

BIRTH DEFECTS AND OTHER ADVERSE PREGNANCY OUTCOMES IN ILLINOIS 2014-2018

A REPORT ON COUNTY-SPECIFIC PREVALENCE



Illinois Department of Public Health
Division of Epidemiologic Studies

July 2021

ACKNOWLEDGMENTS

This report was possible because of the special efforts of many individuals and organizations. Thanks are due to the following Adverse Pregnancy Outcomes Reporting System (APORS) staff:

Jodi Snow, APORS Abstractor Liaison

Julie Rowden, APORS Field Abstractor

Latina Iverson-Simmons, APORS Field Abstractor

Lisa Lingleo, APORS Field Abstractor

Angela Butler, APORS Field Abstractor

Support

This publication was supported by Grant/Cooperative Agreement Number U50DD004947 from the U.S. Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the U.S. Centers for Disease Control and Prevention.

Suggested Citation

Sandidge T, Fornoff JE, Shen T. Birth Defects and Other Adverse Pregnancy Outcomes in Illinois 2014-2018. Epidemiologic Report Series 22:01. Illinois Department of Public Health, July 2021.

Copyright Information

All material in this report is in the public domain and may be reproduced or copied without permission; citation as to source, however, is appreciated.

**BIRTH DEFECTS AND OTHER ADVERSE PREGNANCY OUTCOMES
IN ILLINOIS, 2014-2018
A REPORT ON COUNTY-SPECIFIC PREVALENCE**

TABLE OF CONTENTS

Index of Tables	ii
Index of Figures	iii
Introduction.....	1
Methods	
<i>Calculation and Interpretation of Rates and Confidence Intervals</i>	2
<i>Multiple Comparisons</i>	3
<i>Creating Map Illustrations</i>	3
Section I	
Birth Defects	4
Central Nervous System Defects	5
Cardiovascular System Defects	10
Alimentary Tract Defects.....	16
Genitourinary Tract Defects	21
Musculoskeletal Defects	25
Chromosomal Defects.....	30
Section II	
Other Adverse Pregnancy Outcomes	
Prematurity.....	35
Serious Congenital Infections	39
Perinatal Deaths	45
Endocrine, Metabolic and Immune Disorders	49
Blood Disorders	54
Other Adverse Pregnancy Outcomes	59
References.....	65

INDEX OF TABLES

APORS Case Criteria, 2014-2018	
Table 1. Number of Infants	2
Central Nervous System, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 2. Illinois	6
Table 3. By County	7
Cardiovascular Defects, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 4. Illinois	12
Table 5. By County	13
Alimentary Tract Defects, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 6. Illinois	17
Table 7. By County	18
Genitourinary Defects, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 8. Illinois	21
Table 9. By County	22
Musculoskeletal Defects, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 10. Illinois	26
Table 11. By County	27
Chromosomal Defects, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 12. Illinois	31
Table 13. By County	32
Prematurity, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 14. By County	36
Serious Congenital Infections, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 15. Illinois	41
Table 16. By County	42
Perinatal Death, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 17. Illinois	45
Table 18. By County	46
Endocrine, Metabolic, and Immune Disorders, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 19. Illinois	50
Table 20. By County	51
Blood Disorders, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 21. Illinois	55
Table 22. By County	56
Other Adverse Pregnancy Outcomes, Number and Prevalence Rates in Newborn Infants, 2014-2018	
Table 23. Illinois	61
Table 24. By County	62

INDEX OF FIGURES

Conditions in Newborn Infants for Selected Counties of Residence, 2014-2018

Central Nervous System Defects	
Figure 1. Prevalence Rates and 95% Confidence Intervals	8
Figure 2. Map of Prevalence Rates	9
Cardiovascular Defects	
Figure 3. Prevalence Rates and 95% Confidence Intervals	14
Figure 4. Map of Prevalence Rates	15
Alimentary Tract Defects	
Figure 5. Prevalence Rates and 95% Confidence Intervals	19
Figure 6. Map of Prevalence Rates	20
Genitourinary Defects	
Figure 7. Prevalence Rates and 95% Confidence Intervals	23
Figure 8. Map of Prevalence Rates	24
Musculoskeletal Defects	
Figure 9. Prevalence Rates and 95% Confidence Intervals	28
Figure 10. Map of Prevalence Rates	29
Chromosomal Defects	
Figure 11. Prevalence Rates and 95% Confidence Intervals	33
Figure 12. Map of Prevalence Rates	34
Prematurity	
Figure 13. Prevalence Rates and 95% Confidence Intervals	37
Figure 14. Map of Prevalence Rates	38
Serious Congenital Infections	
Figure 15. Prevalence Rates and 95% Confidence Intervals	43
Figure 16. Map of Prevalence Rates	44
Perinatal Death	
Figure 17. Prevalence Rates and 95% Confidence Intervals	47
Figure 18. Map of Prevalence Rates	48
Endocrine Metabolic and Immune Disorders	
Figure 19. Prevalence Rates and 95% Confidence Intervals	52
Figure 20. Map of Prevalence Rates	53
Blood Disorders	
Figure 21. Prevalence Rates and 95% Confidence Intervals	57
Figure 22. Map of Prevalence Rates	58
Other Adverse Pregnancy Outcomes	
Figure 23. Prevalence Rates and 95% Confidence Intervals	63
Figure 24. Map of Prevalence Rates	64

INTRODUCTION

Since 1989, the Illinois Department of Public Health (IDPH) Adverse Pregnancy Outcome Reporting System (APORS) has collected information about infants with congenital anomalies (birth defects) and other serious neonatal conditions. This information is collected for two major reasons. First, infants with a congenital anomaly or other problem often need special services to help assure they reach their full potential. Therefore, these babies are referred to their local health departments for follow-up services. Second, the data are collected for surveillance and evaluation purposes. These may include describing disease patterns, tracking trends, and developing education and intervention strategies.

At its inception, APORS relied primarily on reports sent from hospitals to identify cases, but the program has evolved over time and currently uses multiple sources of data as well as active surveillance methods to identify and verify cases. All Illinois hospitals are mandated to report infants with adverse pregnancy outcomes born to women who are Illinois residents. (Perinatal centers in St. Louis also participate.) Birth, death, and fetal death certificates (maintained by the IDPH's Division of Vital Records) are an additional data source, allowing APORS to identify infants with certain birth defects or other conditions who were unreported by the hospitals. The IDPH Division of Patient Safety and Quality, which collects patient level discharge data from Illinois acute care hospitals, provides information about children under the age of 2 with a documented birth defect. This allows APORS to identify children whose birth defect diagnosis was made after their newborn stay, or who were unidentified for other reasons.

APORS undertakes systematic active case verification of cases reported to APORS and those identified through other sources. APORS staff members review charts for infants reported with selected serious birth defects. As the charts are reviewed, APORS staff correct and add to information reported by hospitals. The extensive data collection and verification activities assure APORS is the most complete source of data on adverse pregnancy outcomes in Illinois newborns.

Over the years, APORS case definition has been reviewed and revised periodically resulting in conditions being dropped or added at different points in time. Table 1 reflects the number of cases and rates of different neonatal conditions included in the APORS case definition between 2014 and 2018. Since multiple adverse outcomes may coexist, it is possible for an infant to be counted in more than one of the categories in Table 1. While the APORS case definition includes prenatal drug exposure, data is not presented in this report as the prevalence of infants prenatally exposed to controlled substances is subject to testing bias (Fornoff JE *et al.*) and not representative of Illinois newborns. Infants who are reported to APORS are referred to local health departments for follow-up services

Table 1. Frequency of Reported Infants Meeting APORS Case Criteria, 2014-2018

Infants	5-Year Total	Annual Average	Rate ¹	% APORS Cases
Total APORS Cases	54,486	10,897.2	711.9	100.0
Birth Defects	25,767	5,153.4	336.7	48.9
Less than 31 weeks gestational age	13,025	2,605.0	170.2	24.7
Fetal Deaths	4,371	874.2	57.1	8.3
Died During Newborn Hospitalization	3,626	725.2	47.4	6.9
Intrauterine Growth Restriction	6,532	1,306.4	85.4	12.4
Congenital Infections	3,357	671.4	43.9	6.4
Retinopathy of Prematurity	3,272	654.4	42.8	6.2
Endocrine, Metabolic or Immune Disorder	1,230	246.0	16.1	2.3
Blood Disorder	558	111.6	7.3	1.1

¹ Rate per 10,000 live births

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

This report includes two sections. The first describes the county-specific prevalence rates of six groups of major birth defects for which APORS staff have reviewed infant charts. In addition, a listing of International Classification of Diseases, Tenth Revision Clinical Modification (ICD-10-CM) diagnosis codes corresponding to each included birth defect is provided, together with a brief description of each defect. The second section provides similar information about other adverse pregnancy outcomes reported to APORS, including those listed in Table 1.

METHODS

Calculation and Interpretation of Rates and Confidence Intervals

Annual prevalence rates (per 10,000 live births) for selected adverse pregnancy outcomes identified during the newborn hospital stay or associated with a fetal death were calculated as

$$10,000 \times \frac{\text{number of infants with selected congenital anomaly}}{\text{number of live births}}$$

The numbers of live births were obtained from the IDPH's master birth files. Occurrence of a specific adverse outcome is assumed to be a rare event, therefore following a Poisson distribution. Exact confidence intervals were calculated for each rate (Hardeo S & Khurshid A) as

$$\mu_L = \frac{1}{2} \chi^2_{2x, 0.025}$$

$$\mu_U = \frac{1}{2} \chi^2_{2x+2, 0.975}$$

Where μ_L and μ_U are lower and upper confidence limits for X, the number of birth defects, and χ^2 is Chi-square deviate at $p=0.05$ with degrees of freedom specified (either $2X$ or $2X+2$). Where

there are many birth defect cases, the confidence interval is narrow, indicating the rate is stable. Where there are few birth defect cases, the confidence interval becomes very wide, indicating the rate is not very stable. A small change in the number of infants born with the specific birth defect could result in a large change in the rate.

To compare two rates, it is important to look at their confidence intervals as well as their values. As a conservative approximation, if two confidence intervals overlap, then there is no evidence the two rates are different. If two confidence intervals do not overlap, then the rates are said to be statistically different. In this report, 95% confidence intervals are used; where the confidence intervals do not overlap the rates are statistically different at the 5% level ($p < 0.05$).

Multiple Comparisons

Since this report examines many adverse outcomes, the corresponding statistical tests are subject to the “multiple comparison problem.” For a given birth defect, the observed rate is an estimate of the true birth defect rate in the population. When two rates from different times or groups are compared, statisticians will assert the observed rates are evidence of the groups having differing birth defect rates, if the observed rates are so different that the chance of them coming from the same underlying population is less than 5%. The 5% type I error rate, however, suggests that when 100 comparisons are made, on average, five will be “significantly different,” when, in fact, there is no difference between the two groups. Therefore, as more comparisons are made, more may be statistically significant, just by chance. In this report, no explicit corrections of the multiple comparison problem were made; instead, exact probabilities are reported. The smaller the reported probability, the more likely it is that the difference is not simply the result of chance.

Map Illustrations

The maps in this report were created using Tableau 2018.2. The categories were determined using natural break-points in the data. The maps are used to create a visual representation of birth defect prevalence rates and do not have any statistical significance associated with them.

SECTION I

BIRTH DEFECTS

Birth defects have long been a leading cause of infant mortality in the United States, and they contribute substantially to childhood morbidity and long-term disability. In 2018, birth defects were responsible for 20.9% of infant deaths in the U.S. (Ely M & Driscoll AK). In Illinois birth defects were responsible for 19.1% of infant deaths, ranking as the second leading cause of these deaths (IDPH, 2021).

Known causes of birth defects include one or a combination of the following:

- Genetic disorders.
- Exposures to chemicals, medications, or other substances during pregnancy.
- Certain infections during pregnancy that expose the baby to viruses or bacteria.
- Lack of certain nutrients before and during pregnancy, such as folic acid.

The stage of fetal development at the time of exposure to one of the latter three causes is critical, as fetal development is particularly vulnerable to disruption in the first trimester of pregnancy. Despite an increasing understanding of factors that give rise to birth defects, the cause of most birth defects is complex and remains unknown.

While not all birth defects are preventable, a woman can plan to try to be as healthy as possible both before and during pregnancy to increase her chances of having a healthy baby. According to the U.S. Centers for Disease Control and Prevention (CDC) in 2021, specific steps she can take include:

- Adopting a healthy active lifestyle.
- Avoiding harmful substances (alcohol, smoking, marijuana, illicit drugs).
- Getting enough folic acid daily.
- Seeing a health care provider prior to pregnancy to discuss health conditions, medications, diet, and how to prevent infections.
- Beginning prenatal care as soon as she thinks she is pregnant.

The life expectancy and quality of life for many individuals with birth defects has improved over the last several decades as new tests and treatments are available. Surgical techniques can correct certain birth defects before a baby is born and neonatal intensive care units are able to provide specialized care and technology.

Between 2014 and 2018, APORS identified 21,012 major birth defects in Illinois newborns at a rate of 274.6 per 10,000 live births. Heart and circulatory system defects were the most commonly identified major defect in Illinois, accounting for 44.8% of birth defects

Because a baby may be born with more than one birth defect, he or she may be counted in more than one birth defect group. A baby may even have more than one birth defect from the same birth defect group. Therefore, the data in this report cannot be used to determine the number of children with a particular group of birth defects.

CENTRAL NERVOUS SYSTEM DEFECTS

Central nervous system defects involve the brain, spinal cord, and associated tissues. These include neural tube defects (anencephaly, spina bifida, and encephalocele), microcephalus, and holoprosencephaly. Because central nervous system defects are very severe, many affected babies will miscarry early in pregnancy. Additionally, since the defects are detectable in pregnancy either by alpha-fetoprotein testing or ultrasound screening, women may elect to terminate the pregnancy.

A description of each defect follows, together with Table 2 that gives the five-year prevalence rates for each defect for the state. Table 3 provides five-year prevalence rates for all major central nervous system defects combined by county. The observed rates may be substantially lower than the true rates because APORS does not collect birth defect information from miscarriages or elective abortions. Figures 1 and 2 provide prevalence rates for major central nervous system defects for selected counties in table and map formats, respectively.

Anencephaly is a serious defect that occurs when the upper part of the neural tube fails to close, resulting in the absence of a major portion of the brain, skull, and scalp. It includes craniorachischisis in which there is incomplete closure of both the skull and the spinal column. Nearly all babies born with this condition die soon after birth.

Encephalocele is a defect affecting the skull resulting in the protrusion of the meninges and portions of the brain through a bony midline defect in the skull. High mortality and morbidity are associated with this condition, and overall outcomes depend on the specific site.

Holoprosencephaly incomplete formation of the brain into the right and left hemispheres. There are several subtypes of the condition and it is frequently associated with facial anomalies. The most severe forms result in stillbirth or death shortly after birth. However, outcomes vary depending upon the sub-type and severity of the condition in each individual (National Institutes of Health, 4/23/2020).

Microcephalus is an abnormally small head due to failure of proper brain development during pregnancy. This condition can range from mild to severe and may occur alone or in conjunction with other birth defects. Microcephaly can result in a range of issues including seizures, developmental delays, intellectual disability, and feeding, hearing, and vision problems.

Spina bifida is a defect in which part of the spinal cord is exposed because of a bony defect in the vertebral column. It may be associated with hydrocephalus. The degree of disability depends on the extent and location of the malformation.

Table 2. Total Number and Prevalence Rates of Major Central Nervous System Defects in Children Under 2 Years of Age, Illinois, 2014-2018

Defect	ICD-10-CM Codes	Number	Rate¹	95% CI²
Anencephalus	Q00.0-Q00.1	106	1.4	(1.1, 1.7)
Encephalocele	Q01	67	0.9	(0.7, 1.1)
Holoprosencephaly	Q04.2	92	1.2	(1.0, 1.5)
Microcephalus	Q02	1,370	17.9	(17.0, 18.9)
Spina bifida ³	Q05,Q070.01,Q07.3	253	3.3	(2.9, 3.7)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

³ Includes only spina bifida without anencephaly

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Table 3. Total Number and Prevalence Rates of Major Central Nervous System Defects in Children Under 2 Years of Age by County of Residence, 2014-2018

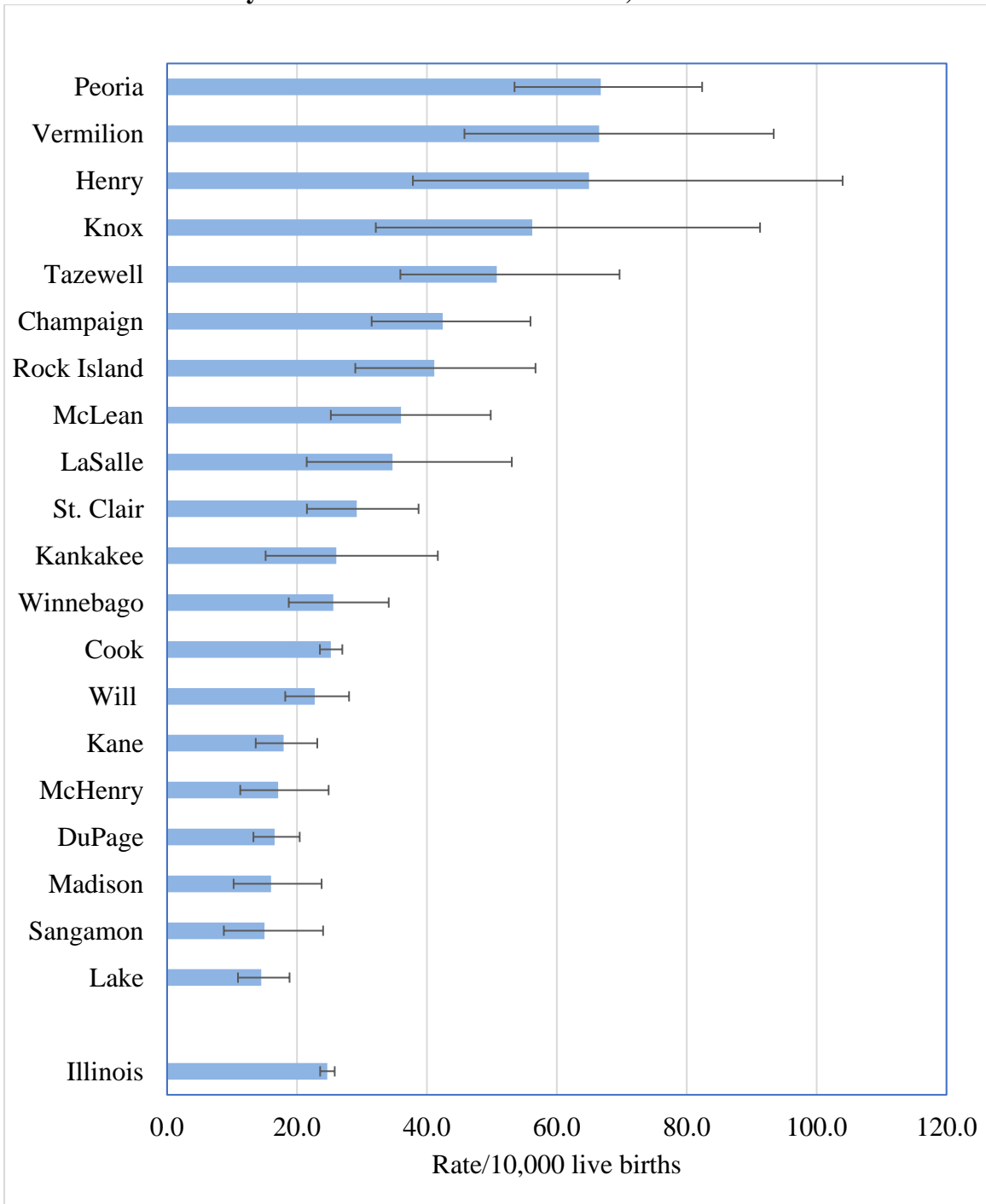
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	1,888	24.7	23.6	25.8	Lee	1	5.8	0.1	32.5
Adams	6	14.6	5.4	31.9	Livingston	8	39.3	17.0	77.5
Alexander	1	25.6	0.6	142.5	Logan	5	32.9	10.7	76.7
Bond	1	13.3	0.3	74.0	McDonough	12	87.1	45.0	152.2
Boone	4	13.9	3.8	35.5	McHenry	27	17.1	11.3	24.9
Brown	1	33.4	0.8	186.3	McLean	36	36.0	25.2	49.8
Bureau	9	53.8	24.6	102.2	Macon	14	21.1	11.5	35.4
Calhoun	0	0.0	0.0	161.1	Macoupin	5	21.7	7.0	50.6
Carroll	1	14.2	0.4	79.3	Madison	24	16.0	10.2	23.8
Cass	0	0.0	0.0	42.0	Marion	7	28.5	11.4	58.7
Champaign	50	42.4	31.5	55.9	Marshall	2	31.7	3.8	114.5
Christian	0	0.0	0.0	21.9	Mason	2	30.2	3.7	109.0
Clark	2	22.1	2.7	80.0	Massac	0	0.0	0.0	46.9
Clay	3	38.3	7.9	112.0	Menard	0	0.0	0.0	60.7
Clinton	3	14.2	2.9	41.5	Mercer	2	27.7	3.4	99.9
Coles	7	27.8	11.2	57.2	Monroe	2	11.3	1.4	40.7
Cook	835	25.2	23.5	27.0	Montgomery	3	20.2	4.2	59.0
Crawford	1	9.5	0.2	52.7	Morgan	4	22.2	6.0	56.7
Cumberland	0	0.0	0.0	59.2	Moultrie	1	10.8	0.3	60.0
DeKalb	14	24.4	13.3	40.9	Ogle	7	26.3	10.6	54.2
DeWitt	4	46.0	12.5	117.9	Peoria	87	66.8	53.5	82.4
Douglas	6	46.4	17.0	101.0	Perry	0	0.0	0.0	35.8
DuPage	88	16.6	13.3	20.4	Piatt	2	22.1	2.7	79.9
Edgar	2	22.7	2.7	81.9	Pike	2	20.8	2.5	75.0
Edwards	0	0.0	0.0	93.6	Pope	0	0.0	0.0	254.4
Effingham	4	17.3	4.7	44.4	Pulaski	0	0.0	0.0	115.3
Fayette	4	32.7	8.9	83.8	Putnam	0	0.0	0.0	148.1
Ford	5	67.8	22.0	158.1	Randolph	1	6.0	0.2	33.4
Franklin	2	8.4	1.0	30.3	Richland	1	10.6	0.3	58.9
Fulton	8	46.4	20.0	91.4	Rock Island	37	41.2	29.0	56.7
Gallatin	0	0.0	0.0	140.3	St.Clair	48	29.2	21.5	38.7
Greene	0	0.0	0.0	55.5	Saline	5	31.6	10.2	73.7
Grundy	11	36.8	18.4	65.8	Sangamon	17	15.0	8.7	24.0
Hamilton	0	0.0	0.0	85.4	Schuyler	3	98.4	20.3	287.5
Hancock	1	10.4	0.3	58.2	Scott	0	0.0	0.0	153.7
Hardin	0	0.0	0.0	241.1	Shelby	0	0.0	0.0	29.8
Henderson	0	0.0	0.0	113.9	Stark	3	98.7	20.4	288.4
Henry	17	65.0	37.8	104.0	Stephenson	5	20.2	6.6	47.2
Iroquois	5	32.5	10.5	75.8	Tazewell	38	50.8	35.9	69.7
Jackson	4	11.8	3.2	30.1	Union	0	0.0	0.0	40.0
Jasper	1	17.6	0.4	98.1	Vermilion	33	66.5	45.8	93.4
Jefferson	7	28.4	11.4	58.4	Wabash	0	0.0	0.0	52.0
Jersey	1	9.6	0.2	53.3	Warren	3	28.1	5.8	82.1
JoDaviess	3	34.2	7.0	99.9	Washington	0	0.0	0.0	46.6
Johnson	1	18.6	0.5	103.8	Wayne	1	9.7	0.2	53.8
Kane	59	17.9	13.6	23.1	White	0	0.0	0.0	48.2
Kankakee	17	26.0	15.2	41.7	Whiteside	6	19.3	7.1	42.0
Kendall	11	14.0	7.0	25.0	Will	87	22.7	18.2	28.0
Knox	16	56.2	32.1	91.3	Williamson	1	2.6	0.1	14.3
Lake	55	14.5	10.9	18.9	Winnebago	46	25.6	18.7	34.1
LaSalle	21	34.7	21.5	53.1	Woodford	6	28.2	10.4	61.4
Lawrence	1	12.5	0.3	69.8					

¹ Per 10,000 live births (The number for Illinois includes two cases for which county of residence is missing.)

