COMPARISON OF THE CHARACTERISTICS OF THREE INFANT POPULATIONS IN ILLINOIS, 1996-2000

Illinois Department of Public Health
Division of Epidemiologic Studies

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COMPARISON OF THE CHARACTERISTICS OF THREE INFANT POPULATIONS IN ILLINOIS, 1996-2000

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INTRODUCTION

Adverse pregnancy outcomes are recorded by the Illinois Department of Public Health (IDPH) for infants with congenital anomalies (birth defects) and other serious neonatal conditions. Each year in Illinois, IDPH's Adverse Pregnancy Outcomes Reporting System (APORS) obtains information on thousands of such births throughout the state. Information about congenital anomalies and other adverse pregnancy outcomes identified in newborn infants was first collected statewide by APORS in 1989.

Information about adverse pregnancy outcomes is collected for two major reasons. First, infants with a congenital anomaly or other problem often need special services to help assure that 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 public health surveillance purposes. These may include describing disease patterns, tracking trends, conducting cluster investigations, and developing education and intervention strategies.

Although infants in APORS are clearly different from the general population in terms of health status, it is not clear how much difference exists for other population characteristics. This report uses data from APORS and the Illinois Project for Local Assessment of Needs (IPLAN) to compare three infant populations over the five-year period 1996 through 2000. The three populations are the general infant population of Illinois, the population of infants born in Illinois with a congenital anomaly and the population of infants born in Illinois with some other recognized adverse outcome. The rates of cigarette use, alcohol use, maternal age and education, maternal pregnancy risk factors, gestational age and birth weight are compared for the three populations.

METHODS

Data sources

APORS is the most complete source of data on adverse pregnancy outcomes that exists in Illinois. All Illinois hospitals are mandated to report infants born to Illinois women. (Perinatal centers in St. Louis, Missouri voluntarily participate.) APORS is a passive surveillance system since reports are sent to IDPH rather than APORS staff going to hospitals to identify children with adverse outcomes. Such passive systems, though economical and relatively easy to operate, are likely to underestimate adverse outcome rates. The Trust for America's Health (2002) gave APORS a rating of B because of this lack of active surveillance activities.

Birth certificates, maintained by the Department's Division of Vital Records, are an additional data source. APORS matches records with these birth data to identify infants with very low

birth-weights or with certain birth defects, who are otherwise unreported by the hospitals. The Division of Vital Records also provides information about fetal deaths.

Calculation and interpretation of rates and confidence intervals

Annual percentage rates (per 100 live births) for selected adverse pregnancy outcomes identified during the newborn hospital stay or associated with a fetal death were calculated as

$$100 \times \frac{\text{number of infants delivered with a congenital anomaly}}{\text{number of live births}}$$

Similar rates were calculated for other outcomes. The numbers of live births were obtained from the IDPH master birth files, provided by the Department's Center for Health Statistics.

Occurrence of a specific outcome is assumed to follow a Binomial distribution. Exact confidence intervals were calculated for each rate (Armitage and Berry, 1987, page 119). Where there are a large number of cases, the confidence interval is narrow, indicating that the rate is stable. Where there are few cases, the confidence interval becomes very wide, indicating that the rate is not very stable and a small change in the number of infants born with the specific characteristic could result in a large change in the rate.

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

Validity of data

Since APORS is a passive surveillance system it is likely that the rates of birth defects and the other adverse outcome rates are under reported. In addition, primarily only conditions diagnosed by the end of the newborn stay are reported. Consequently, conditions that are typically diagnosed later in a child's life, such as fetal alcohol syndrome or gastrointestinal defects, are under ascertained. However, case reporting is gradually improving, especially in recent years, as the resources available to the registry are increasing. Despite its limitations, APORS is the most complete source of data on adverse pregnancy outcomes in Illinois.

Most children in the APORS system are matched to their birth certificate (or fetal death certificate). However, 2,224 APORS cases (almost all birth defect cases) included in this report were identified through special studies. These cases are not matched to their birth

certificate. In other cases, either a birth certificate cannot be located for the APORS case or limited APORS staff resources have restricted the amount of demographic data that could be collected for a case.

Birth certificate data is usually very complete, however, the accuracy with which a birth certificate is completed is more questionable. Mothers may be reluctant to honestly answer questions that reflect on their behavior during pregnancy (smoking and alcohol consumption). In addition, the birth certificate does not differentiate between a single event (e.g. a single glass of wine with dinner once during the pregnancy), and a continuous pattern of behavior (a couple of drinks each night throughout the pregnancy). Nevertheless, recent research indicates that while these difficulties should be acknowledged, the birth certificate does provide useful information for exploring the relationships between birth outcomes and pregnancy behaviors (Honein *et al.*). However, the birth certificate validity is less certain when most maternal risk factors (such as diabetes) are examined (DiGiuseppe *et al.*; Gore DC *et al.*)

RESULTS AND DISCUSSION
I. DESCRIPTIONS OF THREE POPULATIONS

General population of newborns

The general population of newborns consists of all infants born in the state of Illinois during the five-year period 1996 through 2000. Information about this population was gathered from birth certificates. Portions of these data are readily available in report form through IPLAN (Illinois Project for Local Assessment of Needs). All birth certificate data were collected by the IDPH Division of Vital Statistics. A total of 913,261 infants were born in Illinois during this time period.

Newborns with birth defects

Birth defects are the fifth-leading cause of years of potential life lost in the United States. Birth defects also contribute substantially to childhood morbidity and long-term disability. More than 4,500 different birth defects have been identified. Birth defects are generally grouped according to the organ system that they affect: central nervous system, eye, ear, cardiovascular, respiratory, orofacial, gastrointestinal, genitourinary, musculoskeletal and chromosomal. Most birth defects lie within the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) range of 740.0 and 759.9.

The population of newborns with birth defect consists of all babies with at least one reportable congenital anomaly diagnosed during the newborn stay, born in the state of Illinois during the five-year period 1996 through 2000. Information about this population was collected by APORS, with some information coming from the birth certificate (demographic and birth-related information).

Examples of reportable birth defects range from rarities such as anencephalus and spina bifida to more common defects such as Down syndrome and club foot[1] (Fornoff *et al.*). Information regarding which congenital anomalies are reported to APORS and included in the database are available in an earlier IDPH report entitled *Birth Defects and Other Adverse Pregnancy Outcomes in Illinois 1995-1999* (Fornoff *et al.*). A total of 20,602 infants were born with reportable congenital anomalies in Illinois during 1996-2000.

Infants with birth defects may also have some of the other adverse conditions described in the next section. However, they are only included in the birth defects group for this report.

