributed to the longer duration of exposure to estrogen (Dunger et al. 2005; Susman and Dorn 2009).

Clearly, cultural, environmental, and biological factors play an integral and complex role in female reproductive health, especially in the timing of menarche. Sámi and Swedish women provided a comparative population to test some of the hypotheses about the correlates and consequences of an early age at menarche. This comparison was especially fruitful since Sámi women have only recently transitioned from a traditional, nomadic reindeer-herding lifestyle to a westernized lifestyle and all that it entails, while Swedish women transitioned to a westernized lifestyle much earlier in their cultural history.

Chapter Three: Methods

In order to obtain data regarding age at menarche among Swedish and Sámi women, I administered recollection surveys and interviews (see Appendices A-C for the surveys and interviews approved by the Iowa State University Institutional Review Board ID Number 09-229). There is no official definition of what it is to be Sámi; however, the Sámi Parliament "...includes all those who regard themselves as Sámi and use, or have used, Sámi as a language in the home or have parents, or grandparents, who use, or have used, the Sámi language" (Lund et al. 2008, Kvarfordt et al. 2005). Therefore, I qualified any female who had reached menarche, lived in Norrbotten or Västerbotten county, identified as a Swedish citizen, and who also identified as Sámi, as a Sámi participant. Norwegian, Finnish, or Russian Sámi were not eligible. In order to qualify as a Swedish participant, a woman needed to live in Norrbotten or Västerbotten county and identify as a Swedish citizen.

The snowball technique was used (existing participants provided contact information for potential participants from within their social circle) and proved to be an effective way to increase the number of participants. It must be noted that the snowball technique, although useful in some ways, does not provide a random sample and tends to attract similar types of people. For purposes of this research, however, this technique was sufficient. If a girl would agree to meet with me and bring a friend or sibling along, or she provided me with the phone number of a friend who might be interested in participating in my study, these girls would be allowed to participate if they fit the eligibility criteria. In some cases, women showed an interest in my research and asked to be a part of it. For example, a woman working a retail

store asked why I was visiting Sweden; when I explained my study, she expressed an interest in participating.

The majority of the women were contacted by email or telephone. Contact information for the women was provided by Sámi and Swedish scholars and non-scholars via the use of online phone books and social networking. Once contacted and pending acceptance, the participant chose the time and place of meeting for the survey and interview. Upon meeting, the survey (written questionnaire) was administered. Once the survey was completed, the interview commenced. Every participant who agreed to be interviewed allowed the use of a voice recorder to record the interviews. Seven participants agreed to be interviewed.

In an effort to boost the Sámi sample size, about 30 mailed surveys were sent to women in Norrbotten county with typical Sámi last names after I returned to the U.S. These surveys were the same as the surveys administered in person, and the same interview questions asked in person were printed with the survey so the respondent could answer the same questions the others had(see Appendix B). Two Sámi women responded.

Surveys have been shown to be a viable method for obtaining life history data. Data for The United Kingdom population study Avon Longitudinal Study of Parents and Children (ALSPAC) was gathered using a recall questionnaire (Ong 2006). In an effort to find the relationship between age at menarche, smoking, and oral contraceptive use among Israeli girls, Chodick et al. (2005) distributed questionnaires that included questions concerning the recollection of age at menarche. Hulanicka and Waliszko (1991) used questionnaires in order to find secular changes in menarcheal age of Polish women.

My pilot research “Life Events and Menarche” at the University of Northern Iowa under Dr. M. Catherine DeSoto found that the surveys were a useful tool to obtain data. However, Dr. DeSoto and I found that sample size ($n=75$) was too small to correlate multiple variables to age at menarche. Nevertheless, we were able to find relationships between a younger age at menarche in mothers and a younger age at menarche in daughters. We found that daughters, on average, were reaching menarche at least one year younger than their maternal grandmothers ($p < .001178$ in a t-test assuming equal variances). There was a relationship between divorce before menarche and younger age at menarche, but the results were not statistically significant (Gillette, unpublished data).

Multiple studies have also shown that recollection interviews and surveys are an accurate way to obtain data because women can recall their age at menarche accurately. Lee and Sasser-Coen (1996), Golub and Catalano (1983), and Grief and Ulman (1982) found that, even with the passage of time, women remembered their first menstrual period quite clearly. Another study by Bean et al. (1979) found that even after 40 years, 90% of women in the study group accurately recalled their age at menarche within one year of actual occurrence.

The surveys were provided in English and colloquial Swedish (many Sámi are fluent in Swedish and English). Of the 20,000 Sámi in Sweden, only about 7,000 speak a Sámi language, of which there are many dialects (Lund et al. 2008). In fact, dialects are so different that a northern Sámi and a southern Sámi cannot understand each other, and so will speak Swedish in order to communicate (Beach 1988). Furthermore, of the Swedish non-herding Sámi, “20% cannot understand Sámi; 40% cannot speak Sámi; 65% cannot read Sámi; 85% cannot write Sámi” (Beach 1988). Therefore, it would be nearly impossible to

provide surveys in all forms of Sámi language. In addition, because all official documents in Sweden are in Swedish and because there is not an official Sámi language law, most Sámi are bilingual (Lehtola 2004). All surveys and interview questions were reviewed by Peter Sköld, a Sámi scholar from the Center for Sámi Research, prior to administration to check for potential cultural taboo questions (i.e. it is considered rude to ask a Sámi how many reindeer are in his or her herd). Interviews were always conducted in English, and all participants chose to take the survey in Swedish.

Although intra-familial studies are recommended to track secular changes (Ong et al. 2006), this was not possible for this study. Thus, the participants were placed into birth cohorts (pre-1930, 1931-1950, 1951-1979, and 1980 to present). The selection of years for these birth cohorts is based on previous findings that a declining age at menarche in European countries (including Norway) plateaued by the end of the 1970's (Hauspie et al. 1996) and also reflects the timing of economic change among the Swedish Sámi. For example, many Sámi quit reindeer herding by the 1930's due to new laws; the use of the snowmobile and other pollution-emitting vehicles such as the helicopter and motorbike were incorporated into Sámi society in the 1980's (Kvarfordt et al. 2005); now, many Sámi born after 1980 live and work in industrialized areas.

This method is just as useful, as Mansfield and Bracken (2003) used a second cohort to test for any secular trends in age at menarche. The selection of years for these birth cohorts was based on previous findings that a declining age at menarche in European countries (including Norway) plateaued by the end of the 1970's (Hauspie et al. 1996) and also reflected the timing of economic change for the Sámi in Sweden. For example, many

Sámi stopped herding reindeer by the 1930's due to new laws; the use of the snowmobile and other pollution-emitting vehicles such as the helicopter and motorbike were incorporated into Sámi society in the 1980s (Kvarfordt et al. 2005); now, many Sámi born after 1980 live and work in industrialized areas.

