Application of statistical methods on finding median, mean and standard deviation and BMI for second year students

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Abstract

The data was collected from 200 second year students majoring in Mathematics at Yadanabon University. After organizing, analyzing and interpreting the collected data, median, mean and standard deviation of weights and heights were computed. Finally, the body mass index (BMI) of the students was discussed.

1. Introduction

Statistics, or Statistical method as it is sometimes called, is playing an increasingly important role in nearly all phases of human endeavor. Formerly dealing only with affairs of the state, thus accounting for its name, the influence of statistics has now spread to agriculture, biology, business, chemistry, communications, economics, education, electronics, medicine, physics, political science, psychology, sociology and numerous other fields of science and engineering.

63	60	62	62	65	59	62	61	66	60
59	60	59	60	62	59	66	62	67	64
60	59	66	61	59	61	64	64	64	61
62	65	61	62	61	70	61	62	67	63
61	61	64	61	64	65	64	61	59	62
65	60	59	63	63	65	65	69	57	60
60	62	63	61	61	62	61	63	66	62
63	64	69	59	64	64	58	65	68	60
57	64	60	61	68	66	61	59	65	58
64	63	59	64	63	65	62	68	69	61

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2. The Following Table Second Year Students in University **is Heights of 200** Yadanabon

Table (1)

62	62	65	65	63	66	66	64	62	61
62	60	64	67	62	61	64	63	68	65
61	62	59	68	59	67	63	62	61	57
55	61	66	72	61	61	65	61	62	67
59	62	66	67	60	67	65	62	67	65
60	61	64	69	63	68	68	61	61	62
64	67	61	64	64	67	60	58	67	69
64	61	61	61	60	67	62	58	66	67
62	63	62	69	61	69	60	65	64	62
60	60	63	64	62	66	60	71	64	68

$$\text{approximate interval} = \frac{\text{largest value} - \text{smallest value}}{\text{number of class}}$$

$$= \frac{72 - 55}{5} = 3.4 = 3 \, (\text{approximate}).$$

The class intervals are 55–57, 58–60, 61–63, 64–66, . . . , 70–72 and the class marks 56, 59, . . . , 71.

Table(2)

Hights (inches)	Ferquency
55–57	4
58–60	37
61–63	77
64–66	51
67–69	28
70–72	3

Now we have to find the median height of the students.

$$\text{median} = L_1 + \left(\frac{\frac{N}{2} - \left(\sum f \right)_L}{f_{median}} \right) c.$$

$$\text{median} = \frac{60 + 61}{2} + \left(\frac{\frac{200}{2} - 41}{77} \right) 3 = 62.80 \text{ inches.}$$

Table(3)

X	u	f	u^2	fu	f u^2
56	−2	4	4	−8	16
59	−1	37	1	−37	37
62	0	77	0	0	0
65	1	51	1	51	51
68	2	28	4	56	112
71	3	3	9	9	27

$$\text{mean } \overline{X} = A + \left(\frac{\sum fu}{N} \right) c$$

$$= 62 + \left(\frac{71}{200} \right) 3 = 63.065 \text{ inches.}$$

$$\text{Standard derivation } S = 3 \sqrt{ \frac{243}{200} - \left(\frac{71}{200} \right)^2 } = 3.13 \text{ inches.}$$

3. The Weight of 200 Second Year Students in Yadanabon University are Recorded in the Following Table.

158	109	115	130	130	98	108	132	110	98
80	95	93	83	92	80	112	76	119	100
89	89	90	89	90	110	129	119	121	89
109	100	99	91	98	129	95	122	112	105

