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**Part 1 Question 1**

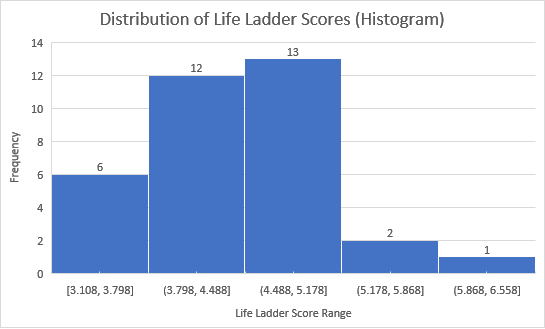
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| Dependent variable | |  |
| *Summary statistics for life ladder score* | | |
|  |  |  |
| Mean | 5.4954 |  |
| Standard Error | 0.0942 |  |
| Median | 5.5865 |  |
| Mode | #N/A |  |
| Standard Deviation | 1.1224 |  |
| Sample Variance | 1.2598 |  |
| Kurtosis | -0.6374 |  |
| Skewness | -0.0344 |  |
| Range | 5.1265 |  |
| Minimum | 2.6617 |  |
| Maximum | 7.7883 |  |
| Sum | 780.3403 |  |
| Count | 142 |  |

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| Explanatory variable |  |
| *Summary statistics for social support* | |
|  |  |
| Mean | 0.8092 |
| Standard Error | 0.0096 |
| Median | 0.8295 |
| Mode | #N/A |
| Standard Deviation | 0.1144 |
| Sample Variance | 0.0131 |
| Kurtosis | 0.2183 |
| Skewness | -0.8577 |
| Range | 0.5309 |
| Minimum | 0.4359 |
| Maximum | 0.9668 |
| Sum | 114.9051 |
| Count | 142 |

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| For dependent variable, life ladder score was selected. The average score for it is 5.4954, with a standard error of 0.0942. Standard error indicates how much of a different the sample mean will differ from the population mean. The median is 5.5865, with no mode as all of the scores did not appear twice. Standard deviation is how dispersed the data is in relation to the mean. In this case the standard deviation is 1.1224. The sample variance is 1.2598, it is a measure of the degree to which the numbers in a list are spread out. Kurtosis is a measure of tailness of a distribution, in this case it is -0.6374 which indicates a flatter distribution. Skewness measures how the diagram will look like, it can be left skewed or right skewed depending on the value. In this case, it is - 0.0344 which means more to the left than the right, or it has a longer tail on the left side. It is 2.6617 for minimum and 7.7883 for maximum. The total added together for social support variable is 780.3403, out of the 142 observations. |
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| For explanatory variable, social support is selected. The average score for social support is 0.8092, with a standard error of 0.0096. The middle point or the median is 0.8295. Standard deviation talks about how spreaded out is the data in the sample, with a 0.1144 spread. The sample variance measures the degree to which the numbers in the sample are spread out, which is 0.0131 for this column. Kurtosis is a measurement of how flat or tall it is. In the case of social support, it has a higher distribution. In addition, it has a -0.8577 skewness, indicating that it has a longer tial on the left side. the range takes the biggest value and minus the smallest value, obtaining the range. Minimum is the smallest number available in the variable while maximum is the largest number available in the variable. It is 0.4359 for minimum and 0.9668 for maximum. The total added together for social support variable is 114.9051, out of the 142 observations. |
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**Part 1 Question 2**



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| The above histogram talks about the distribution of life ladder scores between 2.6617 which is the minimum score and 7.9117, the maximum score. The x-axis are the life ladder score range while the y-axis is the frequency or the amount of times values fall onto each category. From the graph, we can see that the life ladder scores have. The distribution begins with a low frequency of 4 in the first column, increasing to 14 in the second, and at 30 for the third and fourth bins. The highest frequency, 38, is observed in the fifth column at 5.6617 - 6.4117, after which the frequencies taper off to 13 for the last two columns. |
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| The above scatterplot talks about the distribution of value based on social support. The x-axis are the number of rows based on the year 2017, having 142 observation and the y-axis are the range of value with a minimum of 0.4359 to maximum of 0.9668. We can see that only a few, around 4 to 5 of social support can be considered an outlier due to how far they are from the crowd of data. |
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**Part 2 Question 1**

