



Central Australian
Aboriginal Congress

ABORIGINAL CORPORATION | ICN 7823

Title:
**Data driven approach for
Continuous Quality
Improvement - Step by
step method for analysing
data in CQI**

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**Central Australian
Aboriginal Congress**
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Topics covered

1. Select variable
2. Define variables
3. Define sampling strategy
4. Organise data
5. Visualise data



Step 1: Select variables



1. Select variables

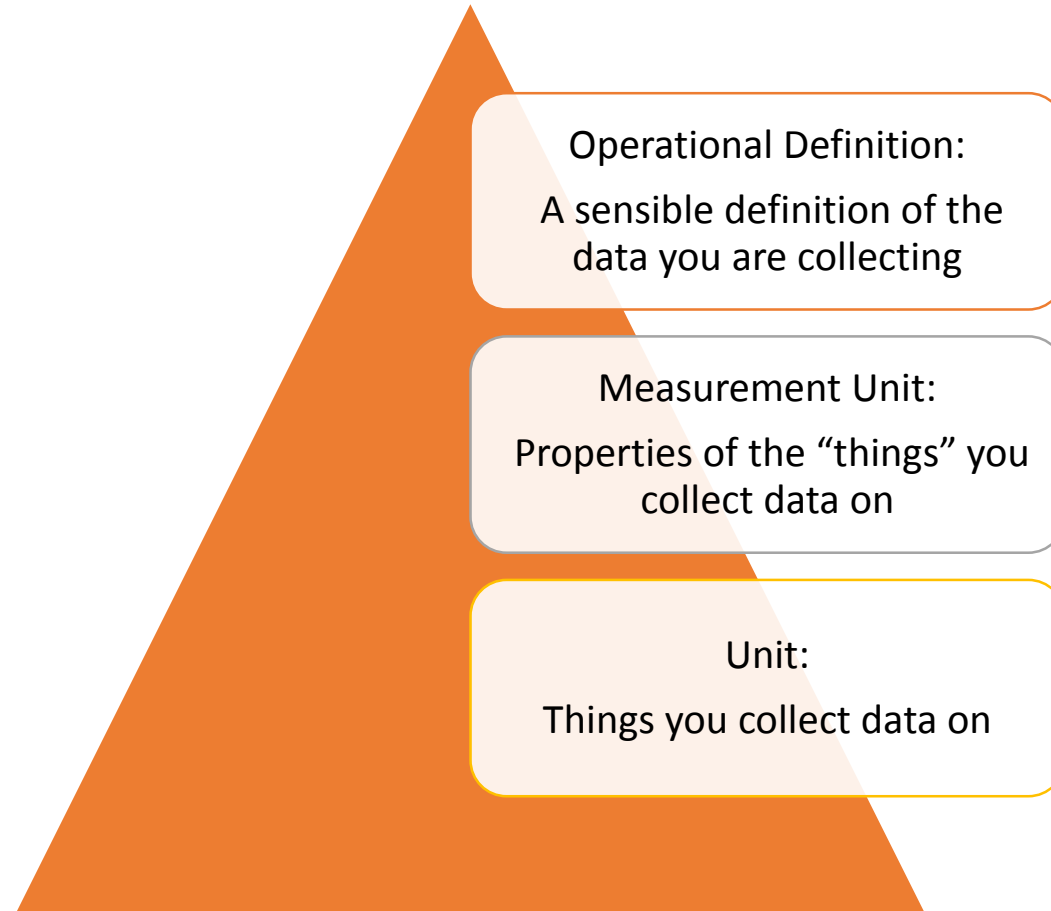
- A property or a characteristic of a service that is relevant to the project goal.
- Examples:
 - Processing time
 - Waiting time
 - Cost
 - Childhood Anaemia



Step 2: Define variable



Step 2. Define variables





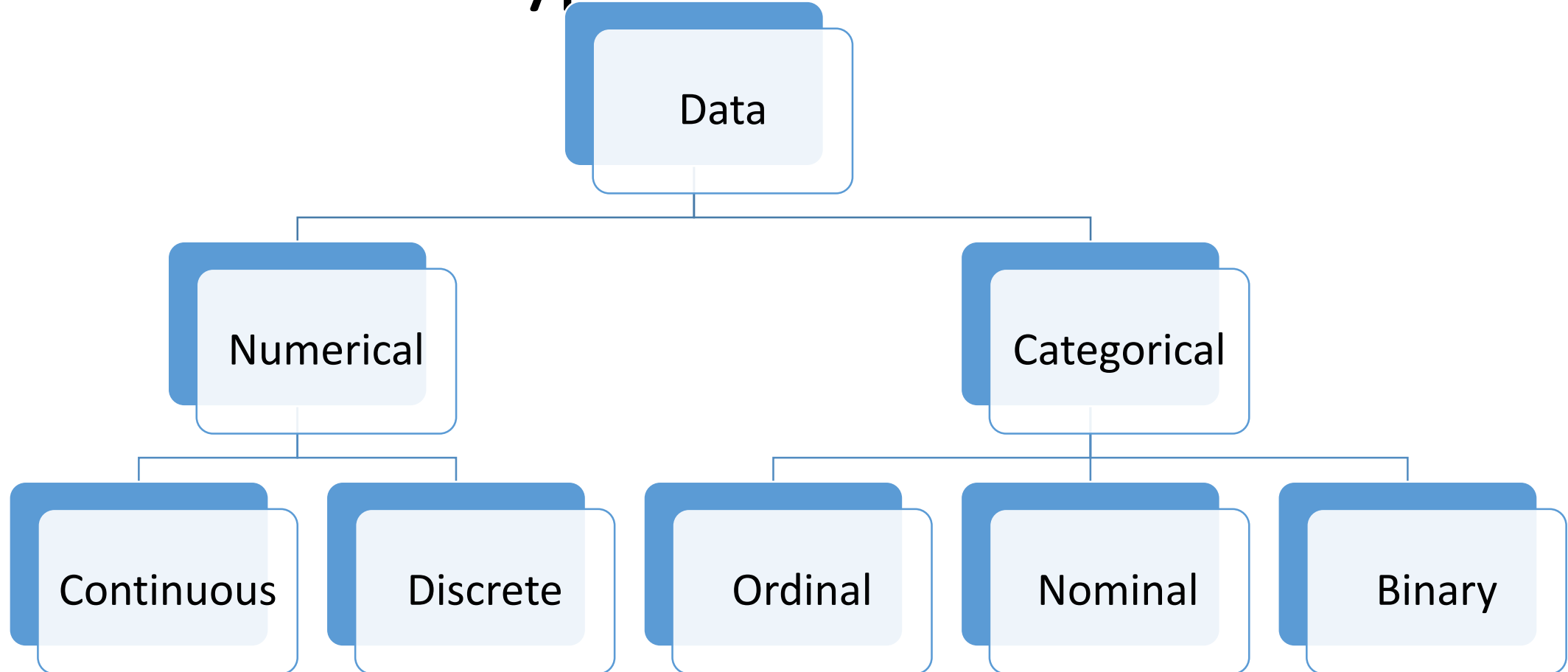
Step 2. Define variables....

Variable	Unit	Measurement unit	Operational definition
Number of Anaemic children	Child	Hb level of children	Number of children with Hb value of <105 for children aged between 6-11 month and <110 for children aged between 12-48 months for all children presented to the clinic in the last 12 months.
Time to treatment for children diagnosed with Anaemia	Child	Time in Days	Time between the date of diagnosis and the date of administration of first treatment.
% children received delayed treatment	Child	Delay in percentage	Proportion of anemic children commenced treatment 30 calendar days from the date of diagnosis.



2. Define Variables...

Types of variables





Define Variable

Data type		Description
Numerical	Continuous	A product characteristic that is continuous and can be measured on a continuous scale such as: weight, length, time, volume
	Discrete	Counted number of events: e.g.: number of errors in a memo, number of breakdowns per equipment.
Categorical	Ordinal	There is a well defined order among different categories (Very satisfied, satisfied, dissatisfied, very dissatisfied)
	Nominal	Unordered categories- Clinic name, staff name, clinician type
	Binary	Characteristic that can be classified into two categories- Yes/No, Pass/Fail etc



2. Define variables....

Variable	Unit	Measurement unit	Operational definition	Data type
Number of Anaemic children	Child	Hb level of children	Number of children with Hb value of <105 for children aged between 6-11 month and <110 for children aged between 12-48 months for all children presented to the clinic in the last 12 months.	Discrete
Time to treatment for children diagnosed with Anaemia	Child	Time in Days	Time between the date of diagnosis and the date of administration of first treatment for all children presented to the clinic in the last 12 months.	Continuous
% children received delayed treatment	Child	Delay in percentage	Proportion of Anemic children commenced treatment after 30 calendar days from the date of diagnosis for all children presented to the clinic in the last 12 months.	Binary



Why this distinction?

1. Information density

Client Number	Treatment delayed?	Time to treatment
1	Yes	5
2	No	10
3	Yes	5
4	Yes	4
5	No	8

2. Sample size

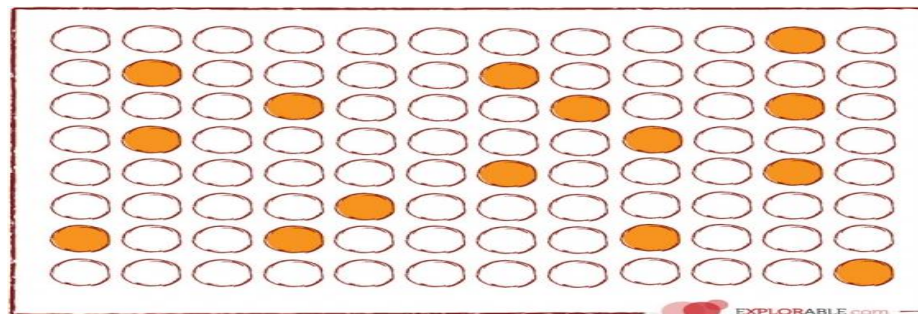
1. Numerical data: Minimum $N = 30$
2. Categorical data: Minimum $N = 300$

3. Variable type determines the type of data analysis or data visualization tool you should use.



3. Define sampling strategy

Simple random sampling.



Systematic sampling.



Stratified random sampling





Step 4: Organise data



4. Organise data

Unit	Variable 1	Variable 2	Variable 3
Client ID			
Client ID			



4.Organise data...

	Client ID	Hb mothers	Mother anaemic stat	Birth weight in Kg	LBW	Hb 6th Month	Child Anaemic stat	Time to treatment
1	1	120	No	3.22	No	108	No	0
2	2	118	No	4.16	No	107	No	0
3	3	119	No	3.80	No	107	No	0
4	4	110	No	1.98	Yes	107	No	0

Unit

Variables

Client ID	Clinic Treated	Mother anaemic stat	Mother Hb	Birth weight in Kg	LBW	Presentation to clinic 6-7 M	Age at first presentation	Child tested at first presentation	Hb at first presentation	Time to treatment	Treatment type	Hb After Treatment	Anaemic stat after treatment	Errors
1	Town	No	113	3.22	No	Yes	180	Yes	103	0	Iron Injection	116	No	
2	Town	No	108	4.16	No	Yes	181	Yes	98	198	Iron Injection	120	No	Delayed treatment
3	Town	No	113	3.8	No	Yes	268	Yes	103	0	Iron Injection	108	Yes	Treatment not completed
4	Town	No	109	1.98	Yes	Yes	186	Yes	99	0	Iron Injection	110	No	
5	Town	Yes	107	2.03	Yes	Yes	170	No	97	0	Iron Injection	111	No	Not tested
6	Town	Yes	114	2.76	No	No	366	Yes	104	0	Oral kit	118	No	Late presentation
7	Town	Yes	113	3.08	No	Yes	188	Yes	103	301	Iron Injection	120	No	Delayed treatment
8	Town	Yes	106	2.98	No	No	346	Yes	96	150	Iron Injection	92	Yes	Late presentation
9	Town	Yes	109	3	No	Yes	198	Yes	99	0	Oral kit	111	No	
10	Town	No	114	3.56	No	Yes	245	Yes	104	0	Iron Injection	114	No	
11	Town	Yes	114	2.7	No	Yes	181	Yes	104	6	Iron Injection	116	No	
12	Town	Yes	106	4.08	No	Yes	186	Yes	96	162	Iron Injection	127	No	Delayed treatment
13	Town	Yes	100	2.96	No	Yes	189	Yes	95	0	Oral kit	109	Yes	Treatment not completed
14	Town	Yes	109	3.7	No	Yes	190	Yes	99	0	Iron Injection	112	No	
15	Town	Yes	105	2.02	Yes	No	269	Yes	98	159	Iron Injection	111	No	Late presentation
16	Town	Yes	100	3	No	Yes	199	Yes	101	35	Iron Injection	112	No	Delayed treatment
17	Town	Yes	113	4.3	No	Yes	185	Yes	103	189	Oral kit	105	Yes	Delayed treatment
18	Town	Yes	112	2.4	Yes	Yes	205	Yes	104	0	Iron Injection	103	Yes	Treatment not completed
19	Town	Yes	99	3.25	No	Yes	231	Yes	102	2	Iron Injection	101	Yes	Treatment not completed
20	Utju	Yes	111	3.16	No	Yes	198	Yes	101	57	Oral kit	115	No	Delayed treatment
21	Utju	Yes	88	3.8	No	Yes	426	Yes	78	57	Oral kit	107	Yes	Delayed treatment
22	Utju	Yes	112	3.18	No	Yes	250	Yes	102	9	Iron Injection	97	Yes	Treatment not completed
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24	Utju	Yes	112	2.16	Yes	Yes	182	Yes	102	7	Iron Injection	121	No	
25	Utju	Yes	113	2.67	No	No	257	Yes	103	0	Iron Injection	121	No	Late presentation
27	Mutjitjulu	Yes	100	3.5	No	Yes	209	No	94	0	Iron Injection	124	No	Not tested
28	Mutjitjulu	Yes	100	2.7	No	Yes	290	Yes	102	198	Iron Injection	115	No	Delayed treatment
29	Mutjitjulu	Yes	98	3.64	No	Yes	275	Yes	103	89	Iron Injection	118	No	Delayed treatment
30	Mutjitjulu	Yes	104	3.32	No	No	235	Yes	100	168	Oral kit	104	Yes	Delayed treatment
31	Mutjitjulu	Yes	107	2.73	No	No	269	Yes	97	6	Iron Injection	122	No	
32	Mutjitjulu	Yes	114	3.1	No	Yes	199	Yes	104	186	Oral kit	94	Yes	Late presentation
33	Mutjitjulu	Yes	110	2.7	No	No	377	Yes	100	0	Iron Injection	117	No	



