Describing the data

Parameter	Statistics
μ(ค่าเฉลี่ย)	$\bar{x}$
σ(ค่าเบี่ยงเบนมาตรฐาน)	Sd
π(ค่าสัดส่วน)	p
ρ(ค่าสปส.ความสัมพันธ์)	r

Type of Statistics

1. **Descriptive Statistics**(สถิติเชิงพรรณนา)
2. **Inferential Statistics**(สถิติเชิงอนุมาน)
   - **Parameter estimation**
   - **Hypothesis testing**
   - **Modeling &Prediction**

Type of Measurement Scale in Statistics

1.**Nominal scale –** เพศ (**Gender or sex**) ชาย หญิง (**M,F**)
การศึกษา (**Education**) ประถม มัธยม ปริญญาตรี
อาชีพ (**Occupation**) ไม่ได้ทำงาน เกษตรกรรม ค้าขาย
ราชการ เอกชน

2.**Ordinal scale –** คุณภาพชีวิต (**Quality of life (QOL)** ดี ปานกลาง แย่
ทัศนคติ (**Attitude**) ไม่เห็นด้วยอย่างยิ่ง (1) ...เห็นด้วยอย่างยิ่ง(5) ,
ความพึงพอใจ(**Satisfaction**) ไม่พึงพอใจที่สุด (1)...พึงพอใจที่สุด(5)

3.**Interval scale –** อุณหภูมิ , ความรู้
4.**Ratio scale –** น้ำหนัก (**Weight**) ส่วนสูง(**Height**) ปริมาตร(**Volume**)

