



## Teaching Idea: Analysing Risk Factors Associated with Increased Systolic Blood Pressure

**Key idea:** This teaching idea uses data from the Health Survey for England to produce a multiple regression model which explores lifestyle factors (weight, smoking, drinking) that may be associated with increased blood pressure.



**Keywords:** Health, Correlation, Association, Interval Variables, Means, Regression

### Background

Raised blood pressure, or hypertension, is a risk factor for coronary heart disease and strokes in adults. Blood pressure is given as two values: systolic and diastolic. The table below shows the range of values considered to be normal, elevated or high.

Measure	Normal	Elevated (risk)	high
Systolic pressure	90-120 mmHg	120-140 mmHg	>140mmHg
Diastolic pressure	60-80 mmHg	80-90mmHg	>90 mmHg

For individuals aged up to 50, both diastolic blood pressure and systolic blood pressure are independently associated with cardiovascular risk. At age 50, systolic blood pressure becomes far more important than diastolic blood pressure in predicting the risk of coronary heart disease and other complications (Basile, 2002). The Elevation of systolic blood pressure is also known as Isolated Systolic Hypertension. This remains the most common form of hypertension and the most difficult to treat. Risk factors associated with hypertension include age, being overweight, alcohol consumption, family history, ethnic background, sedentary life style and smoking habits. We can use data from the Health Survey for England to test the association between hypertension and factors related to an unhealthy lifestyle.

**Research question:** To what extent is systolic blood pressure associated with unhealthy lifestyle habits?

### Data: SN 7402 Health Survey for England, 2011, Teaching Data Set

The Health Survey for England (HSE) is designed to monitor trends in the nation's health. It began in 1991 and is carried out annually. The study provides regular information not available from other sources on a range of aspects concerning the public's health, including many factors that affect health. Some core questions are included in every wave but each year's survey also has a particular focus on a disease or condition or population group. The survey combines questionnaire-based answers with physical measurements and the analysis of blood samples. The Teaching dataset is based on the Health Survey for England 2011. It includes data for 10,617 cases and 58 variables. Most of the variables are individual-level variables, though some household-level variables are included. This teaching idea is based on questions asked during the interview and measures taken by the nurse visit.

### Variables of Interest

Variable	Name in dataset	Categories and codes
Systolic blood pressure	Omsysval	None (interval variable)
Age	Age	Ranges from 16 and over
BMI	Bmival	None (interval variable)
Total units of alcohol consumption	Totalwu	None (interval variable)
Cigarette smoking status	Cigst1	Never smoked cigarettes at all (1) Used to smoke cigarettes occasionally (2) Used to smoke cigarettes regularly (3) Current cigarette smoker (4)

## Data Analysis

1. Measure the strength of association between the dependent variable (omsysval) and each explanatory variable (Age, bmival, totalwu, cigst1):
  - a. Use Pearson's correlation and scatter plots to explore the association between systolic blood pressure (omsysval) and each scalar independent variable (Age, bmival, totalwu).
  - b. Use Spearman's Rank and boxplots to explore the association between systolic blood pressure (omsysval) and cigarette smoking status (cigst1).
- c. Compare the mean systolic blood pressure of each category of cigarette smoking status (cigst1) and use ANOVA to test whether these differences are statistically significant.
2. Use multiple linear regression to assess the effects of age, weight, smoking habits and alcohol consumption on systolic blood pressure. Create a dummy variable for smoking status in order to include it in the model (e.g. 0= has never smoked, 1=used to smoke/current cigarette smoker).

Access the SPSS syntax commands for each of these exercises:

<https://ukdataservice.ac.uk/media/622452/syntaxanalysingriskfactors.pdf>

## Example Results

**Table 1: Pearson correlation between systolic blood pressure and explanatory variables**

	Person's correlation	P-value
BMI	0.399	< 0.001
Age	0.516	<0.001
Total units alcohol consumption	0.103	<0.001

**Table 2: Mean and frequency of systolic blood pressure for smoking status**

Cigarette smoking status	Mean Systolic BP	Count Systolic BP
Never smoked	124.14	4,145
Used to smoke-occasionally	124.93	442
Used to smoke-regularly	129.36	2142
Current cigarette smoker	124.55	1766

Access the data: [SN 7402 Health Survey for England, 2011: Teaching Dataset](#)

## References:

Basile, J. (2002). Systolic blood pressure. *BMJ*, 325: 917-918. [https://www.researchgate.net/profile/Jan\\_Basile/publication/11064863\\_Systolic\\_blood\\_pressure/links/09e4150f45f7e91f4c000000.pdf](https://www.researchgate.net/profile/Jan_Basile/publication/11064863_Systolic_blood_pressure/links/09e4150f45f7e91f4c000000.pdf)

Blood pressure chart. Retrieved online from: <http://www.bloodpressureuk.org/BloodPressureandyou/Thebasics/Bloodpressurechart>