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[1] The rates for these conditions are

anencephaly:	1.9/10,000 live births,
spina bifida:	2.8/10,000 live births,
Down syndrome:	9.6/10,000 live births,
club foot:	10.0/10,000 live births.

These rates are averages for 1995-1999.

Newborns with other adverse outcomes

The population of babies born with other adverse outcomes consists of all infants diagnosed with at least one reportable condition other than a congenital anomaly, born in the state of Illinois during the five-year 1996 through 2000. The reportable conditions include fetal and neonatal deaths, infants born with very-low birthweights, blood disorders, serious congenital infections (either viral or bacterial), or immune disorders. It also includes infants exposed to illegal drugs during pregnancy and babies with fetal alcohol syndrome (FAS). Information about this population was gathered using data collected by APORS, with some information coming from the birth certificate (demographic and birth-related information).

Since its inception in 1989, the APORS program has mandated reporting of infants whose only reportable condition was that they spent 24 hours in neonatal intensive care. Since these cases do not usually have long-term problems, they have been excluded for the purposes of this report. Detailed information regarding which adverse outcomes are reported to APORS are available in an earlier IDPH surveillance report entitled *Birth Defects and Other Adverse Pregnancy Outcomes in Illinois 1995-1999* (Fornoff *et al.*).

A total of 25,786 infants were born with reportable adverse outcomes other than congenital anomalies in Illinois during 1996-2000. This number excludes the 34,448 cases whose only adverse outcome was a stay in intensive care of more than 24 hours. Table 1 shows the conditions that are most common among children in this group. The percentages do not add up to 100 percent and the condition-specific numbers do not sum up to the total number of infants in this group because these children commonly meet more than one of the case criteria.

Table 1: Frequency of infants without birth defects meeting other APORS case criteria, 1996-2000

Infants	5-Year Total	Annual Average	Percent of births with adverse outcome
Very-Low Birthweight	11,847	2,369.4	45.9
Positive for Controlled Substances	7,888	1,577.6	30.6
Congenital Infections	4,405	881.0	17.1
Fetal Deaths	3,756	751.2	14.6
Died During Newborn Hospitalization	2,532	506.4	9.8
Intrauterine Growth Retardation	1,934	386.8	7.5

Source: Adverse Pregnancy Outcomes Reporting System, March 2002

II. COMPARISON OF DEMOGRAPHIC CHARACTERISTICS

The following three tables display the frequency distributions, percentages and 95 percent confidence intervals of all three populations based on demographic factors (race, ethnicity and gender). The corresponding figures display the same information graphically.

Race distribution

In Illinois, three-fourths of the births are of white infants, while one-fifth are of black infants. Similar proportions are reflected in the population of infants born with a congenital anomaly. However, infants with an adverse outcome are more likely to be black than white. This difference is seen nationally also: the National Vital Statistics Reports (Martin *et al.*) indicates that black mothers are more likely to have very low birthweight babies than white mothers. (Very low birthweights make up almost half the non-birth defect adverse outcomes experienced by Illinois infants.) The observed difference does not necessarily reflect a true difference between races; combinations of other factors associated with race in Illinois, such as poverty, maternal education or prenatal care also may give rise to the observed variations in adverse outcome rates.

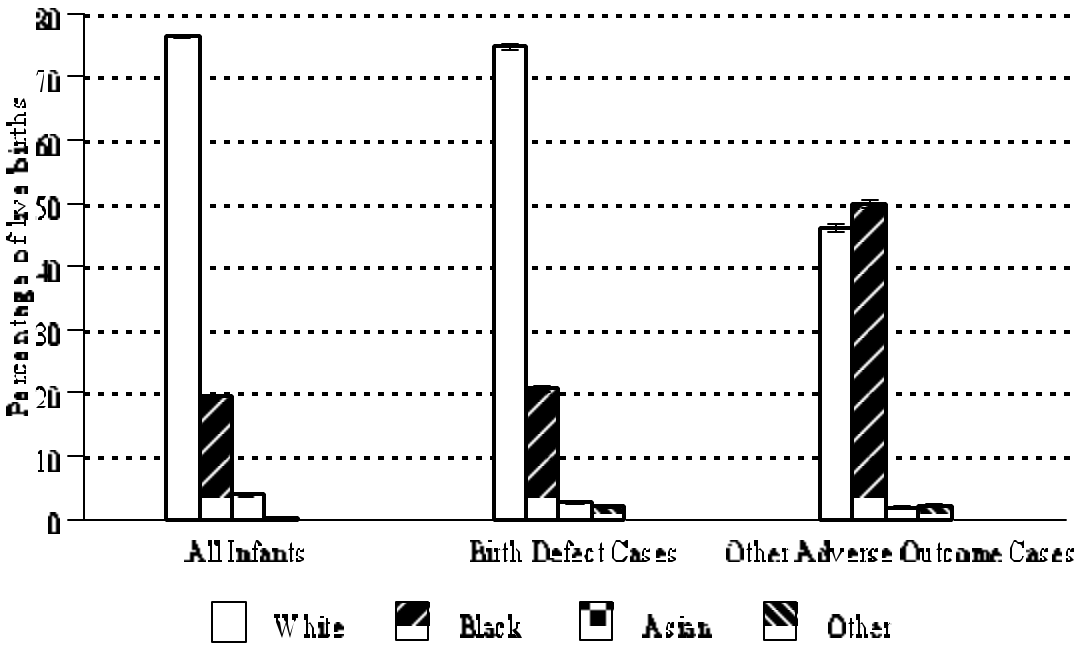
Table 2. Annual Averages and 95% Confidence Intervals by Race for Three Populations of Newborn Infants, 1996-2000

	All Infants			Birth Defect Cases			Other Adverse Outcomes		
Race	***Annual Average***	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***
White	139,470.8	76.4	(76.2, 76.4)	3,083.2	74.8	(74.2, 75.4)	2,375.0	46.1	(45.4, 46.7)
Black	35,688.2	19.5	(19.5, 19.6)	847.6	20.6	(20.0, 21.1)	2,571.4	49.9	(49.2, 50.5)
Asian	7,109.6	3.9	(3.9, 3.9)	107.6	2.6	(2.4, 2.8)	98.0	1.9	(1.7, 2.1)
Other	383.6	0.2	(0.2, 0.2)	82.0	2.0	(1.8, 2.2)	112.8	2.1	(2.0, 2.4)

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Figure 1. Percent Distributions and 95% Confidence Intervals by Race for Three Populations of Newborn Infants, 1996-2000

[1]Confidence intervals for all infant populations are displayed, but may not be visible because they are very narrow due to the very large sample size.