Step 5: Understanding and visualising data

5.1 Compute descriptive statistics

5.2 Visualising one variable

5.2 Visualising two variables

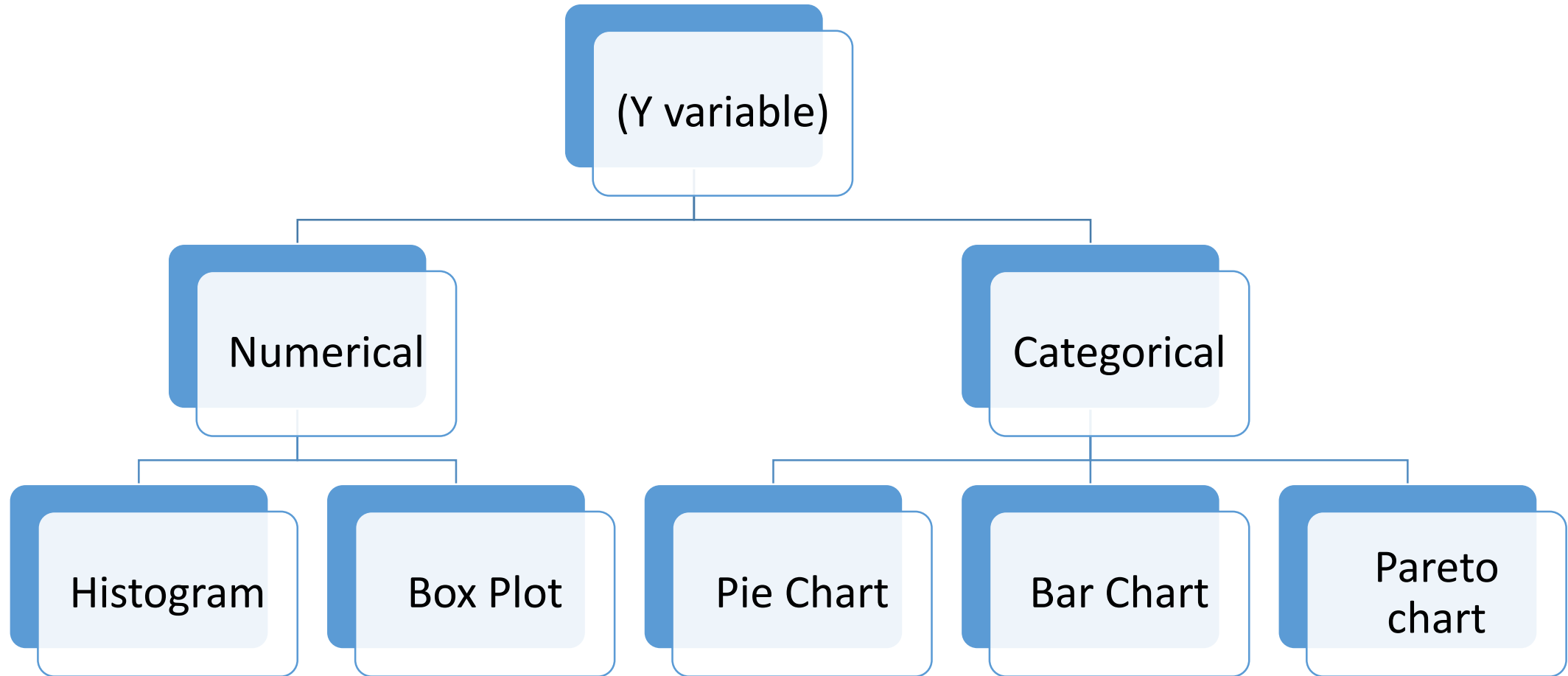


5.1 Compute descriptive statistics

- Applicable for numerical data only.
 - Mean (average)
 - Median – the middle value
 - Range (difference between the lowest and highest values)
 - Standard Deviation
 - Interquartile range



5.2 Visualising single variable





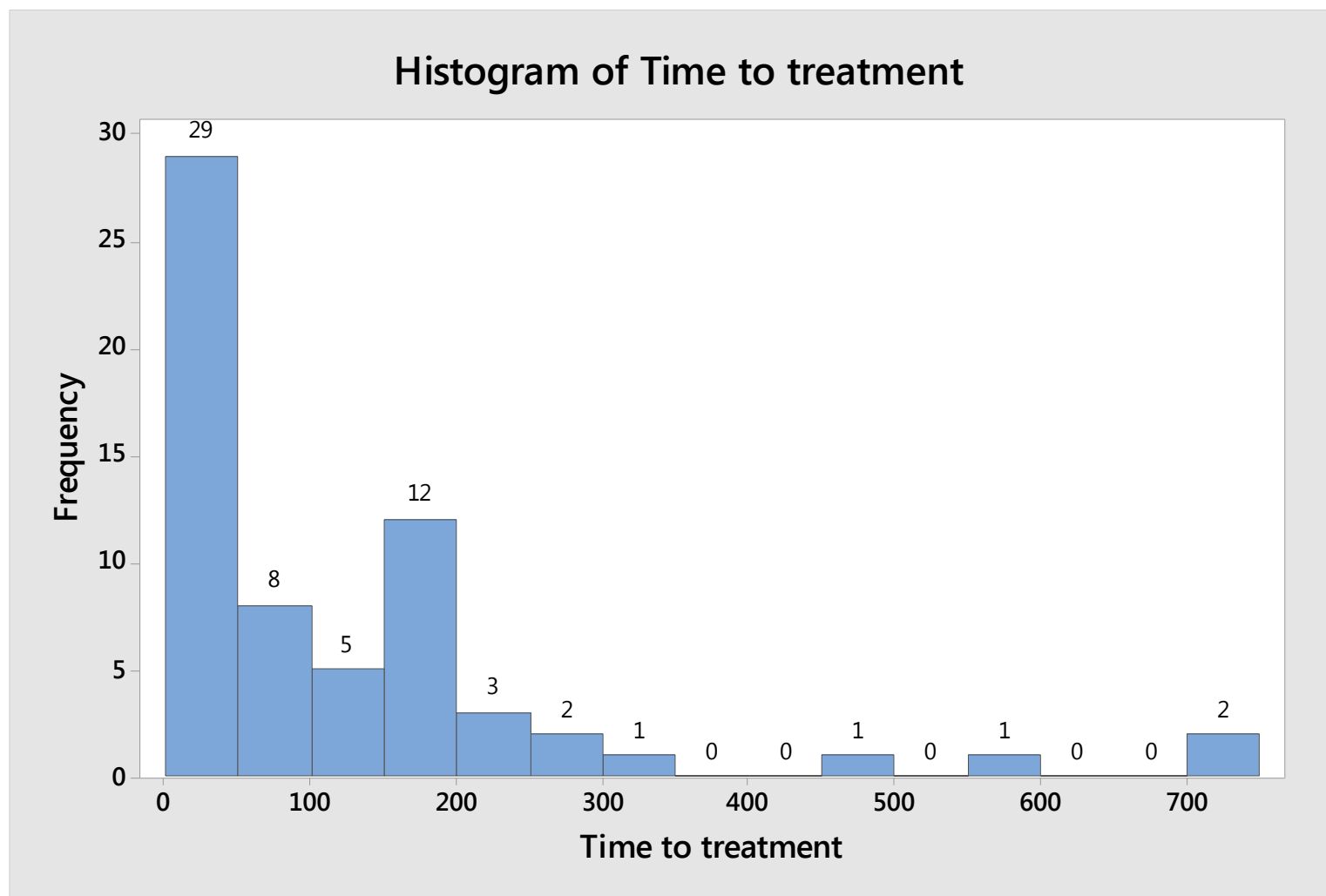
a. Numerical Y Variable

Client ID	Clinic Treated	Mother anaemic stat	Mother Hb	Child Birth weight in Kg	LBW	Child Presentation to clinic 6-7 M	Child Age at first presentation	Child Tested at first presentation	Child Hb at first presentation	Child Time to treatment	Treatment type	Hb After Treatment	Anaemic stat after treatment	Errors
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3	Town	No	113	3.8	No	Yes	268	Yes	103	0	Iron Injection			Treatment not completed
4	Town	No	109	1.98	Yes	Yes	186	Yes	99	0	Iron Injection			
5	Town	Yes	107	2.03	Yes	Yes	170	No	97	0	Iron Injection			Late presentation
6	Town	Yes	114	2.76	No	No	366	Yes	104	0	Oral kit			Late presentation
7	Town	Yes	113	3.08	No	Yes	188	Yes	103	301	Iron Injection			Late presentation
8	Town	Yes	106	2.98	No	No	346	Yes	96	150	Iron Injection			Late presentation
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10	Town	No	114	3.56	No	Yes	245	Yes	104	0	Iron Injection			
11	Town	Yes	114	2.7	No	Yes	181	Yes	104	6	Iron Injection	116	No	
12	Town	Yes	106	4.08	No	Yes	186	Yes	96	162	Iron Injection	127	No	Delayed treatment
13	Town	Yes	100	2.96	No	Yes	189	Yes	95	0	Oral kit	109	Yes	Treatment not completed
14	Town	Yes	109	3.7	No	Yes	190	Yes	99	0	Iron Injection	112	No	
15	Town	Yes	105	2.02	Yes	No	269	Yes	98	159	Iron Injection	111	No	Late presentation
16	Town	Yes	100	3	No	Yes	199	Yes	101	35	Iron Injection	112	No	Delayed treatment
17	Town	Yes	113	4.3	No	Yes	185	Yes	103	189	Oral kit	105	Yes	Delayed treatment
18	Town	Yes	112	2.4	Yes	Yes	205	Yes	104	0	Iron Injection	103	Yes	Treatment not completed
19	Town	Yes	99	3.25	No	Yes	231	Yes	102	2	Iron Injection	101	Yes	Treatment not completed
20	Utju	Yes	111	3.16	No	Yes	198	Yes	101	57	Oral kit	115	No	Delayed treatment
21	Utju	Yes	88	3.8	No	Yes	426	Yes	78	57	Oral kit	107	Yes	Delayed treatment

