Critical Periods of Development

This fact sheet is about the critical periods of development and the birth defects or complications that can happen from exposures at different times in a pregnancy. This information is based on published research studies. It should not take the place of medical care and advice from your healthcare providers.

What are critical periods of development?

Critical periods of development are times during pregnancy when the fetal organs and body parts are forming. During these times, the fetus is especially sensitive to things that could cause harm, like toxins or infections.

Birth defects can happen in any pregnancy for different reasons. Out of all babies born each year, about 3 out of 100 (3%) will have a birth defect. Pregnancy problems (like miscarriage) can also happen in any pregnancy. Sometimes, exposures like medications, drugs, alcohol, and infections can increase the chance of birth defects or pregnancy complications. However, for an exposure to affect a pregnancy, it generally has to happen during the "critical period" when a body part is forming. The dose (how much), frequency (how often), and the way the exposure enters the body (swallowed, breathed in, put on the skin, etc.) can also play a role.

What are birth defects?

Birth defects are differences in how a body part looks or works. Birth defects can be called "major" or "minor". Major birth defects, like heart problems or spina bifida (when the spine does not close as it should), might need surgery or treatment. Minor birth defects (such as wide-set eyes or large ears) do not usually need treatment.

In the chart below, the **green** bars refer to timing of when fetal body parts are forming. During the critical time of development for the body parts, they can be more sensitive to exposure.

What are functional defects?

Functional defects change how a part of the body works without changing how it looks. Examples of a functional defect are some types of intellectual disability and hearing loss. Intellectual disability can occur at any point during pregnancy, but most functional defects usually develop after the first trimester.

The critical period for when different functional defects can occur is shown on the chart below in **purple**.

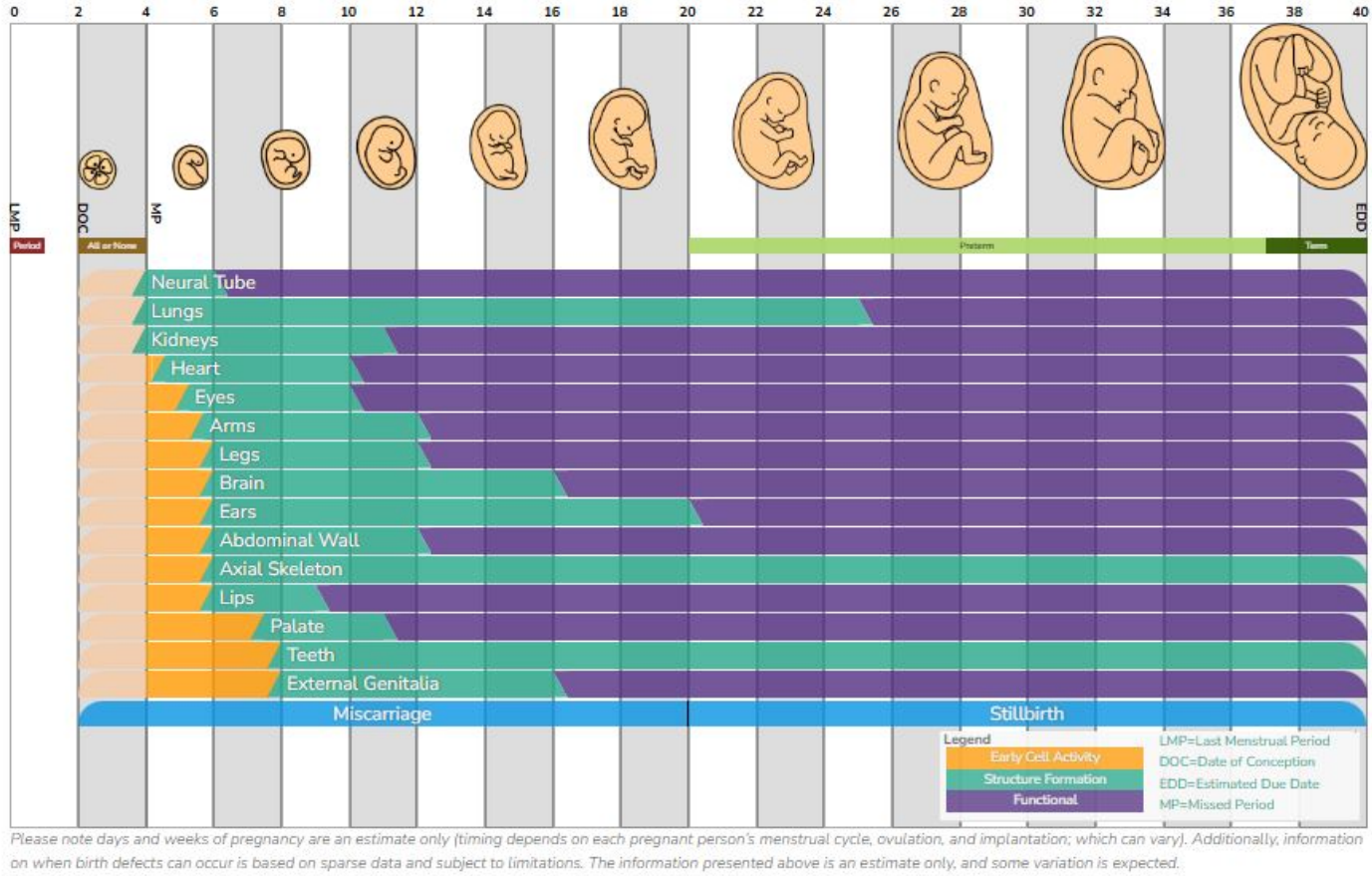
When can birth defects happen?

