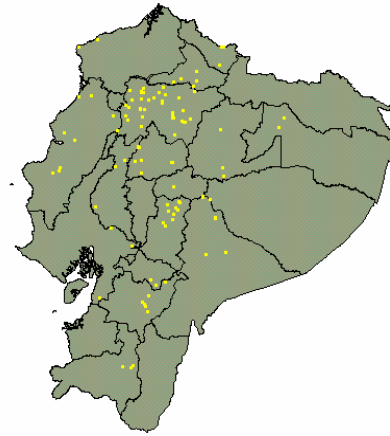
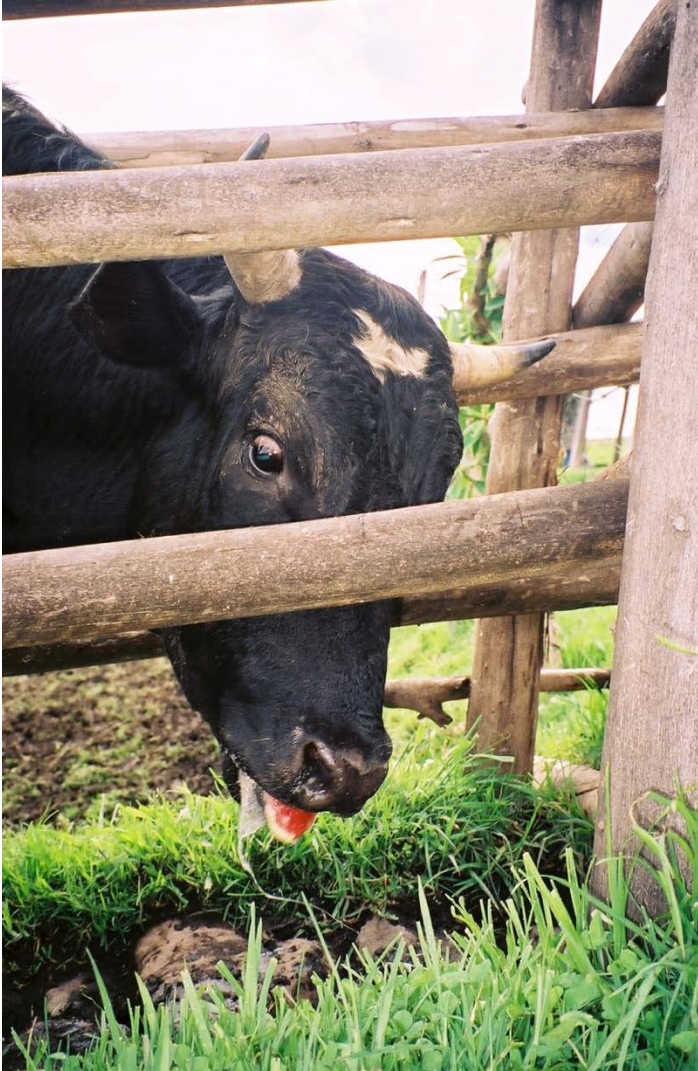


Case-control studies

design, sampling, sample size, data collection, epidemiologic analysis and interpretation



Case-control studies

design, sampling, sample size, data collection, epidemiologic analysis and interpretation

Suggested reading

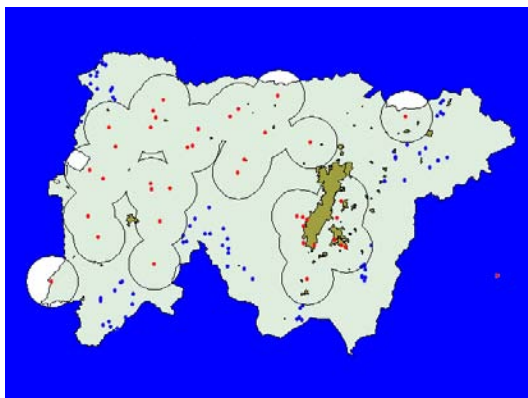
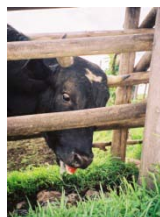
- Epidemiology, Gordis, Ch 9
- Vet Epidemiology, Martin et al, Ch 6
- Vet Epi Research, Dohoo et al, Ch 9
- Vet Epidemiology, Thrusfield, Ch 15

Case-control studies

design, sampling, sample size, data collection, epidemiologic analysis and interpretation

