Early Childhood Longitudinal Studies – Birth Cohort

"Levels of Alcohol Consumption During Pregnancy and Child, Social, Mental, Motor, and Physical Development for the ECLS-B"

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Population

- The Early Childhood Longitudinal Studies-Birth Cohort (ECLS-BC), is drawn from a sample of nearly 4 million children born in 2001.
- The ECLS-B sample consists of 10,688 children who were selected and 10,221 of these who were directly assessed at 9 months. The sample is representative of "all" children born in 2001.

Research Question

- What are the characteristics of infants whose mothers reported that they consumed alcohol at mild, moderate, and large (heavy) levels in the last 3 months of pregnancy compared to infants whose mothers reported that they did not drink during this period?

Levels of Alcohol Consumption

- Levels of alcohol consumption
- Did not drink
- <1 drink per week
- 1-3 drinks per week
- 4-6 drinks per week
- 7-13 drinks per week
- 14-19 drinks per week
- 20 or more drinks per week

Alcohol Consumption: Relevance to Child Development - Timing

- Alcohol consumption questions on ECLS-B:
  - Level of consumption, 3 months before pregnancy;
  - Level of consumption, last 3 months of pregnancy;
  - Level of consumption at 9 months of child's age;

Parent questionnaire given at 9 months of age.

Self-report.

Fetal Alcohol Spectrum Disorder (FASD)

- Includes: Fetal Alcohol Syndrome (FAS)
- 2.8 – 4.8 per 1,000 births
- With Alcohol-related neuro-developmental disorder (ARND) – combined incidence:
- 9.1 per 1,000 (Sampson, et. al., 1997)
- With Alcohol-related birth defects (ARBD) estimated to be 10 per 1,000 cases or 1% of the population (May & Gossage, 2005).
- Note: Brain Model

Diagnostic Criteria for FAS

- Maternal report of alcohol consumption
- Low birth weight, FTT, or growth below 10th percentile and
- "Global cognitive or intellectual deficits; multiple domains with performance below the 3rd percentile (2 standard deviations below mean) or
- Functional deficits below the 16th percentile (1 standard deviation below the mean) in at least 3 of following domains: (1) cognitive/developmental deficits or discrepancies; (2) executive functioning deficits, (3) motor functioning delays; (4) problems with attention and hyperactivity, (5) social skills, (6) other such as sensory problems, pragmatic language problems and memory deficits," (Floyd, et. al., 2005).

Child Characteristics/FAS Model

- Diagnosis of FAS on birth certificate;
- Physical and health symptoms
- Cognitive development; executive function
- Growth
  - Birthweight
  - Weight, and height
  - Head circumference available for infants who were born prematurely

Child Characteristics On ECLS – B (9 months) following FAS Model

- Social interaction
  - NCATS, Barnard, (1976)
- Infant Symptom Scale, DiGangi, et. al. (1995)
- Health characteristics
- Physical growth characteristics
- Mental and Motor scores
  - Bayley Short Form (BSF) from *Bayley Scales of Infant Development*

Child Characteristics on ECLS-B - 24 months data wave for future study

- Separation/Attachment
- Mental/Motor
- Physical health and services received
- Child care received; early intervention
- On-going data collection at 48 months and kindergarten.

Alcohol Consumption Levels Reported Pre-Pregnancy

- P1NMKDP3 (P1 FH101 – Alcoholic Drinks 3 months before conception/ average per week
- _____

Response	Number	Percentage
Did not drink then	6,900	64.5%
Less than one drink	1,500	13.8%
1-3 drinks	1,500	14%
4-6 drinks	400	3.8%
7-13 drinks	150	1.4%
14-19 drinks	50	.3%
20 or more	50	.6%
NA	150	1.4%
Refused	-	0%
Don't know	-	0%
Not ascertained	-	.1%

Alcohol Consumption During Pregnancy

- P1NMDK3M(P1 FH103 – Alcoholic Drinks during the last 3 months of pregnancy/average per week
- _____