² 95 % confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 1. Prevalence Rates¹ and 95% Confidence Intervals for Major Central Nervous System Defects in Children Under 2 Years of Age by Selected Counties of Residence,² 2014-2018

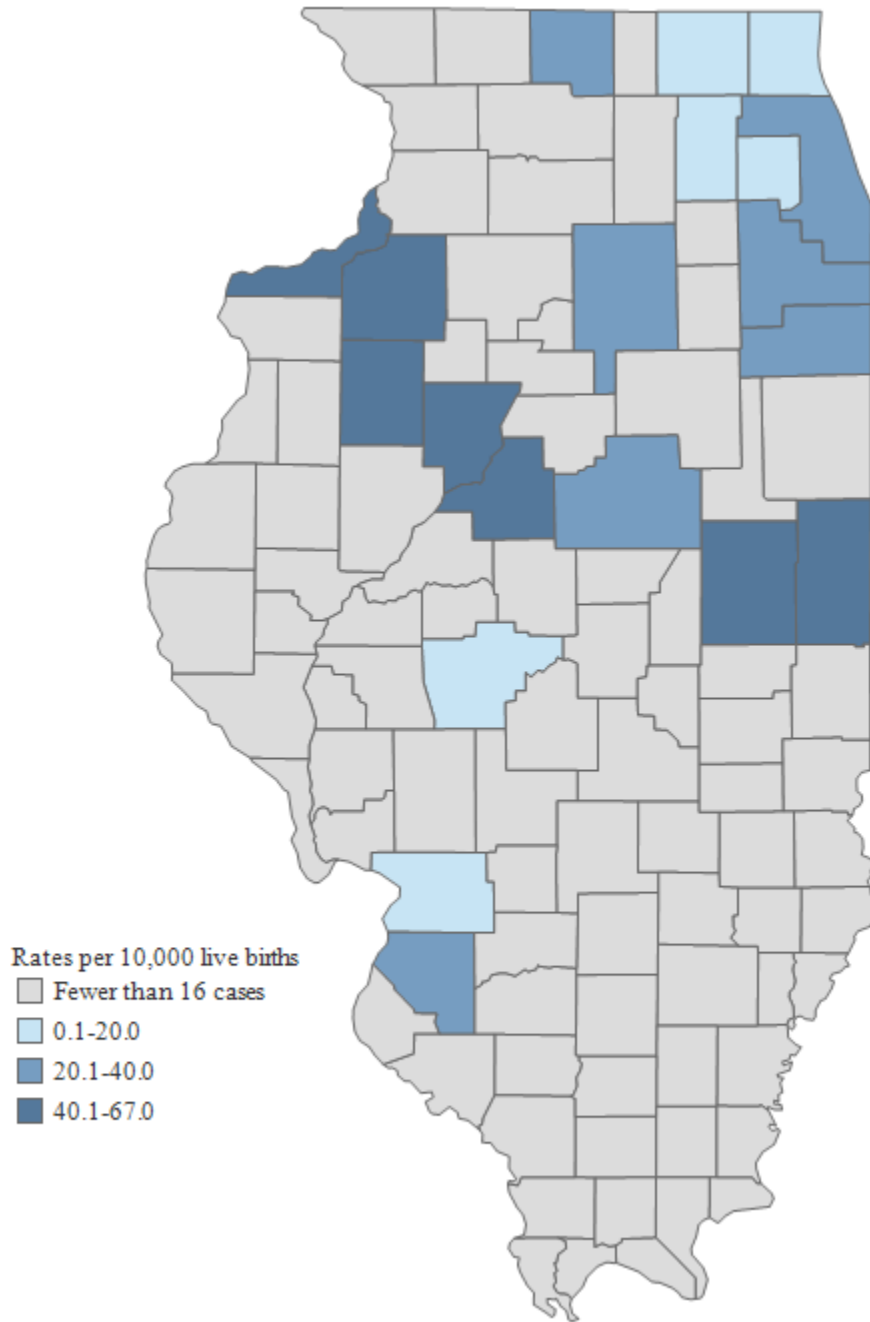


¹ Rates per 10,000 live births

² Only counties with 16 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 2. Map of Prevalence Rates for Major Central Nervous System Defects in Children Under 2 Years of Age by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

CARDIOVASCULAR SYSTEM DEFECTS

Cardiovascular system defects involve the heart and circulatory system. They are the most common group of birth defects in the U.S. and Illinois, with a rate of 123.0 identified cases per 10,000 live births in Illinois during the period of 2014-2018.

Cardiovascular defects can range from mild to severe and some are diagnosed during pregnancy, while others are not discovered until after birth or later in life. CDC estimates about 25% of congenital heart defects are considered critical (CDC, 07/28/2021). Babies born with critical heart defects need intervention, including surgical repair, during the first year of life to restore normal circulation as much as possible. Because of advances in treatment, many with cardiovascular defects can live longer lives. However, they often must maintain regular visits with a doctor throughout their lives as they can develop other health problems over time.

A description of each major defect follows, together with Table 4, which gives the five-year prevalence rates for each defect for the state. Table 5 provides five-year prevalence rates for all major cardiovascular system defects combined by county. Figures 2 and 3 provide prevalence rates for major central nervous system defects for selected counties in map and table formats, respectively.

Aortic valve stenosis is a narrowing or obstruction of the aortic heart valve. This condition can be repaired surgically in some cases.

Atrial septal defect is a hole in the wall between the upper chambers of the heart. The opening may resolve without treatment or may require surgical treatment.

Atrioventricular septal defect is a spectrum of septal defects arising from imperfect fusion of the endocardial cushions in the fetal heart. These defects are repaired surgically.

Coarctation of the aorta is a defect in which the aorta is narrowed somewhere along its length. Surgical correction is recommended even for mild defects.

Common truncus is the failure of the fetal truncus arteriosus to divide into the aorta and pulmonary artery. It can be corrected surgically, usually during the first months of life.

Double outlet right ventricle occurs when both the pulmonary artery and aorta are connected to the right ventricle. Surgical correction is necessary in most cases.

Ebstein anomaly is a deformation or displacement of the tricuspid valve with the septal and posterior leaflets attached to the wall of the right ventricle. Only disabling cases are corrected surgically.

Hypoplastic left heart syndrome is a form of congenital heart disease in which the entire left half of the heart is underdeveloped. This condition can be surgically repaired or treated by transplantation. If not treated, this condition is usually fatal in the first month of life.

Interrupted Aortic Arch is a disruption between the ascending and descending aorta. There are several types classified by where the disruption occurs. Surgical correction is necessary.

Pulmonary valve atresia and stenosis is an absence or narrowing of the valve between the right ventricle and the pulmonary artery. Mild forms are relatively well tolerated and require no intervention. More severe forms are surgically corrected.

Single Ventricle occurs when there is one ventricle, instead of two. There are several forms, the most common being double-inlet left ventricle.

Tetralogy of Fallot is a defect consisting of four abnormalities that result in poorly oxygenated blood pumped to the body. It can be treated surgically, usually soon after birth.

Total anomalous pulmonary venous return (TAPVR) occurs when all four pulmonary veins are abnormally connected to the heart. It results in poorly oxygenated blood pumped to the body and must be surgically corrected.

Transposition of great arteries is a defect in which the position of the aorta and the pulmonary artery is transposed. Immediate surgical correction is needed.

Tricuspid atresia and stenosis is the absence or pathological narrowing of the valve between the right atrium and ventricle. Severe cases are corrected surgically.

Ventricular septal defect is a hole in the wall between the lower chambers of the heart. The opening may resolve without treatment or may require surgical treatment.

Table 4. Total Number and Prevalence Rates of Major Cardiovascular System Defects in Children Under 2 Years of Age, Illinois, 2014-2018

Defect	ICD-10-CM Codes	Cases	Rate ¹	95% CI ²
Aortic valve stenosis	Q23.0	212	2.8	(2.4,3.2)
Atrial septal defect	Q21.1 ³	2,295	30.0	(28.8, 31.2)
Atrioventricular septal defect	Q21.2	416	5.4	(4.9,6.0)
Coarctation of aorta	Q25.1	430	5.6	(5.1,6.2)
Common truncus	Q20.0	39	0.5	(0.4,0.7)
Double outlet right ventricle	Q20.1	171	2.2	(1.9, 2.6)
Ebstein anomaly	Q22.5	54	0.7	(0.5, 0.9)
Hypoplastic left heart syndrome	Q23.4	215	2.8	(2.4, 3.2)
Interrupted aortic arch	Q25.2, Q25.4	55	0.7	(0.5, 0.9)
Pulmonary valve atresia/stenosis	Q22.0, Q22.1	594	7.8	(7.1, 8.4)
Single ventricle	Q20.4	43	0.6	(0.4, 0.8)
Tetralogy of Fallot	Q21.3	356	4.7	(4.2, 5.2)
Total anomalous pulmonary venous return (TAPVR)	Q26.2	102	1.3	(1.1, 1.6)
Transposition of great arteries	Q20.3, Q20.5	232	3.0	(2.7, 3.4)
Tricuspid valve atresia/stenosis	Q22.4	92	1.2	(1.0, 1.5)
Ventricular septal defect	Q21.0	4,108	53.7	(52.0,55.3)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

³Does not include patent foramen ovale (PFO)

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Table 5. Total Number and Prevalence Rates of Major Cardiovascular System Defects in Children Under 2 Years of Age by County of Residence, 2014-2018

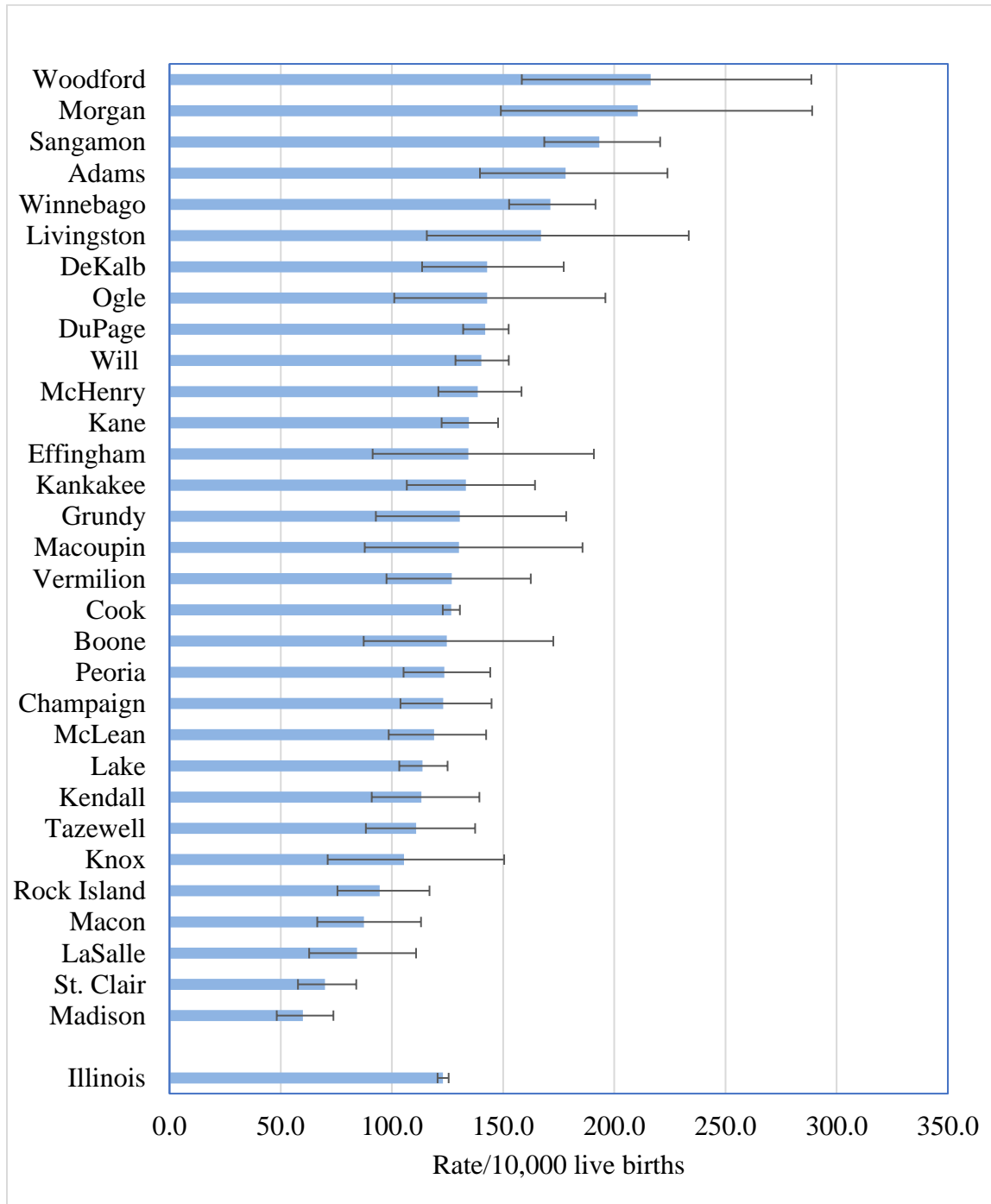
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	9,414	123.0	120.5	125.5	Lee	20	116.8	71.4	180.4
Adams	73	178.1	139.6	223.9	Livingston	34	167.1	115.7	233.5
Alexander	1	25.6	0.6	142.5	Logan	23	151.2	95.9	226.9
Bond	4	53.1	14.5	136.0	McDonough	21	152.5	94.4	233.1
Boone	36	124.7	87.3	172.6	McHenry	219	138.6	120.9	158.3
Brown	3	100.3	20.7	293.2	McLean	119	119.0	98.6	142.4
Bureau	18	107.7	63.8	170.1	Macon	58	87.5	66.4	113.1
Calhoun	0	0.0	0.0	161.1	Macoupin	30	130.1	87.8	185.7
Carroll	4	56.9	15.5	145.7	Madison	90	60.0	48.2	73.7
Cass	19	216.4	130.3	337.9	Marion	14	56.9	31.1	95.5
Champaign	145	123.1	103.9	144.8	Marshall	4	63.4	17.3	162.3
Christian	25	148.4	96.0	219.0	Mason	3	45.2	9.3	132.2
Clark	4	44.3	12.1	113.4	Massac	0	0.0	0.0	46.9
Clay	5	63.9	20.7	149.0	Menard	14	230.3	125.9	386.3
Clinton	13	61.5	32.7	105.1	Mercer	13	179.8	95.7	307.5
Coles	19	75.4	45.4	117.7	Monroe	12	67.5	34.9	118.0
Cook	4,196	126.7	122.9	130.6	Montgomery	26	175.0	114.3	256.4
Crawford	7	66.2	26.6	136.4	Morgan	38	210.5	149.0	289.0
Cumberland	6	96.3	35.3	209.6	Moultrie	14	150.7	82.4	252.8
DeKalb	82	142.8	113.6	177.3	Ogle	38	142.8	101.1	196.0
DeWitt	18	207.1	122.8	327.4	Peoria	161	123.6	105.2	144.2
Douglas	11	85.1	42.5	152.2	Perry	1	9.7	0.2	54.1
DuPage	754	142.0	132.0	152.5	Piatt	10	110.6	53.0	203.4
Edgar	7	79.4	31.9	163.5	Pike	16	166.1	95.0	269.8
Edwards	0	0.0	0.0	93.6	Pope	0	0.0	0.0	254.4
Effingham	31	134.4	91.3	190.8	Pulaski	0	0.0	0.0	115.3
Fayette	18	147.3	87.3	232.8	Putnam	2	80.3	9.7	290.1
Ford	7	94.9	38.1	195.4	Randolph	12	71.9	37.2	125.7
Franklin	13	54.5	29.0	93.2	Richland	6	63.4	23.3	138.0
Fulton	14	81.2	44.4	136.3	Rock Island	85	94.5	75.5	116.9
Gallatin	3	114.1	23.5	333.4	St.Clair	115	70.0	57.8	84.0
Greene	8	120.3	51.9	237.0	Saline	9	56.8	26.0	107.9
Grundy	39	130.5	92.8	178.4	Sangamon	219	193.3	168.5	220.6
Hamilton	0	0.0	0.0	85.4	Schuyler	4	131.1	35.7	335.8
Hancock	11	114.9	57.4	205.7	Scott	4	166.7	45.4	426.7
Hardin	3	196.1	40.4	573.0	Shelby	24	193.7	124.1	288.2
Henderson	0	0.0	0.0	113.9	Stark	0	0.0	0.0	121.3
Henry	17	65.0	37.8	104.0	Stephenson	22	89.0	55.8	134.7
Iroquois	25	162.4	105.1	239.8	Tazewell	83	110.9	88.3	137.4
Jackson	27	79.5	52.4	115.6	Union	1	10.8	0.3	60.4
Jasper	3	52.8	10.9	154.4	Vermilion	63	127.0	97.6	162.4
Jefferson	21	85.1	52.7	130.0	Wabash	0	0.0	0.0	52.0
Jersey	9	86.0	39.3	163.3	Warren	11	103.0	51.4	184.3
JoDaviess	4	45.6	12.4	116.6	Washington	2	25.3	3.1	91.2
Johnson	1	18.6	0.5	103.8	Wayne	3	29.0	6.0	84.6
Kane	443	134.6	122.4	147.7	White	1	13.1	0.3	72.8
Kankakee	87	133.2	106.7	164.3	Whiteside	27	86.8	57.2	126.3
Kendall	89	113.2	90.9	139.3	Will	537	140.2	128.6	152.6
Knox	30	105.4	71.1	150.5	Williamson	11	28.2	14.1	50.4
Lake	432	113.8	103.3	125.0	Winnebago	308	171.3	152.7	191.5
LaSalle	51	84.3	62.8	110.9	Woodford	46	216.4	158.4	288.6
Lawrence	4	50.1	13.7	128.3					

¹ Per 10,000 live births (The number for Illinois includes one case for which county of residence is missing.)

² 95 % confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 3.
Prevalence Rates¹ and 95% Confidence Intervals for
Major Cardiovascular System Defects in Children Under 2 Years of Age
by Selected Counties of Residence,² 2014-2018

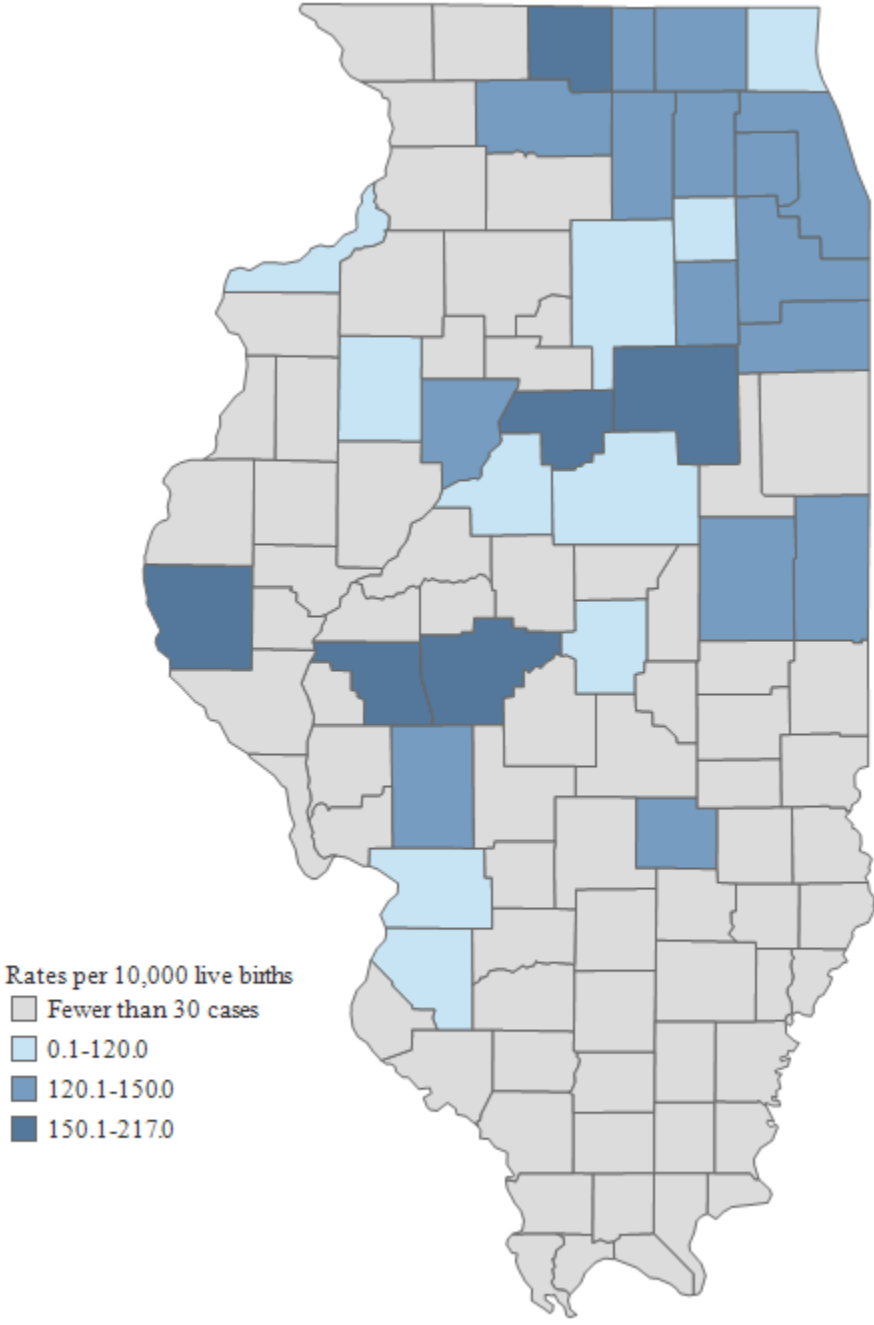


¹ Rates per 10,000 live births

² Only counties with 30 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 4. Map of Prevalence Rates for Major Cardiovascular System Defects in Children Under 2 Years of Age by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

ALIMENTARY TRACT DEFECTS

Alimentary tract defects are made up of orofacial defects (cleft palate and lip, choanal atresia) and gastrointestinal defects (esophageal atresia, rectal and intestinal atresia and stenosis, and pyloric stenosis). Most of these defects can be repaired surgically. A description of each defect follows. Table 6 gives the five-year prevalence rates for each defect for the state. Table 7 provides five-year prevalence rates for all major alimentary tract defects combined by county. Figures 5 and 6 present prevalence rates for major alimentary tract defects for selected counties in table and map and formats, respectively.

Biliary atresia is a congenital absence or closure of the major bile ducts that drain bile from the liver.

Choanal atresia is the narrowing or blockage of the nasal airway by membranous or bony tissue. Bilateral choanal atresia is a surgical emergency.

Cleft lip is the presence of one or two openings in the upper lip resulting from failure of the normal process of fusion of the lip during embryonic development. The opening can range in size and can be on one or both sides of the lip. Rarely, the opening is in the middle of the lip.

Cleft lip and palate is the presence of both cleft and palate.

Cleft palate is an opening in the roof of the mouth (the palate) due to a failure of the palatal shelves to fuse fully during embryonic development.

Esophageal atresia is a defect of the esophagus in which there are two separate sections that do not connect. It often occurs with a *tracheoesophageal fistula*, in which part of the esophagus is connected to the trachea. With these conditions, a baby is not able to pass food to the stomach and may have difficulty breathing. Surgical repair is necessary soon after diagnosis.

Rectal, anal, and large intestinal atresia or stenosis is the absence, abnormal localization, or blockage of the rectum, anus, or large intestine. It may be corrected surgically or bypassed.

Small intestinal atresia/stenosis occurs when there is a partial or complete occlusion in one or more parts of the small intestine. The condition ranges in severity and is diagnosed and treated surgically.

