

Risk Factors for Gastroschisis, Washington State 1987-2004

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MATERNAL AND CHILD HEALTH CONCERN

- Birth defects are the leading cause of infant death and childhood disability in the U.S.
- Gastroschisis is a life-threatening birth defect in which the abdominal wall is formed incompletely and the intestines protrude through a defect in the abdomen, most commonly in the right upper abdomen.
- Young maternal age (in particular age less than 20 years) is the most consistently identified risk factor for gastroschisis.
- Other possible risk factors include poor maternal diet, Hispanic race, maternal smoking during pregnancy, maternal drug use, and environmental exposures such as solvents, colorants, and agricultural chemicals.
- Limited information exists to support these possible associations. Additional research is warranted to investigate risk factors for the defect, in particular environmental and occupational exposures.

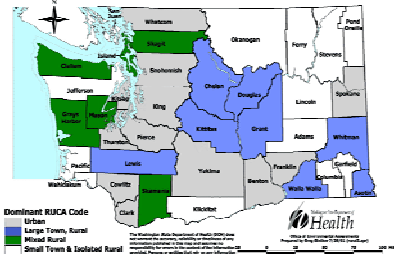
OBJECTIVES

- Describe trends in gastroschisis prevalence in Washington State.
- Attempt to confirm the potential association of gastroschisis with maternal age, race, smoking and alcohol use.
- Identify potential environmental risk factors for gastroschisis related to farming and pesticides.

APPROACH

- Population-based case control study using birth certificate data linked to hospital discharge diagnostic information from the birth hospitalization
- Cases: Singleton births with gastroschisis, identified by:
 - birth certificate check box for omphalocele or gastroschisis (prior to 2003) or for gastroschisis (for years 2003-2004);
 - diagnosis of other abdominal wall defects (International Classification of Diseases, 9th Revision code 756.79) on the birth hospitalization discharge record; or
 - gastroschisis repair (procedure code 54.71) recorded on the birth hospitalization discharge record.
- Controls: 2,439 normal singleton infants, frequency matched on birth year.
- Exposures: Maternal and paternal demographic information, parental occupation, and maternal county of residence gathered from the birth certificate. Maternal and paternal occupation and maternal county of residence, categorized according to region (east-west), rural-urban classification (Figure 1), and proportion of orchard land, used as surrogate measures of pesticide or agricultural exposure.
- Analysis: Mantel-Haenszel stratified analyses used to calculate odds ratios and 95% confidence intervals for those predictors found to have a significant association with gastroschisis in univariate analysis. Risk estimates adjusted for maternal age and marital status.

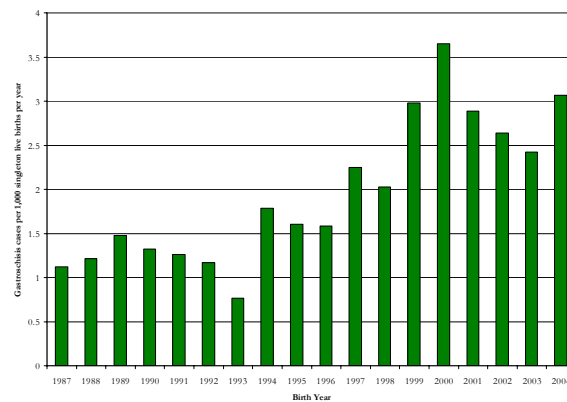
Figure 1. County-level rural-urban grouping (Rural-Urban Commuting Area (RUCA) classification) [Washington State Department of Health]



Characteristics among women delivering infants with and without gastroschisis, Washington State, 1987-2004

	Cases (N=579)	Controls (N=2,439)
Mean Age (years)	23.6	27.3
Maternal Race (%)		
White	70.5	71.0
Black	3.3	4.8
Hispanic	13.1	10.8
Asian/Pacific Islander	5.0	7.3
Native American	5.4	2.5
Marital Status (%)		
Unmarried	49.6	28.7
Married	49.7	71.0
Maternal Education (years) (%)		
<12	22.3	15.5
12	28.0	20.9
>12	24.2	39.4
Previous Deliveries (%)		
0	59.4	41.1
1	24.2	32.1
2	10.4	14.8
3+	4.2	9.7

Gastroschisis incidence by birth year, Washington State, 1987-2004



Risk estimates for parental demographic characteristics

Exposure of Interest Adjusted Odds Ratio* (95% Confidence Interval)

Maternal Age (years)**	
<18	2.9 (1.9, 4.5)
18-19	2.6 (1.8, 3.6)
20-24	1.8 (1.4, 2.3)
25-29	1.0 (reference)
30-34	0.7 (0.5, 1.0)
35+	0.8 (0.5, 1.2)
Paternal Age (years)	
<18	3.0 (1.0, 8.8)
18-19	2.1 (1.2, 3.8)
20-24	1.5 (1.1, 2.0)
25-29	1.0 (reference)
30-34	0.6 (0.4, 0.8)
35+	0.6 (0.4, 0.8)
Maternal Race	
White	1.0 (reference)
Black	0.5 (0.3, 0.9)
Hispanic	1.0 (0.7, 1.5)
Asian/Pacific Islander	0.8 (0.5, 1.2)
Native American	1.4 (0.9, 2.2)
Paternal Race	
White	1.0 (reference)
Black	0.9 (0.6, 1.4)
Hispanic	0.9 (0.6, 1.2)
Asian/Pacific Islander	0.5 (0.3, 0.8)
Native American	1.5 (0.8, 2.6)
Maternal Smoking	1.2 (0.9, 1.5)
Maternal Alcohol	1.9 (1.0, 3.4)

*Adjusted for maternal age and marital status
**Adjusted only for marital status

Risk estimates for surrogate measures of occupational and environmental exposures

Exposure of Interest	Adjusted Odds Ratio* (95% Confidence Interval)
Maternal county of residence	1.0 (0.8, 1.2)
upper 50 th percentile orchard acreage	
Maternal county of residence	
Small town/isolated	1.1 (0.7, 2.0)
Mixed rural	1.4 (0.9, 2.1)
Large town, rural	1.6 (1.1, 2.2)
Urban	1.0 (reference)
Maternal Eastern Washington county of residence	1.2 (1.0, 1.5)
Maternal occupation	
Agricultural employment	0.7 (0.3, 2.0)
Non-agricultural employment	1.0 (reference)
Unemployed	1.0 (0.8, 1.3)
Child under 18	1.5 (0.9, 2.5)
Paternal occupation	
Agricultural employment	0.4 (0.2, 0.8)
Non-agricultural employment	1.0 (reference)
Unemployed	0.8 (0.4, 1.5)
Child under 18	2.8 (1.1, 6.9)

*Adjusted for maternal age and marital status

IMPLICATIONS

- Young maternal and paternal ages were strongly associated with risk of gastroschisis.
- The disproportionate burden of gastroschisis among young mothers in Washington State suggests that targeted education and other birth defect prevention efforts may be beneficial.
- These results do not support the hypothesis of parental agricultural occupation and pesticide exposure as risk factors for gastroschisis.
- There appeared to be regional variation in Washington State in the occurrence of gastroschisis.
- Future research:
 - Explore factors associated with young parental age
 - Develop more precise measures of environmental and occupational factors

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