a)Fat intake – Total Fat Intake 1 and Total Fat Intake 2

For testing of normality consider the histograms of fat before (Total fat intake 1) and after (total fat intake 2) Nutrition education program.

Given that the data for both the fat before and after Nutrition education program are normally distributed, a parametric test is appropriate. In this case, a z-test is necessary because it compares the mean values for a sample size that is large (usually greater than 50). The sample size in this case is 66. The test will compare the Critical Z value at 95% confidence level and the calculated Z value using the formula: Z = (population mean (*µ*)– mean) / (standard deviation / sqrt (no. of samples))

**Null hypothesis**, ho: there is no significant difference in the mean fat intake before and after the Nutrition education program. In this case, u1 – u2 = 0.

**Alternative hypothesis**, h1: the mean fat intake before the Nutrition education program is more than the mean fat intake after Nutrition education program. That is u1 > u2.

Therefore, U1 is the mean fat intake before Nutrition education program, and

U2 is the mean fat intake after the Nutrition education program

The **Level of significance**, alpha = 0.05, implying that I am 95% confident about my results.

**Z-test results:**

|  |  |  |
| --- | --- | --- |
|  | *TotFat 1* | *TotFat 2* |
| Mean | 66.06601013 | 40.82237594 |
| Known Variance | 988.736 | 423.396 |
| Observations | 66 | 66 |
| Hypothesized Mean Difference | 0 |  |
| z | 5.457405176 |  |
| P(Z<=z) one-tail | 2.41572E-08 |  |
| z Critical one-tail | 1.644853627 |  |
| P(Z<=z) two-tail | 4.83143E-08 |  |
| z Critical two-tail | 1.959963985 |  |

**Conclusion**. With z = 5.4574 and p-value smaller than alpha (0.05), we reject the null hypothesis, ho at 5% level of significance and conclude that the mean fat intake before the Nutrition education program is more than the mean fat intake after Nutrition education program. That is u1 > u2.

**b)**

**Impact of Age on Fat Intake reduction and Calories from Fat reduction**

Fat Intake Reduction:

**Null hypothesis**, Ho: No significant linear relationship exists between age and fat intake reduction.

**Alternative hypothesis**, H1: there is significant linear relationship between age and fat intake reduction.

|  |  |
| --- | --- |
| r (correlation) | 0.0248 |
| n | 66 |

**Test statistic**, T = r\*sqrt((n-2)/(1-r^2))

|  |  |
| --- | --- |
| t | 0.1379 |

The Critical value:

|  |  |
| --- | --- |
| t(a/2,n-2) = | 1.9971 |

|  |  |
| --- | --- |
| p-value = | 0.8907 |

**Therefore,** with a t value of = 0.1982 and p-value > 0.05, we reject the null hypothesis at 5% level of significance and conclude that there is no significant linear relationship between age and Fat Intake reduction.

Calories from Fat Reduction:

**Null hypothesis**, Ho: No significant linear relationship exists between age and fat intake reduction.

**Alternative hypothesis**, H1: there is significant linear relationship between age and fat intake reduction.

|  |  |
| --- | --- |
| r (correlation) | 0.0885 |
| n | 66 |

**Test statistic**, T = r\*sqrt((n-2)/(1-r^2))

|  |  |
| --- | --- |
| t | 0.7107 |

The Critical value:

|  |  |
| --- | --- |
| t(a/2,n-2) = | 1.9971 |

|  |  |
| --- | --- |
| p-value = | 0.4798 |

**Therefore,** with a t value of = 0.7107 and p-value > 0.05, we reject the null hypothesis at 5% level of significance and conclude that there is no significant linear relationship between age and Calories from Fat reduction.

The **scatter plot** for age and reduction in Fat Intake and Calories from Fat are as shown in the chart below.

The scatter-plot shows a weak positive linear relationship between age and reduction in Fat Intake and Calories from Fat. In this case, as age increases, the values for Fat Intake reduction and Calories from Fat reduction go up only slightly.

**c)**

**Fat reduction in males and females**

For testing of normality, we consider the histograms of total fat intake by males before the program and total fat intake for females after the program.

The samples are skewed to the right, and are not normally distributed; therefore, a non-parametric test will be appropriate. The appropriate test will be the Wilcoxon Rank Sum test. This test in appropriate in comparing whether there is a difference in the variance for fat reduction between females and males.

The **Null hypothesis**, ho: There is no significant difference in the variances of fat reduction between females and males.

**Alternative hypothesis**, H1: There is significant difference in the variances of fat reduction between females and males.

|  |  |
| --- | --- |
| **Data** |  |
| **Level of Significance** | **0.05** |
|  |  |
| Male fat reduction |  |
| Sample Size | 34 |
| Sum of Ranks | 1099 |
| Female fat reduction |  |
| Sample Size | 32 |
| Sum of Ranks | 1112 |
|  |  |
| Intermediate Calculations | |
| Total Sample Size n | 66 |
| *U Stat* | 584 |
| U1 Mean | 1072 |
| Standard dev U1 | 22.4994 |
| ***Z* value** | **-21.68948394** |
|  |  |
| **Upper-Tail Test** |  |
| **Upper Critical Value** | **1.6449** |
| ***p*-Value** | **0.000000000000** |
| **Reject the null hypothesis** |  |

**Conclusion:** Given that the p-value < alpha (0.05), we reject the null hypothesis and conclude that there is significant difference in the variances of fat reduction between females and males.