Measurement scale

1. **Nominal**
2. **Ordinal**

} **Qualitative or Category**

เชิงคุณภาพ หรือ เชิงกลุ่ม

3. **Interval**
4. **Ratio**

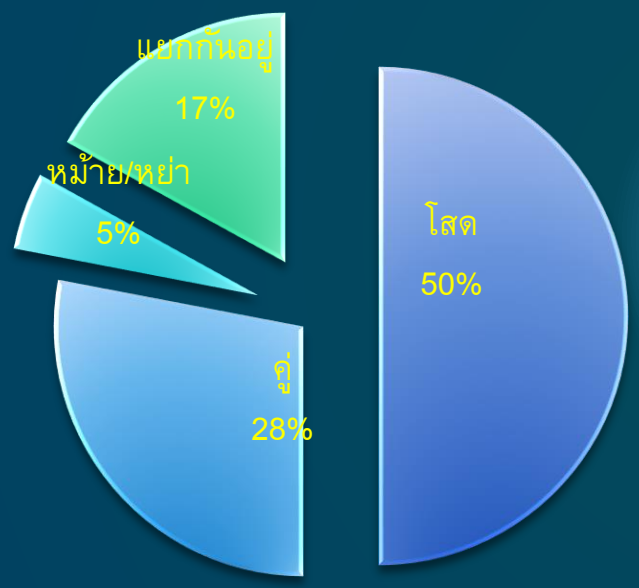
} **Quantitative or Continuous**

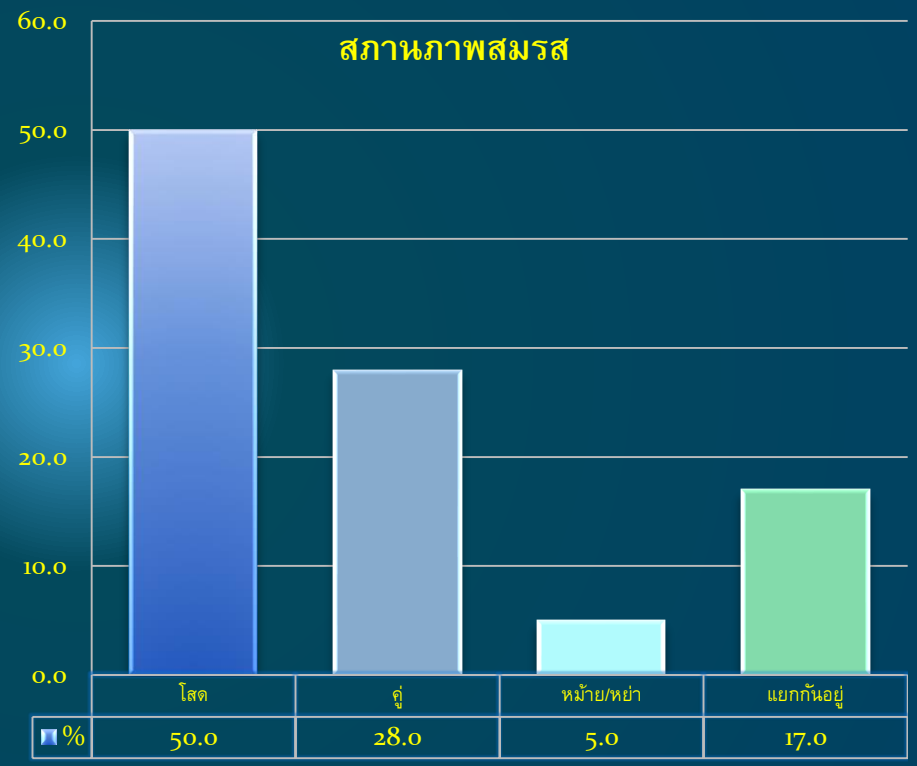
เชิงปริมาณหรือ เชิงต่อเนื่อง

