

# **Center for Environmental Health**

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## **New York Air Brake Area Health Outcomes Review: Birth Outcomes Watertown, Jefferson County, NY**

September 2024

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## Summary

The New York State Department of Health conducted a health outcomes review for an area in Watertown, Jefferson County in response to community concerns about potential health effects from residential proximity to the New York Air Brake facility. The site is contaminated with chlorinated solvents, metals, and polychlorinated biphenyls (PCBs), some of which have migrated off-site. A health outcomes review examines health outcomes in a particular group of people as a whole to see how the group in a specific area of concern compares to a group not living in the area of concern. It cannot prove that a specific environmental exposure caused a specific health effect, and it cannot tell us about individuals' health problems.

This health outcomes review included data from 1995 to 2013. Original community concerns reported in 2012 included 5 cases of a birth defect, craniosynostosis. We reviewed New York State Birth Defects Registry case reports for this and other birth defects, as well as birth outcomes such as low birth weight among infants and preterm births, for people who lived in the area at the time of the child's birth. We compared the rates of these health outcomes in the New York Air Brake study area to the rates for people in New York State excluding New York City. A separate report by the State Health Department reviewed the rates of cancer among area residents in a similar manner.

None of the 47 specific birth defects studied were statistically significantly elevated in the study area, nor were total birth defects statistically significantly elevated. We reviewed the medical records of all cases of craniosynostosis in the study area and the area immediately surrounding the study area but did not find any unusual patterns to suggest a common cause.

Of the other birth outcomes examined, there were statistically significant elevations of moderately low birth weight births and small for gestational age (SGA) births when compared to New York State excluding New York City. There are many risk factors for having a low birth weight child. Preterm birth and fetal growth restriction are the most common risk factors for low birth weight.

Cigarette smoking is the single largest risk factor for fetal growth restriction and thus for low birth weight in term infants. Based on information on birth certificates, the rate of smoking among mothers in the study area (34%) was considerably higher than the comparison area (15%), so this difference likely played a role in the elevations. However, smoking history is not complete on many birth certificates, so we were not able to assess the role of smoking more precisely. This report provides information about accessing maternal and child health and tobacco control services in the Watertown, Jefferson County area.

## INTRODUCTION

The New York State Department of Health conducted this health outcomes review in response to community concerns about the health of Watertown area residents in the neighborhoods surrounding the New York Air Brake facility. This review examined the occurrence of adverse birth outcomes among people living near that facility and compared them to occurrence among residents of New York State excluding New York City.

This type of review cannot prove whether there is a causal relationship between specific exposures and health outcomes in a community, nor can it determine the cause of any specific individual's health problem. The findings of this type of review may be used, together with findings from other similar investigations, to suggest hypotheses for more in-depth research studies. The study may also be useful to residents because it provides information about levels of health outcomes in their area.

*A **health outcomes review** uses information from existing sources, such as birth certificates and disease registries, to compare levels of health outcomes among residents of a specific area to levels in one or more comparison populations.*

## BACKGROUND

The New York Air Brake facility is in a mixed-use area in the northeast part of Watertown, Jefferson County, and has been the site of industrial activity for over 100 years. Residents of the surrounding neighborhood have expressed concerns about site-related contaminants impacting off-site properties, including along Kelsey Creek, and via soil-vapor intrusion. Residents have also expressed concerns about a variety of health outcomes, including cancer, neurological and autoimmune diseases, allergies and respiratory irritation, and adverse birth outcomes. The New York State Department of Health conducted this health outcomes review at the request of community members concerned about cases of craniosynostosis in the area. Additional background about potential exposures and health outcomes is provided below.

### Exposure information

The facility itself is contaminated with chlorinated solvents, volatile organic compounds (VOCs), metals, and PCBs. Off-site contamination has included metals and PCBs found in Kelsey Creek and Oily Creek, and chlorinated solvents found in groundwater.

Past exposures to metals, VOCs and PCBs via dermal contact or incidental ingestion could have occurred in some residential yards adjacent to Kelsey Creek and Oily Creek or from exposure to surface waters and sediments in Kelsey Creek and Oily Creek. These areas were mitigated in 2017-2019.

Past exposures to VOCs via inhalation could have occurred from releases to the ambient air as well as from on-site soil vapor intrusion into facility buildings. Measures are currently in place

to control the potential for contact with subsurface soil and groundwater contamination. People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. Volatile organic compounds in the groundwater may move into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings and affect indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the air of buildings, is referred to as soil vapor intrusion. Sub slab depressurization systems (systems that ventilate/remove the air beneath the building) have been installed in on-site buildings and one off-site structure to prevent the indoor air quality from being affected by the contamination in soil vapor beneath the buildings. Sampling indicates soil vapor intrusion is not a concern for other off-site buildings. Prior to the sale of the business in 1991, the US EPA Toxic Release Inventory identified fugitive air emissions of VOCs from the site, specifically trichloroethylene and xylene. In more recent years the Toxic Release Inventory data show small amounts of copper and lead (less than 2 pounds per year), and no VOCs.

Based on available information about environmental contaminants and existing mitigation systems, the general public is not currently being exposed to site related contaminants.

### **Community Health Concerns**

Members of the community reported concerns about cancer and adverse birth outcomes, among other illnesses. A separate report was written about the analysis of cancer cases diagnosed among area residents. The current review focuses on adverse birth outcomes, which is feasible because State Health Department collects comprehensive data on these outcomes for the entire state population. While there are other health outcomes of interest, those were not included in this review because statewide data are not available for these conditions.

