

bd steps NEWS

The Centers for Birth Defects Research and Prevention (CBDRP) and the Centers for Disease Control and Prevention (CDC) distribute BD-STEPs News.

The purpose of this newsletter is to inform study participants and the public of the Centers' activities and current news about birth defects.

About the Birth Defects Study To Evaluate Pregnancy exposureS (BD-STEPs)

The Birth Defects Study To Evaluate Pregnancy exposureS ([BD-STEPs](#)) builds on the promising findings of the National Birth Defects Prevention Study ([NBDPS](#)), whose researchers have been looking at possible causes of birth defects for more than 20 years.

Through BD-STEPs, researchers study factors that may influence the risk for having a baby with a birth defect. In addition, the study includes research into why stillbirths may happen. There are some things that can be changed to reduce the chances of having a baby with a birth defect or a stillbirth, while other things cannot be changed. BD-STEPs focuses on risk factors that can perhaps be changed or where different options might be available:

- Diabetes and obesity
- Travel and lifestyle
- Treatments for long term health conditions (such as asthma or high blood pressure)
- Treatment for infertility
- Other medication use during pregnancy

In July 2014, BD-STEPs began telephone interviews with women from seven states (Arkansas, California, Georgia, Iowa, Massachusetts, New York, and North Carolina). Interviewers called women who had pregnancies affected by birth defects and women whose pregnancies were not affected by birth defects. In 2016, BD-STEPs began telephone interviews with women from two states (Arkansas and Massachusetts) who had pregnancies affected by stillbirth in which the baby did not have birth defects. Through these interviews, researchers collect information about the factors mentioned above and how they might relate to birth defects. When enough information is collected, researchers analyze these data and publish scientific papers about their findings.

Recent Findings from the National Birth Defects Prevention Study (NBDPS)

Interviews for the NBDPS were completed in March 2013, but researchers continue to analyze this rich source of information. During the 14 years of interviews, more than 43,000 women from 10 states (Arkansas, California, Georgia, Iowa, Massachusetts, New Jersey, New York, North Carolina, Texas, and Utah) took part in the study. More than 23,000 families provided cheek cell samples, which are used to understand how genetics play a role in the development of birth defects. Researchers have published more than 350 scientific papers using NBDPS data. Below are some of the recent research findings.

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Centers for Disease Control and Prevention
National Center on Birth Defects and Developmental Disabilities

No Link Found Between Hydroxychloroquine and Birth Defects

Hydroxychloroquine (HCQ) is a medicine used to treat autoimmune diseases. Doctors and researchers believe HCQ is safe to use during pregnancy, but little is known about whether taking the medicine can increase the risk of birth defects. Using data from NBDPS and the Slone Epidemiology Center Birth Defects Study, researchers found that very few women use HCQ during pregnancy, and those who do use HCQ often have complicated medical histories. Researchers did not find a pattern in the birth defects observed in babies of women who used HCQ during pregnancy. This suggests that using HCQ during pregnancy does not increase the risk of having a baby with specific defects. Given the small number of women who used HCQ in this study, safety of HCQ use in pregnancy could be informed by future research with additional women. It is important that women with autoimmune disease talk with their provider about the best plan of treatment during pregnancy.



Howley MM, Werler MM, Fisher SC, Van Zutphen AR, Carmichael SL, Broussard CS, Heinke D, Ailes EC, Pruitt SM, Reefhuis J, Mitchell AA, Browne ML; National Birth Defects Prevention Study. Maternal exposure to hydroxychloroquine and birth defects. *Birth Defects Research*. 2021 Oct 15;113(17):1245-1256. doi: <https://doi.org/10.1002/bdr2.1943>. Epub 2021 Jul 23.

Participation in Birth Defects Research Using Newborn Bloodspots

Newborn screening is used in hospitals after delivery to test babies for certain conditions that may require immediate treatment. Nearly every baby born in the United States is tested for certain conditions using a few drops of blood collected after birth on a paper card (bloodspot). If a parent agrees (consents), scientists can use any remaining part of the bloodspot for research. Mothers from certain states participating in NBDPS were asked for consent to use their baby's remaining bloodspot for research about birth defects. More than half of mothers agreed. Researchers found that mothers whose babies were born with a birth defect were more likely to give consent than mothers whose babies were born without a birth defect.



