#### STAT 420 Final Data Analysis Project - Team KWS

# Introduction

Life expectancy varies greatly across the world. Understanding the factors that influence life expectancy can provide insights for policymakers, healthcare providers, and individuals. This project aims to delve into the determinants of life expectancy.

The dataset used is from the World Health Organization (WHO) and United Nations, which provides a wealth of data related to life expectancy across 193 countries. The dataset, publicly available on Kaggle under the title "Life Expectancy (WHO)", comprises 22 columns and 2,938 observations. Each observation represents the state of a given country in a particular year, with 20 predictor variables providing comprehensive information about various factors potentially impacting life expectancy.

The predictor variables span across a broad spectrum, including immunization-related factors, mortality factors, economic indicators, and social factors. Among these, we believe certain variables like the status of the country (developed vs developing), infant mortality rate, adult mortality rate, health expenditure, GDP, and average years of schooling may have significant importance in predicting life expectancy.

Our objective in this project is to create a model that can effectively predict life expectancy based on these predictors. We're particularly interested in this dataset due to our curiosity about the factors influencing life expectancy and our desire to uncover the differences between countries that lead to a wide range of life expectancies. By building this model, we aim to provide insights that could potentially guide health policy and contribute to improvements in global health outcomes.

## Methods

## **Loading Data**

```
#read data
library(readr)
life_expectancy_data_full = read_csv("Life Expectancy Data.csv")
```

```
## Rows: 2938 Columns: 22
## — Column specification
## Delimiter: ","
## chr (2): Country, Status
## dbl (20): Year, Life expectancy, Adult Mortality, infant deaths, Alcohol, pe...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

We will remove rows with empty values to make analysis easier.

```
#remove rows with empty vals
life_expectancy_data = na.omit(life_expectancy_data_full)
View(life_expectancy_data)
```

For our analysis, we have chosen to convert the predictors Status and Country into factor variables, so that we can treat them as categories.

```
#convert Status (levels: Developing, Developed) to factor variable
life_expectancy_data$Status = as.factor(life_expectancy_data$Status)
#convert Country to factor variable
life_expectancy_data$Country = as.factor(life_expectancy_data$Country)
```

#### **Exploratory Analysis**

The pairs plot of all of the variables was very large, so we will display correlations between the numeric variables in the dataset with a Correlogram instead.

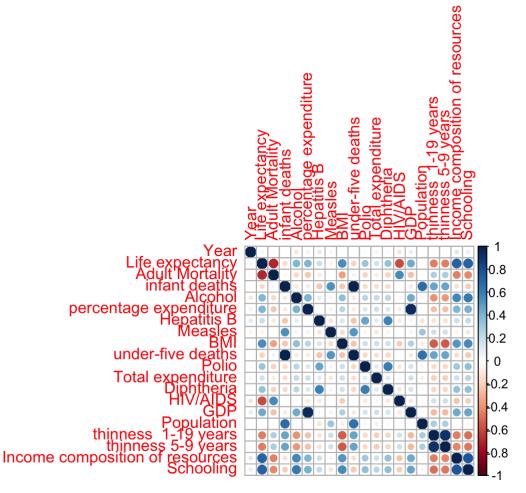
```
#pairs(life_expectancy_data)

#find pairwise correlations between all numeric variables in dataset
numeric_cols = unlist(lapply(life_expectancy_data, is.numeric))
life_expectancy_data_numeric = life_expectancy_data[ , numeric_cols]
View(life_expectancy_data_numeric)

correlations = cor(life_expectancy_data_numeric)

#plot correlogram (positive correlations are blue, negative correlations are red)
library(corrplot)

corrplot(correlations)
```



We notice that there are a few variables with very high correlations, so we will attempt to address this issue in our modeling.

## **Initial Additive Model**

First, we create a main effects model using all of the available predictors in the dataset to predict life expectancy.

```
additive_model = lm(life_expectancy_data$`Life expectancy` ~ ., data = life_expectancy_d
ata)
#summary(additive_model)
```

#### **Analyze Model**

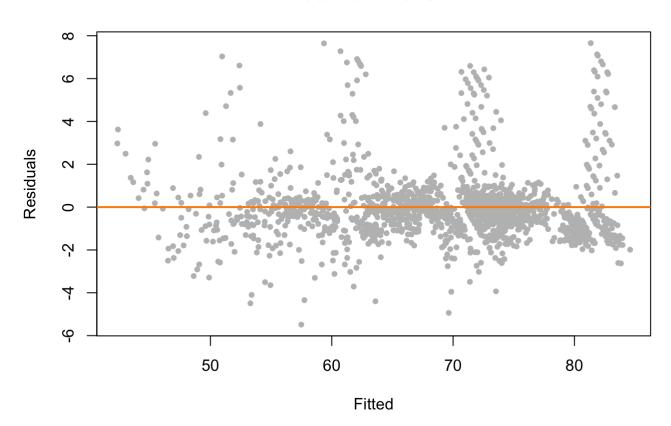
```
#Calculate LOOCV RMSE
calc loocv rmse = function(model) {
  sqrt(mean((resid(model) / (1 - hatvalues(model))) ^ 2))
}
# Function to calculate model metrics
calc model metrics = function(model) {
  # Calculate adjusted R squared
 model_adjr2 = summary(model)$adj.r.squared
 # Calculate RMSE
 model rmse = sqrt(mean(resid(model) ^ 2))
 # Calculate LOOCV RMSE
 model_loocv_rmse = sqrt(mean((resid(model) / (1 - hatvalues(model))) ^ 2))
 # Calculate AIC
 model_AIC = extractAIC(model)[2] # get only the AIC value, not the degrees of freedom
 # Return a list containing the calculated metrics
 list(Adj_R_Squared = model_adjr2, RMSE = model_rmse, LOOCV_RMSE = model_loocv_rmse, AI
C = model AIC)
}
additive model metrics = as.data.frame(calc model metrics(additive model))
library(knitr)
knitr::kable(additive model metrics, caption = "Additive Model Summary", digits = 4)
```

Additive Model Summary

AIC	LOOCV_RMSE	RMSE	Adj_R_Squared
1824.977	1.7559	1.5859	0.9642

# Check model assumptions

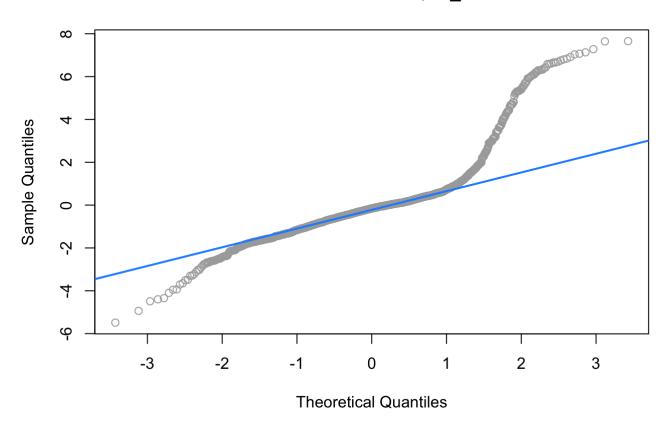
## **Data from Model 1**



```
#Q-Q Plot

qqnorm(resid(additive_model), main = "Normal Q-Q Plot, fit_1", col = "darkgrey")
qqline(resid(additive_model), col = "dodgerblue", lwd = 2)
```

#### Normal Q-Q Plot, fit\_1



The fitted vs residuals plot and Q-Q plot suggest issues with this model's assumptions, which we will confirm via more formal tests.