Response	Number	Percentage
Did not drink then	10,250	95.7%
Less than one drink	200	1.7%
1-3 drinks	100	.9%
4-6 drinks	-	.1%
7-13 drinks	-	.1%
14-19 drinks	-	0%
20 or more	0	0%
NA	150	1.4%
Refused	-	0%
Don't know	-	0%
Not ascertained	-	.1%

Behavioral Risk Factor Surveillance System (BRFSS)

- BRFSS, an ongoing national health study;
- Telephone survey
- Pregnant?
- Alcohol Consumed in the last month?
- In 1999, 12.8% of pregnant women reported alcohol consumption in the last month.
- 2000 and early 2001 pregnancy period for women in ECLS-B study.

Alcohol Consumption After Pregnancy

- P1DRKNOW (P1FH105 - currently drinking alcohol)
- At 9 month interview, Currently drinking alcohol
- _____

Response	Number	Percentage
Yes	3,400	31.6%
No	7,300	68.3%
NA	-	0
Refused	-	0
Don't know	-	.1%
Not ascertained	-	0

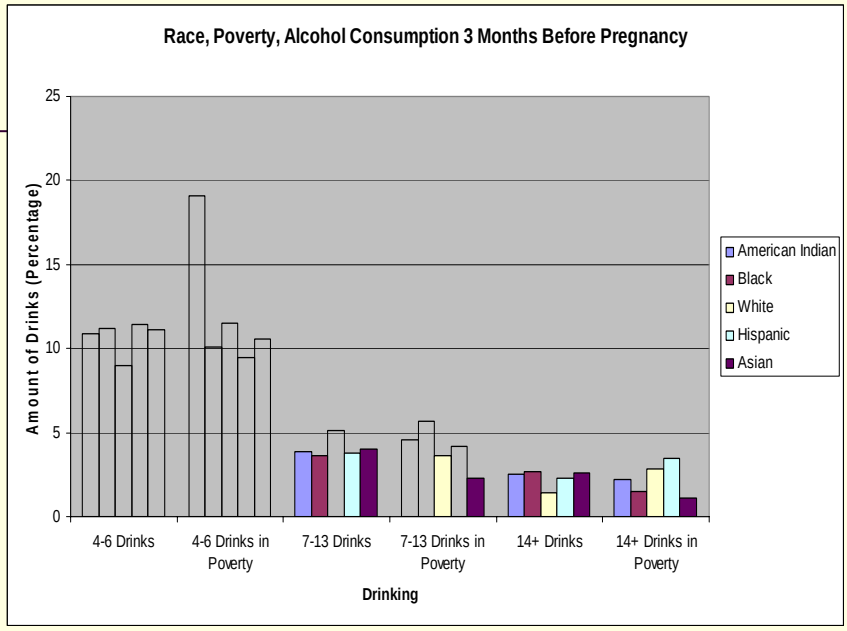
Rationale for Pre Pregnancy Data Relevance

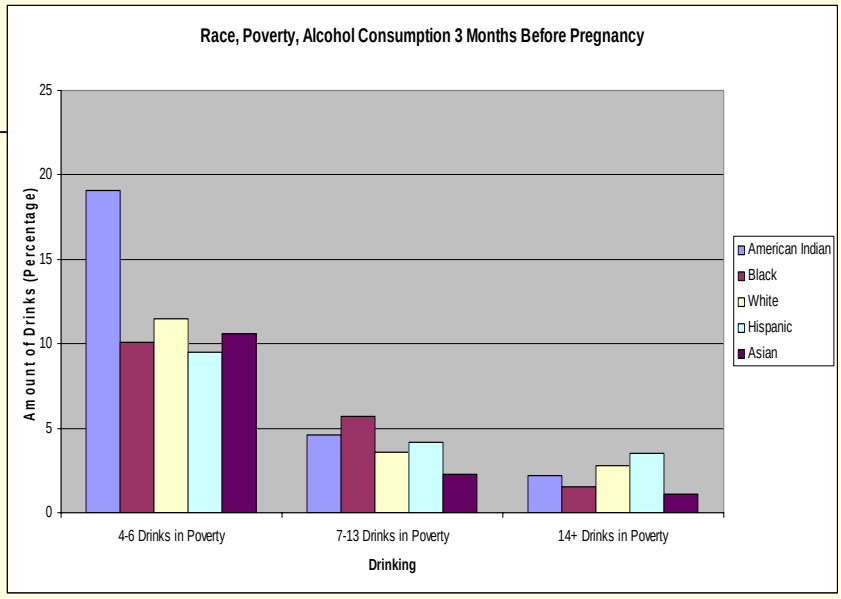
Assumption in epidemiology literature:

Women who drink prior to pregnancy likely to be drinking at time of conception.

Syntatogenesis – formation of brain and synapses

Pregnancy recognition in ECLS-B study among women – 5.4 weeks; women who consumed alcohol – 5.7 or 5.8 weeks





Number of Alcoholic Drinks/ SES and Household Income

	Family Socioeconomic Scale		Household Income	
	Mean	SE	Mean	SE
Less than 1 Drink	10,012.2	2.63	8.10	0.11
1 to 3 Drinks	10,020.4	2.93	8.40	0.13
4 to 6 Drinks	10,021.4	6.60	8.50	0.25
7 to 13 Drinks	9,991.7	7.41	7.40	0.29
14 or More Drinks	9,961.8	10.51	6.70	0.52

Methods

- Early examination of two questions;
  - Alcohol consumption 3 months before pregnancy; and
  - Alcohol consumption 3 months during pregnancy
  - Overlapping populations; stronger relationship from latter question in regression analysis
  - Covariates – Poverty and Prematurity
  - Preliminary conclusion to focus on alcohol consumption during the last 3 months of pregnancy

Approach to Analysis

- I am using AM software from AIR; JK2
- Consistent with NCES replicate weight methodology: W1C0;
- Levels of significance
- p<.05*
- p<.01**
- p<.001***
- With Bonferroni correction; adjustments are lower, vary, and may appear less than .05

Methods continued

- Descriptive information for the range of drinking levels for the question related to alcohol consumption in the last three months of pregnancy.
- Intrauterine growth retardation
- Example of birth weight follows

Intrauterine Growth Retardation – example of U shaped pattern

	Weighted	Mean	SE	SD	Min	Max
N	3720004	3.547	0.012	1.449	1.000	6.000
< 1	85571	3.289	0.129	1.303	1.000	6.000
1-3	40993	3.169	0.185	1.409	1.000	6.000
4-6	1864	2.581	0.846	0.877	1.000	4.000
7-13	1883	3.623	0.218	0.691	2.000	5.000
14-19	863	3.000	-1.#IO	0.000	3.000	3.000

Intrauterine Growth Retardation, T-Test, Probability

	Estimate	Estimate	Difference	SE	df	T value	Prob
< 1	3.547	3.289	0.257	0.129	90	1.997	0.419
1-3	3.547	3.169	0.378	0.187	90	2.019	0.046*
4-6	3.547	2.581	0.966	0.845	90	1.144	0.256
7-13	3.547	3.623	-0.076	0.217	90	-0.351	0.726
14-19	3.547	3.000	0.547	-1.#IO	90	-1.#IO	1.#QO

- The U curve trend – higher values at < 1 drink per week or 1-3 drinks per week. Higher SES mean in these groups; higher than did not drink and drinking at higher levels per week. Difficult to establish a linear effect for items where SES is likely to interact.