## **METHODS**

This study examined the levels of adverse birth outcomes among residents near the New York Air Brake facility and compared them to the levels among residents living in New York State excluding New York City. These comparisons show us whether the levels of these conditions are higher, lower, or about the same as would be expected, taking into account the specific details of the population during the timeframe of the investigation. Because birth certificates contain a great deal of information about the mother and infant, the analyses of adverse birth outcomes take into consideration the impact of race, education, previous live births, and level of prenatal care.

### **Adverse birth outcomes reviewed**

This review includes low birth weight births, preterm births, growth restriction births, and birth defects among singleton births (one baby). Growth restriction births are births that are small despite being full-term (term low birth weight), or are small, given their gestational age (small for gestational age). (See Appendix A for more detailed definitions of each.)

We reviewed the birth defects that are most consistently and reliably reported to the NYS Birth Defects Registry. This includes 47 individual birth defects identified in the National Birth Defects Prevention Network (NBDPN) Guidelines for Conducting Birth Defects Surveillance. (See Appendix B for more information on the defects and categories of defects included in this review.) Because there is no national birth defects surveillance program, these standardized case definitions allow for comparisons across surveillance programs and among individual birth defects ascertained by the same program. We also grouped the NBDPN birth defects by body system and overall.

### **Boundaries and Timeframe**

We began by working with concerned community members to identify the parts of Watertown that were of specific concern. We also took into consideration information about possible site-related contamination. This information was used to identify the specific U.S. Census blocks to define the final study area.

The study area map is provided in Figure 1. The study area runs approximately a mile and a quarter east to west, and three quarters of a mile north to south. Based on the availability of data and reported health outcomes, we examined birth outcomes occurring among individuals born between 1995 and 2013.

### **Identifying and defining health outcomes**

We obtained records of all births and birth defects with home addresses in ZIP code 13601 (of which the study area is a small part) from New York State Vital Records and the New York State Birth Defects Registry. To capture records with missing ZIP code information, we also obtained the addresses for all birth and birth defect records in Jefferson County without a ZIP code. We evaluated each record and assigned the individual to a location, either in or out of the study area. These records were then analyzed to determine which individuals had been diagnosed with the health outcomes under study. Additional information about identifying and analyzing the adverse birth outcomes is available in Appendix A.

### **Statistical analyses**

This review compares the level of specific health outcomes that occurred among residents of the study area (observed), and the level we would expect to see (expected) based on the levels experienced among the residents of the comparison area. We calculated a rate ratio or a prevalence ratio (PR) to measure the difference between the observed and expected levels of health outcomes.

***Rate ratios and prevalence ratios (RRs and PRs)*** are measures of the association between an exposure or risk factor and a health outcome. A ratio of 1.0 means the study population and comparison have the same rate of disease. A ratio greater than 1.0 means the study population had a higher level of the health outcome than the comparison group, while a ratio of less than 1.0 means the study population had a lower level of the health outcome than the comparison group.

To determine whether any differences between the observed and expected numbers are statistically significant (unlikely due to chance alone), we also calculated 95% confidence intervals.

*The **95% confidence interval (95% CI)** helps us decide whether the difference between the study and comparison levels is likely due to chance. If the 95% CI excludes 1.0, the PR or RR is considered to be statistically significant. If the 95% CI includes 1.0, the PR or RR is not statistically significant. **Statistically significant** means that the difference between the measure in the study population and comparison population is unlikely to have occurred by chance alone, given the statistical assumptions of the test.*

To account for differences in maternal and child characteristics between the study and comparison areas, rate ratios were adjusted for mother's age (<20, 20-34, 35+ years), mother's education (no high school degree, high school-some college, 4+ years of college), mother's race (White, Black, other), total previous live births (0, 1, 2+), prenatal care (intensive use, adequate, intermediate, inadequate), and infant's sex. These characteristics were adjusted for in the low birth weight, preterm birth, and growth restriction analyses, but not in the birth defects analyses due to the small number of birth defects in each category.

## RESULTS

### Geocoding

After geocoding all birth records from 1995-2013 from ZIP code 13601, or from Jefferson County but with no ZIP code, we identified 1,120 births in the study area during the study timeframe.

### Maternal characteristics

Based on birth certificate information, mothers in the study area are different than mothers in New York State excluding New York City in several ways. The study area has a higher percentage of mothers who identified as White than New York State excluding New York City. Mothers in the study area also tended to be younger than the comparison population, and less likely to have a college degree. Details on maternal characteristics are shown in Table 1. To account for these differences, mother's age, race, education, and prenatal care were controlled for in the analysis of adverse birth outcomes. The analyses for birth defects were not adjusted for maternal characteristics due to small numbers.

### Low birth weight, preterm birth, and growth restriction

Table 2 shows the birth weight, preterm birth, and growth restriction results for the study area. There was not a statistically significant elevation of low birth weight births, but the subset of

moderately low birth weight showed a statistically significant elevation of 26%. Preterm births were not elevated. There was a statistically significant 31% elevation of small for gestational age births. The subset of term low birth weight births was elevated by 39%, but the result was just below the level of statistical significance. These categories are overlapping, meaning that one birth can be included in several categories.

### **Birth defects**

Using the available data for birth defects diagnosed among 1,120 births occurring from 1995-2013, 27 infants were identified with one or more birth defects (a total of 34 birth defects). Table 3 shows the observed and expected numbers and PRs for each category of birth defects for the entire study area. No category of birth defects was statistically significantly elevated. The PR for craniosynostosis did not show a statistically significant elevation. In addition, the total number of all birth defects combined was not higher than expected.

