Maternal Occupation and Infant Hearing

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COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC HEALTH

Universal
Newborn Hearing
Screening Program

Public Health Core Sciences

Possible Uses of EHDI-IS Data

I. Surveillance—Track infants from birth through the1-3-6 goals
   A. Ongoing Data Collection
   B. Monitoring/Evaluation/Analysis
   C. Stimulate Research

II. Epidemiology—Analyze Data
   A. Research
   B. Assess Etiologic Relationships—Prevent physical or mental challenges

Possible Uses of EHDI-IS Data

Surveillance

Independent Variable	Accomplishment of EHDI Goal #2	
Maternal Age	Diagnosis by 3 Mos	No Diagnosis by 3 Mos
Young Mother	a	b
Older Mother	c	d

Relationship = a/a+b divided by c/c+d

If no relationship, then a/a+b divided by c/c+d=1

Epidemiology

Independent Variable	D/HH Diagnosis	
Mother's Occupation	D/HH	Normal Hearing
Ototoxic Exposure	a	b
No Ototoxic Exposure	c	D

Relationship = a/a+b divided by c/c+d

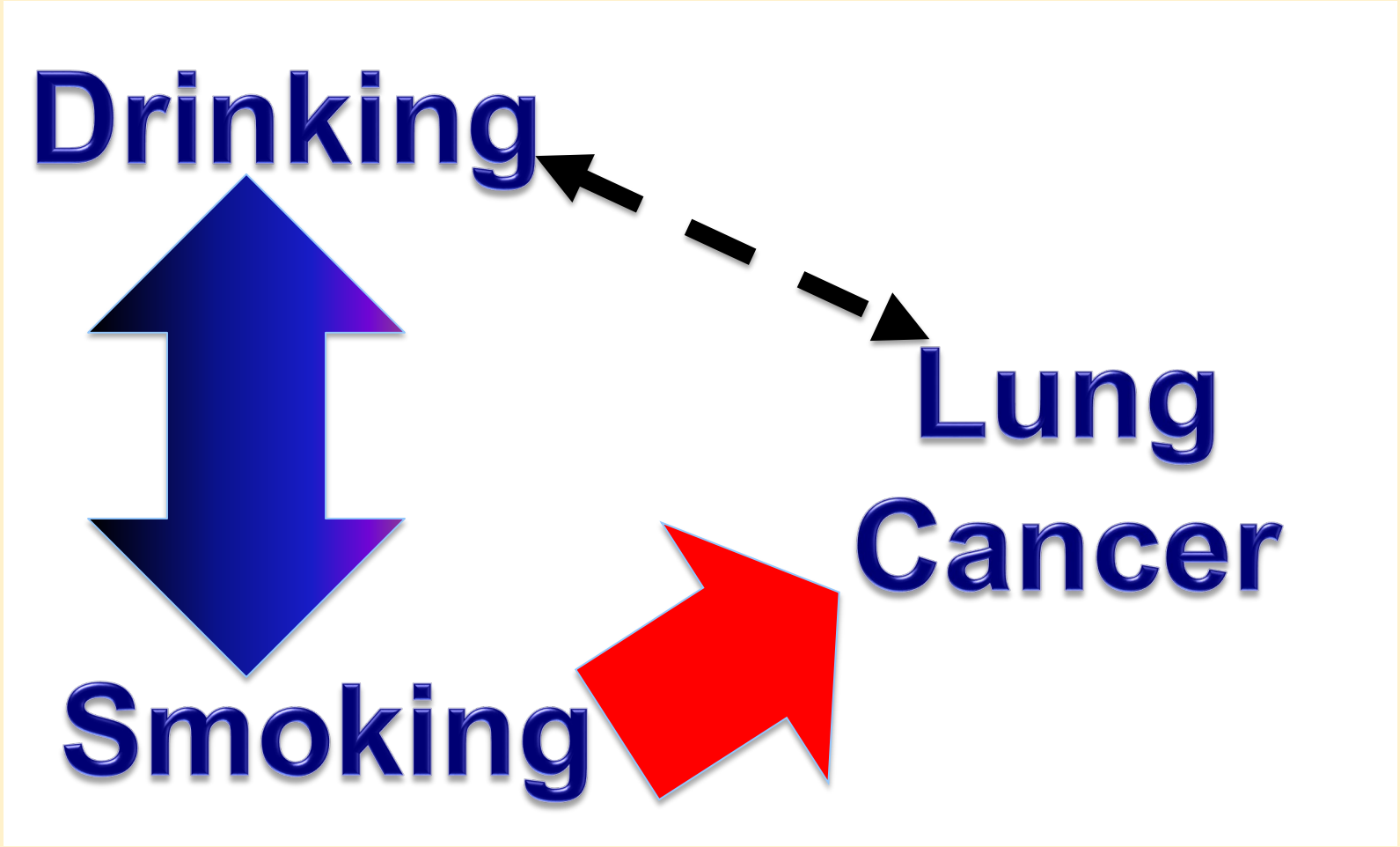
If no relationship, then a/a+b divided by c/c+d=1

