

**ADVERSE PREGNANCY OUTCOMES
IN ILLINOIS
COUNTY-SPECIFIC PREVALENCE AND
RELATED INFANT MORTALITY
1989-1998**

Illinois Department of Public Health
Division of Epidemiologic Studies

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**ADVERSE PREGNANCY OUTCOMES IN ILLINOIS
COUNTY-SPECIFIC PREVALENCE AND RELATED INFANT MORTALITY USING
THE BIRTH-DEATH MASTER FILE
1989-1998**

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INTRODUCTION

Adverse pregnancy outcomes are recorded by the Illinois Department of Public Health for infants with congenital anomalies and other serious neonatal conditions. Each year in Illinois, the Adverse Pregnancy Outcome Reporting System (APORS) obtains information on thousands of such births throughout the state (see Appendix A for a complete description of APORS).

Advances in medical treatment have greatly improved the survival of these infants. Interventions such as technologies developed for neonatal intensive care units (NICUs), new procedures for fetal surgery, and better diagnosis and management of maternal medical conditions are saving more and more newborn lives.

Although medical improvements are expected to continue, prevention efforts also attempt to address conditions that may result in adverse outcomes. Prenatal care emphasizes proper nutrition and the cessation of maternal smoking to improve birth weights. Social service programs target the complex problems of drug and alcohol abuse during pregnancy. During the early 1990s, it was discovered that a woman's daily dietary intake of the B vitamin folic acid, before and during the early stages of pregnancy, reduced the risk of certain types of central nervous system birth defects.

This report uses APORS data to highlight those adverse outcomes that might especially be addressed by prevention efforts. In particular the focus is on low birth weight infants, cocaine toxicity, neural tube defects and fetal alcohol syndrome.

OVERVIEW

The report contains two sections. The first provides descriptive information about county-specific prevalence rates for specific adverse pregnancy outcomes identified in Illinois newborns from 1989 through 1998. These data on geographical distribution may provide clues concerning the presence of socio-demographic or environmental risk factors.

The second section examines the mortality experience of Illinois newborns diagnosed with these conditions. Because of the small number of deaths, information is presented by underlying cause of death only at the state level. These data contrast fatality for all infants with that of infants born with conditions that may be influenced by preventive care.

SECTION I

COUNTY PREVALENCE RATES OF SELECTED ADVERSE BIRTH OUTCOMES 1989-1998

Section I. County Prevalence Rates of Selected Adverse Birth Outcomes, 1989-1998

The Adverse Pregnancy Outcomes Reporting System (APORS) has been monitoring trends in the prevalence of birth defects and other conditions for the state of Illinois for the past 10 years. This report provides information on selected adverse outcomes for all 102 Illinois counties. All data presented are aggregated for the period of 1989 through 1998 to improve statistical stability.

FORMAT

Each group of adverse outcomes is introduced with a brief discussion. The number of cases and prevalence rates by county are shown in a related table. Rates are calculated only for counties with a sufficient number of cases to establish a “stable” rate (as described in the next section). A graphic displays the county rates that were calculated along with their 95 percent confidence intervals. Finally, if counties were found with significantly higher prevalence rates than the state rate, then these counties are highlighted on a map of the state.

METHODS

County-prevalence rates at birth were calculated by taking the number of birth defects identified postnatally (newborn up to hospital discharge) and dividing this value by the total number of live births (for each county) during the study period. For the years 1989 through 1998 the numbers of live births were extracted from the birth master files. These files are maintained by the Center for Health Statistics of the Illinois Department of Public Health.

The conditions under study were assumed to be rare events, and such events follow a Poisson distribution. Features of this distribution help determine when the number of cases is too small to be interpreted meaningfully. In particular, if the number of cases is less than 16 in a Poisson distribution, then the rate is not considered to be stable (there is a relative standard error in the rate, a gauge of meaningless random fluctuation, of more than 26 percent). As a result, rates or statistical information for values that were based on fewer than 16 cases were not calculated.

Under the Poisson model, the number of observed cases in a county were compared with the number of expected cases. The expected number was obtained by multiplying the state prevalence rate by the number of live births in the county. Differences were considered statistically significant when the probability of the observed number of cases was 0.01 or less given the expected number of cases.¹ The selection of 0.01 rather than the conventional 0.05 probability level was to correct

for multiple comparison errors. Counties with significantly high or low numbers of observed cases were highlighted on state maps for each condition studied.

Additional information was presented to describe data at a county level. The number of cases, prevalence rates and 95 percent confidence intervals for each condition were presented by county in a table and in a bar chart. Calculations again presumed a Poisson distribution.² The 95 percent confidence intervals can be approximately interpreted as the range of values having a 95 percent probability of including the true rate. The intervals help put county comparisons in perspective.

LOW BIRTH WEIGHTS OF LESS THAN 1,501 GRAMS

Medical advances have had particular success in increasing the survival of low birth weight newborns. Research is also ongoing to improve the long-term health status of these infants. Surviving low birth weight newborns have more chronic conditions, more limitations in daily activities and poorer overall health than newborns with normal birth weights in their first few years of life.³ Also, although not as important as poverty or a lower level of maternal education, low birth weight has been associated with poor educational outcomes.⁴

Risk Factors

Risk factors associated with low birth weight infants include socioeconomic factors, teenage maternity and smoking.^{5,6} Increased prenatal care is believed to result in improved neonatal birth weight, and emphasis continues to be placed on prenatal care programs for pregnant teens and for uninsured or under-insured women. Smoking cessation programs provided during pregnancy may lead to higher long-term quit rates.⁷

Prevalence

APORS records birth weights for all infants. The rate of newborns with birth weights less than 1,501 grams in Illinois between 1989 and 1998 was 163.6 per 10,000 live births, affecting 3,080 pregnancies annually. Among counties with at least 16 cases, Cook, Peoria and St. Clair counties reported a significantly high number of

observed cases relative to expected. The counties of Adams, Bond, Boone, Bureau, Carroll, Clinton, Coles, Crawford, DeKalb, DeWitt, DuPage, Edgar, Effingham, Grundy, Iroquois, Jersey, Kane, Kendall, Lake, LaSalle, Lee, Macoupin, Madison, Marion, McHenry, Monroe, Moultrie, Ogle, Rock Island, Tazewell, Whiteside, Will, Williamson and Woodford reported observed numbers of cases that were significantly low relative to expected numbers (Table 1, Figures 1 and 2).

Figure 1. Illinois Counties with a Significantly High or Low Number of Observed Relative to Expected Infants with Birth Weights < 1,501 Grams

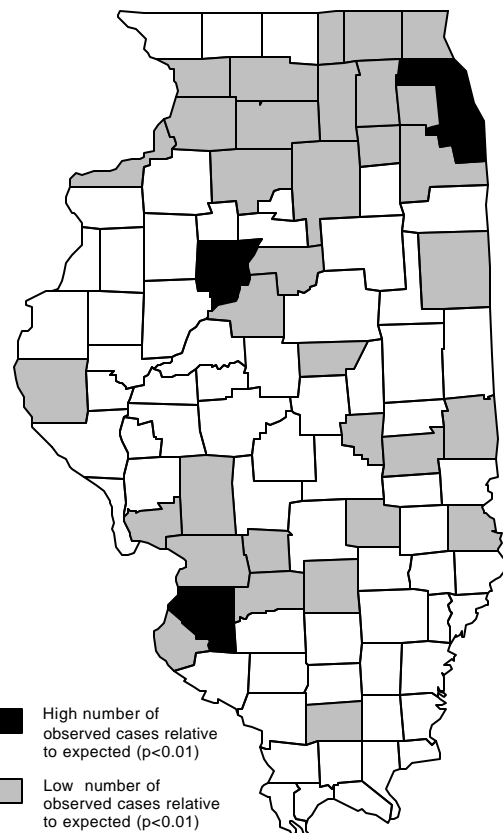


Table 1. Total Number and Prevalence of Infants with Birth Weights Less than 1,501 Grams By County of Residence, Illinois, 1989-1998

