



Loss to follow-up.

- Equal loss to follow-up.

		D+	D-	
		E+	A B	RR -
		E-	C D	OR -
E+	D+		a b	
E-	D-		c d	

- Loss to follow-up unequal by Exposure

$$a = b, c = d$$

$$RR = \frac{aA/(aA+aB)}{cC/(cC+cD)} = \frac{A/(A+B)}{\sqrt{(C+D)}} \quad RR -$$

$$OR = \frac{\frac{aA/(aA+aB)}{aB/(aA+aB)}}{\frac{cC/(cC+cD)}{cD/(cC+cD)}} = \frac{AD}{BC} \quad OR -$$

		D+	D-
		E+	A B
		E-	C D
E+	D+		a b
E-	D-		c d

- Unequal by Disease

	V-1	V
E+	A a c	B b d
E-	C e f	D f g

$$a = c - b = d$$

$$RR = \frac{aA/(aA+bB)}{cC/(cC+dD)} = \frac{aA/(aA+bB)}{cC/(aC+bD)} \quad \begin{matrix} RR \\ \text{Affected} \end{matrix}$$

$$OR = \frac{\frac{aA/(aA+bB)}{bB/(aA+bB)}}{\frac{aC/(aC+dD)}{bD/(aC+dD)}} = \frac{\frac{aA}{bB}}{\frac{aC}{bD}} = \frac{AD}{BC} \quad OR -$$

— unequal by Exposure and Disease (Differentiation) \rightarrow A specific combination of Disease & Exposure affects loss to follow-up

	D+	D-
E+	A a c	B b d
E-	C e f	D f g

$$a+b \neq c+d \quad RR \text{ affected since unequal by i)}$$

$$OR = \frac{aA \cdot dD}{bB \cdot cC} \quad OR \text{ affected}$$

— unequal by Exposure and Disease (Non-Differentiation)

	D+	D-
E+	A a c	B b d
E-	C e f	D f g

$$a = eg, b = eh, \quad RR \text{ affected since unequal by D}$$

$$c = fg, d = fh.$$

$$OR = \frac{eg \cdot fh \cdot D}{eh \cdot fg \cdot C} = \frac{AD}{BC} \quad OR -$$

Measurement error.

4Rs Recognize. Recall. Review. Record.

— How to Quantify. Sensitivity.

specificity.

positive predictive value.

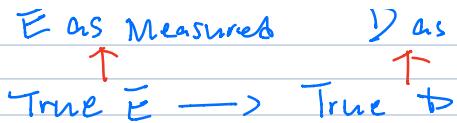
Negative predictive value.

False Negative

False Positive.

— For Binary Variables

— Non-Differentiation Misclassification (independent)



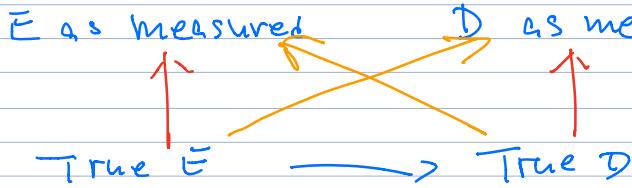
D as measured
 \uparrow

- Biases towards the Null.

- No bias when specificity for $D = 1.00$

- Multiple categories

— Differential Misclassification

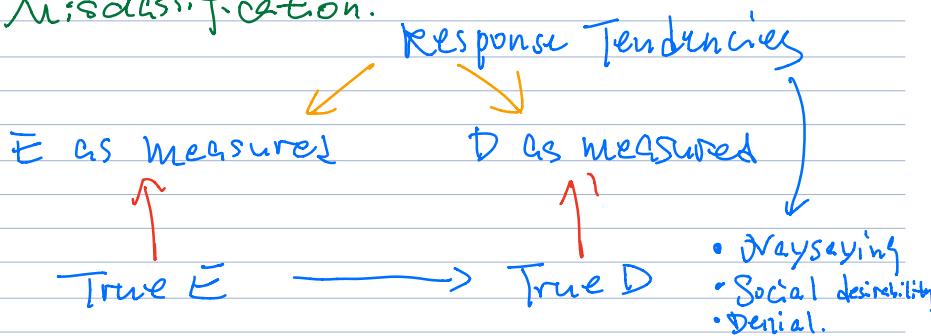


D as measured
 \uparrow

- Biases towards or away from Null

- Create or mask interactions

— Dependent Misclassification



Response Tendencies



D as measured
 \uparrow

- Nay-saying
- Social desirability
- Denial.

