



# Pregnancy

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**Pregnancy**, also known as **gravidity** or **gestation**, is the time during which one or more offspring develops inside a woman.<sup>[1]</sup> A multiple pregnancy involves more than one offspring, such as with twins.<sup>[2]</sup> Pregnancy can occur by sexual intercourse or assisted reproductive technology. It usually lasts around 40 weeks from the last menstrual period (LMP) and ends in childbirth.<sup>[1][3]</sup> This is just over nine lunar months, where each month is about 29½ days.<sup>[1][3]</sup> When measured from conception it is about 38 weeks. An embryo is the developing offspring during the first eight weeks following conception, after which, the term *fetus* is used until birth.<sup>[3]</sup> Symptoms of early pregnancy may include missed periods, tender breasts, nausea and vomiting, hunger, and frequent urination.<sup>[4]</sup> Pregnancy may be confirmed with a pregnancy test.<sup>[5]</sup>

Pregnancy is typically divided into three trimesters. The first trimester is from week one through 12 and includes conception. Conception is when the sperm fertilizes the egg. The fertilized egg then travels down the fallopian tube and attaches to the inside of the uterus, where it begins to form the fetus and placenta.<sup>[1]</sup> The first trimester carries the highest risk of miscarriage (natural death of embryo or fetus).<sup>[6]</sup> The second trimester is from week 13 through 28. Around the middle of the second trimester, movement of the fetus may be felt. At 28 weeks, more than 90% of babies can survive outside of the uterus if provided high-quality medical care. The third trimester is from 29 weeks through 40 weeks.<sup>[1]</sup>


Prenatal care improves pregnancy outcomes.<sup>[7]</sup> Prenatal care may include taking extra folic acid, avoiding drugs and alcohol, regular exercise, blood tests, and regular physical examinations.<sup>[7]</sup> Complications of pregnancy may include high blood pressure of pregnancy, gestational diabetes, iron-deficiency anemia, and severe nausea and vomiting among others.<sup>[8]</sup> Term pregnancy is 37 to 41 weeks, with early term being 37 and 38 weeks, full term 39 and 40 weeks, and late term 41 weeks. After 41 weeks, it is known as post term. Babies born before 37 weeks are preterm and are at higher risk of health problems such as cerebral palsy.<sup>[1]</sup> Delivery before 39 weeks by labor induction or caesarean section is not recommended unless required for other medical reasons.<sup>[9]</sup>

About 213 million pregnancies occurred in 2012, of which, 190 million were in the developing world and 23 million were in the developed world. The number of pregnancies in women ages 15 to 44 is 133 per 1,000 women.<sup>[10]</sup> About 10% to 15% of recognized pregnancies end in miscarriage.<sup>[6]</sup> In 2013, complications of pregnancy resulted in 293,000 deaths, down from 377,000 deaths in 1990.

Common causes include maternal bleeding, complications of abortion, high blood pressure of pregnancy, maternal sepsis, and obstructed labor.<sup>[11]</sup>

Globally, 40% of pregnancies are unplanned. Half of unplanned pregnancies are aborted.<sup>[10]</sup> Among unintended pregnancies in the United States, 60% of the women used birth control to some extent during the month pregnancy occurred.<sup>[12]</sup>

**Pregnancy**



A pregnant woman

**Classification and external resources**

<b>Specialty</b>	Obstetrics, midwifery
<b>ICD-10</b>	Z33 ( <a href="http://apps.who.int/classifications/icd10/browse/2016/en#/Z33">http://apps.who.int/classifications/icd10/browse/2016/en#/Z33</a> )
<b>ICD-9-CM</b>	650 ( <a href="http://www.icd9data.com/getICD9Code.aspx?icd9=650">http://www.icd9data.com/getICD9Code.aspx?icd9=650</a> )
<b>DiseasesDB</b>	10545 ( <a href="http://www.diseasesdatabase.com/ddb10545.htm">http://www.diseasesdatabase.com/ddb10545.htm</a> )
<b>MedlinePlus</b>	002398 ( <a href="https://medlineplus.gov/ency/article/002398.htm">https://medlineplus.gov/ency/article/002398.htm</a> )
<b>eMedicine</b>	article/259724 ( <a href="http://emedicine.medscape.com/article/259724-overview">http://emedicine.medscape.com/article/259724-overview</a> )
<b>MeSH</b>	D011247 ( <a href="https://www.nlm.nih.gov/cgi/mesh/2016/MB_cgi?field=uid&amp;term=D011247">https://www.nlm.nih.gov/cgi/mesh/2016/MB_cgi?field=uid&amp;term=D011247</a> )

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## Terminology

One scientific term for the state of pregnancy is *gravidity* (adjective "*gravid*"), Latin for "heavy" and a pregnant female is sometimes referred to as a *gravida*.<sup>[13]</sup> Similarly, the term *parity* (abbreviated as "para") is used for the number of times a female carries a pregnancy past 20 weeks of gestation. Twins and other multiple births are counted as one pregnancy and birth. A woman who has never been pregnant is referred to as a *nulligravida*. A woman who is (or has been only) pregnant for the first time is referred to as a *primigravida*,<sup>[14]</sup> and a woman in subsequent pregnancies as a *multigravida* or as *multiparous*.<sup>[13][15]</sup> Therefore, during a second pregnancy a woman would be described as *gravida 2, para 1* and upon live delivery as *gravida 2, para 2*. In-progress pregnancies, abortions, miscarriages and/ or stillbirths account for parity values being less than the gravida number. In the case of twins, triplets, etc., gravida number and parity value are increased by one only. Women who have never carried a pregnancy achieving more than 20 weeks of gestation age are referred to as *nulliparous*.<sup>[16]</sup>

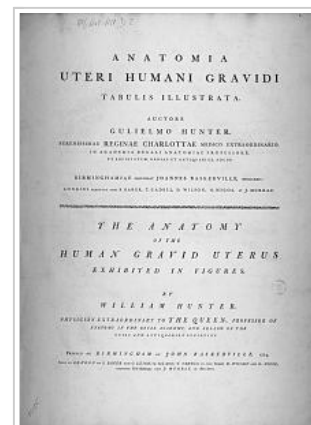
Recent medical literature prefers the terminology *preterm* and *postterm* to *premature* and *postmature*. *Preterm* and *postterm* are defined above, whereas *premature* and *postmature* have historical meaning and relate more to the infant's size and state of development rather than to the stage of pregnancy.<sup>[17][18]</sup>

## Signs and symptoms

The symptoms and discomforts of pregnancy are those presentations and conditions that result from pregnancy but do not significantly interfere with activities of daily living or pose a threat to the health of the mother or baby. This is in contrast to pregnancy complications. Sometimes a symptom that is considered a discomfort can be considered a complication when it is more severe. For example, nausea can be a discomfort (morning sickness), but if, in combination with significant vomiting, it causes water-electrolyte imbalance it is a complication (hyperemesis gravidarum).