Mothers with more education after high school, mothers who identified as non-Hispanic White, and mothers who were born in the United States were also more likely to give consent. Understanding the reasons why parents do or do not give consent is an important part of making sure our NBDPS study community is diverse, and we will continue efforts toward more equitable representation. Equal participation of all groups in our study population helps to make sure that the results of our research can have a positive impact on future generations of all babies and families, regardless of race, ethnicity, or education. NBDPS scientists are using the collected bloodspots to study many questions about birth defects, including how genes and environmental factors (such as air pollution) might be related to some types of birth defects.

Wong EC, Fisher SC, Feldkamp ML, Romitti PA, Nestoridi E, Desrosiers TA. Factors associated with maternal consent for use of residual newborn bloodspots in the National Birth Defects Prevention Study. *Birth Defects Research*. 2022 April; 114(7):238-248. doi: <https://doi.org/10.1002/bdr2.1991>

Influenza Vaccination During Pregnancy Not Linked to Birth Defects

Influenza (flu) vaccination during pregnancy helps to reduce flu-related hospitalizations of pregnant women and of infants less than 6 months of age. However, current information on flu vaccination during pregnancy and the risk of birth defects is limited. Using NBDPS data, researchers studied whether use of inactivated flu vaccine in early pregnancy was related to having a baby with one of 19 nonheart birth defects.



Among the 5% of NBDPS participants who reported receiving the vaccine in early pregnancy, researchers did not find a relationship between vaccination and the birth defects, when compared with women who did not receive the vaccine or received the vaccine later in pregnancy. This study supports use of inactivated flu vaccine during early pregnancy as recommended by the Advisory Committee on Immunization Practices and the American College of Obstetricians and Gynecologists.

Palmsten K, Suhl J, Conway KM, Kharbanda EO, Ailes EC, Cragan JD, Nestoridi E, Papadopoulos EA, Kerr SM, Young SG, DeStefano F, Romitti PA, and the National Birth Defects Prevention Study. Influenza vaccination during pregnancy and risk of selected major structural noncardiac birth defects, National Birth Defects Prevention Study 2006–2011. *Pharmacoepidemiology and Drug Safety*. 2022;31(8):851-62. doi: <https://doi.org/10.1002/pds.5435>

Vasoactive Medications in Pregnancy and Risk of Stillbirth

In 2014, about 24,000 stillbirths were reported in the United States, and stillbirths were more common among pregnancies with birth defects. While the causes of stillbirth are often unknown, some of the known and suspected causes involve problems with the mother's blood supply to the baby. Using only NBDPS cases with birth defects, researchers compared pregnancies that ended in stillbirth with those that ended in live birth to see if there were differences in use of medications that might affect the blood vessels, which are known as vasoactive medications.



These include medications such as pain relievers, nasal decongestants, asthma medications, and medicine taken to treat high blood pressure (HBP). Researchers found that pregnancies ending in live birth and stillbirth had similar levels of exposure to these medications, except for medicine taken for HBP. Women who had stillbirths were about twice as likely to report taking medicine for HBP. Healthcare providers already know that an underlying HBP condition increases risk of stillbirth in all pregnancies. These results show that elevated risk seems to also exist when comparing only among babies delivered with birth defects. While it is reassuring that most of these medicines do not seem to increase stillbirth risk in the presence of a birth defect, potential risk factors for stillbirth could be informed by additional research.

Kerr SM, Heinke D, Yazdy MM, Mitchell AA, Darling AM, Lin A, Nestoridi E, Werler MM, and the National Birth Defects Prevention Study. Use of vasoactive medications in pregnancy and the risk of stillbirth among birth defect cases. *Birth Defects Research*. 2022 May;114(8):277-294. doi: <https://doi.org/10.1002/bdr2.1996>

Cigarette Smoking by Mothers and Congenital Heart Defects

Congenital heart defects (CHDs) are some of the most common types of birth defects. CHDs are present at birth and can affect the structure of a baby's heart and the way it works. Using NBDPS data, researchers studied the relationship between maternal cigarette smoking before and during early pregnancy and having a baby born with a CHD.



The data showed that mothers who smoked cigarettes right before and after getting pregnant had a higher risk of having babies with several types of CHDs (septal defects, tricuspid atresia, double outlet right ventricle). These results support the importance of not smoking cigarettes early in pregnancy to decrease the risk of babies being born with CHDs. In many cases, the causes of CHDs are unknown. But, understanding risk factors, such as smoking, is important because these can be more easily addressed or changed with prevention plans.