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| Kruskal wallis test |  |  |  |  |
| H0 : u1 = u2 = u3 = u4 | |  |  |  |
| H1 : Atleast one group's median is different | | |  |  |
|  |  |  |  |  |
| Income Groups | The sum of Ranks | Count if income group | R^2/N | H-statistics calculation |
| Low Income | 732 | 17 | 31519.0588 | 0.000590958 |
| Lower middle income | 2708 | 41 | 178860.0976 | 449.5920522 |
| Upper middle income | 2420 | 37 | 158281.0811 | 20.5921 |
| High income | 4293 | 47 | 392124.4468 |  |
| Total |  | 142 | 760784.6843 |  |
|  |  |  |  | 0.0001279 |
|  |  |  |  |  |
| Significance\_level | 0.05 |  |  |  |
| P value | 0.0001279 |  |  |  |
|  |  |  |  |  |
| The null hypothesis states that all income groups have the same median while the alternate hypothesis states that there is at least one income group of median that is different. If we take a look at the significance level and P-value, 0.0001279<0.05, therefore the null hypothesis is rejected. Thus, there is enough evidence to show that there is at least one median that is different between the income groups. | | | |  |
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**Part 2 Question 2**

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| (a) |  |  |
| H0: µ1 = µ2 |  |  |
| H1: µ1 ≠ µ2 |  |  |
| The question asks for 2 variables, and µ1 signifies Europe & Central Asia and µ2 is Sub-Saharan Africa  regions. We assume that both are the same in the null hypothesis. As for alternate hypothesis, the question has asked us to test whether both region has a difference in mean life ladder score | | |
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| (b) |  |  |  |
| t-Test: Two-Sample Assuming Unequal Variances | |  |  |
|  |  |  |  |
|  | Europe & Central Asia | Sub-Saharan Africa |  |
| Mean | 6.111439943 | 4.424245203 |  |
| Variance | 0.869226532 | 0.408052978 |  |
| Observations | 48 | 34 |  |
| Hypothesized Mean Difference | 0 |  |  |
| df | 80 |  |  |
| t Stat | 9.72314206 |  |  |
| P(T<=t) one-tail | 1.67735E-15 |  |  |
| t Critical one-tail | 1.664124579 |  |  |
| P(T<=t) two-tail | 3.35471E-15 |  |  |
| t Critical two-tail | 1.990063421 |  |  |
|  |  |  |  |
| Test Statistics | 9.72314206 |  |  |
| Critical value | 1.990063421 |  |  |
|  |  |  |  |
| When the test statistics>critical value or 9.7231>1.990, therefore the null hypothesis is rejected, indicating there is a diffference between mean life ladder score and region | | |  |
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**Part 2 Question 3**

(a)

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| H0: µ1 = µ2 = µ3 = µ4 |  |  |
| H1: there exist one that is not the same |  |  |
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| For this test, I am going to test whether there is a significant difference in the mean life ladder score across the income groups. Null hypothesis assumes that both does not have a significance difference while alternate hypothesis states that there is a difference between the two variables | | |
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(b)

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| Anova: Single Factor |  |  |  |  |
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| SUMMARY |  |  |  |  |
| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
| Low income | 17 | 68.8470 | 4.0498 | 0.3530 |
| Low middle income | 41 | 199.3241 | 4.8616 | 0.5551 |
| Upper middle income | 37 | 202.0340 | 5.4604 | 0.5606 |
| High income | 47 | 310.1352 | 6.5986 | 0.4426 |