Sample Size and Analysis

According to Murphy and Myors' Statistical Power Analysis (2004), in order for an effect size of 0.50 (R^2 value of 0.06), and in order for the results to be statistically significant between groups (birth cohorts), approximately 125 women needed to be surveyed about life events and age at menarche. In order to estimate *all the variables simultaneously* with age at menarche and for the results to be statistically significant with an effect size of .50 (R^2 value of .06), at least 350 observations were needed (Dr. Mack Shelley, personal communication). This number is beyond the scope of the current study, but my goal was to obtain 73 observations, which would have provided statistically significant information with an R^2 value of 0.10 (Dr. Mack Shelley, personal communication). In an effort to keep statistical analysis simple, only year of menarche was recorded; if a woman was, for example, 13.5 years when menarche occurred, the year of menarche was recorded as 13. Due to the nature of this research, direct causes and effects cannot be determined, as the causes for earlier age at menarche are complex and factorial; therefore, tests for correlations between intrinsic and external factors and age at menarche were attempted.

Qualitative data derived from the interviews was used to bolster the quantitative data analysis and to provide supplementary information regarding timing of menarche not necessarily revealed by the quantitative data. The interviews provided a context within

which Sámi and Swedish women and girls experienced their first menstrual period and also provided a deeper understanding of how they conceptualized the event at the time it occurred. Analysis of ethnographic data revealed how the women learned about their menstrual period (if indeed they were told), how they felt about it, and if they remembered experiencing menarche and sexual debut “on time” in relation to their peers. Even though the results were not statistically significant (as discussed later) analysis of qualitative data revealed attitudes regarding a difference in menarcheal age between Swedish and Sámi women.

Limitations

The two main limitations for this research included acquiring enough participants and recollection accuracy and honesty. Acquiring enough participants was difficult because many women were away on summer vacation with their families. Many Sámi women and girls were up in the mountains with their reindeer, and had little to no cell phone contact. A helicopter or a four-wheeler could have been taken to where the pilot or driver had last heard the Sámi and their reindeer were located, but this was expensive, time-consuming, and difficult, since the Sámi had to move when the reindeer moved. It was also hard to acquire enough participants because some women said they had participated in enough studies about the Sámi during their lives and did not want to participate in any more. In addition, some Sámi women may have remembered their parents or grandparents having their heads measured for racial typology studies (Lund et al. 2008), making Sámi reluctant to participate in anthropological research.

Although some research has found that recollection of age at menarche can be accurate, Koo and Rohan (1997) found that the older the woman, the less accurate she was in estimating menarcheal age. In addition, some women may have felt ashamed of their age at menarche, and may have misrepresented their actual menarcheal age on the survey. Also, Artaria and Henneberg (2000) found that highly educated girls in their sample reported a lower age at menarche, possibly in an effort to not appear immature to the researchers. I did not have access to medical files (if any exist) to compare actual menarcheal age to recollected menarcheal age. Nevertheless, successful research on menarcheal timing has been completed using recollection data.

Chapter Four: Results and Discussion

First, I analyzed the survey data to determine if there was a difference in menarcheal age between Swedish and Sámi women. Then, I correlated other variables with age at menarche, including age at sexual debut and first oral contraceptive use, and explored possible explanations for the correlation between age at menarche, sexual debut, and oral contraceptive use. A discussion follows regarding the relationship between age at menarche, sexual debut, and oral contraceptive use among Swedish and Sámi women. Because the sample size is small ($n=34$), few results are statistically significant. Thus, qualitative data retrieved from interviews was used to illuminate the patterns implied by the quantitative data and enrich the analysis.

Age at Menarche: Sámi and Swedish Women

It is clear that, among the 34 participants, Sámi women reached menarche later than their Swedish counterparts (Figure 1). The Sámi in Cohort C (1951-1979) ($n=4$) reached menarche, on average, at 13 years, while Swedes in the same cohort ($n=14$) reached menarche at 12.6 years, about four or five months earlier than the Sámi girls. Those Sámi in Cohort D (born 1980 and after) ($n=6$) reached menarche, on average, at 13.6 years, while Swedes in the same cohort ($n=5$) reached menarche, on average, at 13 years, about seven months before the Sámi girls in the sample. Although these results are not statistically significant, they are suggestive of a larger trend. However, a larger sample size is needed in order to assert that Sámi women reach menarche, on average, later than Swedish women.

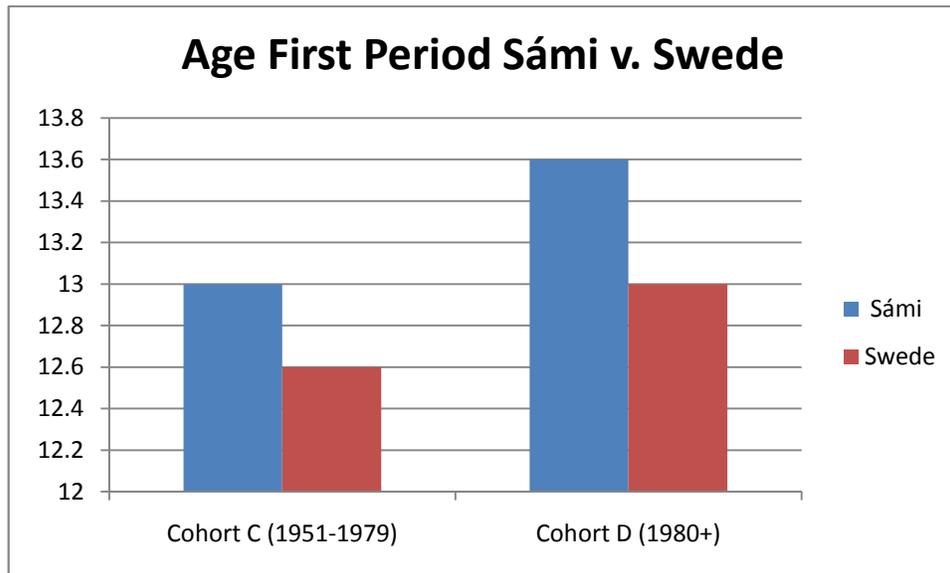


Figure 1 (see Appendix D for sample size)

Interestingly, though, both groups in Cohort D reached menarche later than those participants in Cohort C, which is not surprising given the scholarly debate over whether or not the trend in a decline in age at menarche has slowed or even stopped (Ong et al. 2006). Age at menarche in Europe, in general, was rapidly declining until about the 1980s, after which, the rate of decline slowed and/or stopped altogether (de Muinck Keizer-Schrama and Mul 2001). Even though scholars are unsure as to which factors are correlated with this deceleration, it should be noted that the European Union (of which Sweden is a part) stopped allowing artificial growth hormones in meat and milk in the late 1980s (Akslaede 2006). This trend in declining age at menarche may have been correlated with the termination of artificial growth hormones, or it may be coincidental. In addition, it is unclear whether these European studies included Sámi menarcheal age, or if, in the case of Swedish data, they were limited only to Swedish, non-Sámi girls.

Since the results are not statistically significant, it is not possible to generate an accurate explanation as to this shift in menarcheal age. Alternatively, there may not be a change in age at menarche between cohorts. Although the analyzed data shows that a difference between Swedish and Sámi menarcheal age is possible, this suggestion may be unfounded. However, an analysis of qualitative data suggests it is likely that there is such a trend, even though not statistically proven here.