Birth Weight and Alcohol During the Last Three Months of Pregnancy

	Estimate	Estimate	Difference	SE	df	T value	Prob
< 1	1.087	1.072	0.015	0.017	88	0.875	0.384
1-3	1.087	0.102	-0.015	0.024	88	-0.636	0.527
4-6	1.087	1.266	-0.179	0.523	88	-0.343	0.733
7-13	1.087	1.296	-0.209	0.190	88	-1.102	0.273
14-19	1.087	1.000	0.087	-1.#IO	88	-1.#IO	1.#QO

Physical/Health characteristics and Levels of Drinks

Whole Population Alcohol consumption during the last 3 mths of pregnancy	Low level < 1	Moderately low level of drinking 1-3	Moderate level of drinking 4-6	Moderately high level of drinking 7-13	High level of drinking 14-19	Extremely high level of drinking 20+
Birth weight	p = 0.548	0.445	0.732	0.333	1.#QO	
Intrauterine growth retardation (U curve pattern)	p=0.049 (alpha 0.01021)	p=0.046	p=0.256	p=0.726	1.#QO	
Prematurity	p=0.172	p=0.200	p=0.899	p=0.301	1.#QO	
Weight at 9 months	p=0.662	p=0.834	0.149	p=0.000***	1.#QO	
Length at 9 months	p=0.613	p=0.412	p=0.621	p=0.000***	1.#QO	
Health status	P=0.664	P=0.000	1.#QO	P=0.000***		

Physical and Health Characteristics and Levels of Drinks (2)

Blindness	.000***	.000***	.000***	.000***		
Cleft Palate	.000***	.000***	.000***	.000***		
Heart defects				.000***		
Respiratory illness	p=1.0	p=1.0	1.#QO	p=1.000	-	
Respiratory difficulties: watch and wait (Linear pattern)	p=0.815	p=0.000*** T statistic -4.963	1.#QO	p=0.000*** T statistic -4.963	-	
Respiratory: Asthma U shape	p=0.583	p=0.000*** T statistic – -7.515	1.#QO	p=0.011*	-	
Failure to Thrive	.000*** Linear pattern		.000***	.000***		
Gastrointestinal illness, Watch and Wait	p=0.204	p=0.000***	p=0.094***			

Physical and Health Characteristics and Levels of Drinks (3)

Gastrointestinal illness, antibiotic treatment	p=0.840	p=0.607	p=0.000***			
Gastrointestinal Illness, change formula treatment	p=0.401	p=0.732	p=0.000***			
Gastrointestinal Illness, Treatment for Gastr Dehydration Flat linear	p=0.000***	p=0.000***	p=0.000***			
Ear Infections	p=0.664	p=0.000*** T statistic 11.513	1.#QO	p=0.000*** T statistic -51.227		
Days in hospital	.000*** U pattern			.000***		

Developmental Variables/levels of Alcohol Consumption, Significant Differences

Whole Population Alcohol consumption during the last 3 mths of pregnancy	Low level < 1	Moderately low level of drinking 1-3	Moderate level of drinking 4-6	Moderately High level of drinking 7-13	High level of drinking 14-19	Extremely high level of drinking 20+
Child's assessment age in months (did not drink 10.465; SD=1.925)	p=0.971 mean = 10.456 SD = 2.389	p=0.207 Mean = 10.955 SD = 2.113	p=0.207 Mean = 12.755 SD =1.307	p=0.000*** Mean = 9.214 SD = 0.689	p=1.#QO Mean = 8.600 SD = 0.000	
Mental T Score	p=0.455	p=0.463	p=0.875	p=0.000***	1.#QO	
Motor T Score	p=0.744	p=0.985	p= 0.737	p=0.011***	1.#QO	
Eye-hand coordination	p=0.865	p=0.963	p=0.560	p=0.493	p=0.017 Adjusted alpha= .00851	p=0.391

Developmental Variables, Levels of Drinks Per Week (2)