Numerical Y Variable



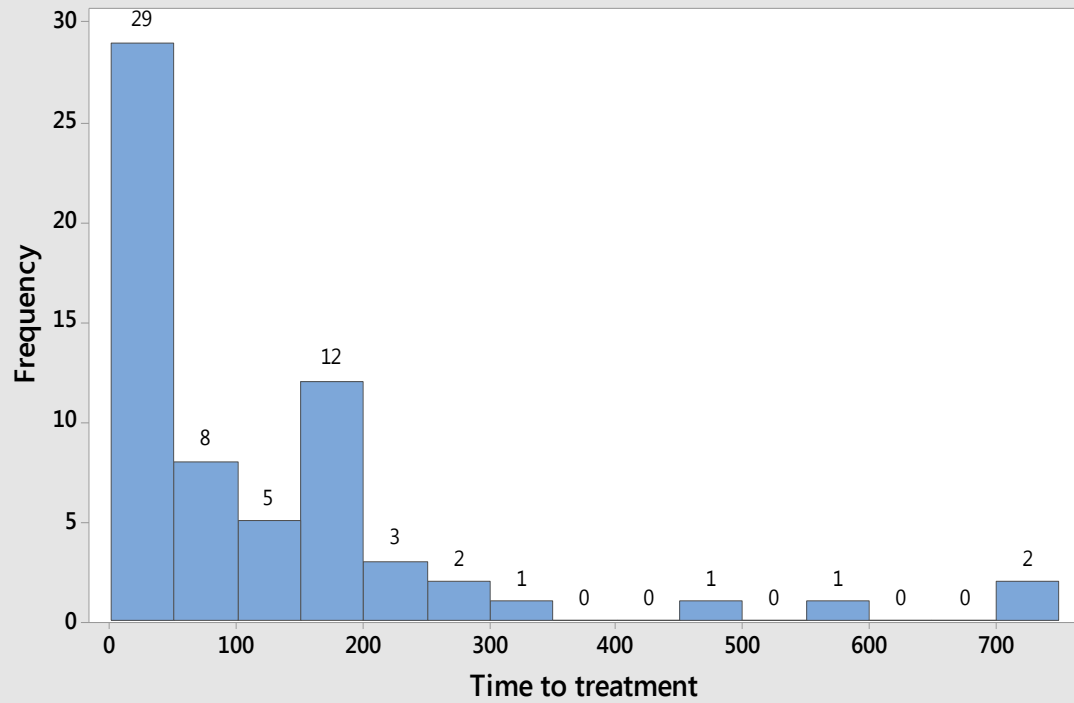
Histogram of time to treatment



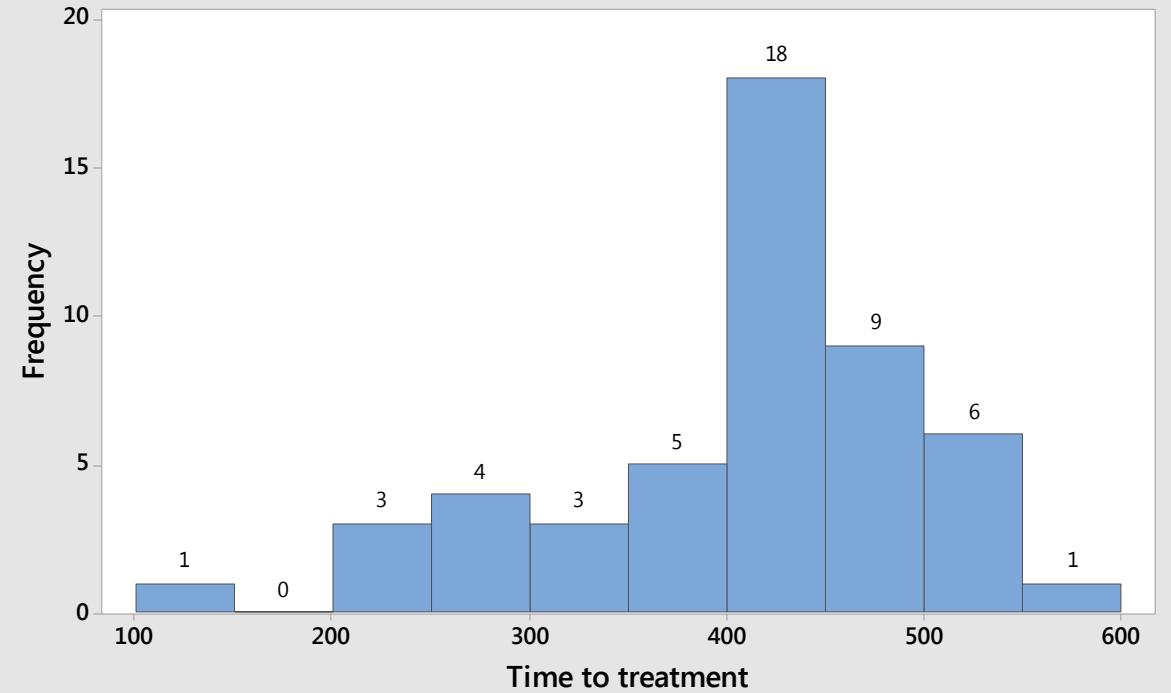


Histogram- Skewness

Histogram of Time to treatment

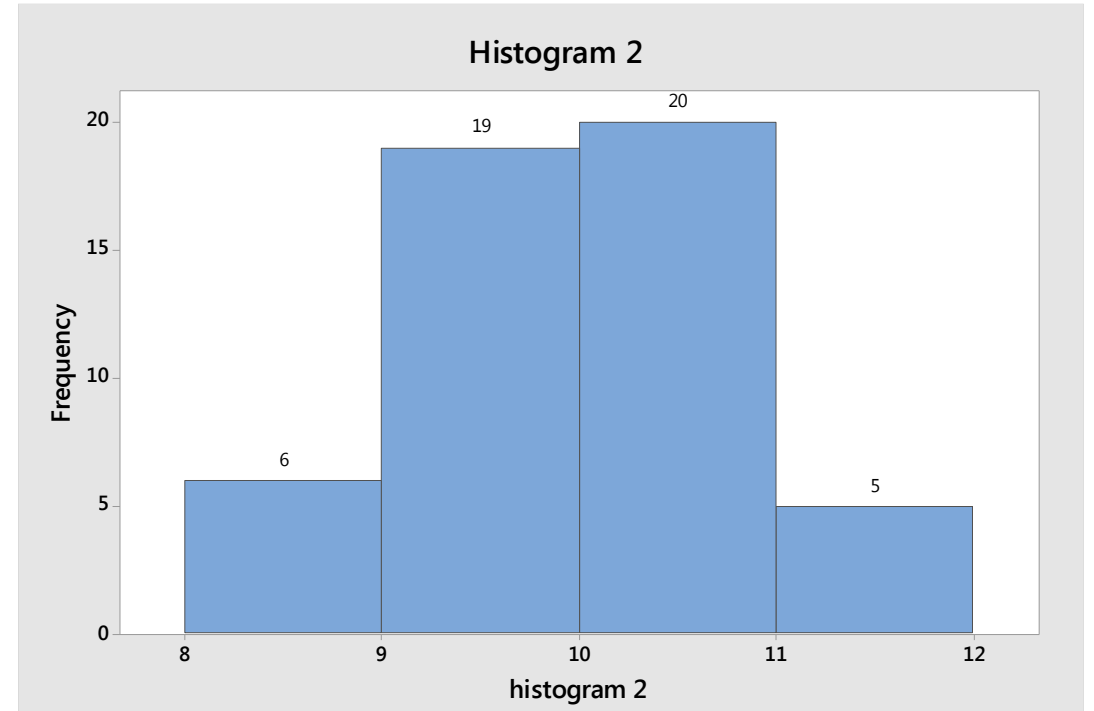
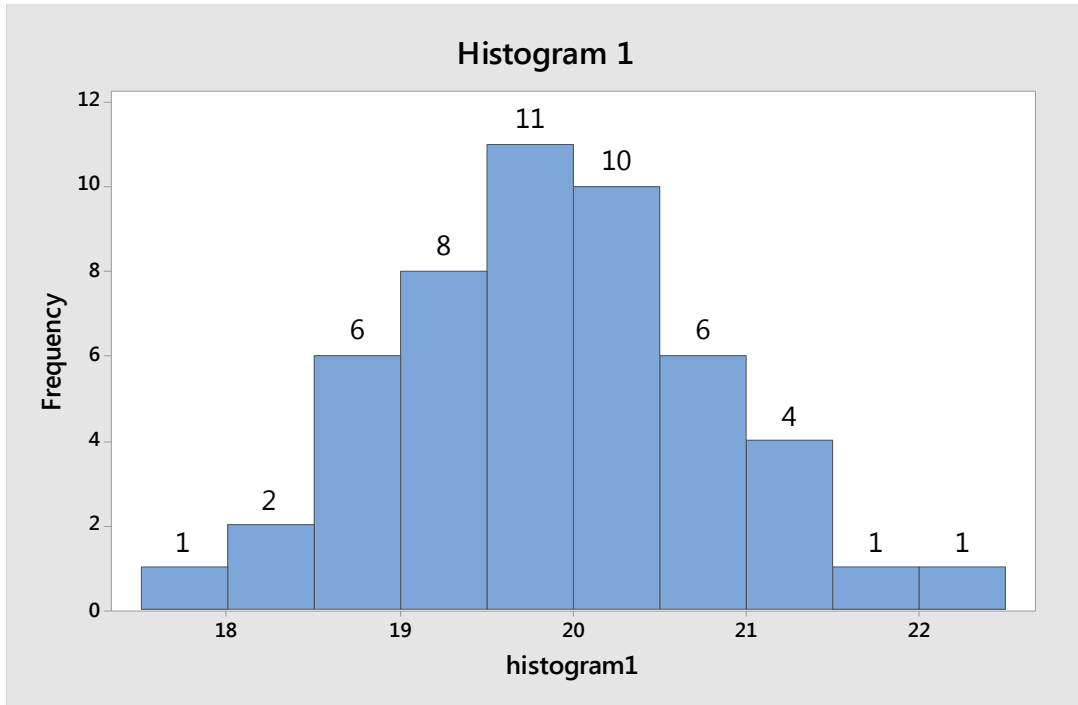