Objective

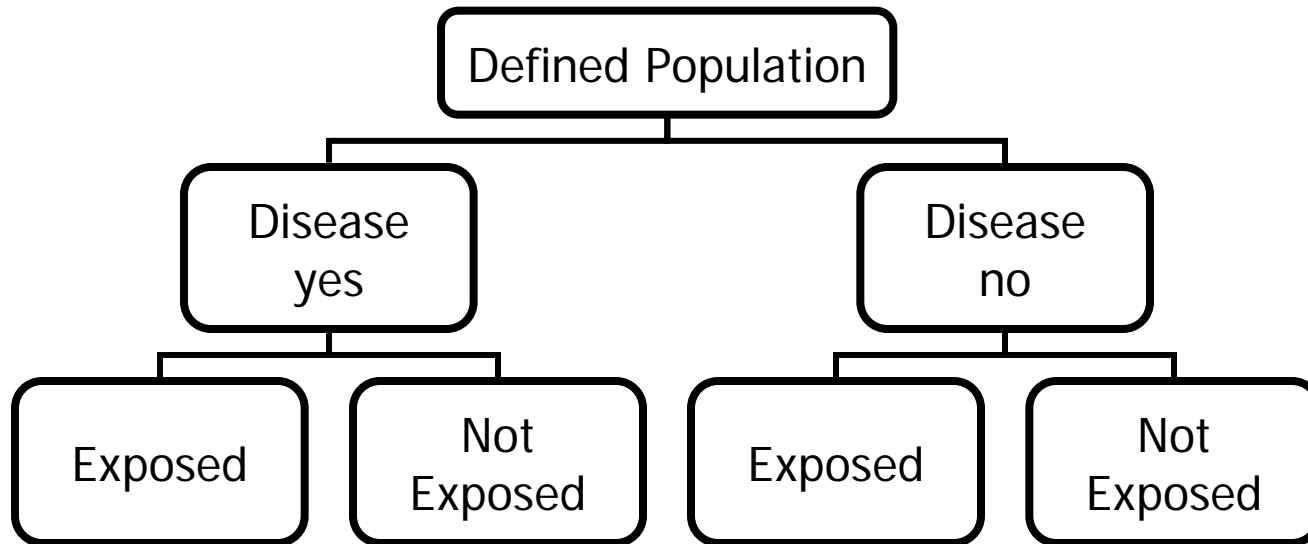
- Know key requirements & steps to be considered in the design and performance of a case-control study



Variable	OR	95% CI	P
Herd type			
Dairy	1.0	Ref	NA
Dairy/Beef	2.2	0.2, 17.0	0.42
Feedlot	45.9	2.1, 977.1	0.01
Cow-Calf	ND	ND	ND
Purchase of livestock			
No	1.0	Ref	NA
Farm-to-farm	0.6	0.09, 4.5	0.65
Market	10.8	1.8, 65.0	<0.01
Distance to market			
20+ km	1.0	Ref	NA
11-20 km	12.4	1.6, 97.6	0.01
< 10 km	39.5	3.8, 402.2	< 0.01
Distance to abattoir			
20+ km	1.0	Ref	NA
< 20 km	25.8	1.7, 373.7	0.01

Purchase of livestock at markets, and close proximity to markets or abattoirs were identified as risk factors for FMD. Intern J Appl Res Vet Med 2007;5:17-24

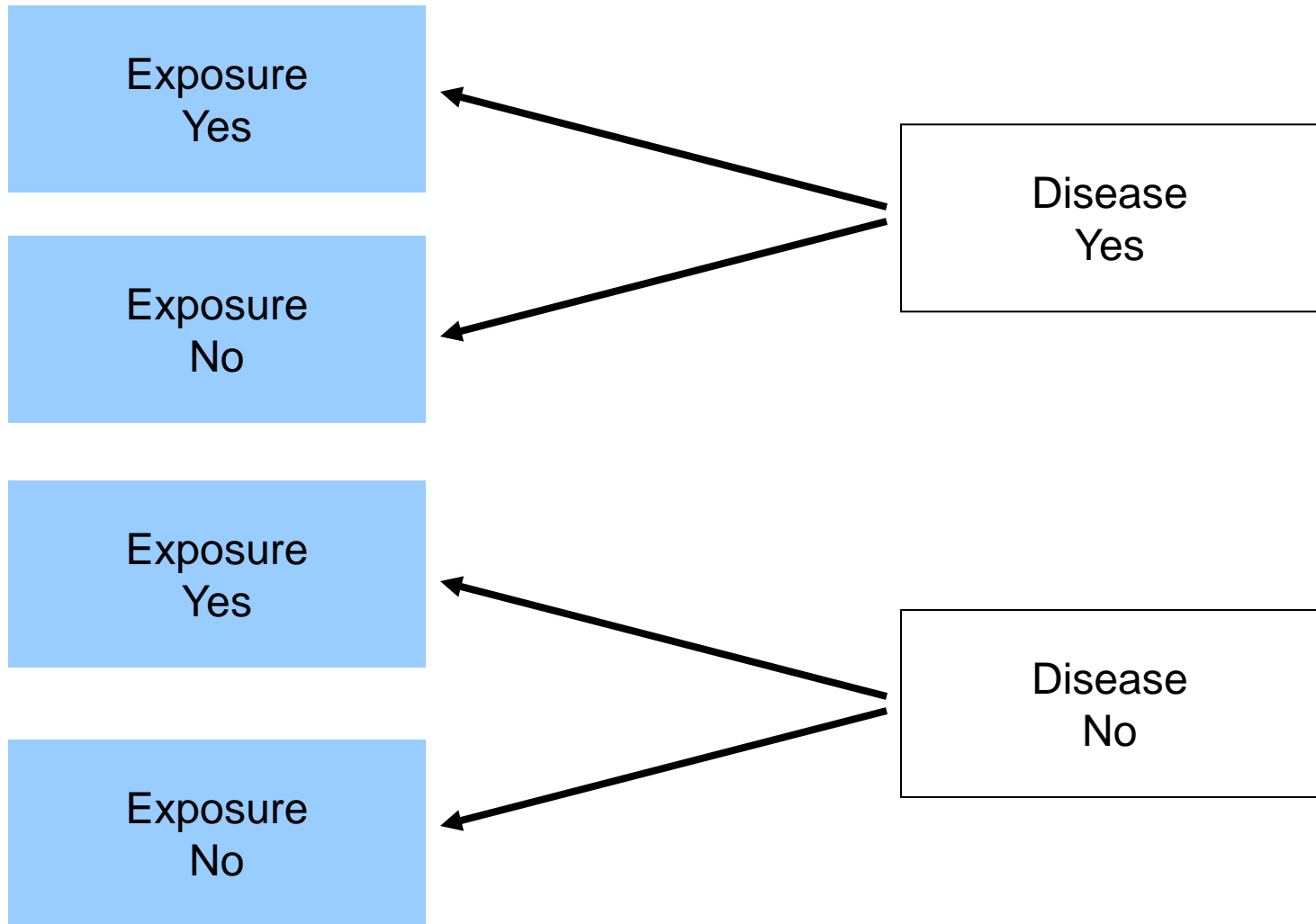
What's a case-control study ?