## **DISCUSSION**

The most common causes for low birth weight are preterm birth and fetal growth restriction. Preterm birth (giving birth before 37 weeks) was not found to be elevated in the study area. This suggests this elevation may be due to restricted fetal growth. Cigarette smoking is the single largest risk factor for fetal growth restriction and thus low birth weight in term infants. Based on information on birth certificates, the rate of smoking among mothers in the study area was considerably higher than in the comparison area (34.2% vs 14.8%). Because smoking history is not complete on many birth certificates, we were not able to control for it in the analysis. The adequacy of prenatal care utilization was notably lower in the study area (inadequate prenatal care utilization 31.1% vs 11.3%).

Studies have also found a persistent association between low birth weight and measures of socioeconomic status, including occupation, income, and education. Socioeconomic disadvantage has been associated with reduced access to health care, including prenatal care; poorer nutrition; and increased behavioral risk factors. Although mother's education is not a direct measure of socioeconomic status, birth certificates contain information about mother's education that is often used as an indicator for a variety of low socio-economic status risk factors. Mothers in the study area were less likely to have four years of college when compared to the rest of NYS, excluding NYC (8.8% vs 32.5%). We attempted to account for these differences by controlling for educational attainment in the analysis. However, there are other individual risk factors we could not take into consideration based on the completeness or the quality of the available information, including chronic maternal health conditions, infections, and a history of having other low birth weight babies.

For the birth defects analysis, the overall number of defects was higher than expected, but the elevation was not statistically significant. None of the 47 specific types of birth defects were statistically significantly elevated in the study area. The fact that the absolute numbers of cases of specific birth defect types were in the single digits made the statistics unstable, with a wide

95% CI and no statistical significance. Evaluation of New York State Birth Defects Registry files identified two cases of craniosynostosis in the study area between 1995-2013. Although the two observed cases in the study area was higher than the expected number for that area, the elevation was not statistically significant. The fact that the absolute number of cases for specific birth defect groups were in the single digits made the statistics unstable, with a wide 95% CI and no statistical significance. Looking at cases diagnosed in the areas immediately surrounding the study area, we identified several additional cases of craniosynostosis. To respond to community concerns about craniosynostosis, we reviewed detailed medical information from the birth records of all cases of craniosynostosis in the study area and the area immediately surrounding the study area. Based on this review, some of the seven total cases that were identified may have occurred among people who were related, suggesting a genetic component to the diagnosis. Otherwise, we did not find any unusual patterns to suggest a common cause. We noted two additional cases just outside the study area boundaries. If the block group in which those cases were located was included in the study area the elevation would have been statistically significant. However, these cases were located outside the southern boundary of the study area. This is some distance away from areas previously known to be contaminated (e.g. Kelsey Creek, Oily Creek), which are near the northern study area boundary. No additional cases of craniosynostosis have occurred in the study area or just outside the study area boundaries from 2014-2023.

While scientists have been able to identify some causes of specific birth defects, the cause of most birth defects is unknown. It is believed that a combination of genetic and environmental factors causes birth defects, and that different factors cause different birth defects. Certain maternal medications, such as thalidomide, Accutane, and anti-seizure drugs, can increase risk of birth defects. Cigarette smoking, alcohol use, and use of illegal drugs can also increase the risk of having a baby with a birth defect. Exposures that have been linked to higher risk of craniosynostosis, specifically, include cigarette smoking, maternal thyroid disease, fertility treatments, and certain types of genetic syndromes. There are different types of craniosynostosis, which may be caused by different things. We could not account for these other potential risk factors in this analysis.

### **Study limitations**

There are several limitations associated with this type of health outcomes review. A health outcomes review cannot take into account important personal information that may be related to health outcomes, such as medical history, dietary and lifestyle choices, and occupational exposures. Many birth defects are associated with genetic or hereditary factors, which we cannot rule out among the cases in this analysis. We also do not know if particular people moved out of or recently moved into the study area. The locations of the birth outcomes are assigned as the mother's residence at time of birth. Mothers who may have moved into the study area just before their child's birth were included in the review although most of the pregnancy (and other possible exposures) occurred outside of the study area.

There are also limitations associated with the statistical tests. For very small areas, it is unlikely that any statistically significant findings will be observed, because the expected numbers of some of the outcomes are too small. Furthermore, geographic boundaries are somewhat arbitrary and while important for helping to determine populations for analysis do not necessarily align with areas of exposure.

## **CONCLUSIONS**

The primary driver of this report was the community concern of craniosynostosis among infants born to area residents. The elevation of craniosynostosis cases in the study area was not statistically significant. The analyses also found that some other adverse birth outcomes, specifically moderately low birth weight births and small for gestational age (SGA) births, were elevated in the study area. The birth outcome analyses adjusted for factors including race, prenatal care, and mother's education, but there are other risk factors that may play a role for which we did not have complete or high-quality individual level data for. Such factors may include smoking and family medical history, for example. Maternal smoking, which was reported at a higher rate on birth certificates of children born in the study area, has been linked to an increased risk of several of the outcomes observed here including SGA, low birth weight and craniosynostosis.

Of particular note in this evaluation were estimated rates of maternal smoking and low utilization of prenatal care in the area. Both of these are risk factors for adverse birth outcomes and could explain higher levels in the study area. Appendix C provides detailed descriptions of risk factors for the types of health outcomes included in this review. In addition, Information is provided below about prenatal services and tobacco prevention programs available in the Watertown area.