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Ethnicity distribution

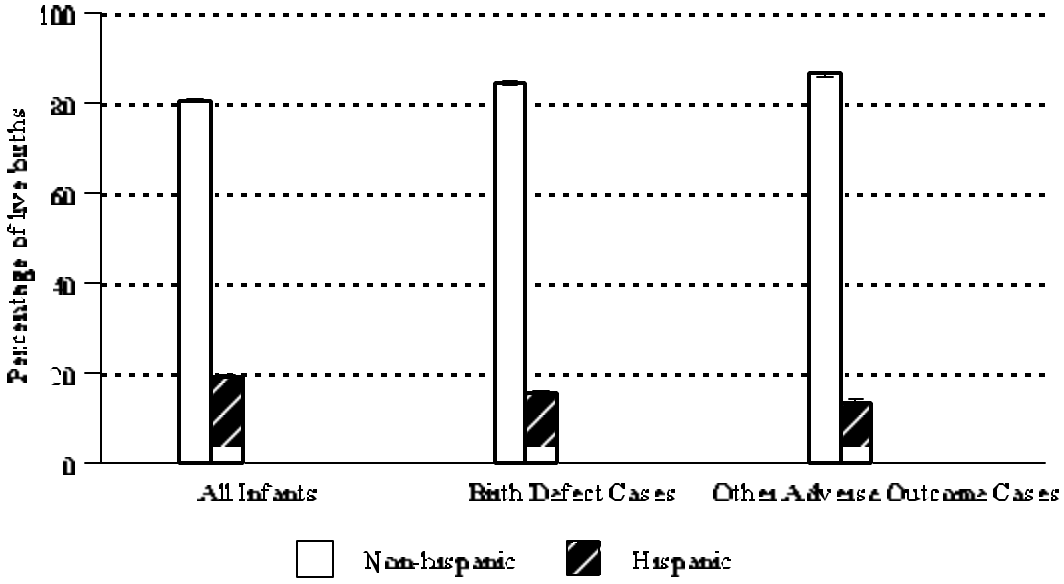
Information regarding ethnicity is recorded on the birth certificate and by APORS independently of race. The percentage of Hispanics is slightly lower in both the population of infants with birth defects and the population of infants with adverse outcomes than the general population. This is reflective of national data: the National Vital Statistics Reports (Martin *et al.*) indicates that hispanic mothers have slightly lower rates of very low birthweight babies than white non-hispanic mothers.

Table 3. Annual Averages and 95% Confidence Intervals by Ethnicity for Three Populations of Newborn Infants, 1996-2000

	All Infants			Birth Defect Cases			Other Adverse Outcomes		
Race	***Annual Ave***	***%***	***95% CI***	***Annual Ave***	***%***	***95% CI***	***Annual Ave***	***%***	***95% CI***
Hispanic	35,388.2	19.4	(19.3, 19.5)	637.6	15.5	(15.0, 16.0)	703.8	13.6	(13.2, 14.1)
Non-hispanic	147,264.0	80.6	(80.5, 80.7)	3,482.2	84.5	(84.0, 85.0)	4,453.4	86.4	(85.9, 86.8)

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Figure 2. Percent Distributions and 95% Confidence Intervals[1] by Ethnicity for Three Populations of Newborn Infants, 1996-2000



[1]Confidence intervals for all infant populations are displayed, but may not be visible because they are very narrow due to the very large sample size.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Gender Distribution

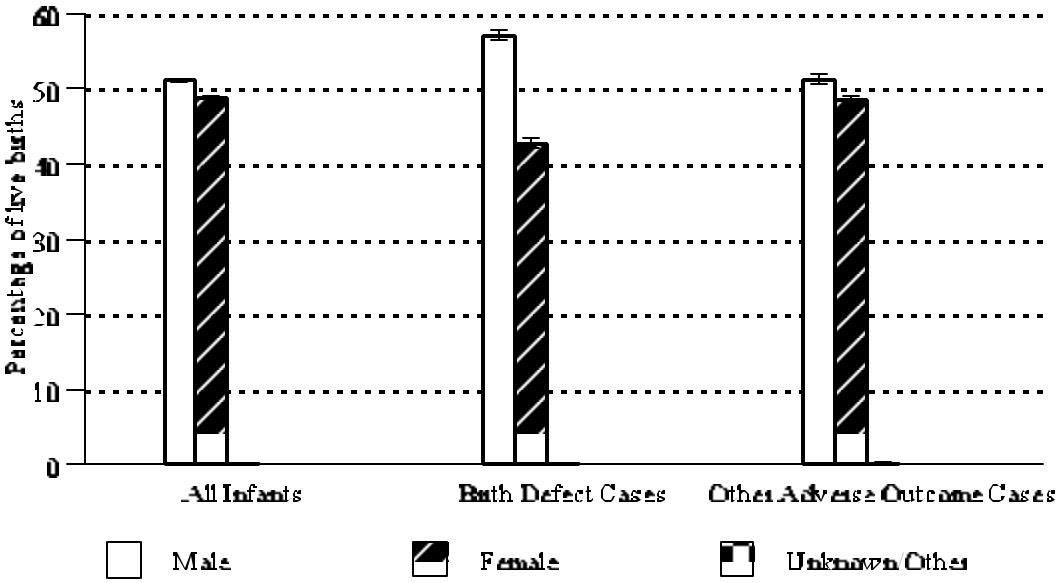
The population of infants with other adverse outcomes share almost exactly the same gender distribution as the general population. The percentage of males is higher in the population of infants with birth defects than in the general population. This pattern of increased birth defects among males has been seen in other studies (Lary *et al.*, Francannet *et al.*).

Table 4. Annual Averages and 95% Confidence Intervals by Gender for Three Populations of Newborn Infants, 1996-2000

	All Infants			Birth Defect Cases			Other Adverse Outcomes		
Gender	***Annual Average***	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***
Male	93,303.4	51.1	(51.0, 51.2)	2,350.6	57.0	(56.4, 57.7)	2,644.6	51.3	(50.7, 51.9)
Female	89,344.4	48.9	(48.8, 49.0)	1,763.8	42.8	(42.1, 43.5)	2,501.2	48.5	(47.9, 49.1)
Other	4.4	0.0	(0.0, 0.0)	6.0	0.1	(0.1, 0.2)	11.4	0.2	(0.2, 0.3)

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Figure 3. Percent Distribution and 95% Confidence Intervals[1] by Gender for Three Populations of Newborn Infants, 1996-2000



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Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

III. COMPARISON OF MATERNAL AND BIRTH-RELATED CHARACTERISTICS

Birth weight

Infants born weighing between 1,500 grams and 2,500 grams (5 lbs 8 oz) are considered to have low birthweight. Infants born weighing less than 1,500 grams (3 lbs 5 oz) are considered to have very low birthweight. Low birthweight is a factor in 65 percent of infant deaths (March of Dimes, 2002). Infants born with low birthweight also have higher risks of facing serious health problems and long term disability.