Non-Causal Reasons for Large Fractions

I. Chance—Large associations are more convincing than small ones
   A. Addressed by statistical significance testing
   B. Only test pre-hypothesized associations

II. Confounding—Is it really occupation or is it something else?
   A. Addressed by multivariate methods
   B. Control analysis for possible something elses

Diagram of Confounding



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D/HH = Mother's Occupation

Variable #1

Biological Plausibility—Previous Studies

On-the-job chemical exposure linked to neurological birth defects and deafness

- Toluene (manicurists, nail salons)
- Pesticides (farmers, golf courses)
- Cleaning Agents (cleaners, janitorial)
- Vehicle Exhaust (drivers)
- Antineoplastics and antibiotics (pharmacists, Pharma scientists)

Study Design

I. **Total Babies: 280,000 + 70,000 = >350,000**

II. Exclusions
   A. Missing mother's occupation/industry
   B. Multiple births

III. D/HH=SNHL, Mixed, ANSD (*n*=476)

IV. Analysis—Ear is the unit of analysis

V. Occupational Coding—NIOCCS-CDC
   A. 2012 to 2015, version 2 (<80% coded)
   B. 2016, version 3 (90% coded)

Occupational Auto-Coding Issues

I. Occupation or industry Misspelled

Mother's Industry	Auto-coded Industry
AT HOE	Cutlery and Hand Tool Manufacturing

II. Nothing wrong, but coding error

Mother's Industry	Auto-coded Industry
LODGING	Agriculture forestry fishing/ hunting

III. Employer name given for industry

Mother's Industry	Auto-coded Industry
MACYS	Durable goods Manufacturing

Risk Factors and D/HH Diagnosis (n=855)

Mother's Age and D/HH Diagnosis

<26	26-29	30-32	33-35	>35
referent	1.0	0.9	0.9	0.7*

Mother's Race and D/HH Diagnosis

NH-White	H-White	NH-Black	H-Black	Asian
referent	1.0	1.0	0.9	1.5*

Mother's Education and D/HH Diagnosis

≥BS	HS Diploma-<BS	9-12 grade	<HS
referent	1.0	1.0	1.8*

Mother's Insurance and D/HH Diagnosis

Labor/Delivery NOT Paid By Gov't.	Labor/Delivery Paid By Gov't.
referent	1.0

Mother's Smoking and D/HH Diagnosis

Non-smoker	Smoker
referent	1.0

Risk Factors and D/HH Diagnosis (n=855)

Prematurity and D/HH Diagnosis	
Gestation >32 weeks	Gestation ≤32 weeks
referent	6.0*
Assisted Ventilation and D/HH Diagnosis	
Assisted Ventilation for 0-6 Hours	Assisted Ventilation for >6 Hours
referent	5.7*
Fertility Drug Use and D/HH Diagnosis	
Conception Unaided by Fertility Drugs	Conception Aided by Fertility Drugs
referent	1.7*
Antibiotic Use and D/HH Diagnosis	
No Antibiotic Use	Antibiotic Use for Suspected Sepsis
referent	3.1*
Assumed On-the-job Ototoxic Exposure and D/HH Diagnosis	
Non-Exposed Occupation/Industry	Exposed Occupation/Industry (*n*=10,555)
referent	3.0*

Effect of Multivariate Confounder Control

Potential Confounder	Relationship to Occupation/Industry with Possible Ototoxic Chemical Exposure
Asian Race	3.0*
<HS Education	2.0*

	Relationship to Having a D/HH Baby		
Potential Confounder	**No Covariates**	**Mutually Controlled**	**Additional Controls[1]**
Asian Race	1.5*	1.4*	1.4*
<HS Education	1.9*	1.8*	1.7*
Ototoxic Job/Industry	3.0*	2.7*	2.8*

[1]Assisted ventilation for >6 hours, prematurity, antibiotic use

Unanswered Questions

I. Is the association causal?

II. What is the critical period for maternal ototoxic chemical exposure?

III. What are the routes of exposure?

IV. What about noisy occupations?

V. Are all occupations/industries equally strongly related to D/HH status?

VI. What about Dad's occupation?

VII. What might be the mechanism (s)?

Conclusion

Babies whose mothers had worked during the year preceding the birth in an occupation or industry affording exposure to ototoxic chemicals were 2-3 times as likely as other babies to receive a D/HH diagnosis.

THANK YOU!