Qualitative data provides insight into how Swedes and Sámi understand differences in menarcheal patterns between and among groups and will be used here to illuminate and expand upon the quantitative data. Lambert and McKeivitt (2002) suggest that anthropological qualitative methods are essential for accurately addressing issues regarding health. Specifically, Lambert and McKeivitt (2002) note that participant observation, including interviews, provides evidence regarding not only what people say but also what people *do*; qualitative data, then, enlightens quantitative data by providing a social or cultural context within which the quantitative data are situated.

Recognition of Difference in Menarcheal Age

When questioned about the differences in menarcheal age between Swedish and Sámi girls, three different women living in different cities in northern Sweden said “they had heard something about that.” A midwife/pediatrician said during her interview that in her 20 or so years of acting as the district nurse in the area, she had noticed that Swedish girls reach menarche earlier than Sámi girls. In speaking with a Sámi woman about this research, she related that both of her daughters reached menarche much later than their Swedish friends. A

Swedish woman whose daughters are half Sámi and half Swedish said her daughters told her they reached menarche after their Swedish friends.

Of the six Sámi women interviewed, five reported reaching menarche after their peers, who included both Swedish and Sámi girls. Of these five, two women are half Sámi and half Swedish, but they still reached menarche after their peers. One woman, who was the only Sámi girl at her school, seemed to have mixed feelings about reaching menarche after her Swedish peers. In a way, she was embarrassed and confessed, “I wanted to have it much earlier because my friends got it a little earlier.” But she also learned about menarche because her friends talked about it, as they had reached menarche a year or two before she had (she reached menarche when she was 13). Another woman (half Sámi and half Swedish) felt relieved when she reached menarche, “Cause I had like waited...when am I going to have it? Because my mother had asked...and my friends...waited for me [to reach menarche].” The sixth Sámi woman who was interviewed reached menarche before the other Sámi girl in her grade, at age 11 (there were only three students in her grade at the Sámi school she attended). It had occurred during the summer, while her family was with the reindeer. I asked her if it stressed her out when she reached menarche to which she replied, “No...not up in the mountains.” But when she started school in the fall, having reached menarche caused significant emotional distress, since the other girl in her grade had not.

It is not surprising that a differentiation between Swedish and Sámi groups was brought up regarding disparities between Sámi and Swedish health. Citizens of Sweden, like those of the United States, are still reeling from racist notions concerning identity. Racial discrimination against the Sámi started in the twentieth century and still remains today (Baer

1996). The Sámi revitalization in the 1980s has improved the Sámi image, but discrimination against the Sámi is still institutionalized; it is apparent in land and water rights issues as well as political issues in which the Sámi are still systematically discriminated against (Baer 1996). When I asked a Sámi informant (Cohort D, born after 1980) whether or not it mattered if Swedes and Sámi intermarried, she replied, “Yeah it does matter for some people so that’s a little bit sad of course.”

Difference in Diet

Thus, whether or not someone is Sámi is still on the forefront of people’s minds. There is still a distinct difference between the two groups, especially concerning diet, and scholars have started to explore this trend as well as its physical and cultural implications (Ross et al. 2009). The intake of reindeer meat, for example, is an important cultural marker for reindeer-herding Sámi (Ross et al. 2009). It is noteworthy, then, that some subjects suggested that the difference between Swedish and Sámi menarcheal age is due to a difference in diet. That is, Sámi generally tend to eat a traditional diet that includes their own reindeer meat, while the Swedish diet includes little to no reindeer meat and more processed foods (Ross et al. 2009).

One Swedish woman, who married a Sámi man, suggested that the diet of Swedes and Sámi are still somewhat different because the Sámi often eat reindeer meat from their own reindeer herds, while Swedes living in the same area buy processed meat from the grocery store. This Swedish woman said that when she grew up, her family never ate reindeer meat; now, she said there is always reindeer meat at her house from her husband’s

herd and rarely does she ever buy different types of meat from the grocery store. One young Sámi woman also offered this opinion and suggested that the disparity in menarcheal age between Sámi and Swedes may not only be due to a difference in type of meat eaten, but also because her family in particular grows their own vegetables, something more commonly done in Northern Sweden than in Southern Sweden. I had explained to this woman the issues surrounding processed versus non-processed, or natural, foods. She thought about this and then said jokingly, “Maybe that’s why our boobs aren’t as big!” When I pressed this further, she jokingly told me that Swedish women tend to have bigger breasts than Sámi women, and suggested it was probably because Swedes eat more processed foods than Sámi people do.

Diet can significantly affect adolescent growth and age at menarche, but claims regarding diet and menarcheal age must be made with caution. Scholars disagree as to how diet and nutrition affect pubertal and menarcheal age, but many have found that those children who ingest more meat protein than vegetable protein are more likely to reach menarche earlier (Parent et al. 2003). If this was true, then the Sámi should reach menarche earlier than their Swedish counterparts because the Sámi, in general, ingest more meat than vegetables (Lund et al. 2008). Protein from what type of animal was not specified, but I suspect that, unless a study was completed specifically on the relationship between reindeer meat and Sámi menarcheal age, the type of protein thought to be related to earlier age at menarche is probably not reindeer, but rather pork or beef. Interestingly, reindeer meat is lower in fat and calories than other meats such as pork or beef (Hægermark 2008). Thus, it does not seem plausible to say that because Sámi eat more meat, they should reach menarche earlier, when it is likely that the type of meat studied to make such a claim is probably not

reindeer meat, which differs significantly from beef or pork in regards to fat content and as well as how it is manufactured.

Similarly, two women suggested that the switch from natural to processed foods has resulted in a decline in age at menarche, while the third woman suggested that better access to food and thus (supposedly) healthier lives has led to a decline in age at menarche. The idea that better access to food has led to an earlier age at menarche is a common notion, though scientifically unfounded. Scholars generally agree that a transition from natural to processed, or market-based, foods is correlated with an increase in health problems; this has been made especially clear in assessing the recent dietary transition of indigenous peoples from traditional to non-traditional foods (Ross et al. 2009). It is possible to claim that the continued intake of unprocessed reindeer meat as a main source of protein for Sámi girls may contribute to a later age at menarche than Swedish girls who eat processed beef and pork, which are higher in fat and calories, possibly linked to an earlier age at menarche. Further research is needed to see if this is, in fact, a credible trend.

Age at Sexual Debut: Sámi and Swedes

Even though there are many cultural and biological differences between the Swedes and Sámi, Sámi and Swedish girls today participate in similar behaviors regarding puberty, including age at sexual debut, although it may not have always been that way (Figure 2). Only 27 of the participants provided their age at sexual debut, but three trends were found: 1. Sámi age at sexual debut is the same for both Cohort C and Cohort D; 2. Swedish age at

sexual debut has declined steadily from Cohort B to Cohort D; 3. Age at sexual debut among Sámi and Swedish girls in Cohort D is similar. Each of these trends will be discussed here.