First select cases and controls

	Disease Yes	Disease No	
Exposure Yes	a	b	a+b
Exposure No	c	d	a+d
	a+c	b+d	a+b+c+d

...then measure past exposure



Case-Control Study: steps

- Background
- Study objective
- Study pop'n
- Sample size
- Selection of cases
- Selection of controls
- Matching
- Exposure
- Bias
- Confounding
- Analysis
- Report of results

Sample size

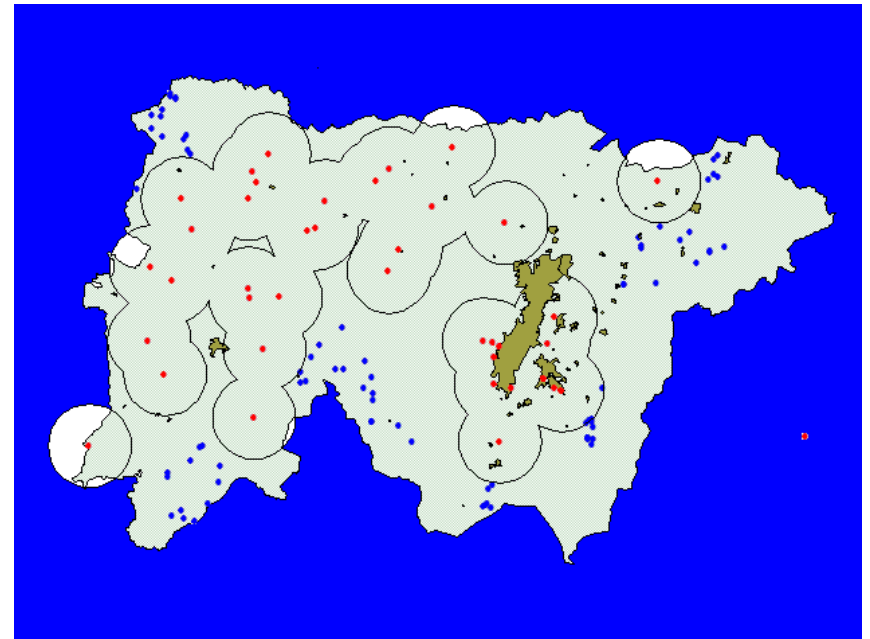
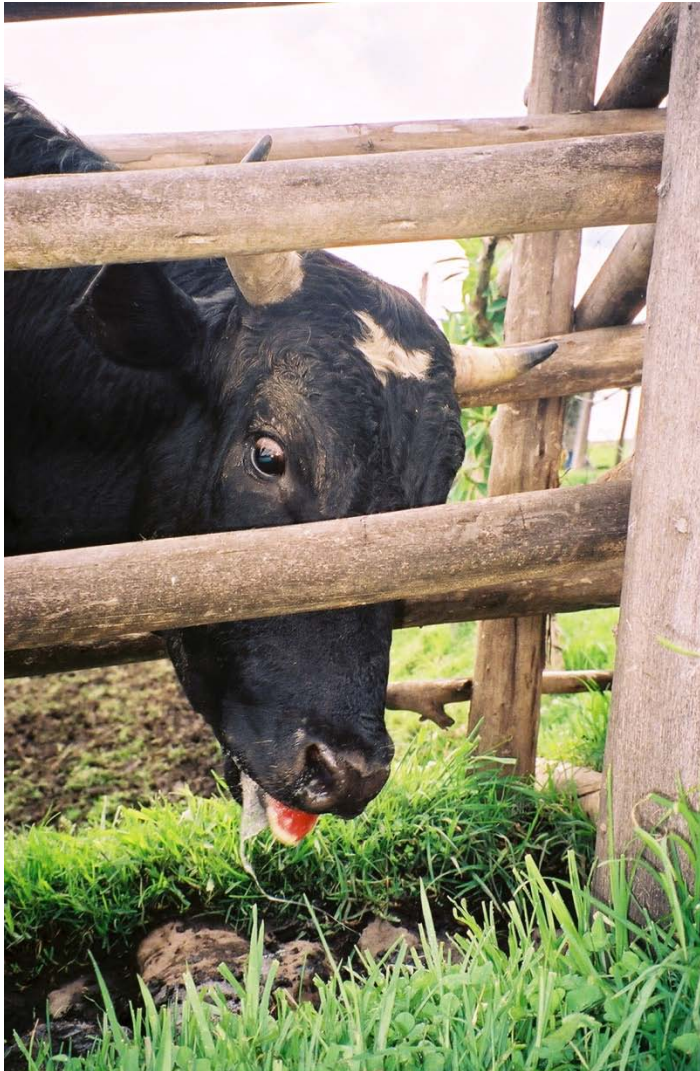
- Alpha
- Beta
- Anticipated (%) exposure among controls
- An hypothesized OR that is considered worth detecting

