

Level of Significance Worksheet

Name: Key

Type 1 and 2 error worksheet

Consider examples below. Then fill in an error table given the context of the problem. For each problem state which type of error has the more severe consequences. I will demonstrate first two as examples in class.

Decision		Hypotheses	
		H_0 :	H_1 :
		Type I Error:	Correct Decision
		Correct Decision	Type II Error:

1. The state of Georgia is considering spending \$350 million on a computerized mathematics curriculum that for grades 3 – 10. They pilot the program with 250 students in grades 5 and 6 whose end-of-course test scores are compared to the state average score of 150.

Decision		Hypotheses	
		$H_0: \mu=150$	$H_1: \mu>150$
	Program is effective	Type 1: The test scores stay at 150 but the program is judged to be effective	Correct decision
	Program is ineffective	Correct decision	Type 2: The test scores improve but the program is judged to be ineffective

2. Pharmaceutical researchers are testing a new drug for acne. Severity of acne is rated on a scale of 1 – 7, 7 being “worst.” Side effects for the new drug may include vomiting, upset stomach, mild fever and/or hyperactivity. Their sample size is 80, with participants randomly assigned to a control group (n = 40) and treatment group (n = 40).

Decision	Hypotheses		
		H_0 : Acne stays the same	H_1 : Acne gets better
Drug is effective	Type 1: Acne stays the same but the drug is deemed ineffective	Correct decision	
Drug is ineffective	Correct decision	Type 2: The acne gets better but the drug is deemed ineffective	

3. Researchers are studying the effects of TV watching on cognitive development in toddlers. Recent surveys have shown that 21% of 3-year-olds watch more than 5 hours of TV per day, and reports from cognitive psychologists indicate TV exposure may “rewire” the developing brain in adverse ways. They wish to test if toddlers who watch 5 hours or more of TV daily score less than average of 40 on tests of cognitive ability when entering first grade. Their sample size is 95.

Decision	Hypotheses		
		H_0 : $\mu=40$	H_1 : $\mu<40$
rewired	Type 1: Scores stay at 40 but we think the toddlers brains have been rewired	Correct decision	
Not rewired	Correct decision	Type 2: scores decrease but we don't think the toddlers brains have been rewired	

4. Pregnant ladies take a glucose tolerance screening during the 24th week of pregnancy to detect developing gestational diabetes. This condition can lead to premature labor.

Decision		Hypotheses	
		H ₀ : the pregnant woman stays healthy	H ₁ : pregnant woman develops diabetes
	Screening indicates diabetes	Type 1: The woman doesn't have diabetes but tests show she does	Correct decision
	Screening doesn't indicate diabetes	Correct decision	Type 2: The woman has diabetes but the screening doesn't show it

5. A manufacturer is testing light bulbs in the quality assurance lab. Each bulb receives a durability score. 100 bulbs from each production run are analyzed. If 11 or more are found to be defective, the entire run of bulbs is discarded. Discarding a run costs the company \$28,000.

Decision		Hypotheses	
		H ₀ : the run of bulbs meets durability standard	H ₁ : the run of bulbs doesn't meet the durability standard
	Bulbs are defective	Type 1: The run is found to be defective when, in fact, it's okay	Correct decision
	Bulbs are not defective	Correct decision	Type 2: The run is defective but the company keeps the bulbs.

6. Researchers at NGCSU are testing the political awareness of the undergraduate population. Due to the Corps of Cadets and an increased level of U. S. military activity, they feel that NGCSU students may be more aware of political policy than average college students. A political awareness survey that has been given nationwide is administered to 1,200 NGCSU students. The average score nationwide is 12.

Decision		Hypotheses	
		H ₀ : NGCSU students have the same level of political awareness as general population OR H ₀ : $\mu=12$	H ₁ : NGCSU students have a higher level of political awareness than the general population OR H ₁ : $\mu>12$
	Test shows awareness	Type 1: NGCSU students have the same level of awareness as the undergrads but we think they have a higher level	Correct decision
	Test doesn't show awareness	Correct decision	Type 2: NGCSU students have a higher level of awareness but we judge them to be the same as the general population

7. Crop researchers are testing the yield (bushels/acre) of a hybridized soy bean to see if it produces per acre than former strains (treatment vs. control). An increase of 2% could mean increased corporate profits of nearly \$3 million. Seventy-two plots are analyzed, half with the new hybrids, half with the former strains.

Decision		Hypotheses	
		H ₀ : control and treatment have the same yield	H ₁ : the treatment has a higher yield than the control
	Yield increases	Type 1: The yield of treatment beans stays the same but we think the production has increased.	correct
	Yield doesn't increase	correct	Type 2: The treatment has a higher yield but an increase is not indicated