Histogram 2- Time to treatment



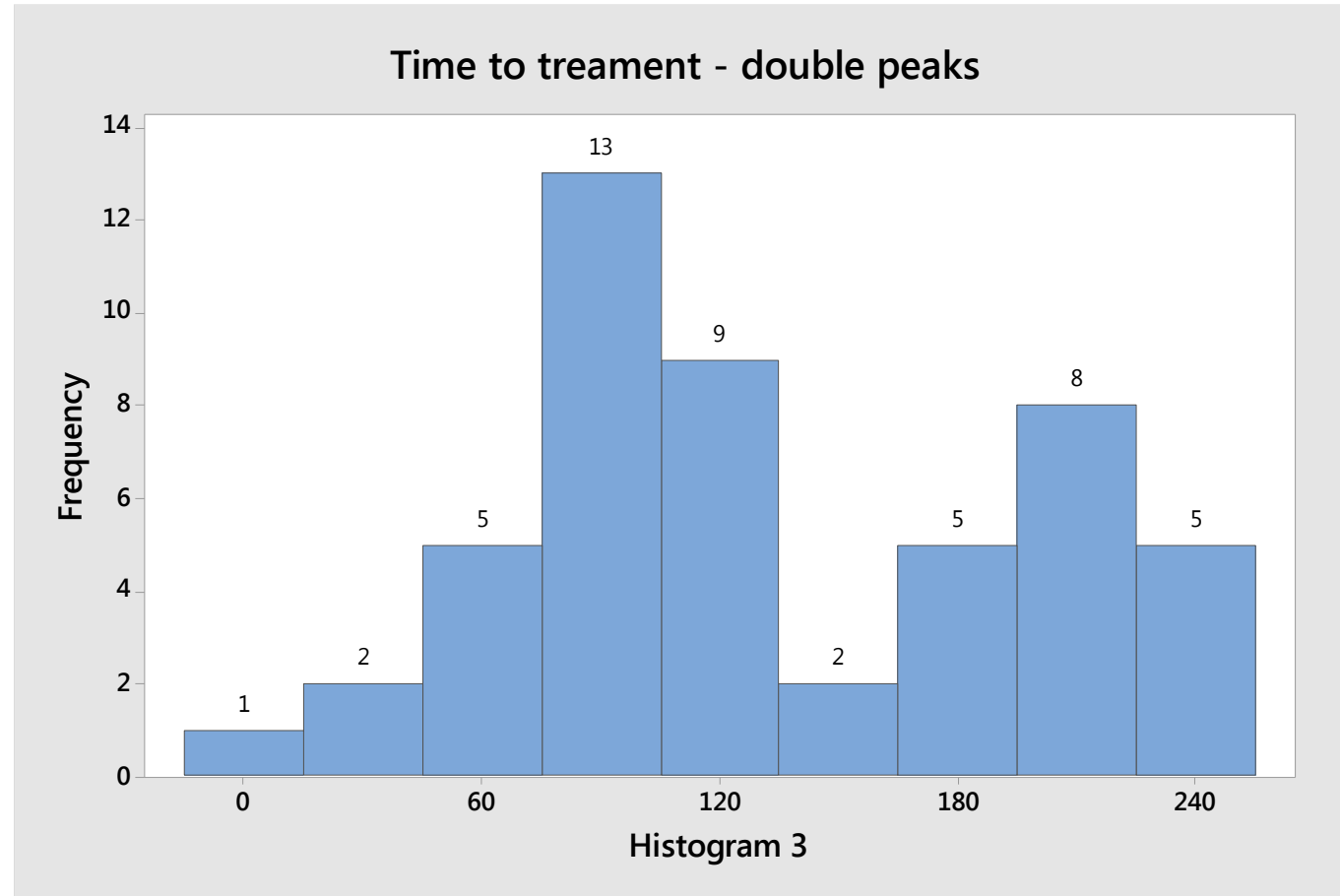


Histograms- Distribution of data





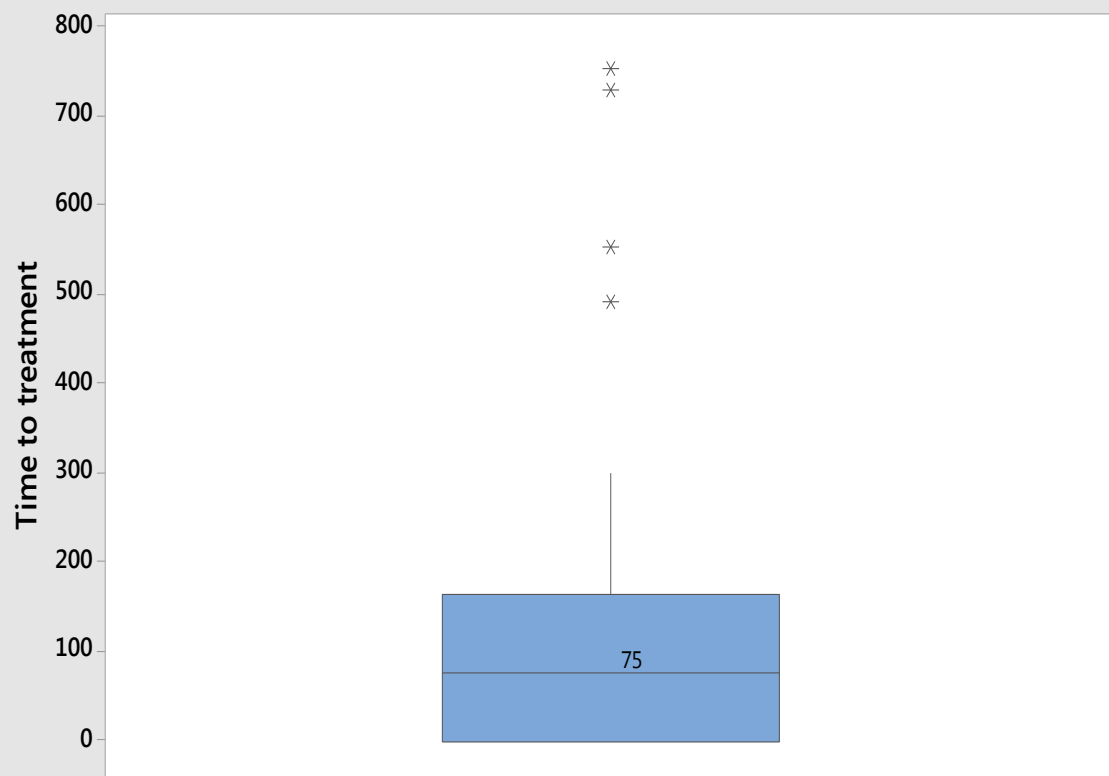
Histogram- Double peaks



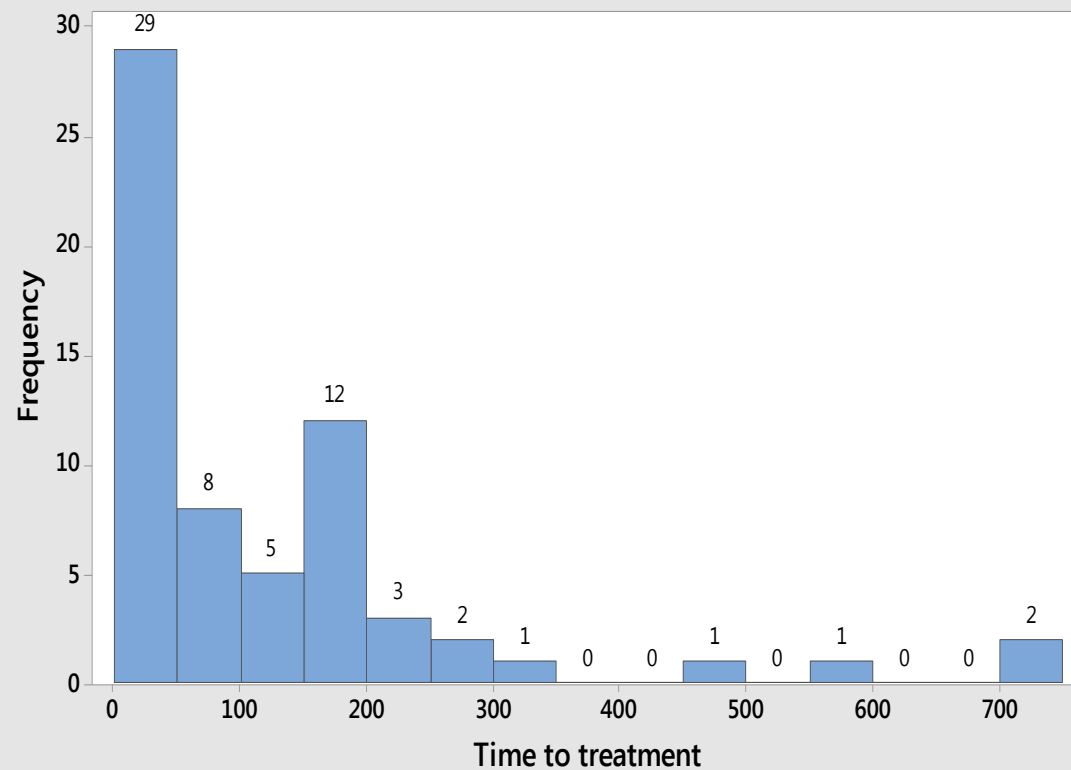


Box plots

Boxplot of Time to treatment

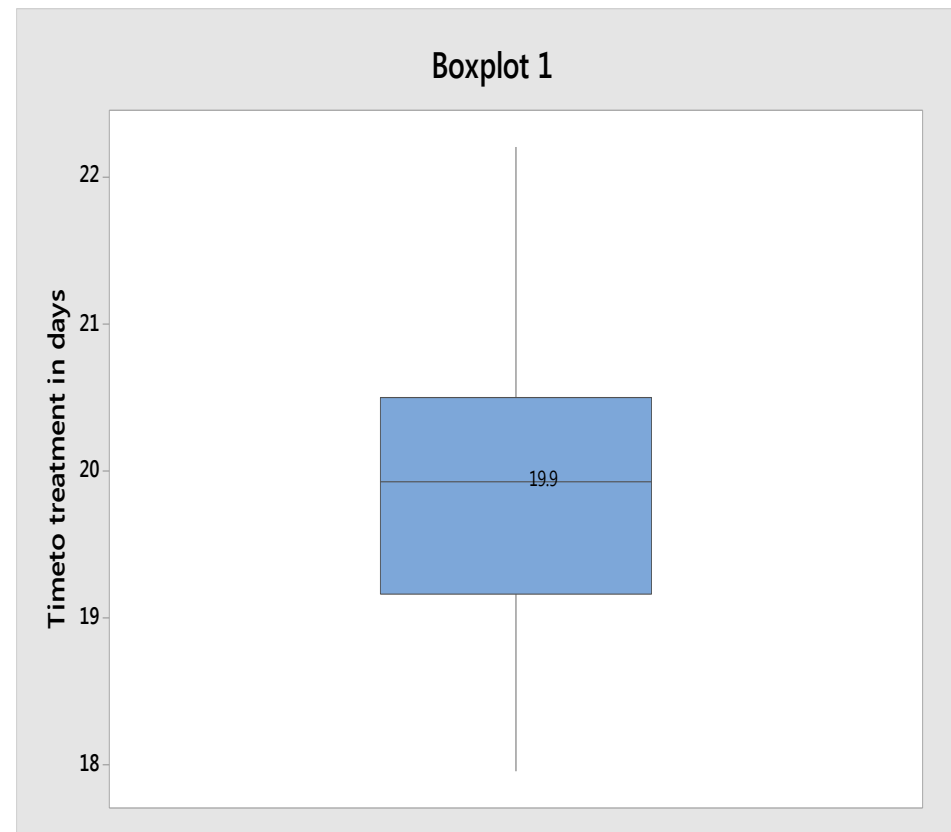
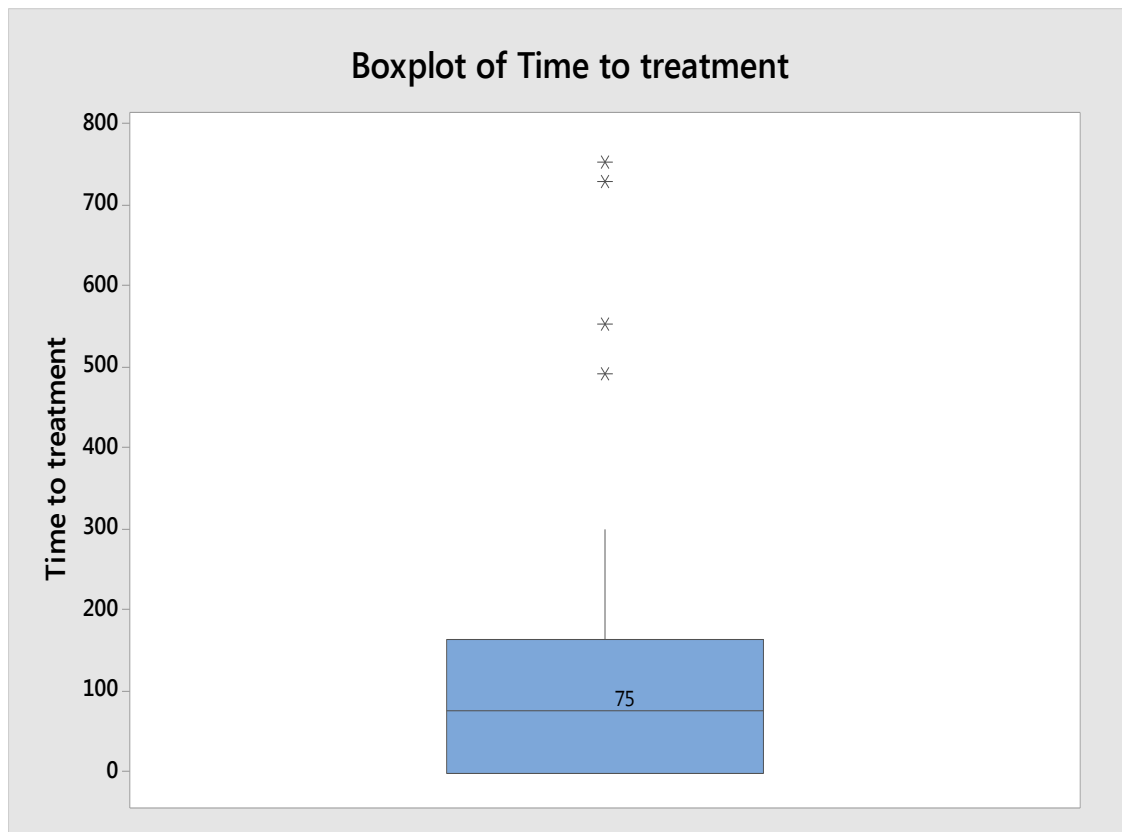