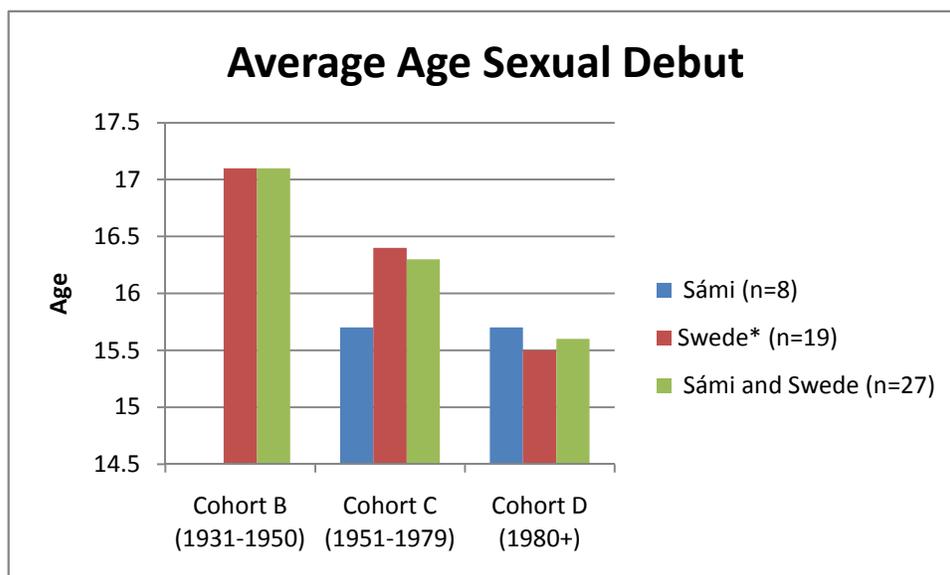


Figure 2 (See Appendix D for sample sizes) *Excluding one outlier

Within the small Sámi sample size ($n=8$) average age at sexual debut is during the fifteenth year. In other words, for those Sámi participants born since 1951, average age at first sex was 15 years old. Interestingly, Sámi age at sexual debut has not declined the same way that Swedish age at sexual debut in this sample has. The average age for Swedish sexual debut since 1951 in this sample declined from almost 16.5 to 15.5 years. In addition, those Swedes in Cohort B experienced sexual debut in their seventeenth year, while those in Cohort D experienced sexual debut in their fifteenth year. In other words, among the Swedish participants, those who were born after 1980 reached sexual debut on average two years after those participants who were born between 1931 and 1950. My data support what other researchers have found previously; a decline in age at first sexual intercourse has been documented between 1960 and 1990 in Sweden (Brännström and Liljestränd 1991). In fact,

as of 2001, 86% of teens in Sweden reach sexual debut in their teenage years (Darroch et al. 2001). It is not clear what accounts for a declining age in sexual debut in Sweden, but one possibility is that older Swedish women had different attitudes regarding teenage sexual activity or sexual activity in general. Svallfors (1994) found that 85% of Swedes did not feel it was wrong to engage in sexual activity before marriage, yet 60% felt it was wrong on some level to have sex under the age of 16. Longitudinal information regarding attitudes toward sexual activity was not provided in this study, however. Unfortunately, there is no data specific to teenage sexual activity among the Sámi to see if attitudes regarding sex have changed over time in that cultural group. Both Sámi and Swedes within the sample do agree, however, that teenage sexual activity is not a risky behavior.

Sexual Activity: Risky Behavior?

Contrary to scholarly attitudes, premarital and/or teenage sexual activity was not characterized as a “risky behavior” by either Swedes or Sámi in the sample. Every person asked about attitudes regarding teenage sexual activity insisted that it was natural, acceptable, and expected. One Swedish participant (born in 1972) remembered that when she was 15 she and her boyfriend would “hang out” at his house. Whenever they wanted to engage in sexual intercourse, they would leave and tell his parents they were going to “take a drive.” She said his parents knew what they were going to do while they were away, but his parents would simply say, “Okay, have fun, see you later.” A young Sámi woman conveyed a similar situation: in Sweden, she said, parents would rather their children wait until they are older to engage in sexual activity, but they think it is okay to do so at a young age as long as it is consensual, safe, and does not include a large quantity of partners. This Sámi woman said

she never told her mother if she was having sex or not, but she knows her mother assumed she was the first time that she had a steady boyfriend. The mother and daughter, though, never spoke explicitly about it.

I was told by one informant that many parents in Sweden feel it is beneficial to have sexual experiences during adolescence so that as adults, their children will be sexually experienced by the time they get married, and they will know what they like and do not like regarding sexual preferences. When asked about teenage sexual activity, four people said, verbatim, “They must try.” Some participants related that many Swedish parents feel that they cannot tell their children what to do once they reach high school age, including topics such as sex, alcohol, and curfews (it is common for Swedish children to only have a curfew up until the age of 12). The attitude is that teenagers will do what they want anyway, so worrying about it is futile.

Sexual Education in the Public Schools

Interestingly, issues of teenage pregnancy or STI transmission were never brought up by the participants, suggesting that these issues are perhaps not on peoples’ minds. It seems that very little is learned (or at least retained) about sexual and reproductive health via public schools; many of the participants cited older friends and television as sources of information and none of the participants cited sexual education at school as educating them on sexual health. One Sámi woman (Cohort D), who attended a public Swedish high school, professed that she had already engaged in sexual behavior by the time it was discussed in sexual education in school. She remembered sexual education only lasting a few weeks, as part of

biology class, and felt that she learned about sexual health from friends and television more than in sexual education class. One Swedish woman lamented that the sexual education program in Sweden is extremely lacking, and that for being such a sexually liberal country, they should have better sexual education in public schools.

Indeed, the international community has often prized Sweden's unique sexual education in the public schools (it focuses on relationships rather than biology), yet there are many improvements that need to be made to the program (Trost and Bergstrom-Walan 1997). For example, teachers and school nurses are rarely provided any sexual education training, and each individual school and each individual teacher choose how much time is devoted to sexual education and what topics they cover (Trost and Bergstrom-Walan 1997). In addition, the topics covered in sexual education classes may not be timely enough for the students; Rembeck and Hermansson (2008) found that Swedish girls wanted to learn about sexuality from adults but when ready, adults would not share information because they perceived the girls as too young.

The attitude that teenage sexual activity is not a risky behavior combined with seemingly ineffective sexual education would, it seems, pose significant health risks to young teenage girls who have reached menarche at a young age and who are also reaching sexual debut at a young age (Swedish scholars define "early" sexual debut as sexual intercourse before age 15) (Andersson-Ellstrom et al. 1996). Perceiving teenage sexual activity as not risky may also lead to a delayed use in contraceptives, especially oral contraceptives.