**Table 6. Total Number and Prevalence Rates of Major Alimentary Tract Defects
in Children Under 2 Years of Age, Illinois, 2014-2018**

Defect	ICD-10-CM Codes	Cases	Rate¹	95% CI²
Biliary atresia	Q44.2-Q44.3	37	0.5	(0.3, 0.7)
Choanal atresia	Q30.0	101	1.3	(1.1, 1.6)
Cleft lip alone	Q36.0-Q36.9	235	3.1	(2.7, 3.5)
Cleft lip and palate	Q37.0-Q37.9	473	6.2	(5.6, 6.8)
Cleft palate alone	Q35.1-Q35.9	477	6.2	(5.7, 6.8)
Esophageal atresia/ tracheoesophageal fistula	Q39.0-Q39.4	196	2.6	(2.2, 2.9)
Rectal, anal, large intestinal atresia/stenosis	Q42.0-Q42.9	322	4.2	(3.8, 4.7)
Small intestinal atresia/stenosis	Q41.0-Q41.9	255	3.3	(2.9, 3.8)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Table 7. Total Number and Prevalence Rates of Alimentary Tract Defects in Children Under 2 Years of Age by County of Residence, 2014-2018

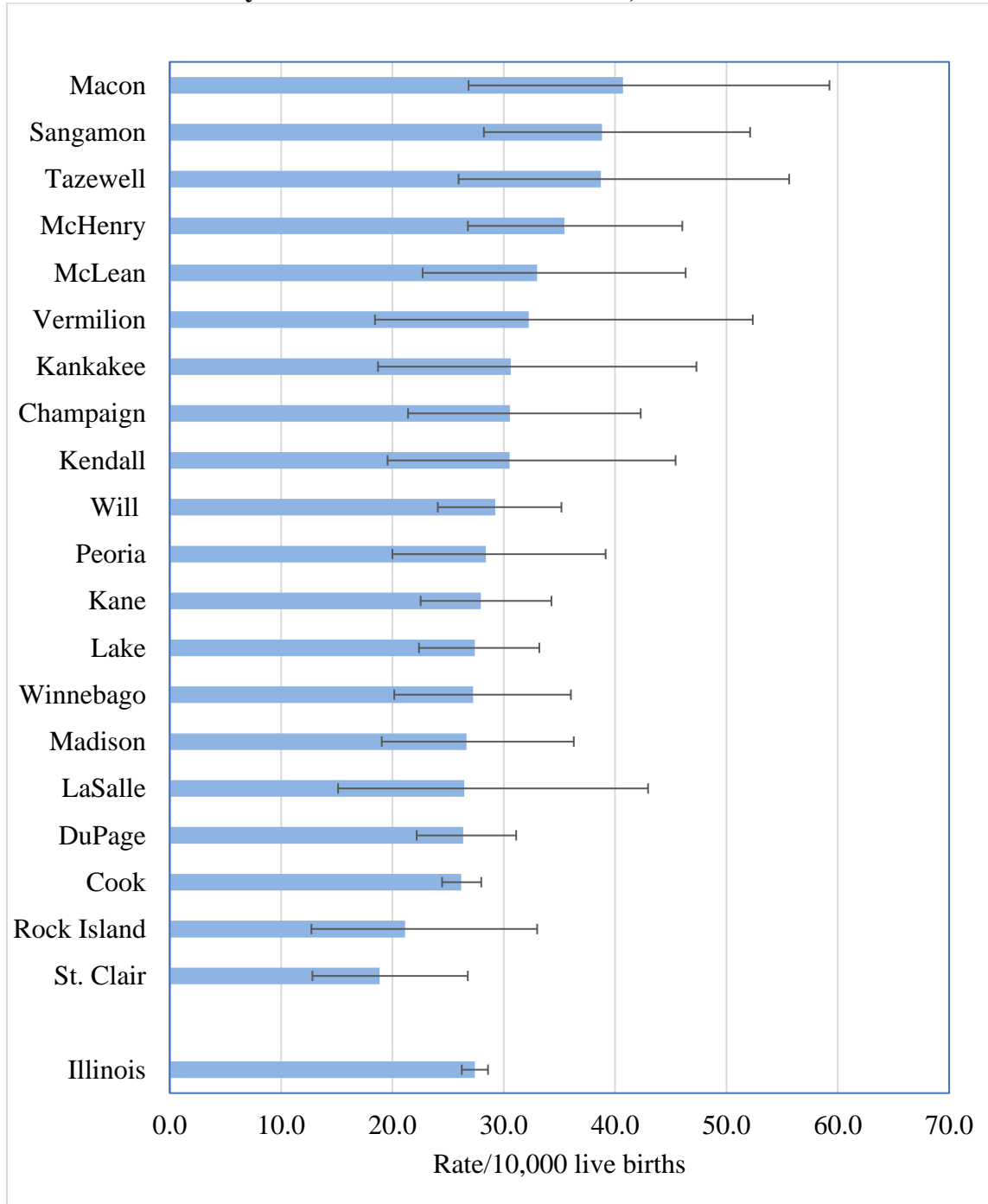
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	2,096	27.4	26.2	28.6	Lee	3	17.5	3.6	51.2
Adams	7	17.1	6.9	35.2	Livingston	7	34.4	13.8	70.9
Alexander	1	25.6	0.6	142.5	Logan	4	26.3	7.2	67.3
Bond	4	53.1	14.5	136.0	McDonough	4	29.0	7.9	74.4
Boone	8	27.7	12.0	54.6	McHenry	56	35.5	26.8	46.0
Brown	0	0.0	0.0	123.4	McLean	33	33.0	22.7	46.3
Bureau	3	17.9	3.7	52.4	Macon	27	40.7	26.8	59.3
Calhoun	1	43.7	1.1	243.3	Macoupin	4	17.3	4.7	44.4
Carroll	2	28.4	3.4	102.8	Madison	40	26.6	19.0	36.3
Cass	3	34.2	7.0	99.9	Marion	5	20.3	6.6	47.5
Champaign	36	30.6	21.4	42.3	Marshall	6	95.1	34.9	207.0
Christian	4	23.7	6.5	60.8	Mason	2	30.2	3.7	109.0
Clark	1	11.1	0.3	61.7	Massac	0	0.0	0.0	46.9
Clay	4	51.1	13.9	130.8	Menard	1	16.4	0.4	91.6
Clinton	4	18.9	5.2	48.4	Mercer	1	13.8	0.4	77.1
Coles	13	51.6	27.5	88.2	Monroe	2	11.3	1.4	40.7
Cook	867	26.2	24.5	28.0	Montgomery	4	26.9	7.3	68.9
Crawford	1	9.5	0.2	52.7	Morgan	9	49.9	22.8	94.7
Cumberland	3	48.2	9.9	140.7	Moultrie	6	64.6	23.7	140.6
DeKalb	15	26.1	14.6	43.1	Ogle	7	26.3	10.6	54.2
DeWitt	2	23.0	2.8	83.1	Peoria	37	28.4	20.0	39.1
Douglas	2	15.5	1.9	55.9	Perry	2	19.4	2.4	70.1
DuPage	140	26.4	22.2	31.1	Piatt	1	11.1	0.3	61.6
Edgar	1	11.3	0.3	63.2	Pike	3	31.2	6.4	91.0
Edwards	1	25.4	0.6	141.4	Pope	0	0.0	0.0	254.4
Effingham	3	13.0	2.7	38.0	Pulaski	0	0.0	0.0	115.3
Fayette	2	16.4	2.0	59.1	Putnam	0	0.0	0.0	148.1
Ford	2	27.1	3.3	97.9	Randolph	8	48.0	20.7	94.5
Franklin	11	46.1	23.0	82.6	Richland	4	42.3	11.5	108.3
Fulton	8	46.4	20.0	91.4	Rock Island	19	21.1	12.7	33.0
Gallatin	2	76.0	9.2	274.7	St.Clair	31	18.9	12.8	26.8
Greene	1	15.0	0.4	83.8	Saline	7	44.2	17.8	91.1
Grundy	6	20.1	7.4	43.7	Sangamon	44	38.8	28.2	52.1
Hamilton	0	0.0	0.0	85.4	Schuyler	0	0.0	0.0	120.9
Hancock	2	20.9	2.5	75.5	Scott	1	41.7	1.1	232.2
Hardin	0	0.0	0.0	241.1	Shelby	7	56.5	22.7	116.4
Henderson	1	30.9	0.8	172.0	Stark	4	131.6	35.9	336.9
Henry	9	34.4	15.7	65.3	Stephenson	7	28.3	11.4	58.3
Iroquois	9	58.5	26.7	111.0	Tazewell	29	38.7	25.9	55.6
Jackson	8	23.6	10.2	46.4	Union	0	0.0	0.0	40.0
Jasper	2	35.2	4.3	127.2	Vermilion	16	32.2	18.4	52.4
Jefferson	7	28.4	11.4	58.4	Wabash	1	14.1	0.4	78.6
Jersey	1	9.6	0.2	53.3	Warren	6	56.2	20.6	122.3
JoDaviess	2	22.8	2.8	82.3	Washington	0	0.0	0.0	46.6
Johnson	1	18.6	0.5	103.8	Wayne	1	9.7	0.2	53.8
Kane	92	28.0	22.5	34.3	White	0	0.0	0.0	48.2
Kankakee	20	30.6	18.7	47.3	Whiteside	12	38.6	19.9	67.4
Kendall	24	30.5	19.6	45.4	Will	112	29.2	24.1	35.2
Knox	3	10.5	2.2	30.8	Williamson	7	17.9	7.2	36.9
Lake	104	27.4	22.4	33.2	Winnebago	49	27.3	20.2	36.0
LaSalle	16	26.5	15.1	43.0	Woodford	7	32.9	13.2	67.8
Lawrence	0	0.0	0.0	46.2					

¹ Per 10,000 live births (The number for Illinois includes one case for which county of residence is missing)

² 95% confidence intervals for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 5. Prevalence Rates¹ and 95% Confidence Intervals for Major Alimentary Tract Defects in Children Under 2 Years of Age by Selected Counties of Residence,² 2014-2018

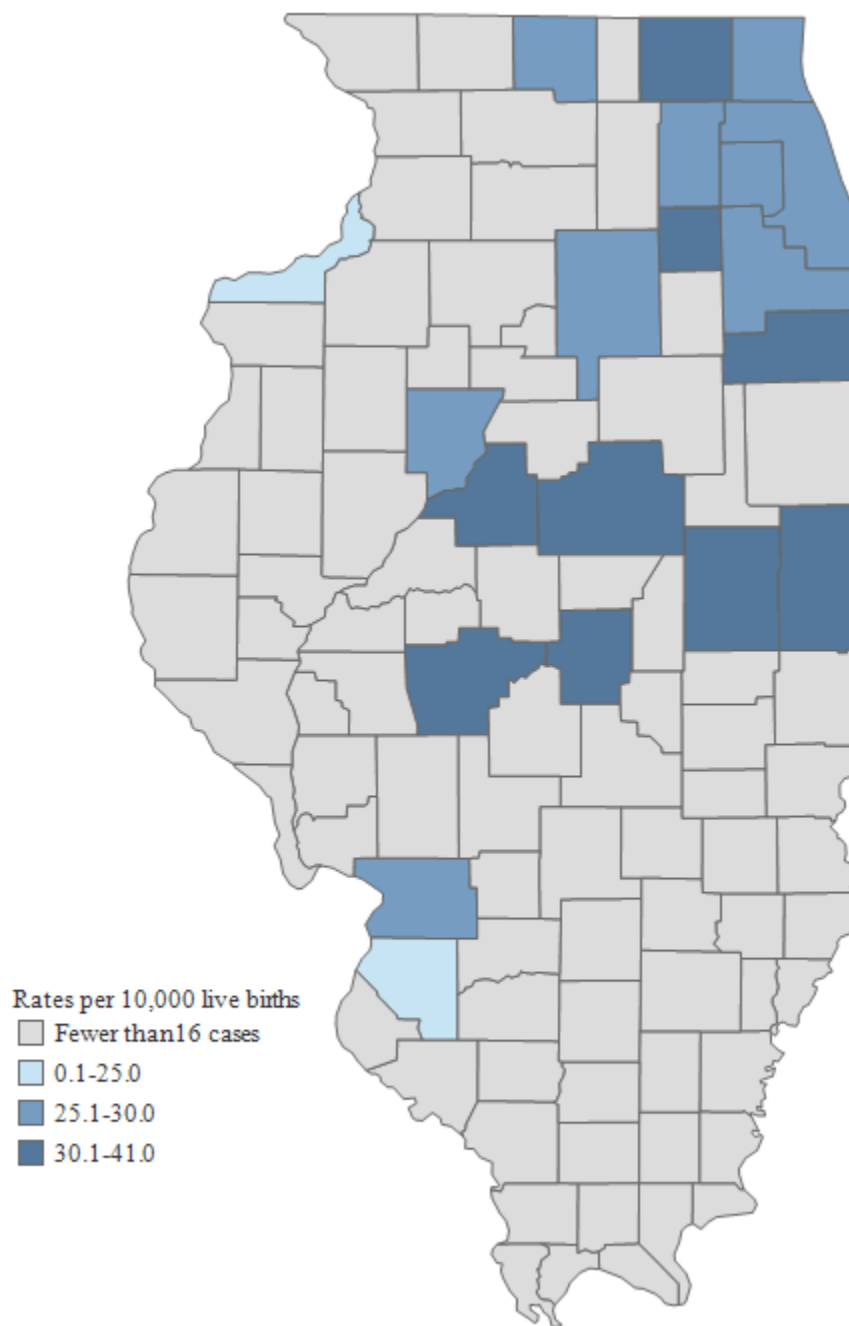


¹ Rates per 10,000 live births

² Only counties with 16 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 6. Map of Prevalence Rates for Major Alimentary Tract Defects in Children Under 2 Years of Age by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

GENITOURINARY DEFECTS

These defects affect the male and female reproductive organs and urinary tracts. Some are relatively minor, common defects that may be readily repaired by surgery. Others are more serious and potentially life-threatening malformations. A description of each defect follows, together with Table 8, which gives the five-year prevalence rates for each defect for the state. Table 9 provides five-year prevalence rates for all major genitourinary defects combined by county. Figures 7 and 8 present prevalence rates for major genitourinary defects for selected counties in table and map formats, respectively.

Bladder exstrophy occurs when the bladder is formed inside-out. Part of the abdominal wall and bladder wall are missing. This condition is usually repaired surgically.

Cloacal exstrophy is a common cloacal cavity with gut, urethra, and reproductive tracts open with exstrophy of the cavity. This condition usually occurs with other defects, including omphalocele, closed neural tube defects, and imperforate anus. A series of surgeries is necessary to treat this condition.

Congenital posterior urethral valves is a congenital obstructing membrane located in the male posterior urethra and is the most common cause of bladder outlet obstruction in males. The condition is treated surgically.

Hypospadias is a relatively common abnormality that appears as an abnormal penile opening on the underside of the penis rather than at the end. The condition may be surgically corrected if needed for cosmetic, urologic, or reproductive reasons.

Renal agenesis/hypoplasia is the absence or maldevelopment of the kidneys; it may be bilateral or unilateral. Newborns with bilateral renal agenesis often die of respiratory failure within a few hours of birth. Unilateral renal agenesis may not be detected during the perinatal period.

Table 8. Total Number and Prevalence Rates of Major Genitourinary System Defects in Children Under 2 Years of Age, Illinois, 2014-2018

Defect	ICD-10-CM Codes	Cases	Rate ¹	95% CI ²
Bladder exstrophy	Q64.10, Q64.19	17	0.2	(0.1, 0.4)
Cloacal Exstrophy	Q64.12	26	0.3	(0.2, 0.5)
Congenital posterior urethral valves	Q64.2	97	1.3	(1.0, 1.5)
Hypospadias	Q54.0-Q54.3, Q54.5-Q54.9	2,627	34.3	(33.0, 35.7)
Renal agenesis/hypoplasia	Q60.0-Q60.6	681	8.9	(8.2, 9.6)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Table 9. Total Number and Prevalence Rates of Genitourinary Tract Defects in Children Under 2 Years of Age by County of Residence, 2014-2018

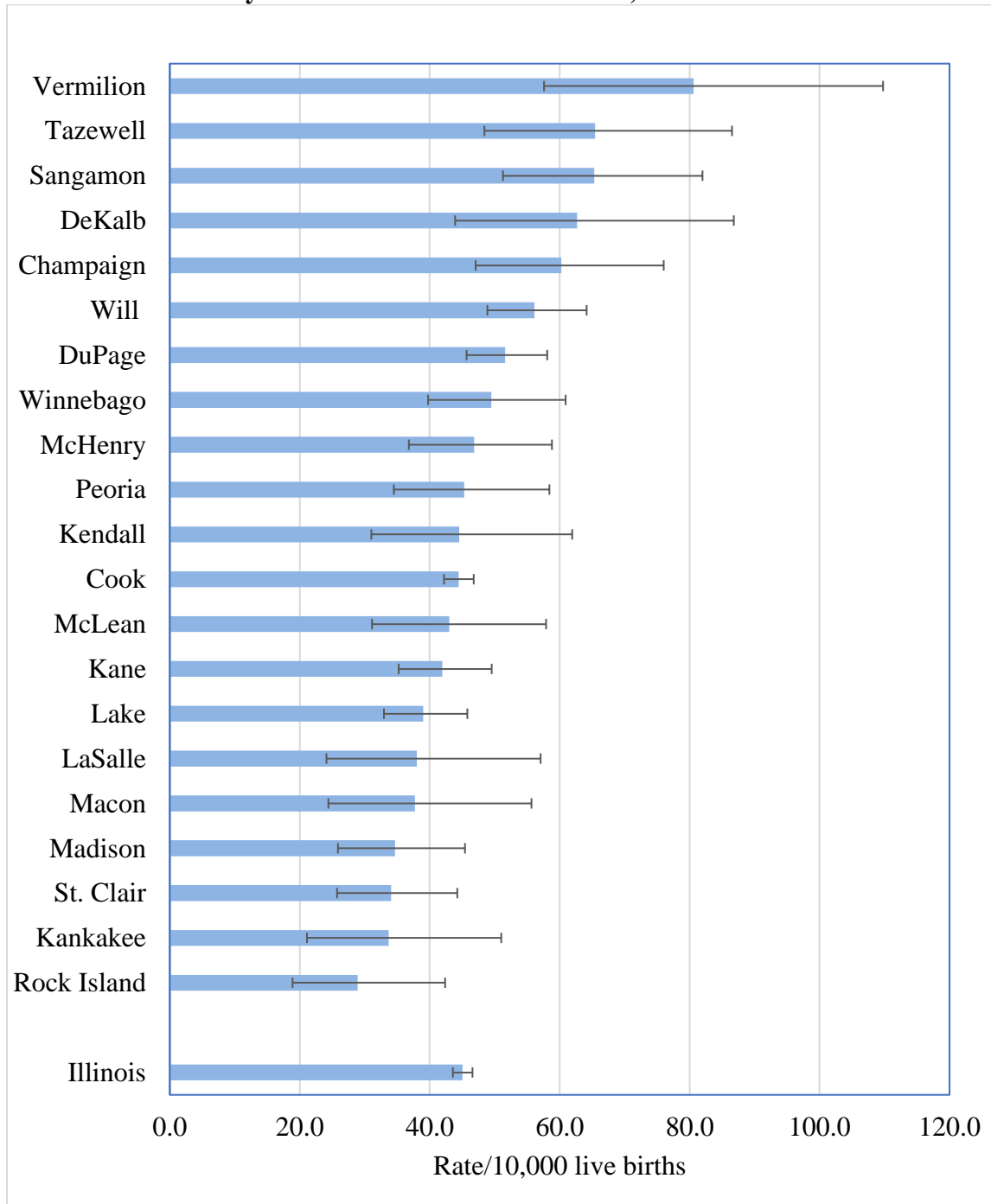
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	3,448	45.1	43.6	46.6	Lee	12	70.1	36.2	122.4
Adams	14	34.2	18.7	57.3	Livingston	15	73.7	41.3	121.6
Alexander	1	25.6	0.6	142.5	Logan	10	65.7	31.5	120.9
Bond	3	39.8	8.2	116.4	McDonough	5	36.3	11.8	84.7
Boone	13	45.0	24.0	77.0	McHenry	74	46.8	36.8	58.8
Brown	1	33.4	0.8	186.3	McLean	43	43.0	31.1	57.9
Bureau	8	47.8	20.7	94.3	Macon	25	37.7	24.4	55.7
Calhoun	0	0.0	0.0	161.1	Macoupin	13	56.4	30.0	96.4
Carroll	5	71.1	23.1	166.0	Madison	52	34.6	25.9	45.4
Cass	2	22.8	2.8	82.3	Marion	9	36.6	16.7	69.5
Champaign	71	60.3	47.1	76.0	Marshall	1	15.8	0.4	88.3
Christian	9	53.4	24.4	101.4	Mason	1	15.1	0.4	84.0
Clark	1	11.1	0.3	61.7	Massac	0	0.0	0.0	46.9
Clay	2	25.5	3.1	92.3	Menard	6	98.7	36.2	214.8
Clinton	7	33.1	13.3	68.2	Mercer	2	27.7	3.4	99.9
Coles	12	47.6	24.6	83.1	Monroe	1	5.6	0.1	31.4
Cook	1,472	44.4	42.2	46.8	Montgomery	4	26.9	7.3	68.9
Crawford	2	18.9	2.3	68.4	Morgan	6	33.2	12.2	72.4
Cumberland	3	48.2	9.9	140.7	Moultrie	3	32.3	6.7	94.4
DeKalb	36	62.7	43.9	86.8	Ogle	16	60.1	34.4	97.6
DeWitt	3	34.5	7.1	100.9	Peoria	59	45.3	34.5	58.4
Douglas	7	54.1	21.8	111.5	Perry	4	38.8	10.6	99.4
DuPage	274	51.6	45.7	58.1	Piatt	8	88.5	38.2	174.4
Edgar	2	22.7	2.7	81.9	Pike	5	51.9	16.9	121.2
Edwards	0	0.0	0.0	93.6	Pope	1	69.0	1.7	384.3
Effingham	12	52.0	26.9	90.9	Pulaski	1	31.3	0.8	174.1
Fayette	5	40.9	13.3	95.5	Putnam	4	160.6	43.8	411.3
Ford	3	40.7	8.4	118.8	Randolph	6	36.0	13.2	78.3
Franklin	13	54.5	29.0	93.2	Richland	3	31.7	6.5	92.7
Fulton	10	58.0	27.8	106.7	Rock Island	26	28.9	18.9	42.4
Gallatin	2	76.0	9.2	274.7	St.Clair	56	34.1	25.7	44.2
Greene	1	15.0	0.4	83.8	Saline	6	37.9	13.9	82.4
Grundy	16	53.5	30.6	86.9	Sangamon	74	65.3	51.3	82.0
Hamilton	0	0.0	0.0	85.4	Schuyler	2	65.6	7.9	236.9
Hancock	2	20.9	2.5	75.5	Scott	0	0.0	0.0	153.7
Hardin	0	0.0	0.0	241.1	Shelby	6	48.4	17.8	105.4
Henderson	0	0.0	0.0	113.9	Stark	1	32.9	0.8	183.3
Henry	7	26.7	10.8	55.1	Stephenson	7	28.3	11.4	58.3
Iroquois	6	39.0	14.3	84.9	Tazewell	49	65.4	48.4	86.5
Jackson	10	29.4	14.1	54.1	Union	0	0.0	0.0	40.0
Jasper	2	35.2	4.3	127.2	Vermilion	40	80.6	57.6	109.8
Jefferson	9	36.5	16.7	69.2	Wabash	1	14.1	0.4	78.6
Jersey	0	0.0	0.0	35.3	Warren	6	56.2	20.6	122.3
JoDaviess	2	22.8	2.8	82.3	Washington	1	12.6	0.3	70.3
Johnson	2	37.2	4.5	134.5	Wayne	0	0.0	0.0	35.6
Kane	138	41.9	35.2	49.5	White	4	52.3	14.2	133.9
Kankakee	22	33.7	21.1	51.0	Whiteside	11	35.4	17.7	63.3
Kendall	35	44.5	31.0	61.9	Will	215	56.1	48.9	64.2
Knox	16	56.2	32.1	91.3	Williamson	18	46.1	27.3	72.8
Lake	148	39.0	33.0	45.8	Winnebago	89	49.5	39.8	60.9
LaSalle	23	38.0	24.1	57.1	Woodford	15	70.6	39.5	116.4
Lawrence	0	0.0	0.0	46.2					

¹Per 10,000 live births

²95% confidence intervals for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 7. Prevalence Rates¹ and 95% Confidence Intervals for Major Genitourinary Defects in Children Under 2 Years of Age by Selected Counties of Residence,² 2014-2018

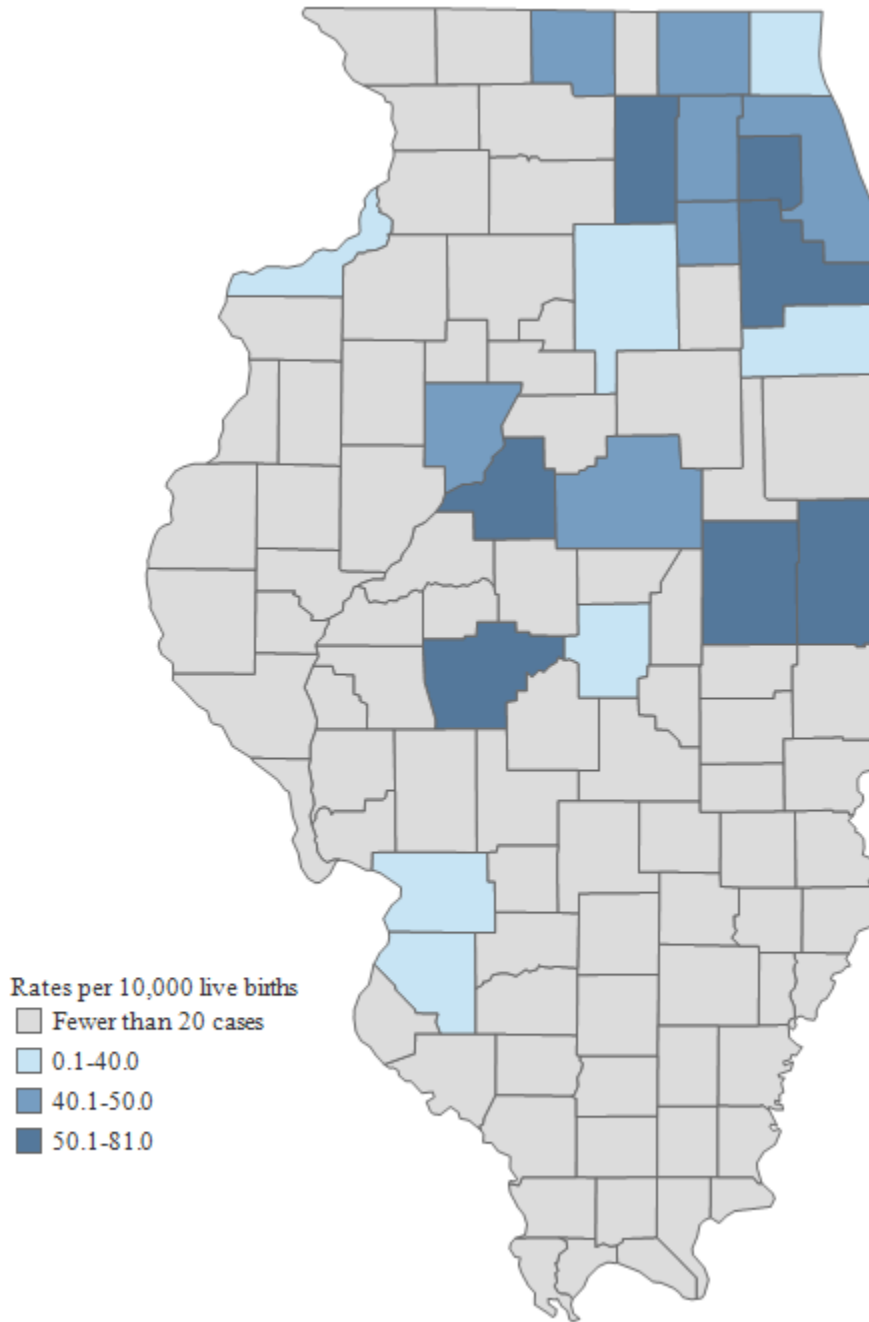


¹ Rates per 10,000 live births

² Only counties with 20 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 8. Map of Prevalence Rates for Major Genitourinary Defects in Children Under 2 Years of Age by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

MUSCULOSKELETAL DEFECTS

These malformations make up a diverse group of defects affecting the musculoskeletal system. A description of each defect follows, together with Table 10, which gives the five-year prevalence rates for each defect for the State. Table 11 provides five-year prevalence rates for all major musculoskeletal defects combined by county. Figures 9 and 10 present prevalence rates for major musculoskeletal defects for selected counties in table and map formats, respectively.