Histogram of Time to treatment





Box plot





b. Categorical Y Variable

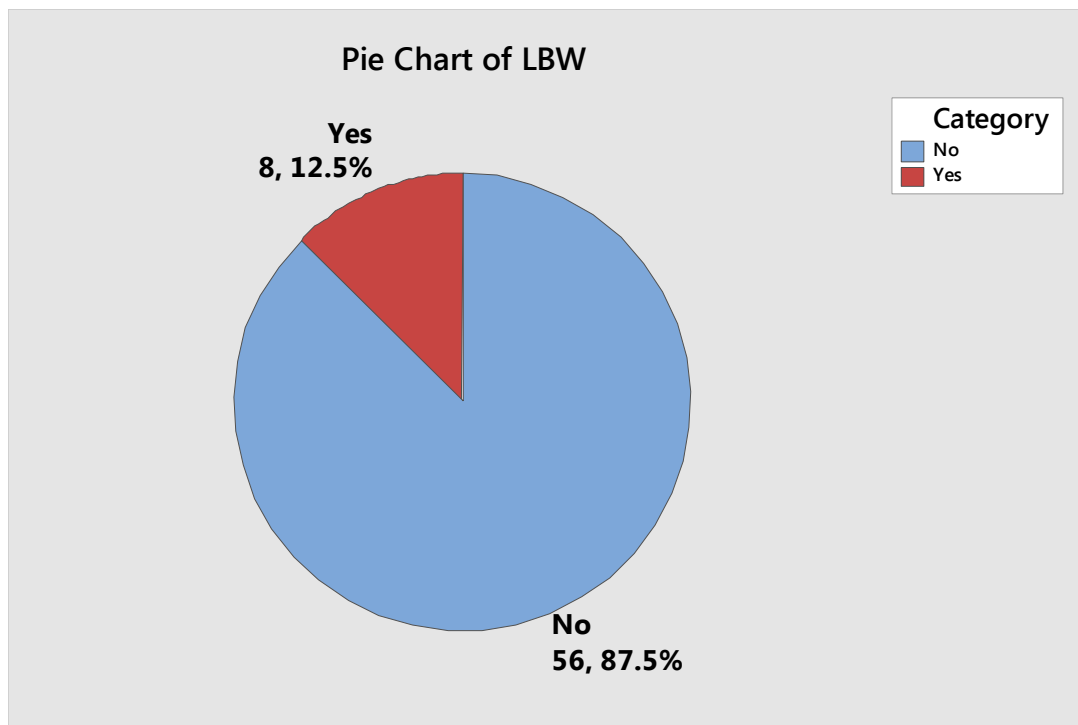
Client ID	Clinic Treated	Mother anaemic stat	Mother Hb	Child Birth weight in Kg	LBW	Child Presentation to clinic 6-7 M	Child Age at first presentation	Child Tested at first presentation	Child Hb at first presentation	Child Time to treatment	Treatment type	Hb After Treatment	Anaemic stat after treatment	Errors
1	Town	No	113	3.22	No	Yes	180	Yes	103	0	Iron Injection	116	No	
2	Town	No	108	4.16	No	Yes	181	Yes	98	198	Iron Injection	120	No	Delayed treatment
3	Town	No	113	3.8	No	Yes	268	Yes	103	0	Iron Injection	108	Yes	Treatment not completed
4	Town	No	109	1.98	Yes	Yes			99	0	Iron Injection	110	No	
5	Town	Yes	107	2.03	Yes	Yes			97	0	Iron Injection	111	No	Not tested
6	Town	Yes	114	2.76	No	No			104	0	Oral kit	118	No	Late presentation
7	Town	Yes	113	3.08	No	Yes			103	301	Iron Injection	120	No	Delayed treatment
8	Town	Yes	106	2.98	No	No			96	150	Iron Injection	92	Yes	Late presentation
9	Town	Yes	109	3	No	Yes			99	0	Oral kit	111	No	
10	Town	No	114	3.56	No	Yes			104	0	Iron Injection	114	No	
11	Town	Yes	114	2.7	No	Yes	181	Yes	104	6	Iron Injection	116	No	
12	Town	Yes	106	4.08	No	Yes	186	Yes	96	162	Iron Injection	127	No	Delayed treatment
13	Town	Yes	100	2.96	No	Yes	189	Yes	95	0	Oral kit	109	Yes	Treatment not completed
14	Town	Yes	109	3.7	No	Yes	190	Yes	99	0	Iron Injection	112	No	
15	Town	Yes	105	2.02	Yes	No	269	Yes	98	159	Iron Injection	111	No	Late presentation
16	Town	Yes	100	3	No	Yes	199	Yes	101	35	Iron Injection	112	No	Delayed treatment
17	Town	Yes	113	4.3	No	Yes	185	Yes	103	189	Oral kit	105	Yes	Delayed treatment
18	Town	Yes	112	2.4	Yes	Yes	205	Yes	104	0	Iron Injection	103	Yes	Treatment not completed
19	Town	Yes	99	3.25	No	Yes	231	Yes	102	2	Iron Injection	101	Yes	Treatment not completed
20	Utju	Yes	111	3.16	No	Yes	198	Yes	101	57	Oral kit	115	No	Delayed treatment
21	Utju	Yes	88	3.8	No	Yes	426	Yes	78	57	Oral kit	107	Yes	Delayed treatment

Numerical Y Variable

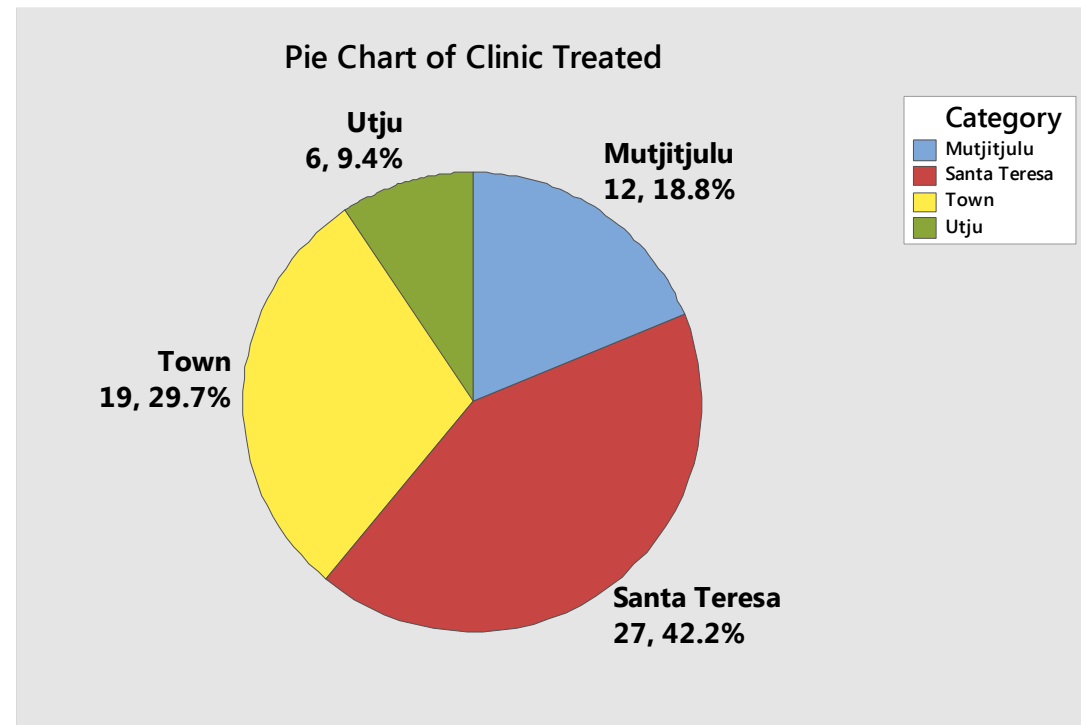


Pie Chart

Pie Chart of Low Birth Weight

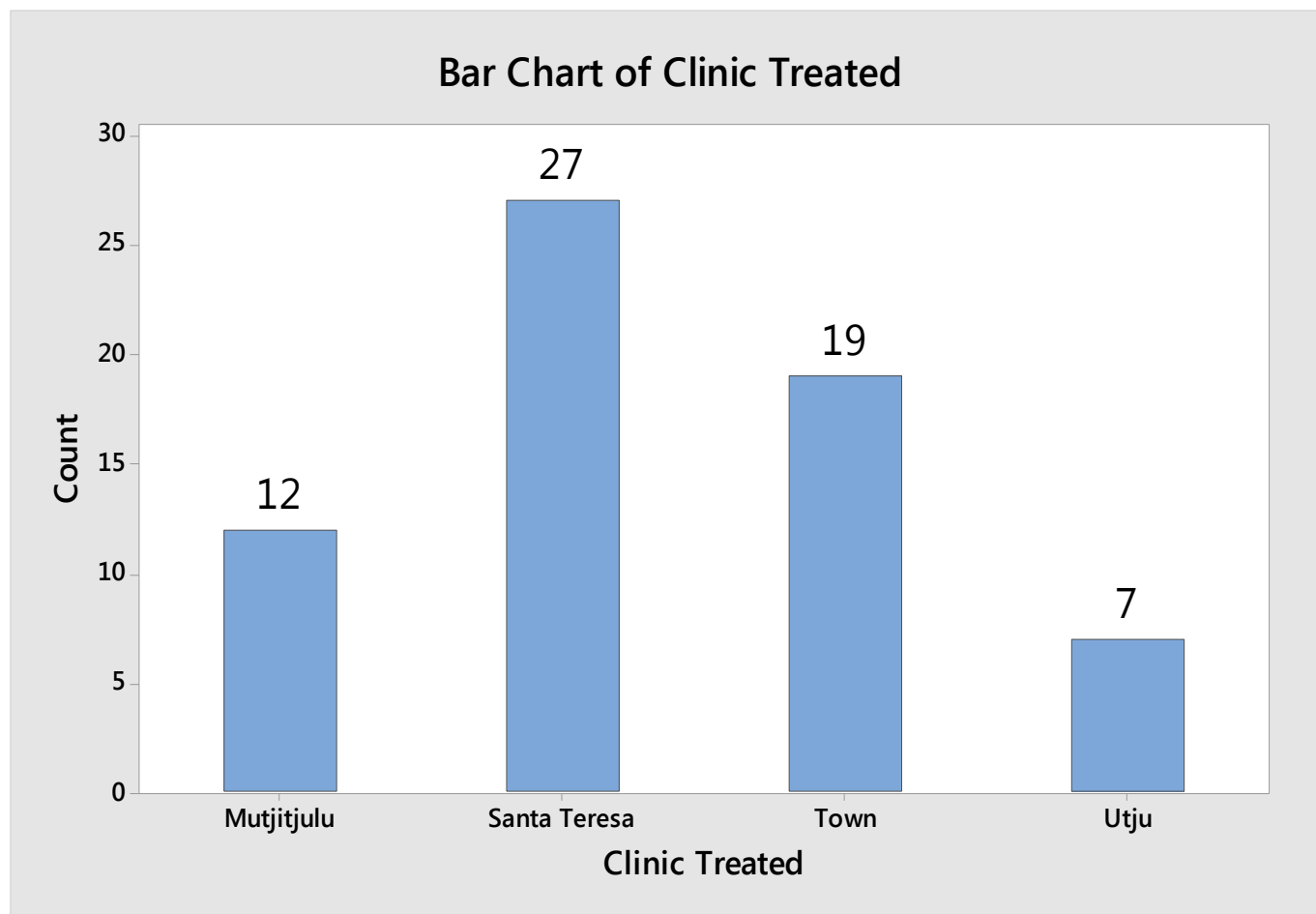


Pie Chart of Clinic Treated





Bar Chart



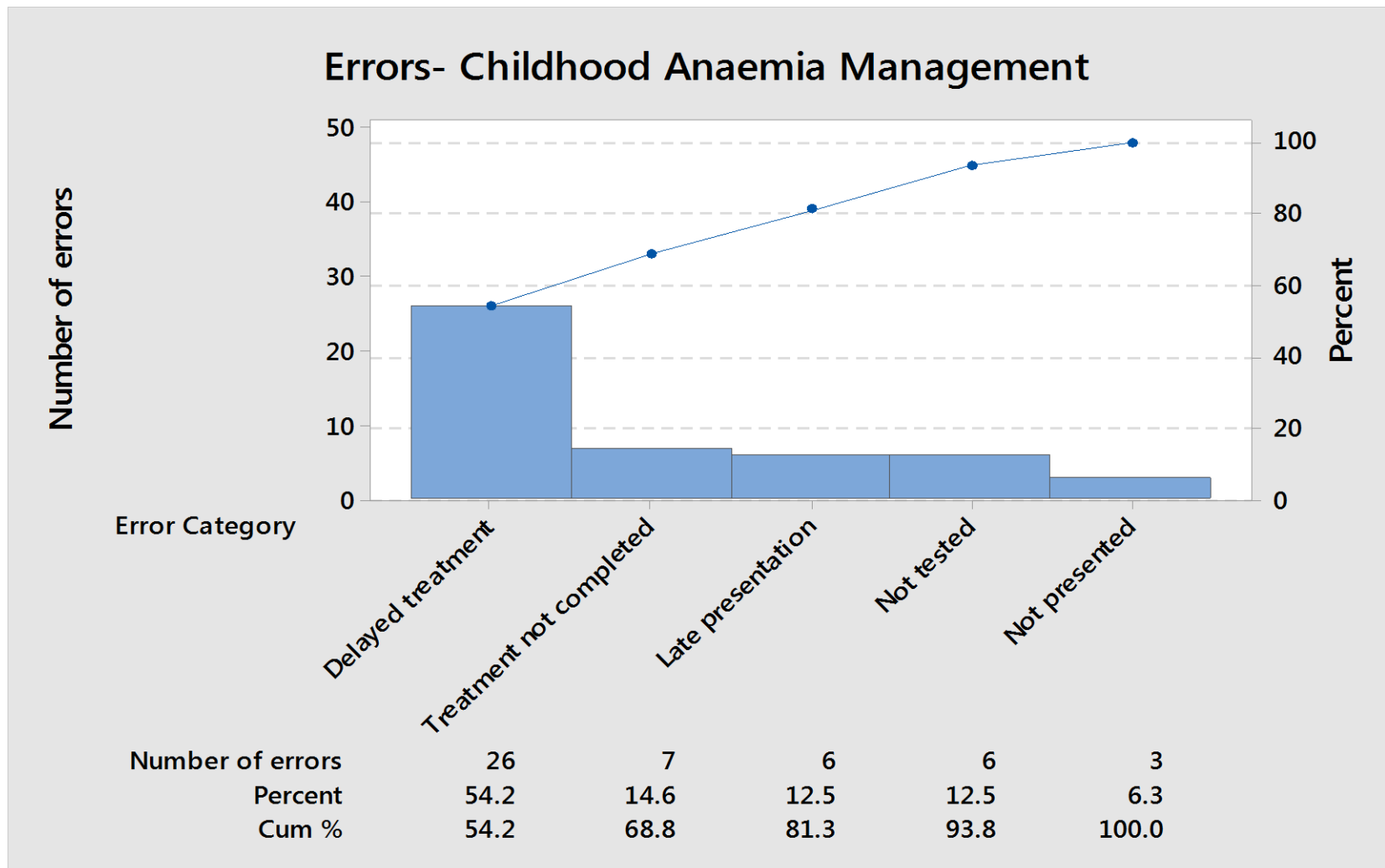


b. Categorical Y Variable....