Sample size

Example

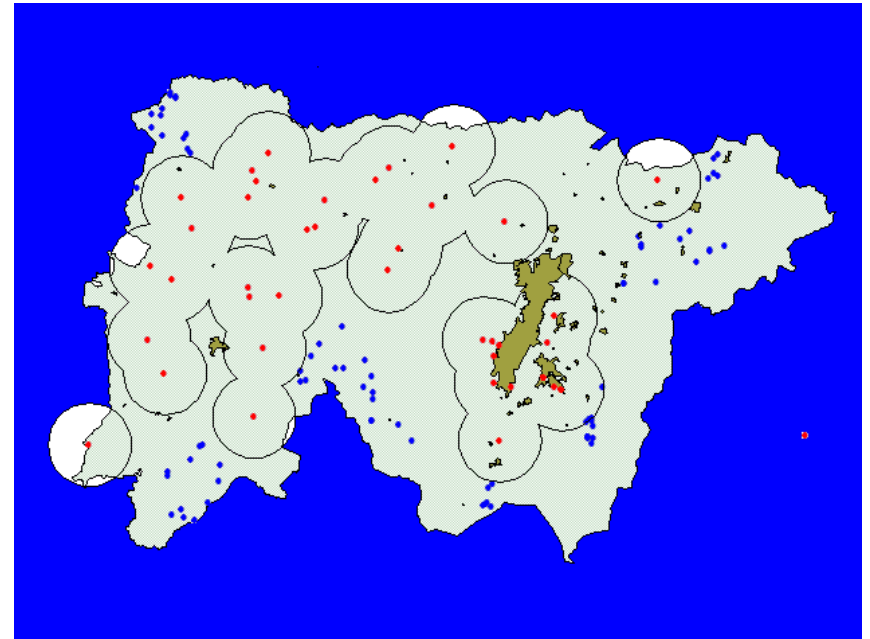
- Type I error (alpha): 5%
- Type II error (beta): 20%
- Exposure among controls: 30%
- OR: 2
- $N_1 = ?$ (cases)
- $N_2 = ?$ (controls)