Abdominal wall defects include gastroschisis (a herniation of the abdominal contents through a defect in the abdominal wall) and omphalocele (protrusion of the intestines or other organs through the belly button in which the organs are covered by a thin layer of tissue). For both conditions, surgery is usually needed soon after birth to put the organs back in the abdomen. For extensive conditions the intervention may be done in stages.

Club foot is a congenital structural foot deformity that may involve the lower leg, ankle and foot joints, ligaments, and tendons. The condition can usually be treated without surgery.

Craniosynostosis occurs when one or more bones in the skull join together prior to full brain development, causing the skull to become misshapen as the brain continues to grow. The condition ranges from mild to severe depending upon how many and which parts of skull have closed. Diagnosis is usually made shortly after birth during a physical exam followed up by imaging for confirmation. Depending upon severity, surgery may be required to allow room for the brain to grow.

Diaphragmatic hernia occurs when contents of the abdomen protrude through a defect in the diaphragm, impeding lung growth. Surgical repair is needed soon after birth.

Reduction deformities may affect upper or lower limbs. They may result in a shortening or absence of one or both limbs.

Table 10. Total Number and Prevalence Rates of Major Musculoskeletal Defects in Children Under 2 Years of Age, Illinois, 2014-2018

Defect	ICD-10-CM Codes	Cases	Rate¹	95% CI²
Clubfoot	Q66.0, Q66.89	1,137	14.9	(14.0, 15.7)
Craniosynostosis	Q75.0	422	5.5	(5.0, 6.1)
Diaphragmatic hernia	Q79.0, Q79.1	237	3.1	(2.7, 3.5)
Gastroschisis	Q79.3	280	3.7	(3.2, 4.1)
Limb reduction deformity	Q71.0-Q73.8	357	4.7	(4.2, 5.2)
Omphalocele	Q79.2	159	2.1	(1.8, 2.4)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Table 11. Total Number and Prevalence Rates of Musculoskeletal Defects in Children Under 2 Years of Age by County of Residence, 2014-2018

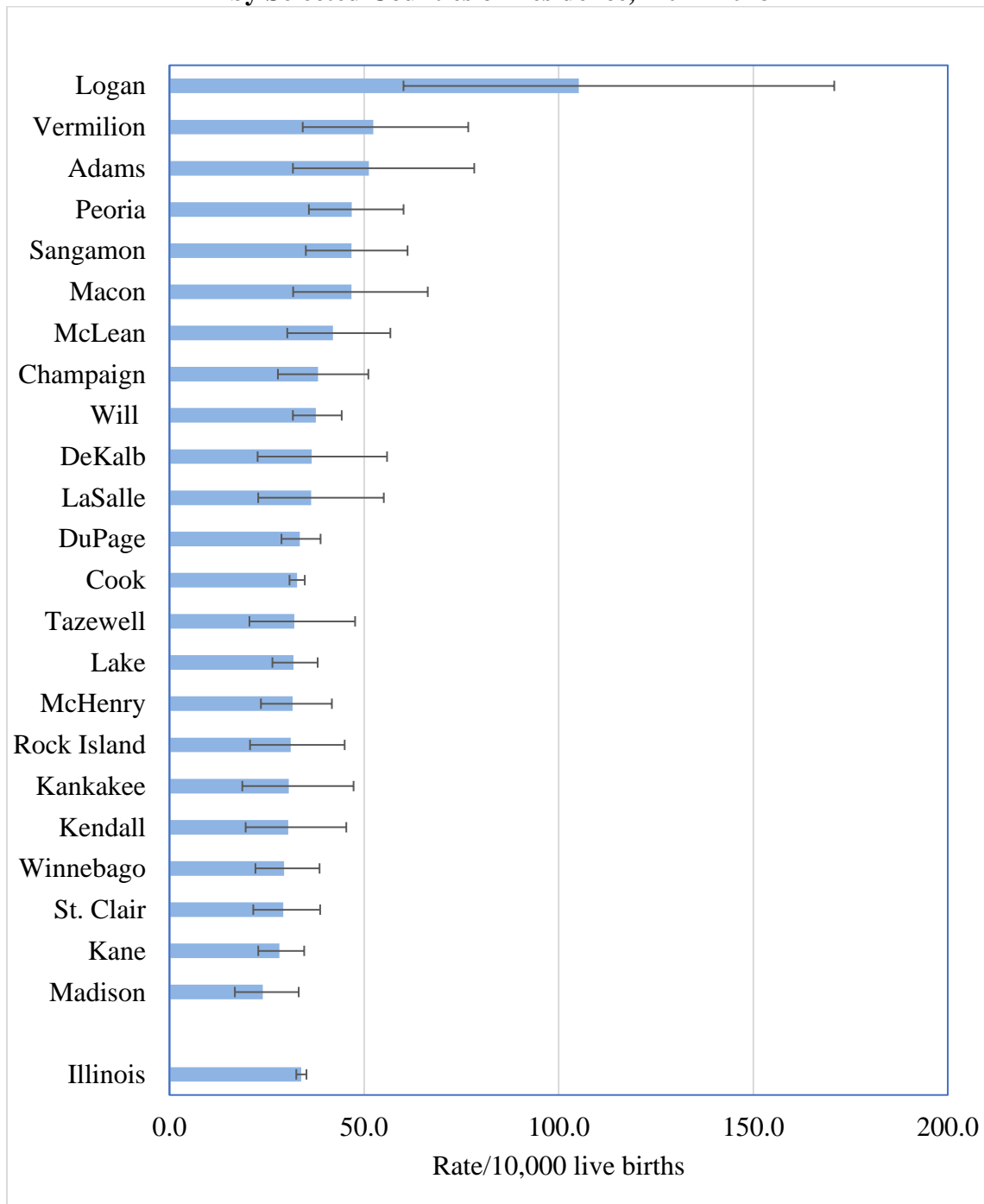
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	2,592	33.9	32.6	35.2	Lee	10	58.4	28.0	107.4
Adams	21	51.2	31.7	78.3	Livingston	11	54.1	27.0	96.7
Alexander	0	0.0	0.0	94.3	Logan	16	105.2	60.1	170.8
Bond	3	39.8	8.2	116.4	McDonough	4	29.0	7.9	74.4
Boone	11	38.1	19.0	68.2	McHenry	50	31.7	23.5	41.7
Brown	1	33.4	0.8	186.3	McLean	42	42.0	30.3	56.8
Bureau	4	23.9	6.5	61.3	Macon	31	46.8	31.8	66.4
Calhoun	0	0.0	0.0	161.1	Macoupin	8	34.7	15.0	68.4
Carroll	1	14.2	0.4	79.3	Madison	36	24.0	16.8	33.2
Cass	0	0.0	0.0	42.0	Marion	9	36.6	16.7	69.5
Champaign	45	38.2	27.9	51.1	Marshall	3	47.5	9.8	138.9
Christian	9	53.4	24.4	101.4	Mason	8	120.7	52.1	237.8
Clark	1	11.1	0.3	61.7	Massac	0	0.0	0.0	46.9
Clay	6	76.6	28.1	166.8	Menard	0	0.0	0.0	60.7
Clinton	7	33.1	13.3	68.2	Mercer	0	0.0	0.0	51.0
Coles	8	31.7	13.7	62.5	Monroe	1	5.6	0.1	31.4
Cook	1,085	32.8	30.8	34.8	Montgomery	11	74.0	37.0	132.4
Crawford	0	0.0	0.0	34.9	Morgan	7	38.8	15.6	79.9
Cumberland	3	48.2	9.9	140.7	Moultrie	6	64.6	23.7	140.6
DeKalb	21	36.6	22.6	55.9	Ogle	14	52.6	28.8	88.3
DeWitt	5	57.5	18.7	134.3	Peoria	61	46.8	35.8	60.1
Douglas	13	100.5	53.5	171.9	Perry	3	29.1	6.0	85.1
DuPage	178	33.5	28.8	38.8	Piatt	5	55.3	18.0	129.1
Edgar	1	11.3	0.3	63.2	Pike	3	31.2	6.4	91.0
Edwards	0	0.0	0.0	93.6	Pope	0	0.0	0.0	254.4
Effingham	10	43.4	20.8	79.8	Pulaski	1	31.3	0.8	174.1
Fayette	8	65.5	28.3	129.0	Putnam	1	40.2	1.0	223.8
Ford	2	27.1	3.3	97.9	Randolph	5	30.0	9.7	70.0
Franklin	10	41.9	20.1	77.1	Richland	2	21.1	2.6	76.4
Fulton	8	46.4	20.0	91.4	Rock Island	28	31.1	20.7	45.0
Gallatin	1	38.0	1.0	211.8	St.Clair	48	29.2	21.5	38.7
Greene	5	75.2	24.4	175.5	Saline	8	50.5	21.8	99.5
Grundy	8	26.8	11.6	52.7	Sangamon	53	46.8	35.0	61.2
Hamilton	1	23.1	0.6	129.0	Schuyler	1	32.8	0.8	182.7
Hancock	2	20.9	2.5	75.5	Scott	0	0.0	0.0	153.7
Hardin	0	0.0	0.0	241.1	Shelby	5	40.4	13.1	94.2
Henderson	1	30.9	0.8	172.0	Stark	2	65.8	8.0	237.7
Henry	10	38.2	18.3	70.3	Stephenson	6	24.3	8.9	52.8
Iroquois	9	58.5	26.7	111.0	Tazewell	24	32.1	20.5	47.7
Jackson	5	14.7	4.8	34.3	Union	0	0.0	0.0	40.0
Jasper	3	52.8	10.9	154.4	Vermilion	26	52.4	34.2	76.8
Jefferson	12	48.6	25.1	84.9	Wabash	0	0.0	0.0	52.0
Jersey	5	47.8	15.5	111.6	Warren	6	56.2	20.6	122.3
JoDaviess	1	11.4	0.3	63.5	Washington	2	25.3	3.1	91.2
Johnson	1	18.6	0.5	103.8	Wayne	2	19.3	2.3	69.7
Kane	93	28.3	22.8	34.6	White	0	0.0	0.0	48.2
Kankakee	20	30.6	18.7	47.3	Whiteside	7	22.5	9.0	46.4
Kendall	24	30.5	19.6	45.4	Will	144	37.6	31.7	44.3
Knox	9	31.6	14.5	60.0	Williamson	7	17.9	7.2	36.9
Lake	121	31.9	26.4	38.1	Winnebago	53	29.5	22.1	38.6
LaSalle	22	36.4	22.8	55.1	Woodford	8	37.6	16.2	74.1
Lawrence	0	0.0	0.0	46.2					

¹ Per 10,000 live births

² 95% confidence intervals for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 9. Prevalence Rates¹ and 95% Confidence Intervals for Major Musculoskeletal Defects in Children Under 2 Years of Age by Selected Counties of Residence,² 2014-2018

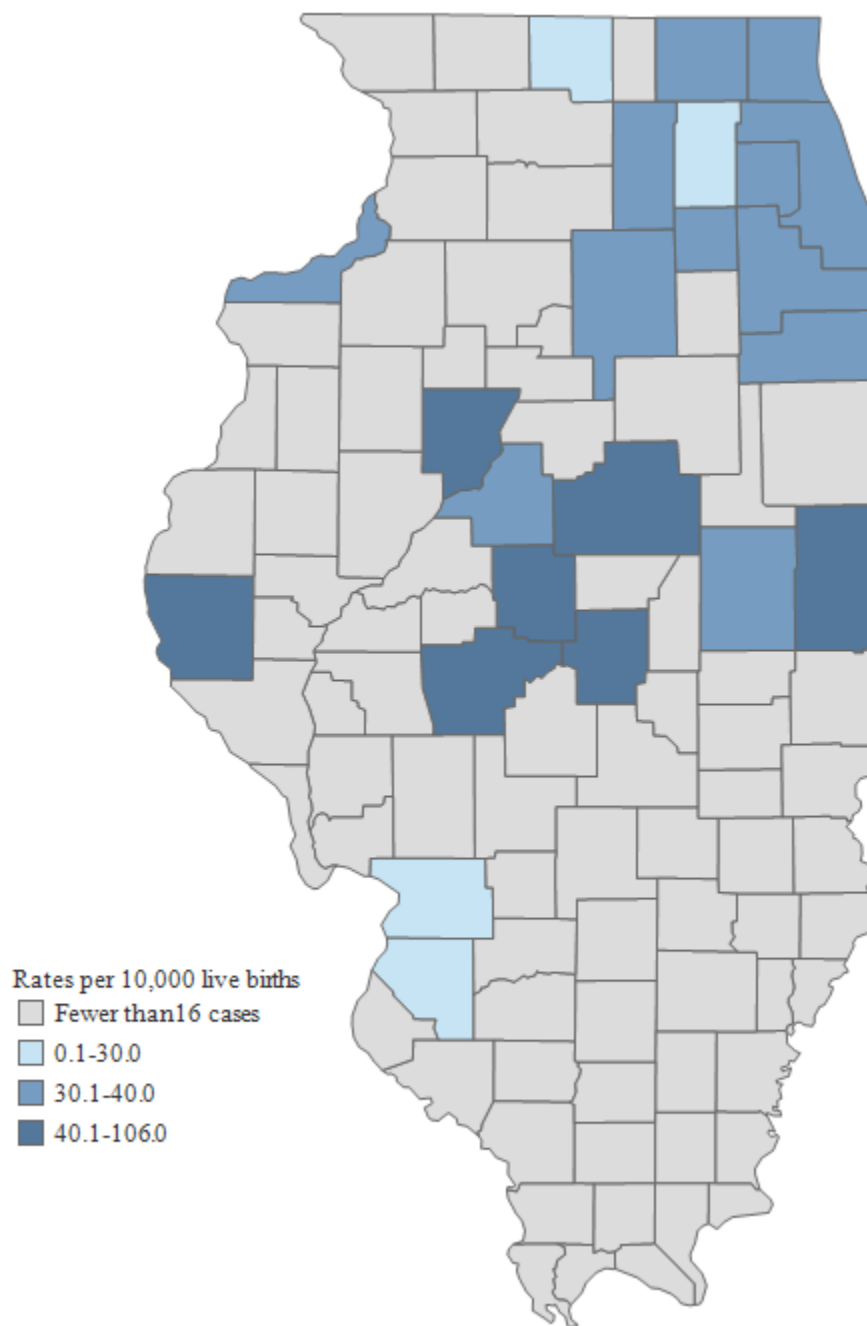


¹ Rates per 10,000 live births

² Only counties with 16 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 10. Map of Prevalence Rates for Major Musculoskeletal Defects in Children Under 2 Years of Age by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

CHROMOSOMAL CONDITIONS

Chromosomal conditions can arise from abnormal numbers of chromosomes or from breaks or deletions in specific fragments of the chromosomes. APORS collects information about three conditions, called “trisomies,” in which a baby is born with an extra copy of a specific chromosome. This extra copy affects the growth and development of the body and brain. Congenital heart defects (especially septal defects) are common among these infants and are a major cause of death. APORS also collects information about two syndromes in which genes are either missing, altered, or there is a deletion. A description of each condition collected by APORS follows, together with Table 12, which gives the five-year prevalence rates for each condition for the state. Table 13 provides five-year prevalence rates for all major chromosomal defects combined by county. Figures 11 and 12 present prevalence rates for major chromosomal defects for selected counties in table and map formats, respectively.

Deletion 22q11.2 syndrome is caused by a deletion of a part of chromosome 22 at the location designated q11.2. This deletion causes varying issues in individuals affecting many parts of the body. Heart defects and cleft palate are commonly seen. Other issues include, but are not limited to, immune system issues, kidney abnormalities, gastrointestinal issues, low blood calcium, thrombocytopenia, developmental delay, skeletal irregularities, and facial dysmorphism. Individuals are also more likely than those without the syndrome to have attention-deficit/ hyperactivity disorder (ADHD) and autism spectrum disorder (National Institutes of Health, 04/24/2020).

Down syndrome (trisomy 21) is associated with the presence of a third number 21 chromosome. This causes distinctive physical features, including short stature and a characteristic facial appearance. Most individuals with Down syndrome have mild to moderate intellectual disability. They may also have other health problems, such as hearing loss, sleep apnea, ear infections, and congenital heart defects. Early and ongoing interventions, including speech, physical, and occupational therapies are helpful in assuring all attain their full potential.

Edward syndrome (trisomy 18) is associated with the presence of a third number 18 chromosome. It causes heart and other organ defects, major physical abnormalities, and severe developmental disabilities. Few children afflicted with this disease survive beyond one year of life, and those who do survive usually have profound disabilities.

Patau syndrome (trisomy 13) is associated with the presence of a third number 13 chromosome. Newborns have numerous organ defects, physical abnormalities, and profound developmental disabilities. Most die in the first days or weeks of life due to severe medical problems.

Turner Syndrome is a condition affecting females in which an X chromosome is either missing or altered. Although variable in degree from person to person, distinctive physical features associated with this syndrome include short stature, body edema, loose neck skin, low set ears, and wide-set eyes. Congenital heart and renal defects and premature loss of ovarian function are common (National Institutes of Health, 4/24/2020).

Table 12. Total Number and Prevalence Rates of Major Chromosomal Defects in Children Under 2 Years of Age, Illinois, 2014-2018

Defect	ICD-10-CM Codes	Cases	Rate ¹	95% CI ²
Deletion 22q11.2	Q93.81	85	1.1	(0.9, 1.4)
Down syndrome (trisomy 21)	Q90.0-Q90.9	1,102	14.4	(13.6, 15.3)
Edward syndrome (trisomy 18)	Q91.0-Q91.3	202	2.6	(2.3, 3.0)
Patau syndrome (trisomy 13)	Q91.4-Q91.7	95	1.2	(1.0, 1.5)
Turner syndrome	Q96.0-Q96.9	90	1.2	(0.9, 1.4)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Table 13. Total Number and Prevalence Rates of Chromosomal Defects in Children Under 2 Years of Age by County of Residence, 2014-2018

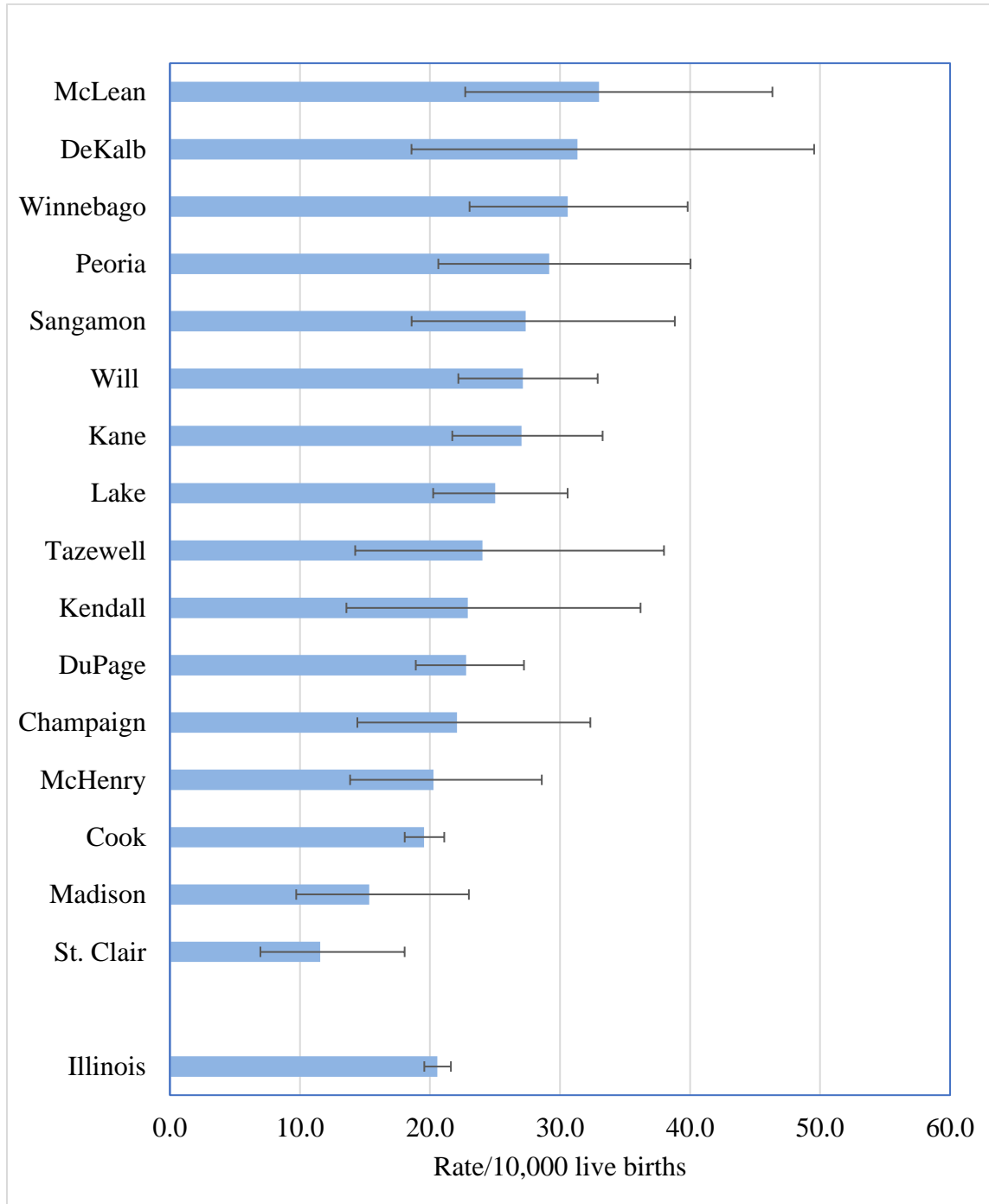
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	1,574	20.6	19.6	21.6	Lee	5	29.2	9.5	68.2
Adams	5	12.2	4.0	28.5	Livingston	4	19.7	5.4	50.3
Alexander	0	0.0	0.0	94.3	Logan	3	19.7	4.1	57.6
Bond	1	13.3	0.3	74.0	McDonough	2	14.5	1.8	52.5
Boone	3	10.4	2.1	30.4	McHenry	32	20.3	13.9	28.6
Brown	0	0.0	0.0	123.4	McLean	33	33.0	22.7	46.3
Bureau	3	17.9	3.7	52.4	Macon	10	15.1	7.2	27.7
Calhoun	0	0.0	0.0	161.1	Macoupin	3	13.0	2.7	38.0
Carroll	2	28.4	3.4	102.8	Madison	23	15.3	9.7	23.0
Cass	1	11.4	0.3	63.5	Marion	3	12.2	2.5	35.7
Champaign	26	22.1	14.4	32.3	Marshall	1	15.8	0.4	88.3
Christian	2	11.9	1.4	42.9	Mason	1	15.1	0.4	84.0
Clark	0	0.0	0.0	40.9	Massac	0	0.0	0.0	46.9
Clay	0	0.0	0.0	47.1	Menard	2	32.9	4.0	118.8
Clinton	0	0.0	0.0	17.4	Mercer	1	13.8	0.4	77.1
Coles	7	27.8	11.2	57.2	Monroe	1	5.6	0.1	31.4
Cook	647	19.5	18.1	21.1	Montgomery	1	6.7	0.2	37.5
Crawford	2	18.9	2.3	68.4	Morgan	7	38.8	15.6	79.9
Cumberland	0	0.0	0.0	59.2	Moultrie	2	21.5	2.6	77.8
DeKalb	18	31.3	18.6	49.5	Ogle	7	26.3	10.6	54.2
DeWitt	1	11.5	0.3	64.1	Peoria	38	29.2	20.6	40.0
Douglas	6	46.4	17.0	101.0	Perry	0	0.0	0.0	35.8
DuPage	121	22.8	18.9	27.2	Piatt	0	0.0	0.0	40.8
Edgar	0	0.0	0.0	41.8	Pike	3	31.2	6.4	91.0
Edwards	0	0.0	0.0	93.6	Pope	0	0.0	0.0	254.4
Effingham	2	8.7	1.1	31.3	Pulaski	0	0.0	0.0	115.3
Fayette	5	40.9	13.3	95.5	Putnam	0	0.0	0.0	148.1
Ford	1	13.6	0.3	75.5	Randolph	2	12.0	1.5	43.3
Franklin	3	12.6	2.6	36.8	Richland	1	10.6	0.3	58.9
Fulton	3	17.4	3.6	50.9	Rock Island	12	13.3	6.9	23.3
Gallatin	1	38.0	1.0	211.8	St.Clair	19	11.6	7.0	18.1
Greene	1	15.0	0.4	83.8	Saline	2	12.6	1.5	45.6
Grundy	11	36.8	18.4	65.8	Sangamon	31	27.4	18.6	38.8
Hamilton	0	0.0	0.0	85.4	Schuyler	0	0.0	0.0	120.9
Hancock	2	20.9	2.5	75.5	Scott	0	0.0	0.0	153.7
Hardin	0	0.0	0.0	241.1	Shelby	2	16.1	2.0	58.3
Henderson	0	0.0	0.0	113.9	Stark	0	0.0	0.0	121.3
Henry	3	11.5	2.4	33.5	Stephenson	3	12.1	2.5	35.5
Iroquois	5	32.5	10.5	75.8	Tazewell	18	24.0	14.2	38.0
Jackson	5	14.7	4.8	34.3	Union	1	10.8	0.3	60.4
Jasper	0	0.0	0.0	64.9	Vermilion	9	18.1	8.3	34.4
Jefferson	5	20.3	6.6	47.3	Wabash	1	14.1	0.4	78.6
Jersey	1	9.6	0.2	53.3	Warren	1	9.4	0.2	52.2
JoDaviess	0	0.0	0.0	42.0	Washington	1	12.6	0.3	70.3
Johnson	1	18.6	0.5	103.8	Wayne	1	9.7	0.2	53.8
Kane	89	27.0	21.7	33.3	White	0	0.0	0.0	48.2
Kankakee	11	16.8	8.4	30.1	Whiteside	4	12.9	3.5	32.9
Kendall	18	22.9	13.6	36.2	Will	104	27.1	22.2	32.9
Knox	2	7.0	0.9	25.4	Williamson	1	2.6	0.1	14.3
Lake	95	25.0	20.2	30.6	Winnebago	55	30.6	23.0	39.8
LaSalle	7	11.6	4.7	23.8	Woodford	6	28.2	10.4	61.4
Lawrence	1	12.5	0.3	69.8					

¹ Per 10,000 live births (The number for Illinois includes one case for which county of residence is missing.)