Having very low birthweight is an APORS adverse outcome case criteria so the incidence of very low birthweight is much higher in the population of infants with adverse outcomes than in the other two populations. However, there is also a higher percentage of low birthweight infants with other adverse outcomes than among the infants in the general population. The percentage of both low and very low birthweight babies also is considerably higher than that of the general population among infants with birth defects. A baby with a birth defect is almost 13 times more likely to have a very low birthweight than a baby in the general population.

Table 5. Annual Averages and 95% Confidence Intervals by Birth Weight for Three Populations of Newborn Infants, 1996-2000

	All Infants			Birth Defect Cases			Other Adverse Outcomes		
Birthweight	***Annual Average***	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***
Very Low < 1500g	2,961.8	1.6	(1.6, 1.6)	849.8	20.6	(20.1, 21.2)	2,459.6	47.7	(47.1, 48.3)
Low 1500-2499g	11,636.8	6.4	(6.3, 6.4)	687.2	16.7	(16.2, 17.2)	1,016.4	19.7	(19.2, 20.2)

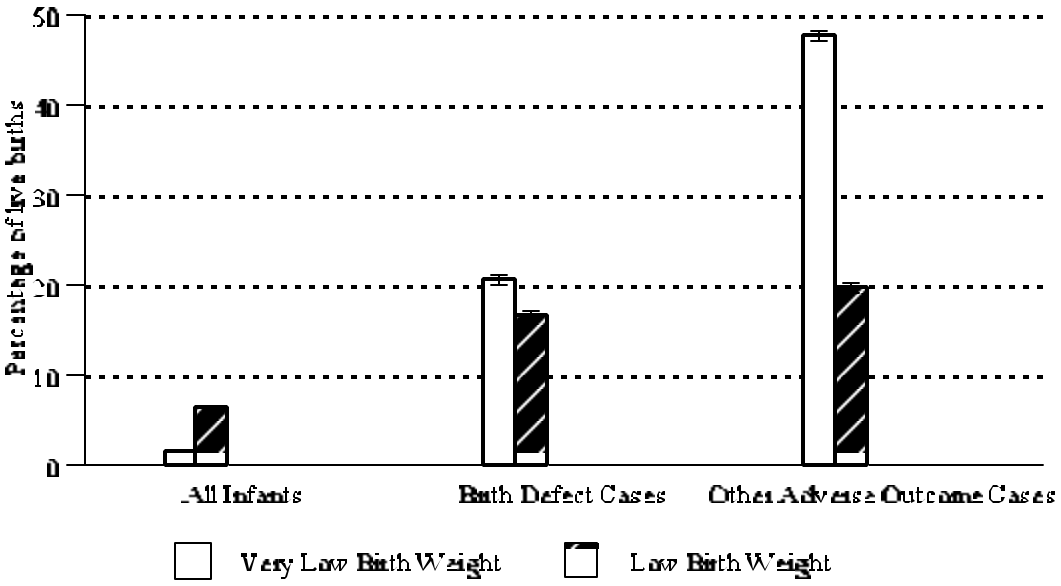
Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

An infant born prematurely (before 37 weeks of gestation) will usually have low birthweight, as will babies of multiple births (e.g. twins). Factors that can cause in interruption or delay in fetal growth – intrauterine growth retardation – may also lead to low birthweight. Such factors include maternal conditions (age, nutritional status, hypertension) and maternal habits (tobacco or alcohol use, and drug use – either illicit, prescription or over the counter).

Illinois rates of low and very low birthweights are very similar to those of the United States as a whole. Nationally in 2001, 6.3 percent of infants were born with low birthweight, and 1.4 percent were born with very low birthweight (Martin *et al*.). Mili *et al*. (1991) reported that

children with low or very-low birthweights were more likely to have birth defects than those with higher birthweights. Khoury *et al*. (1988) found that almost all birth defects are associated with increased rates of intrauterine growth retardation.

Figure 4. Percent Distribution and 95% Confidence Intervals[1] by Birth Weight for Three Populations of Newborn Infants, 1996-2000



[1]Confidence intervals for all infant populations are displayed, but may not be visible because they are very narrow due to the very large sample size.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Gestational age (prematurity)

Infants born before 37 completed weeks of gestation are considered premature or pre-term. Infants born before 26 completed weeks of gestation are considered to be extremely premature. According to the March of Dimes (2002), infants born prematurely have higher risks of facing serious health problems and long-term disability.

While prematurity itself is not an APORS case criterion, infants born with drugs or alcohol detected in their systems, or those having low or very low birthweight are APORS cases. Since these factors are associated with pre-term birth, it is unsurprising that the incidence of prematurity is higher in the population of infants with adverse outcomes than in the other two populations.

The percentage of extremely premature and premature babies was substantially lower among the general population than among either infants with birth defects or those with adverse outcomes. One tenth of all children born in Illinois 1996 through 2000 were premature, while one third of children born with a birth defect were also premature.

Table 6. Annual Averages and 95% Confidence Intervals by Degree of Prematurity for Three Populations of Newborn Infants, 1996-2000