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| ANOVA |  |  |  |  |  |  |
| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
| Between Groups | 109.2453 | 3 | 36.4151 | 73.4763 | 1.855E-28 | 2.6702 |
| Within Groups | 68.3933 | 138 | 0.4956 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 177.6386 | 141 |  |  |  |  |
|  |  |  |  |  |  |  |
| Test Statistics | 73.4763 |  |  |  |  |  |
| Critical value | 2.6702 |  |  |  |  |  |

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| Since critical value<test statistics or 2.6702<73.4763, we reject the null hypothesis. In other words, there is enough evidence to conclude that there is at least one income group that is different |
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**Part 2 Question 4**

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| SUMMARY OUTPUT | | |  |  |  |  |  |
|  |  | |  |  |  |  |  |
| *Regression Statistics* | | |  |  |  |  |  |
| Multiple R | 0.8614 | |  |  |  |  |  |
| R Square | 0.7421 | |  |  |  |  |  |
| Adjusted R Square | 0.7306 | |  |  |  |  |  |
| Standard Error | 0.5826 | |  |  |  |  |  |
| Observations | 142 | |  |  |  |  |  |
|  |  | |  |  |  |  |  |
| ANOVA |  | |  |  |  |  |  |
|  | *df* | | *SS* | *MS* | *F* | *Significance F* |  |
| Regression | 6 | | 131.8230 | 21.9705 | 64.7382 | 2.49209E-37 |  |
| Residual | 135 | | 45.8156 | 0.3394 |  |  |  |
| Total | 141 | | 177.6386 |  |  |  |  |
|  |  | |  |  |  |  |  |
|  | *Coefficients* | | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
| Intercept | -2.4208 | | 0.6622 | -3.6559 | 0.0003661 | -3.7304 | -1.1112 |
| Log GDP per capita | | 0.3094 | 0.0784 | 3.9472 | 0.0001267 | 0.1544 | 0.4645 |
| Social support | 3.2999 | | 0.6424 | 5.1371 | 0.0000009554 | 2.0295 | 4.5703 |
| Healthy life expectancy at birth | 0.0229 | | 0.0125 | 1.8383 | 0.06822 | -0.0017 | 0.0476 |
| Freedom to make life choices | 1.5883 | | 0.4681 | 3.3929 | 0.0009079 | 0.6625 | 2.5141 |
| Generosity | 0.2900 | | 0.3543 | 0.8187 | 0.4144 | -0.4106 | 0.9906 |
| Perceptions of corruption | -0.5154 | | 0.3131 | -1.6462 | 0.1021 | -1.1346 | 0.1038 |

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| Multiple linear regression model | |
| Y = β0 + β1x + β2x + β3x + β4x + β5x + β6x | |
| Y = -2.4209 + 0.3094x + 3.2999x + 0.0229x + 1.5883x + 0.2900x - 0.5154x | |
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| (b) |  |
| Significance level | 0.05 |
| P-value (Log GDP per capita) | 0.0001267 |
| P-value (Social Support) | 0.0000009554 |
| P-value (Healthy life expectancy at birth) | 0.06822 |
| P-value (Freedom to make life choices) | 0.0009079 |
| P-value (Generosity) | 0.4144 |
| P-value (Perceptions of corruption) | 0.1021 |