Client ID	Clinic Treated	Mother anaemic stat	Mother Hb	Child Birth weight in Kg	LBW	Child Presentation to clinic 6-7 M	Child Age at first presentation	Child Tested at first presentation	Child Hb at first presentation	Child Time to treatment	Treatment type	Hb After Treatment	Anaemic stat after treatment	Errors
1	Town	No	113	3.22	No	Yes	180	Yes	103	0	Iron Injection	110	No	
2	Town	No	108	4.16	No	Yes	181	Yes	98	198	Iron Injection	120	No	Delayed treatment
3	Town	No	113	3.8	No	Yes	268	Yes	103	0	Iron Injection	108	Yes	Treatment not completed
4	Town	No	109	1.98	Yes	Yes	186	Yes	95	0	Iron Injection	110	No	
5	Town	Yes	107	2.03	Yes	Yes			97	0	Iron Injection	111	No	Not tested
6	Town	Yes	114	2.76	No	No			104	0	Oral kit	118	No	Late presentation
7	Town	Yes	113	3.08	No	Yes			103	301	Iron Injection	120	No	Delayed treatment
8	Town	Yes	106	2.98	No	No			96	150	Iron Injection	92	Yes	Late presentation
9	Town	Yes	109	3	No	Yes			99	0	Oral kit	111	No	
10	Town	No	114	3.56	No	Yes	245	Yes	104	0	Iron Injection	114	No	
11	Town	Yes	114	2.7	No	Yes	181	Yes	104	6	Iron Injection	116	No	
12	Town	Yes	106	4.08	No	Yes	186	Yes	96	162	Iron Injection	127	No	Delayed treatment
13	Town	Yes	100	2.96	No	Yes	189	Yes	95	0	Oral kit	109	Yes	Treatment not completed
14	Town	Yes	109	3.7	No	Yes	190	Yes	99	0	Iron Injection	112	No	
15	Town	Yes	105	2.02	Yes	No	269	Yes	98	159	Iron Injection	111	No	Late presentation
16	Town	Yes	100	3	No	Yes	199	Yes	101	35	Iron Injection	112	No	Delayed treatment
17	Town	Yes	113	4.3	No	Yes	185	Yes	103	189	Oral kit	105	Yes	Delayed treatment
18	Town	Yes	112	2.4	Yes	Yes	205	Yes	104	0	Iron Injection	103	Yes	Treatment not completed
19	Town	Yes	99	3.25	No	Yes	231	Yes	102	2	Iron Injection	101	Yes	Treatment not completed
20	Utju	Yes	111	3.16	No	Yes	198	Yes	101	57	Oral kit	115	No	Delayed treatment
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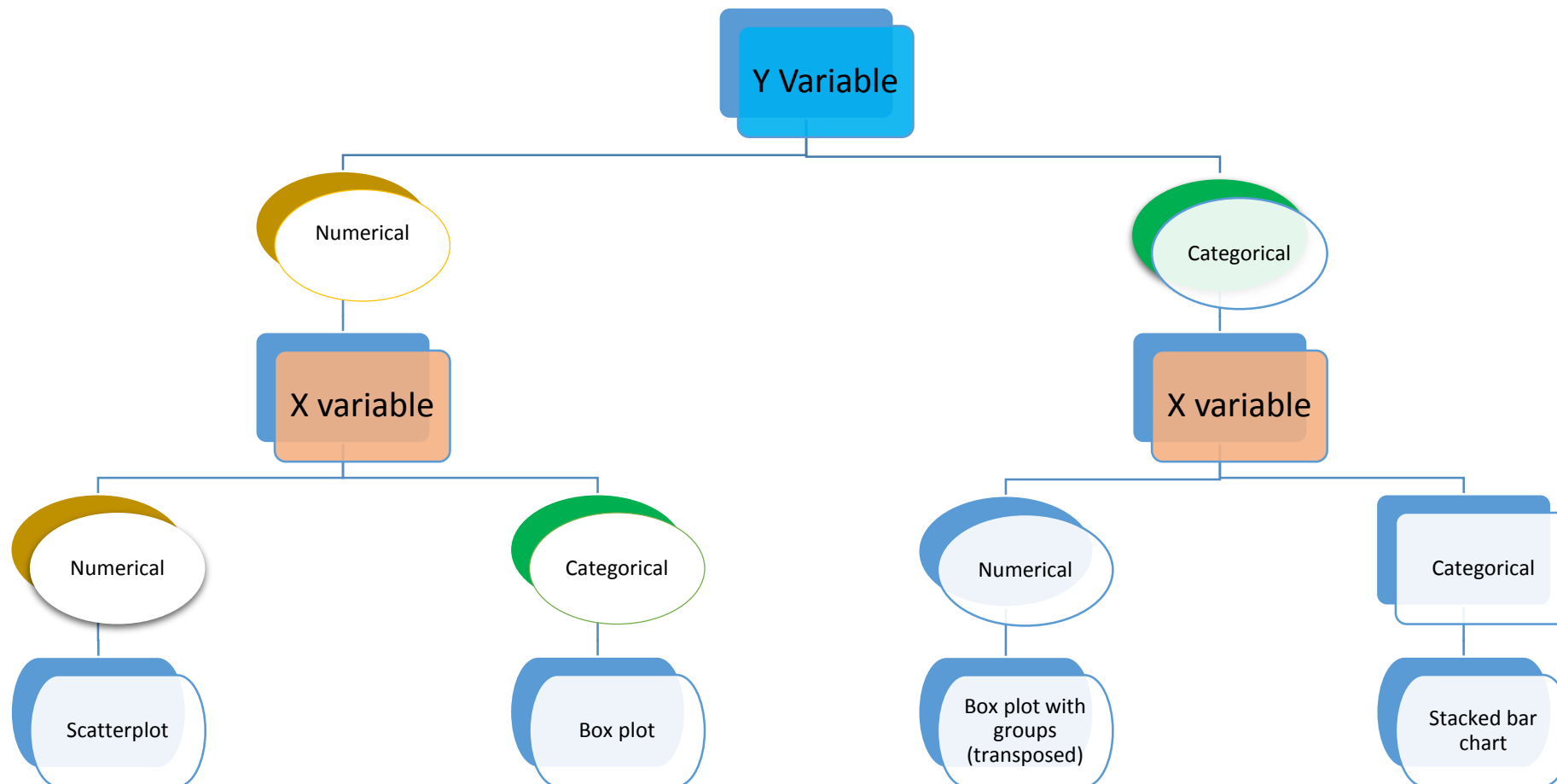


Pareto Chart





5.3 Visualising two variables



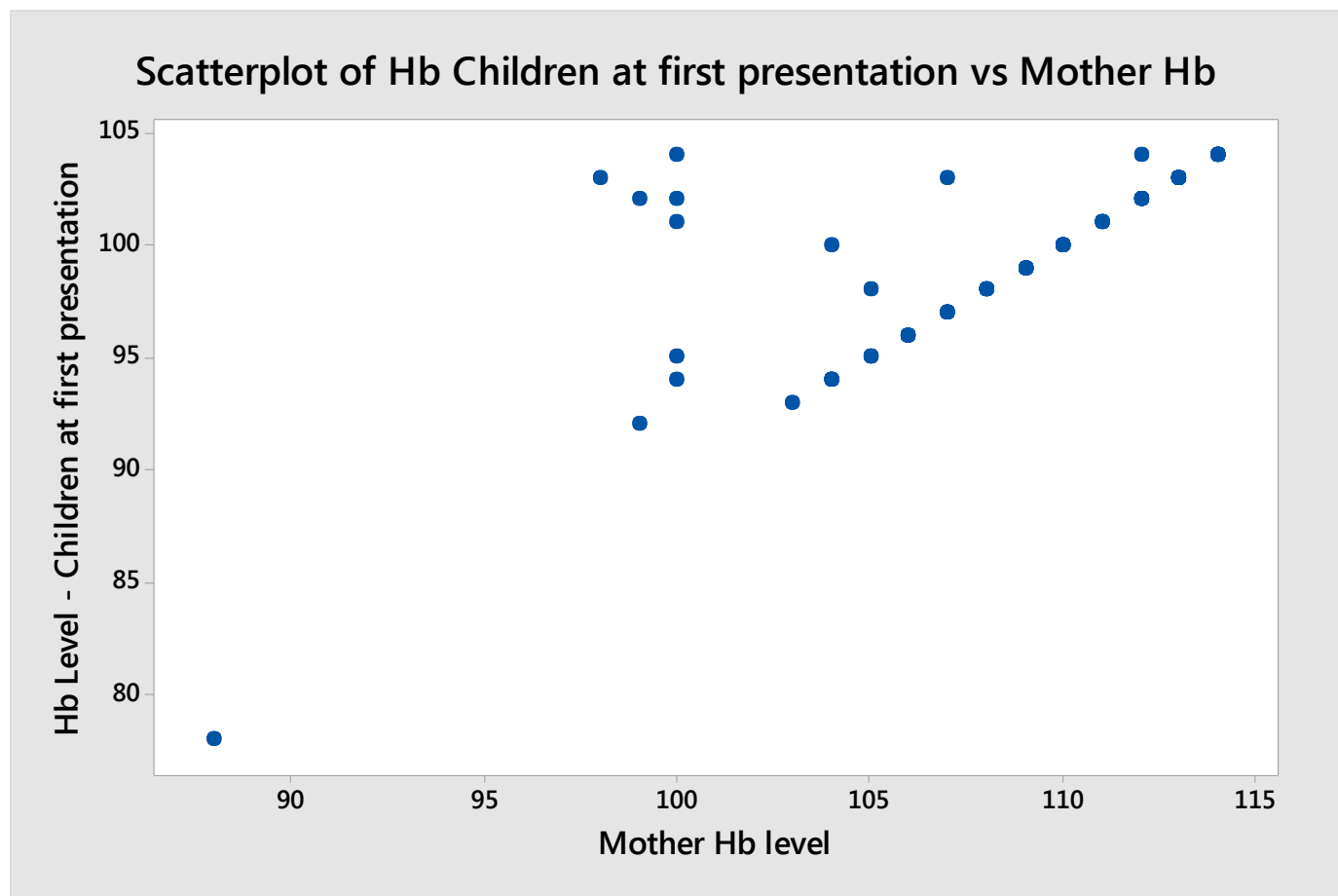


a. Numerical Y & Numerical X

Client ID	Clinic Treated	Mother anaemic stat	Mother Hb	Child Birth weight in Kg	LBW	Child Presentation to clinic 6-7 M	Child Age at first presentation	Child Tested at first presentation	Child Hb at first presentation	Child Time to treatment	Treatment type	Hb After Treatment	Anaemic stat after treatment	Errors
1	Town	No	115	3.22	No	Yes	180	Yes	103	0	Iron Injection	116	No	
2	Town	No	108	4.16	No	Yes	181	Yes	98	198	Iron Injection	120	No	Delayed treatment Treatment not completed
3	Town	No	113	2.8	No	Yes	268	Yes	103	0	Iron Injection	108	Yes	
4	Town	No	109	2.76	No	Yes	186	Yes	99	0	Iron Injection	110	No	
5	Town	Yes	107	2.1	No	No	170	No	97	0	Iron Injection	111	No	Not tested
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10	Town	No	114	3.08	No	Yes	245	Yes	104	0	Iron Injection	110	No	
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22	Utju	Yes	112	3.18	No	Yes	250	Yes	102	9	Iron Injection	97	Yes	Treatment not completed
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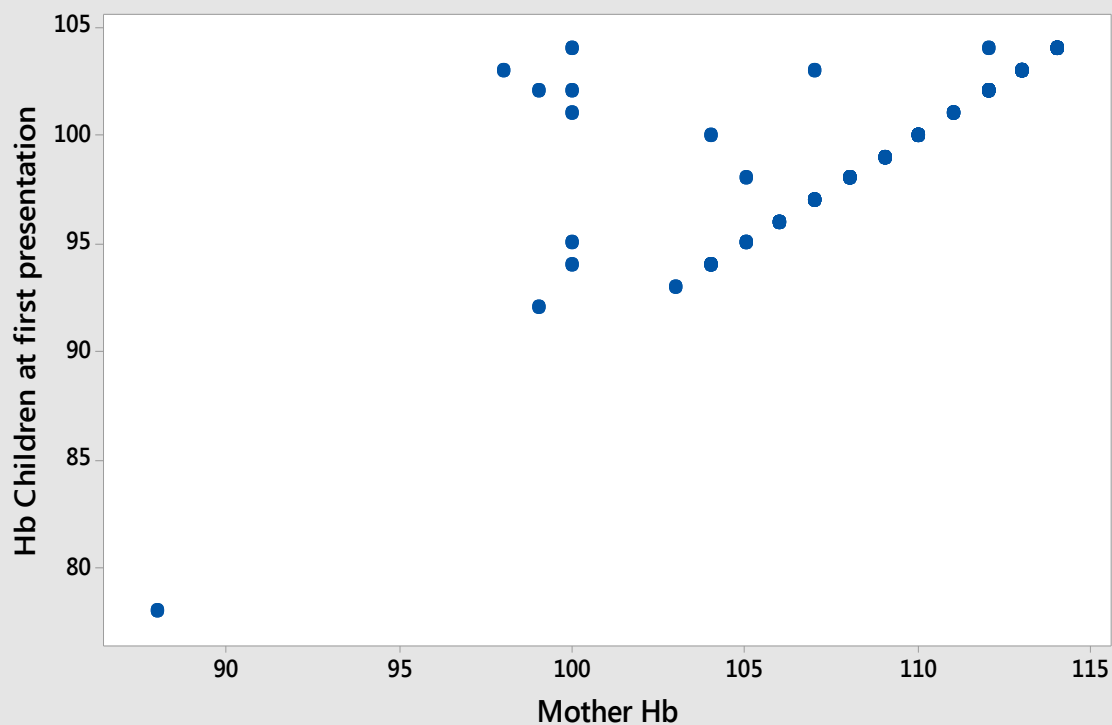
a. Scatter plot