Bolin EH, Gokun Y, Romitti PA, Tinker SC, Summers AD, Roberson PK, Hobbs CA, Malik S, Botto LD, Nembhard WN and the National Birth Defects Prevention Study. (2021) Maternal Smoking and Congenital Heart Defects, National Birth Defects Prevention Study, 1997-2011. *Journal of Pediatrics*. 2022 Jan;240:79-86.e1. doi: <https://doi.org/10.1016/j.jpeds.2021.09.005>. Epub 2021 Sep 8

Risk of Birth Defects Among Pregnant Nail Salon Workers and Hairdressers

Nail technicians and hairdressers use products that often contain chemicals with known potential reproductive effects. However, there has been little research on birth defects in children of women working in these job types during pregnancy. A study using NBDPS data suggested a potential link between a mother working as a nail technician during pregnancy and having a baby affected by congenital heart defects (CHDs) and neural tube defects. The study also found a potential link between hairdressing work and oral clefts and defects of the ear (anotia/microtia). This study only had a small number of mothers working as nail technicians and hairdressers, but it does provide clues for us to follow up in future studies. Specific workplace practices or chemical exposures that might be associated with birth defects among nail technicians and hairdressers remain unclear. Reproductive health effects and potential interventions among nail technicians and hairdressers could be informed by further research on job tasks or chemical exposures for these populations.



Siegel MR, Rocheleau CM, Broadwater K, Santiago-Colón A, Johnson CY, Herdt ML, Chen IC, Lawson CC. (2022). National Birth Defects Prevention Study. Maternal occupation as a nail technician or hairdresser during pregnancy and birth defects, National Birth Defects Prevention Study, 1997-2011. *Journal of Occupational and Environmental Medicine*, (1):17-23. doi: <https://doi.org/10.1136/oemed-2021-107561>.

Spotlight on BD-STEPS Research Centers

BD-STEPS Research Centers work together to collect and analyze data. You can read about each of the Research Centers below.

ARKANSAS

Each year in Arkansas, about 1,300 babies are born with a birth defect. The Arkansas Center for Birth Defects Research and Prevention collects data from the Arkansas Reproductive Health Monitoring System, one of the oldest active birth defects monitoring systems. Research at the Arkansas Center focuses on genetic (inherited) factors that might increase the risk for birth defects, specifically congenital heart defects and hypospadias. Additionally, the Arkansas Center conducts multiple research and community-based initiatives to understand the socioeconomic, demographic, and genetic risk factors that increase the risk for stillbirths. The Arkansas Center also looks at how a woman's lifestyle habits, exposure to substances such as tobacco smoke, and genes might work together to affect risks for birth defects and stillbirths.

CALIFORNIA

Each year in California, nearly 13,000 babies are born with a birth defect. The California Center for Birth Defects Research and Prevention at Stanford University partners with the California Department of Public Health, California Birth Defects Monitoring Program to participate in BD-STEPS. The California Center conducts studies on numerous types of defects to learn how our diet, environmental circumstances, and our genetics may influence the risk of babies being born with birth defects.

GEORGIA/CDC

Each year in Georgia, about 4,000 babies are born with birth defects. CDC coordinates BD-STEPS activities and serves as the Georgia Center for Birth Defects Research and Prevention. CDC studies how medicine is used by pregnant women and how certain medicines might affect the risk for birth defects. CDC tracks the number of birth defects in Atlanta through the Metropolitan Atlanta Congenital Defects Program, which has collected data in Atlanta since 1968 and continues to serve as a model for other state birth defects tracking systems.

IOWA

Each year in Iowa, more than 1,200 pregnancies are affected by birth defects. The Iowa Center for Birth Defects Research and Prevention studies pregnancies across the state. Studies include urban and rural residents with differences in personal behaviors such as smoking, alcohol use, and exposure to farming chemicals and other toxins. The Iowa Registry for Congenital and Inherited Disorders was established in part to study how a person's genes and behaviors might affect birth defect risk. For BD-STEPS, the Iowa Center will look at the impact of personal behaviors, environmental exposures, and genes on birth defects.

MASSACHUSETTS

Each year in Massachusetts, about 2,500 pregnancies are affected by birth defects. The Massachusetts Center for Birth Defects Research and Prevention started in 1997 and is a partnership between the Massachusetts Department of Public Health, the Slone Epidemiology Center at Boston University, and the Genetics Unit at Massachusetts General Hospital for Children. The Massachusetts Center has experts in many research areas including congenital heart defects, limb deficiencies, gastroschisis, and perinatal pathology. In addition to research on birth defects, these specialists also focus on stillbirth research.