Oral Contraceptive Use: Sámi and Swedes

Both Sámi and Swedish teenagers are aware of and utilize oral contraceptives. In many cities, a free clinic opens a few days per month to provide confidential service to residents up to age 24. It is through these clinics that many teenage girls procure oral contraceptives. Some young women do not use oral contraceptives for fear the drug will negatively affect their hormonal functions, but the aforementioned midwife/pediatrician said that many girls want to take it when they reach menarche to help alleviate painful menstrual symptoms and to protect themselves against unwanted pregnancies.

Although both Swedish and Sámi groups within this sample utilize oral contraceptives, there are some disparities between the two groups in regards to timing (see Figure 3). The Sámi participants in this sample started using oral contraceptives, on average, two years after sexual debut. The Swedish participants, however, started using oral contraceptives, on average, the same year of sexual debut. It is not clear what accounts for this difference; one Sámi participant noted that both Sámi and non-Sámi girls attend a health clinic that is open to teenagers and young adults a few days per month in order to obtain birth control pills. Yet, scholars have found that there is a disparity in health care between indigenous and non-indigenous teenagers and young adults.

Health systems are created and maintained by the state governments, who are often discriminatory, historically and today, against indigenous people. In his work on Native American health services, Gone (2004) found that often, for indigenous peoples, health services provided by the state are representative of the dominant culture that oppresses

indigenous people; these same health institutions may have participated in systematic discrimination and racialization. Snowden and Yamada (2005) and Manson (2000) found that for many indigenous groups (Native American and Alaskan native specifically) language barriers, perceived discrimination, and structural obstacles such as location, availability, and distance hinder indigenous peoples' access to medical personnel. Turi et al.'s (2009) study shows that indigenous adolescents tend to be reluctant to seek medical services and have a lower rate of health service use than their non-indigenous peers.

Sámi discrimination has not been eradicated, though many feel it has improved in recent years. Turi et al. (2009) suggest that, even today, Sámi self-expression may create a target for discrimination and alienation; this may be associated with negative consequences concerning medical service accessibility and use. They found that, for Sámi adolescents, the combination of language barriers and cultural discrimination felt by the Sámi created a barrier against use of school health services (Turi et al. 2009). In Norway, much of the health (both physical and mental) services provided for and utilized by children and adolescents is through the school system (Turi et al. 2009). Adolescents can receive services and information regarding sexual health and contraception at the school clinics (Turi et al. 2009).

This is important, since Turi et al. (2009) found that those Sámi adolescents who experienced discrimination were less likely to seek school-based health services. In addition, Nystad et al. (2008) found that Sámi speakers were, in general, less satisfied with health services than non-Sámi, Norwegian speakers. Sámi youth were less likely than their non-Sámi counterparts to seek help for mental or psychological needs (Turi et al. 2009). Sámi

girls in Norway are more likely to use school health services than Sámi boys in Norway (Turi et al. 2009).

This is also significant since those Sámi adolescents who participate in reindeer herding may not have access to health care during the summer. In Sweden, between 1300 and 1600 Sámi live at summer sites which are not connected by road or telecommunication (Elg 2002). These Sámi have little to no access to medical care and personnel, even though the county councils in northern Sweden are responsible for having ambulance helicopters and for Sámi access to medical services (Elg 2002). The Swedish National Development Agency found that improvement in telecommunications is needed, especially for medical emergencies, and that even basic service such as mail delivery, access to daily commodities, and telecommunication do not exist at Sámi summer sites (Elg 2002). I was told by an older Sámi woman that there was no cell phone contact up in the mountains, and that tracking the Sámi and the reindeer may prove to be next to impossible. Even a four-wheeler ride into the mountains may prove futile because the reindeer herd could have moved earlier that day or the day prior. Family members and friends who lived in town simply waited for somebody to come down from the mountains with news about their whereabouts. It is also very expensive to go back and forth into the mountains; a one-way helicopter ride costs around 2000 SEK, or \$250. Interestingly, none of my informants, Sámi or otherwise, suggested that there was a discrepancy between the two ethnic groups regarding access to medical care. Although Turi et al.'s (2009) study is the only research to date concerning adolescent Sámi utilization of health services, it is clear from their study and from Elg (2002) that there is not,

in fact, adequate infrastructure and personnel available to Sámi citizens of Sweden year-round.

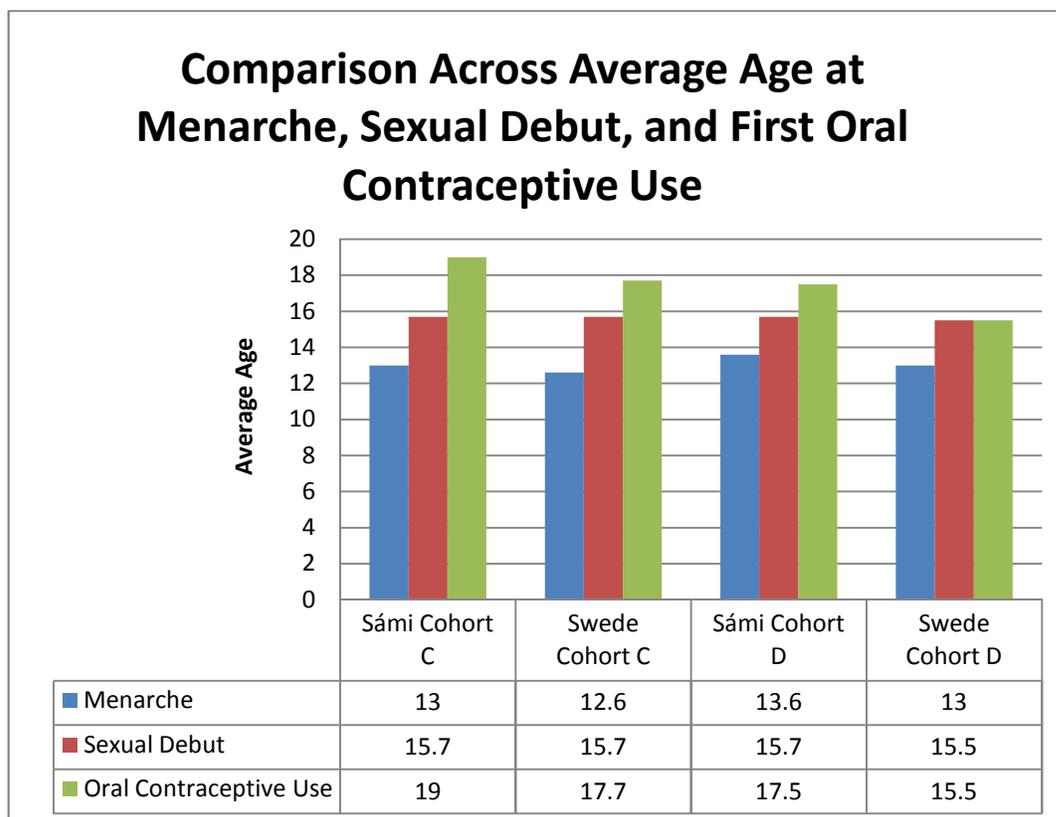


Figure 3 (See Appendix D for sample sizes)