Common symptoms and discomforts of pregnancy include:

- Tiredness.
- Constipation
- Pelvic girdle pain
- Back pain
- Braxton Hicks contractions. Occasional, irregular, and often painless contractions that occur several times per day.
- Edema (swelling). Common complaint in advancing pregnancy. Caused by compression of the inferior vena cava (IVC) and pelvic veins by the uterus leads to increased hydrostatic pressure in lower extremities.
- Increased urinary frequency. A common complaint referred by the gravida, caused by increased intravascular volume, elevated GFR (glomerular filtration rate), and compression of the bladder by the expanding uterus.
- Urinary tract infection<sup>[19]</sup>



William Hunter, *Anatomia uteri humani gravidi tabulis illustrata*, 1774

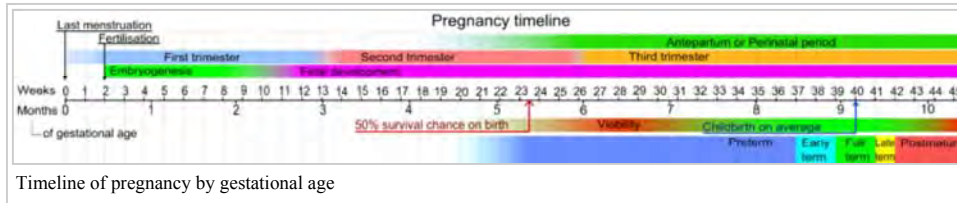


Melasma pigment changes to the face due to pregnancy

- Varicose veins. Common complaint caused by relaxation of the venous smooth muscle and increased intravascular pressure.
- Haemorrhoids (piles). Swollen veins at or inside the anal area. Caused by impaired venous return, straining associated with constipation, or increased intra-abdominal pressure in later pregnancy.<sup>[20]</sup>
- Regurgitation, heartburn, and nausea.
- Striae gravidarum, pregnancy-related stretch marks
- Breast tenderness is common during the first trimester, and is more common in women who are pregnant at a young age.<sup>[21]</sup>

In addition, pregnancy may result in pregnancy complication such as deep vein thrombosis or worsening of an intercurrent disease in pregnancy.

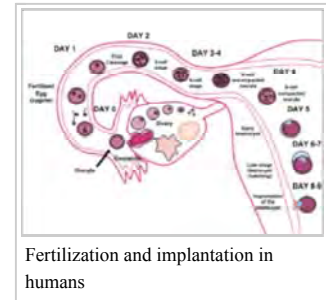
## Physiology



### Initiation

There are multiple definitions of the beginning of a pregnancy.<sup>[22]</sup> Healthcare providers normally count the initiation of pregnancy from the first day of the woman's last menstrual period. Using this date, the resulting fetal age is called the gestational age. This choice was a result of inability to discern the point in time when the actual conception happened. In *in vitro* fertilisation, gestational age is calculated by days from oocyte retrieval + 14 days (the 14 days before the known time of conception).<sup>[23]</sup>

Through an interplay of hormones that includes follicle stimulating hormone that stimulates folliculogenesis and oogenesis creates a mature egg cell, the female gamete. Fertilization is the event where the egg cell fuses with the male gamete, spermatozoon. After the point of fertilization, the fused product of the female and male gamete is referred to as a zygote or fertilized egg. The fusion of male and female gametes usually occurs following the act of sexual intercourse. Fertilization can also occur by assisted reproductive technology such as artificial insemination and *in vitro* fertilisation.



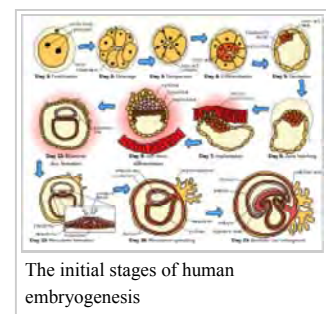
Fertilization (conception) is sometimes used as the initiation of pregnancy, with the derived age being termed fertilization age. Fertilization usually occurs about two weeks before the *next* expected menstrual period.

A third point in time is also considered by some people to be the true beginning of a pregnancy: This is time of implantation, when the future fetus attaches to the lining of the uterus. This is about a week to ten days after fertilization.<sup>[22]</sup> In this model, during the time between conception and implantation, the future fetus exists, but the woman is not considered pregnant.

### Development of embryo and fetus

The sperm and the egg cell, which has been released from one of the female's two ovaries, unite in one of the two fallopian tubes. The fertilized egg, known as a zygote, then moves toward the uterus, a journey that can take up to a week to complete. Cell division begins approximately 24 to 36 hours after the male and female cells unite. Cell division continues at a rapid rate and the cells then develop into what is known as a blastocyst. The blastocyst arrives at the uterus and attaches to the uterine wall, a process known as implantation.

The development of the mass of cells that will become the infant is called embryogenesis during the first approximately ten weeks of gestation. During this time, cells begin to differentiate into the various body systems. The basic outlines of the organ, body, and nervous systems are established. By the end of the embryonic stage, the beginnings of features such as fingers, eyes, mouth, and ears become visible. Also during this time, there is development of structures important to the support of the embryo, including the placenta and umbilical cord. The placenta connects the developing embryo to the uterine wall to allow nutrient uptake, waste elimination, and gas exchange via the mother's blood supply. The umbilical cord is the connecting cord from the embryo or fetus to the placenta.



