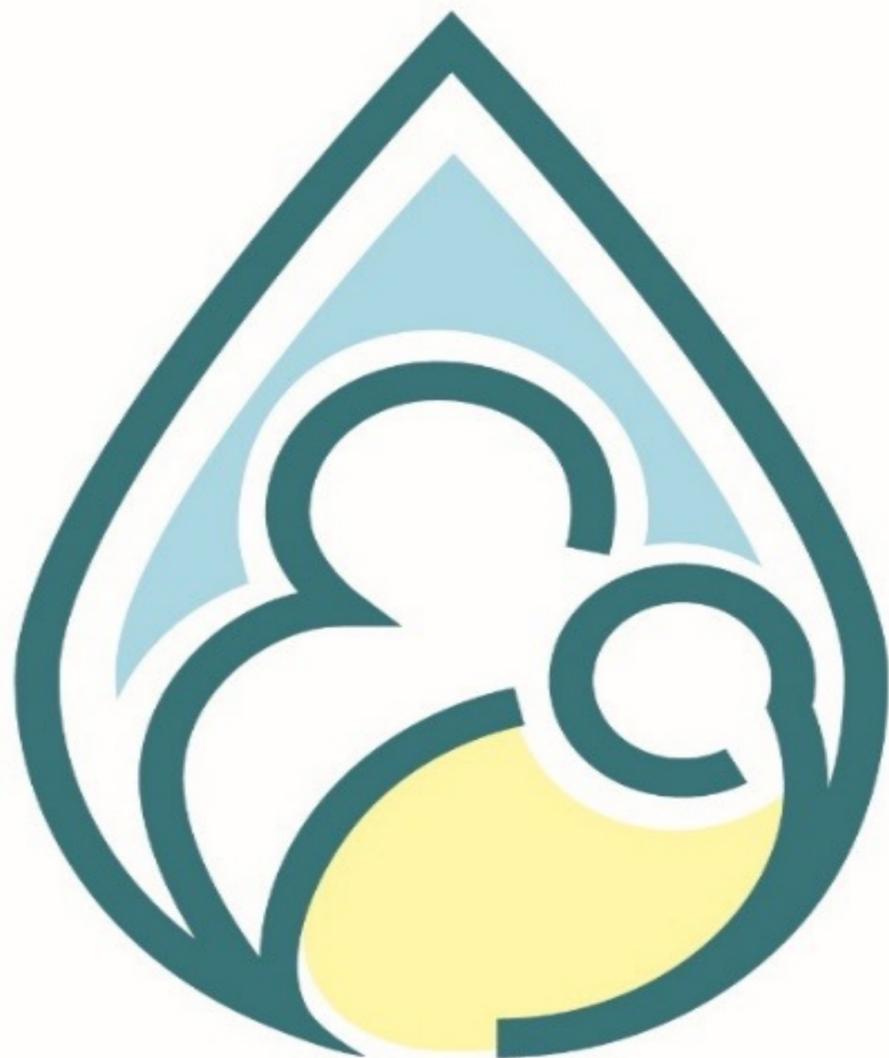


# BIRTH OUTCOMES AND WATER



**BIRTH OUTCOMES  
AND WATER**

bow.unl.edu **N**

UNL IRB #: 20180117044EP

## STUDY GOAL

- Better understand how women's health and environmental factors impact the health of their children.
- **Research Question:** Does a woman's exposure to agricultural chemicals in drinking water affect the outcome of her pregnancies?
- Determine sample size for a fully powered case-control study.