Sample size (reality): 39 cases and 78 controls



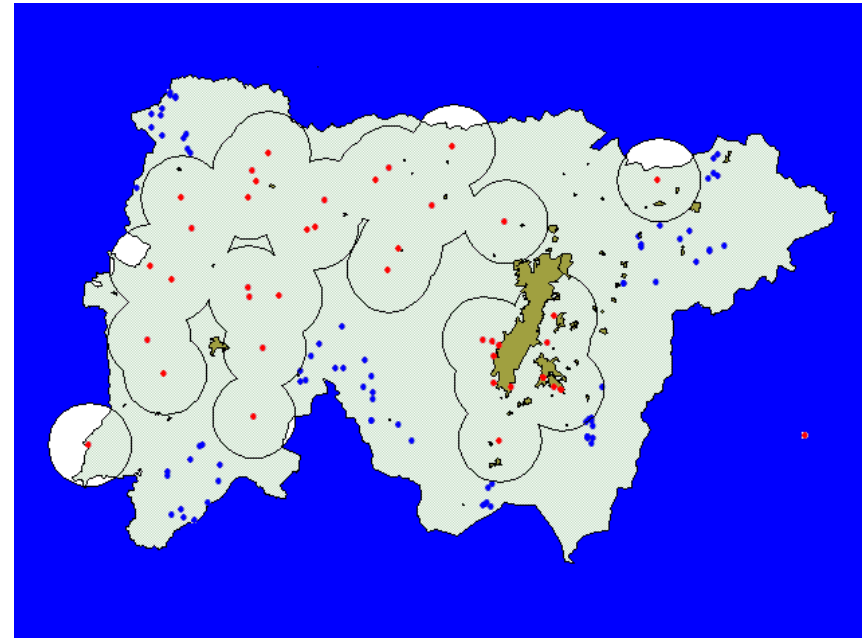
Selection of cases

- Cases can be selected from a variety of sources, including herds, flocks, racetracks, hospitals, government veterinary services ...
- Incident vs prevalent (existing) cases



Selection of controls

- Controls should be selected in an unbiased manner from those individuals who would have been included in the case series, had they developed the disease under study
- Multiple controls



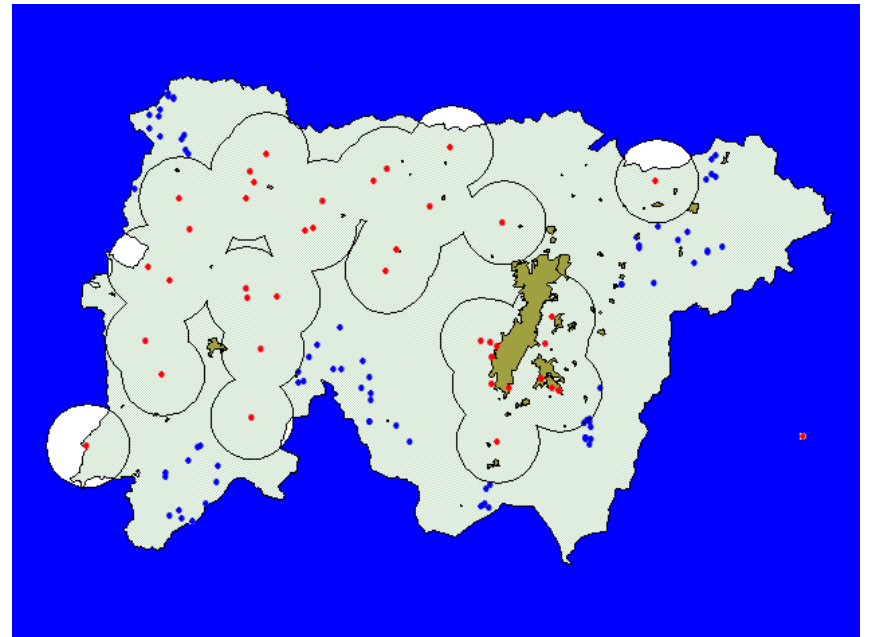
Matching a control is selected, who is similar to the case in terms of the specific variable(s) of concern

Examples

- Based on geographic location
- Herd size

Issues

- Practical problems
- Conceptual problems
- Unplanned matching
- Overmatching



Exposure

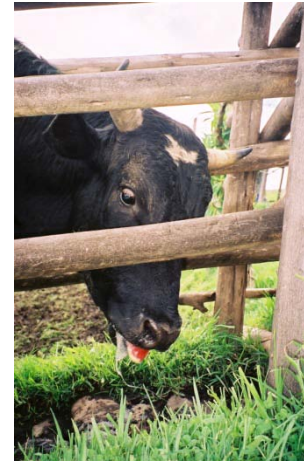
- Epi questionnaire
- Exposure information must be correct (valid) and comparable between cases and controls
- Make sure that the exposure precedes the onset of disease

Bias

is a systematic error that results in an incorrect conclusion

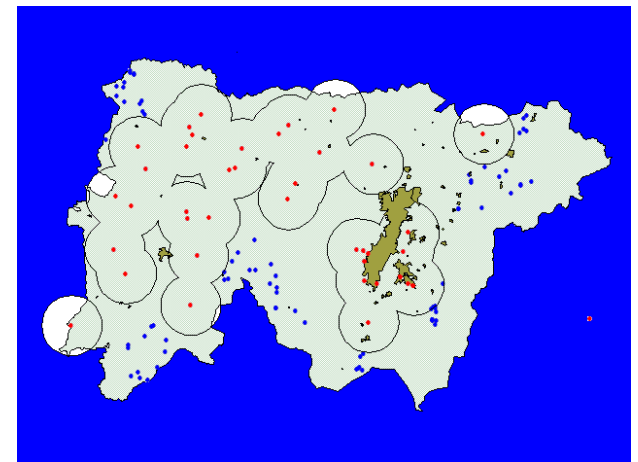
Selection bias

- Misclassification of cases and controls
- Sensitivity and specificity
- Representativeness of cases and controls