After about ten weeks of gestational age, the embryo becomes known as a fetus. At the beginning of the fetal stage, the risk of miscarriage decreases sharply.<sup>[24]</sup> At this stage, a fetus is about 30 mm (1.2 inches) in length, the heartbeat is seen via ultrasound, and the fetus makes involuntary motions.<sup>[25]</sup> During continued fetal development, the early body systems, and structures that were established in the embryonic stage continue to develop. Sex organs begin to appear during the third month of gestation. The fetus continues to grow in both weight and length, although the majority of the physical growth occurs in the last weeks of pregnancy.

Electrical brain activity is first detected between the fifth and sixth week of gestation. It is considered primitive neural activity rather than the beginning of conscious thought. Synapses begin forming at 17 weeks, and begin to multiply quickly at week 28 until 3 to 4 months after birth.<sup>[26]</sup>

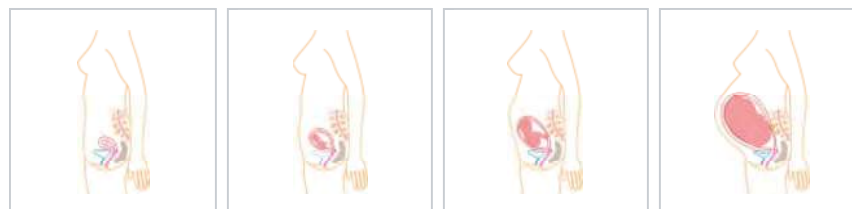


Embryo at 4 weeks after fertilization. (Image from gestational age of 6 weeks). Retrieved 2007-08-28.

Fetus at 8 weeks after fertilization. (Image from gestational age of 10 weeks). Retrieved 2007-08-28.

Fetus at 18 weeks after fertilization. (Image from gestational age of 20 weeks). Retrieved 2007-08-28.

Fetus at 38 weeks after fertilization. (Image from gestational age of 40 weeks). Retrieved 2007-08-28.



Relative size in 1st month (simplified illustration)

Relative size in 3rd month (simplified illustration)

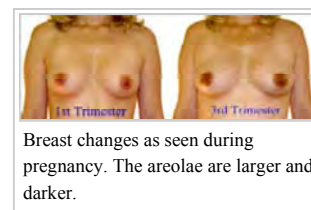
Relative size in 5th month (simplified illustration)

Relative size in 9th month (simplified illustration)

## Maternal changes

During pregnancy, the woman undergoes many physiological changes, which are entirely normal, including cardiovascular, hematologic, metabolic, renal, and respiratory changes. Increases in blood sugar, breathing, and cardiac output are all required. Levels of progesterone and oestrogens rise continually throughout pregnancy, suppressing the hypothalamic axis and therefore also the menstrual cycle.

The fetus is genetically different from the woman and can be viewed as an unusually successful allograft.<sup>[27]</sup> The main reason for this success is increased immune tolerance during pregnancy.<sup>[28]</sup> Immune tolerance is the concept that the body is able to not mount an immune system response against certain triggers.<sup>[27]</sup>



Breast changes as seen during pregnancy. The areolae are larger and darker.

Pregnancy is typically broken into three periods, or trimesters, each of about three months.<sup>[29][30]</sup> Each trimester is defined as 14 weeks, for a total duration of 42 weeks, although the average duration of pregnancy is 40 weeks.<sup>[31]</sup> While there are no hard and fast rules, these distinctions are useful in describing the changes that take place over time.

### First trimester

Minute ventilation increases by 40% in the first trimester.<sup>[32]</sup> The womb will grow to the size of a lemon by eight weeks. Many symptoms and discomforts of pregnancy like nausea and tender breasts appear in the first trimester.<sup>[33]</sup>

### Second trimester

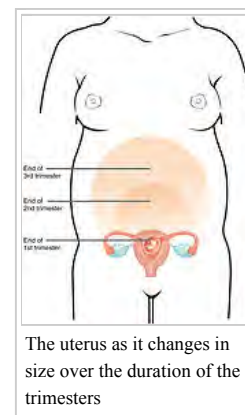
Weeks 13 to 28 of the pregnancy are called the second trimester. Most women feel more energized in this period, and begin to put on weight as the symptoms of morning sickness subside and eventually fade away. The uterus, the muscular organ that holds the developing fetus, can expand up to 20 times its normal size during pregnancy.

Although the fetus begins to move during the first trimester, it is not until the second trimester that movement, often referred to as "quickening", can be felt. This typically happens in the fourth month, more specifically in the 20th to 21st week, or by the 19th week if the woman has been pregnant before. It is common for some women not to feel the fetus move until much later. During the second trimester, most women begin to wear maternity clothes.

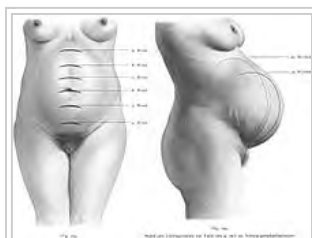
### Third trimester

Final weight gain takes place, which is the most weight gain throughout the pregnancy. The woman's abdomen will transform in shape as it drops due to the fetus turning in a downward position ready for birth. During the second trimester, the woman's abdomen would have been upright, whereas in the third trimester it will drop down low. The fetus moves regularly, and is felt by the woman. Fetal movement can become strong and be disruptive to the woman. The woman's navel will sometimes become convex, "popping" out, due to the expanding abdomen.

Head engagement, where the fetal head descends into cephalic presentation, relieves pressure on the upper abdomen with renewed ease in breathing. It



The uterus as it changes in size over the duration of the trimesters



The uterus expands making up a larger and larger portion of the woman's abdomen. At left anterior view with months labeled, at right lateral view labeling the last 4 weeks. During the final stages of gestation before childbirth the fetus and uterus will drop to a lower position.

also severely reduces bladder capacity, and increases pressure on the pelvic floor and the rectum.