² 95% confidence intervals for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 11. Prevalence Rates¹ and 95% Confidence Intervals for Major Chromosomal Defects in Children Under 2 Years of Age by Selected Counties of Residence,² 2014-2018

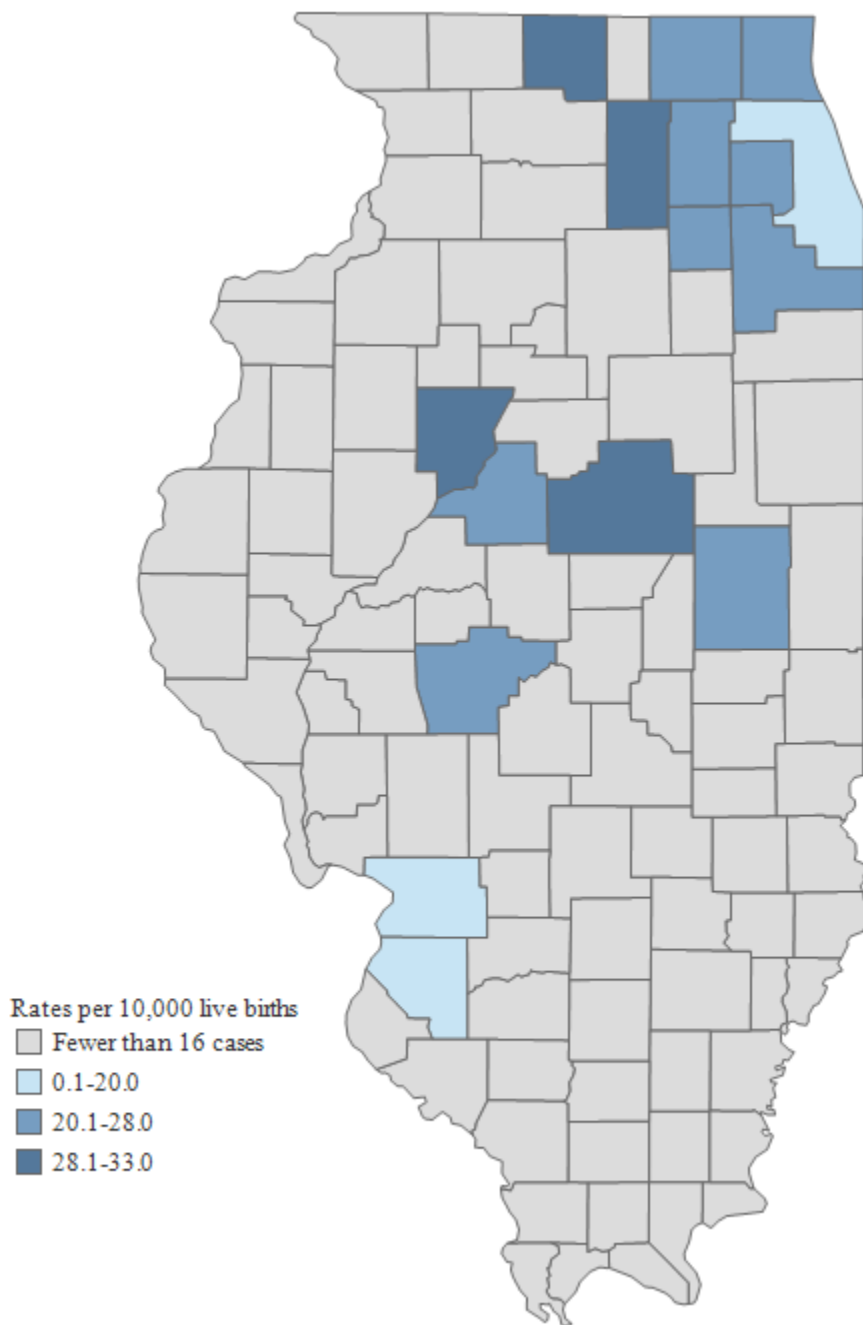


¹ Rates per 10,000 live births

² Only counties with 16 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 12. Map of Prevalence Rates for Major Chromosomal Defects in Children Under 2 Years of Age by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

SECTION II

OTHER ADVERSE PREGNANCY OUTCOMES

PREMATURITY

Infants born before 37 weeks gestation are considered preterm, and the earlier a child is born the greater the risk for a range of health issues related to prematurity. APORS collects information on very preterm infants who are born before 31 weeks of completed gestation. These infants are more susceptible to infections and can have serious conditions such as intraventricular hemorrhage (bleeding in the brain), patent ductus arteriosus, retinopathy of prematurity, breathing problems, necrotizing enterocolitis, and problems with other organs. Further, they may suffer developmental delays in the longer term (March of Dimes).

While medical advances over the years have increased the survival of extremely premature infants, disorders relating to short gestation and low birth weight remained the second leading cause of infant death in the U.S. and the leading cause of infant death in Illinois in 2018 (17.1 and 23.6% respectively) (Ely M & Driscoll AK and IDPH, 2021).

There are several risk factors that can lead to premature births. The National Institutes of Health reported March 1, 2019 that these include, but are not limited to:

- Previous pre-term births.
- Multiple gestation pregnancies.
- Use of assisted reproductive technology.
- Having a short cervix or a cervix that shortens during the second trimester of pregnancy.
- Certain medical conditions, including infections, high blood pressure, and diabetes.
- Being either underweight or obese prior to pregnancy.
- Being of African-American or American Indian/Alaska Native race.
- Maternal age either younger than 18 or older than 35.
- Short inter-pregnancy interval.
- Late or no prenatal care.
- Smoking, drinking alcohol, or using illicit drugs during pregnancy.

Table 14 provides five-year prevalence rates for infants born before 37 completed weeks of gestation reported to APORS by county, and Figures 13 and 14 present prevalence rates for selected counties in Illinois.

Table 14. Total Number and Prevalence Rates of Infants with Prematurity (<31 Weeks Completed Gestation) by County of Residence, 2014-2018

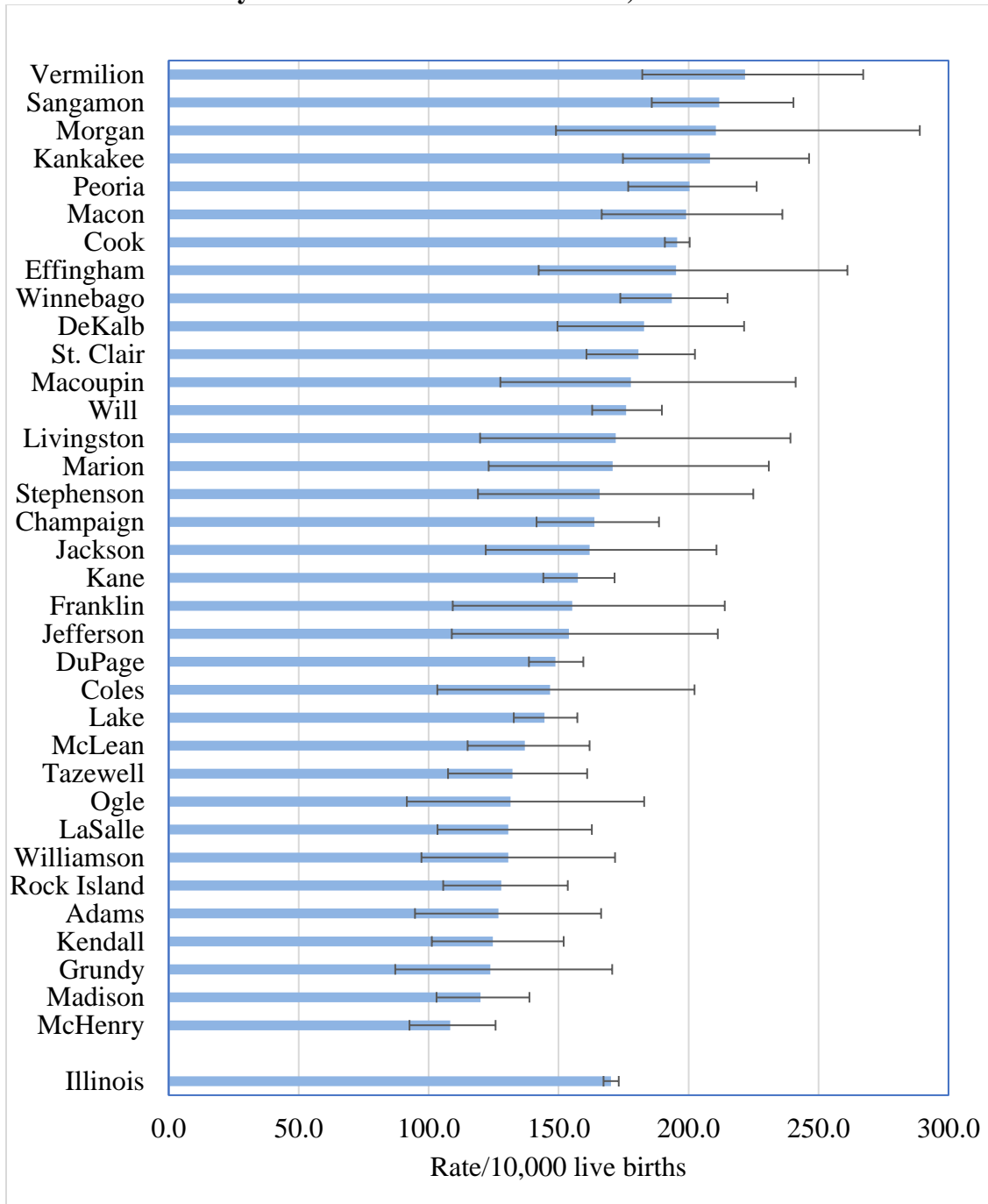
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	13,025	170.2	167.3	173.1	Lee	21	122.7	75.9	187.5
Adams	52	126.9	94.7	166.4	Livingston	35	172.0	119.8	239.2
Alexander	4	102.3	27.9	261.9	Logan	27	177.5	117.0	258.3
Bond	5	66.4	21.6	155.0	McDonough	24	174.3	111.7	259.3
Boone	33	114.3	78.7	160.5	McHenry	171	108.3	92.6	125.8
Brown	0	0.0	0.0	123.4	McLean	137	137.0	115.0	161.9
Bureau	24	143.5	92.0	213.6	Macon	132	199.1	166.6	236.1
Calhoun	2	87.3	10.6	315.5	Macoupin	41	177.8	127.6	241.2
Carroll	5	71.1	23.1	166.0	Madison	180	119.9	103.0	138.8
Cass	10	113.9	54.6	209.5	Marion	42	170.8	123.1	230.9
Champaign	193	163.8	141.5	188.6	Marshall	6	95.1	34.9	207.0
Christian	22	130.6	81.8	197.7	Mason	10	150.8	72.3	277.4
Clark	6	66.4	24.4	144.6	Massac	8	101.7	43.9	200.3
Clay	10	127.7	61.2	234.9	Menard	7	115.1	46.3	237.2
Clinton	26	122.9	80.3	180.1	Mercer	5	69.2	22.5	161.4
Coles	37	146.8	103.3	202.3	Monroe	5	28.1	9.1	65.7
Cook	6,479	195.6	190.9	200.4	Montgomery	23	154.8	98.1	232.2
Crawford	13	123.0	65.5	210.3	Morgan	38	210.5	149.0	289.0
Cumberland	9	144.5	66.1	274.2	Moultrie	6	64.6	23.7	140.6
DeKalb	105	182.9	149.6	221.4	Ogle	35	131.5	91.6	182.9
DeWitt	15	172.6	96.6	284.7	Peoria	261	200.4	176.8	226.2
Douglas	16	123.7	70.7	201.0	Perry	12	116.5	60.2	203.5
DuPage	790	148.8	138.6	159.5	Piatt	10	110.6	53.0	203.4
Edgar	12	136.1	70.3	237.7	Pike	9	93.5	42.7	177.4
Edwards	0	0.0	0.0	93.6	Pope	2	137.9	16.7	498.3
Effingham	45	195.1	142.3	261.1	Pulaski	5	156.3	50.7	364.6
Fayette	13	106.4	56.6	181.9	Putnam	5	200.8	65.2	468.6
Ford	7	94.9	38.1	195.4	Randolph	18	107.9	64.0	170.6
Franklin	37	155.2	109.3	213.9	Richland	9	95.1	43.5	180.6
Fulton	14	81.2	44.4	136.3	Rock Island	115	127.9	105.6	153.5
Gallatin	0	0.0	0.0	140.3	St.Clair	297	180.7	160.7	202.5
Greene	5	75.2	24.4	175.5	Saline	13	82.1	43.7	140.3
Grundy	37	123.8	87.2	170.6	Sangamon	240	211.8	185.8	240.3
Hamilton	3	69.4	14.3	202.9	Schuyler	4	131.1	35.7	335.8
Hancock	6	62.7	23.0	136.5	Scott	1	41.7	1.1	232.2
Hardin	0	0.0	0.0	241.1	Shelby	10	80.7	38.7	148.4
Henderson	2	61.7	7.5	223.0	Stark	3	98.7	20.4	288.4
Henry	28	107.0	71.1	154.6	Stephenson	41	165.8	119.0	224.9
Iroquois	34	220.9	153.0	308.7	Tazewell	99	132.2	107.5	161.0
Jackson	55	161.9	122.0	210.7	Union	1	10.8	0.3	60.4
Jasper	7	123.2	49.5	253.9	Vermilion	110	221.7	182.2	267.2
Jefferson	38	153.9	108.9	211.3	Wabash	2	28.2	3.4	101.9
Jersey	13	124.3	66.2	212.5	Warren	13	121.7	64.8	208.1
JoDaviess	4	45.6	12.4	116.6	Washington	9	113.6	52.0	215.7
Johnson	5	93.1	30.2	217.3	Wayne	14	135.1	73.9	226.7
Kane	518	157.4	144.1	171.5	White	4	52.3	14.2	133.9
Kankakee	136	208.3	174.7	246.4	Whiteside	19	61.1	36.8	95.4
Kendall	98	124.7	101.2	151.9	Will	674	175.9	162.9	189.7
Knox	34	119.5	82.7	166.9	Williamson	51	130.6	97.2	171.7
Lake	549	144.6	132.8	157.2	Winnebago	348	193.5	173.7	215.0
LaSalle	79	130.6	103.4	162.8	Woodford	28	131.7	87.5	190.3
Lawrence	9	112.8	51.6	214.1					

¹ Per 10,000 births (The number for Illinois includes one case for which county of residence is missing.)

²95 percent confidence intervals

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 13. Prevalence Rates¹ and 95% Confidence Intervals for Infants with Prematurity (<31 Completed Weeks Gestation) by Selected Counties of Residence,² 2014-2018

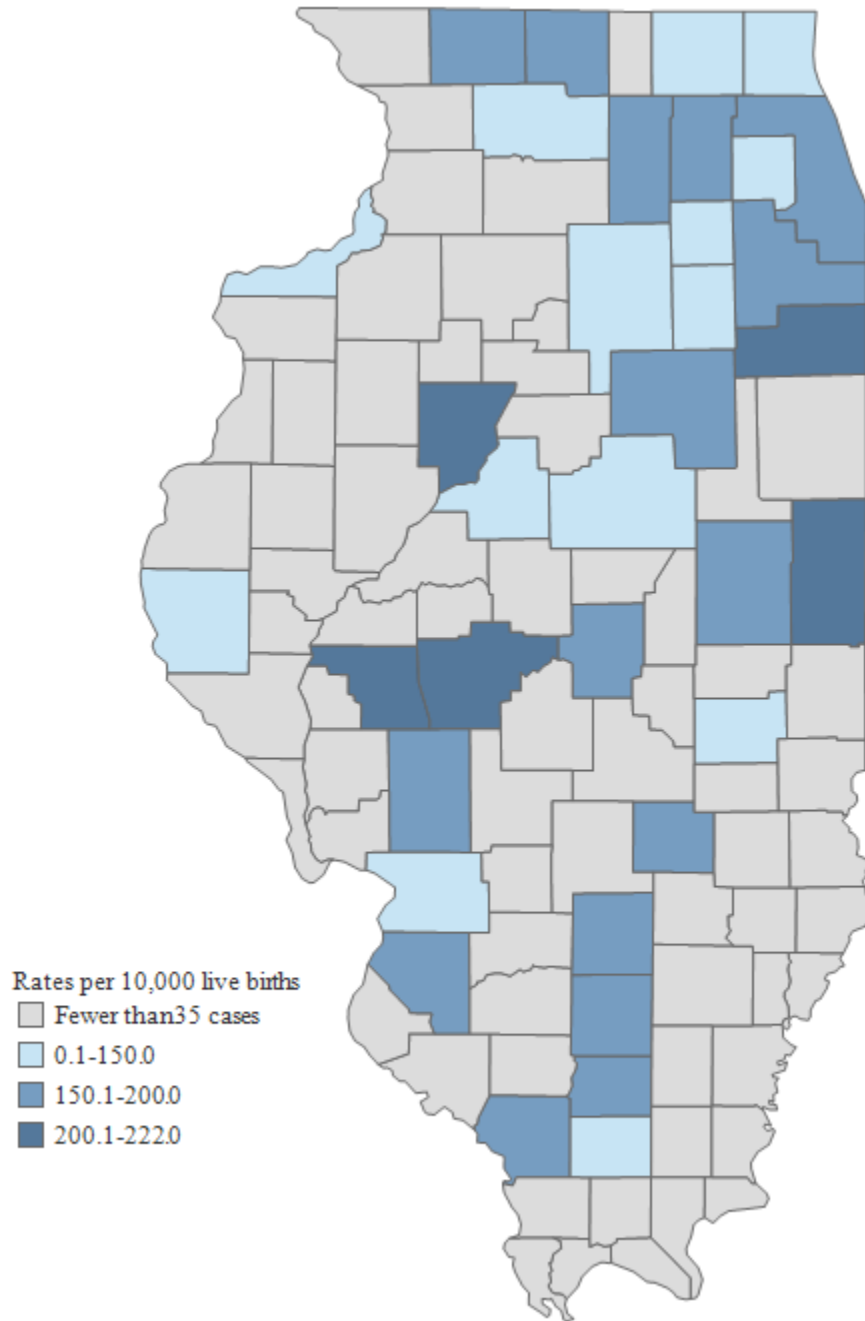


¹ Rates per 10,000 live births

² Only counties with 35 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 14. Map of Prevalence Rates for Infants with Prematurity (<31 Completed Weeks Gestation), by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

SERIOUS CONGENITAL INFECTIONS

Congenital infections may be either viral or bacterial. Infants may have been exposed *in utero* (by transfer across the placental barrier) or during delivery. A description of each condition collected by APORS follows, together with Table 15, which gives the five-year prevalence rates for each condition for the state. Table 16 provides five-year prevalence rates for all serious congenital infections combined by county. Figures 15 and 16 present prevalence rates for all serious congenital infections for selected counties in table and map formats, respectively.

Chlamydia is caused by the *Chlamydia trachomatis* bacterium. Infection can lead to dangerous complications during pregnancy and birth. If a pregnant woman is untreated, her baby can develop conjunctivitis (threatening eyesight) or pneumonia. Chlamydia also can lead to premature birth or low birth weight.

Cytomegalovirus (CMV) is a common virus that infects many people, but may show no symptoms. Pregnant women can pass the virus to their baby through the placenta when infected for the first time or if infected again during pregnancy. The baby may or may not show signs of infection at birth. Congenital infection may cause hearing loss, intellectual disability, vision loss, and seizures. Tests may be done on a baby within a few weeks of birth to determine whether the baby is infected, and the baby may be treated to lessen the severity of health problems associated with the disease.

Gonorrhea is caused by the *Neisseria gonorrhoeae* bacterium. Gonorrhea can be passed from an infected woman to her newborn infant during delivery, causing neonatal conjunctivitis. Most states require the eyes of newborns be treated with silver nitrate or other medication immediately after birth to prevent gonococcal infection of the eyes, which can lead to blindness.

Group B streptococcus (GBS) is a bacterium that can be part of normal flora in the body and is carried by about 25% of women. The bacteria can cause pneumonia and meningitis in infants who are exposed during delivery. All pregnant women should be tested for the bacteria, and, if positive, treated with antibiotics during labor to prevent disease in the baby.

Hepatitis B virus (HBV) can be passed to a baby during delivery. A baby may be asymptomatic, but as he or she grows up, liver damage may be present. About 80% of liver cancers are caused by HBV infections. A vaccine has been used since 1982 to prevent hepatitis B.

Herpes in a newborn is usually a result of exposure to the herpes simplex virus II (HSV-2) during vaginal delivery. The infection rate is about 50% in primary maternal infection and about 5% in a recurrent infection. The most common clinical symptom is the presence of cutaneous vesicles. In 20% of cases, there is major systemic involvement, central nervous system involvement, or both. Less than 10% of babies with neurologic disease develop normally. The overall mortality rate among infants with untreated infection is 65%.

Listeriosis is caused by infection with the bacterium *Listeria monocytogenes*; half of all infected newborns will die from the illness. Babies infected during pregnancy may be born

prematurely, have a blood infection (sepsis), and may have a serious, whole body infection called granulomatosis infantisepticum. When a baby is infected during childbirth, symptoms usually appear about two weeks after birth; these babies typically have meningitis or sepsis.

Rubella, or German measles, is caused by the rubella virus. If a woman contracts this virus during pregnancy, the baby may miscarry or be born with birth defects, including deafness, cataracts, heart defects, low birthweight, intellectual disabilities, and damage to the liver and spleen.

Sepsis may be caused by any of several infections. It is reportable if the infection is confirmed and is invasive. Once the organism has invaded the bloodstream, the infection may lead to pneumonia, septicemia, arthritis, endocarditis, or meningitis.

Syphilis (congenital) is caused by the *Treponema pallidum* bacterium. It can infect the baby either by transplacental passage of bacteria or from contact with an infectious lesion during delivery. Congenital syphilis can cause miscarriage, stillbirth, prematurity, or death shortly after birth. Without immediate treatment, infection can cause many health problems in the baby, including deformed bones, anemia, blindness, deafness, enlarged liver and spleen, and meningitis (CDC).

Tetanus infection in newborns is caused when an infant is exposed to the bacterium *Clostridium tetani* during delivery. The bacteria produce a neurotoxin that selectively blocks inhibitory nerve transmission from the spinal cord to the muscles, allowing the muscles to go into severe spasm. Without treatment, two out of three newborns with tetanus will die.

**Table 15. Total Number and Prevalence Rates of Serious Congenital Infections
in Newborn Infants, Illinois, 2014-2018**

Defect	ICD-10-CM Codes	Cases	Rate¹	95% CI²
Chlamydial infections	A7489, A749, P231	14	0.2	(0.1, 0.3)
Cytomegalovirus	P35.1	135	1.8	(1.5, 2.1)
Gonococcal infections	A5431	2	0.0	(0.0, 0.1)
Group B streptococcus	B95.1, J15.3, P36.0	215	2.8	(2.4, 3.2)
Hepatitis B	P35.3	4	0.1	(0.0, 0.1)
Prenatal exposure to hepatitis B	Z205_B	1,426	18.6	(17.7, 19.6)
Herpes and other infections	P35.2	65	0.8	(0.7, 1.1)
Listeriosis	P37.2	0	0.0	(0.0, 0.0)
Rubella	P35.0	0	0.0	(0.0, 0.0)
Sepsis (confirmed septicemia)	P36.9_C ³ , P3639, P364, P365, P368, B377, P3610, P3619, P362, P3630	1,071	14.0	(13.2, 14.9)
Syphilis (disease or prenatal exposure to active disease)	A50.01-A53.9	425	5.6	(5.0, 6.1)
Tetanus neonatorum	A33	0	0.0	(0.0, 0.0)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

³ APORS specific code used to distinguish confirmed sepsis from suspected sepsis

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021.