There are a number of community-based Maternal and Child Health (MCH) programs available to women in the Jefferson County area. The North Country Prenatal/Perinatal Council provides home visiting program services to Watertown and surrounding areas. In addition, the regional perinatal system overseen by NYSDOH supports enhanced collaboration and referral/transfer agreements between hospitals to ensure women in need of specialty care can access it at the closest regional perinatal center. See Appendix D for additional information on these and other MCH services in the area. Despite these programs, local provider shortages have (and continue to) increase gaps in prenatal care provider availability in the service area.

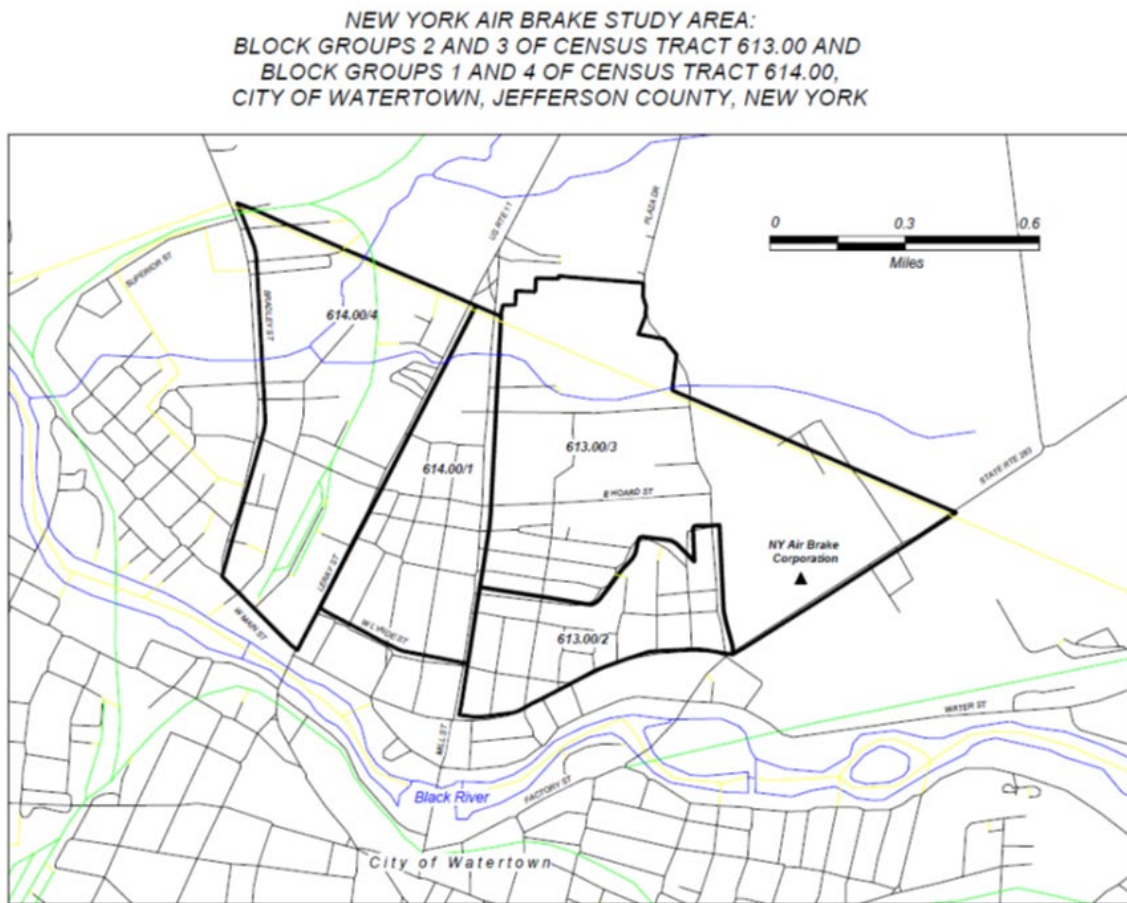
The Regional Center for Tobacco Health Systems at St. Joseph's Hospital is one of eight NYS DOH Bureau of Tobacco Control grant-funded programs working to reduce tobacco use and dependence. Their area covers Jefferson County and they implemented a multi-year disparity project regarding prenatal/perinatal smoking, due to the higher rates of smoking among that population in the Central NY region that concluded in 2021. The project included a needs assessment of their entire 14 county catchment area regarding this specialty population was

completed in 2016. Out of the 11 key findings, it was noted that cessation is a high priority among providers, but the assist rates are low and additional training and skill development are needed for health systems to provide tobacco dependence treatment and supports. In their assessment, St. Joseph's noted a perceived lack of support for funding resources targeting tobacco dependence treatment among this population by local organizations. As a result, they distributed resources and hosted webinars to support evidence-based treatment. See Appendix D for additional information of these and other tobacco cessation services in the area.

While this review showed excesses for some adverse birth outcomes, this type of study cannot determine whether there is a causal link between possible past exposures from living in the study area and the excesses of adverse birth outcomes shown in this review.