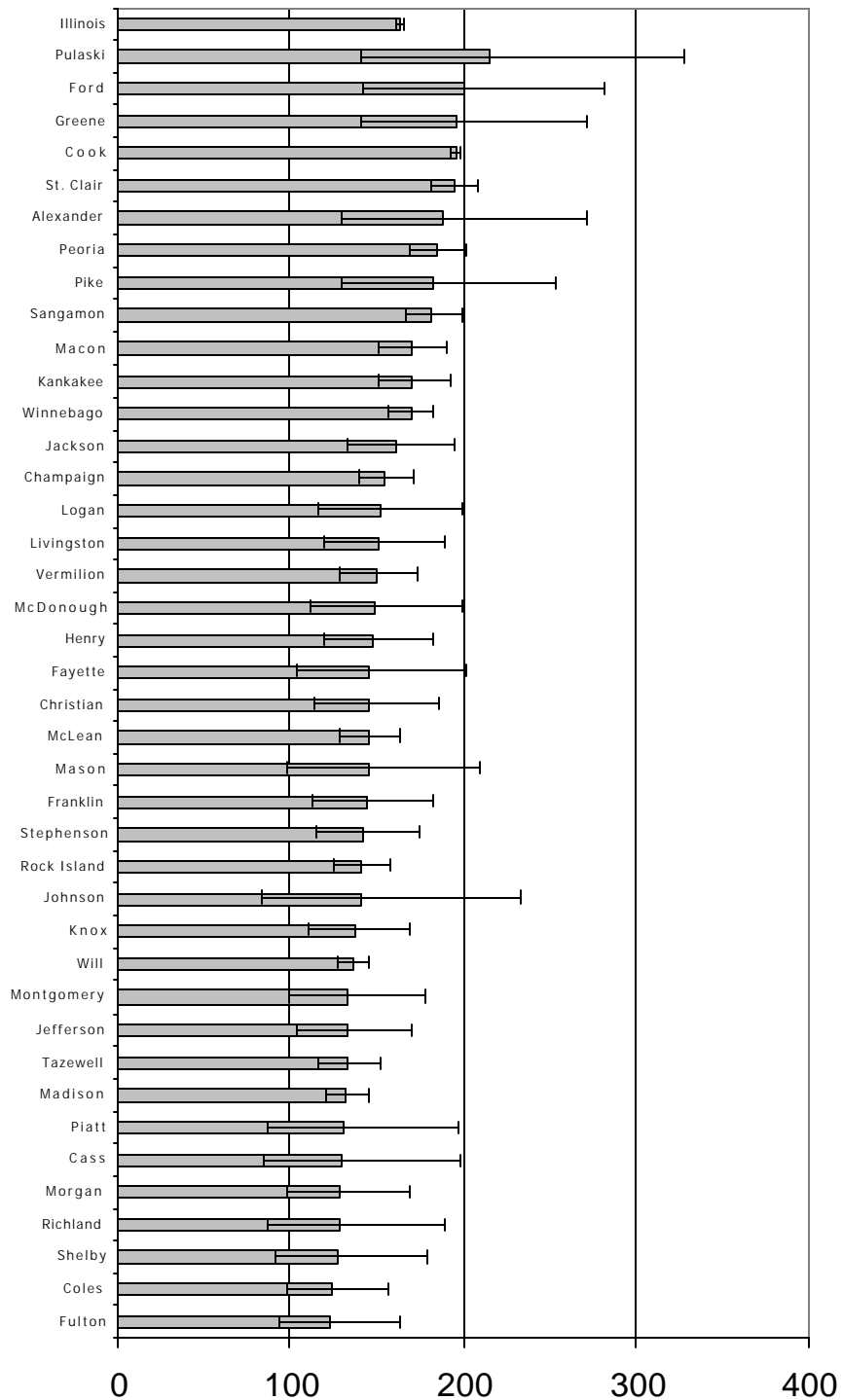
County	Case	Rate	95% CI ²		County	Case	Rate ¹	95% CI ²	
			Upper	Lower				Upper	Lower
Illinois	30,80	163.	161.8	165.4	Lee	45	105.3	77.8	141.9
Adams	98	111.	90.7	135.7	Livingston	73	150.8	119.2	190.4
Alexander	30	188.	130.0	271.9	Logan	54	152.2	115.6	199.7
Bond	16	81.7	48.4	135.5	McDonough	47	149.1	111.0	199.5
Boone	54	107.	81.4	140.7	McHenry	400	112.5	101.9	124.2
Brown	5				McLean	271	145.1	128.7	163.6
Bureau	44	104.	77.2	141.9	Macon	282	170.5	151.6	191.7
Calhoun	5				Macoupin	57	102.6	78.5	133.7
Carroll	16	84.4	50.0	139.9	Madison	462	132.2	120.7	144.9
Cass	23	130.	84.6	197.8	Marion	65	111.2	86.6	142.5
Champaign	363	154.	139.3	171.3	Marshall	17	114.4	69.0	186.6
Christian	65	145.	113.3	186.2	Mason	29	144.9	99.0	210.3
Clark	8				Massac	11			
Clay	11				Menard	13			
Clinton	48	112.	84.2	150.7	Mercer	8			
Coles	73	124.	98.1	156.7	Monroe	22	71.5	46.0	110.0
Cook	18,00	195.	193.0	198.6	Montgomery	49	133.9	100.3	178.1
Crawford	22	94.7	60.9	145.6	Morgan	56	129.0	98.5	168.4
Cumberland	17	119.	71.8	194.2	Moultrie	16	90.5	53.6	150.0
DeKalb	122	121.	101.4	145.4	Ogle	75	118.6	94.0	149.3
DeWitt	21	97.3	61.9	151.0	Peoria	509	184.8	169.4	201.6
Douglas	33	120.	84.5	171.1	Perry	30	115.3	79.3	166.3
DuPage	1,577	114.	109.3	120.6	Piatt	25	131.7	87.2	196.8
Edgar	22	98.0	63.0	150.5	Pike	37	182.5	130.6	253.4
Edwards	4				Pope	4			
Effingham	51	100.	76.0	133.5	Pulaski	23	216.4	140.8	328.2
Fayette	37	145.	104.1	202.2	Putnam	5			
Ford	35	201.	142.5	281.6	Randolph	44	116.7	85.9	157.8
Franklin	67	143.	112.6	183.6	Richland	27	128.9	86.8	189.7
Fulton	52	123.	93.3	163.0	Rock Island	286	140.9	125.3	158.3
Gallatin	4				St. Clair	824	195.2	182.3	208.9
Greene	37	196.	140.5	272.4	Saline	36	113.2	80.6	158.1
Grundy	51	109.	82.6	145.1	Sangamon	477	182.2	166.5	199.3
Hamilton	10				Schuyler	12			
Hancock	26	109.	73.0	162.3	Scott	12			
Hardin	1				Shelby	36	128.4	91.4	179.3
Henderson	6				Stark	14			
Henry	88	148.	119.8	183.3	Stephenson	91	141.6	114.8	174.3
Iroquois	33	91.3	63.9	129.6	Tazewell	217	133.2	116.4	152.3
Jackson	112	161.	134.0	195.1	Union	25	114.1	75.5	170.5
Jasper	12				Vermilion	180	149.7	129.1	173.5
Jefferson	67	133.	104.2	169.9	Wabash	6			
Jersey	25	102.	67.5	152.6	Warren	26	115.7	77.3	171.6
Jo Daviess	10				Washington	15			
Johnson	16	140.	83.5	233.0	Wayne	23	117.6	76.5	179.0
Kane	781	119.	111.3	128.1	White	7			
Kankakee	272	170.	151.2	192.0	Whiteside	93	115.7	93.9	142.2
Kendall	56	85.7	65.4	111.9	Will	863	136.2	127.4	145.6
Knox	89	136.	110.7	169.0	Williamson	83	118.2	94.8	147.1
Lake	1,217	123.	116.5	130.4	Winnebago	678	169.8	157.5	183.1
LaSalle	152	110.	93.9	129.6	Woodford	39	93.4	67.4	128.8
Lawrence	19	109.	67.8	173.4	Unspecified	3			

