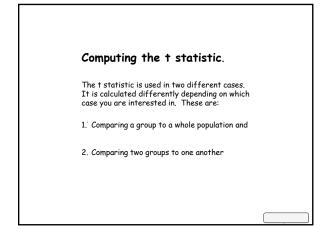
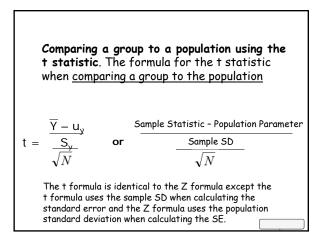
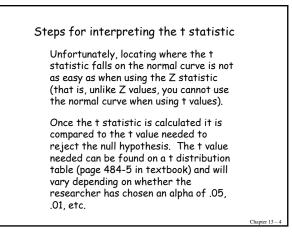
5 Steps in Testing an Hypothesis

- 1. Verify that assumptions are met (random sample, normal distri., level of measurement)
- 2. State research and null hypotheses and alpha
- Select sampling distribution and test statistic to be used (Z or t statistic)

 (use Z if have population standard deviation, use t if have only sample SD)
- 4. Compute test statistic
- 5. Make a decision and interpret results







How to use the t distribution table to determine significance

- Determine the degrees of freedom your sample provides (this is typically: N-1) and then locate the DF on the t-distribution table (table is on page 484-5).
- (2) Find on the table: the alpha which you selected at the start of the statistical analysis (an alpha of .05 and a two-tailed test are typically used by researchers)
- (3) Find the intersecting point where the DF and the alpha cross. At the intersecting point you will find the t value needed to reject the null hypothesis.

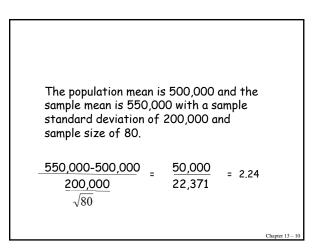
Chapter 13

t distribution table Table 13.2 Values of the t Distribution Level of Significance for One-Tailed Test .10 .025 .01 .005 .05 Level of Significance for Two-Tailed Test .05 .02 .01 .20 .10 6.314 12.706 31.821 63.657 636.619 3.078 1.886 2.920 4.303 6.965 9.925 31.598 1.638 2.353 3.182 4.541 5.841 12.941 1.533 2.132 2.776 3.747 3.365 4.604 8.610 2.015 2.571 4.032 6.859 1.372 4.587 10 15 1.812 2.228 2.764 3.169 1.753 1.725 1.708 1.697 2.131 2.602 2.947 4.073 1.325 1.316 1.310 2.528 2.485 2.457 3.850 3.725 3.646 20 25 30 2.086 2.845 2.060 2.042 2.787 1.303 1.296 1.289 1.282 1.684 1.671 1.658 1.645 2.021 2.000 1.980 1.960 2.423 2.390 2.358 2.326 2.704 2.660 2.617 2.576 40 60 3.551 3.460 3.400 3.373 3.291 120 rce: Abridged from R. A. Fisher and F. Yates, Statistical Tables for Biological, Agricultural Medical Research, Table 111. Copyright © R. A. Fisher and F. Yates 1963. Reprinted by nission of Pearson Education Limited. and Me Chapter 13 - (4) Compare the t value calculated from the data to the t value identified on the t distribution table. If the calculated t value is larger than the t value found in the table, then the null hypothesis can be rejected and the difference between the group and the population can be considered statistically significant (but not necessarily "substantively" significant).

In-Class Exercise: The average number of caviar eggs laid in a season by a single sturgeon fish is roughly 500,000. We have a sample of 80 sturgeon fish from lake Michigan that lay on average roughly 550,000 eggs in a season with a standard deviation of 200,000. We want to know whether our fish are different from the average. Begin by calculating the t statistic. $Y - u_v$ Group Mean - Population Mean Sy or Sample SD \sqrt{N} \sqrt{N} Chapter 13 - 8

Why are we calculating the t statistic instead of the Z statistic?

What alpha (level of confidence) would you like to use and why?



Finding the t statistic in the t distribution table Our degrees of freedom for this example is N - 1 or 79 and our t statistic is 2.24 (the larger the t statistic the more likely it will be significant). On page 484-5 of your book we can find the t distribution table. It displays the degrees of freedom for 60 and for 120. Since ours is 79 it is less than 120. Therefore, to be conservative we will use 60 DF. We won't assume a one-tailed test since there is no existing knowledge to support the hypothesis that sturgeon fish in Lake Michigan lay more eggs than the average sturgeon fish.

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		Level of Significance for One-Tailed Test					
		.10	.05	.025	.01	.005	.0005
		Level of Significance for Two-Tailed Test					
	df	.20	.10	.05	.02	.01	.001
	1	3.078	6.314	12.706	31.821	63.657	636.619
	2	1.886	2.920	4.303	6.965	9.925	31.598
	3	1.638	2.353	3.182	4.541	5.841	12.941
	4	1.533	2.132	2.776	3.747	4.604	8.610
	5	1.476	2.015	2.571	3.365	4.032	6.859
	10	1.372	1.812	2.228	2.764	3.169	4.587
	15	1.341	1.753	2.131	2.602	2.947	4.073
	20	1.325	1.725	2.086	2.528	2.845	3.850
	25	1.316	1.708	2.060	2.485	2.787	3.725
	30	1.310	1.697	2.042	2.457	2.750	3.646
	40	1.303	1.684	2.021	2.423	2.704	3.551
	60	1.296	1.671	2.000	2.390	2.660	3.460
	120	1.289	1.658	1.980	2.358	2.617	3.373
	00	1.282	1.645	1.960	2.326	2.576	3.291

Determining Statistical Significance

Since our t statistic is 2.24 we can conclude statistical significance at the .05 level.

Would our findings be significant if we had chosen an alpha of .01?

Comparing the Sample Statistics of Two Groups (Presented above is a comparison of a group's sample statistic to a population parameter)

Example for comparing two groups:

Comparing the mean salary of new sociology professors (group 1) to the mean salary for new engineering professors (group 2). Previously we were comparing the group statistic (such as the mean salary of sociology professors) to the population parameter (such as the mean salary of the whole U.S. population).

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Steps for comparing the sample statistics of two groups are the same as that for comparing a sample statistic to the population parameter with three exceptions:

(1) the formula for calculating the t statistic is different

(2) calculating the degrees of freedom is different, and

(3) must now determine whether the two groups have equal or unequal variances. (If the Levene's test is significant then their variances are unequal)

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