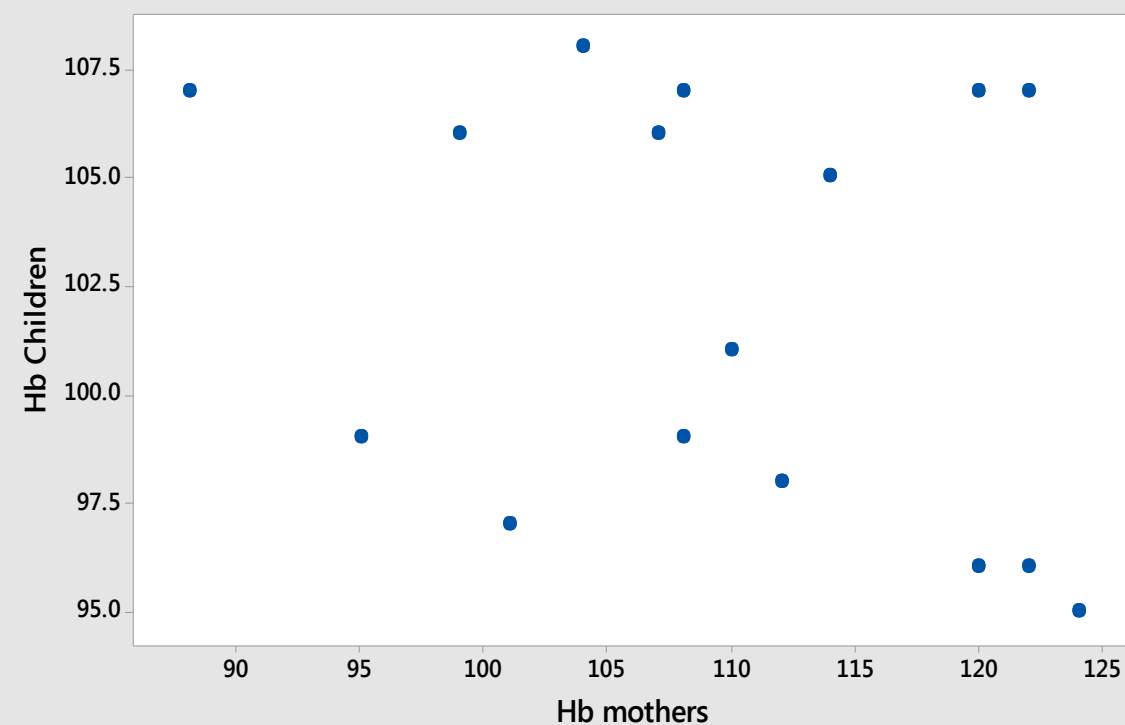


Numerical Y & Numerical X: Scatter plots

Scatterplot of Hb Children at first presentation vs Mother Hb



Scatterplot of Hb Children vs Hb mothers





b. Numerical Y & Categorical X

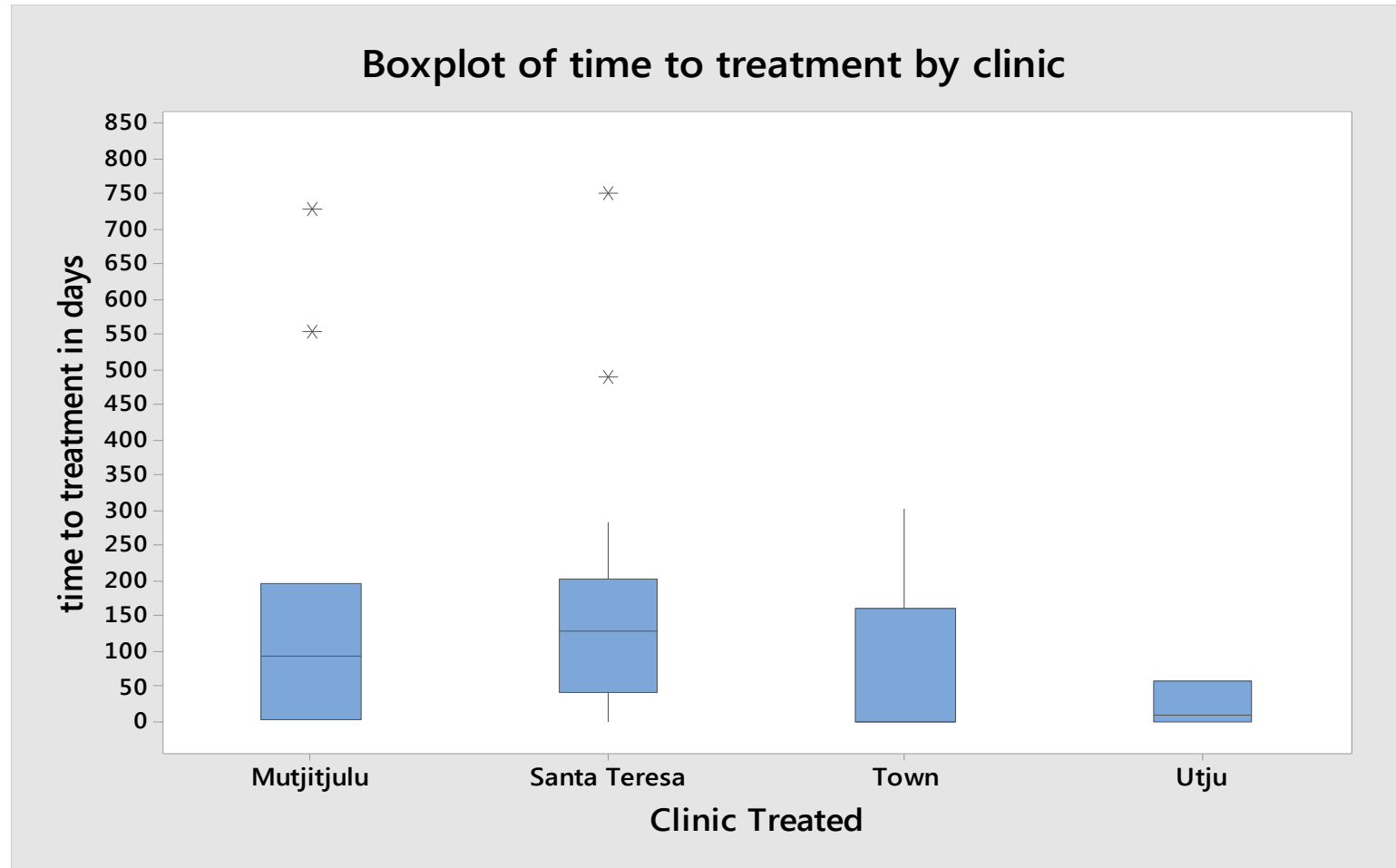
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3	Town	No			No	Yes	268	Yes	103	0	Iron Injection	108	Yes	Treatment not completed
4	Town	No				Yes	186	Yes	99	0	Iron Injection			
5	Town	Yes				Yes	170	No	97	0	Iron Injection			Delayed presentation
6	Town	Yes				No	366	Yes	104	0	Iron Oral kit			
7	Town	Yes				Yes	188	Yes	103	301	Iron Injection			Delayed treatment
8	Town	Yes			No	No	346	Yes	96	150	Iron Injection			Delayed presentation
9	Town	Yes			3	Yes	198	Yes	99	0	Iron Oral kit			
10	Town	No	114	3.56	No	Yes	245	Yes	104	0	Iron Injection			
11	Town	Yes	114	2.7	No	Yes	181	Yes	104	6	Iron Injection	116	No	
12	Town	Yes	106	4.08	No	Yes	186	Yes	96	162	Iron Injection	127	No	Delayed treatment
13	Town	Yes	100	2.96	No	Yes	189	Yes	95	0	Iron Oral kit	109	Yes	Treatment not completed
14	Town	Yes	109	3.7	No	Yes	190	Yes	99	0	Iron Injection	112	No	
15	Town	Yes	105	2.02	Yes	No	269	Yes	98	159	Iron Injection	111	No	Late presentation
16	Town	Yes	100	3	No	Yes	199	Yes	101	35	Iron Injection	112	No	Delayed treatment
17	Town	Yes	113	4.3	No	Yes	185	Yes	103	189	Iron Oral kit	105	Yes	Delayed treatment
18	Town	Yes	112	2.4	Yes	Yes	205	Yes	104	0	Iron Injection	103	Yes	Treatment not completed

