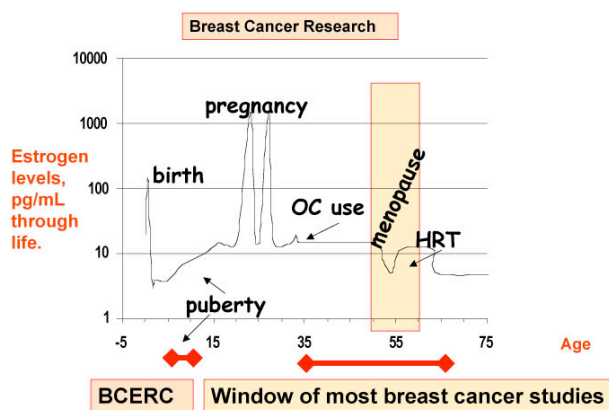


## Onset of Puberty in Girls and Breast Cancer Research

The National Institute of Environmental Health Sciences (NIEHS) and the National Cancer Institute (NCI) have funded four national **Breast Cancer and the Environment Research Centers (BCERC)** to study the impact of prenatal-to-adult environmental exposures that may predispose a woman to breast cancer. The Centers' epidemiology studies have enrolled over 1,200 young girls of different racial/ethnic groups at ages 6 – 7 who are being followed prospectively for five years to investigate environmental, lifestyle and genetic determinants of puberty. CYGNET, the Bay Area Breast Cancer and the Environment Research Center (BABCERC) epidemiology study, is conducted by the Division of Research, Kaiser Permanente.



## Why is early onset of puberty in girls a risk factor for breast cancer in later years?

Early or premature puberty can expand the interval between a girl's breast budding (thelarche) and first menstrual period (menarche) and can expose a woman to greater amounts of estrogen over her lifetime. This risk is of special concern since numerous studies are providing evidence that U.S. girls are entering puberty (thelarche) up to 1 1/2 years earlier than they have in past generations.



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**Zero Breast Cancer leads the Bay Area Breast Cancer & the Environment Research Center Community Outreach and Translation Core.**

Zero Breast Cancer is dedicated to finding the causes of breast cancer through community participation in the research process.

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The Bay Area Breast Cancer & the Environment Research Center  
Community Outreach and Translation Core  
[www.bcerc.org/cotc.htm](http://www.bcerc.org/cotc.htm) UCSF Comprehensive Cancer Center

## The Mind-Body Connection – Onset of Puberty in Girls

### What is puberty?

Puberty is the time period in a young girl's life when a series of hormonal, physiological, cognitive, and socio-emotional changes are simultaneously taking place. This time period begins when a small region of the brain called the hypothalamus begins releasing chemical messages to the ovaries that trigger a series of hormonal and physical processes to tell the body to grow and develop reproductive capability.

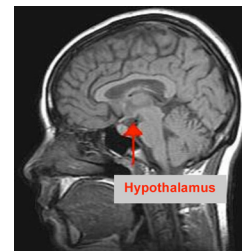


Lou Beach

### When does puberty begin?

The onset of puberty actually begins during the third trimester while the fetus is still in a mother's womb. At that time, the fetus is developing a luteinizing hormone-releasing hormone (LHRH) pulse generator in the hypothalamus. The LHRH pulse generator "turns off" after birth, between the ages of six and twelve months, and remains off until the onset of puberty several years later.

A gradual re-awakening of the LHRH pulse generator begins when the hypothalamus starts releasing pulses of a hormone called gonadotropin (GnRH). GnRH causes the ovaries to respond by growing and beginning to produce estradiol, an endogenous form of estrogen. The exterior physical growth changes of female puberty are initiated by the rising levels of estradiol. This gradual re-awakening is usually impossible to detect and varies in age by person to person and precedes the first signs of visible physical changes by 1–2 years.