```
library(lmtest)
bptest(additive_model)

##

## studentized Breusch-Pagan test
##

## data: additive_model

## BP = 283.35, df = 151, p-value = 4.012e-10

shapiro.test(resid(additive_model))
```

The results of the Breusch-Pagan test and the Shapiro-Wilk test confirm that this model violates both the constant variance assumption and the normality assumption. We will attempt to improve these issues below.

Shapiro-Wilk normality test

## data: resid(additive\_model)
## W = 0.82427, p-value < 2.2e-16</pre>

## ##

## Model Improvement: Removing Highly Correlated Variables

We will attempt to fix these issues by removing highly correlated predictors. In particular, the variables thinness 1–19 years and thinness 5–9 years had a correlation of 0.997. In addition, the variables under 5 death and infant death had a correlation of 0.928. We'll remove one from each of the above pairs of predictors and reassess the model.

```
#----- Next step -----
#Removing infant deaths and thinness 1-19 years
corr_removed_data_1 = life_expectancy_data[ , !(names(life_expectancy_data) %in% c('infa
nt deaths', 'thinness 1-19 years'))]
corr_removed_model_1 = lm(`Life expectancy` ~ ., data = corr_removed_data_1)
corr_removed_metrics_1 = calc_model_metrics(corr_removed_model_1)
#Removing infant deaths and thinness 5-9 years
corr_removed_data_2 = life_expectancy_data[ , !(names(life_expectancy_data) %in% c('infa
nt deaths', 'thinness 5-9 years'))]
corr_removed_model_2 = lm(`Life expectancy` ~ ., data = corr_removed_data_2)
corr removed metrics 2 = calc model metrics(corr removed model 2)
#Removing under 5 deaths and thinness 1-19 years
corr_removed_data_3 = life_expectancy_data[ , !(names(life_expectancy_data) %in% c('unde
r 5 death', 'thinness 1-19 years'))]
corr_removed_model_3 = lm(`Life expectancy` ~ ., data = corr_removed_data_3)
corr removed metrics 3 = calc model metrics(corr removed model 3)
#Removing under 5 deaths and thinness 5-9 years
corr_removed_data_4 = life_expectancy_data[ , !(names(life_expectancy_data) %in% c('unde
r 5 death', 'thinness 5-9 years'))]
corr removed model 4 = lm(`Life expectancy` ~ ., data = corr_removed_data_4)
corr removed metrics 4 = calc model metrics(corr removed model 4)
# Create a data frame summarizing the model metrics
model summary = data.frame(
 Variables Removed = c("infant deaths + thinness 1-19", "infant deaths + thinness 5-9",
"under 5 deaths + thinness 1-19", "under 5 deaths + thinness 5-9 years"),
 Adjusted R Squared = c(corr removed metrics 1$Adj R Squared, corr removed metrics 2$Ad
j R Squared, corr removed metrics 3$Adj R Squared, corr removed metrics 4$Adj R Square
d),
 RMSE = c(corr removed metrics 1$RMSE, corr removed metrics 2$RMSE, corr removed metric
s 3$RMSE, corr removed metrics 4$RMSE),
 LOOCV RMSE = c(corr removed metrics 1$LOOCV RMSE, corr removed metrics 2$LOOCV RMSE, c
orr removed metrics 3$LOOCV RMSE, corr removed metrics 4$LOOCV RMSE),
 AIC = c(corr removed metrics 1$AIC, corr removed metrics 2$AIC, corr removed metrics 3
$AIC, corr removed metrics 4$AIC)
)
library(knitr)
knitr::kable(model summary, caption = "Model Summary", digits = 4)
```

Model Summary

Variables_Removed	Adjusted_R_Squared	RMSE LOOCV_RMSE	AIC
infant deaths + thinness 1-19	0.9640	1.5914 1.7576	1834.247

Variables_Removed	Adjusted_R_Squared	RMSE LOOCV_RMSE	AIC
infant deaths + thinness 5-9	0.9639	1.5937 1.7590	1837.088
under 5 deaths + thinness 1-19	0.9642	1.5859 1.7559	1824.977
under 5 deaths + thinness 5-9 years	0.9641	1.5883 1.7572	1827.939

Our analysis suggests that removing the variables under 5 deaths and thinness 1-19 results in the most model improvement. However, the resulting AIC of this model is still large, so we need to further improve the model.

#### Model Improvement: Log Transformation of Predictor Variables

We will attempt to further improve the model by log transforming certain predictor variables (Population and GDP).

```
#----- Next step -----
log_transform_1 = lm(`Life expectancy` ~ . + log(Population) + log(GDP), data = life_exp
ectancy_data)
log_transformed_metrics_1 = calc_model_metrics(log_transform_1)
log transform 2 = lm(`Life expectancy` ~ . + log(GDP), data = life expectancy data)
log transformed metrics 2 = calc model metrics(log transform 2)
log transform 3 = lm(`Life expectancy` ~ . + log(Population), data = life expectancy dat
a)
log transformed metrics 3 = calc model metrics(log transform 3)
log model summary = data.frame(
  Variables Log Transformed = c("Population + GDP", "GDP", "Population"),
  Adjusted R Squared = c(log transformed metrics 1$Adj R Squared, log transformed metric
s 2$Adj R Squared, log transformed metrics 3$Adj R Squared),
  RMSE = c(log_transformed_metrics_1$RMSE, log_transformed_metrics_2$RMSE, log_transform
ed metrics 3$RMSE),
  LOOCV RMSE = c(log transformed metrics 1$LOOCV RMSE, log transformed metrics 2$LOOCV R
MSE, log transformed metrics 3$LOOCV RMSE),
  AIC = c(log transformed metrics 1$AIC, log transformed metrics 2$AIC, log transformed
metrics 3$AIC)
knitr::kable(log model summary, caption = "Log Transformed Model Summary", digits = 4)
```

Log Transformed Model Summary

Variables_Log_Transformed	Adjusted_R_Squared	RMSE	LOOCV_RMSE	AIC
Population + GDP	0.9642	1.5853	1.7583	1827.612
GDP	0.9642	1.5853	1.7569	1825.613

Variables_Log_Transformed	Adjusted_R_Squared	RMSE L	OOCV_RMSE	AIC
Population	0.9642	1.5859	1.7574	1826.977

Experimenting with various log transformations of the predictor variables Population and GDP suggests that log transformation of GDP resulted in a minimal improvement in AIC.