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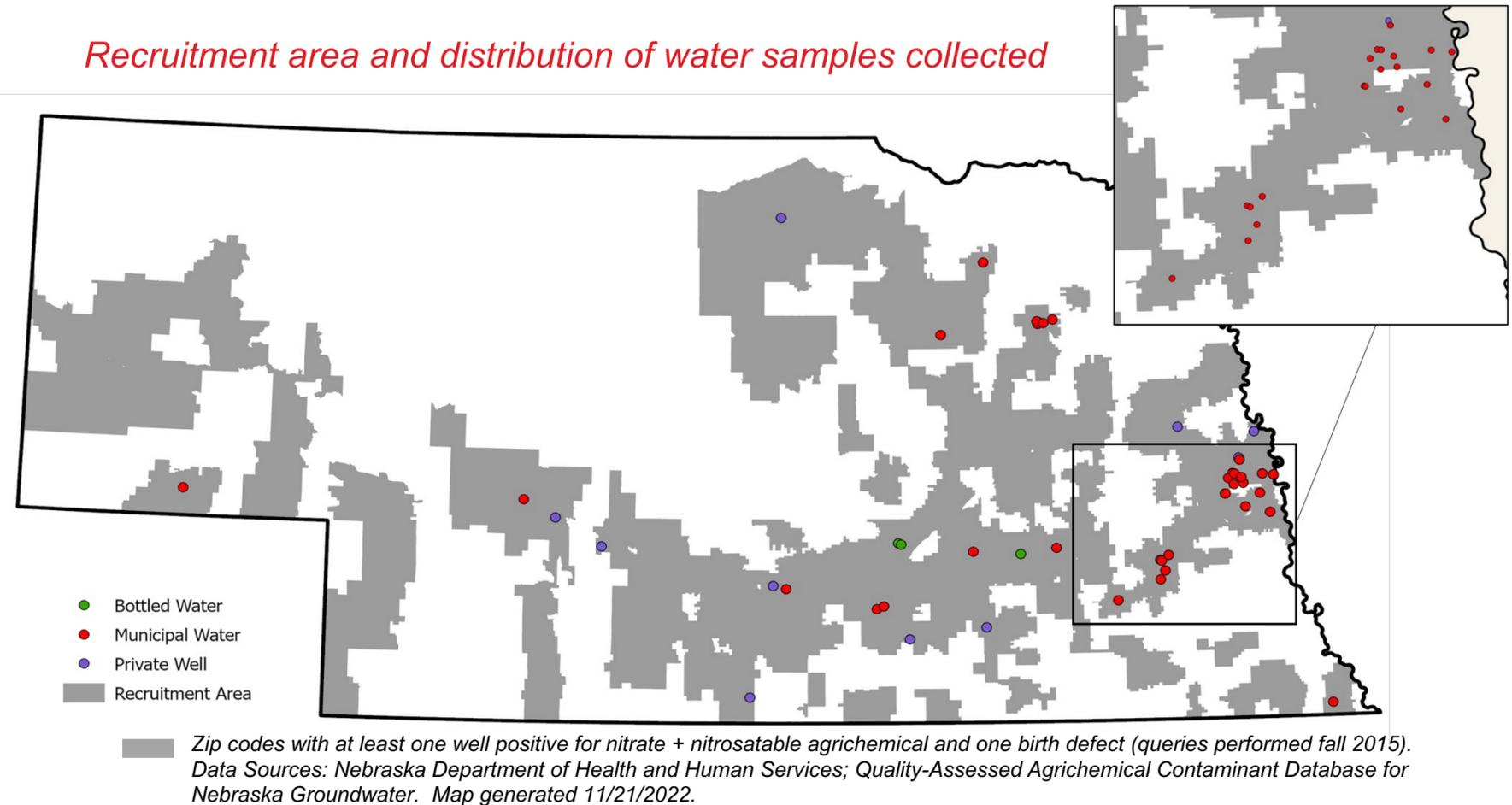
School of Natural Resources and Department of Statistics



**SCHOOL OF NATURAL RESOURCES**

# PILOT/FEASIBILITY CASE-CONTROL STUDY DESIGN

- Nebraska women (n=40; 20 cases and 20 controls)
  - 5 per water supply-public, private, bottled, other
  - Have access to water source used 3 years prior to conception
- Questionnaire - Demographics/health/residential history
- Water sample
  - Nitrate/pesticide analysis
  - Age dating → exposure duration
- Saliva sample - Salivary nitrate/nitrite → nitrosation potential
- Blood sample
  - Gene x Environment Interactions
    - Genotyping for *N*-nitrosamine metabolizers (CYP2E1 and NQO1)
    - Chromosomal aberrations – t(14;18)
- Participant Perception
  - Barriers/motivation to participate



TYPE OF WATER	NUMBER OF RESPONSES*
Bottled water	3
Municipal water	33
Private well	9

\*Some responders listed two or more drinking water sources

# AGRICHEMICALS OF INTEREST

## Agrichemicals ( ≥ 5 subjects exposed)

<b>Acetochlor ESA</b>	<b>Acetochlor OA</b>	<b>Alachlor ESA</b>	<b>Alachlor OA</b>	Atrazine	<b>DEA</b>	Metolachlor
<b>Metolachlor ESA</b>	<b>Metolachlor OA</b>	Nitrite-N	Propazine	Simazine	2,4-D	<b>Nitrate-N</b>

## Agrichemicals (no subjects exposed)

Chlorothanil	Cyanazine	EPTC	Metribuzin
Norflurazon	Pendamethalin	Prometon	Propachlor
Trifluralin	4-Hydroxy chlorthalonil	<i>N</i> -Nitroso dimethylamine	<b>Propachlor ESA</b>

## Agrichemicals ( < 5 subjects exposed)

Acetochlor	Alachlor	Butylate	Dicamba
<b>DIA</b>	Dimethenamid	Permethrin	Tefluthrin