An additional trend evident from Figure 3 is that the commencement of oral contraceptive use decreased by about two years between Cohort C and Cohort D for both groups. This could suggest a few things: 1. Taking oral contraceptives has become more acceptable over time; 2. Accessibility to oral contraceptives has increased over time; 3. Girls have taken more responsibility for contraception over time. Regardless of why it happens, it

is clear that age at sexual debut predicts age at first oral contraceptive use. The Pearson correlation for age at sexual debut and age at first oral contraception use was .769 ($p < .001$, $n = 21$). Thus, women living in northern Sweden who were older at first sexual intercourse also used oral contraceptives at a later age. It is not surprising that a younger age at oral contraceptive use is seen, since the age of sexual debut, in general, has decreased. It also seems plausible that girls have taken more responsibility for using contraception, leading to more use of oral contraceptives, as Ekstrand et al. (2007) found that Swedish boys, in general, feel contraception is the girl's responsibility and blindly assume that their partners take oral contraception. Attitudes regarding who is responsible for taking oral contraception were not explored in my research. In addition, the midwife/pediatrician said that at first, girls did not want to take oral contraceptives for fear it would cause negative hormonal side-effects, but now more and more have no problem doing so. Indeed, scholars have found that an apprehension toward oral contraceptive use for fear of negative side effects on hormones has been widespread throughout Sweden (Ekstrand et al. 2005).

Implications

If Sámi girls in general are not reaching menarche as early as their Swedish counterparts, it may be beneficial to understand what factors may be protecting Sámi girls against early menarche in an effort to continue to keep Sámi menarcheal age in the range it is now, at least as represented by this small sample. It is not clear what may be correlated with a later age at menarche for Sámi girls versus Swedish girls, but likely factors are genetics and difference in diet. Such information could be used to halt or possibly reverse a declining age at menarche. Not only would a later age at menarche be beneficial for early maturers

physically, emotionally, and psychologically, it may also increase the age at sexual debut, since early age at menarche often predicts early age at sexual debut (Andersson-Ellstrom et al. 1996; Edgardh 2000). An increased age at sexual debut may contribute to less transmission of STIs, teenage pregnancy, and abortion rates. Sweden has the highest abortion rate among the Nordic countries and it continues to rise (Ekstrand et al. 2005). In 2002, the abortion rate was 25 per 1000 pregnancies for girls between the ages of 15 and 19 (Ekstrand et al. 2005).

Another issue to consider is if Sámi girls are reaching sexual debut around age 15, do not have access to health care year-round, and are not utilizing oral contraceptives until at least two years after sexual debut, the consequences may be detrimental to the individuals and the society as a whole. Of course, other forms of contraception have not been considered in this study, but the combination of the attitude that girls should be responsible for utilizing oral contraception, sexual intercourse in the early teenage years is not considered risky, and the Sámi often have poor access to health services (oral contraceptives or abortion, for example), especially during the summer months, may all diverge to produce a detrimental social trend. Availability and usage of oral contraceptives by Sámi, especially reindeer-herding Sámi girls, should be studied further. Using Swedish contraceptive use as a model for Sámi contraceptive use may be beneficial, and to help public health professionals (both Sámi and non-Sámi) improve oral contraceptive use among Sámi girls.

What are Possible Causes of a Difference in Age at Menarche?

It is difficult to assert what exactly accounts for a possible difference in age at menarche between Swedish and Sámi girls for three reasons. First, when dealing with human

biological variation, especially in the context of human development, it must be remembered that even though some groups of people are more genetically alike than others, it does not mean they will necessarily react to their environment in the exact same way. Certain external variables that have been correlated with early age at menarche affect people differently. For example, ingestion of artificial growth hormones via meat may affect someone whose endocrine system is already altered by endocrine-disrupting hormones from exposure to pesticides than somebody whose endocrine system functions normally. Secondly, it is difficult to assert what accounts for a possible difference in menarcheal age between Swedish and Sámi girls because I was not able to control for genetics in this study. Some participants were genetically half Sámi and half Swedish (although all of these participants identified as Sámi, and were analyzed as such), and I was not able to assess familial trends in age at menarche; only birth cohort trends over time. It may be impossible for researchers to fully separate intrinsic and external influences on age at menarche, since both factors contribute to age at menarche but scientists are not sure how much. Third, I was not able to say for certain that all Swedish girls, on average, reach menarche at a younger age than all Sámi girls, on average, because of the small sample size of 34 participants.

The notion that a difference in consumption of meat may at least contribute to a difference in age at menarche between Sámi and Swedes may be plausible, although further research with more conclusive evidence is needed. It is possible that “natural” reindeer meat may be healthier than processed meat (especially beef) not only in regards to a difference in additive content but also because reindeer meat is leaner. The European Union banned the use of rBGH in meat in 1989 (Aksglaede 2006) but it is possible that processed meat

consumed by Swedes born before 1989 may have contributed to an early age at menarche. Again, this claim requires more substantial evidence.

Other Variables

As for the other variables aforementioned (father absence/stepfather presence in the home, ingestion of artificial hormones in meat and/or milk, exposure to environmental chemicals, low birth weight, stress, exposure to cigarette smoke, divorce of parents, number of siblings, and amount of exercise/physical activity) not enough data was collected consistently by enough participants to be able to correlate them to age at menarche. In addition, these variables were not asked about in the interview, and none of the participants mentioned them on their own. Further research will need to be carried out regarding these factors, especially in relation to Sámi girls.

Chapter Five: Conclusion

Although the sample size used in this research was too small to support claims regarding Swedish and Sámi menarcheal age as a whole, the combination of qualitative and quantitative data shows it is likely that there is a disparity between Sámi and Swedish menarcheal age, and indicates that this disparity may be partly due to a difference in consumption of meat. If this is true, then the health impacts of the type of meat consumed by people in Sweden need to be researched further, especially concerning the possible benefits of consuming reindeer meat versus commercially processed meat such as beef and pork. If reindeer meat is, indeed, healthier to consume, it may boost reindeer meat production and sale for the Sámi in Sweden and in other areas. Studies regarding difference in meat consumption should not be carried out just within Sweden but throughout the rest of Scandinavia as well.

This study also made clear the possibility that there is a disparity between health care access and usage between Swedish and Sámi girls, specifically regarding the use of oral contraceptives. If Sámi girls in Northern Sweden do not have the same access to health care year-round, they may be less likely to use oral contraceptives and/or to continue using them during the summer months, possibly putting Sámi teenagers at a higher risk for pregnancy. If Sámi teenagers are the same as their Swedish counterparts regarding the notion that contraception is the girl's responsibility, and if it is not a cultural norm to start using oral contraceptives around the same time as sexual debut, Sámi girls may be at a higher risk for teenage pregnancy than Swedish, non-Sámi girls. This possible trend is worth exploring, and may provide further insight into health disparities between the Swedes and the Sámi. A

study with a larger sample size will be required to explore these trends. It is imperative that the Swedish and Sámi community take note of and further explore menarcheal trends as well as possible health disparities, as these factors can be vital to understanding larger societal issues.