¹ Per 10,000 live births (rates were calculated only for counties with 16 or more cases)

² 95% Confidence interval

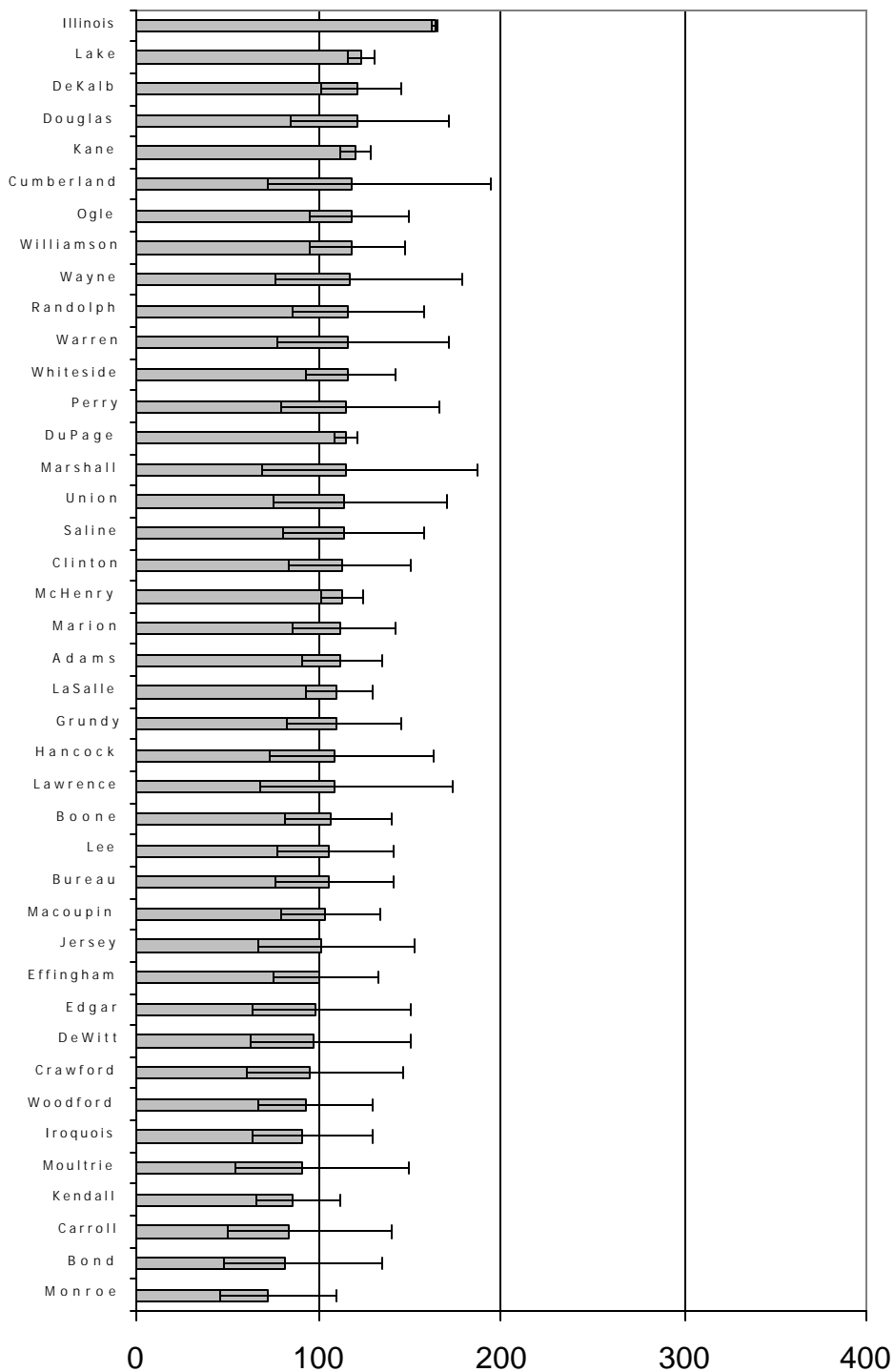
Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

Figure 2. Prevalence Rates¹ and 95% Confidence Intervals for Infants with Birth Weights Less than 1,501 Grams By County² of Residence, Illinois, 1989-1998



¹ Rate per 10,000 live births ² Only counties with 16 or more cases are presented.
 Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

Figure 2. Prevalence Rates¹ and 95% Confidence Intervals for Infants with Birth Weights Less than 1,501 Grams By County² of Residence, Illinois, 1989-1998 (continued)



¹ Rate per 10,000 live births ² Only counties with 16 or more cases are presented.
 Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

COCAINE TOXICITY

Cocaine toxicity in newborns is associated with difficulties in neurobehavioral development.⁸ Maternal cocaine use during the early stages of pregnancy also may lead to decreased intrauterine fetal growth. The long-term effects of fetal cocaine exposure on childhood development are still under investigation, but psychiatric disorder and depression in school-aged children may result.⁹ Community services have particular difficulty handling the concerns faced by families with drug abusing members, and one study found that more exposed infants were placed in adoption or foster care than control infants who had a similar home environment.¹⁰

Risk Factors

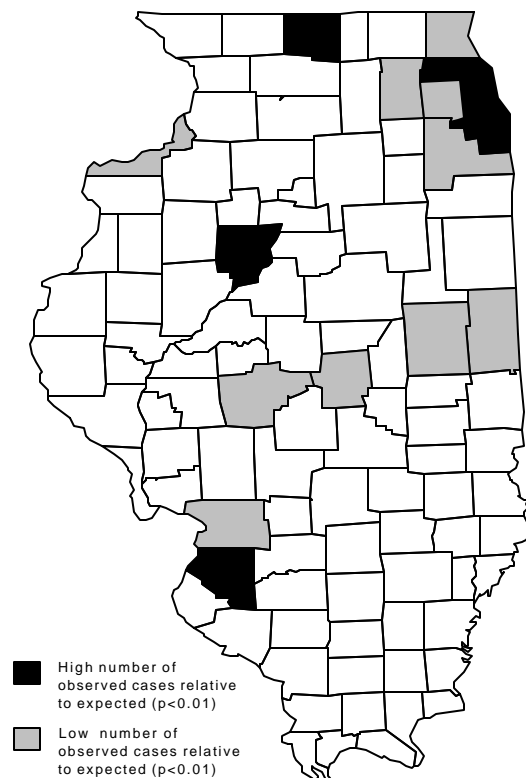
Socioeconomic factors have been associated with maternal cocaine use, as have depression and psychiatric disorders. A large proportion of substance abusing women experienced physical abuse during childhood and they are often victims of domestic violence.¹¹ Prevention programs emphasize case management to integrate social services and the greater success of residential treatment relative to outpatient programs for reducing drug use.^{12,13,14}

Prevalence

APORS records identify cocaine toxicity cases by either a positive urine toxicology in the newborn or by signs of drug toxicity or

withdrawal. The recording of these data began in 1991. The overall rate of such infants reported to APORS in Illinois between 1991 and 1998 was 79.9 per 10,000 live births, affecting 1,196 pregnancies annually. Among counties with at least 16 cases, Cook, Peoria, St. Clair and Winnebago counties reported a significantly high number of observed cases relative to expected. The counties of Champaign, DuPage, Kane, Lake, Macon, Madison, Rock Island, Sangamon, Vermilion and Will reported an observed number of cases that was significantly low relative to expected numbers (Table 2, Figures 3 and 4).