Descriptive Statistic (สถิติเชิงพรรณนา)

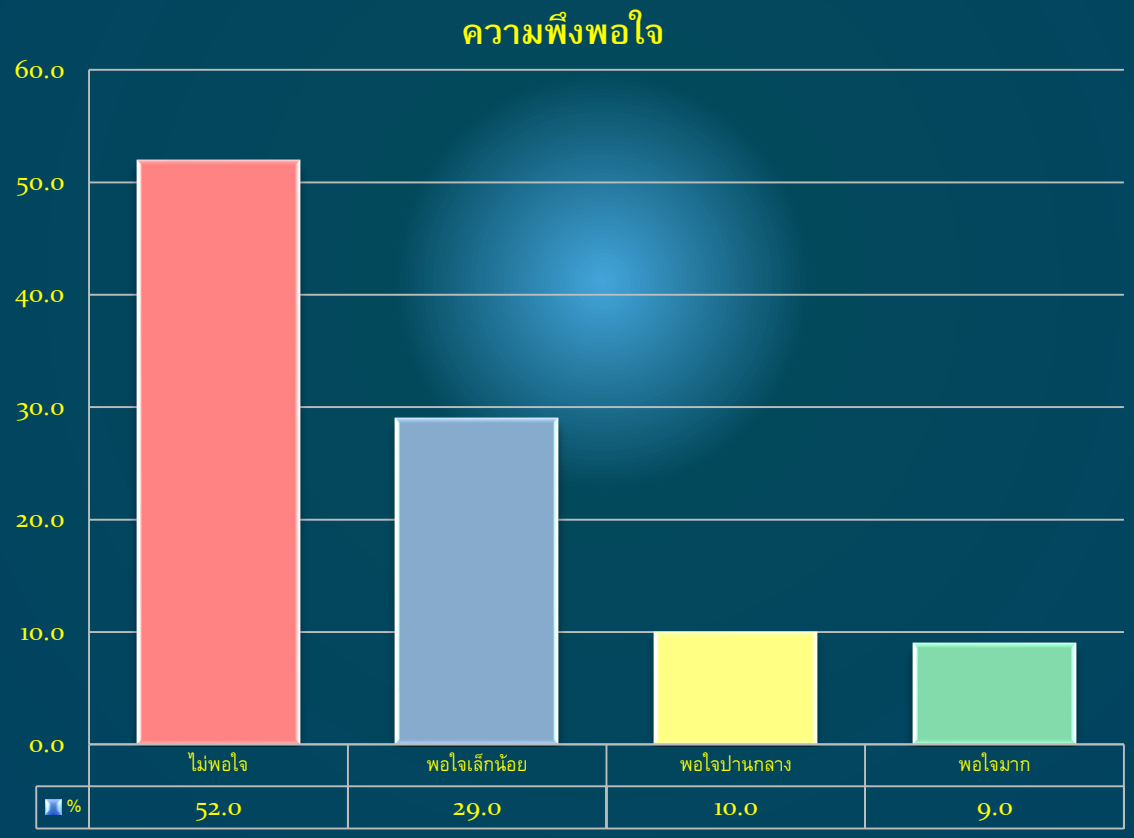
1. **Nominal data** - จำนวน(ร้อยละ) **n(%)**
2. **Ordinal data** - แคบ **Mode (Min – Max)**
   กว้าง **Median (IQR or Q_1 – Q_3)**
   or Median (Range or Min – Max)
3. **Continuous data – Mean ± SD**