```
n = length(resid(additive_model))

#----- Next step ------
#We will use AIC and BIC backwards search to attempt to further improve the model
```

#AIC and BIC for additive models
additive\_mod\_back\_aic = step(additive\_model, direction = "backward")

```
## Start: AIC=1824.98
## life_expectancy_data$`Life expectancy` ~ Country + Year + Status +
##
       `Adult Mortality` + `infant deaths` + Alcohol + `percentage expenditure` +
##
       `Hepatitis B` + Measles + BMI + `under-five deaths` + Polio +
       `Total expenditure` + Diphtheria + `HIV/AIDS` + GDP + Population +
##
##
       `thinness 1-19 years` + `thinness 5-9 years` + `Income composition of resources`
##
       Schooling
##
##
## Step: AIC=1824.98
## life_expectancy_data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + Polio + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Polio
                                         1
                                                 0.1 4147.8 1823.0
## - Diphtheria
                                         1
                                                 0.2 4147.9 1823.1
## - Population
                                         1
                                                 0.3 4147.9 1823.1
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.0 1823.1
## - BMI
                                         1
                                                 0.5 4148.1 1823.2
## - `percentage expenditure`
                                                 1.1 4148.7 1823.4
                                         1
                                                 1.6 4149.3 1823.6
## - GDP
                                         1
## - `Total expenditure`
                                         1
                                                 1.9 4149.6 1823.7
## - Measles
                                         1
                                                 2.8 4150.5 1824.1
## - `Adult Mortality`
                                                 3.9 4151.6 1824.5
                                         1
## - `Hepatitis B`
                                         1
                                                 4.8 4152.4 1824.9
## <none>
                                                      4147.6 1825.0
## - `Income composition of resources`
                                                 7.6 4155.2 1826.0
                                         1
## - `thinness 5-9 years`
                                                12.5 4160.1 1827.9
                                         1
## - Alcohol
                                         1
                                                12.8 4160.4 1828.1
## - `infant deaths`
                                                28.4 4176.1 1834.2
                                         1
## - `under-five deaths`
                                         1
                                                32.1 4179.7 1835.7
## - Schooling
                                         1
                                                37.0 4184.6 1837.6
## - Year
                                         1
                                               456.5 4604.1 1995.2
## - `HIV/AIDS`
                                         1
                                              1016.8 5164.4 2184.5
                                             16527.0 20674.7 4209.9
## - Country
                                       132
##
## Step: AIC=1823.04
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## - Diphtheria
                                                 0.2 4147.9 1821.1
                                         1
## - Population
                                         1
                                                 0.3 4148.0 1821.2
```

```
0.3 4148.1 1821.2
## - `thinness 1-19 years`
                                        1
## - BMI
                                        1
                                                0.5 4148.3 1821.2
## - `percentage expenditure`
                                                1.1 4148.8 1821.5
                                        1
## - GDP
                                        1
                                                1.6 4149.4 1821.7
## - `Total expenditure`
                                        1
                                                2.0 4149.7 1821.8
## - Measles
                                        1
                                                2.9 4150.6 1822.2
## - `Adult Mortality`
                                        1
                                                3.9 4151.7 1822.6
## - `Hepatitis B`
                                                4.7 4152.4 1822.9
                                                     4147.8 1823.0
## <none>
## - `Income composition of resources`
                                               7.6 4155.4 1824.1
                                        1
                                               12.6 4160.3 1826.0
## - `thinness 5-9 years`
                                        1
## - Alcohol
                                        1
                                               12.8 4160.5 1826.1
## - `infant deaths`
                                        1
                                               28.6 4176.4 1832.4
## - `under-five deaths`
                                        1
                                               32.2 4180.0 1833.8
## - Schooling
                                        1
                                               36.9 4184.7 1835.6
## - Year
                                        1
                                              456.6 4604.4 1993.2
## - `HIV/AIDS`
                                        1
                                            1016.7 5164.4 2182.5
                                            16542.4 20690.1 4209.1
## - Country
                                      132
##
## Step: AIC=1821.1
## life_expectancy_data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
      Measles + BMI + `under-five deaths` + `Total expenditure` +
      `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - Population
                                        1
                                                0.3 4148.2 1819.2
## - `thinness 1-19 years`
                                        1
                                                0.3 4148.2 1819.2
## - BMI
                                                0.5 4148.4 1819.3
                                        1
## - `percentage expenditure`
                                        1
                                                1.1 4149.0 1819.5
## - GDP
                                        1
                                                1.6 4149.5 1819.7
## - `Total expenditure`
                                        1
                                                2.0 4149.9 1819.9
## - Measles
                                        1
                                                2.8 4150.8 1820.2
## - `Adult Mortality`
                                        1
                                                3.9 4151.8 1820.7
## <none>
                                                     4147.9 1821.1
## - `Hepatitis B`
                                                7.1 4155.0 1821.9
                                        1
## - `Income composition of resources`
                                               7.9 4155.8 1822.2
                                        1
## - `thinness 5-9 years`
                                        1
                                               12.6 4160.5 1824.1
## - Alcohol
                                        1
                                               12.8 4160.7 1824.2
## - `infant deaths`
                                               28.9 4176.9 1830.6
                                        1
## - `under-five deaths`
                                        1
                                               32.6 4180.5 1832.0
## - Schooling
                                        1
                                               37.1 4185.0 1833.8
## - Year
                                        1
                                              456.9 4604.9 1991.4
## - `HIV/AIDS`
                                            1020.4 5168.3 2181.8
                                        1
                                      132 16656.3 20804.2 4216.2
## - Country
##
## Step: AIC=1819.21
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
      Measles + BMI + `under-five deaths` + `Total expenditure` +
```