Issues

- Control herds were not tested
- Control herds inside 10km radius of cases were not included



Bias is a systematic error that results in an incorrect conclusion

Observation bias

- Misclassification of exposure of cases and controls
- Recall bias

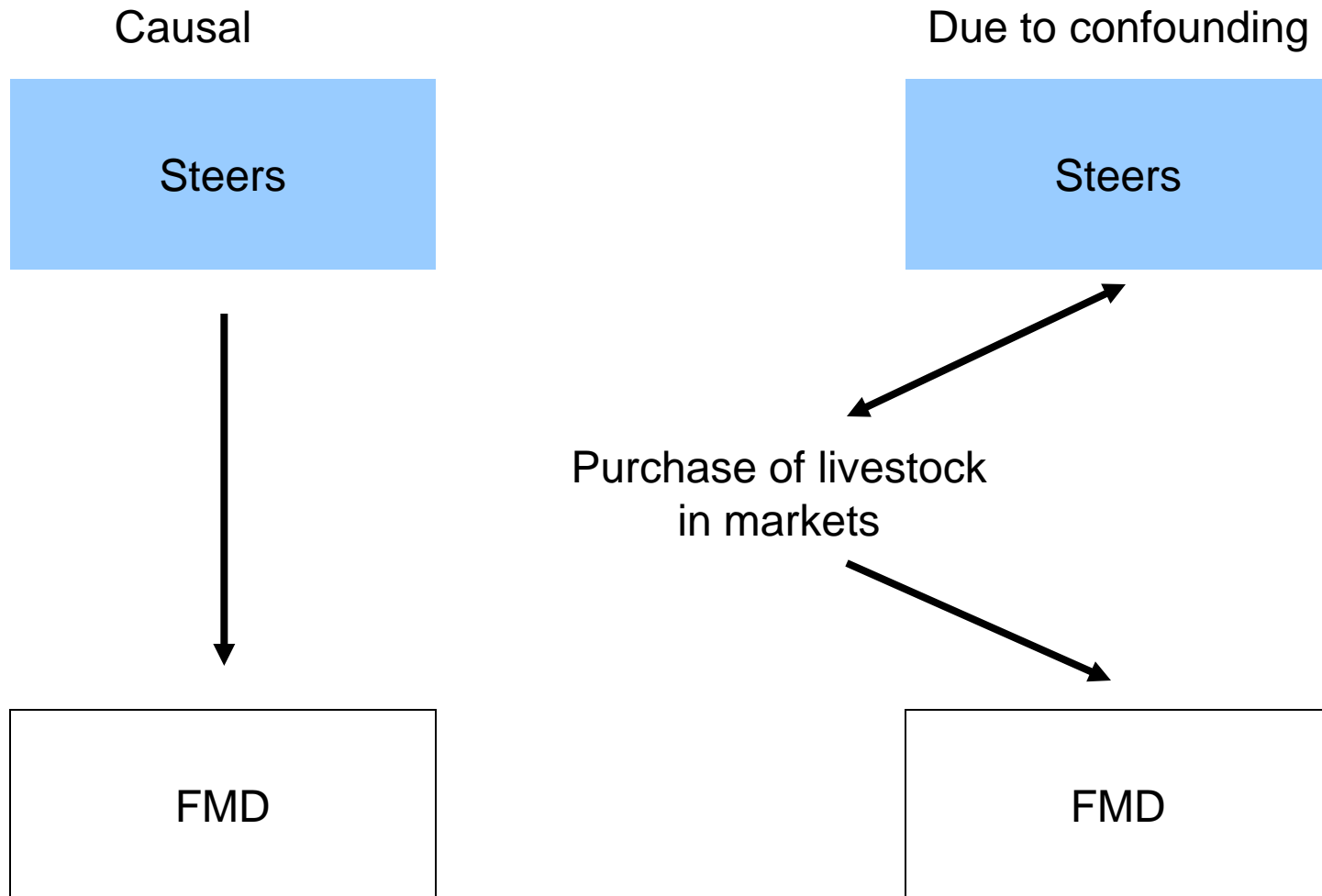
Issues

- Standardization of selected exposure factors



Confounding

real vs false associations



Epidemiologic analysis and interpretation

Univariable analysis

	Disease Yes	Disease No	
Exposure Yes	18	22	40
Exposure No	20	56	76
	38	78	116

$$OR = 18 / 20 = 0.90$$