Graph for Nominal data

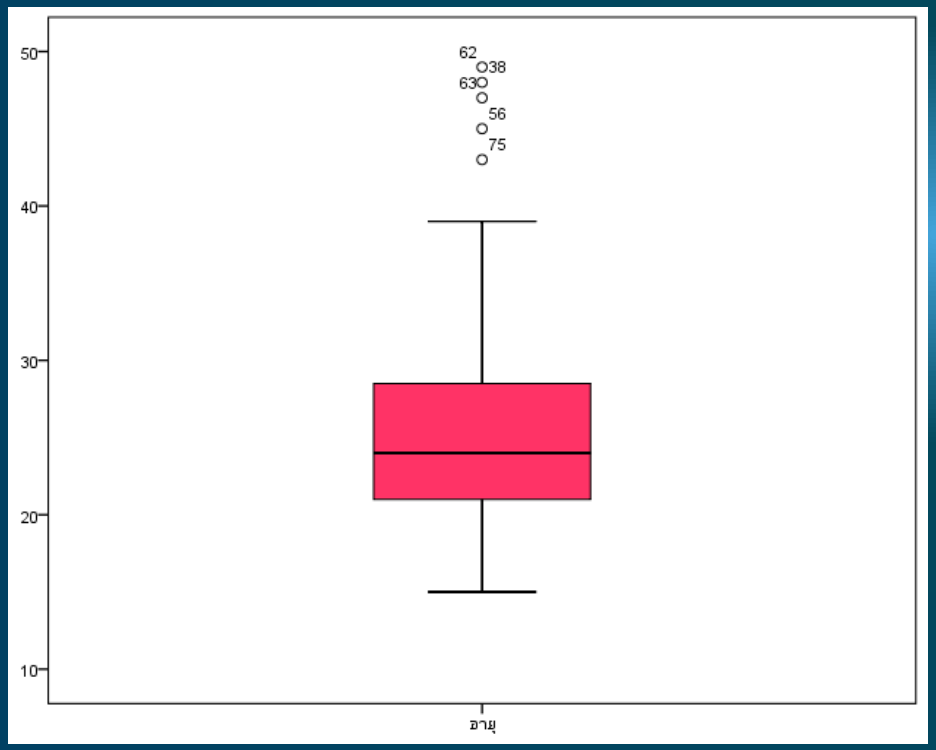


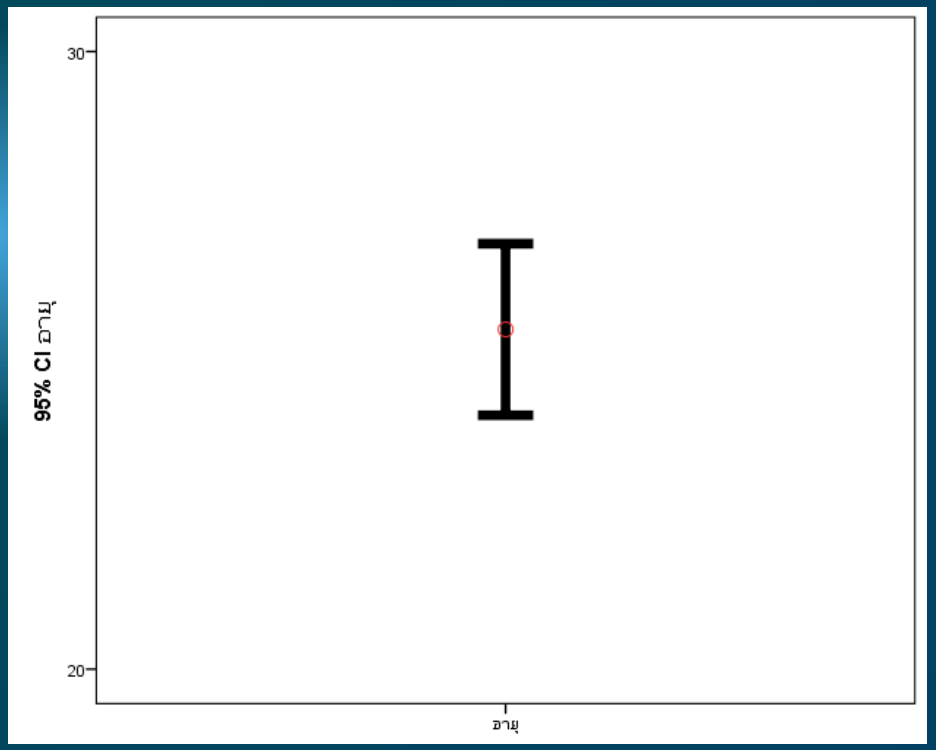


