

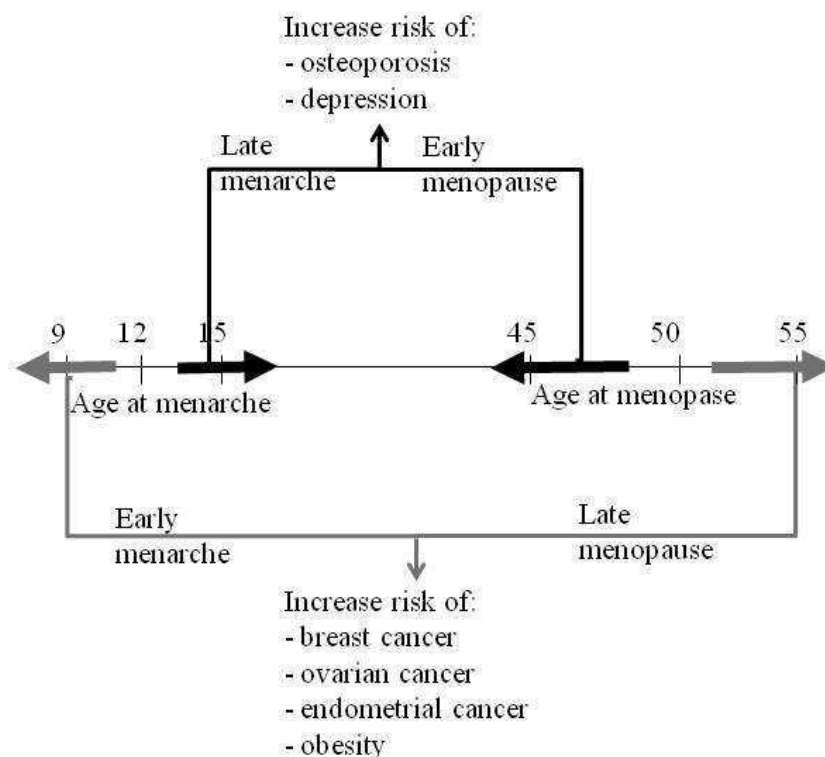
## Introduction

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Menarche and menopause make key moments in a woman's reproductive biology as they initiate and terminate her reproductive period. The time of occurrence of these phenomena is characterized by great interindividual variability. Researchers suggest that the age at menarche and menopause is affected by both genetic and environmental factors. The influence of environmental factors on the age at menarche is well documented and the studies carried out so far have proved that natal parameters, hormone levels, body weight, nutritional status, number of children in the family, socioeconomic status, degree of urbanization of the place of residence, lifestyle, physical activity and climatic factors have significant effect on the age at menarche [inter alia: Bielicki et al. 1986; Kirchengast, Hartman 1994; Charvarro et al. 2004; Wronka, Pawlińska-Chmara 2005a,b; Adair 2008; Louis et al. 2008; Lehmann et al. 2010; Matusik et al. 2011; Opore-Addo et al. 2012; Szwed, Kosińska 2012, Szwed et al. 2013]. Studies around the age of menopause indicate factors such as hormone levels, regularity and the course of menstrual cycles, number of pregnancies, degree of urbanization of the place of residence, socioeconomic status, smoking, physical activity, medical history, stress, diet and climatic factors [inter alia: Brambilla, McKinlay 1989; Thomas et al. 2001; Kaczmarek, 2007b; Henderson et al. 2008; Pawlińska-Chmara, Szwed 2008; Phipps et al. 2010, Morris et al. 2012; Stepaniak et al. 2013]. However, besides smoking which is known to accelerate the menopause for about 1,5 to 2 years, the influence of other factors on the occurrence of the last menstrual cycle is still ambiguous.

In addition, examination of the time of the appearance of the menarche and menopause is extremely important because the two phenomena may be important modulators of the risk of certain diseases (Figure 1). Several studies have shown that early menarche and late menopause, thus long reproductive period, are associated with increased risk of diseases including breast cancer, ovarian cancer, endometrial cancer and obesity [Apter, Vihko 1983; Ress 1995; Titus-Ernstoff et al. 2001; Remsberg et al. 2005; Karapanou, Papadimitriou 2010, Britt 2012; Pierce et al. 2012], while late menarche and

early menopause increase the risk of osteoporosis and depression [Fox et al.1993, Karapanou, Papadimitriou 2010; Baccaro et al. 2013]. Early menarche and early menopause increase on the other hand the risk of cardiovascular diseases [Ress 1995; Remsberg et al. 2005; Atsma et al. 2006, Feng et al. 2008]. Age at menopause is also a marker of aging of the female reproductive system, indicating a decline in the reproductive capacity which in turn leads to the end of fertility, which takes place about 5-10 years before the occurrence of menopause [te Velde et al. 1998; de Bruin et al. 2001].



**Fig. 1.** Influence of the time of occurrence of menarche and menopause on women's health

Environmental factors explain only a small part of the diversity of the age at menarche and menopause, because the occurrence of these phenomena largely results from the interaction between many genes whose identification and inspection of their impact on the length, the course and the quality of women's reproductive period is still to be determined.

In this context, family research on women's reproductive period is particularly important. The results of the family research presented in this paper will allow for a more detailed analysis of the similarities and differences in the time of occurrence of the menarche and menopause as determinants of the reproductive period. They will particularly help to evaluate whether these similarities and differences are a result of shared genes, similar or even identical living conditions or are the result of interaction of genetic and environmental factors, as well as what is the contribution of each component to the development of the reproductive period in women. The results of the research presented in the literature relate only to the individual attempts to determine the family interdependence relating to age at menarche or menopause. So far those phenomena has not been analysed together, hence the research presented in this paper take on some additional value.

It should also be noted that in recent decades there has been an increase in the average age at which a woman decides to give birth to her first child. In Europe in 1980, the average age of a woman giving birth to a child was 26,9 years, in 1990 – 27,8 years, in 2000 – 29,1 years, while in 2012 – already 30,1 years [Eurostat 2006, Eurostat 2012]. Situation is similar in Poland. The average age of women at the time of giving birth has increased from 26,5 years in 1980 to 28,9 years in 2012 [Eurostat 2006, Eurostat 2012]. Therefore, given the delay in the age of giving birth and the fact that a woman's fertility declines with age [Baird et al. 2005; Schmidt et al. 2012], it is expected that the percentage of women with reproductive problems will increase. Therefore, apart from cognitive significance, the results can be used to develop models for predicting the course and the length of the individual period of fertility in women.