Categorical X Variable

Numerical Y Variable



b. Numerical Y & Categorical X: Box plot



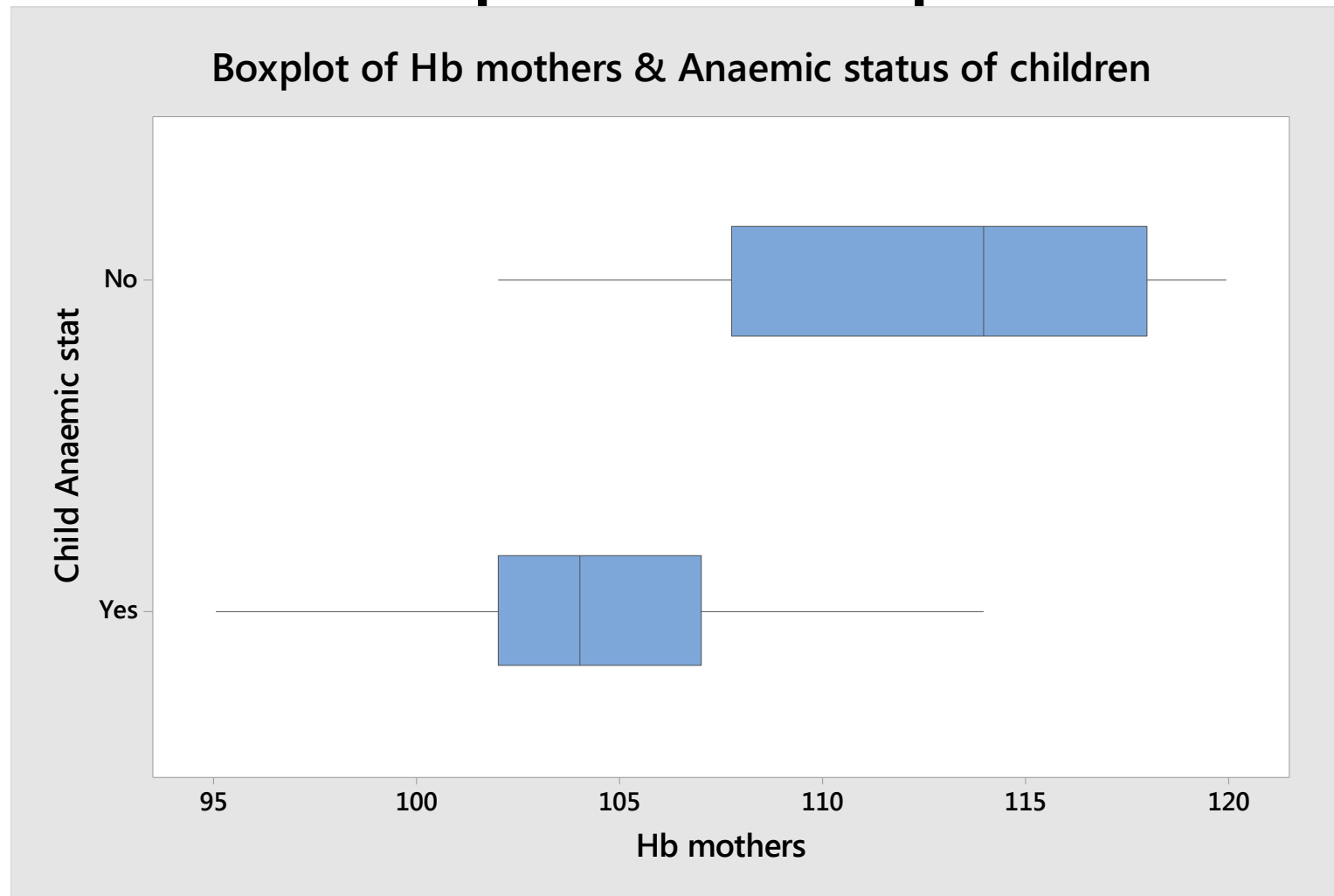


c. Categorical Y & Numerical X

Client ID	Hb mothers	Mother anaemic stat	Child Birth weight in Kg	LBW	Child Hb 6th Month	Child Anaemic stat 6 th Month	Child Time to treatment	Clinic Treated	Treatment type	Child Hb After Treatment
1	120	No	3.8	No	108	No	0	Town	Iron Injection	116
2	118	No			107	No	0	Town	Iron Injection	120
3	119	No			107	No	0	Town	Iron Injection	108
4	110	No			107	No	0	Town	Iron Injection	110
5	105	Yes			97	Yes	0	Town	Iron Injection	111
6	104	Yes			107	No	0	Town	Iron Injection	118
7	103	Yes			105	No	0	Town	Iron Injection	120
8	102	Yes			96	Yes	0	Town	Iron Injection	92
9	103	Yes			99	Yes	0	Town	Iron Injection	111
10	111	NO			106	No	0	Town	Iron Injection	114
11	107	Yes			106	No	0	Town	Iron Injection	116
12	102	Yes	4.08	No	96	Yes	0	Town	Iron Injection	127
13	103	Yes	2.96	No	95	Yes	0	Town	Oral kit	109
14	106	Yes	3.7	No	99	Yes	0	Town	Iron Injection	112
15	102	Yes	2.02	Yes	98	Yes	159	Town	Iron Injection	111
16	101	Yes	3	No	101	Yes	35	Town	Iron Injection	112
17	103	Yes	4.3	No	103	Yes	189	Town	Oral kit	105
18	105	Yes	2.4	Yes	104	Yes	0	Town	Iron Injection	103
19	100	Yes	3.25	No	102	Yes	2	Town	Iron Injection	101
20	102	Yes	3.16	No	101	Yes	57	Utju	Oral kit	115
21	95	Yes	3.8	No	78	Yes	57	Utju	Oral kit	107
22	100	Yes	3.18	No	102	Yes	9	Utju	Iron Injection	97
23	103	Yes	2.9	No	98	Yes	0	Utju	Iron Injection	111
24	100	Yes	2.16	Yes	102	Yes	7	Utju	Iron Injection	121
25	102	Yes	2.67	No	105	No	0	Utju	Iron Injection	121



c. Categorical Y & Numerical X: Transposed Box plots





d. Categorical Y & Categorical X

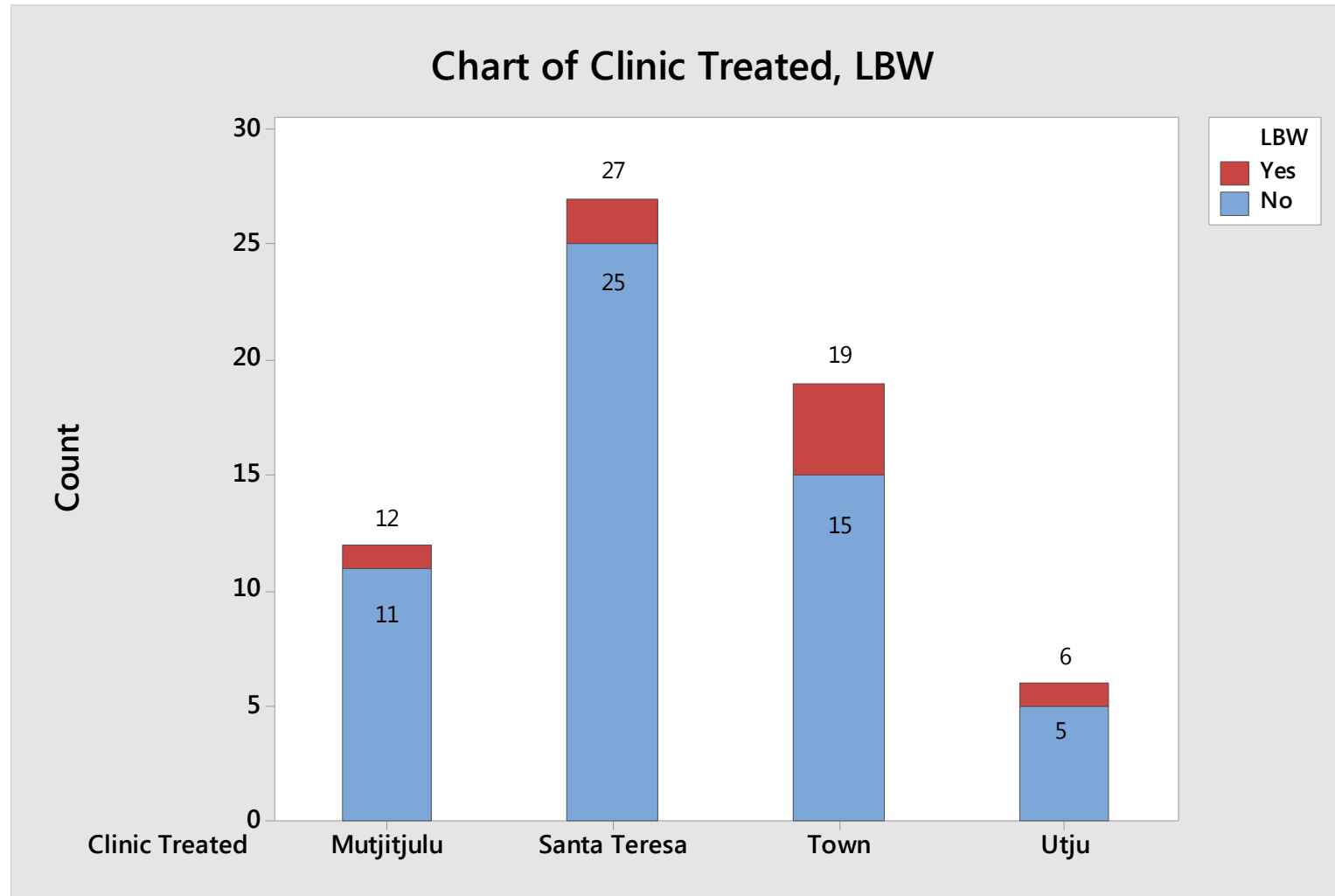
Client ID	Clinic Treated	Mother anaemic stat	Mother Hb	Child Birth weight in Kg	LBW	Child Presentation to clinic 6-7 M	Child Age at first presentation n	Child Tested at first presentation	Child Hb at first presentation n	Child Time to treatment	Treatment type	Hb After Treatment	Anaemic stat after treatment	Errors
1	Town	No	113	3.22	No	Yes	180	Yes	103	0	Iron Injection	116	No	
2	Town	No	108	4.16	No	Yes	181	Yes		198	Iron Injection	120	No	Delayed treatment Treatment not completed
3	Town	No	113	3.8	No	Yes		Yes	103	0	Iron Injection	108	Yes	
4	Town	No	109	1.98	Yes	Yes			99	0	Iron Injection	110	No	
5	Town	Yes	107	2.03	Yes	Yes			97	0	Iron Injection	111	No	Not tested
6	Town	Yes	114	2.76	No	No			104	0	Oral kit	118	No	Not tested
7	Town	Yes	113	3.08	No	Yes			103	301	Iron Injection			
8	Town	Yes	106	2.98	No	No			96	150	Iron Injection			
9	Town	Yes	109	3	No	Yes			99	0	Oral kit			
10	Town	No	114	3.56	No	Yes		Yes	104	0	Iron Injection			
11	Town	Yes	114	2.7	No	Yes	181	Yes	104	6	Iron Injection			
12	Town	Yes	106	4.08	No	Yes	186	Yes	96	162	Iron Injection	127	No	Treatment not completed
13	Town	Yes	100	2.96	No	Yes	189	Yes	95	0	Oral kit	109	Yes	
14	Town	Yes	109	3.7	No	Yes	190	Yes	99	0	Iron Injection	112	No	
15	Town	Yes	105	2.02	Yes	No	269	Yes	98	159	Iron Injection	111	No	Late presentation
16	Town	Yes	100	3	No	Yes	199	Yes	101	35	Iron Injection	112	No	Delayed treatment
17	Town	Yes	113	4.3	No	Yes	185	Yes	103	189	Oral kit	105	Yes	Delayed treatment Treatment not completed
18	Town	Yes	112	2.4	Yes	Yes	205	Yes	104	0	Iron Injection	103	Yes	Treatment not completed
19	Town	Yes	99	3.25	No	Yes	231	Yes	102	2	Iron Injection	101	Yes	Treatment not completed
20	Utju	Yes	111	3.16	No	Yes	198	Yes	101	57	Oral kit	115	No	Delayed treatment
21	Utju	Yes	88	3.8	No	Yes	426	Yes	78	57	Oral kit	107	Yes	Delayed treatment

Categorical Y
Variable

Numerical X
Variable

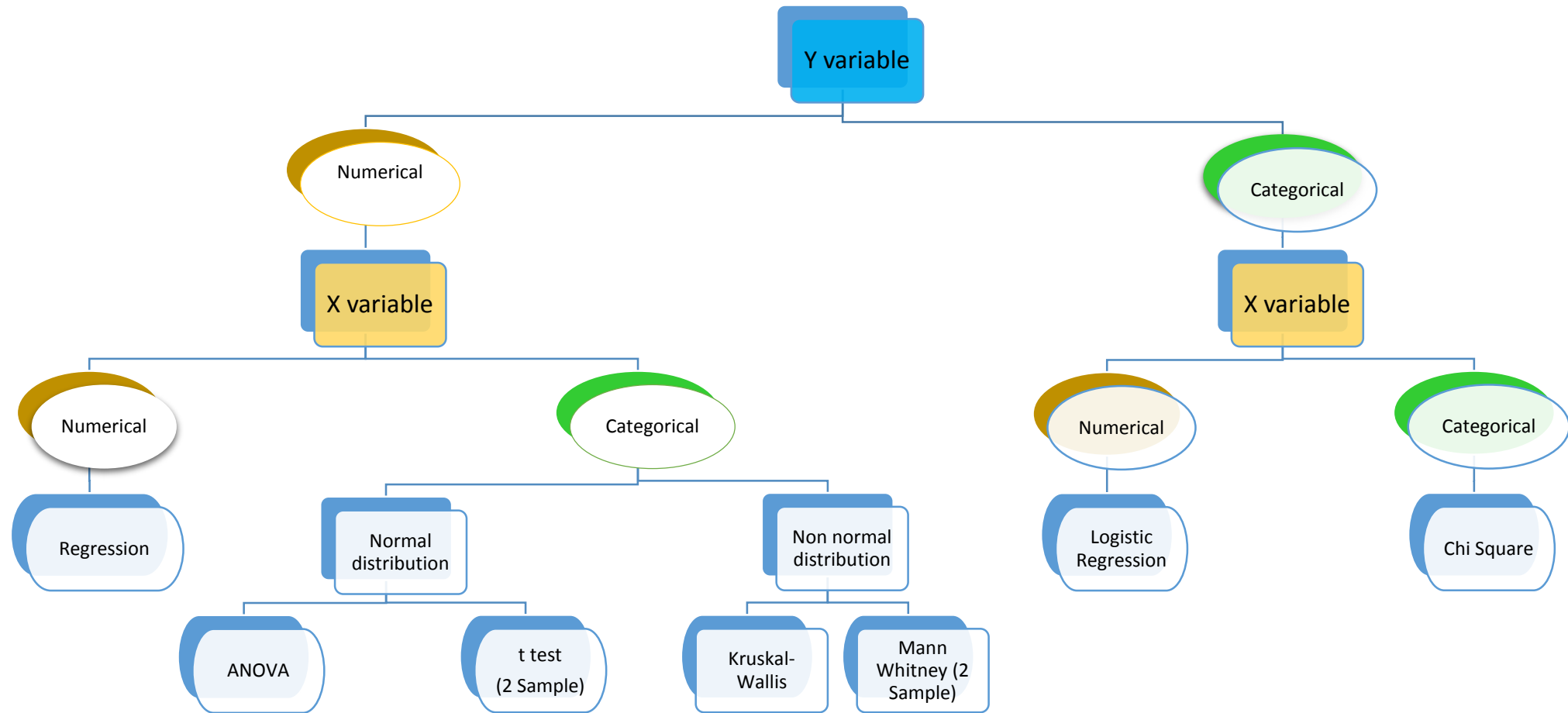


d. Categorical Y & Categorical X: Stacked bar chart





6. Analyse data



Thank you.

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