[commons.wikimedia.org/wiki/Image:Hypothalamus.jpg](https://commons.wikimedia.org/wiki/Image:Hypothalamus.jpg)

## At what age can parents begin seeing physical change in girls related to puberty?

There is considerable individual variation as to when physical changes related to puberty begins in girls. The onset of puberty, identified by the appearance of “budding” breasts (thelarche) and pubic hair (pubarche), normally begins between the ages of 8 and 14. Pubarche often occurs within a few months of breast budding and usually is a result of rising levels of adrenal androgens and/or exposure to an anabolic steroid, not estrogen. A girl’s first menstrual period (menarche) typically occurs about 2 years after thelarche. In the U.S. the average age of menarche is approximately 12 1/2 years of age.

Pediatricians and researchers use a five-stage sexual maturity rating system to assess the onset of puberty by describing stages of breast and pubic hair development. These stages are referred to as Tanner Stages.

### What are Tanner Stages?

Tanner Stages are a series of five discrete stages that describe and categorize breast and pubic hair development. Tanner Stages are part of a sexual maturity rating system developed in 1969 by a British pediatrician, Dr. James Tanner. The description and timing of each of these stages is variable and dependent on many other factors. The amount of time needed to progress through these five stages can vary between two and five years.

Other physical changes, such as a girl’s first menstrual bleeding (menarche) and height, are often referenced to Tanner Stages, but are not part of the Tanner Staging System.

This handout provides general information to use for further discussion with your daughter’s pediatrician.

*For more information, please see the following resources.*

KidsHealth for Parents, Nemours Foundation: Understanding Puberty  
[www.kidshealth.org/parent/growth/growing/understanding\\_puberty.html](http://www.kidshealth.org/parent/growth/growing/understanding_puberty.html)

Endocrinology: An Integrated Approach  
[www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=endocrin.box.1059](http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=endocrin.box.1059)

## What are the known risk factors for early puberty in girls?

Risk factors associated with timing of puberty are genetic, nutritional, environmental, and psychosocial.

- **Genetic and racial/ethnic heritage**  
*The specific genes affecting pubertal timing are not defined yet; however, genetic association is strongest between biological mothers and daughters.*

*In the U.S., African American girls tend to enter puberty the earliest, followed by girls of Latina heritage. White or Caucasian girls enter puberty later, and it appears that Asian girls enter puberty the latest.*

- **High BMI-for-age percentile**  
*Surplus calories (beyond growth and activity requirements) from diet and physical inactivity are reflected in measurement of body fat. A reliable measurement of body fat for most children and teens is BMI (Body Mass Index) when plotted on a chart with age to obtain a percentile ranking (relationship to a general population). The Centers for Disease Control and Prevention (CDC) defines children at or above the 85<sup>th</sup> percentile – i.e., greater than 85% of the general population – as being at risk for becoming overweight as adults.*

*BMI-for-age percentiles greater than the 85<sup>th</sup> percentile are associated with earlier onset of puberty.*

*BMI-for-age percentiles less than the 5<sup>th</sup> percentile are associated with later onset of puberty.*

- **Social and psychological stress**  
*Psychological and anthropological research have associated family relationships and the timing of menarche.*

### How can I calculate my daughter’s BMI – for-age percentile?

BMI is a number calculated from a person’s weight and height. BMI does not measure body fat directly, but research has shown that BMI correlates to direct measures of body fat. After BMI is calculated for children and teens, the BMI number is plotted on the Centers for Disease Control and Prevention (CDC) BMI-for-age growth charts (for either girls or boys) to obtain a percentile ranking. Percentiles are the most commonly used indicator to assess the size and growth patterns of individual children in the United States.

Plotting your daughter’s BMI-for-age on the appropriate CDC growth chart can alert you to early signs that your daughter is gaining or losing weight too fast.

An online children’s BMI-percentile-for-age calculator can be accessed at: [www.kidsnutrition.org/bodycomp/bmizz.html](http://www.kidsnutrition.org/bodycomp/bmizz.html)

For more information, please see the following resource. Centers for Disease Control and Prevention: Using the BMI-for-Age Growth Charts  
[www.cdc.gov/nccdphp/dnpa/growthcharts/training/modules/module1/text/page1a.htm](http://www.cdc.gov/nccdphp/dnpa/growthcharts/training/modules/module1/text/page1a.htm)