Medical Statistics
Homework 3

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1. Exercise 1

1.1 Reference Range

$$mean : \bar{x} = 4.95\ mmol/L \tag{1.1}$$

$$standard\ deviation : s = 0.85\ mmol/L \tag{1.2}$$

$$95\%\ reference\ range\ (unit : mmol/L) : (\bar{x} - 1.96s, \bar{x} + 1.96s) = (3.284, 6.616) \tag{1.3}$$

1.2 Method of Estimation

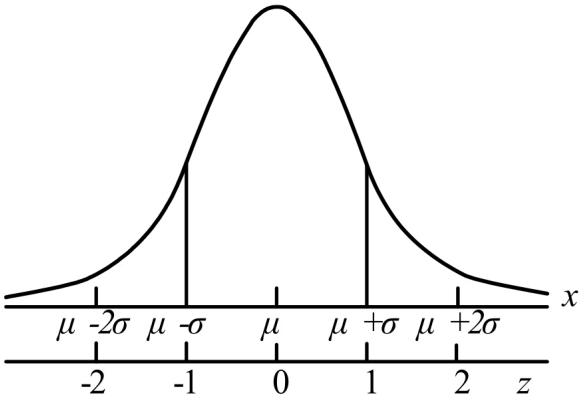

Figure 1: Distribution Function of Standard Normal Distribution

The total cholesterol of normal adult males aged 30 to 45 years follows a normal distribution. According to the standardization transformation:

$$Z = \frac{X - \bar{x}}{s} = 0.91 \tag{1.4}$$

The percentage of normal adult males with total cholesterol greater than 5.72 mmol/L is the area to the right of the line $x = 0.91$, and under the distribution function of standard normal distribution. According to the table of standard normal diatribution function, when $Z = 0.90588$, the percentage is 18.14%.

So 18.14% of normal adult males have total cholesterol greater than 5.72mmol/L.

*Github repo: https://github.com/MoRunbing/Medical_Statistics
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2. Exercise 2

2.1 Sampling Error

$$sample\ size : n = 144 \tag{2.5}$$

$$sampling\ error : s_{\bar{x}} = \frac{s}{\sqrt{n}} = 0.07\ mmol/L \tag{2.6}$$

2.2 Confidence Interval

$$confidence\ interval : (\bar{x} - t_\alpha s_{\bar{x}}, \bar{x} + t_\alpha s_{\bar{x}}) \tag{2.7}$$

$$degree\ of\ freedom : v = n - 1 = 143 \tag{2.8}$$

The t_α value corresponding to two sides probability α. According to the table of t distribution, $t_{0.05} = 1.980$ and $t_{0.01} = 2.617$ when $v = 143$.

$$95\%\ confidence\ interval\ (unit : mmol/L) : (\bar{x} - t_{0.05} s_{\bar{x}}, \bar{x} + t_{0.05} s_{\bar{x}}) = (4.81, 5.09) \tag{2.9}$$

$$99\%\ confidence\ interval\ (unit : mmol/L) : (\bar{x} - t_{0.01} s_{\bar{x}}, \bar{x} + t_{0.01} s_{\bar{x}}) = (4.77, 5.13) \tag{2.10}$$

The 95% confidence interval indicates that 95% of the confidence intervals will include the population mean if we sample repestedly and use the same method to calculate the confidence interval. If we want a larger percentage of confidence intervals to include the population mean, then a wider confidence interval is a necessity. As a result, the 99% confidence interval is wider than the 95% confidence interval.