Pre-walking	p=0.174	p=0.967	p=0.280	p=.001**	1/#QO	
Sitting	p=0.239	p=0.956	p=0.188	p=0.037	1.#QO	
Stands Alone	p=0.421	p=0.415	p=0.456	p=0.000***	1.#QO	
Skillful Walking	p=0.921	p=0.243	p=0.498	p=0.000***	1.#QO	
Balance	p=0.456	p=0.225	p=0.591	p=0.000***	1.#QO	
Fine Motor	p=0.792	p=0.309	p=0.236	p=0.454	1.#QO	
Uses stairs	p=0.705	p=0.285	p=0.453	p=0.316	1.#QO	
Alternating Balance	p=0.772	p=0.152	p=0.693	p=0.147	1.#QO	
Motor Planning	p=0.821	p=0.083	p=0.906	p=0.071	1.#QO	
NCATS Child	p=0.419	p=0.010**	p=0.971	p=0.062	1.#QO	

Developmental Variables, Levels of Drinks Per week (3)

Child displays positive affect	p=0.286	p=0.182	p=0.651	p=0.230	1.#QO	
Child displays negative affect	p=0.419	p=0.052	p=0.302	p=0.590	1.#QO	
Child adapts to change in material	p=0.125	p=0.219	p=0.384	p=0.000***	1.#QO	
Child shows interest in material	p=0.299	p=0.186	p=0.608	p=0.052	1.#QO	
Child pays attention to tasks	p=0.144	p=0.302	p=0.450	p=0.001***	1.#QO	
Displays social engagement	p=0.635	p=0.022	p=0.325	p=0.560	1.#QO	
Child shows control of movements	p=0.456	p=0.471	p=0.492	p=0.058	1.#QO	
NCATS Parent Adjusted alpha	p=.049 U Shape pattern	p=0.249	p=0.735	p=0.342	1.#QO	

Developmental variables, Levels of Drinks Per Week, (4)

NCATS Total	p=0.377	p=0.995	p=0.905	p=0.205	1.#QO	
Fussy	p=0.925	p=0.330	p=0.606	p=0.000***	1.#QO	
Whimper to Crying	p=0.136	p=0.598	p=0.772	p=0.000***	1.#QO	
Demands Attention and company	p=0.659	p=0.076	p=0.318	p=0.001***	1.#QO	
Wakes up three or more times	p=0.343	p=0.883	p=0.802	p=0.000***	1.#QO	
Needs help to fall asleep	p=0.404	p=0.469	p=0.567	p=0.540	1.#QO	
Startled by loud sounds	p=0.589	p=0.354	p=0.409	p=0.003**	1.#QO	
Cries for Food or Toys	p=0.083	p=0.489	p=0.000***	p=0.194	1.#QO	
Difficulty to raise on average	p=0.265	p=0.543	p=0.797	p=0.000***	1.#QO	

Methods continued

- Need for mechanism to deal with disparity in the child's age at assessment
- Birth variables not affected
- Mental and Motor T scores adjusted
- Some variables clearly affected
- Regression with child age at assessment for each significant relationship at 4-6 drinks per week or 7-13 drinks per week
- Results follow

Alcohol related Birth Defects

- Cleft Palate <1 , 1-3, 4-6, 7-13 drinks .0000***
- Blindness <1, 1-3, 4-6, 7-13 drinks .0000***
- Heart defects 7-13 drinks .0000***
- Prematurity, Intrauterine growth retardation – not significant; literature mixed on these issues
- Prematurity as a covariate

Issue of Failure to Thrive

- FTT
  - 4-6 drinks***
    - Regression
    - .005** Child age at assessment .212
  - 7-13 drinks***
  - Pattern of gastrointestinal illness
    - Regression
    - Gast Illness; treatment for Gast dehydration
    - 1-3 drinks, 4-6 drinks – 0.000***
    - Other gastro illnesses not significant for child's age at assessment

Mental scores at 9 months (Short form Bayley Scales of Infant Development

	Estimate	Estimate	Diff	SE	df	T value	Prob
P2							
< 1	50.109	49.493	0.616	0.822	90	0.750	0.455
1-3	50.109	48.959	1.150	1.560	90	0.737	0.463
4-6	50.109	50.754	-0.646	4.094	90	-0.158	0.875
7-13	50.109	41.960	8.148	1.395	90	5.843	0.000***
14-19	50.109	47.909	2.199	-1.#IO	90	-1.#IO	1 .#QO