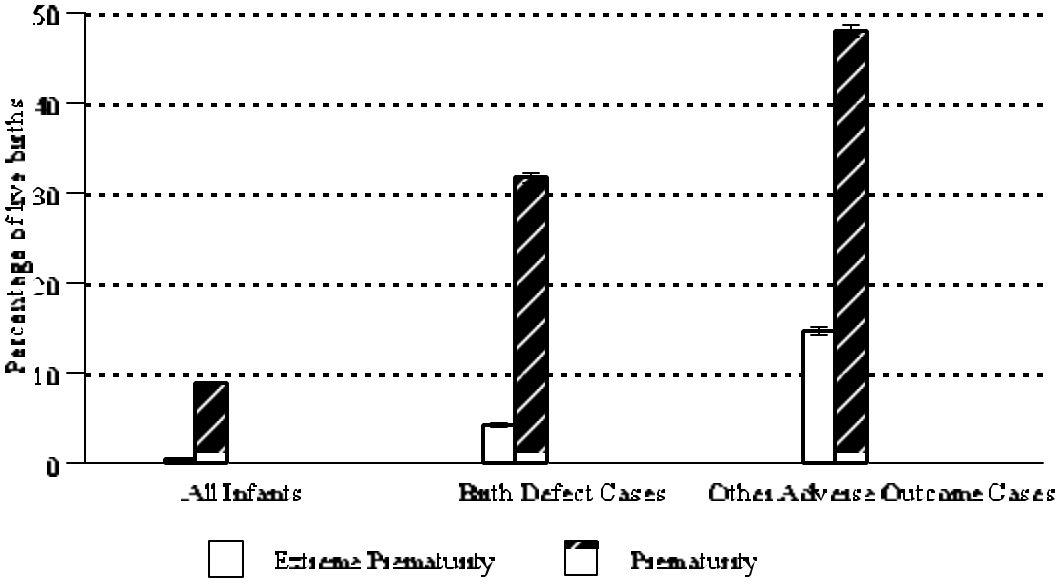
	All Infants			Birth Defect Cases			Other Adverse Outcomes		
Degree of Prematurity	***Annual Average***	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***
Extreme Prematurity	1,028.2	0.6	(0.5, 0.6)	178.2	4.3	(4.1, 4.6)	757.2	14.7	(14.3, 15.1)
Premature	16,421.3	9.0	(8.9, 9.0)	1,305.6	31.7	(31.1, 32.3)	2,473.0	48.0	(47.3, 48.6)

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Babies of multiple births (e.g. twins) are frequently born prematurely, as are babies born to a mother who has previously had a premature infant. Other factors that can lead to preterm birth include maternal stress, infections, smoking, drug use and extreme maternal age (either very young or very old). However, the reasons an infant is born prematurely may be complex and are not yet fully understood (Johnston *et al*.)

Nationally in 2001, 11.9 percent of infants were born prematurely, and 2.0 percent were born very prematurely (Martin *et al*.), slightly worse rates than those reported in Illinois among the general population. A number of recent studies have shown that the prevalence of birth defects is increased among premature infants (Tough *et al.*, Rasmussen *et al.*, Shaw *et al.*)

Figure 5. Percent Distribution and 95% Confidence Intervals by Degree of Prematurity for Three Populations of Newborn Infants, 1996-2000



[1]Confidence intervals for all infant populations are displayed, but may not be visible because they are very narrow due to the very large sample size.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Maternal smoking habits

In 2001, 14.3 percent of all pregnant women in the United States smoked tobacco during their pregnancy (Martin *et al.*). A smoker is almost twice as likely to have a baby with low birthweight at delivery. Smoking while pregnant can also increase the risk of having a pre-term birth or a baby with intrauterine growth retardation. Some oro-facial birth defects also have been associated with smoking while pregnant (March of Dimes, 2000)

A certain amount of information about maternal smoking habits is unavailable, especially for children with birth defect and other adverse outcomes (see page three for an explanation). In the discussion below, we assume that the distribution of smokers and non-smokers is similar in the group with unknown smoking status as in the group whose smoking status is known.

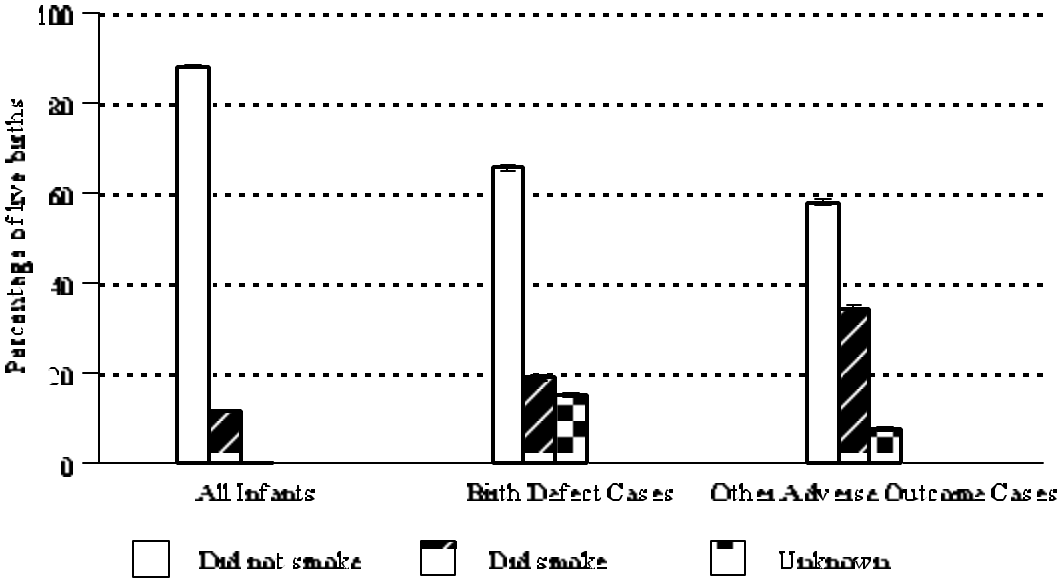
In Illinois, during 1996-2000, the percentage of babies born to maternal smokers was significantly lower in the general population than in either infants with birth defects or infants with adverse outcomes. Babies born to maternal smokers are believed to be at increased risk for a number of birth defects, including gastroschisis, oral clefts and clubfoot (Honein *et al.*). This is in agreement with the higher rates of maternal smoking among infants with birth defects observed in this report. Similarly babies born to maternal smokers are known to be at increased risk for very low birthweight (March of Dimes, 2000). This is also in accord with the very high rates of maternal smokers among babies born with an adverse outcome.

Table 7. Annual Averages and 95% Confidence Intervals by Maternal Smoking History for Three Populations of Newborn Infants, 1996-2000

Maternal Smoking during Pregnancy	**All Infants**			**Birth Defect Cases**			**Other Adverse Outcomes**		
	Annual Average	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***
Did not smoke	160,889.4	88.1	(88.0, 88.2)	2,708.4	65.7	(65.1, 66.4)	2,986.2	57.9	(57.3, 58.5)
Did Smoke	21,430.0	11.7	(11.7, 11.8)	781.0	19.0	(18.4, 19.5)	1,775.2	34.4	(33.8, 35.0)
Unknown	338.8	0.2	(0.2, 0.2)	631.0	15.3	(14.8, 15.8)	395.8	7.7	(7.4, 8.0)

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Figure 6. Percent Distribution and 95% Confidence Intervals by Maternal Smoking History for Three Populations of Newborn Infants, 1996-2000



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Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Maternal alcohol consumption

In 2001, about 1 percent of pregnant women drank alcohol while pregnant in the United States (Martin *et al.*) Any degree of alcohol consumption, whether it be heavy or light, can be harmful to a fetus. Fetal alcohol syndome (FAS) is the best known consequence of alcohol consumption during pregnancy. At birth, children with FAS can be recognized by growth deficiency and a characteristic set of minor facial traits that tend to become more normal as the child matures. Less evident at birth is damage to the brain. FAS is not considered a birth defect in this report, but it is classified as an adverse pregnancy outcome. FAS often is not diagnosed until a child enters school, since many indicators of FAS are behavioral. Alcohol consumption while pregnancy may also cause birth defects including facial and cranial abnormalities.

