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Epidemiology III
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TABLE 1. Study Population Characteristics for a Case-Control Study*

	All Eligible Births		Cases		Controls	
	N	%	N	%	N	%
Prenatal Care <20 weeks†						
Yes	3418	85.5	1648	82.4	1770	88.5
No	582	14.5	352	17.6	230	11.5
Missing	0		0		0	
Race & Hispanic Ethnicity‡						
White, non-Hispanic	2796	70.0	1297	64.9	1499	75.1
White, Hispanic	75	1.9	30	1.5	45	2.3
African American, non-Hispanic/Hispanic	843	21.1	531	26.6	312	15.6
Other, non-Hispanic/Hispanic	281	7.0	140	7.0	141	7.1
Missing	5		2		3	
Maternal Smoking§						
Yes	735	18.2	416	20.9	319	16.0
No	3265	81.8	1577	79.1	1678	84.0
Missing	10		7		3	
Gravidity#						
1 Pregnancy	1133	28.5	518	26.1	615	30.9
2 Pregnancies	1042	26.3	472	23.8	570	28.7
More than 2 Pregnancies	1795	45.2	992	50.1	803	40.4
Missing	30		18		12	
Mother's Age**						
<20	304	7.6	164	8.2	140	7.0
20-24	995	24.9	524	26.2	471	23.6
25-29	1192	29.8	555	27.8	637	31.8
30-34	991	24.7	466	23.3	525	26.2
35-39	419	10.5	230	11.5	189	9.5
>=40	99	2.5	61	3.0	38	1.9
Missing	0		0		0	

*All data were derived from Ohio Live Birth Certificate data for 2014. The study population included live singleton births without congenital malformations that experienced the entire risk period for preterm birth (the 17-week interval beginning with the 21st week of gestation and ending upon completion of the 37th week of gestation) during 2014. Births with unknown gestational age were excluded. Cases were 2000 eligible spontaneous preterm births sampled from all eligible spontaneous preterm birth. Controls were 2000 eligible births samples from all eligible births.

† Prenatal care before the 20th week of gestation was determined based on the month prenatal care began, as recorded on the Ohio birth certificate.

‡ Based on the mother's self-reported race and Hispanic origin. 'Other' race includes all births with race identified as something other than White or African American. 'Missing' indicates births missing information on Hispanic ethnicity; race was recorded for all births.

§ Births with maternal smoking during pregnancy recorded on the birth certificate were classified as smokers. Data are missing for births with unknown smoking status.

Data for the categories were recorded from the total number of pregnancies. Based on the total number of pregnancies of the mother, Gravidity was determined.

** Mother's Age was separated into categories from the original continuous data. The number in each category was then determined from the original mother's age data.

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DAG Analysis:

List of Paths

PC -> PB	Causal	Open
PC <- G -> PB	Non-Causal	Open
PC <- G <- MA -> PB	Non-Causal	Open
PC <- G <- MA <- U -> MS -> PB	Non-Causal	Open
PC <- G <- MA <- U <- RE -> PB	Non-Causal	Open
PC <- MA -> PB	Non-Causal	Open
PC <- MA -> G -> PB	Non-Causal	Open
PC <- MA <- U -> MS -> PB	Non-Causal	Open
PC <- MA <- U <- RE -> PB	Non-Causal	Open
PC <- U -> MA -> PB	Non-Causal	Open
PC <- U -> MA -> G -> PB	Non-Causal	Open
PC <- U -> MS -> PB	Non-Causal	Open
PC <- U <- RE -> PB	Non-Causal	Open
PC <- RE -> PB	Non-Causal	Open
PC <- RE -> U -> MS -> PB	Non-Causal	Open
PC <- RE -> MA -> PB	Non-Causal	Open
PC <- RE -> MA -> G -> PB	Non-Causal	Open

Potential Confounders:

Gravidity, Race/Ethnicity, Mother's Age, Smoking Status

Minimum Sufficient adjustment set:

Gravidity, Mother's Age, Race/Ethnicity, Smoking Status

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Statistical Methods:

This study examined 4000 births from the Ohio 2014 Live Birth, 2000 were preterm births (cases) and selected from the same cohort and independent of birth status were 2000 controls. Using SAS 9.4, a logistic regression model was used with the cases being the outcome and early prenatal care being the primary exposure. We estimated Case-Control Odds Ratios and used 95% confidence intervals in our analysis. A DAG analysis was conducted to determine the confounders for the relationship between early prenatal care and preterm birth, those variables being Gravidity, Race/Ethnicity, Smoking Status, and Mother's Age. For early prenatal care, we created a new binary variable of whether there was prenatal care within the first 5 months (yes/no). For Maternal Race and Hispanic Ethnicity, we created two variables. One was categorical (White/Non-Hispanic, White/Hispanic, African American, Other) and the other was binary (White/Non-Hispanic, All other race/ethnicity groups). A binary variable was used for whether there was any maternal smoking during pregnancy (yes/no). For Maternal age and gravidity, we decided to use categorical disjoint indicator coding (<20, 20-24, 25-29, 30-34, 45-40, >40 for maternal age) (1,2,>2 for gravidity). Categorical mother's age was selected since the natural log graph looked like the regular age model and is easier to interpret. The categorical gravidity model was chosen since it is rare for women to give birth to more than 2 children and that it would be easier to interpret. For the constancy evaluation, the likelihood ratio test was performed with an interaction with early prenatal care with one possible confounder at a time as the full model against a reduced model without the interaction with a significance criteria of ($\alpha = 0.05$). To assess risk difference modification, we created new indicator variables for possible categories for the combination between early prenatal care and the binary race/ethnicity and early prenatal care and smoking. Odds Ratio estimates were used in our assessment of risk difference modification. We compared all estimates to the referent category (No early care, White/Non-Hispanic). In addition to that, we conducted a stratum specific analysis for each race/ethnicity category and smoking category.

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Interpretation Paragraph:

In this study, the measure of effect that is being estimated is the risk ratio. This is because case-control studies estimate risk ratios while providing odds ratio estimates. If one wanted to estimate risks from this study to apply for a target population of all eligible births in North Carolina in 2011, we would recommend that it isn't possible. The demographics are not the same between North Carolina and Ohio, not only that, but the data in this study is from 2014, not from 2011.

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Title:

Effect of Early Prenatal Care on Preterm Birth

Background:
Preterm birth from premature rupture of chorioamniotic membranes or induced labour have different etiologies than those from spontaneous preterm births. After conducting a cohort study on the 2014 Ohio live birth certificate data, we've determined several potential risk factors for preterm birth and one such factor is prenatal care. Therefore, we have decided to conduct a case-control study on the relationship between prenatal care and preterm birth.
Objective:
We will also be assessing the effect of maternal race/ethnicity and smoking has on the relationship between prenatal care and preterm birth and whether Ohio prenatal care programs would be more effective in the reduction of preterm births if they targeted minority women or smokers.
Methods:
This Case-Control study obtained its population from the 2014 Ohio live birth certificate file. The study period was the year of 2014, with restrictions on eligible births. The entire 17 week risk period had to occur in 2014 and the pregnancy had to begin 45 weeks prior to the end of 2014. The 2000 cases were selected from all eligible spontaneous preterm births and the 2000 controls were sampled from all eligible births. The main exposure in this study is early prenatal care (having prenatal care within the first 5 months of pregnancy). The confounders were found using a DAG analysis, them being gravidity, smoking status, mother's age, and race/ethnicity. They were defined with categories, with gravidity being 1, 2, or >2 pregnancies, mother's age with <20, 20-24, 25-29, 30-34, 45-40, >40, and race/ethnicity with white/non-Hispanic, white/Hispanic, African-American, and Other. We assessed the risk difference modification by smoking and race by obtaining Odds Ratios (OR) via logistic regression, in this case Risk Ratio, with the referent group being no early care/white non-Hispanic, against other combinations of early prenatal care and race/ethnicity or smoking status. Stratum specific OR were also obtained for race/ethnicity and smoking status.
Results:
85.5% of our study population had prenatal care, with our cases having 82.4% with prenatal care and our controls with 88.5%. A majority of our study population is White/Non-Hispanic (70.0%), with the second largest category being African-American at 21.1%. In terms of smoking status, a majority, 81.8%, did not smoke during pregnancy. There were very few data missing. Only 5 were missing from Race/Ethnicity, 10 from Smoking Status and 30, from Gravidity. Those who have prenatal care within the first 5 months have a .6084 (.5086, .7278) times odds of preterm birth than those who did not have prenatal care within the first 5 months. Adjusting for smoking status, race/ethnicity, and mother's age, those who had early prenatal care have a .6647 (.5534, .7983) times odds of preterm birth than those who don't. The Interaction Contrast Ratio for race/ethnicity is .2794 (-.0718, .6306) and for smoking status is -0.0057 (-.461, .461).
Conclusions:
A strength of this study is that it has a small amount of missing values and that the cohort that this case-control obtains its study population is a good representation of the target population. A weakness is that there is no causality between prenatal care and preterm birth, and due to social desirability bias, smoking might be underreported. The results mostly agreed with our expectations on prior knowledge. However, our analysis did not support targeting prenatal care programs to minority women or smoking status. We do not believe that we can extrapolate the data here for North Carolina.