Re: behind the #s

		D^+	D^-
		A	B
\bar{E}^+	1.	2.	↑
	C	D	
\bar{E}^-	1.	2.	4.

1. Doomed
2. Causal
4. Immune.

Misclassification of Third variables

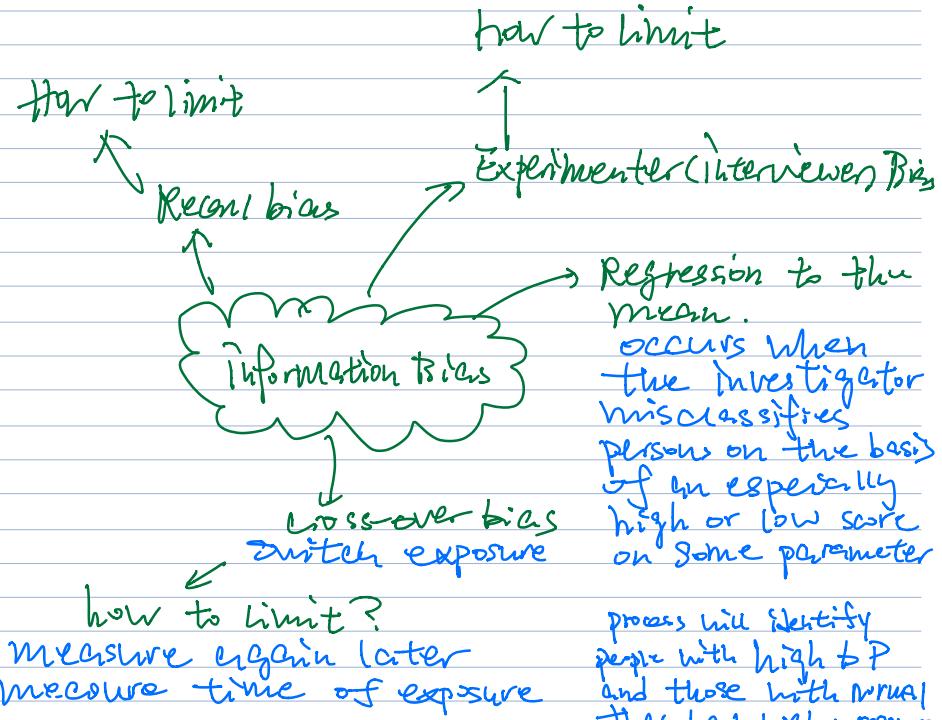
All types of misclassification can bias the \bar{E}/D relationship.

- Towards the Null
- Away from the Null.
- Mimic interaction.

Economic Fallacy.

Atonomic Fallacy.

TM512.



if classification is used to select participants

Selection Bias

how to limit.
classify subjects based on the basis of repeated extreme scores rather than by a single measurement.



Examples:
Women who use OCs are more likely to have cervical cancers detected at an early stage.

eg. hospital-based controls may attenuate the association.
how to limit?
- include multiple control groups and complete separate estimates of RRs based on the separate control groups.

Lead time: the time by which a screening test advances the date of diagnosis from the usual symptomatic phase to an earlier pre-symptomatic phase.

Lead time bias: the tendency for cases detected by screening to appear to live longer than cases detected clinically.

Self-selection bias.

- ① Those participating in screening programs are generally healthier and have positive health behaviors
- ② Screened are more likely to follow medical regimens that may be prescribed after a positive screening test.

Source of bias in evaluating screening effectiveness

Length bias

The tendency for cases with a long detectable preclinical phase of the disease to be overrepresented among screening-detected cases compared to symptom-detected cases, i.e. cases of rapidly progressing disease usually pass through the detectable preclinical phase too quickly to be picked up by most screening programs.

overdiagnosis bias

The tendency for some small proportion of non-diseased individuals to be falsely diagnosed as having the disease

Biases caused by hospital based case-control study?