Mean comparison

• One sample test

compare a mean with a standard value

• Independent samples test

compare means between two independent groups

• Paired sample test

compare two means of a sample group

• ANOVA (Analysis of variance)

compare means between three or more independent groups

Mean comparison

• One sample test

compare a mean with a standard value $H_n: \mu \neq 165$

• Independent samples test

compare means between two independent groups

 $H_n: \mu 1 \neq \mu 2$

H: $\mu_1 = \mu_2$

H: $\mu = 165$

 $H_{\rm p}:\mu 1\neq\mu 2\neq\mu 4....$

• Paired sample test $H: \mu_1 = \mu_2$

compare two means of a sample group $H_n: \mu_1 \neq \mu_2$

• ANOVA (Analysis of variance) $H: \mu_1 = \mu_2 = \mu_3....$

compare means between three or more independent groups

compare a mean with a standard value

Question: Are Thai men's average-height equal to 165 cm?

H: $\mu = 165$ Hn: $\mu \neq 165$



คนที่	เพศ	ความสูง
1	m	167
2	m	162
3	m	168
4	m	162
5	m	162
6	m	165
7	m	166
8	m	166
9	m	160
10	m	165

SPSS

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2 Input data									m	160	0.00			
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SPSS

5. Define Test Value 165

click OK



Results

T-TEST

/TESTVAL=165

/MISSING=ANALYSIS

/VARIABLES=Height

/CRITERIA=CI(.95).

T-Test

[DataSet1] C:\Users\Administrator\Documents\slide1-testData.sav

	One-Sample Statistics											
		Std Doviation		Std. Error								
1		N (B	Mean	Stu. Deviation	┝┥	wear						
	ความสูง	.83066										

One-Sample Test

		Test Value = 165										
				Mean	95% Confidence Interval of the Difference							
	t	df	Sig. (2-tailed)	Difference	Lower	Upper						
ความสู่ง	843	9	.421	70000	-2.5791	1.1791						



[DataSet1] C:\Users\Administrator\Documents\slide1-testData.sav

One-Sample Statistics

significance level = 0.05

				Std. Error
	N	Mean	Std. Deviation	Mean
ความสูง	10	164.3000	2.62679	.83066





		Test Value = 165												
				Mean	95% Confidenc Differ	e Interval of the ence								
	t	df	Sig. (2-tailed)	Difference	Lower	Upper								
ความสูง	843	9	.421	70000	-2.5791	1.1791								

conclusion

Hypotheses:

H: $\mu = 165$ Hn: $\mu \neq 165$

Sig (2-tailed) = 0.421 that is greater than 0.05 (not significant)

Therefore, accept *H*: μ = 165

Thai men's average-height is equal to 165 cm

One sample test Example: *Significant*

Н: **µ =** 167 Hn: **µ** ≠ 167

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[DataSet1] C:\Users\Administrator\Documents\slide1-testData.sav

				Sig (2-tailed)	Sig (2-tailed) = 0.01 == Less than 0.05 (significance level)				
	N	Mean	Std. Deviation	== Less than					
ความสูง	10	164.3000		>>>> Significant = Accept Hn					
			One-San	nple Test	•				
			One-San Tes	nple Test st Value = 167	-				
·			One-San Tes	nple Test st Value = 167 Mean	95% Confidenc Differ	e Interval of the rence			
	t	df f	Sig. (2-tailed)	nple Test st Value = 167 Mean Difference	95% Confidenc Differ Lower	e Interval of the rence Upper			

One-Sample Statistics

Independent samples test

compare means between two independent groups

Question:

Are Thai men's average-height equal to Thai women's average-height ?

H: $\mu_1 = \mu_2$ Hn: $\mu_1 \neq \mu_2$

Independent sample T-test

compare two means of two sample groups

Question:

Is the average of male test-score equal to female test-score?

H: $\mu_1 = \mu_2$ Hn: $\mu_1 \neq \mu_2$

Paired sample T-test

compare two means of a sample group

Question:

Is the average of Pretest-score equal to Posttest-score?

H: $\mu 1 = \mu 2$ *Hn*: $\mu 1 \neq \mu 2$

Paired sample T-test

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1	2						

SPSS: Paired-samples T-test

Click Analyze > Compare Means > Paired-Samples T Test



Paired-samples T-test

Click 🖋 คะแนนก่อนใช้ [Pretest] then click 🕞 for Variable1 Click 🚀 คะแนนหลังใช้ [Posttest] then click 🕟 for Variable2



Paired-samples T-test

5. Click Options

set confidence interval as 95% then click OK



Paired-samples T-test

T-TEST PAIRS=Pretest WITH Posttest (PAIRED) /CRITERIA=CI(.9500) /MISSING=ANALYSIS.

T-Test

[DataSet5] C:\Users\Administrator\Documents\PairSampletestData.sav

	Paired Samples Statistics										
		Mean	Ν	Std. Deviation	Std. Error Mean						
Pair 1	คะแนนก่อนใช้	2.40	10	1.506	.476						
	คะแนนหล <i>ังใช้</i>	7.40	10	.966	.306						

Paired Samples Correlations

	Ν	Correlation	Sig.
Pair1 คะแนนก่อนใช้ & คะแนนหลังใช้	10	.107	.769

Sig (2-tailed) = 0.000 less than 0.05

- \Rightarrow Significant
- \Rightarrow Accept Hn: μ 1 \neq μ 2

the average of Pretest-score is

not equal to Posttest-score

Paired Samples Test

		Paired Differences								
				Std. Error	95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Mean	Lower	Upper	t	df	5	tailed)
Pair 1	คะแนนก่อนใช้ - คะแนนหลังใช้	-5.000	1.700	.537	-6.216	-3.784	-9.303	9		.000

ANOVA (Analysis of variance)

compare means between three or more independent groups

H: $\mu 1 = \mu 2 = \mu 3$ Hn: $\mu 1 \neq \mu 2 \neq \mu 3$

Variables





Regression

Simple Linear Regression

1 independent variable, <mark>1 dependent variable</mark>

$$\frac{\mathbf{Y}}{\mathbf{Y}} = \mathbf{a} \frac{\mathbf{X}}{\mathbf{X}} + \mathbf{b}$$

Multiple Regression

many independent variables, <mark>1 dependent variable</mark> **Y** = a₁**X**₁ + a₂**X2** + a_k**Xk** + b

Conceptual framework