NEW YORK

Each year in New York State, more than 7,000 babies are born with birth defects. Experts at the New York Center for Birth Defects Research and Prevention study a range of exposures, including maternal disease and medication use during pregnancy, as well as environmental exposures that might lead to birth defects. The New York Center often collaborates with the Wadsworth Center, the research-focused public health laboratory at the New York State Department of Health. Their colleagues at Wadsworth have developed ways to do genetic and environmental analyses of newborn screening blood spots for birth defects research.

NORTH CAROLINA

Each year in North Carolina, more than 4,000 babies are born with birth defects. The North Carolina Center for Birth Defects Research and Prevention is a partnership between the Epidemiology Department at the University of North Carolina at Chapel Hill and the North Carolina Division of Public Health's Birth Defects Monitoring Program, in operation since 1995. The North Carolina Center has a multidisciplinary group of researchers working to identify how genetics affect birth defect risk, as well as to identify potentially actionable environmental and behavioral risk factors that can serve as targets for clinical or public health interventions to prevent birth defects in the future and to reduce disabilities among children living with a birth defect.

Resource Corner

Listed below are several resources that might be of interest. The Centers are not responsible for the content found on these websites.

MEDICINE AND PREGNANCY:

The **Mother to Baby** website contains a library of factsheets about different medications. These sheets answer questions about the use of each medicine during pregnancy and breastfeeding. <https://mothertobaby.org/fact-sheets/>

CDC's website has webpages for providing information for women and their healthcare providers on **medication use during pregnancy**. <https://www.cdc.gov/pregnancy/meds>

The **American College of Allergy, Asthma, and Immunology** has a webpage on asthma and allergies during pregnancy. It provides guidance for pregnant women dealing with these conditions. <https://acaai.org/allergies/allergies-101/who-gets-allergies/pregnancy-and-allergy/>

STRESS AND PREGNANCY:

The **March of Dimes** website on life changes during pregnancy talks about causes of stresses and ways to reduce stress during pregnancy. <https://www.marchofdimes.org/find-support/topics/pregnancy/stress-and-pregnancy>

The **Mother to Baby** website has a fact sheet on stress during pregnancy, available in English and Spanish. It covers what stress is, if moms-to-be should be concerned, ways to reduce stress, and where to go for help. <https://mothertobaby.org/fact-sheets/stress-pregnancy/pdf/>

CONGENITAL HEART DEFECTS:

CDC's website has an entire index of webpages on **congenital heart defects**, including information on specific heart defects, research, and statistics, among other useful resources. <https://www.cdc.gov/ncbddd/heartdefects/>

CDC's website also has a webpage on **critical congenital heart defects**. The webpage has information on screening, current research activities, and information for healthcare providers. <https://www.cdc.gov/ncbddd/heartdefects/cchd-facts.html>

CLEFT LIP AND PALATE:

CDC's website has a webpage on **cleft lip and cleft palate**, providing information on the conditions, some of the known causes of cleft lip and palate, and diagnosis and treatment options. <http://www.cdc.gov/ncbddd/birthdefects/cleftlip.html>

Operation Smile has information for parents of children with cleft lip with or without cleft palate. www.operationssmile.org

Children's Craniofacial Association website has information about birth defects of the head and face. They have resources on connecting with other parents and families as well as information on each condition. <https://ccakids.org/>

CHOANAL ATRESIA:

The **Children's Choanal Atresia Foundation** has a website that provides information, research, and support for choanal atresia or birth defects of the nasal passage. <https://babynose.org/>

GASTROSCHISIS:

CDC's website has a webpage on **gastroschisis**. It talks about what gastroschisis is, how common it is, how it is diagnosed, and how it is treated. <https://www.cdc.gov/ncbddd/birthdefects/gastroschisis.html>

The Global Gastroschisis Foundation is a foundation that is helping children and families affected by gastroschisis. The website has resources for connecting with other families and ways to raise awareness about gastroschisis. <https://averysangels.org/>

GENETICS:

CDC has a unique **Family Health History and Genetics** index of web pages that provide a great deal of information on the role genetics plays on the health of families, newborn screening, and many other useful resources. <https://www.cdc.gov/genomics/famhistory/>

Directory of the Research Centers

To reach a BD-STEPS project coordinator, please email us at BD-STEPS@cdc.gov. Below is the contact information for each BD-STEPS Center.

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*For more information or to learn more about birth defects,
visit the BD-STEPS website <http://bdsteps.org/>*

share your stories

Newsletter Ideas and Mailing:

Please contact your Center listed in the directory if you:

- Want to share your experience about the NBDPS or BD-STEPS
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- Would like to receive the newsletter via e-mail

Also, please let us know if you have topic ideas for future issues.