Figure 3. Illinois Counties with a Significantly High or Low Number of Observed Relative to Expected Infants Born with Cocaine Toxicity



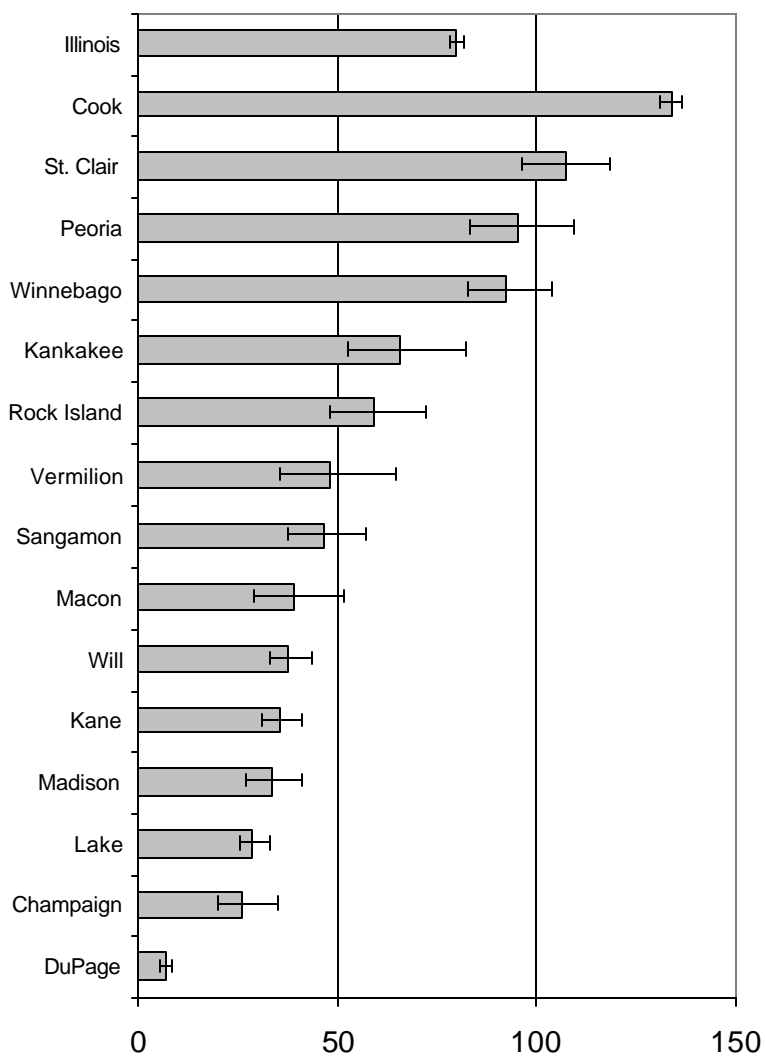
**Table 2. Total Number and Prevalence of Infants Born with Cocaine Toxicity
By County of Residence, Illinois, 1989-1998**

County	Case	Rate ¹	95% CI ²		County	Case	Rate ¹	95% CI ²	
			Upper	Lower				Upper	Lower
Illinois	11,96	79.9	78.5	81.4	Lee	1			
Adams	5				Livingston	9			
Alexander	1				Logan	0			
Bond	1				McDonough	0			
Boone	3				McHenry	11			
Brown	0				McLean	13			
Bureau	1				Macon	51	39.1	29.4	51.8
Calhoun	0				Macoupin	5			
Carroll	0				Madison	92	33.6	27.2	41.3
Cass	0				Marion	8			
Champaign	48	26.3	19.6	35.2	Marshall	0			
Christian	0				Mason	0			
Clark	0				Massac	0			
Clay	1				Menard	0			
Clinton	0				Mercer	0			
Coles	5				Monroe	0			
Cook	9,747	133.8	131.2	136.5	Montgomery	0			
Crawford	0				Morgan	1			
Cumberland	0				Moultrie	1			
DeKalb	5				Ogle	4			
DeWitt	1				Peoria	209	95.3	83.1	109.3
Douglas	1				Perry	0			
DuPage	73	6.6	5.2	8.4	Piatt	1			
Edgar	0				Pike	0			
Edwards	0				Pope	0			
Effingham	0				Pulaski	0			
Fayette	0				Putnam	0			
Ford	0				Randolph	0			
Franklin	0				Richland	0			
Fulton	0				Rock Island	94	58.9	47.8	72.3
Gallatin	0				St. Clair	351	107.0	96.3	118.9
Greene	0				Saline	2			
Grundy	4				Sangamon	96	46.3	37.7	56.8
Hamilton	0				Schuyler	1			
Hancock	0				Scott	0			
Hardin	0				Shelby	0			
Henderson	0				Stark	0			
Henry	3				Stephenson	8			
Iroquois	1				Tazewell	9			
Jackson	4				Union	0			
Jasper	0				Vermilion	46	48.1	35.6	64.6
Jefferson	12				Wabash	0			
Jersey	1				Warren	1			
Jo Daviess	1				Washington	0			
Johnson	0				Wayne	0			
Kane	189	35.5	30.7	41.0	White	0			
Kankakee	83	65.8	52.8	82.0	Whiteside	15			
Kendall	2				Will	195	37.8	32.8	43.6
Knox	12				Williamson	0			
Lake	231	28.9	25.4	33.0	Winnebago	292	92.5	82.3	103.8
LaSalle	12				Woodford	0			
Lawrence	0				Unspecified	2			

¹ Per 10,000 live births (rates were calculated only for counties with 16 or more cases) ² 95% Confidence interval

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

Figure 4. Prevalence Rates¹ and 95% Confidence Intervals for Infants Born with Cocaine Toxicity By County² of Residence, Illinois, 1989-1998



¹ Rate per 10,000 live births

² Only counties with 16 or more cases are presented.

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

CENTRAL NERVOUS SYSTEM BIRTH DEFECTS OF SPINA BIFIDA AND ANENCEPHALY

Central nervous system malformations include defects that involve the brain, spinal cord and associated tissues. These include the neural tube defects spina bifida and anencephaly. Research has established that women can reduce the risk of having a child with neural tube defects by taking 0.4 mg of the B-vitamin folic acid daily prior to and during the first trimester of pregnancy.¹⁵

Spina Bifida

Spina bifida is an inclusive name for various conditions characterized by non-closure of the spine and a neurological deficit that results from defective spinal cord development.

Anencephaly

Anencephaly is a neural tube defect affecting the skull and resulting in a large defect of the calvarium, meninges and scalp that is incompatible with life. The condition originates early in development and is related to the non-closure of the anterior neuropore. Prenatal diagnosis can be made with a high degree of accuracy either by ultrasound or by studies on alphafetoprotein in maternal blood or in amniotic fluid.