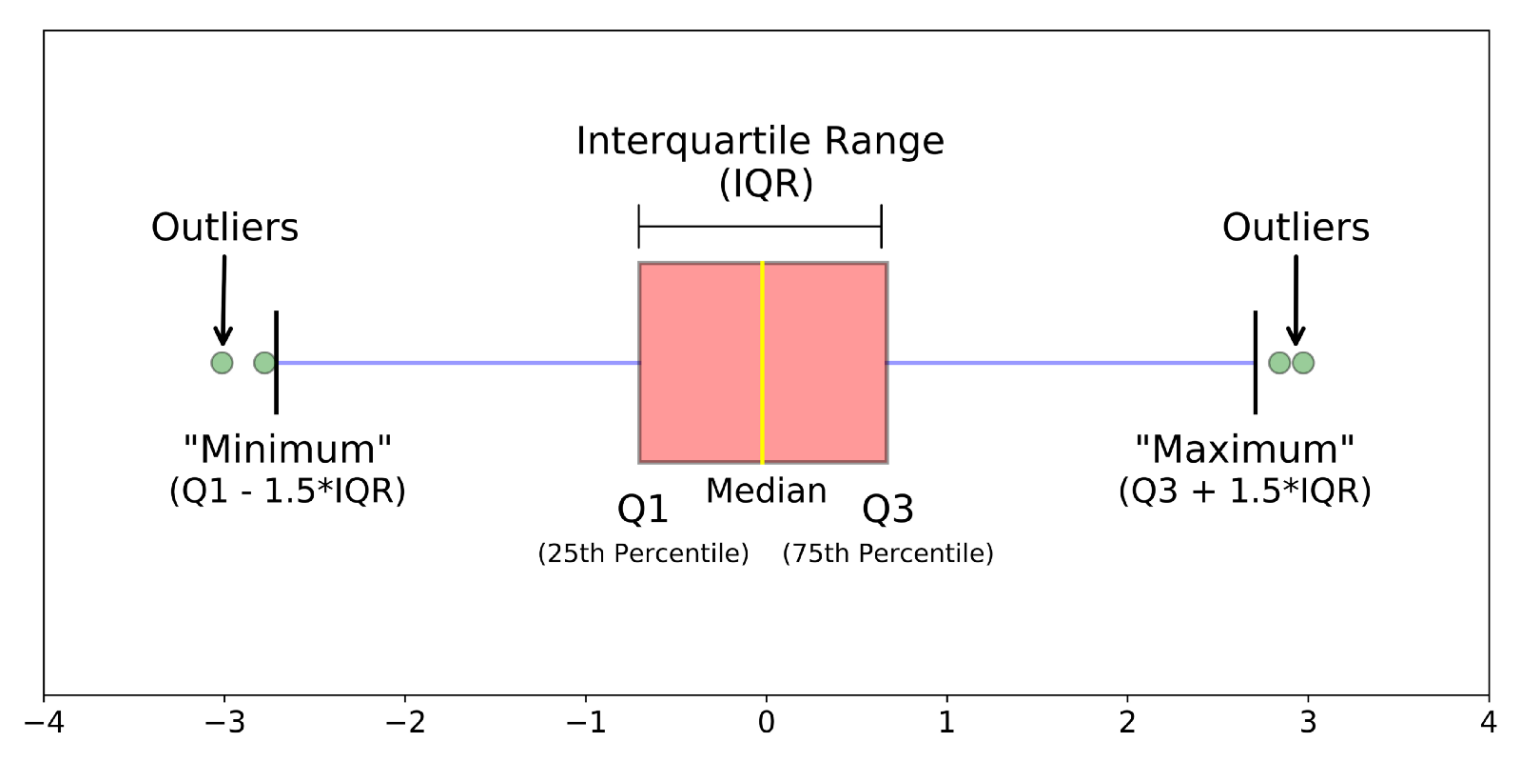
Graph for Ordinal data