```
`HIV/AIDS` + GDP + `thinness 1-19 years` + `thinness 5-9 years` +
##
##
      `Income composition of resources` + Schooling
##
##
                                       Df Sum of Sq
                                                      RSS
                                                               AIC
## - `thinness 1-19 years`
                                        1
                                                0.3 4148.5 1817.3
## - BMI
                                        1
                                                0.5 4148.7 1817.4
## - `percentage expenditure`
                                        1
                                                1.1 4149.3 1817.6
## - GDP
                                        1
                                                1.6 4149.8 1817.9
## - `Total expenditure`
                                                1.9 4150.1 1818.0
                                        1
                                        1
                                                3.0 4151.2 1818.4
## - Measles
## - `Adult Mortality`
                                        1
                                                4.0 4152.2 1818.8
                                                     4148.2 1819.2
## <none>
## - `Hepatitis B`
                                        1
                                                7.0 4155.2 1820.0
## - `Income composition of resources`
                                               7.9 4156.1 1820.4
                                        1
## - Alcohol
                                        1
                                               12.9 4161.1 1822.3
## - `thinness 5-9 years`
                                        1
                                               12.9 4161.1 1822.3
## - `infant deaths`
                                        1
                                               29.6 4177.8 1828.9
## - `under-five deaths`
                                        1
                                               32.9 4181.1 1830.2
## - Schooling
                                               36.9 4185.1 1831.8
                                        1
## - Year
                                        1
                                              456.7 4604.9 1989.4
## - `HIV/AIDS`
                                        1
                                            1021.7 5169.9 2180.3
## - Country
                                      132
                                            16656.9 20805.1 4214.3
##
## Step: AIC=1817.32
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
      `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
##
      Measles + BMI + `under-five deaths` + `Total expenditure` +
##
      `HIV/AIDS` + GDP + `thinness 5-9 years` + `Income composition of resources` +
      Schooling
##
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
                                                0.5 4149.0 1815.5
## - BMI
                                        1
## - `percentage expenditure`
                                        1
                                                1.1 4149.5 1815.7
## - GDP
                                       1
                                                1.6 4150.1 1816.0
## - `Total expenditure`
                                        1
                                                1.9 4150.4 1816.1
                                        1
                                                2.9 4151.4 1816.5
## - Measles
## - `Adult Mortality`
                                        1
                                               4.0 4152.5 1816.9
## <none>
                                                     4148.5 1817.3
                                               7.1 4155.6 1818.1
## - `Hepatitis B`
                                        1
## - `Income composition of resources`
                                               7.9 4156.4 1818.5
## - Alcohol
                                        1
                                               12.8 4161.3 1820.4
## - `thinness 5-9 years`
                                               22.2 4170.7 1824.1
                                        1
## - `infant deaths`
                                        1
                                               29.4 4177.9 1827.0
## - `under-five deaths`
                                        1
                                               32.7 4181.2 1828.3
## - Schooling
                                        1
                                               36.8 4185.3 1829.9
## - Year
                                        1
                                              456.5 4605.0 1987.5
## - `HIV/AIDS`
                                            1021.7 5170.1 2178.4
                                        1
## - Country
                                      132
                                            16656.6 20805.1 4212.3
##
## Step: AIC=1815.52
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
##
      `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
```

```
##
       Measles + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
       GDP + `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 AIC
## - `percentage expenditure`
                                         1
                                                 1.2 4150.2 1814.0
## - GDP
                                         1
                                                 1.7 4150.7 1814.2
## - `Total expenditure`
                                         1
                                                 1.8 4150.8 1814.3
                                                 3.0 4152.0 1814.7
## - Measles
                                         1
## - `Adult Mortality`
                                         1
                                                 4.0 4153.0 1815.1
## <none>
                                                       4149.0 1815.5
## - `Hepatitis B`
                                                 6.9 4155.9 1816.3
                                         1
## - `Income composition of resources`
                                         1
                                                 7.7 4156.6 1816.6
## - Alcohol
                                         1
                                                12.8 4161.8 1818.6
## - `thinness 5-9 years`
                                         1
                                                22.4 4171.4 1822.4
## - `infant deaths`
                                         1
                                                29.4 4178.4 1825.2
                                                32.7 4181.7 1826.5
## - `under-five deaths`
                                         1
## - Schooling
                                         1
                                                36.8 4185.8 1828.1
## - Year
                                               456.8 4605.8 1985.8
                                         1
## - `HIV/AIDS`
                                         1
                                              1026.4 5175.4 2178.0
## - Country
                                       132
                                             16982.3 21131.3 4235.9
##
## Step: AIC=1813.99
## life_expectancy_data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
       `infant deaths` + Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
       `Total expenditure` + `HIV/AIDS` + GDP + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - GDP
                                         1
                                                 0.9 4151.0 1812.3
## - `Total expenditure`
                                                 1.9 4152.1 1812.7
                                         1
## - Measles
                                         1
                                                 3.0 4153.2 1813.2
## - `Adult Mortality`
                                                 4.0 4154.1 1813.6
## <none>
                                                      4150.2 1814.0
## - `Hepatitis B`
                                                 7.0 4157.2 1814.8
                                         1
## - `Income composition of resources`
                                                 7.7 4157.8 1815.0
                                         1
## - Alcohol
                                                12.5 4162.7 1817.0
                                         1
## - `thinness 5-9 years`
                                                22.3 4172.5 1820.8
                                         1
## - `infant deaths`
                                         1
                                                29.1 4179.2 1823.5
## - `under-five deaths`
                                         1
                                                32.4 4182.5 1824.8
## - Schooling
                                         1
                                                37.5 4187.6 1826.8
## - Year
                                               459.9 4610.1 1985.3
                                         1
## - `HIV/AIDS`
                                         1
                                              1025.3 5175.4 2176.0
## - Country
                                       132
                                             17019.7 21169.8 4236.9
##
## Step: AIC=1812.34
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
       `Total expenditure` + `HIV/AIDS` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
```

```
## - `Total expenditure`
                                        1
                                                1.8 4152.9 1811.1
## - Measles
                                        1
                                                3.0 4154.0 1811.5
## - `Adult Mortality`
                                        1
                                                3.9 4155.0 1811.9
## <none>
                                                     4151.0 1812.3
## - `Hepatitis B`
                                        1
                                                6.9 4158.0 1813.1
## - `Income composition of resources`
                                        1
                                                7.5 4158.5 1813.3
## - Alcohol
                                        1
                                               12.3 4163.3 1815.2
## - `thinness 5-9 years`
                                        1
                                               22.3 4173.4 1819.2
## - `infant deaths`
                                               29.0 4180.0 1821.8
                                        1
## - `under-five deaths`
                                               32.3 4183.3 1823.1
                                        1
## - Schooling
                                        1
                                               37.0 4188.0 1825.0
## - Year
                                              483.5 4634.5 1992.0
                                        1
## - `HIV/AIDS`
                                        1
                                             1024.5 5175.5 2174.1
## - Country
                                      132
                                            17885.0 22036.0 4301.0
##
## Step: AIC=1811.06
## life_expectancy_data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
       `infant deaths` + Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - Measles
                                        1
                                                2.9 4155.7 1810.2
## - `Adult Mortality`
                                        1
                                                3.9 4156.8 1810.6
## <none>
                                                     4152.9 1811.1
## - `Hepatitis B`
                                                6.7 4159.6 1811.7
                                        1
## - `Income composition of resources`
                                        1
                                                7.6 4160.4 1812.1
## - Alcohol
                                        1
                                               12.2 4165.0 1813.9
## - `thinness 5-9 years`
                                        1
                                               22.2 4175.1 1817.9
## - `infant deaths`
                                        1
                                               29.1 4181.9 1820.6
## - `under-five deaths`
                                               32.4 4185.2 1821.9
                                        1
## - Schooling
                                        1
                                               37.2 4190.0 1823.8
## - Year
                                        1
                                              481.7 4634.5 1990.0
## - `HIV/AIDS`
                                        1
                                             1022.7 5175.5 2172.1
                                            18014.7 22167.6 4308.9
## - Country
                                      132
##
## Step: AIC=1810.2
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
       `infant deaths` + Alcohol + `Hepatitis B` + `under-five deaths` +
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - `Adult Mortality`
                                                 3.9 4159.6 1809.7
## <none>
                                                     4155.7 1810.2
## - `Hepatitis B`
                                                6.8 4162.5 1810.9
                                        1
## - `Income composition of resources`
                                                7.5 4163.2 1811.2
## - Alcohol
                                        1
                                               12.2 4167.9 1813.0
## - `thinness 5-9 years`
                                               22.8 4178.5 1817.2
                                        1
## - `infant deaths`
                                               27.4 4183.2 1819.0
                                        1
## - `under-five deaths`
                                        1
                                               31.0 4186.7 1820.4
## - Schooling
                                        1
                                               38.3 4194.0 1823.3
```