It is also during the third trimester that maternal activity and sleep positions may affect fetal development due to restricted blood flow. For instance, the enlarged uterus may impede blood flow by compressing the vena cava when lying flat, which is relieved by lying on the left side.<sup>[34]</sup>

### Determining gestational age

The mean pregnancy length has been estimated to be 283.4 days of gestational age as timed from the first day of the last menstrual period and 280.6 days when retrospectively estimated by obstetric ultrasound measurement of the fetal biparietal diameter (BPD) in the second trimester.<sup>[35]</sup> Other algorithms take into account other variables, such as whether this is the first or subsequent child, the mother's race, age, length of menstrual cycle, and menstrual regularity. In order to have a standard reference point, the normal pregnancy duration is assumed by medical professionals to be 280 days (or 40 weeks) of gestational age.

The best method of determining gestational age is ultrasound during the first trimester of pregnancy. This is typically accurate within seven days.<sup>[36]</sup> This means that fewer than 5 percent of births occur on the day of being 40 weeks of gestational age; 50 percent of births are within a week of this duration, and about 80 percent are within 2 weeks.<sup>[35]</sup> For the estimation of due date, mobile apps essentially always give consistent estimations compared to each other and correct for leap year, while pregnancy wheels made of paper can differ from each other by 7 days and generally do not correct for leap year.<sup>[37]</sup> Once the estimated due date (EDD) is established, it should rarely be changed, as the determination of gestational age is most accurate earlier in the pregnancy.<sup>[38]</sup>

The most common system used among healthcare professionals is Naegele's rule, which was developed in the early 19th century. This calculates the expected due date from the first day of the last normal menstrual period (LMP or LNMP) regardless of factors known to make this inaccurate, such as a shorter or longer menstrual cycle length. Pregnancy most commonly lasts for 40 weeks according to this LNMP-based method, assuming that the woman has a predictable menstrual cycle length of close to 28 days and conceives on the 14th day of that cycle.

The average time to birth has been estimated to be 268 days (38 weeks and two days) from ovulation, with a standard deviation of 10 days or coefficient of variation of 3.7%.<sup>[39]</sup>

Accurate dating of pregnancy is important, because it is used in calculating the results of various prenatal tests, (for example, in the triple test). A decision may be made to induce labour if a fetus is perceived to be overdue. Furthermore, if ultrasound dating predicts a later due date than LMP, this might indicate slowed fetal growth and require closer review.

The stage of pregnancy defined as the beginning of legal fetal viability varies around the world. It sometimes incorporates weight as well as gestational age.<sup>[40]</sup> It ranges from 16 weeks in Norway, to 20 weeks in the US and Australia, 24 weeks in the UK and 26 weeks in Italy and Spain.<sup>[40][41][42]</sup>

### Timing of childbirth

#### Stages of pregnancy term

stage	starts	ends
Preterm <sup>[43]</sup>	-	at 37 weeks
Early term <sup>[44]</sup>	37 weeks	39 weeks
Full term <sup>[44]</sup>	39 weeks	41 weeks
Late term <sup>[44]</sup>	41 weeks	42 weeks
Postterm <sup>[44]</sup>	42 weeks	-

In the ideal childbirth labor begins on its own when a woman is "at term".<sup>[45]</sup> Pregnancy is considered at term when gestation has lasted between 37 and 42 weeks.<sup>[44]</sup>

Events before completion of 37 weeks are considered preterm.<sup>[43]</sup> Preterm birth is associated with a range of complications and should be avoided if possible.<sup>[46]</sup>

Sometimes if a woman's water breaks or she has contractions before 39 weeks, birth is unavoidable.<sup>[44]</sup> However, spontaneous birth after 37 weeks is considered term and is not associated with the same risks of a pre-term birth.<sup>[47]</sup> Planned birth before 39 weeks by Caesarean section or labor induction, although "at term", results in an increased risk of complications.<sup>[48]</sup> This is from factors including underdeveloped lungs of newborns, infection due to underdeveloped immune system, feeding problems due to underdeveloped brain, and jaundice from underdeveloped liver.<sup>[49]</sup>



By the end of the second trimester, the expanding uterus has created a visible "baby bump". Although the breasts have been developing internally since the beginning of the pregnancy, most of the visible changes appear after this point.



Babies born between 39 and 41 weeks gestation have better outcomes than babies born either before or after this range.<sup>[44]</sup> This special time period is called "full term".<sup>[44]</sup> Whenever possible, waiting for labor to begin on its own in this time period is best for the health of the mother and baby.<sup>[45]</sup> The decision to perform an induction must be made after weighing the risks and benefits, but is safer after 39 weeks.<sup>[45]</sup>

Events after 42 weeks are considered postterm.<sup>[44]</sup> When a pregnancy exceeds 42 weeks, the risk of complications for both the woman and the fetus increases significantly.<sup>[50][51]</sup> Therefore, in an otherwise uncomplicated pregnancy, obstetricians usually prefer to induce labour at some stage between 41 and 42 weeks.<sup>[52]</sup>

## Childbirth

Childbirth, referred to as labor and delivery in the medical field, is the process whereby an infant is born.<sup>[47]</sup>

A woman is considered to be in labour when she begins experiencing regular uterine contractions, accompanied by changes of her cervix – primarily effacement and dilation. While childbirth is widely experienced as painful, some women do report painless labours, while others find that concentrating on the birth helps to quicken labour and lessen the sensations. Most births are successful vaginal births, but sometimes complications arise and a woman may undergo a cesarean section.