Risk Factors

All women of childbearing age are considered to be at risk for a neural tube defect pregnancy. One recent study suggests that Hispanic mothers

may be associated with a higher rate of these defects than white mothers.¹⁶

Prevalence

APORS records identify spina bifida and anencephaly by the use of International Classification for Diseases, Ninth Revision (ICD-9-CM) codes. ICD-9-CM codes of 741.0 and 741.9 are associated with spina bifida, and the codes 740.0-740.1 are associated with anencephaly. The overall rate of such infants reported to APORS in Illinois between 1989 and 1998 was 4.9 per 10,000 live births, affecting 93 pregnancies annually. Among counties with at least 16 cases, no county in Illinois reported a significantly high or low number of observed cases relative to expected numbers (Table 3, Figure 5).

(Note: No map is presented because no county in Illinois with at least 16 cases reported a significantly high or low number of observed cases relative to expected numbers for the birth defects of spina bifida and anencephaly.)

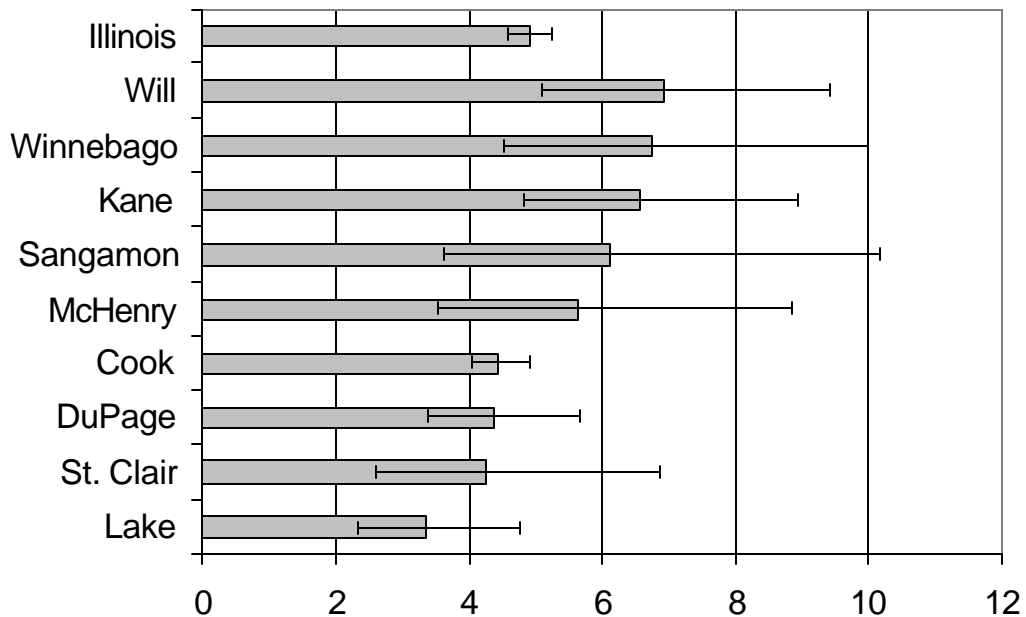
**Table 3. Total Number and Prevalence of Infants Born with Spina Bifida or Anencephaly
By County of Residence, Illinois, 1989-1998**

County	Case	Rate ¹	95% CI ²		County	Cases	Rate ¹	95% CI ²	
			Upper	Lower				Upper	Lower
Illinois	926	4.9	4.6	5.2	Lee	1			
Adams	6				Livingston	5			
Alexander	1				Logan	2			
Bond	3				McDonough	4			
Boone	3				McHenry	20	5.6	3.5	8.9
Brown	0				McLean	10			
Bureau	1				Macon	9			
Calhoun	1				Macoupin	4			
Carroll	1				Madison	11			
Cass	1				Marion	7			
Champaign	7				Marshall	2			
Christian	0				Mason	1			
Clark	2				Massac	1			
Clay	0				Menard	1			
Clinton	3				Mercer	1			
Coles	6				Monroe	1			
Cook	408	4.4	4.0	4.9	Montgomery	2			
Crawford	5				Morgan	1			
Cumberland	0				Moultrie	4			
DeKalb	7				Ogle	2			
DeWitt	0				Peoria	14			
Douglas	2				Perry	2			
DuPage	60	4.4	3.4	5.7	Piatt	0			
Edgar	1				Pike	1			
Edwards	0				Pope	0			
Effingham	4				Pulaski	1			
Fayette	3				Putnam	0			
Ford	2				Randolph	2			
Franklin	2				Richland	0			
Fulton	3				Rock Island	11			
Gallatin	1				St. Clair	18	4.3	2.6	6.9
Greene	3				Saline	2			
Grundy	2				Sangamon	16	6.1	3.6	10.2
Hamilton	0				Schuyler	2			
Hancock	0				Scott	0			
Hardin	0				Shelby	0			
Henderson	0				Stark	0			
Henry	2				Stephenson	1			
Iroquois	1				Tazewell	14			
Jackson	5				Union	4			
Jasper	1				Vermilion	8			
Jefferson	1				Wabash	0			
Jersey	3				Warren	2			
Jo Daviess	1				Washington	1			
Johnson	1				Wayne	2			
Kane	43	6.6	4.8	8.9	White	0			
Kankakee	6				Whiteside	5			
Kendall	3				Will	44	6.9	5.1	9.4
Knox	4				Williamson	4			
Lake	33	3.3	2.3	4.8	Winnebago	27	6.8	4.5	10.0
LaSalle	8				Woodford	4			
Lawrence	2				Unspecified	0			

¹ Per 10,000 live births (rates were calculated only for counties with 16 or more cases) ² 95% Confidence interval

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

Figure 5. Prevalence Rates¹ and 95% Confidence Intervals for Infants Born with Spina Bifida or Anencephaly



By County² of Residence, Illinois, 1989-1998

¹ Rate per 10,000 live births

² Only counties with 16 or more cases are presented.

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

FETAL ALCOHOL SYNDROME

Fetal alcohol syndrome (FAS) is believed to be the most common cause of mental retardation in the United States.¹⁷ Features at birth include a facial dysmorphism affecting the eyelids and upper lip. Central nervous dysfunction, cardiovascular defects and growth abnormalities often result. Behavioral problems particular to the syndrome may occur during adolescence.

Risk Factors

Although FAS is generally underreported,¹⁸ some research suggests that up to one in six women of childbearing age drinks enough alcohol to affect a developing fetus.¹⁹ Awareness has been raised by FAS prevention programs, but there are equivocal findings regarding their success in the prevention of high-risk maternal behavior. A previous FAS pregnancy is a known risk factor, and inadequate prenatal care is probably correlated.

Prevalence

APORS records identify FAS cases according to the ICD-9-CM code of 760.71. The overall rate of such infants reported to APORS in Illinois between 1989 and 1998 was 3.5 per 10,000 live births, affecting 67 pregnancies annually. Among counties with at least 16 cases, Cook County reported a significantly high number of observed cases relative to expected. The counties of DuPage and Lake reported an observed number of cases that was significantly low relative to

expected numbers (Table 4, Figures 6 and 7).