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Appendix A – Survey**Title: Secular Trends in Age at Menarche Among Swedish and Sámi Women in Norrbotten County, Sweden**

Please provide an alias (fake name) in order to remain anonymous:

1. Date of birth: _____
2. Current Height _____
3. Current Weight _____
4. Birth Weight (if known) _____
5. Area of Current Residence _____
6. During childhood, did you feel like you weighed more than other girls your age?
 1. Yes
 0. No
7. During childhood, did you feel like you were taller than other girls your age?
 1. Yes
 0. No
8. How old were you when you had your first menstrual period? _____ years old.
9. Do you remember in what month or season you had your first menstrual period? _____
10. How old were you when you had your first child, if applicable? _____ years old.
11. At any time during your childhood, were your parents *nomadic* reindeer herders?
 1. Yes
 0. No
12. At any time during your childhood, were your parents *sedentary* reindeer herders?
 1. Yes
 0. No
13. At any time during your childhood, were your parents farmers?
 1. Yes
 0. No
14. At any time during your childhood, did your parents work in the tourism industry?
 1. Yes
 0. No
15. At any time during your childhood, did your parents work in any other industry than those previously mentioned above?
 1. Yes
 0. No (Skip to number 17)

16. If you answered Yes to number 14, please explain:

17. Are you a member of a saameby?

- 1. Yes
- 0. No

18. Are either of your parents a member of a saameby?

- 1. Yes
- 0. No

19. Around the age of your first menstrual period, about how many servings of milk did you ingest on a weekly basis? (Estimations are OK)

- A. 8 or more servings of milk per week.
- B. 4-7 servings of milk per week.
- C. 1-3 servings of milk per week.
- D. 0 servings of milk per week.

20. If you consumed milk during your childhood, what type of milk was it?

- A. Reindeer milk
- B. Goat milk
- C. Cow milk
- D. Commercially processed milk
- E. I did not consume milk during my childhood.

21. Around the age of your first menstrual period, how much red meat did you consume? (Estimations are OK)

- A. 2 or more servings of meat per day.
- B. About one serving of meat per day.
- C. At least one serving of meat per week, but not every day.
- D. At least one serving of meat per month.
- E. I did not eat red meat around the age of my first menstrual period.
- F. I did not eat any animal products around the age of my first menstrual period.

22. If you consumed red meat during your childhood, what type of red meat was it?

- A. Cow

- B. Reindeer
 - C. Small game meat
 - D. Other: _____
 - E. I did not consume red meat during my childhood.
23. If you consumed red meat during your childhood, was any of it commercially processed?
- A. Yes
 - B. No
 - C. I do not know
 - D. I did not consume red meat during my childhood.
24. Do you feel that you grew up in an unstable environment?
- 1. Yes
 - 0. No
25. At any time during your childhood, did you feel dissatisfied with your body?
- 1. Yes
 - 0. No
26. At any time during your childhood, were your parents officially married?
- A. Yes
 - B. No
 - C. I do not know.
27. Are your parents divorced?
- 1. Yes
 - 0. No (Skip to question number 30)
28. How old were you when your parents got divorced? _____ years old.
29. Who did you primarily live with after the divorce?
- A. Mother
 - B. Father
 - C. I spent the same amount of time at my mother's and father's dwelling.
 - D. Other:
-
30. At any time during your childhood, did your father reside in the same primary dwelling as you did?
- 1. Yes
 - 0. No
31. If no, at what age did your father permanently leave your primary dwelling? _____ years old.
32. Did any other adult non-blood-related males reside in your primary dwelling during your childhood?
- 1. Yes

0. No

33. If yes, who resided in your primary dwelling and for how long?

34. How many siblings do you have? _____

35. How many brothers do you have? _____

36. If you have older brothers, how much older than you are they?

37. During your childhood, did you participate in a sport that required at least 12 hours of training per week?

1. Yes

0. No

38. About how many hours of exercise/physical activity did you engage in around the time of your first menstrual period?

A. 0-2 hours per week

B. 3-6 hours per week

C. 7-11 hours per week

D. More than 12 hours per week

39. Do you remember feeling stressed around the time of your first menstrual period?

A. I do not remember feeling stress at all.

B. I remember feeling a little stressed sometimes.

C. I remember feeling stressed out often.

D. Sometimes I would become very overwhelmed with stress.

E. I felt very overwhelmed with stress almost every day.

40. Did anybody in your primary dwelling smoke cigarettes during your childhood?

1. Yes

0. No

41. Do you ever smoke cigarettes?

1. Yes

0. No

42. If you smoke cigarettes, how old were you when you started? _____ years old.

43. How often do you smoke cigarettes?

- A. Three or more times a day.
- B. Once or twice a day.
- C. Three to five times per week.
- D. Once or twice per week.
- E. Once or twice per month.
- F. Once or twice per year.
- G. I never smoke cigarettes.

44. Where was your primary dwelling during childhood? (For example, what city or cities did you live in?)

Please remember that all information will be kept confidential. If you feel uncomfortable answering the following questions at any time, feel free to skip the question and move on to the next one.

45. At what age did you first engage in sexual activity? _____ years old.

46. If you use oral contraceptives, at what age did you start? _____ years old.

47. If you have experimented with illegal drugs, at what age did you start? _____ years old.

48. About how old were you when your breasts started growing? _____ years old.

49. If applicable, at what age did you cease menstruating? _____ years old.

Appendix B – Survey (Postal Mail)

Title: **Secular Trends in Age at Menarche Among Swedish and Sámi Women in Norrbotten County, Sweden**

Please provide an alias (fake name) in order to remain anonymous:

1. Date of birth: _____
2. Current Height _____
3. Current Weight _____
4. Birth Weight (if known) _____
5. Area of Current Residence _____
6. During childhood, did you feel like you weighed more than other girls your age?
 1. Yes
 0. No
7. During childhood, did you feel like you were taller than other girls your age?
 1. Yes
 0. No
8. How old were you when you had your first menstrual period? _____ years old.
9. Do you remember in what month or season you had your first menstrual period? _____
10. How old were you when you had your first child, if applicable? _____ years old.
11. At any time during your childhood, were your parents *nomadic* reindeer herders?
 1. Yes
 0. No
12. At any time during your childhood, were your parents *sedentary* reindeer herders?
 1. Yes
 0. No
13. At any time during your childhood, were your parents farmers?
 1. Yes
 0. No
14. At any time during your childhood, did your parents work in the tourism industry?
 1. Yes
 0. No
15. At any time during your childhood, did your parents work in any other industry than those previously mentioned above?
 1. Yes

0. No (Skip to number 17)

16. If you answered Yes to number 14, please explain:

17. Are you a member of a saameby?

1. Yes

0. No

18. Are either of your parents a member of a saameby?

1. Yes

0. No

19. Around the age of your first menstrual period, about how many servings of milk did you ingest on a weekly basis? (Estimations are OK)