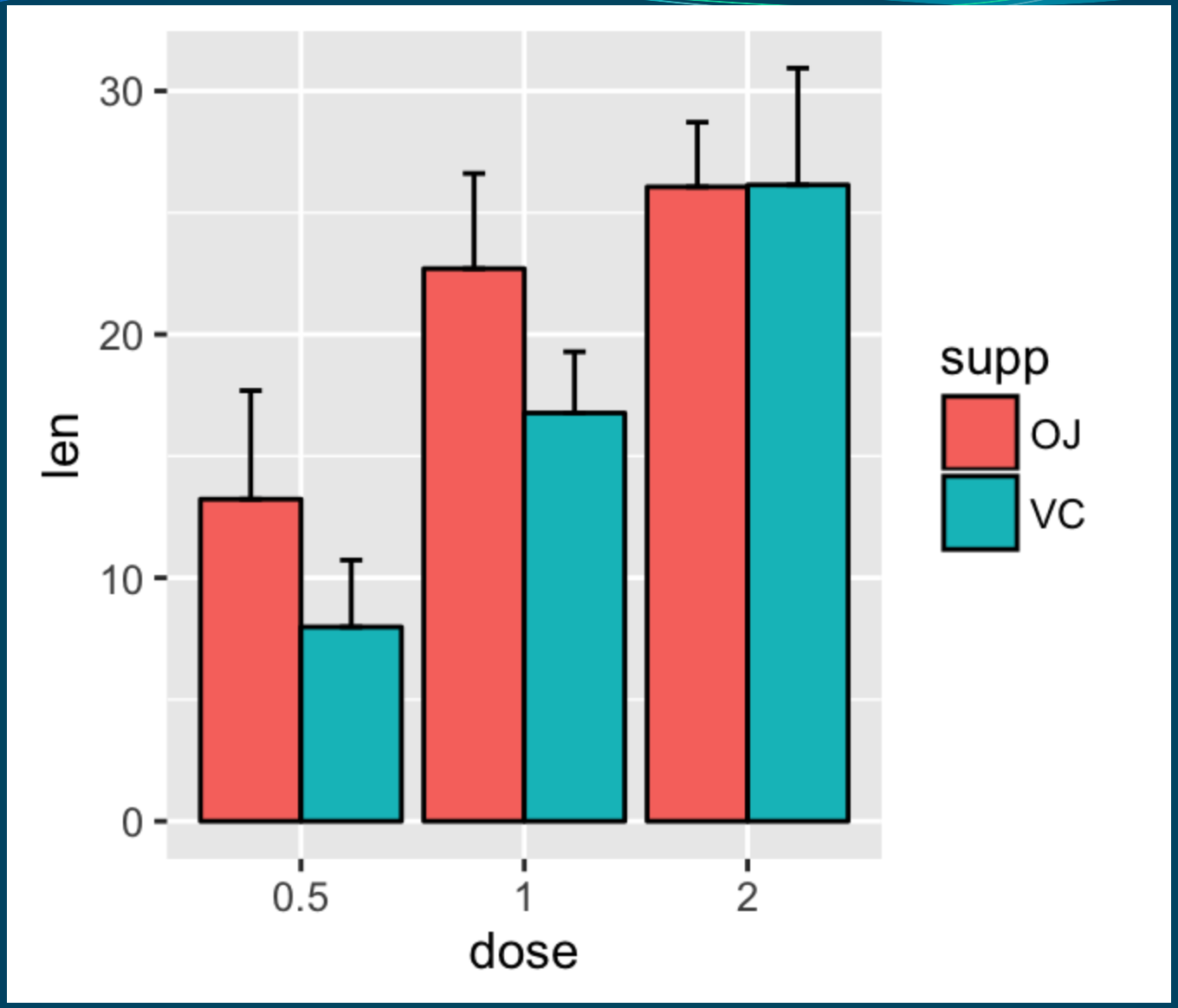


Graph for Continuous data (Interval/ratio)