```
## - Year
                                               482.8 4638.5 1989.4
                                         1
## - `HIV/AIDS`
                                              1021.8 5177.5 2170.7
                                         1
## - Country
                                             18052.6 22208.3 4309.9
                                       132
##
## Step: AIC=1809.74
## life_expectancy_data$`Life expectancy` ~ Country + Year + `infant deaths` +
       Alcohol + `Hepatitis B` + `under-five deaths` + `HIV/AIDS` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                          RSS
                                                                 AIC
## <none>
                                                       4159.6 1809.7
## - `Hepatitis B`
                                         1
                                                  6.6 4166.2 1810.3
                                                 7.7 4167.3 1810.8
## - `Income composition of resources`
                                         1
## - Alcohol
                                         1
                                                12.3 4171.9 1812.6
## - `thinness 5-9 years`
                                         1
                                                22.9 4182.5 1816.8
## - `infant deaths`
                                         1
                                                27.4 4187.0 1818.6
## - `under-five deaths`
                                         1
                                                30.8 4190.4 1819.9
## - Schooling
                                         1
                                                 38.6 4198.2 1823.0
## - Year
                                         1
                                               489.2 4648.8 1991.1
## - `HIV/AIDS`
                                              1071.3 5230.9 2185.6
                                         1
## - Country
                                             22622.6 26782.2 4616.7
                                       132
```

```
additive mod_back_bic = step(additive_model, direction = "backward", k = log(n))
```

```
## Start: AIC=2646.98
## life_expectancy_data$`Life expectancy` ~ Country + Year + Status +
##
       `Adult Mortality` + `infant deaths` + Alcohol + `percentage expenditure` +
##
       `Hepatitis B` + Measles + BMI + `under-five deaths` + Polio +
##
       `Total expenditure` + Diphtheria + `HIV/AIDS` + GDP + Population +
##
       `thinness 1-19 years` + `thinness 5-9 years` + `Income composition of resources`
##
       Schooling
##
##
## Step: AIC=2646.98
## life_expectancy_data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + Polio + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Polio
                                         1
                                                 0.1 4147.8 2639.6
## - Diphtheria
                                         1
                                                 0.2 4147.9 2639.7
## - Population
                                         1
                                                 0.3 4147.9 2639.7
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.0 2639.7
## - BMI
                                         1
                                                 0.5 4148.1 2639.8
## - `percentage expenditure`
                                                 1.1 4148.7 2640.0
                                         1
                                                 1.6 4149.3 2640.2
## - GDP
                                         1
## - `Total expenditure`
                                         1
                                                 1.9 4149.6 2640.3
## - Measles
                                         1
                                                 2.8 4150.5 2640.7
## - `Adult Mortality`
                                         1
                                                 3.9 4151.6 2641.1
## - `Hepatitis B`
                                         1
                                                 4.8 4152.4 2641.5
                                                 7.6 4155.2 2642.6
## - `Income composition of resources`
                                         1
## - `thinness 5-9 years`
                                         1
                                                12.5 4160.1 2644.5
## - Alcohol
                                                12.8 4160.4 2644.7
                                         1
## <none>
                                                      4147.6 2647.0
## - `infant deaths`
                                                28.4 4176.1 2650.8
                                         1
## - `under-five deaths`
                                         1
                                                32.1 4179.7 2652.3
## - Schooling
                                         1
                                                37.0 4184.6 2654.2
## - Year
                                         1
                                               456.5 4604.1 2811.8
## - `HIV/AIDS`
                                         1
                                              1016.8 5164.4 3001.1
                                             16527.0 20674.7 4318.0
## - Country
                                       132
##
## Step: AIC=2639.63
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## - Diphtheria
                                                 0.2 4147.9 2632.3
                                         1
## - Population
                                         1
                                                 0.3 4148.0 2632.3
```

```
0.3 4148.1 2632.3
## - `thinness 1-19 years`
                                        1
## - BMI
                                        1
                                                0.5 4148.3 2632.4
## - `percentage expenditure`
                                                1.1 4148.8 2632.6
                                       1
## - GDP
                                       1
                                               1.6 4149.4 2632.9
## - `Total expenditure`
                                        1
                                               2.0 4149.7 2633.0
## - Measles
                                        1
                                                2.9 4150.6 2633.4
## - `Adult Mortality`
                                       1
                                                3.9 4151.7 2633.8
## - `Hepatitis B`
                                               4.7 4152.4 2634.1
                                        1
                                               7.6 4155.4 2635.2
## - `Income composition of resources` 1
## - `thinness 5-9 years`
                                       1
                                               12.6 4160.3 2637.2
                                               12.8 4160.5 2637.3
## - Alcohol
                                        1
## <none>
                                                    4147.8 2639.6
## - `infant deaths`
                                        1
                                               28.6 4176.4 2643.6
## - `under-five deaths`
                                        1
                                               32.2 4180.0 2645.0
## - Schooling
                                        1
                                               36.9 4184.7 2646.8
## - Year
                                        1
                                              456.6 4604.4 2804.4
## - `HIV/AIDS`
                                        1
                                           1016.7 5164.4 2993.7
                                            16542.4 20690.1 4311.9
## - Country
                                      132
##
## Step: AIC=2632.29
## life_expectancy_data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
      `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
      Measles + BMI + `under-five deaths` + `Total expenditure` +
      `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
      `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
##
                                       Df Sum of Sq
                                                       RSS
                                                              AIC
## - Population
                                        1
                                                0.3 4148.2 2625.0
## - `thinness 1-19 years`
                                        1
                                                0.3 4148.2 2625.0
                                                0.5 4148.4 2625.1
## - BMI
                                       1
## - `percentage expenditure`
                                               1.1 4149.0 2625.3
                                       1
## - GDP
                                        1
                                               1.6 4149.5 2625.5
## - `Total expenditure`
                                        1
                                               2.0 4149.9 2625.7
## - Measles
                                        1
                                               2.8 4150.8 2626.0
## - `Adult Mortality`
                                        1
                                               3.9 4151.8 2626.4
## - `Hepatitis B`
                                               7.1 4155.0 2627.7
                                       1
## - `Income composition of resources` 1
                                               7.9 4155.8 2628.0
                                              12.6 4160.5 2629.9
## - `thinness 5-9 years`
                                       1
## - Alcohol
                                        1
                                               12.8 4160.7 2629.9
## <none>
                                                     4147.9 2632.3
## - `infant deaths`
                                               28.9 4176.9 2636.3
                                        1
## - `under-five deaths`
                                        1
                                               32.6 4180.5 2637.8
## - Schooling
                                        1
                                               37.1 4185.0 2639.6
## - Year
                                        1
                                             456.9 4604.9 2797.2
## - `HIV/AIDS`
                                            1020.4 5168.3 2987.6
                                        1
                                      132 16656.3 20804.2 4313.5
## - Country
##
## Step: AIC=2624.99
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
##
      `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
      Measles + BMI + `under-five deaths` + `Total expenditure` +
```