Most birth defects happen in the first trimester of pregnancy, which ends at 13 weeks and 6 days since a person's LMP (last menstrual period). This is because the major structures of the body (including the heart, arms, legs, lips, and palate) form in the first trimester.

For an exposure to cause a birth defect, the body part must be developing at the time. For example, if a woman takes a medication that can increase the chance of cleft lip (when the top lip does not close correctly), the risk is higher if the exposure happens when the lip is forming (around 6 to 9 weeks). Once a body part has finished forming, exposures are less likely to cause defects. So, if the medication is taken at 20 weeks, the risk of cleft lip is very low because the lip is already formed.

As the fetus continues to grow and develop in the second and third trimesters, some exposures can cause problems with how the body part works (functional defect). The ears, for example, are formed in the first trimester. However, problems with how the ears work (e.g. hearing loss) can happen in the second and third trimester. Problems with fetal growth or preterm delivery (before week 37 of pregnancy) might also happen.

The chart below gives an overview of when different body parts are thought to be most sensitive to exposures during pregnancy. For an interactive version, where you can enter your information and receive a personalized view, please visit: https://mothertobaby.org/critical-periods-pregnancy-development-tool/ . If you have other questions after using the tool, please reach out to a MotherToBaby specialist for more information.



Download the image.

Pregnancy dating:

The chart shown above dates a pregnancy by last menstrual period (LMP). Dating by LMP is also known as gestational age, and this is the type of dating that most healthcare providers use. Gestational age begins with the first day of a person's last menstrual period. This day is usually about two weeks before pregnancy is conceived.

What is the "all or none period"?

The first 2 weeks after conception (weeks 3 and 4 since first day of LMP) is known as the "all or none period". During this time, the sperm and the egg have met and formed an embryo which then makes its way down the fallopian tube toward the uterus. During this time, the embryo is not implanted in the uterus, and it is not sharing a blood supply with the person who is pregnant.

The "all" part of this theory refers to very harmful exposures during this time that might be able to stop the embryo from attaching to the uterus or would be able to damage many of the embryo's cells. Problems with uterine attachment and severe cell damage can both result in 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. If a few cells are damaged early on, the embryo has a greater ability to recover at this early stage than later in pregnancy. If a woman does not have a miscarriage from this early exposure, birth defects are not expected.

The all or none period can be used to understand the chance of many different types of exposures. However, there are

some important exceptions to this rule. Please contact MotherToBaby to discuss your specific exposure with our experts.

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.

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