**Figure 1. New York Air Brake Study Area**

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**Table 1. Selected maternal characteristics, New York Air Brake study area and New York State excluding New York City: 1995-2013\***

<b>Characteristic</b>	<b>NYAB study area</b>	<b>NYS excluding NYC</b>
Maternal Age (years)		
<20	11.8%	6.9%
20-34	82.4%	74.4%
35+	5.8%	18.7%
Maternal Race/Ethnicity		
Hispanic	5.3%	12.4%
Non-Hispanic White	87.7%	64.2%
Non-Hispanic Black	4.9%	9.8%
Other	1.9%	4.5%
Unknown/Missing	0.3%	9.2%
Maternal Education		
Less than High School	19.0%	14.6%
High School to Some College	71.6%	51.8%
4+ Years of College	8.8%	32.5%
Unknown/Missing	0.6%	1.1%
Alcohol Use		
Yes	1.5%	0.8%
Smoking		
Yes	34.2%	14.8%
Adequacy of Prenatal Care Utilization		
Intensive	11.3%	30.5%
Adequate	6.8%	40.0%
Intermediate	48.4%	13.4%
Inadequate	31.1%	11.3%
Unknown/Missing	2.5%	4.8%

\* Data from birth certificates

**Table 2. Low birth weight, preterm birth & growth restriction, New York Air Brake study area: 1995-2013**

<b>Health outcome</b>	<b>Observed</b>	<b>Expected</b>	<b>Adjusted RR (95% CI)*</b>
Low birth weight (LBW)	86	80	1.19 (0.96, 1.47)
Moderately LBW	75	66	1.26 (1.003, 1.58)**
Very LBW	11	14	0.83 (0.44, 1.54)
Preterm birth	109	118	0.94 (0.78, 1.14)
Moderately preterm	95	101	0.95 (0.77, 1.17)
Very preterm	14	17	0.88 (0.51, 1.52)
Small for gestational age	142	110	1.31 (1.11, 1.54)**
Term low birth weight	34	26	1.39 (0.99, 1.95)

Notes: \*RR was adjusted for mother's age (<20, 20-34, 35+ years), mother's education (< high school, high school-some college, 4+ years of college), mother's race (white, black, other), total previous live birth (0, 1, 2+), prenatal care (intensive use, adequate, intermediate, inadequate), and infant's sex.

\*\*Elevation is statistically significant.

**Table 3. Birth defects results, New York Air Brake study area: 1995-2013**

<b>Birth Defects*</b>	<b>Observed</b>	<b>Expected</b>	<b>PR (95% CI)</b>
Central Nervous System	1	≤1	2.00 (0.05, 11.14)
Anencephalus	0	≤1	NC
Spina Bifida without anencephalus	1	≤1	3.23 (0.08-17.97)
Encephalocele	0	≤1	NC
Holoprosencephaly	0	≤1	NC
Eye	1	≤1	2.94 (0.07, 16.39)
Anophthalmia/microphthalmia	0	≤1	NC
Congenital cataract	1	≤1	4.76 (0.12-26.53)
Ear	0	≤1	NC
Anotia/microtia	0	≤1	NC
Cardiovascular**	7	9.78	0.72 (0.29, 1.47)
Aortic valve stenosis	0	≤1	NC
Atrial septal defect	2	3.42	0.58 (0.07-2.11)
Atrioventricular septal defect	0	≤1	NC
Coarctation of aorta	0	≤1	NC
Common truncus	0	≤1	NC
Double outlet right ventricle	0	≤1	NC
Ebstein anomaly	0	≤1	NC
Hypoplastic left heart	0	≤1	NC
Interrupted aortic arch	0	≤1	NC
Pulmonary valve atresia and stenosis	0	≤1	NC
Single ventricle	0	≤1	NC
Tetralogy of Fallot	0	≤1	NC
Total anomalous pulmonary venous connection	0	≤1	NC
Transposition of great arteries	0	≤1	NC
Tricuspid valve atresia and stenosis	0	≤1	NC
Ventricular septal defect	6	4.73	1.27 (0.47-2.76)
Orofacial	2	1.99	1.01 (0.12, 3.63)
Choanal atresia	1	≤1	4.35 (0.11-24.22)
Cleft lip with cleft palate	0	≤1	NC
Cleft lip alone	0	≤1	NC
Cleft palate alone	1	≤1	1.30 (0.03-7.24)
Gastrointestinal	4	1.32	3.03 (0.83, 7.76)
Biliary atresia	0	≤1	NC
Esophageal atresia/tracheoesophageal fistula	2	≤1	6.67 (0.81-24.08)

Rectal & large intestinal atresia/stenosis	2	≤1	3.92 (0.47-14.17)
Small intestinal atresia/stenosis	0	≤1	NC
Genitourinary	10	5.72	1.75 (0.84, 3.22)
Bladder exstrophy	0	≤1	NC
Cloacal exstrophy	0	≤1	NC
Congenital posterior urethral valves	1	≤1	8.33 (0.21-46.43)
Hypospadias	7	5.23	1.34 (0.54, 2.76)
Renal agenesis/dysgenesis	2	≤1	3.85 (0.47-13.89)
Musculoskeletal	7	4.34	1.61 (0.65, 3.32)
Clubfoot	3	2.72	1.10 (0.23-3.22)
Craniosynostosis	2	≤1	3.57 (0.43-12.90)
Diaphragmatic hernia	0	≤1	NC
Gastroschisis	1	≤1	3.33 (0.08-18.57)
Limb deficiencies (reduction defects)	0	≤1	NC
Omphalocele	1	≤1	5.56 (0.14-30.95)
Chromosomal	1	1.83	0.55 (0.01, 3.04)
Deletion 22 q11	0	≤1	NC
Trisomy 13	0	≤1	NC
Trisomy 18	0	≤1	NC
Trisomy 21 (Down syndrome)	1	1.51	0.66 (0.02-3.69)
Turner syndrome	0	≤1	NC
Infants with NBDPN Birth Defects**	27	23.47	1.15 (0.76, 1.67)

\*See Appendix B for National Birth Defects Prevention Network (NBDPN) Birth Defects Surveillance Definitions.

\*\*Because an infant may have more than one birth defect, the total number of infants with NBDPN Birth Defects, or the total number of infants with a birth defect in a major category can be less than the sum of individual birth defects.

NC = not calculated due to 0 observed cases.