Figure 6. Illinois Counties with a Significantly High or Low Number of Observed Relative to Expected Infants Born with Fetal Alcohol Syndrome



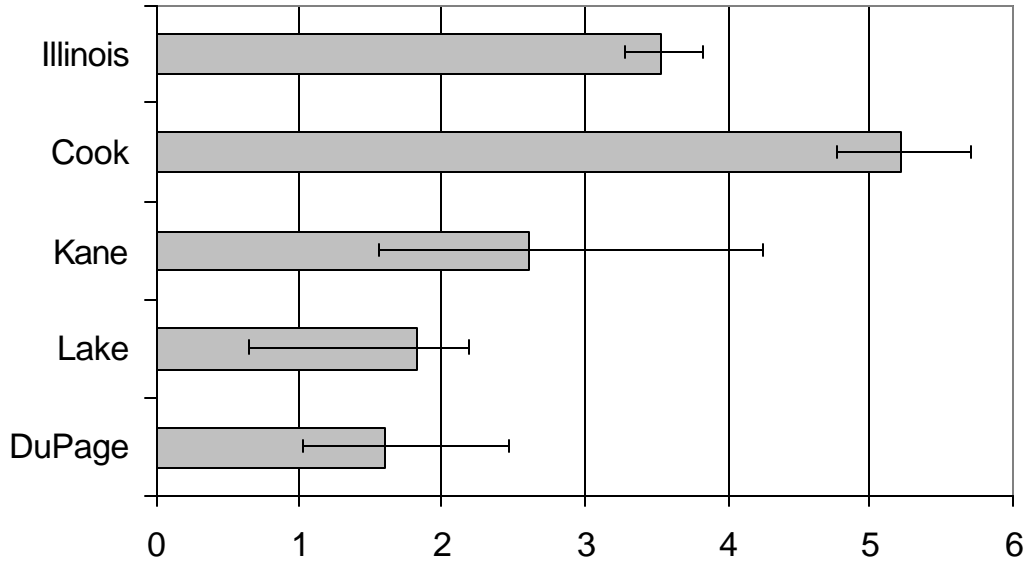
**Table 4. Total Number and Prevalence of Infants Born with Fetal Alcohol Syndrome
By County of Residence, Illinois, 1989-1998**

County	Case	Rate ¹	95% CI ²		County	Case	Rate ¹	95% CI ²	
			Upper	Lower				Upper	Lower
Illinois	667	3.5	3.3	3.8	Lee	0			
Adams	0				Livingston	0			
Alexander	0				Logan	1			
Bond	0				McDonough	0			
Boone	0				McHenry	1			
Brown	0				McLean	5			
Bureau	0				Macon	3			
Calhoun	0				Macoupin	1			
Carroll	1				Madison	5			
Cass	0				Marion	1			
Champaign	11				Marshall	0			
Christian	3				Mason	0			
Clark	0				Massac	0			
Clay	0				Menard	0			
Clinton	0				Mercer	0			
Coles	1				Monroe	0			
Cook	479	5.2	4.8	5.7	Montgomery	0			
Crawford	1				Morgan	1			
Cumberland	0				Moultrie	0			
DeKalb	0				Ogle	2			
DeWitt	0				Peoria	12			
Douglas	0				Perry	0			
DuPage	22	1.6	1.0	2.5	Piatt	1			
Edgar	0				Pike	0			
Edwards	0				Pope	1			
Effingham	0				Pulaski	2			
Fayette	0				Putnam	0			
Ford	1				Randolph	1			
Franklin	0				Richland	0			
Fulton	0				Rock Island	7			
Gallatin	1				St. Clair	9			
Greene	0				Saline	0			
Grundy	0				Sangamon	15			
Hamilton	0				Schuyler	0			
Hancock	0				Scott	0			
Hardin	0				Shelby	0			
Henderson	0				Stark	0			
Henry	0				Stephenson	3			
Iroquois	0				Tazewell	1			
Jackson	5				Union	0			
Jasper	0				Vermilion	5			
Jefferson	3				Wabash	0			
Jersey	0				Warren	0			
Jo Daviess	0				Washington	0			
Johnson	0				Wayne	0			
Kane	17	2.6	1.6	4.3	White	1			
Kankakee	5				Whiteside	0			
Kendall	0				Will	10			
Knox	0				Williamson	0			
Lake	18	1.8	0.7	2.2	Winnebago	10			
LaSalle	1				Woodford	0			
Lawrence	0				Unspecified	0			

¹ Per 10,000 live births (rates were calculated only for counties with 16 or more cases) ² 95% Confidence interval

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

**Figure 7. Prevalence Rates¹ and 95% Confidence Intervals
for Infants Born with Fetal Alcohol Syndrome
By County² of Residence, Illinois, 1989-1998**



¹ Rate per 10,000 live births

² Only counties with 16 or more cases are presented.

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

SECTION II

MORTALITY AMONG INFANTS WITH ADVERSE PREGNANCY OUTCOMES IN ILLINOIS 1989-1997

Section II. Mortality Among Infants with Adverse Pregnancy Outcomes in Illinois, 1989-1997

In a recently published analysis, Illinois infant mortality rates in the late 1990s were found to be the lowest yet recorded.²⁰ Nevertheless, congenital anomalies, prematurity and sudden infant death syndrome remain important causes of infant mortality to address in Illinois and throughout the United States, accounting for more than 20 percent of total infant deaths.

This section discusses these and other causes of mortality for infants born with selected adverse pregnancy outcomes. In particular, the rates of the most common causes of infant mortality for all newborns are evaluated and compared with rates for infants having low birth weight, cocaine toxicity, fetal alcohol syndrome or the neural tube defects of spina bifida or anencephaly.

METHODS

The Illinois Department of Public Health's Center for Health Statistics routinely uses an automated algorithm to link the deaths of infants up to 1 year of age to their birth certificates. The result is a matched birth-death master file.

Separately, Illinois newborns reported to APORS are matched to their birth certificates each year to obtain additional demographic information, including the birth certificate number. This number was used to link APORS infants to the matched birth-death master files to identify infants who died within 364 days of birth.

The matched birth-death master file contains the underlying cause of death. Using this recorded cause, infant deaths were aggregated into the following 12 underlying cause-of-death categories noted in Illinois vital statistics reports (see Appendix B):

- congenital anomalies;
- respiratory conditions of the newborn;
- disorders relating to short gestation and unspecified low birth weight;
- sudden infant death syndrome (SIDS);
- maternal complications of pregnancy;
- unintentional injuries;
- complications of the placenta, cord and membranes;
- infections specific to the perinatal period;
- perinatal disorders of the digestive system;
- neonatal hemorrhage;
- heart disease; and
- pneumonia and influenza.

Similar to Section I of the report, four groups of adverse pregnancy outcomes were selected. Low birth weight infants consisted of newborns weighing less than 1,501 grams. Cocaine toxicity infants exhibited either a positive urine toxicology or signs of drug toxicity or withdrawal. Infants with the neural tube defects of spina bifida and anencephaly were identified according to ICD-9-CM codes. Spina bifida was associated with the codes of 741.0 and 741.9, and anencephaly was associated with the codes of 740.0-740.1. Finally, fetal alcohol syndrome cases were identified by the ICD-9-CM code of 760.71.

The conditions were not mutually exclusive. For all of these groups except cocaine toxicity, data were available beginning in 1989. Data identifying cocaine toxicity began in 1991, so the analysis for this group was started at this later point.

Different from the first section of the report were the ending point of the study and the exclusion of fetal death records. For this section, infant mortality from live birth through 364 days of age from the matched birth-death file was examined. The file was available through 1997, so our study period ended then. Also, cases of fetal death are not included in the matched birth-death file, so they were excluded from this section.

Rates and 95% confidence intervals (CI) were calculated in the same manner as in the first section. Statistical significance ($p < 0.01$) also was interpreted as before.

MORTALITY BY UNDERLYING CAUSE OF DEATH FOR ALL BIRTHS

Of the 1,700,155 live births in Illinois between 1989 and 1997, 16,119 infants died within 364 days of birth (Table 5; data were restricted to the birth-death master file for Illinois residents only). This was a rate of 94.8 deaths per 10,000 live births. Congenital anomalies, respiratory conditions, disorders relating to short gestation and sudden infant death syndrome (SIDS) accounted for nearly two-thirds of these cases.