Mental Scores –

- Seven to 13 drinks per week level
- Mental T .000*** Child age .786

- Regression – Mental T Score
  - Constant .000***
  - Child age .037*
  - Al drinks .050*
  - Prematurity .000***
  - Poverty .000***

Motor T Scores (Child age/assessment not considered)

	Estimate	Estimate	Diff	SE	df	T value	Prob
P2							
< 1	49.999	49.696	0.304	0.927	90	0.328	0.744
1-3	49.999	50.035	-0.036	1.990	90	-0.018	0.985
4-6	49.999	52.060	-2.061	6.124	90	-0.336	0.737
7-13	49.999	46.457	3.542	1.362	90	2.601	0.011
14-19	49.999	42.706	7.293	-1.#IO	90	-1.#IO	1.#QO

Motor – 7- 13 drinks level

- Motor T 0.153 Child age .000***
  - Prewalking 0.039* Child age .000***
  - Stands 0.000*** Child age .000***
  - Skillful wk 0.086 Child age .000***
  - Balance 0.340 Child age .000***

Infant Symptom Scale Items, Georgia DiGangi et. al., 1995

- Sensory regulation, temperament; good fit for some FASD arousal, executive functioning issues in infancy.
- Regression to consider “child’s age at assessment” and level of drinking;
- Needs help to fall asleep – not significantly different from “did not drink” group
- Cries for food or toys – 4-6 drinks per week
  - .000*** Child age at assessment .328
- All other items significant – 7-13 drinks per week:

Infant Symptom Scale Items Significant at 7-13 drink level

Fussy	.000***	Child age	.000***
Whimper/cry	.001***	Child age	.010***
Demands attn	.001***	Child age	.006**
Wakes up 3+	.000***	Child age	.410
Needs help slp	.595	Child age	.000***
Started by loud	.002**	Child age	.372
Difficulty –raise	.000***	Child age	.000***

NCATS – Total Child Score (Child age/assessment not considered)

	Estimate	Estimate	Diff	SE	df	T value	Prob
< 1	15.514	15.285	0.229	0.282	90	0.813	0.419
1-3	15.514	14.748	0.765	0.291	90	2.626	0.010**
4-6	15.514	15.370	0.144	3.983	90	0.036	0.971
7-13	15.514	17.336	-1.822	0.963	90	-1.892	0.062
14-19	15.514	11.000	4.514	-1.#IO	90	-1.#IO	1.#QO

NCATS at 7-13 drinks per week

- Child Total .054* Child age 0.026*
- Parent Total .277 Child age .000***
- Total .000*** Child age .088
- Subtests
  - Child adapts to change in materials
  - .000*** Child age 0.0149
  - Child pays attention to tasks
  - .002** Child age 0.071

Recommendations for Screening/Surveillance

- Consider pattern of child's behaviors and physical attributes
  - Growth patterns – Failure to Thrive
  - Health status
  - Ear infections
- ARBD/Birth defects – cleft palate, blindness, heart defects are potential risk factors for other alcohol related conditions
- With maternal report, possible referral to FASD clinic for diagnosis.

Assessment Recommendations

- Infant Symptom Scale items;
- NCATS Child Subtests:
  - Child adapts to change in material
  - Child pays attention to tasks
- Motor T (BSF – SS) not significant, subtests
  - Stands alone
  - Prewalking
- Mental T (BSF - SS);

Recommendations for Future Study

- Consider other ways to configure/define levels.
- Follow these children at 24 months, 48 months, & K.
- Relevant variables not presented: gender, maternal characteristics; i.e., age, depression, health history, tobacco use, education, employment, parity, and feeding behaviors, father characteristics; family dynamics, linguistic backgrounds, child care and geographical information. Black, White, Hispanic, Asian and Pacific Islander and Native American populations not fully addressed.

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