$$OR = 22 / 56 = 0.39$$

$$OR = 0.90 / 0.39 = 2.30$$

$$OR = 18 \times 56 = 1008$$

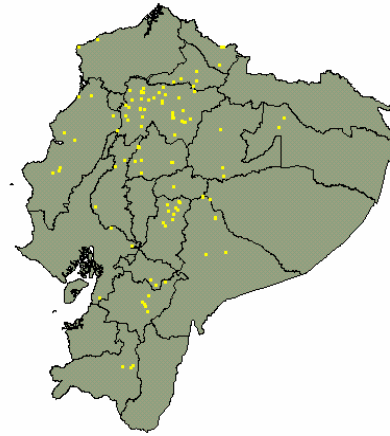
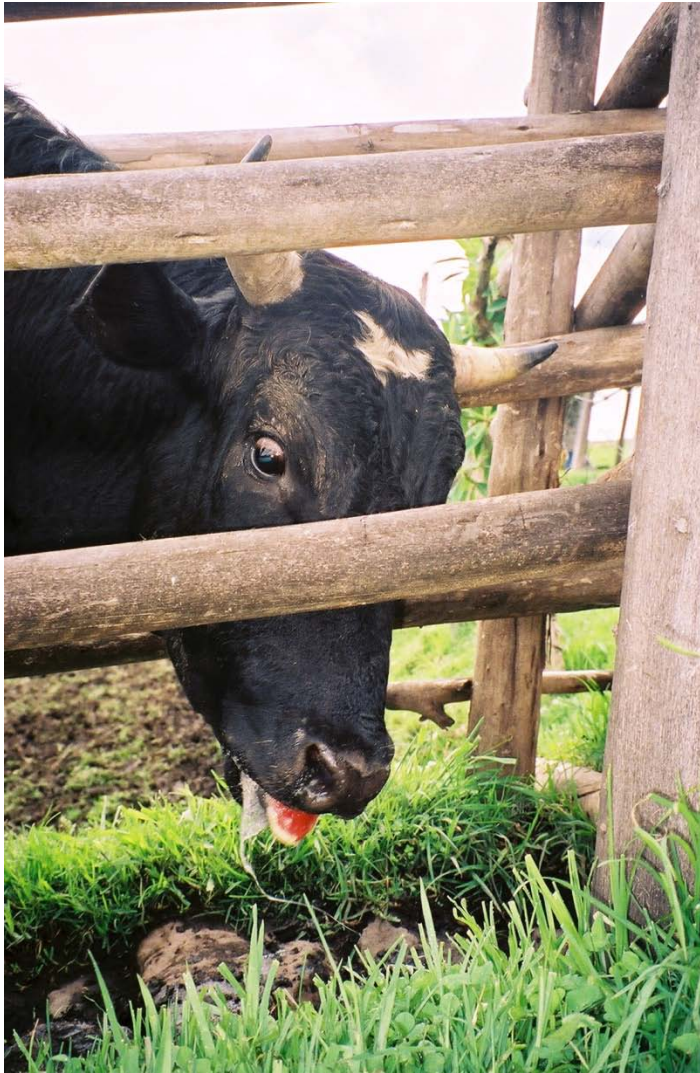
$$OR = 22 \times 20 = 440$$

$$OR = 1008 / 440 = 2.30$$

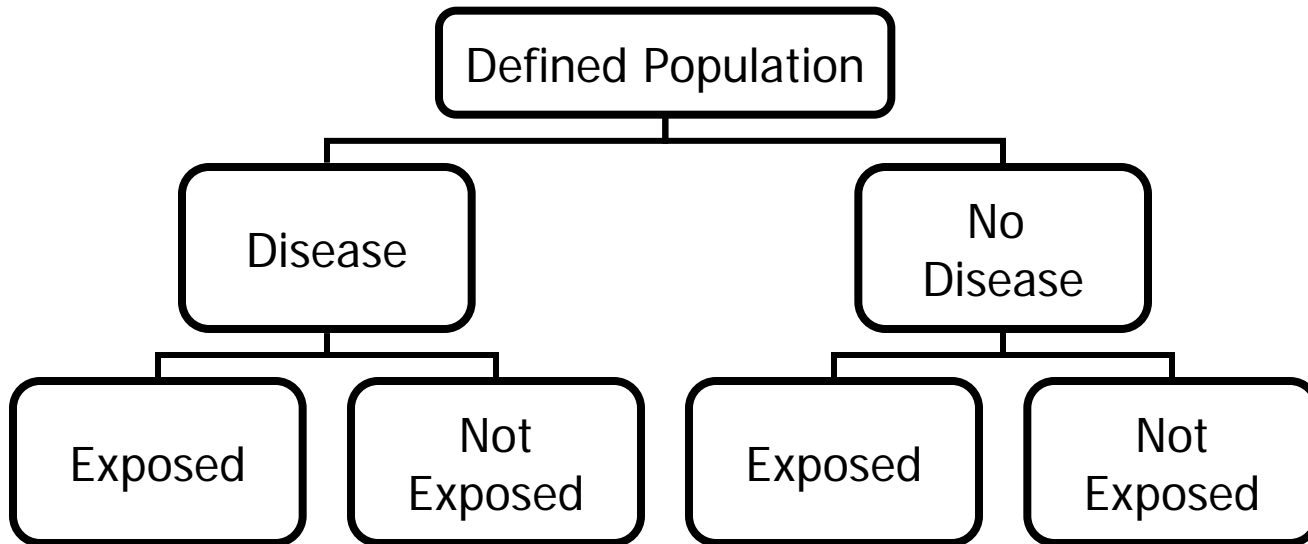
Multivariable analysis

Variable	OR	95% CI
Herd type		
Dairy	1.0	Ref
Dairy/Beef	2.2	0.2, 17.0
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Cow-Calf	ND	ND
Purchase of livestock		
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Distance to abattoir		
20+ km	1.0	Ref
< 20 km	25.8	1.7, 373.7