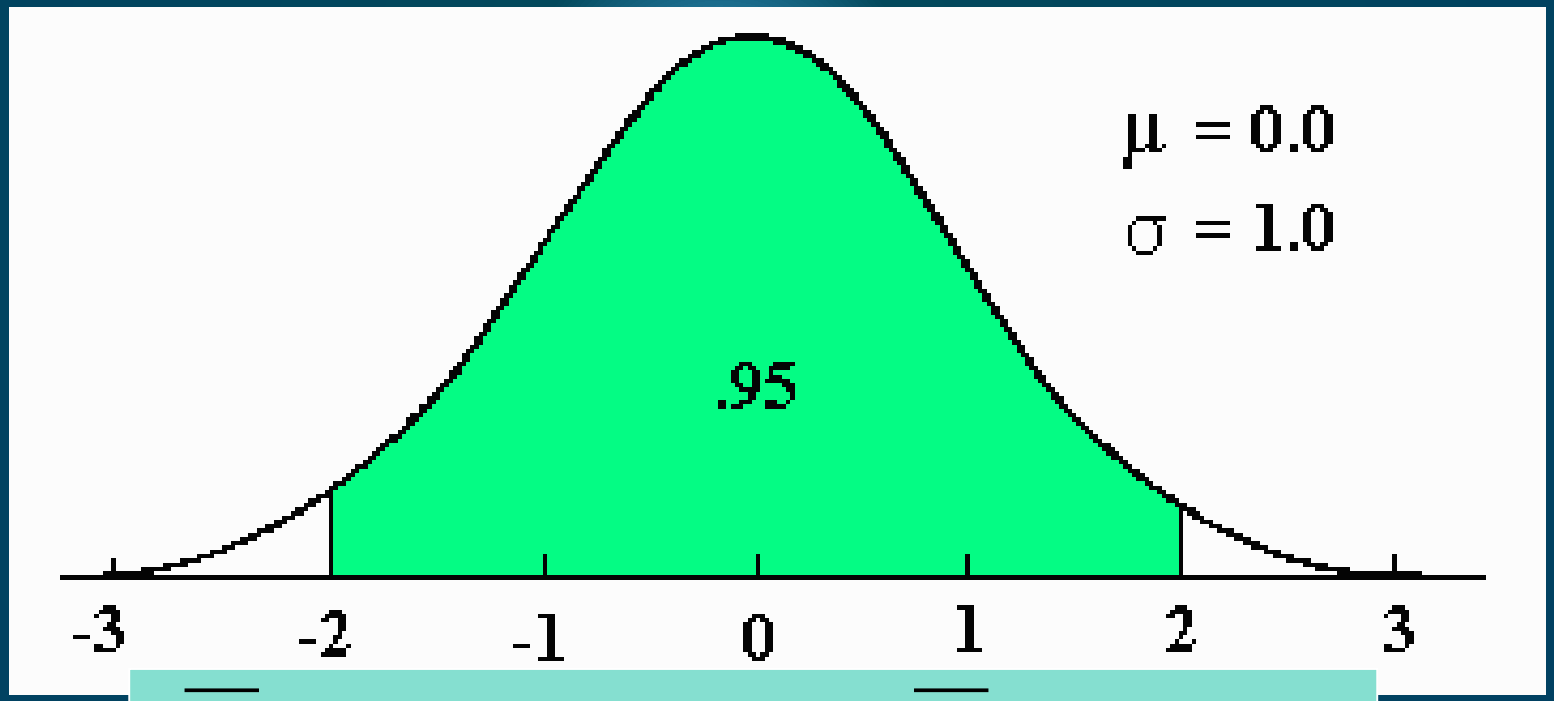



Interquartile Range
(IQR)
Outliers
Outliers
"Minimum"
(Q1 - 1.5*IQR)
Q1
Median
Q3
(25th Percentile)
(75th Percentile)
"Maximum"
(Q3 + 1.5*IQR)
−4
−3
−2
−1
0
1
2
3
4


30
20
10
0
len
0.5
1
2
dose
supp
OJ
VC

Inferential Statistics

- **Estimation of 95% confidence interval of mean**



$$\bar{x} - 2SE < \mu < \bar{x} + 2SE$$

Confidence Interval of Mean

ค่า **Parameter** = ค่า **Statistics** $\pm$ **k** $\times$ **SE**

โดยที่ **k** คือค่าสัมประสิทธิ์ความเชื่อมั่น (**Reliability coefficient**) ซึ่งได้แก่ค่า **t** หรือ **Z**

1.ตัวอย่างชุดเดียว (**One sample mean**)

$$95\%CI\ of\ \mu = \bar{x} \pm t\ x\ SD/\sqrt{n}$$

2 ประชากรอิสระต่อกัน (2 independent mean)

$$S_p^2 \text{ (Pooled variance)} = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

$$\text{SE ของ } \bar{X}_1 - \bar{X}_2 = Sp\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$\text{CI ของ } \mu_1 - \mu_2 = (\bar{X}_1 - \bar{X}_2) \pm (t \text{ หรือ } Z)\ SE$$

Sex	n	Blood sugar		
		Mean	SD	95% CI
Male	150	102	5.8	101.1 - 102.9
Female	180	95	9.3	93.6 - 96.4

102 ± 0.9

95 ± 1.4

95% CI of mean difference = 5.5 - 8.5

GraphPad

Prism Customers Resources Support

QuickCalcs

1. Select category 2. Choose calculator 3. Enter data 4. View results

Analyze continuous data

- (•) Descriptive statistics and confidence interval of a mean.
- ( ) Grubbs' test to detect an outlier.
- ( ) *t* test to compare two means.
- ( ) One sample *t* test. Compare observed and expected means.
- ( ) Post test following two-way (or higher) ANOVA.
- ( ) Confidence interval of a sum, difference, quotient or product of two means.
- ( ) Confidence interval of a standard deviation.
- ( ) Linear regression.

Continue

QuickCalcs

1. Select category 2. Choose calculator 3. Enter data 4. View results

Descriptive statistics and CI of mean

Enter raw data and this calculator will calculate the mean, SD, SEM and confidence interval of the mean. Enter mean, N and SD or SEM, and it will calculate the confidence interval of the mean.

1. Choose data entry format

- ( ) Enter up to 50 rows.
- ( ) Enter or paste up to 10000 rows.
- ( ) Enter mean, SEM and N.
- (•) Enter mean, SD and N.