Table16. Total Number and Prevalence Rates of Serious Infections in Newborn Infants by County of Residence, 2014-2018

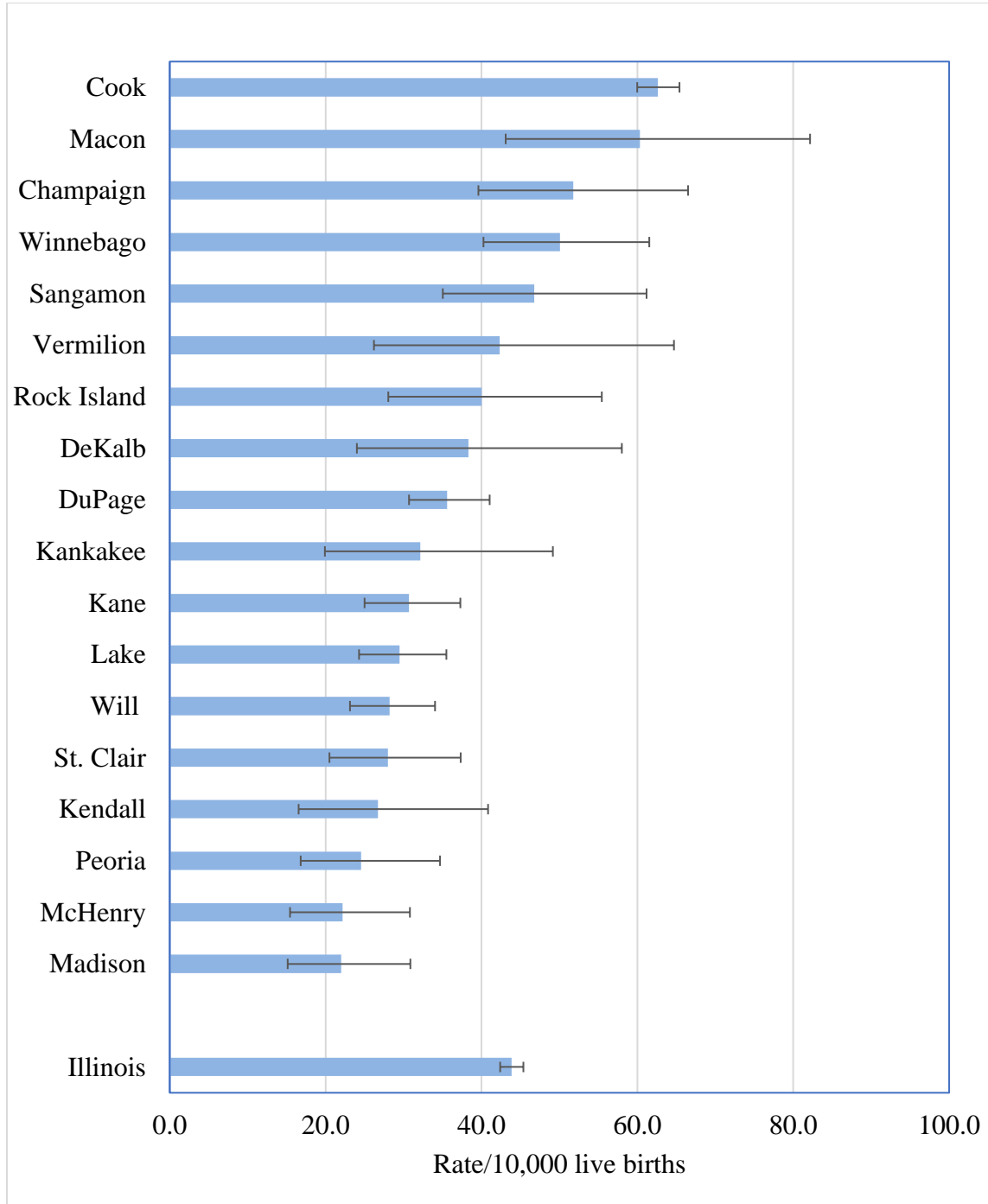
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	3,357	43.9	42.4	45.4	Lee	7	40.9	16.4	84.2
Adams	9	22.0	10.0	41.7	Livingston	4	19.7	5.4	50.3
Alexander	0	0.0	0.0	94.3	Logan	6	39.4	14.5	85.9
Bond	0	0.0	0.0	49.0	McDonough	5	36.3	11.8	84.7
Boone	4	13.9	3.8	35.5	McHenry	35	22.2	15.4	30.8
Brown	0	0.0	0.0	123.4	McLean	14	14.0	7.7	23.5
Bureau	6	35.9	13.2	78.1	Macon	40	60.3	43.1	82.2
Calhoun	1	43.7	1.1	243.3	Macoupin	6	26.0	9.5	56.6
Carroll	3	42.7	8.8	124.7	Madison	33	22.0	15.1	30.9
Cass	5	56.9	18.5	132.9	Marion	2	8.1	1.0	29.4
Champaign	61	51.8	39.6	66.5	Marshall	0	0.0	0.0	58.5
Christian	2	11.9	1.4	42.9	Mason	0	0.0	0.0	55.6
Clark	1	11.1	0.3	61.7	Massac	1	12.7	0.3	70.8
Clay	0	0.0	0.0	47.1	Menard	1	16.4	0.4	91.6
Clinton	3	14.2	2.9	41.5	Mercer	0	0.0	0.0	51.0
Coles	9	35.7	16.3	67.8	Monroe	0	0.0	0.0	20.8
Cook	2,075	62.6	60.0	65.4	Montgomery	2	13.5	1.6	48.6
Crawford	0	0.0	0.0	34.9	Morgan	8	44.3	19.1	87.3
Cumberland	1	16.1	0.4	89.4	Moultrie	1	10.8	0.3	60.0
DeKalb	22	38.3	24.0	58.0	Ogle	9	33.8	15.5	64.2
DeWitt	1	11.5	0.3	64.1	Peoria	32	24.6	16.8	34.7
Douglas	5	38.7	12.6	90.2	Perry	5	48.5	15.8	113.3
DuPage	189	35.6	30.7	41.0	Piatt	1	11.1	0.3	61.6
Edgar	0	0.0	0.0	41.8	Pike	1	10.4	0.3	57.9
Edwards	0	0.0	0.0	93.6	Pope	0	0.0	0.0	254.4
Effingham	5	21.7	7.0	50.6	Pulaski	0	0.0	0.0	115.3
Fayette	1	8.2	0.2	45.6	Putnam	1	40.2	1.0	223.8
Ford	2	27.1	3.3	97.9	Randolph	1	6.0	0.2	33.4
Franklin	7	29.4	11.8	60.5	Richland	0	0.0	0.0	39.0
Fulton	2	11.6	1.4	41.9	Rock Island	36	40.0	28.0	55.4
Gallatin	0	0.0	0.0	140.3	St.Clair	46	28.0	20.5	37.3
Greene	2	30.1	3.6	108.6	Saline	1	6.3	0.2	35.2
Grundy	6	20.1	7.4	43.7	Sangamon	53	46.8	35.0	61.2
Hamilton	0	0.0	0.0	85.4	Schuyler	1	32.8	0.8	182.7
Hancock	1	10.4	0.3	58.2	Scott	1	41.7	1.1	232.2
Hardin	0	0.0	0.0	241.1	Shelby	3	24.2	5.0	70.8
Henderson	1	30.9	0.8	172.0	Stark	0	0.0	0.0	121.3
Henry	2	7.6	0.9	27.6	Stephenson	14	56.6	30.9	95.0
Iroquois	2	13.0	1.6	46.9	Tazewell	12	16.0	8.3	28.0
Jackson	14	41.2	22.5	69.1	Union	0	0.0	0.0	40.0
Jasper	1	17.6	0.4	98.1	Vermilion	21	42.3	26.2	64.7
Jefferson	4	16.2	4.4	41.5	Wabash	0	0.0	0.0	52.0
Jersey	1	9.6	0.2	53.3	Warren	10	93.6	44.9	172.2
JoDaviess	0	0.0	0.0	42.0	Washington	1	12.6	0.3	70.3
Johnson	0	0.0	0.0	68.7	Wayne	3	29.0	6.0	84.6
Kane	101	30.7	25.0	37.3	White	0	0.0	0.0	48.2
Kankakee	21	32.2	19.9	49.2	Whiteside	8	25.7	11.1	50.7
Kendall	21	26.7	16.5	40.8	Will	108	28.2	23.1	34.0
Knox	6	21.1	7.7	45.9	Williamson	12	30.7	15.9	53.7
Lake	112	29.5	24.3	35.5	Winnebago	90	50.1	40.3	61.5
LaSalle	11	18.2	9.1	32.5	Woodford	1	4.7	0.1	26.2
Lawrence	1	12.5	0.3	69.8					

¹ Per 10,000 live births

² 95% confidence intervals for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 15. Prevalence Rates¹ and 95% Confidence Intervals for Serious Congenital Infections in Newborn Infants for Selected Counties of Residence,² 2014-2018

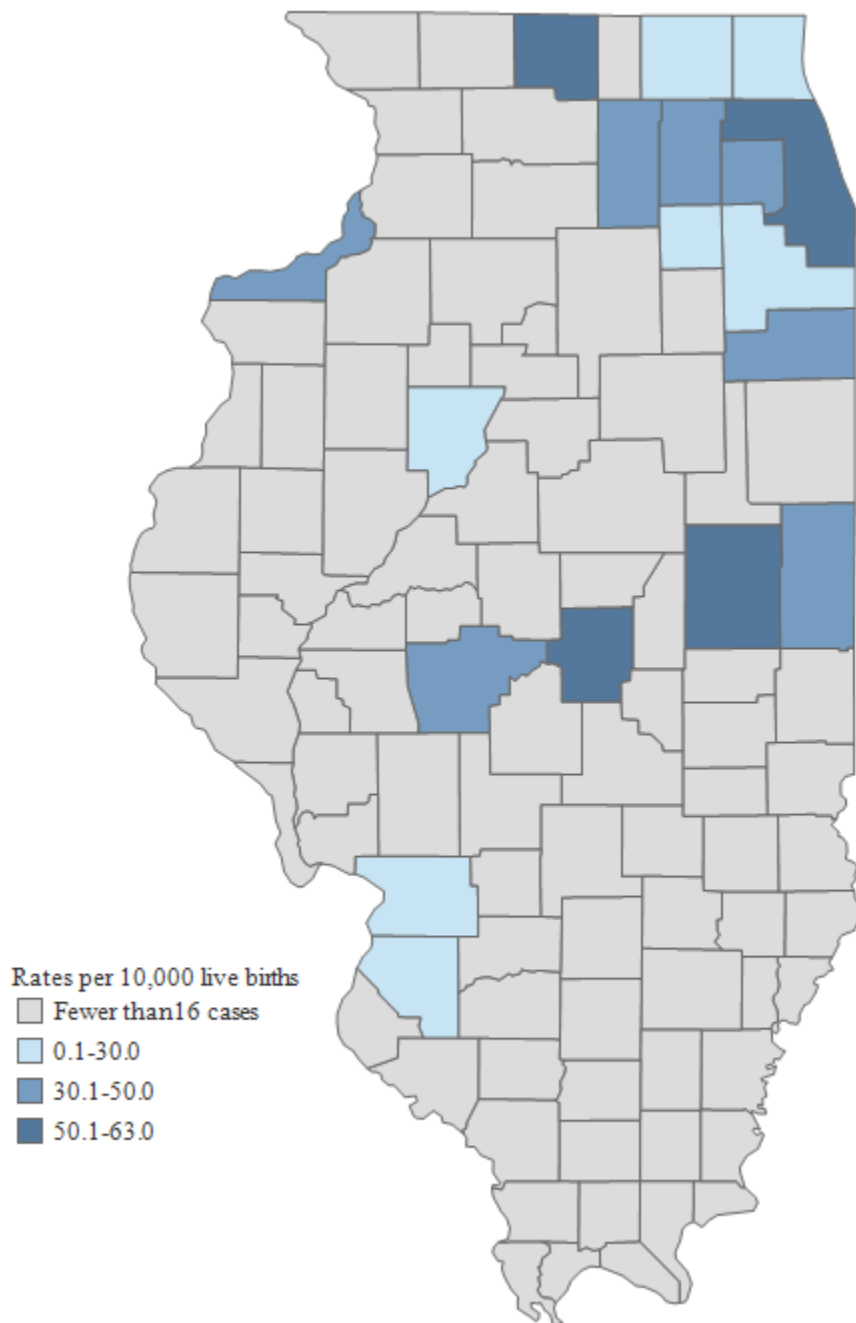


¹ Rates per 10,000 live births

² Only counties with 16 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 16. Map of Prevalence Rates for Serious Congenital Infections in Newborn Infants by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

PERINATAL DEATHS

Perinatal deaths refer to a combination of fetal deaths of at least 20 weeks gestation and neonatal deaths (under 28 days old). APORS collects information from hospitals about neonatal deaths that occur while the baby is still in the hospital for the newborn stay. Additionally, information about fetal deaths is obtained from the IDPH’s Division of Vital Records. Data on elective abortions are not included. Table 17 provides five-year prevalence rates for perinatal deaths for the state. Table 18 provides five-year prevalence rates for perinatal deaths by county. Figures 17 and 18 present five-year prevalence rates by selected counties in Illinois.

Table 17. Total Number and Prevalence Rates of Perinatal Deaths, Illinois, 2014-2018

Defect	Cases	Rate¹	95% CI²
Fetal deaths	4,371	57.1	(55.4, 58.8)
Deaths during newborn stay	3,626	47.4	(45.8, 48.9)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021.

Table18. Total Number and Prevalence Rates of Perinatal Deaths by County of Residence, 2014-2018

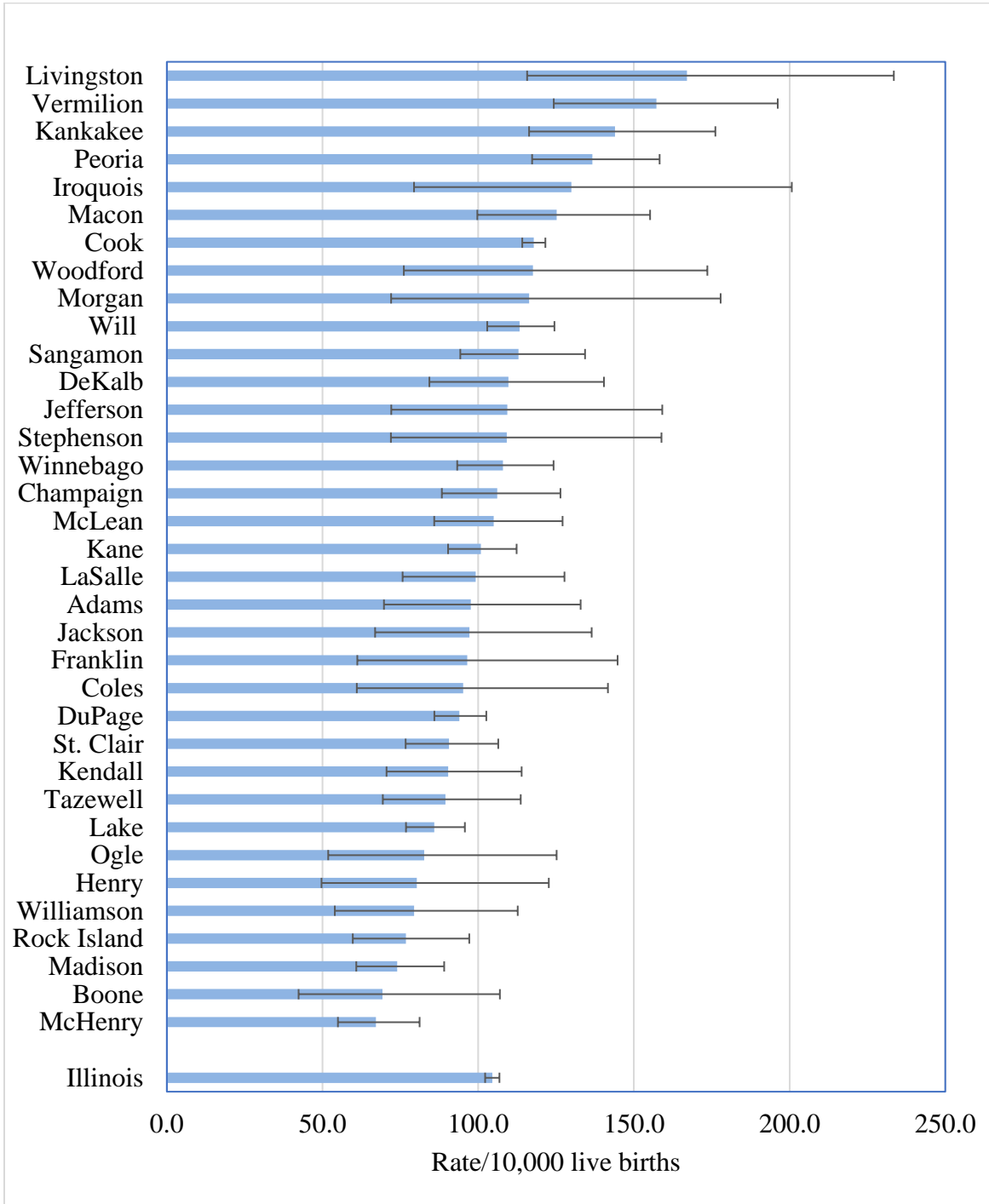
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	7,997	104.5	102.2	106.8	Lee	15	87.6	49.0	144.5
Adams	40	97.6	69.7	132.9	Livingston	34	167.1	115.7	233.5
Alexander	3	76.7	15.8	224.2	Logan	16	105.2	60.1	170.8
Bond	2	26.6	3.2	95.9	McDonough	15	108.9	61.0	179.7
Boone	20	69.3	42.3	107.0	McHenry	106	67.1	54.9	81.2
Brown	1	33.4	0.8	186.3	McLean	105	105.0	85.9	127.1
Bureau	11	65.8	32.8	117.7	Macon	83	125.2	99.7	155.2
Calhoun	2	87.3	10.6	315.5	Macoupin	16	69.4	39.7	112.7
Carroll	1	14.2	0.4	79.3	Madison	111	74.0	60.8	89.1
Cass	7	79.7	32.1	164.3	Marion	17	69.1	40.3	110.7
Champaign	125	106.1	88.3	126.4	Marshall	5	79.2	25.7	184.9
Christian	16	95.0	54.3	154.2	Mason	8	120.7	52.1	237.8
Clark	1	11.1	0.3	61.7	Massac	1	12.7	0.3	70.8
Clay	7	89.4	35.9	184.2	Menard	6	98.7	36.2	214.8
Clinton	13	61.5	32.7	105.1	Mercer	3	41.5	8.6	121.3
Coles	24	95.2	61.0	141.7	Monroe	0	0.0	0.0	20.8
Cook	3,902	117.8	114.1	121.6	Montgomery	15	100.9	56.5	166.5
Crawford	8	75.7	32.7	149.1	Morgan	21	116.3	72.0	177.8
Cumberland	7	112.4	45.2	231.5	Moultrie	6	64.6	23.7	140.6
DeKalb	63	109.7	84.3	140.4	Ogle	22	82.7	51.8	125.2
DeWitt	9	103.6	47.4	196.6	Peoria	178	136.6	117.3	158.3
Douglas	14	108.3	59.2	181.7	Perry	4	38.8	10.6	99.4
DuPage	499	94.0	85.9	102.6	Piatt	13	143.8	76.6	245.9
Edgar	5	56.7	18.4	132.3	Pike	8	83.1	35.9	163.7
Edwards	1	25.4	0.6	141.4	Pope	0	0.0	0.0	254.4
Effingham	19	82.4	49.6	128.7	Pulaski	3	93.8	19.3	274.0
Fayette	8	65.5	28.3	129.0	Putnam	1	40.2	1.0	223.8
Ford	5	67.8	22.0	158.1	Randolph	10	60.0	28.7	110.3
Franklin	23	96.5	61.2	144.8	Richland	9	95.1	43.5	180.6
Fulton	16	92.8	53.0	150.7	Rock Island	69	76.7	59.7	97.1
Gallatin	3	114.1	23.5	333.4	St.Clair	149	90.6	76.7	106.4
Greene	4	60.2	16.4	154.0	Saline	11	69.4	34.7	124.3
Grundy	19	63.6	38.3	99.3	Sangamon	128	113.0	94.2	134.3
Hamilton	3	69.4	14.3	202.9	Schuyler	1	32.8	0.8	182.7
Hancock	3	31.3	6.5	91.6	Scott	0	0.0	0.0	153.7
Hardin	0	0.0	0.0	241.1	Shelby	11	88.8	44.3	158.9
Henderson	0	0.0	0.0	113.9	Stark	3	98.7	20.4	288.4
Henry	21	80.2	49.7	122.7	Stephenson	27	109.2	71.9	158.8
Iroquois	20	130.0	79.4	200.7	Tazewell	67	89.5	69.4	113.6
Jackson	33	97.1	66.9	136.4	Union	1	10.8	0.3	60.4
Jasper	7	123.2	49.5	253.9	Vermilion	78	157.2	124.3	196.2
Jefferson	27	109.4	72.1	159.1	Wabash	1	14.1	0.4	78.6
Jersey	8	76.5	33.0	150.7	Warren	6	56.2	20.6	122.3
JoDaviess	3	34.2	7.0	99.9	Washington	5	63.1	20.5	147.3
Johnson	2	37.2	4.5	134.5	Wayne	8	77.2	33.3	152.2
Kane	332	100.9	90.3	112.3	White	3	39.2	8.1	114.6
Kankakee	94	144.0	116.3	176.2	Whiteside	9	28.9	13.2	54.9
Kendall	71	90.3	70.5	113.9	Will	434	113.3	102.9	124.5
Knox	11	38.7	19.3	69.2	Williamson	31	79.4	53.9	112.7
Lake	326	85.9	76.8	95.7	Winnebago	194	107.9	93.2	124.2
LaSalle	60	99.2	75.7	127.7	Woodford	25	117.6	76.1	173.6
Lawrence	2	25.1	3.0	90.5					

¹Per 10,000 live births (The number for Illinois includes four cases for which county of residence is missing.)

²95% confidence intervals for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting Systems July 2021

Figure 17. Prevalence Rates¹ and 95% Confidence Intervals for Perinatal Deaths for Selected Counties of Residence,² 2014-2018

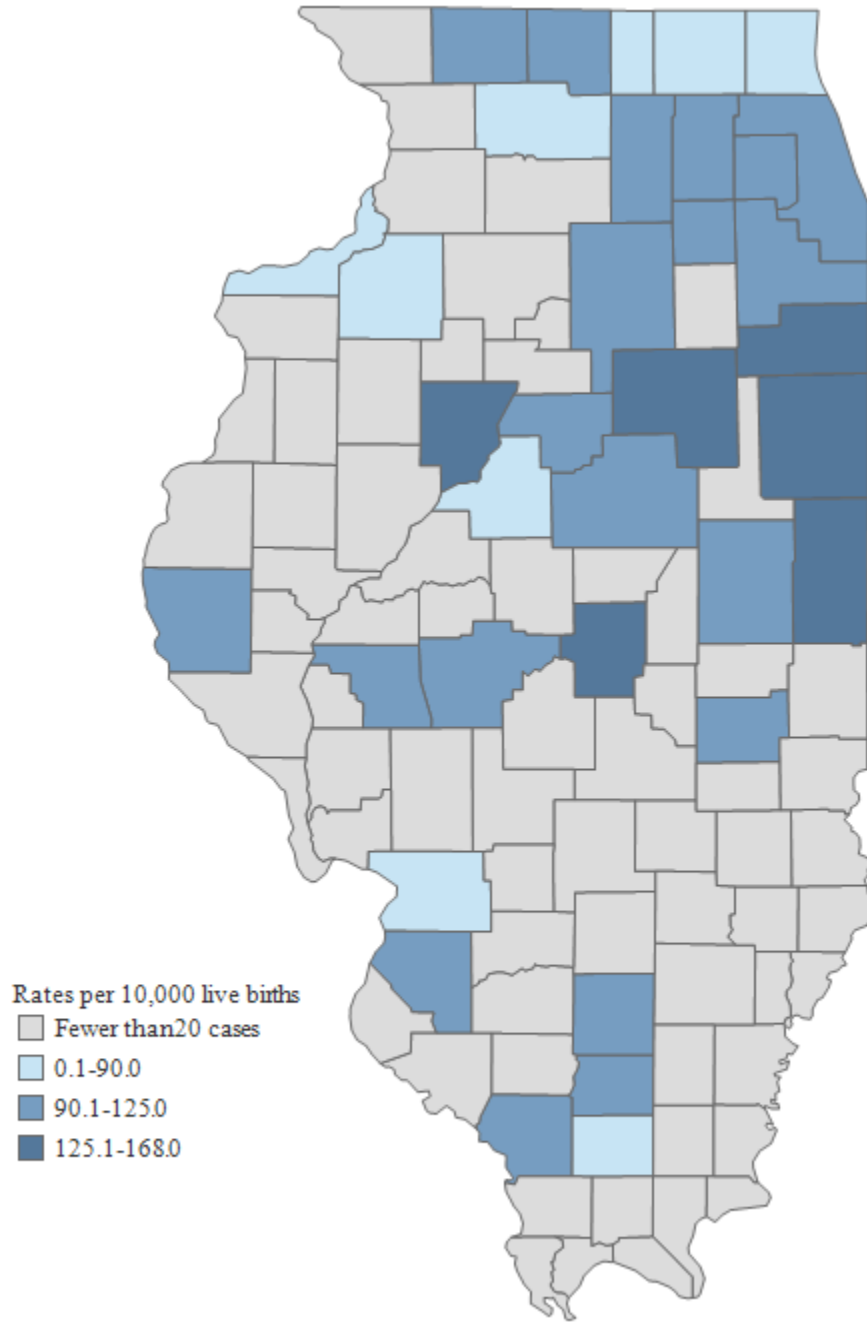


¹ Rates per 10,000 live births

² Only counties with 20 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 18. Map of Prevalence Rates for Perinatal Deaths by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

ENDOCRINE, METABOLIC, OR IMMUNE DISORDERS

APORS works closely with the IDPH Newborn Metabolic Screening program to compile information on endocrine, metabolic, and immune disorders in newborns. Descriptions of the conditions follow. Table 19 provides five-year prevalence rates for the state. Table 20 provides five-year prevalence rates by county. Figures 19 and 20 present prevalence rates for endocrine, metabolic, or immune disorders for selected counties in table and map formats, respectively.

Adrenogenital syndrome is a group of disorders that lead to an overproduction of androgens.

Female newborns have ambiguous genitalia; male newborns have no obvious abnormality but appear to enter puberty as early as 2 to 3 years of age. Some forms are more severe – in the salt-losing form, babies develop symptoms (dehydration, electrolyte changes, and cardiac arrhythmias) soon after birth. Untreated, this condition can lead to death within days.

Cystic fibrosis is a genetic disease that causes the body to produce an abnormally thick, sticky mucus due to the faulty transport of sodium and chloride within cells lining organs, such as the lungs and pancreas. The thick mucus also obstructs the pancreas, preventing enzymes from reaching the intestines to help digest food. This leads to malnutrition and stunted growth.

Immune deficiency diseases occur when one or more parts of the immune system are missing.

There are more than 100 known forms of congenital immune deficiencies (HIV infections do not fit in this category). Many children with immune deficiencies must avoid contagious situations. If a child is diagnosed at birth or soon after with a severe combined immune deficiency, he or she can receive a bone marrow transplant with hopes of reconstituting the missing immune system.