A certain amount of information about maternal use of alcohol is unavailable, especially for children with birth defects and other adverse outcomes (see page three for an explanation). In the discussion below, we assume that the distribution of mothers who drank alcohol during pregnancy and those who did not is similar in the group with unknown status as in the group whose status is known.

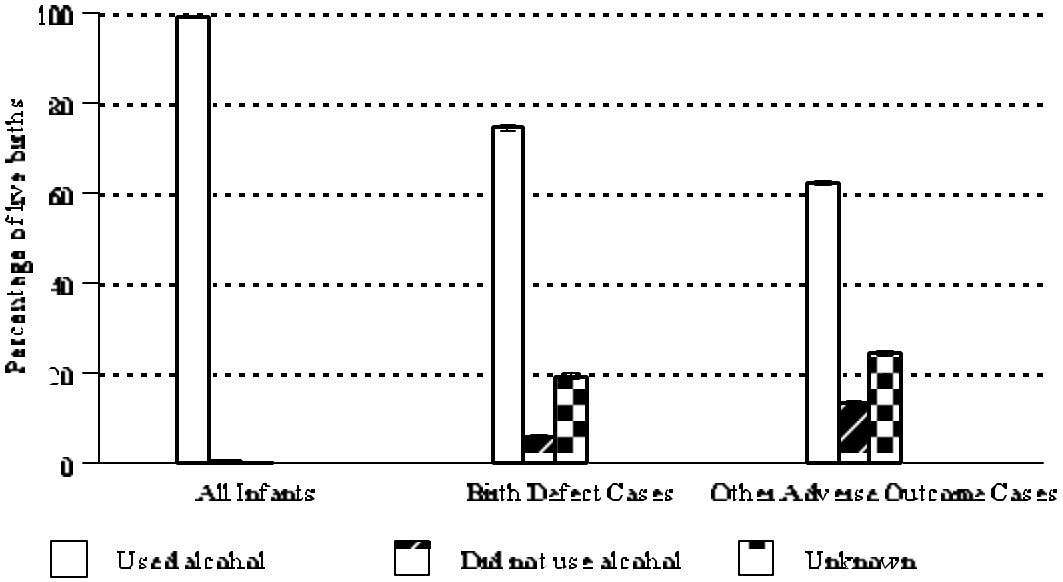
The percentage of babies born to maternal alcohol consumers was significantly lower among the general population than among either infants with birth defects or those with adverse outcomes. Alcohol use during pregnancy is known to give rise to FAS, and also to the individual birth defects that may be associated with FAS. This is in accord with the observed increase in maternal alcohol use among infants with birth defects and among infants with other adverse outcomes when compared to infants from the general population.

Table 8. Annual Averages and 95% Confidence Intervals by Maternal Alcohol Consumption for Three Populations of Newborn Infants, 1996-2000

Maternal Alcohol Consumption Pregnancy	**All Infants**			**Birth Defect Cases**			**Other Adverse Outcomes**		
	Annual Average	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***	***Annual Average***	***%***	***95% CI***
Did not drink	181,132.8	99.2	(99.1, 99.2)	3,069.4	74.5	(73.9, 75.1)	3,205.4	62.1	(61.6, 62.7)
Did drink	1,282.4	0.7	(0.7, 0.7)	252.4	6.1	(5.8, 6.5)	683.6	13.3	(12.8, 13.7)
Unknown	237.0	0.1	(0.1, 0.1)	798.6	19.4	(18.8, 19.9)	1,268.2	24.6	(24.1, 25.1)

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Figure 7. Percent Distribution and 95% Confidence Intervals by Maternal Alcohol Consumption for Three Populations of Newborn Infants, 1996-2000



[1]Confidence Intervals for all infant populations are displayed, but may not be visible because they are very narrow due to the very large sample size.

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Maternal age

Both increasing maternal age and young maternal age (< 20 years old) are associated with increased incidence of specific birth defects. Data show that advanced maternal age can be linked to heart malformations, Down syndrome and other chromosomal anomalies, while teenage mothers have greater risk of giving birth to infants with defects such as spina bifida, polydactyly or syndactyly and gastroschisis. (Martin *et al.*, Werler *et al.*) Teenage mothers are also more likely to give birth to babies with low birthweight (March of Dimes, 2002).

A certain amount of information about maternal age is unavailable, especially for children with birth defects and other adverse outcomes (see page three for an explanation). In the discussion below, we assume that the distribution of maternal ages is similar in the group with unknown maternal age as in the group whose maternal age is known.

Table 9. Annual Averages and 95% Confidence Intervals by Maternal Age for Three Populations of Newborn Infants, 1996-2000