**Table 5. Total Number of Deaths and Rate of Infant Mortality for All Infants
By Underlying Cause of Death, Illinois, 1989-1997**

Cause of Death	Death	Rate ¹	95% CI ²	
			Upper	Lower
Congenital anomalies	3,341	19.7	19.0	20.3
Respiratory conditions of newborn	2,562	15.1	14.5	15.7
Disorders of short gestation and unspecified low birth weight	2,443	14.4	13.8	15.0
Sudden infant death syndrome	2,170	12.8	12.2	13.3
Maternal complications of pregnancy	932	5.5	5.1	5.8
Unintentional injuries	414	2.4	2.2	2.7
Complications of placenta, cord and membranes	392	2.3	2.1	2.5
Infections specific to the perinatal period	386	2.3	2.1	2.5
Perinatal disorders of digestive system	282	1.7	1.5	1.9
Neonatal hemorrhage	277	1.6	1.4	1.8
Pneumonia and influenza	259	1.5	1.3	1.7
Heart disease	242	1.4	1.3	1.6
Other	2,419	14.2	13.7	14.8
Totals	16,119	94.8	93.4	96.3
Live births (used for rate denominator, fetal deaths excluded)	1,700,155 live births			

¹ Per 10,000 live births (rates were calculated only for causes with 16 or more cases)

² 95% Confidence interval

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

MORTALITY BY UNDERLYING CAUSE OF DEATH FOR INFANTS WITH LOW BIRTH WEIGHTS OF LESS THAN 1,501 GRAMS

Nearly one in five infants with birth weights less than 1,501 grams did not survive past their first year, with a rate of 1,886.1 deaths per 10,000 live births (Table 6). These infants had significantly higher rates than the general population for nearly all underlying causes of infant death. The sole exception was death from unintentional injury. For this cause, there was an insufficient number of low birth weight infants to calculate a stable rate.

These findings are not surprising given the extensive physiological challenges associated with prematurity. Also, there were a large enough number of low birth weight infants recorded in APORS for this nine-year period (23,223 cases) to compute rates for most of the underlying causes.

Table 6. Infant Mortality in the First Year for Infants with Birth Weights Less Than 1,501 Grams By Underlying Cause of Death, Illinois, 1989-1997

Cause of Death	Deaths	Rate ¹	95% CI ²	
			Upper	Lower
Congenital anomalies	428	184.3	167.6	202.6
Respiratory conditions of newborn	1,448	623.5	592.9	655.6
Disorders of short gestation and unspecified low birth weight	840	361.7	338.2	386.7
Sudden infant death syndrome	99	42.6	34.8	52.1
Maternal complications of pregnancy	293	126.2	112.4	141.6
Unintentional injuries	13			
Complications of placenta, cord and membranes	108	46.5	38.3	56.3
Infections specific to the perinatal period	196	84.4	73.2	97.2
Perinatal disorders of digestive system	192	82.7	71.6	95.4
Neonatal hemorrhage	203	87.4	76.0	100.5
Pneumonia and influenza	52	22.4	16.9	29.6
Heart disease	27	11.6	7.8	17.2
Other	481	207.1	189.4	226.5
Totals	4,380	1,886.1	1,836.1	1,937.1
Live births (used for rate denominator, fetal deaths excluded)	23,223 live births			

¹ Per 10,000 live births (rates were calculated only for causes with 16 or more cases)

² 95% Confidence interval

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

MORTALITY BY UNDERLYING CAUSE OF DEATH FOR INFANTS BORN WITH COCAINE TOXICITY

Relative to the general population of Illinois newborns, cocaine toxicity was associated with a significantly higher rate of overall infant mortality, at 221.6 deaths per 10,000 live births (Table 7). A sufficient number of cases was available to calculate a stable rate for four of the underlying causes of infant mortality. Significantly higher rates were found for respiratory conditions and SIDS.

Because there was considerable overlap between cocaine toxicity and low birth weight infants, the evaluation was repeated for cocaine toxic infants with birth weights of more than 1,500 grams. The overall rate of mortality remained significantly higher than the general population at 136.3 per 10,000 live births (CI 116.6-159.2). A sufficient number of cases was available to calculate a stable rate for only one of the underlying causes of death for these infants. Cocaine toxic infants had a significantly higher rate of SIDS than the general population at 51.8 per 10,000 live births (CI 40.1-66.9).

**Table 7. Infant Mortality in the First Year for Infants Born with Cocaine Toxicity
By Underlying Cause of Death, Illinois, 1989-1997**

Cause of Death	Deaths	Rate ¹	95% CI ²	
			Upper	Lower
Congenital anomalies	32	26.8	18.6	38.2
Respiratory conditions of newborn	44	36.8	27.1	49.8
Disorders of short gestation and unspecified low birth weight	21	17.6	11.2	27.3
Sudden infant death syndrome	68	56.9	44.5	72.5
Maternal complications of pregnancy	3			
Unintentional injuries	12			
Complications of placenta, cord and membranes	1			
Infections specific to the perinatal period	7			
Perinatal disorders of digestive system	11			
Neonatal hemorrhage	3			
Pneumonia and influenza	13			
Heart disease	4			
Other	46	38.5	28.5	51.7
Totals	265	221.6	196.3	250.0
Live births (used for rate denominator, fetal deaths excluded)	11,958 live births			

¹ Per 10,000 live births (rates were calculated only for causes with 16 or more cases)

² 95% Confidence interval

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

MORTALITY BY UNDERLYING CAUSE OF DEATH FOR INFANTS WITH THE CENTRAL NERVOUS SYSTEM BIRTH DEFECTS OF SPINA BIFIDA AND ANENCEPHALY

More than one in five infants with the neural tube defects of spina bifida or anencephaly do not survive past their first year, with a rate of 2,100.3 deaths per 10,000 live births (Table 8). A sufficient number of cases was available to calculate a stable rate for only one of the underlying causes of infant mortality. A significantly higher rate than that of the general population was found for death due to congenital anomalies. This finding is not surprising in that these birth defects are among the most harmful of all such anomalies.

**Table 8. Infant Mortality in the First Year for Infants Born with
Spina Bifida or Anencephaly
By Underlying Cause of Death, Illinois, 1989-1997**

Cause of Death	Death	Rate ¹	95% CI ²	
			Upper	Lower
Congenital anomalies	121	1,896.6	1,604.0	2,227.3
Respiratory conditions of newborn	3			
Disorders of short gestation and unspecified low birth weight	2			
Sudden infant death syndrome				
Maternal complications of pregnancy				
Unintentional injuries				
Complications of placenta, cord and membranes	1			
Infections specific to the perinatal period				
Perinatal disorders of digestive system				
Neonatal hemorrhage				
Pneumonia and influenza	1			
Heart disease				
Other	6			
Totals	134	2,100.3	1,794.7	2,441.5
Live births (used for rate denominator, fetal deaths excluded)		638 live births		

¹ Per 10,000 live births (rates were calculated only for causes with 16 or more cases)

² 95% Confidence interval

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

MORTALITY BY UNDERLYING CAUSE OF DEATH FOR INFANTS BORN WITH FETAL ALCOHOL SYNDROME

Relative to the general population of Illinois newborns, fetal alcohol syndrome (FAS) was associated with a significantly higher rate of overall infant mortality, at 375.0 deaths per 10,000 live births (Table 9). There were not a sufficient number of cases to calculate a stable rate for any of the underlying causes of infant death for FAS newborns.