During the time immediately after birth, both the mother and the baby are hormonally cued to bond, the mother through the release of oxytocin, a hormone also released during breastfeeding. Studies show that skin-to-skin contact between a mother and her newborn immediately after birth is beneficial for both the mother and baby. A review done by the World Health Organization found that skin-to-skin contact between mothers and babies after birth reduces crying, improves mother–infant interaction, and helps mothers to breastfeed successfully. They recommend that neonates be allowed to bond with the mother during their first two hours after birth, the period that they tend to be more alert than in the following hours of early life.<sup>[53]</sup>

## Postnatal period

The postnatal period, also referred to as the *puerperium*, begins immediately after delivery and extends for about six weeks.<sup>[47]</sup> During this period, the mother's body begins the return to pre-pregnancy conditions that includes changes in hormone levels and uterus size.<sup>[47]</sup>

## Diagnosis

The beginning of pregnancy may be detected either based on symptoms by the pregnant woman herself, or by using a medical test(s). However, an important condition with serious health implications that is more common than expected is denial of pregnancy by the pregnant woman. It has rate at 20 weeks gestation of approximately 1 in 475 pregnant women. The proportion of cases persisting until delivery is about 1 in 2500 refusing to acknowledge that they are pregnant (*denial of pregnancy*).<sup>[54]</sup> Conversely, some non-pregnant women have a very strong belief that they are pregnant along with some of the physical changes. This condition is known as pseudocyesis or false pregnancy.<sup>[55]</sup>

## Physical signs

Most pregnant women experience a number of symptoms,<sup>[56]</sup> which can signify pregnancy. A number of early medical signs are associated with pregnancy.<sup>[57][58]</sup> These signs include:

- the presence of human chorionic gonadotropin (hCG) in the blood and urine
- missed menstrual period
- implantation bleeding that occurs at implantation of the embryo in the uterus during the third or fourth week after last menstrual period
- increased basal body temperature sustained for over 2 weeks after ovulation
- Chadwick's sign (darkening of the cervix, vagina, and vulva)
- Goodell's sign (softening of the vaginal portion of the cervix)
- Hegar's sign (softening of the uterus isthmus)
- Pigmentation of linea alba – Linea nigra, (darkening of the skin in a midline of the abdomen, caused by hyperpigmentation resulting from hormonal changes, usually appearing around the middle of pregnancy).<sup>[57][58]</sup>
- Darkening of the nipples and areolas due to an increase in hormones.<sup>[59]</sup>



Linea nigra in a woman at 22 weeks pregnant

## Biomarkers

Pregnancy detection can be accomplished using one or more various pregnancy tests,<sup>[60]</sup> which detect hormones generated by the newly formed placenta, serving as biomarkers of pregnancy.<sup>[61]</sup> Blood and urine tests can detect pregnancy 12 days after implantation.<sup>[62]</sup> Blood pregnancy tests are more sensitive than urine tests (giving fewer false negatives).<sup>[63]</sup> Home pregnancy tests are urine tests, and normally detect a pregnancy 12 to 15 days after fertilization.<sup>[64]</sup> A quantitative blood test can determine approximately the date the embryo was conceived because HCG doubles every 36 to 48 hours.<sup>[47]</sup> A single test of progesterone levels can also help determine how likely a fetus will survive in those with a threatened miscarriage (bleeding in early pregnancy).<sup>[65]</sup>

## Ultrasound

Obstetric ultrasonography can detect some congenital diseases at an early stage, estimate the due date, and detect multiple pregnancies.<sup>[66]</sup> The resultant estimated gestational age and due date of the fetus are slightly more accurate than methods based on last menstrual period.<sup>[67]</sup> Ultrasound is used to measure the nuchal fold in order to screen for Down's syndrome.<sup>[68]</sup>

## Management

### Prenatal care

Pre-conception counseling is care that is provided to a woman and/ or couple to discuss conception, pregnancy, current health issues and recommendations for the period before pregnancy.<sup>[69]</sup>

Prenatal medical care is the medical and nursing care recommended for women during pregnancy, time intervals and exact goals of each visit differ by country.<sup>[70]</sup> Women who are high risk have better outcomes if they are seen regularly and frequently by a medical professional than women who are low risk.<sup>[71]</sup> A woman can be labeled as high risk for different reasons including previous complications in pregnancy, complications in the current pregnancy, current medical diseases, or social issues.<sup>[72][73]</sup>

The aim of good prenatal care is prevention, early identification, and treatment of any medical complications.<sup>[74]</sup> A basic prenatal visit consists of measurement of blood pressure, fundal height, weight and fetal heart rate, checking for symptoms of labor, and guidance for what to expect next.<sup>[69]</sup>

### Nutrition

Nutrition during pregnancy is important to ensure healthy growth of the fetus.<sup>[75]</sup> Nutrition during pregnancy is different from the non-pregnant state.<sup>[75]</sup> There are increased energy requirements and specific micronutrient requirements.<sup>[75]</sup> Women benefit from education to encourage a balanced energy and protein intake during pregnancy.<sup>[76]</sup> Some women may need professional medical advice if their diet is affected by medical conditions, food allergies, or specific religious/ ethical beliefs.<sup>[77]</sup>

Adequate periconceptional (time before and right after conception) folic acid (also called folate or Vitamin B<sub>9</sub>) intake has been shown to decrease the risk of fetal neural tube defects, such as spina bifida.<sup>[78]</sup> The neural tube develops during the first 28 days of pregnancy, a urine pregnancy test is not usually positive until 14 days post-conception, explaining the necessity to guarantee adequate folate intake before conception.<sup>[64][79]</sup> Folate is abundant in green leafy vegetables, legumes, and citrus.<sup>[80]</sup> In the United States and Canada, most wheat products (flour, noodles) are fortified with folic acid.<sup>[81]</sup>

DHA omega-3 is a major structural fatty acid in the brain and retina, and is naturally found in breast milk.<sup>[82]</sup> It is important for the woman to consume adequate amounts of DHA during pregnancy and while nursing to support her well-being and the health of her infant.<sup>[82]</sup> Developing infants cannot produce DHA efficiently, and must receive this vital nutrient from the woman through the placenta during pregnancy and in breast milk after birth.<sup>[83]</sup>