\*DEA=deethylatrazine, DIA=deisopropylatrazine, 2,4-D=2,4-dichlorophenoxyacetic acid, ESA=ethane sulfonic acid, OA=oxanilic acid, EPTC=S-Ethyl dipropylthiocarbamate

# PROPORTIONS OF CONTROL-CASE EXPOSED

Agrichemicals	Control (n=19)	Case (n=23)	Odds Ratio(OR)	P-value
Atrazine			2.1	0.28
No	7	5		
Yes	12 (63%)	18 (78%)		
Metolachlor			1.9	0.32
No	12	11		
Yes	7 (37%)	12 (52%)		
Acetochlor ESA			2.1	0.26
No	9	7		
Yes	10 (53%)	16 (70%)		
Simazine			1.3	0.71
No	11	12		
Yes	8 (42%)	11 (48%)		

# PROPORTIONS OF CONTROL-CASE EXPOSED

Agrichemicals	Control (n=19)	Case (n=23)	Odds Ratio(OR)	P-value
Acetochlor OA			2.1	0.23
No	11	9		
Yes	8 (42%)	14 (61%)		
Nitrite			3.6	0.04
No	14	10		
Yes	5 (26%)	13 (57%)		
Alachlor ESA			1.6	0.43
No	8	7		
Yes	11 (58%)	16 (70%)		
Alachlor OA			1.7	0.38
No	10	9		
Yes	9 (47%)	14 (61%)		
2,4-D			1.7	0.38
No	10	13		
Yes	9 (47%)	10 (44%)		

# PROPORTIONS OF CONTROL-CASE EXPOSED

Agrichemicals	Control (n=19)	Case (n=23)	Odds Ratio(OR)	P-value
DEA			1.3	0.73
No	5	5		
Yes	14 (74%)	18 (78%)		
Metolachlor ESA			1.3	0.76
No	4	4		
Yes	15 (79%)	19 (83%)		
Metolachlor OA			0.82	0.77
No	5	7		
Yes	14 (74%)	16 (70%)		
Propazine			1.1	0.93
No	11	13		
Yes	8 (42%)	10 (44%)		

# AGRICHEMICAL MIXTURES

Agrichemicals	Control (n=19)	Case (n=23)	Odds Ratio(OR)	P-value
Atrazine*Nitrite			4.1	0.03
No	15	11		
Yes	4 (21%)	12 (52%)		
Alachlor ESA*Nitrite			4.9	0.02
No	16	12		
Yes	3 (16%)	11 (48%)		
Alachlor OA*Nitrite			6.5	0.01
No	17	13		
Yes	2 (11%)	10 (44%)		

## DIETARY RISK FACTORS FOR BIRTH DEFECTS

Milk	Control (n=16)	Case (n=18)	OR(95% CI)	P-value
Low fat (Skim, 1% , 2%)	16	12	1.5 (1.1-2.1)	0.01
High fat (Fresh/ raw, whole)	0 (0 %)	6 (33 %)		

# DISCUSSION AND CONCLUSION

- Significant association between exposure to nitrite and birth defects
- Results suggest exposure to agrichemical mixture has a higher risk for birth defects
- Future research should investigate
  - further interactions between nitrite and other compounds (Is the interaction linear?)
  - whether risk for birth defects varies across different demographic groups

# LIMITATIONS AND NEXT STEPS

- Specific birth defects
- Lack of diversity in race and ethnicity
  - May be due to eligibility criteria
  - Recruitment area
- Study will consider blood sample for:
  - Gene x Environment Interactions
  - Genotyping for *N*-nitrosamine metabolizers (CYP2E1 and NQO1)
  - Chromosomal aberrations – t(14;18)
- Expand the study
  - Estimated sample size = 572 (286 cases and 286 controls)
  - Expand to other states (CO,KS,MO,WY,OK)/High Plains Aquifer?
- \$50 million cradle-to-grave cohort study
  - Grand challenge/N2025

# COLLABORATORS

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- Greg Brinkman

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- Abigail Snyder

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- **Water Quality Report Cover Letters**

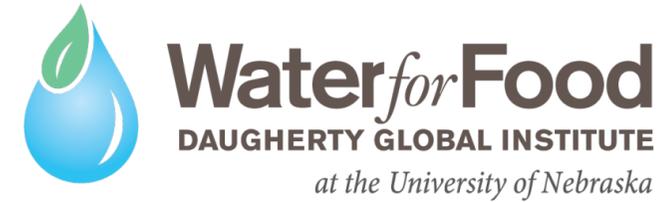
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# PARTICIPATING ORGANIZATIONS