Inborn errors of metabolism include hundreds of genetic disorders affecting metabolism. These errors interfere with the synthesis of proteins, carbohydrates, fats, and enzymes. Absence or excesses of normal or abnormal metabolites can lead to disease and death. Many inborn errors of metabolism are untreatable; others require restrictions or extremely high dosages of certain nutrients.

Neonatal hypothyroidism is characterized by decreased thyroid hormone production at birth. If untreated, hypothyroidism leads to severe defects, including poor vision, developmental disabilities, muscle weakness, and severe lethargy. If diagnosed and treated soon after birth, growth and mental development can proceed relatively normally.

Table 19. Total Number and Prevalence Rates of Endocrine, Metabolic, or Immune Disorders in Newborn Infants, Illinois, 2014-2018

Defect	ICD-10-CM Codes	Cases	Rate¹	95% CI²
Adrenogenital syndrome	E25.0-E25.9	41	0.5	(0.4, 0.7)
Cystic fibrosis	E84.0-E84.9	180	2.4	(2.0, 2.7)
Hypothyroidism	E03.0, E03.1	427	5.6	(5.1, 6.1)
Immune deficiency disease	D81.0, D81.9	76	1.0	(0.8, 1.2)
Inborn errors of metabolism	E70-E79	506	6.6	(6.0, 7.2)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021.

Table 20. Total Number and Prevalence of Endocrine, Metabolic and Immune Disorders in Newborn Infants by County of Residence, 2014-2018

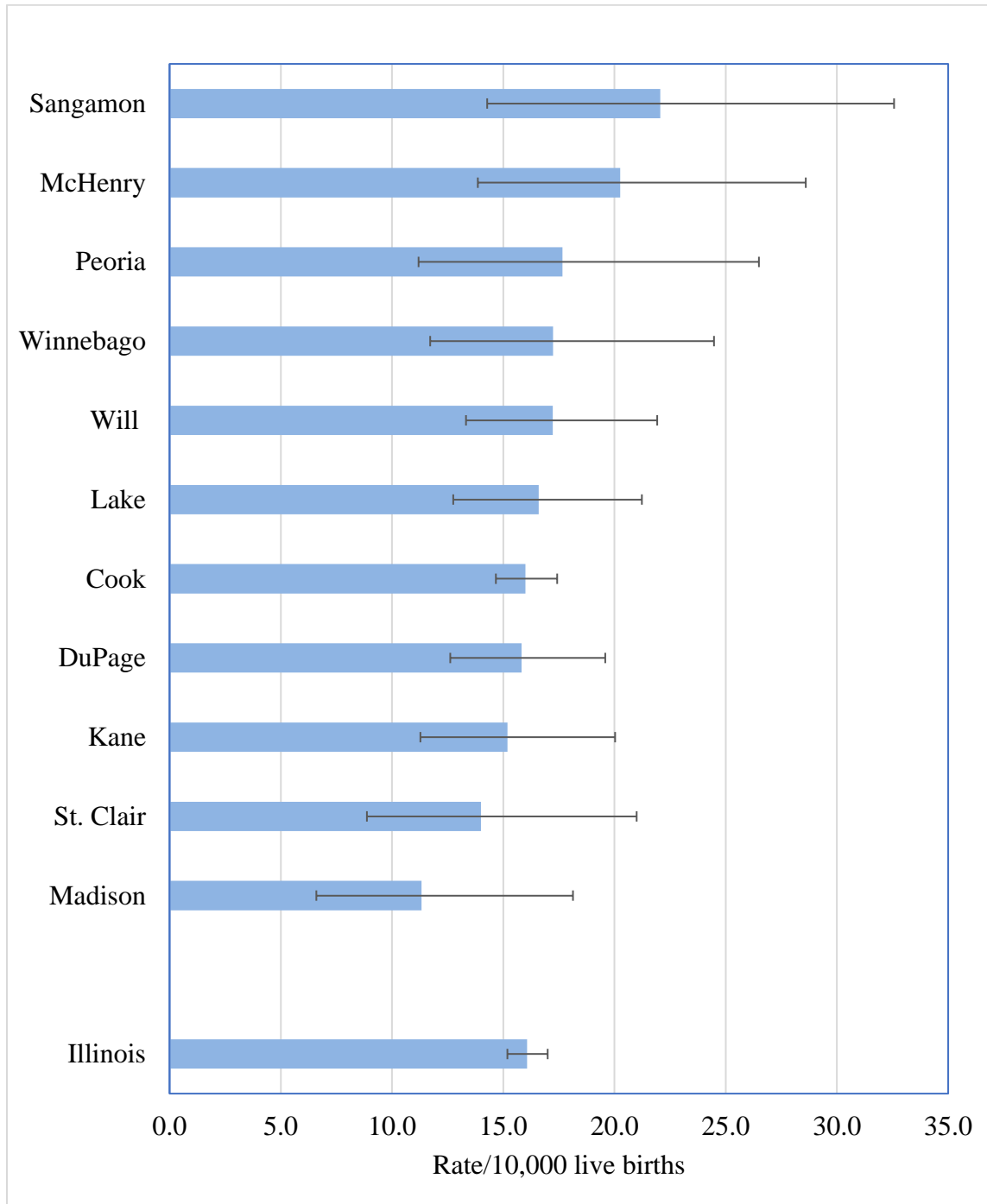
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	1,230	16.1	15.2	17.0	Lee	3	17.5	3.6	51.2
Adams	4	9.8	2.7	25.0	Livingston	1	4.9	0.1	27.4
Alexander	0	0.0	0.0	94.3	Logan	2	13.1	1.6	47.5
Bond	0	0.0	0.0	49.0	McDonough	1	7.3	0.2	40.5
Boone	3	10.4	2.1	30.4	McHenry	32	20.3	13.9	28.6
Brown	1	33.4	0.8	186.3	McLean	15	15.0	8.4	24.7
Bureau	4	23.9	6.5	61.3	Macon	9	13.6	6.2	25.8
Calhoun	1	43.7	1.1	243.3	Macoupin	2	8.7	1.1	31.3
Carroll	0	0.0	0.0	52.5	Madison	17	11.3	6.6	18.1
Cass	1	11.4	0.3	63.5	Marion	4	16.3	4.4	41.6
Champaign	15	12.7	7.1	21.0	Marshall	1	15.8	0.4	88.3
Christian	5	29.7	9.6	69.2	Mason	0	0.0	0.0	55.6
Clark	0	0.0	0.0	40.9	Massac	1	12.7	0.3	70.8
Clay	7	89.4	35.9	184.2	Menard	2	32.9	4.0	118.8
Clinton	7	33.1	13.3	68.2	Mercer	3	41.5	8.6	121.3
Coles	8	31.7	13.7	62.5	Monroe	0	0.0	0.0	20.8
Cook	530	16.0	14.7	17.4	Montgomery	4	26.9	7.3	68.9
Crawford	1	9.5	0.2	52.7	Morgan	4	22.2	6.0	56.7
Cumberland	1	16.1	0.4	89.4	Moultrie	3	32.3	6.7	94.4
DeKalb	15	26.1	14.6	43.1	Ogle	3	11.3	2.3	32.9
DeWitt	2	23.0	2.8	83.1	Peoria	23	17.7	11.2	26.5
Douglas	3	23.2	4.8	67.8	Perry	2	19.4	2.4	70.1
DuPage	84	15.8	12.6	19.6	Piatt	1	11.1	0.3	61.6
Edgar	1	11.3	0.3	63.2	Pike	0	0.0	0.0	38.3
Edwards	0	0.0	0.0	93.6	Pope	0	0.0	0.0	254.4
Effingham	7	30.4	12.2	62.5	Pulaski	0	0.0	0.0	115.3
Fayette	1	8.2	0.2	45.6	Putnam	0	0.0	0.0	148.1
Ford	2	27.1	3.3	97.9	Randolph	2	12.0	1.5	43.3
Franklin	1	4.2	0.1	23.4	Richland	0	0.0	0.0	39.0
Fulton	1	5.8	0.1	32.3	Rock Island	7	7.8	3.1	16.0
Gallatin	0	0.0	0.0	140.3	St.Clair	23	14.0	8.9	21.0
Greene	2	30.1	3.6	108.6	Saline	0	0.0	0.0	23.3
Grundy	5	16.7	5.4	39.0	Sangamon	25	22.1	14.3	32.6
Hamilton	0	0.0	0.0	85.4	Schuyler	0	0.0	0.0	120.9
Hancock	1	10.4	0.3	58.2	Scott	0	0.0	0.0	153.7
Hardin	0	0.0	0.0	241.1	Shelby	2	16.1	2.0	58.3
Henderson	1	30.9	0.8	172.0	Stark	0	0.0	0.0	121.3
Henry	7	26.7	10.8	55.1	Stephenson	1	4.0	0.1	22.5
Iroquois	2	13.0	1.6	46.9	Tazewell	14	18.7	10.2	31.4
Jackson	11	32.4	16.2	57.9	Union	0	0.0	0.0	40.0
Jasper	0	0.0	0.0	64.9	Vermilion	9	18.1	8.3	34.4
Jefferson	1	4.1	0.1	22.6	Wabash	0	0.0	0.0	52.0
Jersey	4	38.2	10.4	97.9	Warren	2	18.7	2.3	67.6
JoDaviess	0	0.0	0.0	42.0	Washington	1	12.6	0.3	70.3
Johnson	2	37.2	4.5	134.5	Wayne	2	19.3	2.3	69.7
Kane	50	15.2	11.3	20.0	White	1	13.1	0.3	72.8
Kankakee	15	23.0	12.9	37.9	Whiteside	3	9.6	2.0	28.2
Kendall	15	19.1	10.7	31.5	Will	66	17.2	13.3	21.9
Knox	5	17.6	5.7	41.0	Williamson	6	15.4	5.6	33.4
Lake	63	16.6	12.8	21.2	Winnebago	31	17.2	11.7	24.5
LaSalle	10	16.5	7.9	30.4	Woodford	3	14.1	2.9	41.2
Lawrence	0	0.0	0.0	46.2					

¹ Per 10,000 births

²95 percent confidence intervals for rate

Source: Illinois Department Of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 19. Prevalence Rates¹ and 95% Confidence Intervals For Endocrine, Metabolic, or Immune Disorders in Newborn Infants by Selected Counties of Residence,² 2014-2018

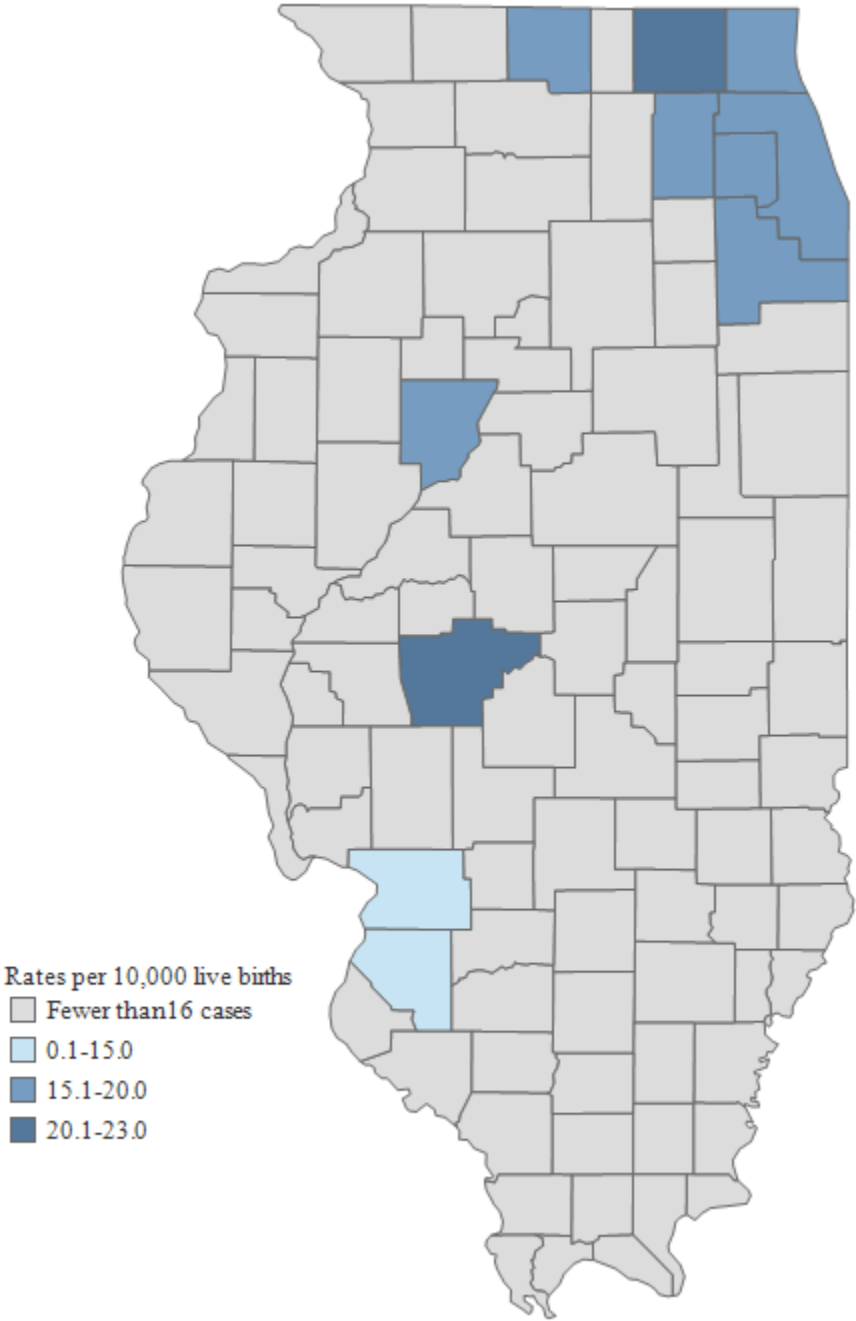


¹ Rates per 10,000 live births

² Only counties with 16 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 20. Map of Prevalence Rates for Endocrine, Metabolic, or Immune Disorders in Newborn Infants by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

BLOOD DISORDERS

APORS collects information on congenital blood disorders, including anemias, leukemias, and coagulation defects. Descriptions of these conditions follow, together with Table 21, which gives the five-year prevalence rates for each condition for the state. Table 22 provides five-year prevalence rates by county. Figures 21 and 22 present prevalence rates for blood disorders for selected counties in table and map formats, respectively.

Coagulation defects are a group of inherited blood disorders characterized by a deficiency in one or more of the factors that make up the blood clotting system. Each condition may be severe, moderate, or mild. In hemophilia, easy bruising and internal bleeding are characteristic. In the severe forms, repeated bleeding into joints is a problem and can lead to long-term joint damage. Treatment consists of intravenous replacement of the missing clotting factors.

Constitutional aplastic anemia is a hereditary, often fatal bone marrow failure disease that occurs when the bone marrow is hypoplastic. Bone marrow transplantation replaces the defective bone marrow of a patient with healthy cells from a normal donor and can cure the disease in about 80% of cases where a sibling with identical tissue type is the donor. Growth factors are also being used in treatment.

Hereditary hemolytic anemia is a condition characterized by an inadequate number of circulating red blood cells (anemia), caused by premature destruction of red blood cells. There are several types of hereditary hemolytic anemia, including sickle cell anemia, hemoglobin SC disease, sickle beta thalassemia, and spherocytosis. Symptoms include fatigue, shortness of breath, rapid heart rate, and jaundice.

Leukemia is cancer of the blood cells. When it develops, the body produces large numbers of abnormal white blood cells. Acute lymphocytic leukemia is seen most commonly in children. Children with leukemia may have anemia; swollen lymph nodes, liver, or spleen; and bone or joint pain. In acute leukemia, the abnormal cells may collect in the central nervous system leading to headaches, confusion, loss of muscle control, and seizures. Leukemia also can affect the eyes, skin, testicles, digestive tract, kidneys, lungs, or other parts of the body.

**Table 21. Total Number and Prevalence Rates of Blood Disorders
in Newborn Infants, Illinois, 2014-2018**

Defect	ICD-10-CM Codes	Cases	Rate¹	95% CI²
Coagulation defects	D65-D68.9	50	0.7	(0.5, 0.9)
Constitutional aplastic anemia	D61.0-D61.9	7	0.1	(0.0, 0.2)
Hereditary hemolytic anemia	D58.0-D58.9, D550, D551, D559, D560-D563, D565, D568, D571, D5720, D5740, D5780	497	6.5	(5.9, 7.1)
Leukemia	C91-C95.92	4	0.1	(0.0, 0.1)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Table 22. Total Number and Prevalence Rates of Blood Disorders in Newborn Infants by County of Residence, 2014-2018

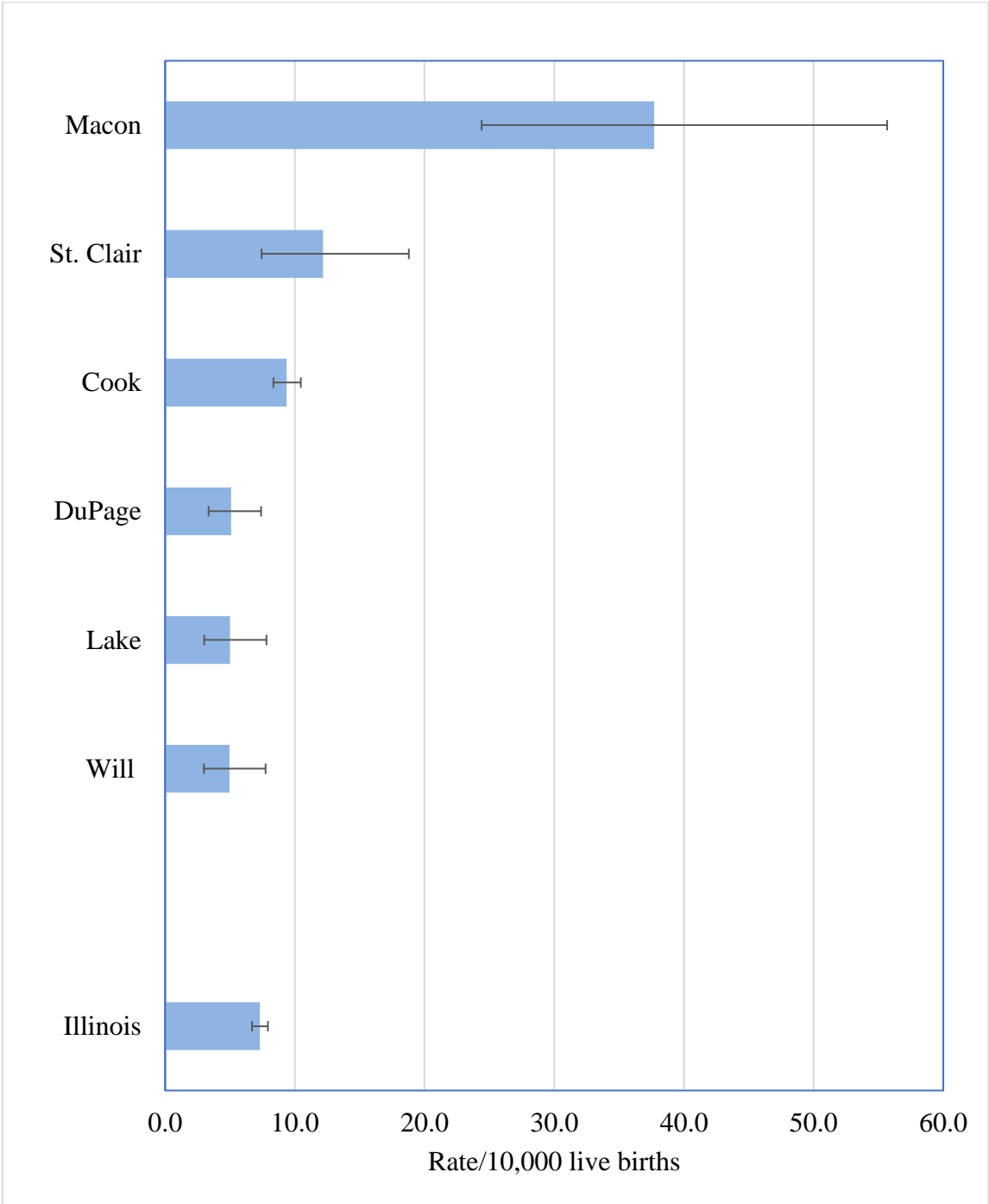
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	558	7.3	6.7	7.9	Lee	3	17.5	3.6	51.2
Adams	1	2.4	0.1	13.6	Livingston	1	4.9	0.1	27.4
Alexander	0	0.0	0.0	94.3	Logan	0	0.0	0.0	24.3
Bond	0	0.0	0.0	49.0	McDonough	0	0.0	0.0	26.8
Boone	1	3.5	0.1	19.3	McHenry	3	1.9	0.4	5.6
Brown	0	0.0	0.0	123.4	McLean	6	6.0	2.2	13.1
Bureau	0	0.0	0.0	22.1	Macon	25	37.7	24.4	55.7
Calhoun	0	0.0	0.0	161.1	Macoupin	0	0.0	0.0	16.0
Carroll	0	0.0	0.0	52.5	Madison	3	2.0	0.4	5.8
Cass	2	22.8	2.8	82.3	Marion	1	4.1	0.1	22.7
Champaign	11	9.3	4.7	16.7	Marshall	0	0.0	0.0	58.5
Christian	0	0.0	0.0	21.9	Mason	1	15.1	0.4	84.0
Clark	0	0.0	0.0	40.9	Massac	1	12.7	0.3	70.8
Clay	0	0.0	0.0	47.1	Menard	0	0.0	0.0	60.7
Clinton	0	0.0	0.0	17.4	Mercer	0	0.0	0.0	51.0
Coles	0	0.0	0.0	14.6	Monroe	0	0.0	0.0	20.8
Cook	310	9.4	8.3	10.5	Montgomery	2	13.5	1.6	48.6
Crawford	0	0.0	0.0	34.9	Morgan	1	5.5	0.1	30.9
Cumberland	0	0.0	0.0	59.2	Moultrie	2	21.5	2.6	77.8
DeKalb	2	3.5	0.4	12.6	Ogle	1	3.8	0.1	20.9
DeWitt	3	34.5	7.1	100.9	Peoria	13	10.0	5.3	17.1
Douglas	0	0.0	0.0	28.5	Perry	0	0.0	0.0	35.8
DuPage	27	5.1	3.4	7.4	Piatt	1	11.1	0.3	61.6
Edgar	0	0.0	0.0	41.8	Pike	0	0.0	0.0	38.3
Edwards	0	0.0	0.0	93.6	Pope	1	69.0	1.7	384.3
Effingham	0	0.0	0.0	16.0	Pulaski	1	31.3	0.8	174.1
Fayette	0	0.0	0.0	30.2	Putnam	0	0.0	0.0	148.1
Ford	0	0.0	0.0	50.0	Randolph	0	0.0	0.0	22.1
Franklin	0	0.0	0.0	15.5	Richland	0	0.0	0.0	39.0
Fulton	1	5.8	0.1	32.3	Rock Island	12	13.3	6.9	23.3
Gallatin	0	0.0	0.0	140.3	St.Clair	20	12.2	7.4	18.8
Greene	0	0.0	0.0	55.5	Saline	1	6.3	0.2	35.2
Grundy	0	0.0	0.0	12.3	Sangamon	11	9.7	4.8	17.4
Hamilton	0	0.0	0.0	85.4	Schuyler	0	0.0	0.0	120.9
Hancock	1	10.4	0.3	58.2	Scott	0	0.0	0.0	153.7
Hardin	0	0.0	0.0	241.1	Shelby	0	0.0	0.0	29.8
Henderson	0	0.0	0.0	113.9	Stark	0	0.0	0.0	121.3
Henry	0	0.0	0.0	14.1	Stephenson	1	4.0	0.1	22.5
Iroquois	0	0.0	0.0	24.0	Tazewell	3	4.0	0.8	11.7
Jackson	4	11.8	3.2	30.1	Union	0	0.0	0.0	40.0
Jasper	0	0.0	0.0	64.9	Vermilion	6	12.1	4.4	26.3
Jefferson	1	4.1	0.1	22.6	Wabash	0	0.0	0.0	52.0
Jersey	0	0.0	0.0	35.3	Warren	0	0.0	0.0	34.5
JoDaviess	0	0.0	0.0	42.0	Washington	0	0.0	0.0	46.6
Johnson	0	0.0	0.0	68.7	Wayne	1	9.7	0.2	53.8
Kane	9	2.7	1.3	5.2	White	0	0.0	0.0	48.2
Kankakee	6	9.2	3.4	20.0	Whiteside	0	0.0	0.0	11.9
Kendall	1	1.3	0.0	7.1	Will	19	5.0	3.0	7.7
Knox	1	3.5	0.1	19.6	Williamson	1	2.6	0.1	14.3
Lake	19	5.0	3.0	7.8	Winnebago	15	8.3	4.7	13.8
LaSalle	2	3.3	0.4	11.9	Woodford	0	0.0	0.0	17.4
Lawrence	0	0.0	0.0	46.2					

¹ Per 10,000 births

²95 percent confidence intervals for rate

Source: Illinois Department Of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

**Figure 21. Prevalence Rates¹ and 95% Confidence Intervals
For Blood Disorders in Newborn Infants
by Selected Counties of Residence,² 2014-2018**

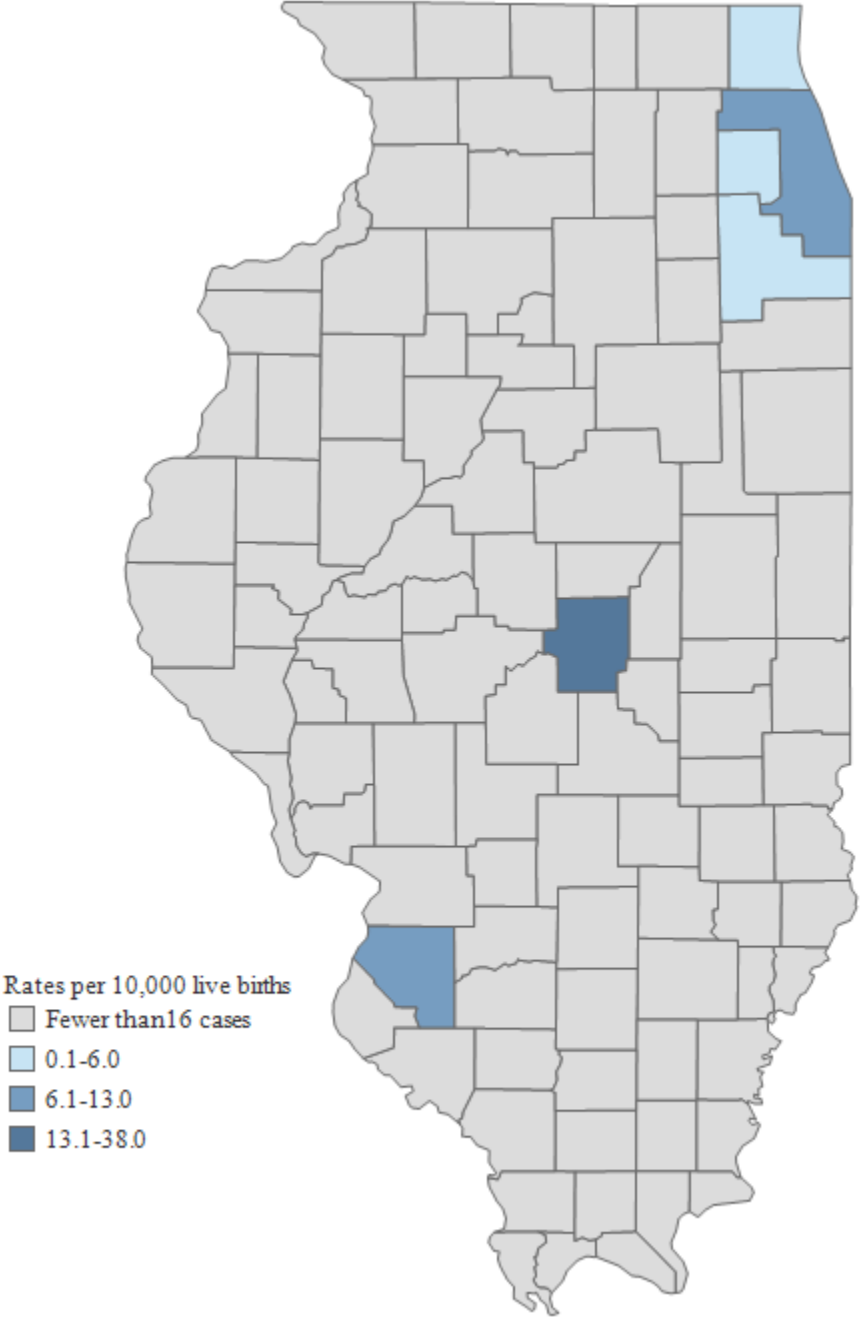


¹ Rates per 10,000 live births

² Only counties with 16 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 22. Map of Prevalence Rates for Blood Disorders in Newborn Infants by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

OTHER ADVERSE PREGNANCY OUTCOMES

APORS collects information on a variety of other adverse outcomes in newborns. Descriptions of these conditions follow, together with Table 23, which gives the five-year prevalence rates for each condition for the state. Table 24 provides five-year prevalence rates by county. Figures 23 and 24 present prevalence rates for other adverse outcomes for selected counties in table and map formats, respectively.