Several micronutrients are important for the health of the developing fetus, especially in areas of the world where insufficient nutrition is common.<sup>[84]</sup> Whereas micronutrient supplementation for the mother has been found to reduce the risk of low birth weight, several studies reported variable effects on mortality in the newborn in developing countries.<sup>[84][85]</sup> In developed areas, such as Western Europe and the United States, certain nutrients such as Vitamin D and calcium, required for bone development, may require supplementation.<sup>[86][87][88]</sup> Vitamin E supplementation has not been shown to improve birth outcomes.<sup>[89]</sup> Zinc supplementation has been associated with a decrease in preterm birth, but it is unclear whether it is causative.<sup>[90]</sup> Daily iron supplementation reduces the risk of maternal anemia.<sup>[91]</sup> Studies of routine daily iron supplementation for all pregnant women in developed countries found improvement in blood iron levels, without a clear clinical benefit.<sup>[92]</sup>

Women are counseled to avoid certain foods, because of the possibility of contamination with bacteria or parasites that can cause illness.<sup>[93]</sup> Careful washing of fruits and raw vegetables may remove these pathogens, as may thoroughly cooking leftovers, meat, or processed meat.<sup>[94]</sup> Unpasteurized dairy and deli meats may contain *Listeria*, which can cause neonatal meningitis, stillbirth and miscarriage.<sup>[95]</sup> Pregnant women are also more prone to *Salmonella* infections, can be in eggs and poultry, which should be thoroughly cooked.<sup>[96]</sup> Cat feces and undercooked meats may contain the parasite *Toxoplasma gondii* and can cause toxoplasmosis.<sup>[94]</sup> Practicing good hygiene in the kitchen can reduce these risks.<sup>[97]</sup>

Women are also counseled to eat seafood in moderation and to eliminate seafood known to be high in mercury because of the risk of birth defects.<sup>[96]</sup> Pregnant women are counseled to consume caffeine in moderation, because large amounts of caffeine are associated with miscarriage.<sup>[47]</sup> However, the relationship between caffeine, birthweight, and preterm birth is unclear.<sup>[98]</sup>

### Weight gain

The amount of healthy weight gain during a pregnancy varies.<sup>[99]</sup> Weight gain is related to the weight of the baby, the placenta, extra circulatory fluid, larger tissues, and fat and protein stores.<sup>[75]</sup> Most needed weight gain occurs later in pregnancy.<sup>[100]</sup>

The Institute of Medicine recommends an overall pregnancy weight gain for those of normal weight (body mass index of 18.5–24.9), of 11.3–15.9 kg (25–35 pounds) having a singleton pregnancy.<sup>[101]</sup> Women who are underweight (BMI of less than 18.5), should gain between 12.7–18 kg (28–40 lbs), while those who are overweight (BMI of 25–29.9) are advised to gain between 6.8–11.3 kg (15–25 lbs) and those who are obese (BMI>30) should gain between 5–9 kg (11–20 lbs).<sup>[102]</sup>

During pregnancy, insufficient or excessive weight gain can compromise the health of the mother and fetus.<sup>[100]</sup> The most effective intervention for weight gain in underweight women is not clear.<sup>[100]</sup> Being or becoming overweight in pregnancy increases the risk of complications for mother and fetus, including cesarean section, gestational hypertension, pre-eclampsia, macrosomia and shoulder dystocia.<sup>[99]</sup> Excessive weight gain can make losing weight after the pregnancy difficult.<sup>[99][103]</sup>

Around 50% of women of childbearing age in developed countries like the United Kingdom are overweight or obese before pregnancy.<sup>[103]</sup> Diet modification is the most effective way to reduce weight gain and associated risks in pregnancy.<sup>[103]</sup> A diet that has foods with a low glycemic index may help prevent the onset of gestational diabetes.<sup>[104]</sup>

## Medication

Drugs used during pregnancy can have temporary or permanent effects on the fetus.<sup>[105]</sup> Anything (including drugs) that can cause permanent deformities in the fetus are labeled as teratogens.<sup>[106]</sup> In the U.S., drugs were classified into categories A,B,C,D and X based on the Food and Drug Administration (FDA) rating system to provide therapeutic guidance based on potential benefits and fetal risks.<sup>[107]</sup> Drugs, including some multivitamins, that have demonstrated no fetal risks after controlled studies in humans are classified as Category A.<sup>[105]</sup> On the other hand, drugs like thalidomide with proven fetal risks that outweigh all benefits are classified as Category X.<sup>[105]</sup>

## Recreational drugs

The use of recreational drugs in pregnancy can cause various pregnancy complications.<sup>[47]</sup>

- Ethanol during pregnancy can cause fetal alcohol syndrome and fetal alcohol spectrum disorder.<sup>[47]</sup> Studies have shown that light to moderate drinking during pregnancy might not pose a risk to the fetus, although no amount of alcohol during pregnancy can be guaranteed to be absolutely safe.<sup>[108]</sup>
- Tobacco smoking during pregnancy can cause a wide range of behavioral, neurological, and physical difficulties.<sup>[109]</sup> Smoking during pregnancy causes twice the risk of premature rupture of membranes, placental abruption and placenta previa.<sup>[110]</sup> Smoking is associated with 30% higher odds of preterm birth.<sup>[111]</sup>
- Prenatal cocaine exposure is associated with premature birth, birth defects and attention deficit disorder.<sup>[47]</sup>
- Prenatal methamphetamine exposure can cause premature birth and congenital abnormalities.<sup>[112]</sup> Short-term neonatal outcomes show small deficits in infant neurobehavioral function and growth restriction.<sup>[113]</sup> Long-term effects in terms of impaired brain development may also be caused by methamphetamine use.<sup>[112]</sup>
- Cannabis in pregnancy has been shown to be teratogenic in large doses in animals, but has not shown any teratogenic effects in humans.<sup>[47]</sup>

## Exposure to toxins

Intrauterine exposure to environmental toxins in pregnancy has the potential to cause adverse effects on the development of the embryo/fetus and to cause pregnancy complications.<sup>[47]</sup> Air pollution has been associated with low birth weight infants.<sup>[114]</sup> Conditions of particular severity in pregnancy include mercury poisoning and lead poisoning.<sup>[47]</sup> To minimize exposure to environmental toxins, the *American College of Nurse-Midwives* recommends: checking whether the home has lead paint, washing all fresh fruits and vegetables thoroughly and buying organic produce, and avoiding cleaning products labeled "toxic" or any product with a warning on the label.<sup>[115]</sup>

