

Critical Periods of Development

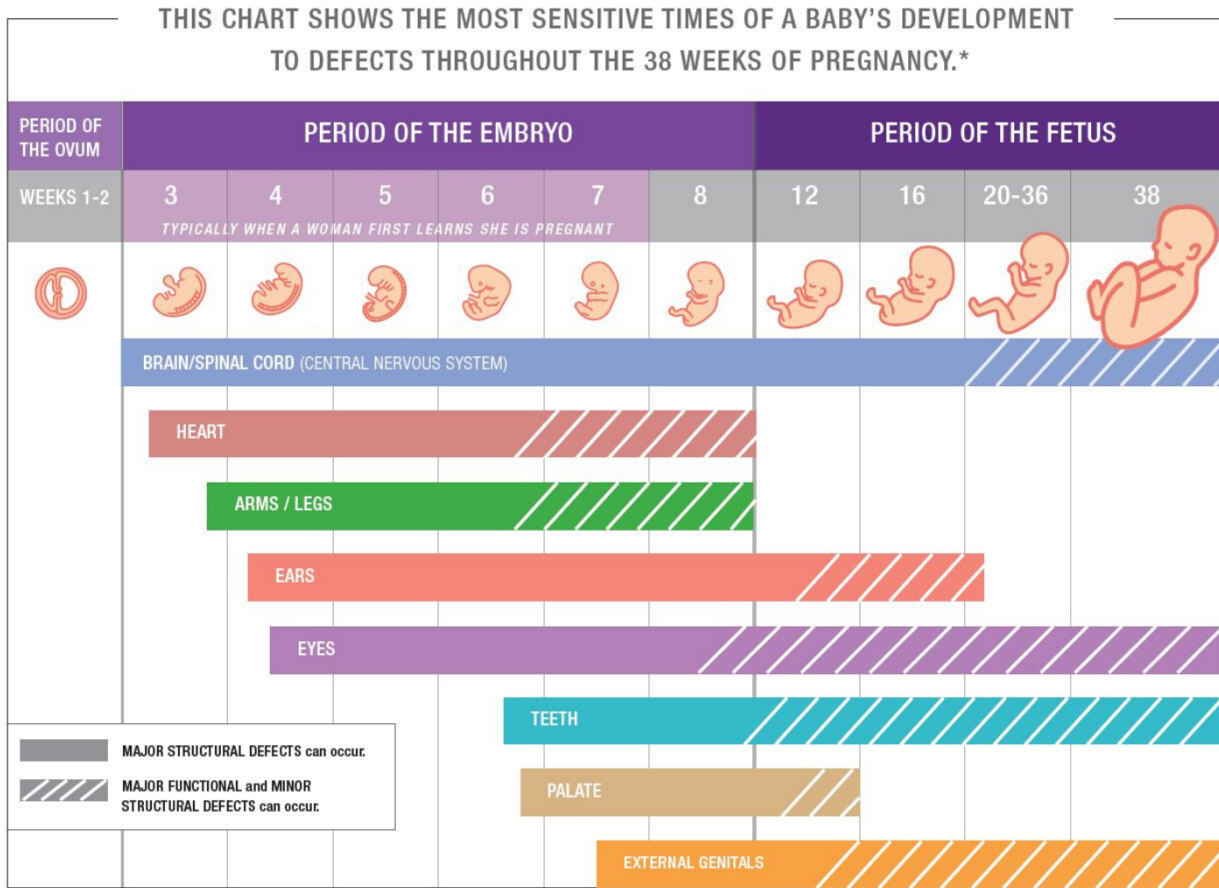
This fact sheet is about the critical periods of development and types of birth defects that can result from exposures at different stages of pregnancy. This information should not take the place of medical care and advice from your healthcare provider.

What are critical periods of development?

In pregnancy, each part of the fetus' body forms during a specific time. This specific time is called the "critical period of development" for that body part. During this critical time of development, the body can be very sensitive to exposures. Examples of exposures may include medications, alcohol, infections, health conditions, or other substances.

Does the chance for different types of birth defects change during pregnancy?

Every pregnancy starts out with a 3-5% chance of having a birth defect. This is called the background risk. If an exposure can increase the chance for birth defects, the chance depends on what body part is developing at the time of exposure. Once a body part has formed, it is no longer at risk to develop major birth defects. Some exposures could still affect a body part's growth and/or function even after that body part has formed.



***Adapted from Moore 1993, and the National Organization of Fetal Alcohol Syndrome (NOFAS) 2009.**

The chart in this fact sheet shows the critical periods of development for different parts of the body. The chart starts from the time of conception when the egg and sperm join. The weeks listed on the chart are the “embryonic age” or “fetal age” of a pregnancy. This is different from a common way of dating a pregnancy called “gestational age.” Gestational age begins with the first day of a person’s last menstrual period. This day is usually about two weeks before a pregnancy is conceived. For example, 12 gestational weeks (since the first day of your last period) is the same as 10 fetal weeks (since the first day of conception).