A. 8 or more servings of milk per week.

B. 4-7 servings of milk per week.

C. 1-3 servings of milk per week.

D. 0 servings of milk per week.

20. If you consumed milk during your childhood, what type of milk was it?

A. Reindeer milk

B. Goat milk

C. Cow milk

D. Commercially processed milk

E. I did not consume milk during my childhood.

21. Around the age of your first menstrual period, how much red meat did you consume? (Estimations are OK)

A. 2 or more servings of meat per day.

B. About one serving of meat per day.

C. At least one serving of meat per week, but not every day.

D. At least one serving of meat per month.

E. I did not eat red meat around the age of my first menstrual period.

F. I did not eat any animal products around the age of my first menstrual period.

22. If you consumed red meat during your childhood, what type of red meat was it?

- A. Cow
 - B. Reindeer
 - C. Small game meat
 - D. Other: _____
 - E. I did not consume red meat during my childhood.
23. If you consumed red meat during your childhood, was any of it commercially processed?
- A. Yes
 - B. No
 - C. I do not know
 - D. I did not consume red meat during my childhood.
24. Do you feel that you grew up in an unstable environment?
- 1. Yes
 - 0. No
25. At any time during your childhood, did you feel dissatisfied with your body?
- 1. Yes
 - 0. No
26. At any time during your childhood, were your parents officially married?
- A. Yes
 - B. No
 - C. I do not know.
27. Are your parents divorced?
- 1. Yes
 - 0. No (Skip to question number 30)
28. How old were you when your parents got divorced? _____ years old.
29. Who did you primarily live with after the divorce?
- A. Mother
 - B. Father
 - C. I spent the same amount of time at my mother's and father's dwelling.
 - D. Other:
-
30. At any time during your childhood, did your father reside in the same primary dwelling as you did?
- 1. Yes
 - 0. No
31. If no, at what age did your father permanently leave your primary dwelling? _____ years old.
32. Did any other adult non-blood-related males reside in your primary dwelling during your childhood?

1. Yes

0. No

33. If yes, who resided in your primary dwelling and for how long?

34. How many siblings do you have? _____

35. How many brothers do you have? _____

36. If you have older brothers, how much older than you are they?

37. During your childhood, did you participate in a sport that required at least 12 hours of training per week?

1. Yes

0. No

38. About how many hours of exercise/physical activity did you engage in around the time of your first menstrual period?

A. 0-2 hours per week

B. 3-6 hours per week

C. 7-11 hours per week

D. More than 12 hours per week

39. Do you remember feeling stressed around the time of your first menstrual period?

A. I do not remember feeling stress at all.

B. I remember feeling a little stressed sometimes.

C. I remember feeling stressed out often.

D. Sometimes I would become very overwhelmed with stress.

E. I felt very overwhelmed with stress almost every day.

40. Did anybody in your primary dwelling smoke cigarettes during your childhood?

1. Yes

0. No

41. Do you ever smoke cigarettes?

1. Yes

0. No

42. If you smoke cigarettes, how old were you when you started? _____ years old.

43. How often do you smoke cigarettes?

- A. Three or more times a day.
- B. Once or twice a day.
- C. Three to five times per week.
- D. Once or twice per week.
- E. Once or twice per month.
- F. Once or twice per year.
- G. I never smoke cigarettes.

44. Where was your primary dwelling during childhood? (For example, what city or cities did you live in?)

Please remember that all information will be kept confidential. If you feel uncomfortable answering the following questions at any time, feel free to skip the question and move on to the next one.

45. At what age did you first engage in sexual activity? _____ years old.

46. If you use oral contraceptives, at what age did you start? _____ years old.

47. If you have experimented with illegal drugs, at what age did you start? _____ years old.

48. About how old were you when your breasts started growing? _____ years old.

49. If applicable, at what age did you cease menstruating? _____ years old.

Please answer the questions below to the best of your ability. If you need more room than provided, please use the back of the survey. You may respond in Swedish or English.

1. Do you remember the day you got your first menstrual period? What happened?

2. How did your family and/or peers react **when you told them you had started your first menstrual period?**

3. Did you know that you would be experiencing your first menstrual period, or did it come as a surprise to you? If you knew, who told you?

4. Did you feel different after you had your first menstrual period?

5. Did having your menstrual periods make you not able to participate in certain activities, **like sports or swimming?**

6. Did you know when you got your first menstrual period that it meant you were physically able to bear children?

7. Would you have considered yourself healthy around the age at your first menstrual period? How healthy would you say you are now?

8. Do you feel like you experienced your first menstrual period before other girls your age?

9. If your parents were married and/or cohabitating regularly during your childhood did your father have long absences from the home for whatever reason (i.e. work, travel, etc.)? If so, for how long and how often?

10. Did you experience the death of a family member or close friend during your childhood? If so, who, and how did you react to it?

13. Do you feel like you engaged in sexual activity earlier than other girls your age?

Appendix C – Interview Questions

*Questions in **bold** will only be addressed if the principal investigator has established a rapport with the participant and feels there are minimal risks involved in asking such a personal question.

1. Do you remember the day you got your first menstrual period? How old were you?
2. If so, how did your family and/or peers react? What happened?
3. Did you know that you would be experiencing your first menstrual period, or did it come as a surprise to you? If you knew, who told you?
4. Did you feel different after you had your first menstrual period?
5. Did having your menstrual periods make you not able to participate in certain activities?
6. Did you know when you got your first menstrual period that it meant you were physically able to bear children?
7. Would you have considered yourself healthy around the age at your first menstrual period? How healthy would you say you are now?
8. Do you feel like you experienced your first menstrual period before other girls your age?
9. If your parents were married and/or cohabitating regularly during your childhood did your father have long absences from the home for whatever reason (i.e. work, travel, etc.)?
10. Did you experience the death of a family member or close friend during your childhood? If so, who, and how did you react to it?
- 11. Do you have any of the following medical conditions: osteoporosis, polycystic ovary syndrome, cancer, cardiovascular disease that you are aware of?**
- 12. If applicable, did you smoke cigarettes while pregnant with any of your children?**
- 13. Do you feel like you engaged in sexual activity earlier than other girls your age?**

Appendix D – Sample Sizes for Graphs

Figure 1: Age First Period Sámi v. Swede

Swede Cohort C: $n=14$

Sámi Cohort : $n=4$

Swede Cohort D: $n=5$

Sámi Cohort D: $n=6$

Figure 2: Average Age Sexual Debut

Sámi Cohort C: $n=2$

Sámi Cohort D: $n=6$

Swede Cohort B: $n=3$

Swede Cohort C: $n=11$

Swede Cohort D: $n=5$

Figure 3: Comparison Across Average Age at Menarche, Sexual Debut, and First Oral Contraceptive Use

Menarche

Sámi Cohort C: $n=4$

Swede Cohort C: $n=14$

Sámi Cohort D: $n=6$

Swede Cohort D: $n=5$

Sexual Debut

Sámi Cohort C: $n=2$

Swede Cohort C: $n=11$

Sámi Cohort D: $n=6$

Swede Cohort D: $n=5$

Oral Contraceptive Use

Sámi Cohort C: $n=2$

Swede Cohort C: $n=9$

Sámi Cohort D: $n=5$

Swede Cohort D: $n=3$