## Appendix A. Health outcome data acquisition, evaluation and analysis

### Birth outcomes:

NYS DOH used birth certificate data for 1995-2013 to determine if the study area had an unusual number or pattern of adverse birth outcomes. Only singleton births (one baby) were included in this study because multiple births (e.g., twins, triplets) have a higher risk of adverse birth outcomes such as preterm birth, low birth weight and some birth defects. The birth certificate data include the infant's birth weight, gestational age, and gender. In addition, information is available on the mother's age, race, ethnicity, years of education, the number of previous births (parity), and the timing and number of prenatal visits.

Birth outcomes are divided into three groups: birth weight, preterm birth, and growth restriction. The birth weight outcomes are:

- Low birth weight (LBW) (<2500 g),
  - Moderately LBW ( $\geq 1500$ g and <2500g),
  - Very LBW (<1500g).

The preterm birth outcomes are:

- Pre-term births (<37 weeks gestation),
  - Moderately pre-term births ( $\geq 32$  and <37 weeks gestation),
  - Very pre-term births (<32 weeks gestation).

The measures of growth restriction are:

- Small for gestational age (SGA) is defined as a birth weight below the 10th percentile of the New York State excluding New York City birth weight distribution of singleton births by gestational week, gender, and five-year time period (Alexander et al., 1996).
- Term LBW ( $\geq 37$  weeks gestation **and** birth weight < 2500 g.)

Birth records with missing birth weight or birth weight outside a reasonable range (<100g or >8000g) were excluded from the analysis. Birth records missing gestational age or with gestational ages outside the reasonable range (<20 weeks or >44 weeks) were excluded from the analysis.

Birth records for New York State excluding New York City were used to calculate expected number of births with each type of birth outcome. Using all singleton births during the study period, statewide annual age-group rates for each outcome were calculated. Nine maternal age groups (in years) were used: 10-14, 15-17, 18-19, 20-24, 25-29, 30-34, 35-39, 40-44 and 45 and older. The annual expected number of births with the birth outcome is the annual statewide age-specific rate multiplied by the number of singleton births in the study area for that age group and year. This process adjusts for differences due to the distribution of age and year of birth in the study area and the comparison population. The annual expected numbers are then summed across age groups and study years to get the total expected number. Observed and expected numbers for each birth outcome are presented.

The study area is somewhat different from the comparison areas in measures of socioeconomic

status, race, and ethnicity. Therefore, the analyses used information about the mother and the pregnancy to take some of these differences into account. Poisson regression analysis was used to analyze the risk of each birth outcome with respect to the potential exposure. The following information from the birth certificate was included in the models as potential confounders: baby's gender and year of birth, mother's age (less than 19, 19-34, 35+ years), education (less than high school, high school to some college, 4+ years college), race (white, non-white), number of previous live births (0, 1, 2, 3+), and prenatal care. The modified Kessner Index, which combines the month the mother first got prenatal care and the number of prenatal visits she had, was used to classify her prenatal care into one of three categories: adequate, intermediate, and inadequate (Kessner et al., 1973). For each outcome, we present the adjusted rate ratio (RR) and its 95% confidence interval (95% CI) for exposure status. A RR above (or below) 1.0 with a 95% CI that does not include 1.0 is considered a statistically significant excess (or deficit).

### **Birth defects:**

Records of birth defects diagnosed through 2015 for singleton births occurring during 1995-2013 were obtained from the New York State Birth Defects Registry. Using this information, we identified specific infants diagnosed with birth defects. The expected number of total birth defects reportable to the Registry for the same timeframe for the comparison area was calculated in a similar manner to the other birth outcomes, as described above. Prevalence ratios were calculated for each birth defect.

### **References**

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## Appendix B. National Birth Defects Prevention Network Birth Defects Surveillance

### Definitions

Birth Defect	BPA Codes
Central Nervous System	
Anencephalus	740.00 – 740.10
Spina Bifida without anencephalus	741.00 – 741.99 w/o 740.0 – 740.10
Encephalocele	742.00 – 742.09
Holoprosencephaly	742.26
Eye	
Anophthalmia/microphthalmia	743.00 – 743.10
Congenital cataract	743.32
Ear	
Anotia/microtia	744.01, 744.21
Cardiovascular	
Aortic valve stenosis	746.3
Atrial septal defect	745.51 – 745.59
Atrioventricular septal defect	745.60 – 745.69
Coarctation of aorta	747.10 – 747.19
Common truncus	745.00 only (excluding 745.01)
Double outlet right ventricle	745.13 – 745.15
Ebstein anomaly	746.20
Hypoplastic left heart	746.7
Interrupted aortic arch	747.215 - 747.217, 747.285
Pulmonary valve atresia and stenosis	746.00 (pulmonary valve atresia), 746.01 (pulmonary valve stenosis)
Single ventricle	745.3
Tetralogy of Fallot	745.20 – 745.21, 747.31
Total anomalous pulmonary venous connection	747.42
Transposition of great arteries	745.10 – 745.12, 745.18 – 745.19
Tricuspid valve atresia and stenosis	746.100 (tricuspid atresia), 746.106 (tricuspid stenosis) (excl. 746.105 – tricuspid insufficiency)
Ventricular septal defect	745.40 – 745.49 (excl. 745.487, 745.498)
Orofacial	
Choanal atresia	748.0
Cleft lip with cleft palate	749.20 – 749.29
Cleft lip alone	749.10-749.19
Cleft palate alone	749.00 – 749.09
Gastrointestinal	
Biliary atresia	751.65
Esophageal atresia/tracheoesophageal fistula	750.30 – 750.35