Table 9. Infant Mortality in the First Year for Infants Born with Fetal Alcohol Syndrome By Underlying Cause of Death, Illinois, 1989-1997

Cause of Death	Death Rate ¹	95% CI ²	
		Upper	Lower
Congenital anomalies	3		
Respiratory conditions of newborn	5		
Disorders of short gestation and unspecified low birth weight	1		
Sudden infant death syndrome	5		
Maternal complications of pregnancy			
Unintentional injuries	1		
Complications of placenta, cord and membranes	1		
Infections specific to the perinatal period			
Perinatal disorders of digestive system			
Neonatal hemorrhage	2		
Pneumonia and influenza			
Heart disease			
Other	6		
Totals	24	375.0	246.9 561.1
Live births (used for rate denominator, fetal deaths excluded)	640 live births		

¹ Per 10,000 live births (rates were calculated only for causes with 16 or more cases)

² 95% Confidence interval

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

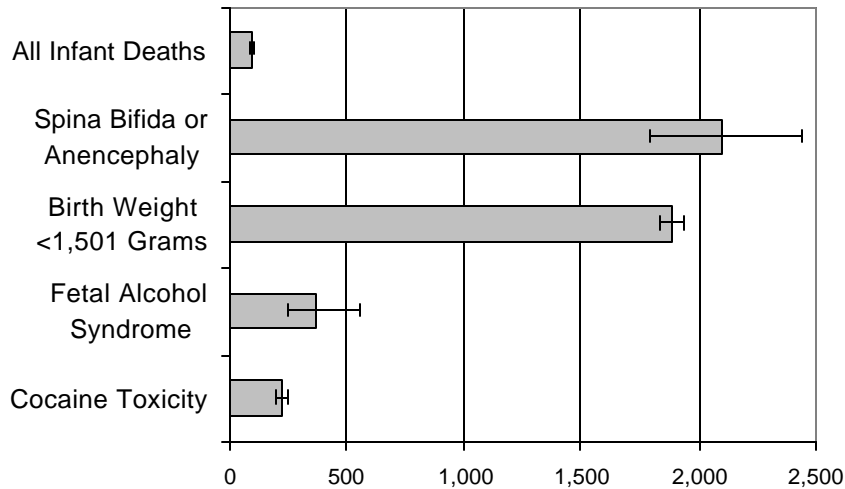
COMPARISON OF INFANT MORTALITY FOR ALL NEWBORNS WITH AND WITHOUT SELECTED ADVERSE PREGNANCY OUTCOMES

For all four of these selected adverse pregnancy outcomes, the rate of mortality was significantly higher than the rate found for the general population (Figure 8). These results are actually underestimates in that fetal deaths are not included.

The association between cocaine toxicity and SIDS is not clearly established. Researchers have found an increased association between these phenomena if low birth weight is also present.²¹ In a meta-analysis, cocaine exposure alone did not significantly contribute to the occurrence of SIDS; however, the concurrent use of cocaine and other drugs did contribute.²² APORS data were not sufficiently detailed to perform a similar analysis.

Other than the finding of cocaine and SIDS, the results of this report compare well with published research and commonly held conceptions. The mortality rates shown here reflect the impact of these conditions on families and on health care systems in Illinois. The morbidity associated with these conditions is considerable in terms of hospitalization and long-term disability. These results underscore the importance of regional and local efforts to prevent adverse pregnancy outcomes.

Figure 8. Infant Mortality Rates¹ and 95% Confidence Intervals for Infants with Selected Adverse Pregnancy Outcomes, Illinois, 1989-1998



¹ Rate per 10,000 live births for mortality within the first year

Source: IDPH, Adverse Pregnancy Outcomes Reporting System, December 1999

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APPENDIX A

Adverse Pregnancy Outcomes Reporting System (APORS)

The Adverse Pregnancy Outcomes Reporting System (APORS) is the most complete source of data on birth defects that currently exists in Illinois. APORS is a component of the Illinois Health and Hazardous Substances Registry in the Division of Epidemiologic Studies, Illinois Department of Public Health.

APORS Reporting Requirements

All hospitals in Illinois, except federal and military hospitals, are mandated to participate. St. Louis perinatal centers that serve southern Illinois residents voluntarily report infants born to Illinois women. The facilities provide information on any delivery that

- a. is discharged from a patient care unit or bassinet(s) designated by the hospital to provide intensive care services requiring constant nursing and cardiopulmonary and other support services for infants with life threatening conditions (stay in unit must exceed 24 hours);
- b. is diagnosed prior to hospital discharge as having a positive drug toxicology for any drug and/or showing signs and symptoms of drug toxicity or withdrawal;
- c. is diagnosed prior to hospital discharge as having a congenital anomaly (birth defect);
- d. is diagnosed prior to hospital discharge as having any of the following:
 - serious congenital infection
 - syphilis
 - other congenital infections
 - endocrine, metabolic, or immune disorder
 - hypothyroidism
 - androgenital syndrome
 - inborn errors of metabolism
 - cystic fibrosis
 - blood disorder
 - leukemia
 - hereditary hemolytic anemia
 - constitutional aplastic anemia
 - coagulation defect;
- e. has a birthweight of less than 1,501 grams;
- f. results in fetal or neonatal death; or
- g. has a reportable other condition
 - neurofibromatosis
 - retinopathy of prematurity
 - chorioretinitis
 - strabismus
 - endocardial fibroelastosis
 - occlusion of cerebral arteries
 - fetal alcohol syndrome
 - intrauterine growth retardation
 - cerebral lipidoses.

Objectives

Careful analysis of this reportable APORS information will enable health care professionals

1. to target, develop, evaluate and monitor prevention and intervention programs;
2. to identify and analyze environmental influences on pregnancy outcomes, especially birth defects; and
3. to identify high-risk populations or geographic areas in Illinois that require epidemiologic investigation.

Coverage

Population-based and statewide

Age Covered

Newborns (from birth to hospital discharge) and, beginning in 1996, infants up to 1 year of age

Case Ascertainment

APORS is both a passive and an active surveillance system. While infant discharge records are passively reported by hospitals (as mandated by state law), maternal information is collected actively by APORS field representatives. In addition, beginning in 1996, active case finding for birth defects was performed by reviewing hospital records for patients less than 1 year old who had a birth defect diagnosis (ICD-9-CM codes 740.0 - 759.9).

Case Identification Sources and Coding System

Individual cases with birth defects are identified by hospital staff. The majority of identification is done in the neonatal intensive care unit (NICU). Additional adverse pregnancy outcomes, including infants with drug toxicity, are identified in the labor and delivery units or in the newborn nursery. After identification, an infant discharge record is completed for each case and forwarded to APORS where reports are processed. Copies also are sent to the family's physician and the local public health agency for follow-up.

In addition, beginning with 1996 newborns, APORS staff began conducting case finding studies of birth defects for infants diagnosed in their first year. Hospitals supply lists of infants with birth defect diagnoses who had received services. APORS staff match the list against existing records to identify new cases or additional birth defects among existing cases.

For coding birth defects and other pregnancy outcomes, APORS utilizes the International Classification of Diseases Ninth Revision - Clinical Modification (ICD-9-CM).

APPENDIX B

Causes of Infant Death

The following scheme for coding the causes of infant death is used by the Center for Health Statistics, Illinois Department of Public Health, for the annual *Vital Statistics Illinois* reports.

Cause	ICD-9-CM Codes
Congenital anomalies	740-759
Respiratory conditions of the newborn	768-770
Disorders relating to short gestation and unspecified low birth weight	765
Sudden infant death syndrome	798.0
Maternal complications of pregnancy	761
Unintentional injuries	E800-E949
Complications of placenta, cord and membranes	762
Infections specific to the perinatal period	771
Perinatal disorders of the digestive system	777
Neonatal hemorrhage	772
Heart disease	393-398, 402, 404-429
Pneumonia and influenza	480-487

For additional copies or more information, please contact

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