Caution: Changing format will erase your data.

2. Enter data

Mean: 102

SD: 5.8

N: 150

QuickCalcs

1. Select category 2. Choose calculator

Descriptive statistics results

Parameter	Value
Mean	102.000
SD	5.800
SEM	0.474
N	150
90% CI	101.216 to 102.784
95% CI	101.064 to 102.936
99% CI	100.764 to 103.236

2 ประชากรไม่อิสระต่อกัน (2 related mean)

CI ของค่าผลต่าง $(\bar{d}) = \bar{d} \pm t.\frac{Sd}{\sqrt{n}}$

	น้ำหนัก		
คนที่	ก่อน	หลัง	ผลต่าง (di)
1	120	123	+ 3
2	141	143	+ 2
3	130	140	+10
4	150	145	- 5
5	135	140	+ 5
6	140	143	+ 3
7	120	118	- 2
8	140	141	+ 1
9	130	132	+ 2

ค่าเฉลี่ยของผลต่าง $(\bar{d}) = \frac{\sum d_i}{n} = \frac{19}{9} =$ **2.11**

$$S_d = \frac{\sum (d_i - \bar{d})^2}{n-1} =$$ **4.197**

95% CI of diff

$= 2.11 \pm (2.31 \times 1.40)$

$= -1.12$ ถึง 5.34

QuickCalcs

1. Select category 2. Choose calculator **3. Enter data** 4. View results

Descriptive statistics and CI of mean

Enter raw data and this calculator will calculate the mean, SD, SEM and confidence interval of the mean. Enter mean, N and SD or SEM, and it will calculate the confidence interval of the mean.

1. Choose data entry format

- ○ Enter up to 50 rows.
- ○ Enter or paste up to 10000 rows.
- ○ Enter mean, SEM and N.
- ◉ Enter mean, SD and N.

Caution: Changing format will erase your data.

2. Enter data

Mean: 2.11

SD: 4.197

N: 9

Descriptive statistics results

Parameter	Value
Mean	2.11000
SD	4.19700
SEM	1.39900
N	9
90% CI	-0.49151 to 4.71151
95% CI	-1.11610 to 5.33610
99% CI	-2.58418 to 6.80418

Confidence Interval of Proportion

Proportion Estimation

1. One sample

p = X / n (Proportion)

$$95\%CI\ of\ P = p \pm Z\ SE\ (p)$$

$$SE\ (p) = \sqrt{\frac{p\ (1-p)}{n}}$$

2. Two independent samples

$$SE\ (p) = \sqrt{\frac{p1\ (1-p1)}{n1} + \frac{p2\ (1-p2)}{n2}}$$

$$p = \frac{15}{50} = 0.30$$

$np = 15 > 5$ และ $n(1-p) = 35$ จึงใช้การแจกแจงแบบปกติได้ ดังนั้นที่ 95 % CI ของ P $= 0.30 \pm$

$$1.96 \sqrt{\frac{(.3)(1-.3)}{50}} = 0.17, 0.43$$

Confidence intervals by modified Wald method

Agresti and Coull (The American Statistician. 52:119-126, 1998) recommend a method they term the modified Wald method . It is easy to compute by hand and is actually more accurate than the so-called "exact" method (below). Here are the results computed by the modified Wald method. (Bug in 90% and 99% CI fixed Feb 2006.)

The 90% confidence interval extends from 0.2055 to 0.4151
The 95% confidence interval extends from 0.1903 to 0.4383
The 99% confidence interval extends from 0.1633 to 0.4835

"Exact" confidence intervals

The confidence intervals below are calculated using the so-called "exact" confidence intervals, computed by the method of Clopper and Pearson (Biometrika 26:404-413, 1934), which is based on a relationship between the F distribution and the binomial distribution. The modified Wald intervals (above) may actually be more exact.

The 90% confidence interval extends from 0.1949 to 0.4237
The 95% confidence interval extends from 0.1786 to 0.4461
The 99% confidence interval extends from 0.1491 to 0.4900