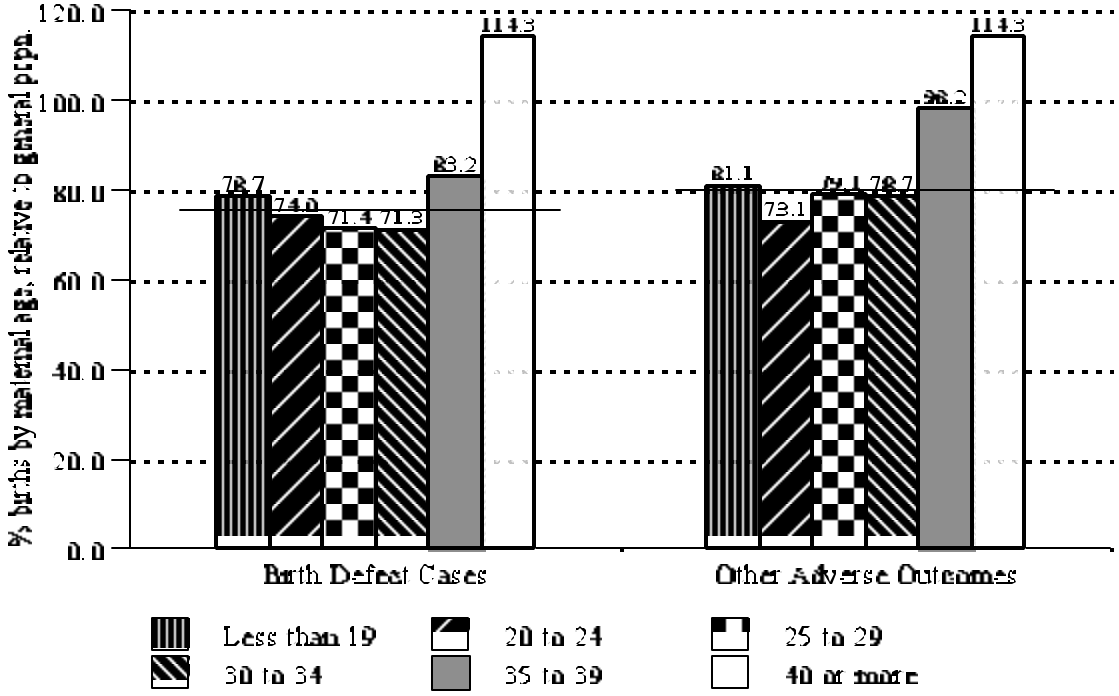
Maternal Age (years)	All Infants			Birth Defect Cases			Other Adverse Outcomes		
	Annual Average	*%*	*95% CI*	*Annual Average*	*%*	*95% CI*	*Annual Average*	*%*	*95% CI*
Less than 19	22,310.0	12.2	(12.1, 12.3)	393.6	9.6	(9.2, 10.0)	511.6	9.9	(9.6, 10.3)
20-24	41,413.6	22.7	(22.6, 22.8)	694.6	16.8	(16.3, 17.4)	856.8	16.6	(16.2, 17.0)
25-29	49,875.0	27.3	(27.2, 27.4)	802.0	19.5	(18.9, 20.0)	1,112.6	21.6	(21.1, 22.1)
30-34	44,579.0	24.4	(24.3, 24.5)	715.4	17.4	(16.8, 17.9)	992.2	19.2	(18.8, 19.7)
35-39	20,655.6	11.3	(11.2, 11.4)	387.6	9.4	(9.0, 9.8)	574.8	11.1	(10.8, 11.5)
40+	3,806.2	2.1	(2.1, 2.1)	97.8	2.4	(2.2, 2.6)	126.2	2.4	(2.3, 2.6)
Unknown	12.8	0.0	(0.0, 0.0)	1,029.4	25.0	(24.4, 25.6)	982.8	19.1	(18.6, 19.5)

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Since 25 percent of the data are missing for the birth defect cases, the percentage of birth defect cases in each maternal age group would be 75 percent of that for all infants, if the distributions of maternal age at birth are the same in the two populations. A slight excess of birth defect cases was observed among mothers aged less than 19 and a larger excess among mothers aged 35 and above. Among infants with other adverse outcomes, an excess was observed among mothers aged 35 and above (Figure 8).

Figure 8 shows the percentage of birth defect and other adverse outcomes compared to all infants by maternal age. The lines overlying each group indicate the expected percentage if the distribution of births over the different maternal ages were the same as in the general population.

Figure 8. Percentage of Births by Maternal Age Group for Two Populations of Newborn Infants, Relative to the Population of All Infants, 1996-2000



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Maternal educational level

Maternal educational level is associated with a number of adverse outcomes. Lower levels of maternal education have been shown to be associated with an increased risk of low birthweight, pre-term delivery and intrauterine growth retardation (Pevalin *et al.*) In the same study, the authors reported that lower levels of maternal education were also associated with other risk factors such as smoking, alcohol use and high blood pressure.

A certain amount of information about maternal educational level is unavailable, especially for children with birth defects and other adverse outcomes (see page three for an explanation). In the discussion below, we assume that the distribution of maternal educational level is similar in the group with unknown maternal age as in the group whose maternal age is known.

Table 10. Annual Averages and 95% Confidence Intervals by Maternal Education for Three Populations of Newborn Infants, 1996-2000

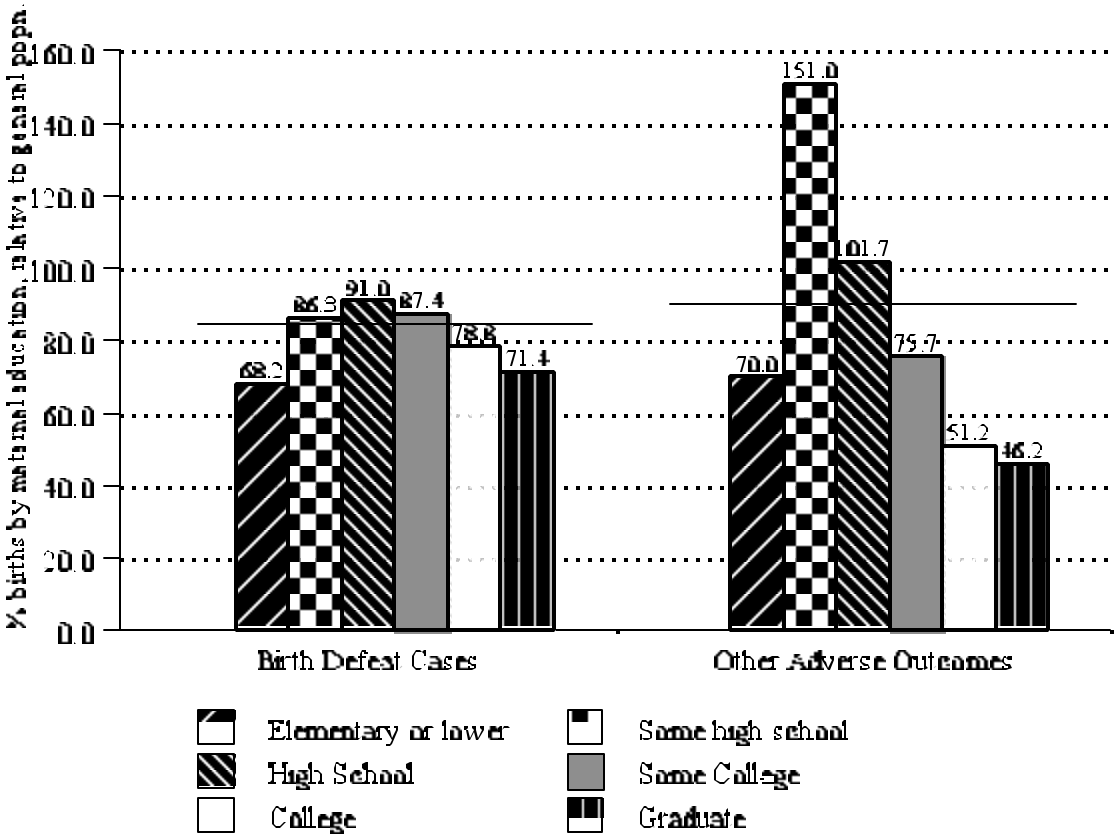
Maternal Education	All Infants			Birth Defect Cases			Other Adverse Outcomes		
	Annual Average	*%*	*95% CI*	*Annual Average*	*%*	*95% CI*	*Annual Average*	*%*	*95% CI*
None	208.2	0.1	(0.1, 0.1)	4.4	0.1	(0.1, 0.2)	4.8	0.1	(0.1, 0.1)
Elementary	11,798.2	6.5	(6.4, 6.5)	181.4	4.4	(4.1, 4.7)	229.8	4.5	(4.2, 4.7)
Some high school	27,932.2	15.3	(15.2, 15.4)	544.6	13.2	(12.8, 13.7)	1,192.8	23.1	(22.6, 23.6)
High school	53,020.0	29.0	(28.9, 29.1)	1,086.6	26.4	(25.8, 27.1)	1,521.4	29.5	(28.9, 30.1)
Some college	40,558.8	22.2	(22.1, 22.3)	800.0	19.4	(18.9, 20.0)	866.6	16.8	(16.3, 17.3)
College	31,101.4	17.0	(17.0, 17.1)	553.0	13.4	(13.0, 13.9)	446.8	8.7	(8.3, 9.0)
Graduate	16,573.4	9.1	(9.0, 9.1)	267.4	6.5	(6.2, 6.8)	220.0	4.2	(4.0, 4.5)
Unknown	1,160.0	0.6	(0.6, 0.7)	683.0	16.6	(16.1, 17.1)	675.0	13.1	(12.7, 13.5)