Birth defects are physical or structural differences that may change how a body part looks and/or works. Birth defects are typically classified as “major” if they cause significant medical problems and may need surgery or other treatment. Heart defects, spina bifida, and clubfeet are examples of major birth defects. The solid bars on the chart show when each body part is most sensitive to harmful exposures and at risk for major birth defects.

“Minor” birth defects by themselves do not cause significant medical problems and usually do not require treatment or surgery. Minor birth defects can also be variations of typical development. Wide-set eyes and large ears are examples of minor birth defects. The striped bars show periods when the body parts are still at risk of developing minor birth defects and functional defects.

“Functional defects” change how a part of the body works without changing how it looks. Intellectual disability and

hearing loss are both examples of functional defects.

The chart also shows the location of the most common birth defects that can occur during each week. In general, major birth defects of the body and internal organs are more likely to happen between 3 to 12 embryonic/fetal weeks. This is the same as 5 to 14 gestational weeks (weeks since the first day of your last period). This is also referred to as the first trimester. Minor defects and functional defects, including those affecting how the brain works, can also occur later in pregnancy.

What is the greatest risk from harmful exposures during very early pregnancy?

Harmful exposures during very early pregnancy have the greatest risk of causing miscarriage. A fertilized egg divides and attaches to the inside of the uterus during the first two weeks of embryo development. Very harmful exposures during this period (first four weeks after the first day of your last period) may interfere with the attachment of the embryo to the uterus. These first four weeks are called the “all or none period.” “All” refers to high exposures damaging all the embryo’s cells. Problems with uterine attachment and severe cell damage can both result in a miscarriage. Sometimes a miscarriage happens before a person even realizes that they are pregnant. “None” refers to exposures that are not high enough to have a significant effect on the pregnancy. Less severe exposures during this time may only damage a few of the embryo’s cells. The cells of the embryo have a greater ability to recover at this early stage than they do later on in pregnancy. If an individual does not have a miscarriage the exposures during this time are not likely to cause a birth defect. The rule of the “all or none period” can be used to determine the chance of many different types of exposures. However, there are some important exceptions to this rule. Please contact MotherToBaby at 866.626.6847 to discuss your specific exposure with our experts.

What are the greatest risks from harmful exposures during the first trimester of pregnancy?

The first trimester of pregnancy is defined as up to the 14th week of pregnancy (13 weeks and 6 days) since the first day of your last menstrual period. Harmful exposures during the first trimester have the greatest chance of causing major birth defects. This is because many important developmental changes take place during this time. The major structures of the body form in the first trimester. These include the spine, head, arms, and legs. The baby’s organs also begin to develop. Some examples of these organs are the heart, stomach, and lungs. While the heart and stomach completely form during the first trimester, the lungs continue to develop past the first trimester.

What are the greatest risks from harmful exposures during the second and third trimesters of pregnancy?

Harmful exposures during the second and third trimesters can cause growth problems and minor birth defects. Growth is an important part of the second and third trimester. The structures and organs that developed during the first trimester grow larger. Babies with growth problems may be much smaller or much larger than average. This size difference can put babies at risk for certain health problems. Harmful exposures during the second and third trimesters can also cause functional defects like learning problems. The brain is part of the central nervous system, and it develops during the entire pregnancy. Major structural brain development lasts until about 16 fetal weeks (18 gestational weeks). However, the brain continues to develop for the rest of the pregnancy, after birth and through young adulthood.

While not well studied, some exposures in the second or third trimester might cause other pregnancy complications, such as preterm delivery (delivery before 37 weeks gestation) or low levels of amniotic fluid (the fluid that surrounds the developing pregnancy in the uterus). The use of certain medications and substances at the end of pregnancy can cause withdrawal symptoms in some newborns. You should always tell your healthcare provider about all your exposures, including medications, supplements and/or other substances that you take.

Does this mean that exposures might be harmful at certain times during pregnancy but not at other times?

Yes. Imagine your healthcare provider gives you a new medication to take during your third trimester (“Medication A”). You read that Medication A increases the chance for heart defects. This means that babies may have a higher chance for major heart defects if they are exposed to this medication during the heart’s critical period of development (from 3 to 6 embryonic weeks/5 to 8 gestational weeks). This also means that using this medication in the third trimester cannot cause a major heart defect. Always talk to your healthcare provider before making any changes to how you take your medication.

Please click [here](#) for references.

USE OUR INTERACTIVE TOOL: CRITICAL PERIODS OF PREGNANCY

Questions? Call 866.626.6847 | Text 855.999.3525 | Email or Chat at [MotherToBaby.org](https://www.MotherToBaby.org).

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