Pregnant women can also be exposed to toxins in the workplace, including airborne particles. The effects of wearing N95 filtering facepiece respirators are similar for pregnant women as non-pregnant women, and wearing a respirator for one hour does not affect the fetal heart rate.<sup>[116]</sup>

## Sexual activity

Most women can continue to engage in sexual activity throughout pregnancy.<sup>[117]</sup> Most research suggests that during pregnancy both sexual desire and frequency of sexual relations decrease.<sup>[118][119]</sup> In context of this overall decrease in desire, some studies indicate a second-trimester increase, preceding a decrease during the third trimester.<sup>[120][121]</sup>

Sex during pregnancy is a low-risk behavior except when the healthcare provider advises that sexual intercourse be avoided for particular medical reasons.<sup>[117]</sup> For a healthy pregnant woman, there is no *safe* or *right* way to have sex during pregnancy.<sup>[117]</sup> Pregnancy alters the vaginal flora with a reduction in microscopic species/genus diversity.<sup>[122]</sup>





## Exercise

Regular aerobic exercise during pregnancy appears to improve (or maintain) physical fitness.<sup>[123]</sup> Physical exercise during pregnancy does appear to decrease the risk of C-section.<sup>[124]</sup>

The Clinical Practice Obstetrics Committee of Canada recommends that "All women without contraindications should be encouraged to participate in aerobic and strength-conditioning exercises as part of a healthy lifestyle during their pregnancy"<sup>[125]</sup> Although an upper level of safe exercise intensity has not been established, women who were regular exercisers before pregnancy and who have uncomplicated pregnancies should be able to engage in high intensity exercise programs.<sup>[125]</sup> In general, participation in a wide range of recreational activities appears to be safe, with the avoidance of those with a high risk of falling such as horseback riding or skiing or those that carry a risk of abdominal trauma, such as soccer or hockey.<sup>[126]</sup>



The American College of Obstetricians and Gynecologists reports that in the past, the main concerns of exercise in pregnancy were focused on the fetus and any potential maternal benefit was thought to be offset by potential risks to the fetus. However, they write that more recent information suggests that in the uncomplicated pregnancy, fetal injuries are highly unlikely.<sup>[126]</sup> They do, however, list several circumstances when a woman should contact her health care provider before continuing with an exercise program: vaginal bleeding, dyspnea before exertion, dizziness, headache, chest pain, muscle weakness, preterm labor, decreased fetal movement, amniotic fluid leakage, and calf pain or swelling (to rule out thrombophlebitis).<sup>[126]</sup>

## Sleep

It has been suggested that shift work and exposure to bright light at night should be avoided at least during the last trimester of pregnancy to decrease the risk of psychological and behavioral problems in the newborn.<sup>[127]</sup>

## Complications

Each year, ill health as a result of pregnancy is experienced (sometimes permanently) by more than 20 million women around the world.<sup>[128]</sup> In 2013 complications of pregnancy resulted in 293,000 deaths down from 377,000 deaths in 1990. Common causes include maternal bleeding (44,000), complications of abortion (44,000), high blood pressure of pregnancy (29,000), maternal sepsis (24,000), and obstructed labor (19,000).<sup>[11]</sup>

The following are some examples of pregnancy complications:

- Pregnancy induced hypertension
- Anemia<sup>[129]</sup>
- Postpartum depression
- Postpartum psychosis
- Thromboembolic disorders. The leading cause of death in pregnant women in the US.<sup>[130][131]</sup>
- PUPPP a skin disease that develops around the 32nd week (Pruritic Urticarial Papules and Plaques of Pregnancy). Signs are red plaques, papules, and itchiness around the belly button that then spreads all over the body except for the inside of hands and face.
- Ectopic pregnancy, implantation of the embryo outside the uterus.
- Hyperemesis gravidarum, excessive nausea and vomiting that is more severe than normal morning sickness.
- Pulmonary embolism, blood clots that form in the legs can migrate to the lungs.<sup>[131]</sup>

There is also an increased susceptibility and severity of certain infections in pregnancy.

## Intercurrent diseases

A pregnant woman may have intercurrent diseases, defined as disease not directly caused by the pregnancy, but that may become worse or be a potential risk to the pregnancy.

- Diabetes mellitus and pregnancy deals with the interactions of diabetes mellitus (not restricted to gestational diabetes) and pregnancy. Risks for the child include miscarriage, growth restriction, growth acceleration, fetal obesity (macrosomia), polyhydramnios (too much amniotic fluid), and birth defects.
- Systemic lupus erythematosus in pregnancy confers an increased rate of fetal death *in utero*, spontaneous abortion (miscarriage), and of neonatal lupus.
- Thyroid disease in pregnancy can, if uncorrected, cause adverse effects on fetal and maternal well-being. The deleterious effects of thyroid dysfunction can also extend beyond pregnancy and delivery to affect neurointellectual development in the early life of the child. Demand for thyroid hormones is increased during pregnancy which may cause a previously unnoticed thyroid disorder to worsen.
- Hypercoagulability in pregnancy is the propensity of pregnant women to develop thrombosis (blood clots). Pregnancy itself is a factor of hypercoagulability (pregnancy-induced hypercoagulability), as a physiologically adaptive mechanism to prevent *post partum* bleeding.<sup>[132]</sup> However, in combination with an underlying hypercoagulable states, the risk of thrombosis or embolism may become substantial.<sup>[132]</sup>

## Epidemiology

About 213 million pregnancies occurred in 2012 of which 190 million were in the developing world and 23 million were in the developed world. This is about 133 pregnancies per 1,000 women between the ages of 15 and 44.<sup>[10]</sup> About 10% to 15% of recognized pregnancies end in miscarriage.<sup>[6]</sup> Globally 40% of pregnancies are unplanned. Half of unplanned pregnancies are aborted.<sup>[10]</sup>

Of pregnancies in 2012 120 million occurred in Asia, 54 million in Africa, 19 million in Europe, 18 million in Latin America and the Caribbean, 7 million in North America, and 1 million in Oceania.<sup>[10]</sup> Pregnancy rates are 140 per 1000 women of childbearing age in the developing world and 94 per 1000 in the developed world.<sup>[10]</sup>

The rate of pregnancy, as well as the ages at which it occurs, differ by country and region. It is influenced by a number of factors, such as cultural, social and religious norms; access to contraception; and rates of education. The total fertility rate (TFR) in 2013 was estimated to be highest in Niger (7.03 children/woman) and lowest in Singapore (0.79 children/woman).<sup>[133]</sup>

In Europe, the average childbearing age has been rising continuously for some time. In Western, Northern, and Southern Europe, first-time mothers are on average 26 to 29 years old, up from 23 to 25 years at the start of the 1970s. In a number of European countries (Spain), the mean age of women at first childbirth has crossed the 30-year threshold.