```
`HIV/AIDS` + GDP + `thinness 1-19 years` + `thinness 5-9 years` +
##
##
      `Income composition of resources` + Schooling
##
##
                                       Df Sum of Sq
                                                      RSS
                                                              AIC
## - `thinness 1-19 years`
                                        1
                                                0.3 4148.5 2617.7
## - BMI
                                        1
                                                0.5 4148.7 2617.8
## - `percentage expenditure`
                                        1
                                                1.1 4149.3 2618.0
## - GDP
                                        1
                                                1.6 4149.8 2618.2
## - `Total expenditure`
                                                1.9 4150.1 2618.4
                                        1
## - Measles
                                        1
                                                3.0 4151.2 2618.8
## - `Adult Mortality`
                                               4.0 4152.2 2619.2
                                        1
## - `Hepatitis B`
                                               7.0 4155.2 2620.4
                                       1
## - `Income composition of resources` 1
                                               7.9 4156.1 2620.7
## - Alcohol
                                        1
                                              12.9 4161.1 2622.7
## - `thinness 5-9 years`
                                       1
                                               12.9 4161.1 2622.7
## <none>
                                                     4148.2 2625.0
## - `infant deaths`
                                        1
                                               29.6 4177.8 2629.3
## - `under-five deaths`
                                        1
                                               32.9 4181.1 2630.6
## - Schooling
                                               36.9 4185.1 2632.2
                                        1
## - Year
                                        1
                                              456.7 4604.9 2789.8
## - `HIV/AIDS`
                                        1
                                            1021.7 5169.9 2980.7
## - Country
                                      132
                                            16656.9 20805.1 4306.2
##
## Step: AIC=2617.69
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
      `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
##
      Measles + BMI + `under-five deaths` + `Total expenditure` +
##
      `HIV/AIDS` + GDP + `thinness 5-9 years` + `Income composition of resources` +
      Schooling
##
##
##
                                       Df Sum of Sq
                                                       RSS
                                                              ATC
                                                0.5 4149.0 2610.5
## - BMI
                                        1
                                                1.1 4149.5 2610.7
## - `percentage expenditure`
                                        1
## - GDP
                                       1
                                                1.6 4150.1 2610.9
## - `Total expenditure`
                                        1
                                               1.9 4150.4 2611.1
                                        1
## - Measles
                                               2.9 4151.4 2611.5
## - `Adult Mortality`
                                       1
                                               4.0 4152.5 2611.9
## - `Hepatitis B`
                                       1
                                                7.1 4155.6 2613.1
## - `Income composition of resources` 1
                                               7.9 4156.4 2613.4
## - Alcohol
                                       1
                                              12.8 4161.3 2615.4
## <none>
                                                     4148.5 2617.7
## - `thinness 5-9 years`
                                               22.2 4170.7 2619.1
                                       1
## - `infant deaths`
                                               29.4 4177.9 2621.9
                                        1
## - `under-five deaths`
                                        1
                                               32.7 4181.2 2623.2
## - Schooling
                                        1
                                               36.8 4185.3 2624.9
## - Year
                                        1
                                              456.5 4605.0 2782.4
## - `HIV/AIDS`
                                            1021.7 5170.1 2973.3
                                        1
## - Country
                                      132
                                            16656.6 20805.1 4298.8
##
## Step: AIC=2610.49
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
##
      `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
```

```
##
       Measles + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
       GDP + `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 AIC
## - `percentage expenditure`
                                         1
                                                 1.2 4150.2 2603.5
## - GDP
                                         1
                                                 1.7 4150.7 2603.8
## - `Total expenditure`
                                                 1.8 4150.8 2603.8
                                         1
                                                 3.0 4152.0 2604.3
## - Measles
                                         1
## - `Adult Mortality`
                                         1
                                                 4.0 4153.0 2604.7
## - `Hepatitis B`
                                         1
                                                 6.9 4155.9 2605.8
## - `Income composition of resources`
                                         1
                                                 7.7 4156.6 2606.1
## - Alcohol
                                         1
                                                12.8 4161.8 2608.2
## <none>
                                                      4149.0 2610.5
## - `thinness 5-9 years`
                                         1
                                                22.4 4171.4 2611.9
## - `infant deaths`
                                         1
                                                29.4 4178.4 2614.7
## - `under-five deaths`
                                         1
                                                32.7 4181.7 2616.0
## - Schooling
                                         1
                                                36.8 4185.8 2617.7
## - Year
                                               456.8 4605.8 2775.3
                                         1
## - `HIV/AIDS`
                                         1
                                              1026.4 5175.4 2967.6
## - Country
                                       132
                                             16982.3 21131.3 4317.0
##
## Step: AIC=2603.55
## life_expectancy_data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
       `infant deaths` + Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
       `Total expenditure` + `HIV/AIDS` + GDP + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 AIC
## - GDP
                                         1
                                                 0.9 4151.0 2596.5
## - `Total expenditure`
                                                 1.9 4152.1 2596.9
                                         1
## - Measles
                                         1
                                                 3.0 4153.2 2597.3
## - `Adult Mortality`
                                         1
                                                 4.0 4154.1 2597.7
## - `Hepatitis B`
                                         1
                                                 7.0 4157.2 2598.9
## - Income composition of resources
                                                 7.7 4157.8 2599.2
                                         1
## - Alcohol
                                                12.5 4162.7 2601.1
                                         1
## <none>
                                                      4150.2 2603.5
## - `thinness 5-9 years`
                                                22.3 4172.5 2605.0
                                         1
## - `infant deaths`
                                                29.1 4179.2 2607.7
                                         1
## - `under-five deaths`
                                         1
                                                32.4 4182.5 2609.0
## - Schooling
                                         1
                                                37.5 4187.6 2611.0
## - Year
                                               459.9 4610.1 2769.5
                                         1
## - `HIV/AIDS`
                                         1
                                              1025.3 5175.4 2960.2
## - Country
                                       132
                                             17019.7 21169.8 4312.6
##
## Step: AIC=2596.49
## life_expectancy_data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
       `Total expenditure` + `HIV/AIDS` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 ATC
```

