**SAS002 Model1**

**QUESTION #1: I**S IT TRUE THAT THE (AVERAGE) BLOOD PRESSURE FOR SMOKERS IS HIGHER THAN IT IS FOR NON SMOKERS?

If the risk of a stroke is believed to be affected by the age and blood (pressure).

(Risk is measured in risk units).

Age is measured in years.

Blood Pressure is measured in blood pressure units)

Then answer the following questions

**Questions #2 - #10**

* By how much does the risk increase if age increases by one year?
* By how much does the risk increase if blood pressure increases by one unit?
* By how much does risk increase if blood pressure increases by 1%?

**For smokers only:**

* By how much does the risk increase if age increases by ten years?
* By how much does the risk increase if blood pressure increases by 10 units?
* By how much does risk increase if blood pressure increases by 10%?

**For non-smokers only:**

* By how much does the risk increase if age increases by ten years?
* By how much does the risk increase if blood pressure increases by 10 units?
* By how much does risk increase if blood pressure increases by 10%?

data first;

input risk Age Pressure Smoker $;

lage = log(age);

lrisk =log(risk);

lpressure =log(pressure);

cards;

12 57 152 No

24 67 163 No

13 58 155 No

56 86 177 Yes

28 59 196 No

51 76 189 Yes

18 56 155 Yes

31 78 120 No

37 80 135 Yes

15 78 98 No

22 71 152 No

36 70 173 Yes

15 67 135 Yes

48 77 209 Yes

15 60 199 No

36 82 119 Yes

8 66 166 No

34 80 125 Yes

3 62 117 No

37 59 207 Yes

;

proc reg; model risk = age pressure;

model lrisk = lage lpressure;

data second; set first; if smoker ='Yes';

proc reg; model risk = age pressure;

proc reg; model lrisk = lage lpressure;

data third; set first; if smoker ='No';

proc reg; model risk = age pressure;

proc reg; model lrisk = lage lpressure;

run;

**ANSWERS**

* By how much does the risk increase if age increases by one year?

1.31 RISK UNITS.

* By how much does the risk increase if blood pressure increases by one unit?

0.296 UNITS OF RISK

* By how much does risk increase if blood pressure increases by 1% ?

RISK INCREASES BY 2.02%

**For smokers only:**

* By how much does the risk increase if age increases by ten years?

RISK INCREASES BY 10.8 UNITS

* By how much does the risk increase if blood pressure increases by 10 units?

RISK INCREASES BY 2.86 UNITS

* By how much does risk increase if blood pressure increases by 10%?

Risk increases by 13.72%

**For non smokers only:**

* By how much does the risk increase if age increases by ten years?

Risk increases by 9.77 units.

* By how much does the risk increase if blood pressure increases by 10 units?

Risk increases by ZERO units

* By how much does risk increase if blood pressure increases by 10%?

Risk increases by zero Percent

OUTPUT:

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| The SAS System |

The REG Procedure

Model: MODEL1

Dependent Variable: risk

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| **Number of Observations Read** | 20 |
| **Number of Observations Used** | 20 |

| **Parameter Estimates** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **DF** | **Parameter Estimate** | **Standard Error** | **t Value** | **Pr > |t|** |
| **Intercept** | **1** | -110.94226 | 16.46987 | -6.74 | <.0001 |
| **Age** | **1** | 1.31500 | 0.17329 | 7.59 | <.0001 |
| **Pressure** | **1** | 0.29640 | 0.05107 | 5.80 | <.0001 |

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| The SAS System |

The REG Procedure

Model: MODEL2

Dependent Variable: lrisk

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| **Number of Observations Read** | 20 |
| **Number of Observations Used** | 20 |

| **Analysis of Variance** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr > F** |
| **Model** | 2 | 6.19594 | 3.09797 | 15.02 | 0.0002 |
| **Error** | 17 | 3.50660 | 0.20627 |  |  |
| **Corrected Total** | 19 | 9.70254 |  |  |  |

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| **Root MSE** | 0.45417 | **R-Square** | 0.6386 |
| **Dependent Mean** | 3.10107 | **Adj R-Sq** | 0.5961 |
| **Coeff Var** | 14.64561 |  |  |

| **Parameter Estimates** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **DF** | **Parameter Estimate** | **Standard Error** | **t Value** | **Pr > |t|** |
| **Intercept** | **1** | -23.52058 | 4.86768 | -4.83 | 0.0002 |
| **lage** | **1** | 3.88427 | 0.79270 | 4.90 | 0.0001 |
| **lpressure** | **1** | 2.02274 | 0.51419 | 3.93 | 0.0011 |