Report of study results and policy setting



Summary

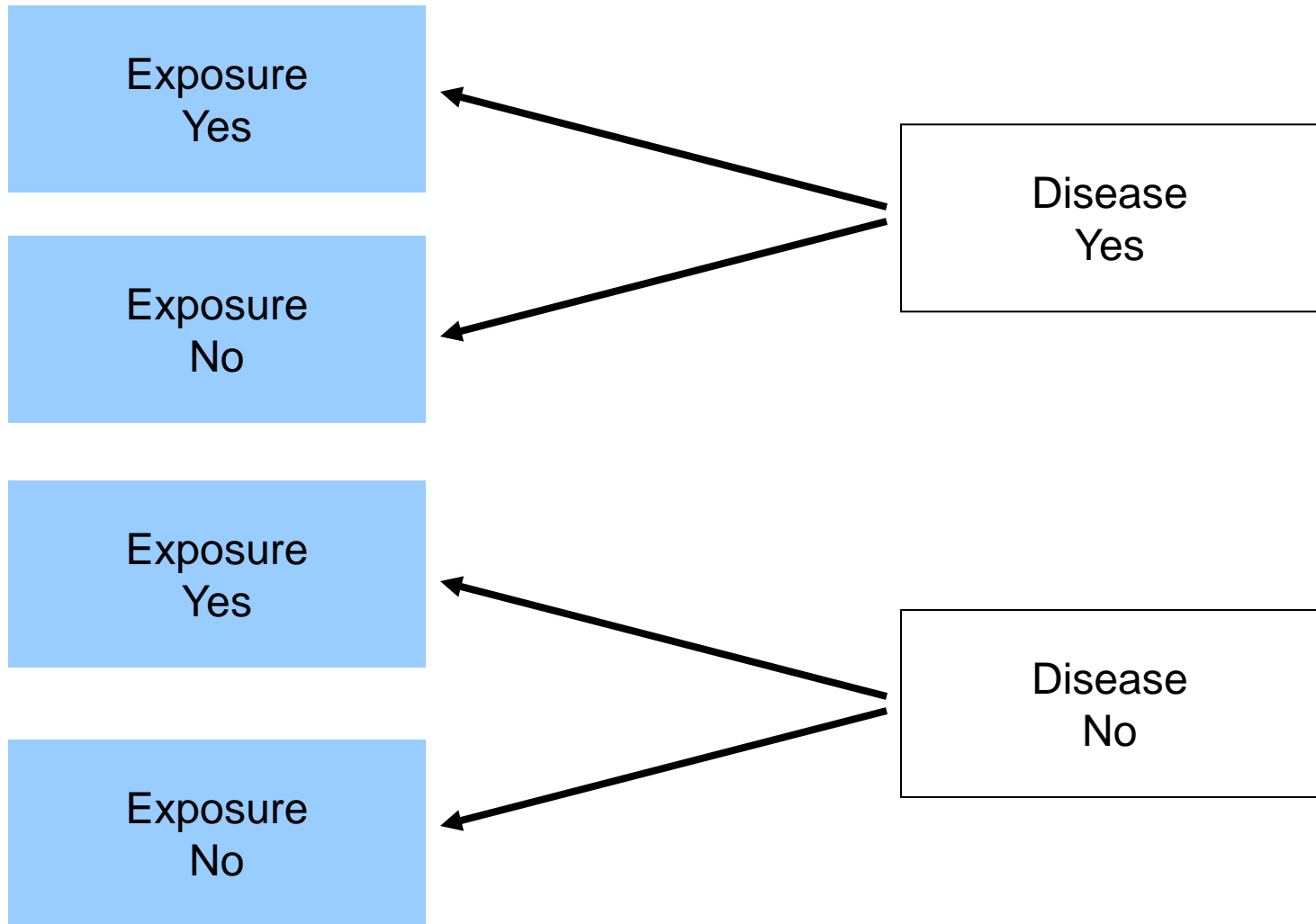


Summary

first select cases and controls

	Disease Yes	Disease No	
Exposure Yes	a	b	a+b
Exposure No	c	d	a+d
	a+c	b+d	a+b+c+d

Summary ...then measure past exposure



Summary..

- Background
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