Bronchopulmonary dysplasia is a chronic lung disease affecting primarily very premature babies who have had oxygen therapy. The severity of the condition varies and may result in such issues as pulmonary hypertension, heart failure, trouble feeding, and delayed development. Treatment is aimed at increasing lung development and reducing further damage (American Lung Association, 2020).

Cerebral lipidoses are inherited genetic defects that result in a deficiency in different enzymes involved with fat storage. The absence of the enzyme prevents the lysosome in the cells of the body from performing its natural recycling function, and various materials are inappropriately stored in the cells of the brain and central nervous system. This leads to a variety of progressive mental and physical deterioration over time. Some patients survive into adulthood, but others with more severe symptoms or conditions die in their teens or earlier.

Endocardial fibroelastosis (EFE) is a rare heart disorder that affects infants and children. It is characterized by a thickening within the muscular lining of the heart chambers due to an increase in the amount of supporting connective tissue and elastic fibers. The symptoms of EFE are related to the overgrowth of fibrous tissues causing abnormal enlargement of the heart (cardiac hypertrophy), especially the left ventricle. Impaired heart and lung function eventually lead to congestive heart failure.

Fetal alcohol syndrome occurs when alcohol ingested by a pregnant woman passes across the placenta to the fetus and adversely affects the development of the baby. This can occur during any trimester, so no amount of alcohol is considered “safe” during any stage of pregnancy. While classic fetal alcohol syndrome is rarely identified in newborns, it is associated with multiple birth defects, including intrauterine growth restriction; delayed development with decreased mental functioning (mild to severe); facial abnormalities (including microcephaly); heart defects; and limb abnormalities of joints, hands, feet, fingers, and toes.

Intrauterine growth restriction (IUGR) occurs when the unborn baby is at or below the 10th weight percentile for his or her gestational age. There are many IUGR risk factors involving the mother and the baby. A mother is at risk for having an infant with IUGR if she has poor weight gain and nutrition during pregnancy, uses substances (like tobacco, narcotics, or alcohol) that can cause abnormal development, or if she has preeclampsia or chronic kidney disease. Additionally, an unborn baby may suffer from IUGR if it is exposed to an infection, has a birth defect, or has placenta or umbilical cord defects. Babies who suffer from IUGR are at an increased risk for death, hypoglycemia, hypothermia, and abnormal development of the nervous system.

Intraventricular hemorrhage Grade III or IV is a condition that occurs in very premature infants in which there is bleeding into the fluid filled ventricles of the brain. The condition is categorized into four grades depending upon the degree of bleeding, with grades III and IV being the most severe. The severe grades can cause pressure on the brain tissue, hydrocephalus and possibly death. In the longer term, children may suffer developmental delays and problems with movement (U. S. National Library of Medicine, April 2020).

Neurofibromatosis (NF) is a genetic disease in which patients develop multiple soft tumors under the skin and throughout the nervous system. NF occurs in about one of every 4,000 births and may cause speech impairment, learning disabilities, and attention deficit disorder in children, as well as loss of hearing, weakness of facial muscles, headache, poor balance, and uncoordinated walking. Cataracts frequently develop at an unusually early age. The chance of brain tumors developing is unusually high.

Occlusion of cerebral arteries is an obstruction of blood flow in one of the cerebral arteries of the brain. This may cause long-term neurologic and cognitive issues. Outcomes may vary depending upon the site and severity of tissue damage (Wegenaar N *et al* and Fernandez-Lopez D *et al*).

Retinopathy of prematurity (ROP) is an eye disease that occurs in some premature babies. The last 12 weeks of a full-term pregnancy are particularly active for the growth of the fetal eye. In premature infants, the normal growth of the retinal vessels stops, and abnormal new vessels begin to grow and spread in the retina. The infant may become blind. Most infants with mild ROP usually develop normal central vision. However, some may have late complications, including strabismus, amblyopia, myopia, glaucoma, and late onset retinal detachment.

Seizures are abnormal electrical charges in the central nervous system and may indicate a serious underlying issue, thus requiring an immediate clinical and laboratory evaluation to determine the cause. In neonates, the most common cause is hypoxia-ischemia, while other causes include but are not limited to inborn errors of metabolism, central nervous system malformations, hemorrhage and infarctions in the brain, and infections. The treatment and prognosis depends on the cause (Victorio C and Panayiotopoulos CP).

Strabismus is a condition in which the eyes do not point in the same direction. Esotropia (crossed eyes) is the most common type of strabismus in infants. Sometimes the eye turn is always in the same eye; however, sometimes the turn alternates from one eye to the other. An eye doctor needs to determine whether the eye turn is true or pseudo strabismus. A baby's eyes should be straight and parallel by three or four months of age. Strabismus can be caused by a defect in muscles or the part of the brain that controls eye movement. It is especially common in children who have disorders that affect the brain.

Table 23. Total Number and Prevalence Rates of Other Adverse Pregnancy Outcomes in Newborn Infants, Illinois, 2014-2018

Defect	ICD-10-CM Codes	Cases	Rate¹	95% CI²
Bronchopulmonary dysplasia	P27.1	2,113	27.6	(26.4, 28.8)
Cerebral lipidoses	E75.4	0	0.0	(0.0, 0.0)
Endocardial fibroelastosis	I42.4	36	0.5	(0.3, 0.7)
Fetal alcohol syndrome	Q860	17	0.2	(0.1, 0.4)
Intrauterine growth restriction (IUGR)	P059	6,532	85.4	(83.3, 87.4)
Intraventricular hemorrhage (Grade III or IV)	P522.1-P52.22	671	8.8	(8.1, 9.5)
Neurofibromatosis	Q85.0-Q85.09	8	0.1	(0.0, 0.2)
Occlusion of cerebral arteries	I63.30-I63.9, I66.0-I66.9	190	2.5	(2.1, 2.9)
Retinopathy of prematurity	H35.1-H35.179	3,272	42.8	(41.3, 44.2)
Seizures	P90	1,196	15.6	(14.8, 16.5)
Strabismus	H50.0-H50.9	18	0.2	(0.1, 0.4)

¹ Rate per 10,000 live births

² 95% confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Table 24. Number and Prevalence Rates of Other Adverse Pregnancy Outcomes in Newborn Infants by County of Residence, 2014-2018

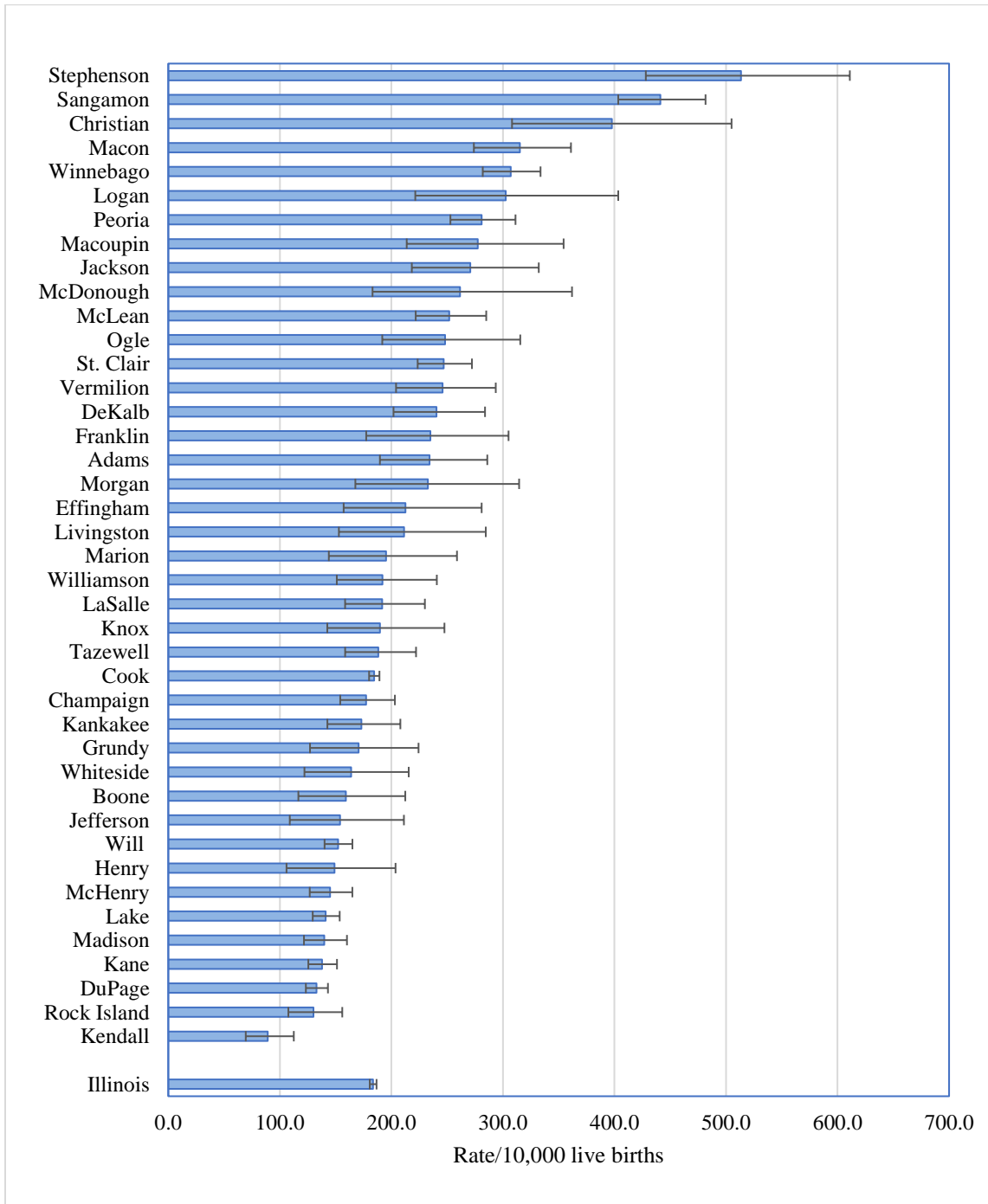
County	Cases	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Lower	Upper				Lower	Upper
ILLINOIS	14,053	183.6	180.6	186.7	Lee	30	175.2	118.2	250.2
Adams	96	234.2	189.7	286.0	Livingston	43	211.3	152.9	284.6
Alexander	0	0.0	0.0	94.3	Logan	46	302.4	221.4	403.4
Bond	9	119.5	54.7	226.9	McDonough	36	261.4	183.1	361.9
Boone	46	159.3	116.6	212.5	McHenry	229	145.0	126.8	165.0
Brown	4	133.8	36.5	342.5	McLean	252	251.9	221.8	285.1
Bureau	29	173.4	116.2	249.1	Macon	209	315.2	273.9	361.0
Calhoun	3	131.0	27.0	382.9	Macoupin	64	277.5	213.7	354.4
Carroll	19	270.3	162.7	422.1	Madison	210	139.9	121.6	160.2
Cass	31	353.1	239.9	501.2	Marion	48	195.2	143.9	258.8
Champaign	209	177.4	154.2	203.1	Marshall	12	190.2	98.3	332.2
Christian	67	397.6	308.2	505.0	Mason	18	271.5	160.9	429.1
Clark	5	55.4	18.0	129.2	Massac	9	114.4	52.3	217.1
Clay	12	153.3	79.2	267.7	Menard	19	312.5	188.1	488.0
Clinton	28	132.4	88.0	191.3	Mercer	6	83.0	30.5	180.6
Coles	23	91.2	57.8	136.9	Monroe	8	45.0	19.4	88.7
Cook	6,115	184.6	180.0	189.3	Montgomery	29	195.2	130.7	280.3
Crawford	4	37.8	10.3	96.9	Morgan	42	232.7	167.7	314.5
Cumberland	6	96.3	35.3	209.6	Moultrie	9	96.9	44.3	183.9
DeKalb	138	240.3	201.9	283.9	Ogle	66	248.0	191.8	315.6
DeWitt	17	195.6	114.0	313.2	Peoria	366	281.0	252.9	311.3
Douglas	13	100.5	53.5	171.9	Perry	22	213.6	133.9	323.4
DuPage	706	133.0	123.3	143.1	Piatt	9	99.6	45.5	189.0
Edgar	9	102.0	46.7	193.7	Pike	17	176.5	102.8	282.6
Edwards	0	0.0	0.0	93.6	Pope	2	137.9	16.7	498.3
Effingham	49	212.5	157.2	280.9	Pulaski	7	218.8	87.9	450.7
Fayette	17	139.1	81.0	222.7	Putnam	4	160.6	43.8	411.3
Ford	9	122.0	55.8	231.5	Randolph	24	143.9	92.2	214.1
Franklin	56	234.9	177.4	305.0	Richland	4	42.3	11.5	108.3
Fulton	24	139.2	89.2	207.1	Rock Island	117	130.1	107.6	156.0
Gallatin	1	38.0	1.0	211.8	St.Clair	406	247.0	223.6	272.2
Greene	10	150.4	72.1	276.5	Saline	19	119.9	72.2	187.3
Grundy	51	170.6	127.0	224.3	Sangamon	500	441.2	403.4	481.7
Hamilton	6	138.9	51.0	302.3	Schuyler	12	393.4	203.3	687.3
Hancock	10	104.5	50.1	192.2	Scott	6	250.0	91.7	544.1
Hardin	2	130.7	15.8	472.2	Shelby	16	129.1	73.8	209.7
Henderson	6	185.2	68.0	403.1	Stark	5	164.5	53.4	383.8
Henry	39	149.0	106.0	203.7	Stephenson	127	513.5	428.1	611.0
Iroquois	27	175.4	115.6	255.3	Tazewell	141	188.3	158.5	222.1
Jackson	92	270.8	218.3	332.1	Union	0	0.0	0.0	40.0
Jasper	5	88.0	28.6	205.4	Vermilion	122	245.9	204.2	293.6
Jefferson	38	153.9	108.9	211.3	Wabash	0	0.0	0.0	52.0
Jersey	17	162.5	94.7	260.2	Warren	19	177.9	107.1	277.8
JoDaviess	12	136.7	70.6	238.7	Washington	9	113.6	52.0	215.7
Johnson	5	93.1	30.2	217.3	Wayne	9	86.9	39.7	164.9
Kane	454	137.9	125.5	151.2	White	4	52.3	14.2	133.9
Kankakee	113	173.0	142.6	208.1	Whiteside	51	163.9	122.1	215.5
Kendall	70	89.1	69.4	112.5	Will	583	152.2	140.1	165.1
Knox	54	189.7	142.5	247.6	Williamson	75	192.1	151.1	240.8
Lake	536	141.2	129.5	153.7	Winnebago	552	307.0	281.9	333.7
LaSalle	116	191.8	158.5	230.0	Woodford	25	117.6	76.1	173.6
Lawrence	6	75.2	27.6	163.7					

¹ Per 10,000 live births (The number for Illinois includes on case for which county of residence is missing.)

² 95% confidence interval for rate

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 23. Prevalence Rates¹ and 95% Confidence Intervals for Other Adverse Pregnancy Outcomes in Newborn Infants by Selected Counties of Residence,² 2014-2018

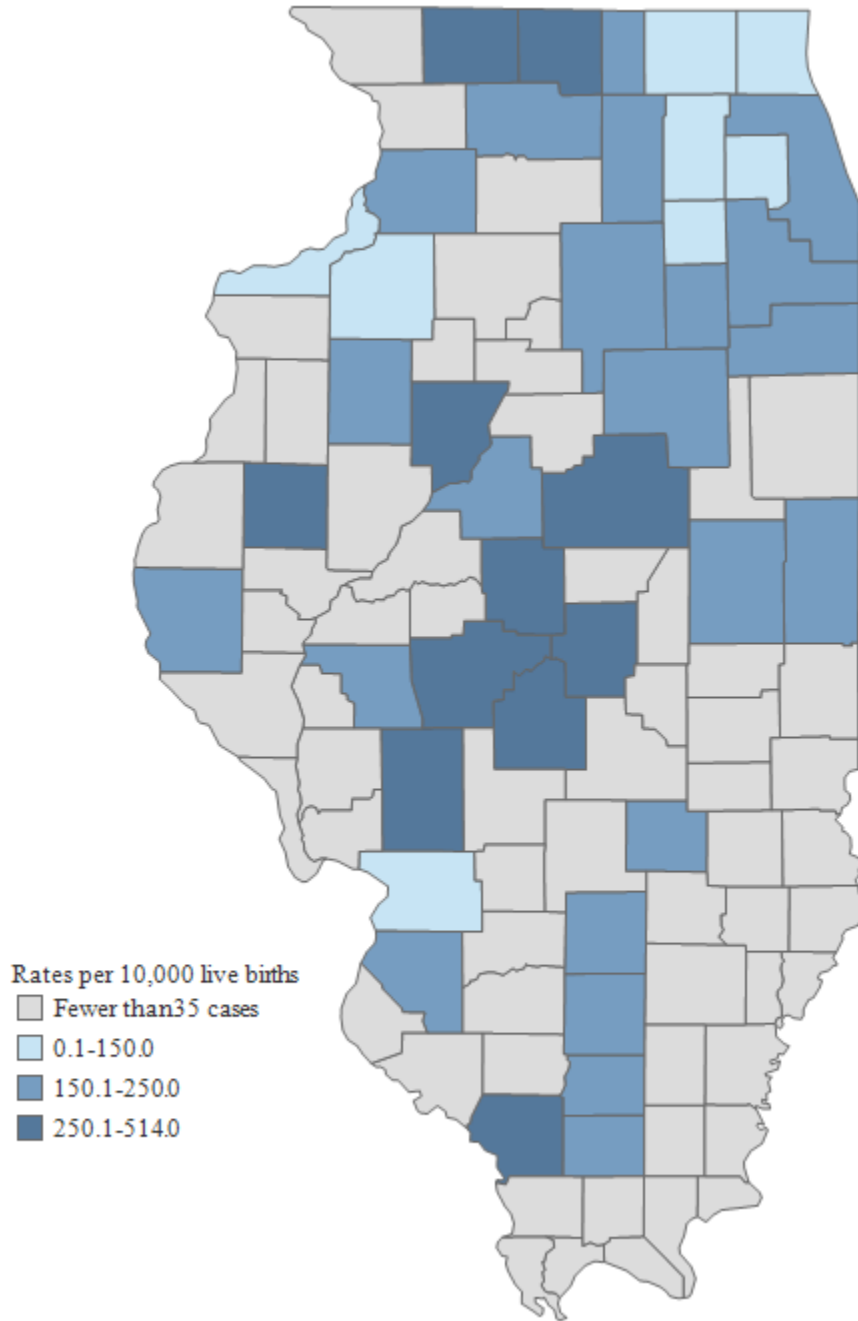


¹ Rates per 10,000 live births

² Only counties with 35 or more cases are presented.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

Figure 24. Map of Prevalence Rates for Newborn Infants with Other Adverse Pregnancy Outcomes, by Selected Counties of Residence, 2014-2018



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, July 2021

REFERENCES

- American Lung Association. <https://www.lung.org/lung-health-diseases/lung-disease-lookup/bronchopulmonary-dysplasia/learn-about-bpd> Accessed April 20, 2020.
- Centers for Disease Control and Prevention. CDC. <https://www.cdc.gov/ncbddd/birthdefects/facts.html> Accessed July 28, 2021.
- CDC <https://www.cdc.gov/ncbddd/heartdefects/facts.html> Accessed July 28, 2021.
- Ely M, Driscoll AK. Infant Mortality in the United States, 2018: Data from the Period Linked Birth/Infant Death File. National Vital Statistics Reports; vol 69 no 7; Hyattsville, MD: National Center for Health Statistics. 2020. <https://www.cdc.gov/nchs/data/nvsr/nvsr69/NVSR-69-7-508.pdf>
- Fernandez-Lopez D, Natarajan N, Ashwal S, et al. Mechanisms of perinatal arterial ischemic stroke. *Journal of Cerebral Blood Flow and Metabolism*. 2014 Jun; 34(6): 921–932. doi: [10.1038/jcbfm.2014.41](https://doi.org/10.1038/jcbfm.2014.41).
- Fornoff JE, Egler T, Shen T. Surveillance of Illinois Infants Prenatally Exposed to Controlled Substances 1991-1999. Epidemiological Report Series 01:4 Springfield, IL: Illinois Department of Public Health, September 2001.
- Hardeo S, Khurshid A. Confidence Intervals for the Mean of a Poisson Distribution: A Review. *Biometrical Journal*;35(1993)7, 857-867. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.900.3700&rep=rep1&type=pdf> Accessed August 7, 2019.
- Illinois Department of Public Health. Leading Causes of Infant Death, Illinois Residents, 2010-2019. <https://dph.illinois.gov/sites/default/files/Infant%20causes%202010-2019.pdf> Accessed July 28, 2021.
- March of Dimes. Premature Babies. <https://www.marchofdimes.org/complications/premature-babies.aspx> Accessed April 29, 2020.
- National Institutes of Health [NIH]. What are the risk factors for preterm labor and birth? https://www.nichd.nih.gov/health/topics/preterm/conditioninfo/who_risk Accessed March 1, 2019.
- NIH. Holoprosencephaly. <https://rarediseases.info.nih.gov/diseases/6665/holoprosencephaly> Accessed April 23,2020.
- NIH. Turner Syndrome. <https://ghr.nlm.nih.gov/condition/turner-syndrome#definition> Accessed April 24, 2020.
- NIH. 22q11 deletion syndrome. <https://ghr.nlm.nih.gov/condition/22q112-deletion-syndrome> Accessed April 24, 2020.

Panayiotopoulos CP. *The Epilepsies: Seizures, Syndromes and Management*. 2005. Bladon Medical Publishing. <https://www.ncbi.nlm.nih.gov/books/NBK2599/> Accessed May 1, 2020.

U. S. National Library of Medicine. Intraventricular hemorrhage of the newborn. <https://medlineplus.gov/ency/article/007301.htm> Accessed April 30, 2020.

Victorio C. Neonatal Seizure Disorders. *Merck Manual Professional Version*. October 2019. <https://www.merckmanuals.com/professional/pediatrics/neurologic-disorders-in-children/neonatal-seizure-disorders> Accessed May 1, 2020.

Wegenaar N, Martinea-Biarge M, van der Aa NE, et al. Neurodevelopment After Perinatal Arterial Ischemic Stroke. *Pediatrics*. September 2018, 142 (3) e20174164; DOI: <https://doi.org/10.1542/peds.2017-4164>