```
## - `Total expenditure`
                                                 1.8 4152.9 2589.8
                                         1
## - Measles
                                         1
                                                 3.0 4154.0 2590.3
## - `Adult Mortality`
                                         1
                                                 3.9 4155.0 2590.6
## - `Hepatitis B`
                                        1
                                                6.9 4158.0 2591.8
## - `Income composition of resources`
                                         1
                                                7.5 4158.5 2592.0
                                                12.3 4163.3 2594.0
## - Alcohol
                                         1
## <none>
                                                      4151.0 2596.5
## - `thinness 5-9 years`
                                         1
                                                22.3 4173.4 2597.9
## - `infant deaths`
                                                29.0 4180.0 2600.6
                                         1
## - `under-five deaths`
                                                32.3 4183.3 2601.9
                                        1
## - Schooling
                                         1
                                                37.0 4188.0 2603.7
## - Year
                                               483.5 4634.5 2770.8
                                         1
                                              1024.5 5175.5 2952.8
## - `HIV/AIDS`
                                         1
## - Country
                                       132
                                             17885.0 22036.0 4371.4
##
## Step: AIC=2589.8
## life_expectancy_data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
       `infant deaths` + Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Measles
                                         1
                                                 2.9 4155.7 2583.5
## - `Adult Mortality`
                                         1
                                                 3.9 4156.8 2584.0
## - `Hepatitis B`
                                                 6.7 4159.6 2585.1
                                         1
## - `Income composition of resources`
                                                7.6 4160.4 2585.4
                                        1
## - Alcohol
                                         1
                                                12.2 4165.0 2587.2
## <none>
                                                      4152.9 2589.8
## - `thinness 5-9 years`
                                        1
                                                22.2 4175.1 2591.2
## - `infant deaths`
                                         1
                                                29.1 4181.9 2593.9
## - `under-five deaths`
                                                32.4 4185.2 2595.2
                                        1
## - Schooling
                                         1
                                                37.2 4190.0 2597.1
## - Year
                                         1
                                               481.7 4634.5 2763.3
## - `HIV/AIDS`
                                        1
                                             1022.7 5175.5 2945.4
                                            18014.7 22167.6 4373.8
## - Country
                                       132
##
## Step: AIC=2583.53
## life expectancy data$`Life expectancy` ~ Country + Year + `Adult Mortality` +
       `infant deaths` + Alcohol + `Hepatitis B` + `under-five deaths` +
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Adult Mortality`
                                                 3.9 4159.6 2577.7
## - `Hepatitis B`
                                        1
                                                 6.8 4162.5 2578.8
## - `Income composition of resources` 1
                                                7.5 4163.2 2579.1
## - Alcohol
                                                12.2 4167.9 2581.0
                                        1
## <none>
                                                      4155.7 2583.5
## - `thinness 5-9 years`
                                                22.8 4178.5 2585.1
                                        1
## - `infant deaths`
                                                27.4 4183.2 2587.0
                                         1
## - `under-five deaths`
                                        1
                                                31.0 4186.7 2588.4
## - Schooling
                                         1
                                                38.3 4194.0 2591.2
```

```
## - Year
                                               482.8 4638.5 2757.4
                                         1
## - `HIV/AIDS`
                                              1021.8 5177.5 2938.6
                                         1
                                             18052.6 22208.3 4369.4
## - Country
                                       132
##
## Step: AIC=2577.67
## life_expectancy_data$`Life expectancy` ~ Country + Year + `infant deaths` +
       Alcohol + `Hepatitis B` + `under-five deaths` + `HIV/AIDS` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Hepatitis B`
                                                 6.6 4166.2 2572.9
                                         1
## - `Income composition of resources`
                                         1
                                                 7.7 4167.3 2573.3
## - Alcohol
                                         1
                                                12.3 4171.9 2575.1
## <none>
                                                      4159.6 2577.7
## - `thinness 5-9 years`
                                         1
                                                22.9 4182.5 2579.3
## - `infant deaths`
                                         1
                                                27.4 4187.0 2581.1
## - `under-five deaths`
                                                30.8 4190.4 2582.4
                                         1
## - Schooling
                                                38.6 4198.2 2585.5
                                         1
## - Year
                                         1
                                               489.2 4648.8 2753.6
## - `HIV/AIDS`
                                         1
                                              1071.3 5230.9 2948.2
                                             22622.6 26782.2 4670.8
## - Country
                                       132
##
## Step: AIC=2572.86
## life_expectancy_data$`Life expectancy` ~ Country + Year + `infant deaths` +
       Alcohol + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Income composition of resources
                                         1
                                                 7.9 4174.1 2568.6
                                                12.1 4178.3 2570.2
## - Alcohol
                                         1
## <none>
                                                      4166.2 2572.9
## - `thinness 5-9 years`
                                         1
                                                23.8 4190.0 2574.9
## - `infant deaths`
                                         1
                                                27.3 4193.5 2576.2
## - `under-five deaths`
                                         1
                                                31.2 4197.4 2577.8
## - Schooling
                                                38.7 4204.8 2580.7
                                         1
## - Year
                                         1
                                               515.0 4681.2 2757.7
## - `HIV/AIDS`
                                              1076.3 5242.5 2944.4
                                         1
                                             22626.1 26792.3 4664.0
## - Country
                                       132
##
## Step: AIC=2568.59
## life expectancy data$`Life expectancy` ~ Country + Year + `infant deaths` +
##
       Alcohol + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
       Schooling
##
##
                           Df Sum of Sq
                                            RSS
                                                   AIC
## - Alcohol
                                   11.5 4185.6 2565.7
## <none>
                                         4174.1 2568.6
## - `thinness 5-9 years`
                                   24.1 4198.2 2570.7
                            1
## - `infant deaths`
                                   27.3 4201.4 2571.9
                            1
## - `under-five deaths`
                            1
                                  31.1 4205.2 2573.4
## - Schooling
                            1
                                   38.5 4212.6 2576.3
```

```
## - Year
                                  646.6 4820.7 2798.7
                            1
## - `HIV/AIDS`
                            1
                                 1070.3 5244.4 2937.6
## - Country
                          132
                                26354.1 30528.2 4871.8
##
## Step: AIC=2565.72
## life_expectancy_data$`Life expectancy` ~ Country + Year + `infant deaths` +
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
       Schooling
##
                           Df Sum of Sq
##
                                            RSS
                                                   AIC
## <none>
                                         4185.6 2565.7
## - `thinness 5-9 years`
                            1
                                   24.3 4209.9 2567.9
## - `infant deaths`
                            1
                                   30.8 4216.4 2570.4
## - `under-five deaths`
                            1
                                   34.4 4220.0 2571.8
## - Schooling
                            1
                                   37.0 4222.6 2572.8
## - Year
                            1
                                  686.5 4872.1 2808.7
## - `HIV/AIDS`
                            1
                                 1099.8 5285.4 2943.0
## - Country
                                26345.0 30530.7 4864.6
                          132
```