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| SMOKERS |

The REG Procedure

Model: MODEL1

Dependent Variable: risk

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| **Number of Observations Read** | 10 |
| **Number of Observations Used** | 10 |

| **Analysis of Variance** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr > F** |
| **Model** | 2 | 1411.21897 | 705.60948 | 40.36 | 0.0001 |
| **Error** | 7 | 122.38103 | 17.48300 |  |  |
| **Corrected Total** | 9 | 1533.60000 |  |  |  |

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| **Root MSE** | 4.18127 | **R-Square** | 0.9202 |
| **Dependent Mean** | 36.80000 | **Adj R-Sq** | 0.8974 |
| **Coeff Var** | 11.36214 |  |  |

| **Parameter Estimates** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **DF** | **Parameter Estimate** | **Standard Error** | **t Value** | **Pr > |t|** |
| **Intercept** | **1** | -89.02369 | 14.10376 | -6.31 | 0.0004 |
| **Age** | **1** | 1.08324 | 0.14381 | 7.53 | 0.0001 |
| **Pressure** | **1** | 0.28585 | 0.04312 | 6.63 | 0.0003 |
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| SMOKERS |

The REG Procedure

Model: MODEL1

Dependent Variable: lrisk

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| **Number of Observations Read** | 10 |
| **Number of Observations Used** | 10 |

| **Analysis of Variance** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr > F** |
| **Model** | 2 | 1.33848 | 0.66924 | 16.26 | 0.0023 |
| **Error** | 7 | 0.28816 | 0.04117 |  |  |
| **Corrected Total** | 9 | 1.62664 |  |  |  |

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| **Root MSE** | 0.20289 | **R-Square** | 0.8228 |
| **Dependent Mean** | 3.53420 | **Adj R-Sq** | 0.7722 |
| **Coeff Var** | 5.74088 |  |  |

| **Parameter Estimates** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **DF** | **Parameter Estimate** | **Standard Error** | **t Value** | **Pr > |t|** |
| **Intercept** | **1** | -13.69693 | 3.02591 | -4.53 | 0.0027 |
| **lage** | **1** | 2.39776 | 0.48730 | 4.92 | 0.0017 |
| **lpressure** | **1** | 1.37166 | 0.33711 | 4.07 | 0.0048 |

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| NON SMOKERS |

The REG Procedure

Model: MODEL1

Dependent Variable: risk

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| **Number of Observations Read** | 10 |
| **Number of Observations Used** | 10 |

| **Analysis of Variance** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr > F** |
| **Model** | 2 | 335.38212 | 167.69106 | 3.08 | 0.1100 |
| **Error** | 7 | 381.51788 | 54.50255 |  |  |
| **Corrected Total** | 9 | 716.90000 |  |  |  |

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| **Root MSE** | 7.38258 | **R-Square** | 0.4678 |
| **Dependent Mean** | 17.10000 | **Adj R-Sq** | 0.3158 |
| **Coeff Var** | 43.17301 |  |  |

| **Parameter Estimates** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **DF** | **Parameter Estimate** | **Standard Error** | **t Value** | **Pr > |t|** |
| **Intercept** | **1** | -77.58955 | 38.26462 | -2.03 | 0.0822 |
| **Age** | **1** | 0.97729 | 0.40876 | 2.39 | 0.0481 |
| **Pressure** | **1** | 0.20144 | 0.09840 | 2.05 | 0.0799 |

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| NON SMOKERS |

The REG Procedure

Model: MODEL1

Dependent Variable: lrisk

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| **Number of Observations Read** | 10 |
| **Number of Observations Used** | 10 |

| **Analysis of Variance** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr > F** |
| **Model** | 2 | 2.09940 | 1.04970 | 3.30 | 0.0977 |
| **Error** | 7 | 2.22436 | 0.31777 |  |  |
| **Corrected Total** | 9 | 4.32375 |  |  |  |

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| **Root MSE** | 0.56371 | **R-Square** | 0.4855 |
| **Dependent Mean** | 2.66793 | **Adj R-Sq** | 0.3386 |
| **Coeff Var** | 21.12900 |  |  |

| **Parameter Estimates** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **DF** | **Parameter Estimate** | **Standard Error** | **t Value** | **Pr > |t|** |
| **Intercept** | **1** | -30.72839 | 13.02143 | -2.36 | 0.0504 |
| **lage** | **1** | 5.01205 | 2.10746 | 2.38 | 0.0490 |
| **lpressure** | **1** | 2.49175 | 1.09039 | 2.29 | 0.0562 |