

1. Type II error is failing to detect an existing effect. The oncologist's conclusion may have had high Type II error because sample size was small and because the criterion for significance (tolerance of Type I error) was very small ( $\alpha = 0.001$ )

2a.  $Y = \gamma_0 + \beta_Z * Z + \epsilon$  regression

2b.  $Y = \gamma_0 + \gamma_{X1} * X1 + \gamma_{X2} * X2 + \gamma_{X1 * X2} * X1 * X2 + \epsilon$  two-way ANOVA

extra  $Y = \gamma_0 + \gamma_X * X + \beta_Z * Z + \beta_{X * Z} * X * Z + \epsilon$  ANCOVA

3. Obtain the distribution by randomizing the data, computing the statistic repeatedly, and tallying the result as an observed frequency distribution.

4.  $F = \text{fishing mortality} = \% / \text{yr}$   
 $t = \text{time} = \text{yr}$

b.  $F = \beta_0 + \beta_t * t + \epsilon$   
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F	V	% / yr	T <sup>-1</sup>
$\beta_0$	P	% / yr	T <sup>-1</sup>
$\beta_t$	P	% / yr <sup>2</sup>	T <sup>-2</sup>
t	V	yr	T
$\epsilon$	V	% / yr	T <sup>-1</sup>

5a.	farm	<u>2</u>	30.0
	field	<u>6</u>	2.3
	replicate	<u>18</u>	67.7
	total	<u>26</u>	

- b. farms 30%  
 fields within farms 2.3%  
 replication within fields 67.7%

c. Fields could be dropped, as there is little variation among fields, little reduction in error mean square due to estimating this term, and hence little effect on sensitivity (ability to detect change in soil fungi) when fields are omitted.

6.

Source	df	SS	MS	F
strains	4	0.3680	<u>          </u>	<u>27.1</u>
days	5	0.0505	<u>          </u>	<u>2.97</u>
interaction	20	<u>          </u>	<u>          </u>	<u>1.53</u>