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| Hypothesis test (Log GDP per capita) | |  |  |
| H0: µ1 = µ2 | P-value | 0.0001267 |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |
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| In this test, null hypothesis signifies that there are no significant influence between Log GDP per capita and happiness while alternate hypothesis states there is a influence. Using 0.05 significance level, 0.0001<0.05. Therefore, null hypothesis is rejected and thus signifying there is a influence between Log GDP per capita and happiness | | | |
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| Hypothesis test (Social Support) | |  |  |  |
| H0: µ1 = µ2 | P-value | 0.0000009554 |  |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |  |
|  |  |  |  |  |
| In this test, null hypothesis signifies that there are no significant difference between social support and happiness while alternate hypothesis states there is a difference. Using 0.05 significance level, 0.0000009554<0.05. Therefore, H0 is rejected and thus signifying there is a difference between Social support and happiness | | | |  |
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| Hypothesis test (Healthy life expectancy at birth) | | |  |  |
| H0: µ1 = µ2 | P-value | 0.06822 |  |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |  |
|  |  |  |  |  |
| In this test, null hypothesis signifies that there are no significant influence between healthy life expectancy at birth and happiness while alternate hypothesis states there is a influence. Using 0.05 significance level, 0.0682>0.05. Therefore, we fail to reject H0 and thus signifying there is no significant influence between healthy life expectancy at birth and happiness | | | |  |
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| Hypothesis test (Healthy life expectancy at birth) | | |  |  |
| H0: µ1 = µ2 | P-value | 0.0009079 |  |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |  |
|  |  |  |  |  |
| In this test, null hypothesis signifies that there are no significant influences between freedom to make life choices and happiness while alternate hypothesis states there is a influence. Using 0.05 significance level, 0.0009079<0.05. Therefore, we reject H0 and thus signifying there is significant influence between freedom to make life choices and happiness | | | |  |
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| Hypothesis test (Generosity) | |  |  |  |
| H0: µ1 = µ2 | P-value | 0.4144 |  |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |  |
|  |  |  |  |  |
| In this test, null hypothesis signifies that there are no significant influences between generosity and happiness while alternate hypothesis states there is a influence. Using 0.05 significance level, 0.4144>0.05. Therefore, we fail to reject null hypothesis and thus signifying there is no significant influence between generosity and happiness | | | |  |
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| Hypothesis test (Perceptions of corruption) | | |  |  |
| H0: µ1 = µ2 | P-value | 0.1021 |  |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |  |
|  |  |  |  |  |
| In this test, null hypothesis signifies that there are no significant influence between perceptions of corruptions and happiness while alternate hypothesis states there is a influence. Using 0.05 significance level, 0.1021>0.05. Therefore, we fail to reject null hypothesis and thus signifying there is no significant influence between perceptions of corruptions and happiness | | | |  |
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| To conclude this test, Log GDP per capita, Social Support, freedom to make life choices has influence influence between them and happiness while healthy life expectancy at birth, generosity and perceptions of corruption does not contribute to happiness. | | | |  |
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| (c) |  |  |  |  |
| variables | p-values | Coefficients |  |  |
| Log GDP per capita | 0.0001267 | 0.3094 |  |  |
| Social Support | 0.0000009554 | 3.2999 |  |  |
| Healthy life expectancy at birth | 0.0682199 | 0.02293 |  |  |
| Freedom to make life choices | 0.0009079 | 1.5883 |  |  |
| Generosity | 0.4144157 | 0.2900 |  |  |
| Perceptions of corruption | 0.1020552 | -0.5154 |  |  |
|  |  |  |  |  |
| When I tcomes log GDP per capita increases every unit, the Log GDP per capita will increase by 0.3094, it also has a significant influence on happiness. Social support increases by 3.2999 for every unit, it also has significant influence on happiness. Thirdly, the healthy life expectancy at birth increases by 0.02993 for every unit increase, this variable does not significantly influence happiness. Freedom to make life choices increasesby 1.5883 for every unit increase with great significant influence on happiness. Generosity increases by 0.2900, having no significant influence on happiness. Last but not least, the perceptions of corruption decreases by -0.5154 for every unit in increase, it does not significantly influence the happiness meter. | | | |  |
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| (d) |  |  |  |  |
| The results obtained has showed a lot of things. The high Log GDP per capita has showed that the social networks has improved significantly by fostering a sense of community and support. In addition, the freedom to make life choices empowers individuals and contributes to their overall satisfaction. These findings has suggested a poor policy created by the governments. What the government should do is to focus on fostering sustainable economic growth, strengthening social systems, and promoting individual freedoms to improve societal happiness. A balanced approach addressing both material and non-material aspects of well-being is essential for creating happier and more resilient populations. | | | |  |
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**Part 2 Question 5**