Rectal & large intestinal atresia/stenosis	751.20 – 751.24
Small intestinal atresia/stenosis	751.10-751.19
Genitourinary	
Bladder exstrophy	753.5
Cloacal exstrophy	751.555
Congenital posterior urethral valves	753.60
Hypospadias	752.60 – 752.62 (excluding 752.61 and 752.621)
Renal agenesis/dysgenesis	753.00 – 753.01
Musculoskeletal	
Clubfoot	754.50, 754.73
Craniosynostosis	756.00-756.03
Diaphragmatic hernia	756.61
Gastroschisis	756.71
Limb deficiencies (reduction defects)	755.20 – 755.49
Omphalocele	756.70
Chromosomal	
Deletion 22 q11	758.37
Trisomy 13	758.10 – 758.19
Trisomy 18	758.20 – 758.29
Trisomy 21 (Down syndrome)	758.00 – 758.09
Turner syndrome	758.60-758.69

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Source: <https://www.nbdpn.org/guidelines.php>

## **Appendix C. Risk factors associated with the health outcomes examined in this report**

*Low birth weight:* The most common risk factors for low birth weight are being born preterm and fetal growth restriction. Cigarette smoking is the single largest risk factor for fetal growth restriction and thus low birth weight in term infants (1). The connection between socioeconomic factors and low birth weight has been analyzed through the lens of maternal economic disadvantage. Socioeconomic inequality impacts maternal conditions during the prenatal period leading to poor health outcomes at birth including low birth weight. Examining maternal advantage through maternal race, marital status and education (proximate indicators of income) reveals that the incidence of low birth weight in the U.S. is highest among unmarried African American women with less than a high school education. Maternal disadvantage is also associated with reduced access to health care, poor nutrition, and an increased risk of behavioral risk factors such as smoking (2). Poor nutritional status of the mother at conception and inadequate nutritional intake during pregnancy can result in term low birth weight births (1). With respect to environmental exposures, a growing body of evidence has pointed to an association between air pollution and various birth outcomes including low birth weight (3).

*Small for gestational age:* There are various reasons why babies might be born underweight for their gestational age (small for gestational age), including restricted fetal growth during pregnancy or smaller than average size parents. Small for gestational age babies can have low birth weight because something slowed or halted their growth in the uterus (4). Small for gestational age births are an important health outcome because babies who are small for gestational age are more likely to have health problems as newborns and children.

Maternal smoking is a major risk factor for having a small for gestational age baby. Multiple reports from the Surgeon General have focused on health effects of smoking and have found increasing evidence of an association between low birth weight and smoking, secondhand smoke and smokeless tobacco (5). When expectant mothers have nutritional disorders, smoke, or use alcohol or illegal drugs, their babies have an increased chance of being small for gestational age (6).

Other factors also influence the risk of having a small for gestational age baby. If a baby has birth defects, is a twin or triplet, has fetal infections or has an abnormality of the placenta, the baby's chances of being small for gestational age may increase. Maternal diseases or medical conditions that reduce the blood flow to the fetus may account for 25 – 30 percent of small for gestational age births (6). Health care provider visits before becoming pregnant and during pregnancy are helpful for identifying and controlling these medical conditions. Prenatal care is also essential for determining whether a baby is growing normally. In some cases, fetal growth can be improved by treating any medical condition in the mother (such as high blood pressure) that may be a contributing factor (7).

*Preterm birth:* Preterm birth babies are born before 37 weeks gestation. Preterm birth is an important health outcome because it causes the greatest risk for infant mortality (death before one year of age). While specific causes remain unknown in many cases, several risk factors have

been identified. Women are at risk of preterm labor if they've previously had a preterm baby, are pregnant with multiples (twins, triplets etc.) or have specific medical conditions including connective tissue disorders, diabetes and high blood pressure. Significant differences exist among groups, with African-American women having a greater risk than white women for preterm delivery, even in studies that control for socio-economic differences. Visits to a healthcare provider before pregnancy and seeking early and regular prenatal care may help reduce the risk of delivering a baby preterm (8).

*Birth defects:* While scientists have been able to identify some causes of specific birth defects, the cause of most birth defects is unknown. In fact, about 60-80 percent of birth defects are of unknown origin (9, 10). It is believed that a combination of genetic and environmental factors causes birth defects. Roughly, twenty percent of birth defects may be due to a combination of heredity and other factors, nine percent due to single gene mutations, twelve percent due to chromosomal abnormalities, and five percent due to maternal illnesses, such as diabetes, infections, or exposure to teratogens (9, 10). Known teratogens associated with birth defects include the use of certain maternal medications, such as thalidomide, Accutane, and anticonvulsant drugs. Women who smoke, use alcohol or illegal drugs while pregnant have a higher risk of having a baby with a birth defect.

There are ways to reduce a baby's risk for birth defects and to ensure early treatment if a birth defect is found. Pre-pregnancy visits with health care providers may identify genetic or other maternal health conditions which can be treated. A woman's daily use of a multivitamin with 400-800 micrograms of the B vitamin, folic acid, before and during pregnancy, also helps prevent some types of birth defects, specifically neural tube defects (11). In addition to using folic acid, women are advised to talk to their health care providers about any medications they take and refrain from smoking, drinking alcohol, or taking illegal drugs while trying to become pregnant or during pregnancy (12). Despite all these efforts, birth defects may still occur. To improve health outcomes, certain medical screenings during pregnancy may assist early identification of any birth defects and lead to early infant treatment.