This process is not restricted to Europe. Asia, Japan and the United States are all seeing average age at first birth on the rise, and increasingly the process is spreading to countries in the developing world like China, Turkey and Iran. In the US, the average age of first childbirth was 25.4 in 2010.<sup>[134]</sup>

In the United States and United Kingdom, 40% of pregnancies are unplanned, and between a quarter and half of those unplanned pregnancies were unwanted pregnancies.<sup>[135][136]</sup>

Globally, an estimated 270,000 women die from pregnancy-related complications each year.<sup>[137]</sup>

## Society and culture

In most cultures, pregnant women have a special status in society and receive particularly gentle care.<sup>[138]</sup> At the same time, they are subject to expectations that may exert great psychological pressure, such as having to produce a son and heir. In many traditional societies, pregnancy must be preceded by marriage, on pain of ostracism of mother and (illegitimate) child.

Overall, pregnancy is accompanied by numerous customs that are often subject to ethnological research, often rooted in traditional medicine or religion. The baby shower is an example of a modern custom.

Pregnancy is an important topic in sociology of the family. The prospective child may preliminarily be placed into numerous social roles. The parents' relationship and the relation between parents and their surroundings are also affected.

A belly cast may be made during pregnancy as a keepsake.

### Arts

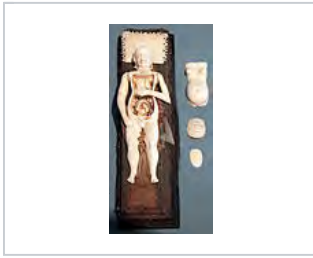
Due to the important role of the Mother of God in Christianity, the Western visual arts have a long tradition of depictions of pregnancy.<sup>[139]</sup>

Pregnancy, and especially pregnancy of unmarried women, is also an important motif in literature. Notable examples include Hardy's *Tess of the d'Urbervilles* and Goethe's *Faust*.



Giotto di Bondone  
Visitation, circa 1305

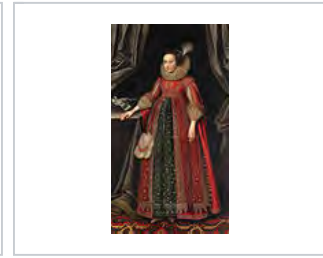
### Pregnancy in art



Anatomical model of a pregnant woman; Stephan Zick (1639-1715); 1700; Germanisches Nationalmuseum



Bronze figure of a pregnant naked woman by Danny Osborne, Merriion Square



Marcus Gheeraerts the Younger *Portrait of Susanna Temple*, second wife of Sir Martin Lister, 1620



Octave Tassaert, *The Waif* aka *L'abandonnée* 1852, Musée Fabre, Montpellier

## Infertility

Modern reproductive medicine offers many forms of assisted reproductive technology for couples who stay childless against their will, such as fertility medication, artificial insemination, *in vitro* fertilization and surrogacy.

## Abortion

An abortion is the termination of an embryo or fetus, either naturally or via medical methods.<sup>[140]</sup> When done electively, it is more often done within the first trimester than the second, and rarely in the third.<sup>[24]</sup> Not using contraception, contraceptive failure, poor family planning or rape can lead to undesired pregnancies. Legality of socially indicated abortions varies widely both internationally and through time. In most countries of Western Europe, abortions during the first trimester were a criminal offense a few decades ago but have since been legalized, sometimes subject to mandatory consultations. In Germany, for example, as of 2009 less than 3% of abortions had a medical indication.

## Legal protection

Many countries have various legal regulations in place to protect pregnant women and their children. Maternity Protection Convention ensures that pregnant women are exempt from activities such as night shifts or carrying heavy stocks. Maternity leave typically provides paid leave from work during roughly the last trimester of pregnancy and for some time after birth. Notable extreme cases include Norway (8 months with full pay) and the United States (no paid leave at all except in some states). Moreover, many countries have laws against pregnancy discrimination.

In 2014, the American state of Kentucky passed a law which allows prosecutors to charge a woman with criminal assault if she uses illegal drugs during her pregnancy and her fetus or newborn is considered harmed as a result.<sup>[141]</sup>

In the United States, laws make some actions that result in miscarriage or stillbirth crimes. One such law is the federal Unborn Victims of Violence Act.

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## Further reading

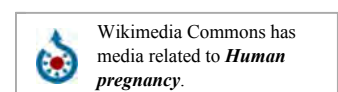
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## External links

- Pregnancy ([https://www.dmoz.org/Health/Reproductive\\_Health/Pregnancy\\_and\\_Birth](https://www.dmoz.org/Health/Reproductive_Health/Pregnancy_and_Birth)) at DMOZ
- Merck Manual Home Health Handbook

([http://www.merckmanuals.com/home/womens\\_health\\_issues/pregnancy\\_complicated\\_by\\_disease/overview\\_of\\_disease\\_during\\_pregnancy.html](http://www.merckmanuals.com/home/womens_health_issues/pregnancy_complicated_by_disease/overview_of_disease_during_pregnancy.html)) – further details on the diseases, disorders, etc., which may complicate pregnancy.

- Pregnancy care planner (<http://www.nhs.uk/Planners/pregnancycareplanner/Pages/PregnancyHome.aspx>) – NHS guide to having baby including preconception, pregnancy, labor, and birth.



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