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| (a) |  |  |  |
| Multiple linear regression: |  |  |  |
| Y = β0 + β1x + β2x + β3x + β4x + β5x + β6x | |  |  |
| Y = -2.9106 + 0.1721x + 3.2424x + 0.0396x + 2.7517x + 0.0604x -0.5883x | | | |
|  |  |  |  |
| Hypothesis test (Log GDP per capita for the year 2023) | | |  |
| H0: µ1 = µ2 | P-value | 0.0138 |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |
|  |  |  |  |
| In this test, null hypothesis signifies that there are no significant influence between Log GDP per capita and life mean ladder while alternate hypothesis states there is a influence. Using 0.05 significance level, 0.0138<0.05. Therefore, null hypothesis is rejected and thus signifying there is a influence between Log GDP per capita and life mean ladder | | | |
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| Hypothesis test (Social Support for the year 2023) | | |  |  |
| H0: µ1 = µ2 | P-value | 0.0000 |  |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |  |
|  |  |  |  |  |
| In this test, null hypothesis signifies that there are no significant difference between social support and life mean ladder while alternate hypothesis states there is a difference. Using 0.05 significance level, 0.0000<0.05. Therefore, H0 is rejected and thus signifying there is a difference between Social support and life mean ladder | | | |  |
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| Hypothesis test (Healthy life expectancy at birth for the year 2023) | | | |  |
| H0: µ1 = µ2 | P-value | 0.0061 |  |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |  |
|  |  |  |  |  |
| In this test, null hypothesis signifies that there are no significant influence between healthy life expectancy at birth and life mean ladder while alternate hypothesis states there is a influence. Using 0.05 significance level, 0.0061<0.05. Therefore, we reject H0 and thus signifying there is significant influence between healthy life expectancy at birth and life mean ladder | | | |  |
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| Hypothesis test (Generosity for the year 2023) | |  |  |  |
| H0: µ1 = µ2 | P-value | 0.0000 |  |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |  |
|  |  |  |  |  |
| In this test, null hypothesis signifies that there are no significant influences between generosity and life mean ladder while alternate hypothesis states there is a influence. Using 0.05 significance level, 0.0000<0.05. Therefore, we reject null hypothesis and thus signifying there is significant influence between generosity and life mean ladder | | | |  |
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| Hypothesis test (Perceptions of corruption for the year 2023) | | | |  |
| H0: µ1 = µ2 | P-value | 0.8348 |  |  |
| H1: µ1 ≠ µ2 | significance level | 0.05 |  |  |
|  |  |  |  |  |
| In this test, null hypothesis signifies that there are no significant influence between perceptions of corruptions and life mean ladder while alternate hypothesis states there is a influence. Using 0.05 significance level, 0.8348>0.05. Therefore, we fail to reject null hypothesis and thus signifying there is no significant influence between perceptions of corruptions and life mean ladder | | | |  |
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| in conclusion, only perceptions of corruption for the year 2023 has no significant influence between perceptions of corruptions and life mean ladder while generosity, healthy life expectancy at birth, social support and log GDP per capita has influence on the life mean ladder | | | |  |
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| (b) |  |  |  |  |
| Compared to the year 2017 and 2023, we can see that the intercept has decreased from -2.4209 on 2017 to -2.9106 in 2023, this suggests that the overall of Y has decreased or worsened. The Log gdp per capita has decreased from 0.3094 to 0.1721 signifying the influence of Log GDP per capita has decreased over the span of 6 years, meaning humans may have become less sensitive to income increasing through the years. The slight decrease for social support could suggest that the decrease has reflect changes in societal structures or a perceived weakening of community bonds. The freedom to make life choices has increased significantly throughout the years from 1.5883 to 2.7517. This means that the perception of humans have changed and become more open minded instead or a shift in priorities. The generosity has decreased drastically from 0.2900 to 0.0604, it could mean that people have become less generous in terms of donation, human interaction, etc. Last but not least, the perception of corruption has intensified from -0.5154 to -0.5883. It could mean that there is an increase in awareness towards corruption. In conclusion, the comparison of the 2017 and 2023 models reveals significant shifts in the factors influencing well-being and mean life ladder. | | | |  |
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