Several large population-based studies have examined the associations between race and ethnicity and risk of birth defects (13-15). Associations have been observed between non-Hispanic Black race/ethnicity and congenital heart defects and between Hispanic ethnicity and central nervous system defects including spina bifida, anencephaly and encephalocele. The association between socioeconomic status (SES) and the risk of birth defects overall has also yielded inconsistent results. Carmichael et. al. (2007) evaluated associations between various SES indicators such as parental education and occupation as well as household income and selected major birth defects, including anencephaly, spina bifida, cleft lip, cleft palate, and conotruncal heart defects. The study observed an increased risk between the selected defects and an index of the individual SES indicators. It is important to note that the evaluation of demographic factors and risk of birth defects serves to highlight potential genetic and environmental clues for future research into the causes of birth defects.

### *Craniosynostosis*

Craniosynostosis, a birth defect involving the premature fusion of at least one of the cranial sutures, is known to occur as a part of various genetic syndromes and most commonly as an isolated (non-syndromic) defect (16). Several potential genetic and environmental risk factors have been identified including male sex, maternal thyroid disease, maternal smoking (17, 18), and fertility treatments (19, 20, 21). It is believed that a combination of genetic and environmental risk factors contributes to the occurrence of craniosynostosis.

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## **Appendix D. Maternal and Child Health & Tobacco Control Services available in Jefferson County**

### **Maternal and Child Health Services**

(Prepared by NYS DOH Division of Family Health April 2024)

#### **Community Based Services:**

- Perinatal Infant Community Health Collaboratives: PICHC Initiative: [Perinatal and Infant Community Health Collaboratives \(PICHC\) Initiative \(ny.gov\)](https://www.health.ny.gov/community/infants_children/early_intervention/)
  - The goal of the PICHC initiative is to support community-based efforts to improve overall health and well-being of birthing people and their families and improve health outcomes.
  - Through the PICHC initiative, New York State is working to improve perinatal and infant health outcomes for high-need, low income, Medicaid eligible individuals and their families and working together with communities to reduce racial, ethnic, and economic disparities in health outcomes and address the factors that affect racial and ethnic disparities.
- North Country Prenatal/Perinatal Council is the funded provider for Jefferson, St. Lewis, & Lawrence Counties. This organization also provide additional services including evidence-based home visiting, adolescent pregnancy prevention, lactation support, and other services. Additional information can be found here: <https://ncppc.org/>
- NYS Early Intervention (EI) program which provides services to infants and children with disabilities which could be available to some families: [https://www.health.ny.gov/community/infants\\_children/early\\_intervention/](https://www.health.ny.gov/community/infants_children/early_intervention/)
- NYS Children and Youth with Special Health Care Needs (CYSHCN) Program seeks to improve the system of care for children and youth with special health care needs from birth and up to 21 years of age and their families. [https://www.health.ny.gov/community/special\\_needs/](https://www.health.ny.gov/community/special_needs/)

#### **Clinical Based Services:**

- NYSDOH supports a system of perinatal regionalization that includes all birthing hospitals throughout NYS. There are 16 Regional Perinatal Centers (RPCs) which are birthing hospitals across NYS identified because of their ability to provide a high level of clinical care for maternal health and neonatal patients. RPCs are also tasked with overseeing a network of affiliated hospitals in their geographic region with whom they work to coordinate transfer and referral of patients needing different levels of care.

- For pregnant people in the Watertown area if a birth defect is detected in a prenatal screening, the care of a maternal-fetal medicine specialist is available in Syracuse in both Crouse Hospital & St. Joseph's Hospital.
- Babies born with a birth defect may need specialized care, depending on the type and severity. In addition to Crouse Hospital and St. Joseph's Hospital, Samaritan Medical Center in Watertown as well as Faxton – St. Luke's Hospital in Utica may also be able to provide the services of neonatologist.
- It is important to discuss these and other concerns with an OB/GYN or other health care provider.

### **Jefferson County – Tobacco Cessation Services**

(Prepared by the NYS DOH Bureau of Tobacco Control April 2024)

#### **Community Based Services:**

Local partners in Jefferson County include:

- North Country Prenatal/Perinatal Council (based in Watertown) – <https://ncppc.org>
- Planned Parenthood of the North Country - <https://www.plannedparenthood.org/planned-parenthood-north-country-new-york>
- Cornell Cooperative Extension - <http://ccejefferson.org/>

#### **Clinical Based Services:**

The Regional Center for Tobacco Health Systems at St. Joseph's Hospital – Contact: Kristen Richardson,; [kristen.richardson@sjhsyr.org](mailto:kristen.richardson@sjhsyr.org)

- The Center is one of eight New York State Department of Health Bureau of Tobacco Control grant-funded programs working to reduce tobacco use and dependence. In addition to Jefferson County, the Center covers Broome, Chenango, Cortland, Lewis, Madison, Oneida, Onondaga, Oswego, St. Lawrence, and Tioga County. The program staff is committed to promoting the Clinical Practice Guidelines developed by the United States Department of Health and Human Services that consist of evidence-based methods and treatments that help tobacco users quit.

The Regional Center for Health Systems at St. Joseph's Hospital works with health care organizations and clinicians to:

- Implement systems to screen patients for tobacco use.
- Assist clinicians in treating patients who struggle with tobacco addiction.

#### **Program Goals:**

- Reduce tobacco use among adults with low incomes, low educational attainment, and/or serious mental illness.

- Focus on system- and policy-level improvements to implement systems to screen patients for tobacco use and provide tobacco dependence education, counselling, and treatment.
- Provide evidence-based referral systems to ensure that tobacco users have access to effective tobacco cessation treatments.

New York State Smokers Quitline/Quitsite - <https://www.nysmokefree.com/> 1-866-NY-QUITS