				Table (4)					
102	91	99	82	100	111	110	82	89	120
131	75	139	111	90	119	112	112	79	111
131	139	109	105	102	108	72	121	99	105
109	98	112	80	129	99	80	121	122	98
77	132	102	91	120	104	110	90	100	90
104	100	86	118	111	120	90	110	78	98
100	101	102	100	98	119	111	145	98	81
89	90	110	111	81	69	98	99	163	130
98	118	98	99	112	119	119	106	99	86
72	121	120	129	105	90	89	90	96	120
81	100	110	120	111	121	129	89	119	99
86	100	138	100	120	110	120	82	102	100
111	110	103	106	141	125	90	79	100	130
109	100	81	82	101	105	92	139	120	112
99	109	81	101	125	109	82	101	102	82
90	90	91	109	106	119	90	130	80	110

The number is smallest 69 and the greatest number is 163.

$$\text{approximate interval} = \frac{\text{largest value} - \text{smallest value}}{\text{number of class}}$$

$$= \frac{163 - 69}{5} = 19 \text{ pounds.}$$

Therefore we take 19 pounds approximately to compare with 18.8 pounds. So the class interval are 69–87, 88–106, 107–125, . . . , 163. Form this values, we can build the frequency Distribution as follow.

A frequency Distribution of weight for 200 second year students in Yadanabon University.

Table (5)

Pound(lb)	Ferquency
69–87	29
88–106	85
107–125	64
126–144	19
145–163	3

Now we have to find the median weight of this group,

$$\text{median} = \frac{87+88}{2} + \left(\frac{\frac{200}{2}-29}{85}\right)19 = 103.37 \text{ pounds.}$$

Next we will find the mean deviation and standard deviation of this grouped data.

Table(6)

X	f	f X	$\left|X-\bar{X}\right|$	$f\left|X-\bar{X}\right|$
78	29	2262	26.79	776.91
97	85	8245	7.79	662.15
116	64	7424	11.21	717.44
135	19	2565	30.21	573.99
`154	3	462	49.21	147.63

By using long method, we obtain

$$\sum fX = 20958, \quad \sum f\left|X-\bar{X}\right| = 2878.12.$$

$$\text{Mean } \bar{X} = \frac{\sum fX}{\sum f} = \frac{20958}{200} = 104.79 \text{ pounds.}$$

$$\text{Mean Deviation MD} = \frac{\sum f|X - \bar{X}|}{\sum f} = \frac{2878.12}{200} = 14.3906 \text{ pounds.}$$

Table(7)

X	u	u^2	f	fu	$f u^2$
78	–2	4	29	–58	116
97	–1	1	85	–85	85
116	0	0	64	0	0
135	1	1	19	19	19
154	2	4	3	6	12

$$\text{Standard derivation } S = c \sqrt{\frac{\sum f u^2}{N} - \left(\frac{\sum f u}{N}\right)^2} = 17.1 \text{ pounds.}$$

When we calculate the body mass index (BMI), we apply formula

$$\text{B.M.I} = \frac{\text{weight(pounds)} \times 703}{\left[\text{Height(inches)}\right]^2}.$$

BMI Earned by 200 second year students

Table(8)

27.985	21.031	21.631	19.751	17.753	18.288	16.792	17.358	17.914	17.922
16.156	18.782	16.825	18.075	18.636	16.277	18.879	14.813	16.820	24.781
17.380	14.523	18.786	22.140	20.767	18.515	19.791	22.619	21.078	18.704
19.934	18.704	18.515	17.948	17.539	16.733	19.366	19.837	14.809	17.557
19.271	16.991	17.163	18.879	17.974	16.358	17.753	21.676	21.464	18.636
21.797	28.072	15.941	18.636	17.094	16.794	23.685	21.255	18.244	19.271
25.581	19.306	19.271	13.603	15.977	19.051	19.460	24.200	17.575	15.661
19.306	16.538	22.140	16.718	18.548	18.708	15.303	19.723	16.825	19.366
16.661	19.918	18.244	20.782	16.639	18.105	14.813	23.616	16.013	17.506