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Since more than 15 percent of the data are missing for the birth defect cases, the percentage of birth defect cases in each maternal age group would be about 85 percent of that for all infants, if the distribution of births by maternal age is the same for the two populations. An excess of birth defect cases and cases with other adverse outcomes was observed among mothers with lower educational level – except for those with elementary or lower (Figure 9). It is not clear why the group of mothers with the lowest educational level should have had a lower rate of birth defects and other adverse outcomes among their children. It is possible that these mothers were less likely to report their educational level, and are therefore over represented in the unknown category.

Figure 9 shows the percentage of birth defect and other adverse outcomes compared to all infants by maternal education level. The lines overlying each group indicate the expected percentage if the distribution of births over the different maternal levels were the same as in the general population.

Figure 9. Percentage of births by Maternal Education for Two Populations of Newborn Infants, Relative to the Population of All Infants, 1996-2000



Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Maternal risk factors

Diabetes in a pregnant woman leads to an increased risk of birth defects in the infant (Queisser-Luft *et al.*). Babies born to diabetic mothers are at increased risk of pre-term delivery and premature rupture of the membranes and are also at risk of having a high birthweight (10 pounds or more), leading to delivery complications (Yang *et al.*). Mothers with pre-eclampsia or anemia also have a higher risk of pre-term delivery resulting in low birthweight babies (Ray *et al.*, Klebanoff *et al.*).

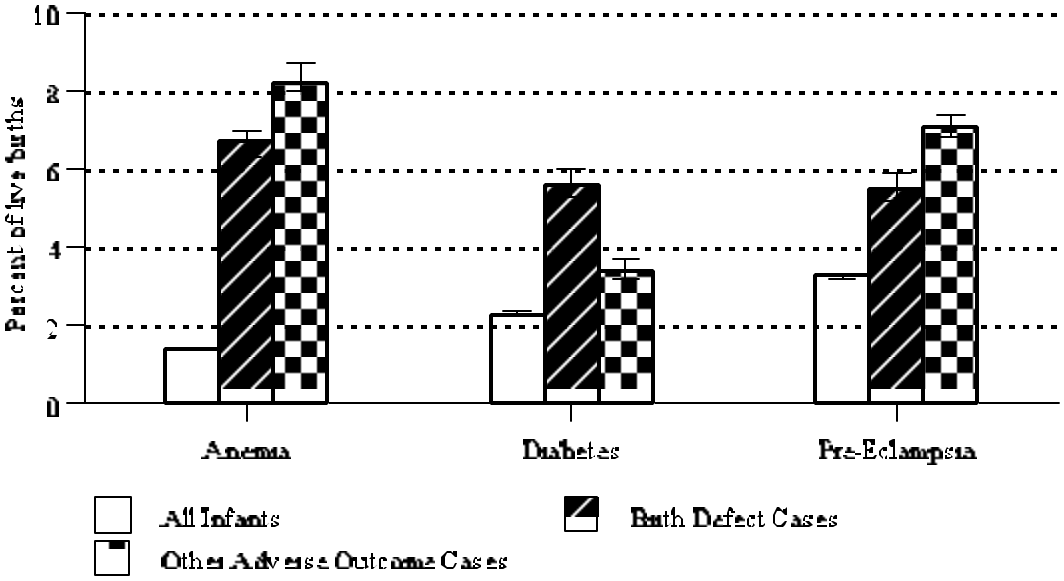
The three risk factors examined here each had higher rates among the babies with birth defects or other adverse outcomes than among the general population. Infants with other adverse outcomes were more than five times more likely to have a mother with anemia than the general population. The same group were twice as likely to have a mother with pre-eclampsia than the general population of newborns. Infants with one or more birth defects were more than twice as likely to have a diabetic mother than the general population of infants.

Table 11. Annual Averages and 95% Confidence Intervals by Maternal Risk Factors for Three Populations of Newborn Infants, 1996-2000

Maternal Risk Factors	All Infants			Birth Defect Cases			Other Adverse Outcomes		
	Annual Average	*%*	*95% CI*	*Annual Average*	*%*	*95% CI*	*Annual Average*	*%*	*95% CI*
Anemia	2,494.6	1.4	(1.4, 1.4)	275.4	6.7	(6.3, 7.0)	423.2	8.2	(8.0, 8.7)
Diabetes	4,255.8	2.3	(2.3, 2.4)	232.8	5.6	(5.3, 6.0)	177.8	3.4	(3.2, 3.7)
Pre-eclampsia	5,990.8	3.3	(3.2, 3.3)	228.6	5.5	(5.2, 5.9)	364.6	7.1	(6.8, 7.4)

Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

Figure 10. Percent Distribution and 95% Confidence Intervals for Maternal Risk Factors for Three Populations of Newborn Infants, 1996-2000



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Source: Illinois Department of Public Health, Adverse Pregnancy Outcomes Reporting System, March 2002
Illinois Department of Public Health, Illinois Project for Local Assessment of Needs, August 2002

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