17.850	17.368	19.661	16.459	11.517	17.575	16.118	19.386	17.575	13.730
21.285	23.775	19.791	24.938	19.137	18.471	16.639	19.205	24.886	15.303
18.551	16.208	16.156	13.899	17.163	17.575	17.383	13.036	17.535	21.631
17.927	16.815	20.782	20.424	16.815	21.580	15.051	18.636	19.386	18.608
16.639	16.642	18.508	22.312	18.598	22.860	17.494	17.003	17.003	18.793
17.192	15.492	18.469	15.492	21.946	18.288	18.793	18.949	16.277	16.473
14.646	19.661	19.800	16.583	21.676	18.893	14.766	16.724	15.492	18.288
25.421	19.837	19.751	21.432	19.203	17.227	18.193	19.576	16.509	19.196
16.820	16.156	16.991	20.133	19.137	18.893	15.492	16.443	29.048	17.540
22.655	17.192	16.784	18.176	18.808	19.306	14.913	16.095	16.805	14.996
17.712	20.252	19.967	16.724	18.515	17.575	18.708	19.205	18.129	16.724

Frequency Distribution of BMI

Table(9)

BMI	Frequency
11.5–14.5	5
14.6–17.6	80
17.7–20.7	83
20.8–23.8	21
23.9–26.9	8
27–30	3

Now we have to find the median BMI.

$$\text{The median} = \frac{17.6 + 17.7}{2} + \left(\frac{\frac{200}{2} - 85}{83} \right) 4 = 18.373.$$

Next we will continue to find the mean and standard deviation BMI.

Table(10)

X	u	f	u^2	fu	$f u^2$
13.0	–1.55	5	2.403	–7.75	12.02
16.1	–0.78	80	0.608	–62.4	48.64
19.2	0	83	0	0	0
22.3	0.78	21	0.608	.16.38	12.77
25.4	1.55	8	2.403	12.4	19.22
28.5	2.33	3	5.429	6.99	16.29

$$\text{Mean}\,\overline{X} = A + \left(\frac{\sum fu}{N}\right) c = 19.2 + \left(\frac{-34.38}{200}\right) 4 = 18.5124.$$

$$\text{Standard derivation}\, S = c \sqrt{\frac{\sum fu^2}{N} - \left(\frac{\sum fu}{N}\right)^2}$$

$$\text{Standard derivation}\, S = 4 \sqrt{\frac{108.94}{200} - \left(\frac{-34.38}{200}\right)^2} = 2.8712.$$

But we have the previous solutions mean $\overline{X}$ (weight) 104.79(pound) and mean $\overline{X}$ (height) is 63.065 (inches).

Form this values, we obtain

$$\text{B.M.I} = \frac{(104.79) \times 703}{[63.065]^2} = 18.522.$$

Now we will discuss about BMI.

BMI cutoff   weight status

    < 18.5   under weight

    18.5–25   Healthy weight range

    25–30   over weight

    > 30   obese

Being under weight also puts you at risk for developing many health problems.

Your weight is within normal range. You can continue to keep a healthy weight through physical activity and healthy eating. Keep up with the good word.

Being over weight can put you at risk for developing many chronic diseases. Discuss with your healthcare professional.

Obesity increases risks for developing many at chronic diseases such as heart disease and diabetes, and decreases overall quality of life.

Something every when your BMI is within normal range, having too much fat around the abdomen (Apple shape body) will still put you at risk for heart disease and diabetes.

BMI of 200 second year students of Yadanabon University

Table (11)

BMI	Frequency
x < 18.5	106
18.5 < x < 25	89
25 < x < 30	5
x > 30	0

Conclusion

53% of mathematics second year students are under weight and they have many health problems. Possible causes of underweight are poor nutrition, psychological, physical conditions, genetics. 2.5% of students are overweight. Possible causes of over weight are food and activity, genetics, health conditions and medications, stress, emotional factors and poor sleep. Number of good BMI between 18.5 and 25 is 44.5% students are very good position.

Acknowledgements

References

[1]   Murray R. S., " Theory and Problems of Statistics", McGraw–Hill, Inc., USA,   1961.