```
metrics_additive_mod_back_aic = calc_model_metrics(additive_mod_back_aic)
metrics_additive_mod_back_bic = calc_model_metrics(additive_mod_back_bic)
```

```
# AIC and BIC for models without highly corelated features
corr_mod_1_back_aic = step(corr_removed_model_1, direction = "backward")
```

```
## Start: AIC=1834.25
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
## Step: AIC=1834.25
  `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
       `under-five deaths` + Polio + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `thinness 1-19 years`
                                         1
                                                 0.1 4176.1 1832.3
## - Polio
                                         1
                                                 0.3 4176.4 1832.4
## - BMI
                                                 0.5 4176.6 1832.4
                                         1
## - Diphtheria
                                         1
                                                 0.7 4176.8 1832.5
## - `percentage expenditure`
                                         1
                                                 0.8 4176.9 1832.6
## - Population
                                         1
                                                 0.9 4176.9 1832.6
                                                 1.3 4177.3 1832.8
## - GDP
                                         1
                                                 1.5 4177.6 1832.8
## - Measles
                                         1
## - `Total expenditure`
                                         1
                                                 2.0 4178.0 1833.0
## - `Adult Mortality`
                                         1
                                                 4.0 4180.1 1833.8
## - `Hepatitis B`
                                         1
                                                 4.2 4180.2 1833.9
## <none>
                                                      4176.1 1834.2
## - `under-five deaths`
                                         1
                                                 6.8 4182.9 1834.9
## - `Income composition of resources`
                                                 7.5 4183.5 1835.2
                                         1
## - `thinness 5-9 years`
                                                12.3 4188.3 1837.1
                                         1
## - Alcohol
                                         1
                                                16.6 4192.6 1838.8
## - Schooling
                                         1
                                                37.5 4213.6 1847.0
## - Year
                                         1
                                               453.5 4629.5 2002.2
## - `HIV/AIDS`
                                         1
                                              1047.7 5223.7 2201.4
## - Country
                                       132
                                             17387.2 21563.3 4277.3
##
## Step: AIC=1832.28
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
       `under-five deaths` + Polio + `Total expenditure` + Diphtheria +
##
##
       `HIV/AIDS` + GDP + Population + `thinness 5-9 years` + `Income composition of res
ources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Polio
                                         1
                                                 0.3 4176.4 1830.4
## - BMI
                                         1
                                                 0.5 4176.6 1830.5
## - Diphtheria
                                                 0.7 4176.8 1830.6
                                         1
## - `percentage expenditure`
                                         1
                                                 0.8 4176.9 1830.6
```

```
## - Population
                                                     4177.1 1830.6
                                         1
                                                 0.9
## - GDP
                                         1
                                                 1.3 4177.4 1830.8
                                         1
                                                 1.5 4177.6 1830.9
## - Measles
## - `Total expenditure`
                                         1
                                                 2.0 4178.1 1831.1
## - `Adult Mortality`
                                         1
                                                 4.1 4180.2 1831.9
## - `Hepatitis B`
                                         1
                                                 4.2 4180.3 1831.9
## <none>
                                                      4176.1 1832.3
## - `under-five deaths`
                                                 6.8 4182.9 1833.0
                                         1
## - `Income composition of resources`
                                                 7.5 4183.6 1833.2
                                         1
## - Alcohol
                                                16.5 4192.7 1836.8
                                         1
## - `thinness 5-9 years`
                                         1
                                                19.9 4196.0 1838.1
                                                37.5 4213.6 1845.0
## - Schooling
                                         1
## - Year
                                         1
                                               453.7 4629.8 2000.3
## - `HIV/AIDS`
                                             1048.3 5224.4 2199.6
                                         1
## - Country
                                       132
                                             17387.8 21563.9 4275.3
##
## Step: AIC=1830.39
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
##
       `under-five deaths` + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 5-9 years` + `Income composition of res
ources` +
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - BMI
                                                 0.5 4176.9 1828.6
                                         1
## - Diphtheria
                                         1
                                                 0.5 4176.9 1828.6
                                                 0.8 4177.2 1828.7
## - `percentage expenditure`
                                         1
## - Population
                                         1
                                                 0.9 4177.3 1828.7
## - GDP
                                         1
                                                 1.3 4177.7 1828.9
## - Measles
                                         1
                                                 1.5 4177.9 1829.0
## - `Total expenditure`
                                         1
                                                 2.0 4178.4 1829.2
## - `Hepatitis B`
                                         1
                                                 4.0 4180.4 1830.0
## - `Adult Mortality`
                                         1
                                                 4.0 4180.5 1830.0
## <none>
                                                      4176.4 1830.4
## - `under-five deaths`
                                                 6.8 4183.2 1831.1
                                         1
## - `Income composition of resources`
                                                7.5 4183.9 1831.3
                                        1
## - Alcohol
                                                16.5 4192.9 1834.9
                                         1
## - `thinness 5-9 years`
                                         1
                                                19.8 4196.2 1836.2
## - Schooling
                                         1
                                                37.4 4213.8 1843.1
## - Year
                                         1
                                               453.9 4630.3 1998.5
## - `HIV/AIDS`
                                             1048.2 5224.7 2197.7
                                         1
## - Country
                                       132
                                             17414.4 21590.8 4275.4
##
## Step: AIC=1828.58
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `percentage expenditure` + `Hepatitis B` + Measles + `under-five deaths` +
##
##
       `Total expenditure` + Diphtheria + `HIV/AIDS` + GDP + Population +
       `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
```

```
## - Diphtheria
                                        1
                                                 0.5 4177.4 1826.8
## - `percentage expenditure`
                                        1
                                                 0.9 4177.8 1826.9
                                        1
## - Population
                                                0.9 4177.8 1826.9
## - GDP
                                        1
                                                1.4 4178.3 1827.1
## - Measles
                                        1
                                                1.6 4178.4 1827.2
## - `Total expenditure`
                                        1
                                                1.9 4178.8 1827.3
## - `Hepatitis B`
                                        1
                                                3.8 4180.7 1828.1
                                                4.1 4180.9 1828.2
## - `Adult Mortality`
                                        1
                                                     4176.9 1828.6
## <none>
## - `under-five deaths`
                                                6.8 4183.7 1829.2
                                        1
## - `Income composition of resources`
                                        1
                                                7.2 4184.1 1829.4
                                               16.5 4193.4 1833.1
## - Alcohol
                                        1
## - `thinness 5-9 years`
                                        1
                                               19.9 4196.8 1834.4
## - Schooling
                                        1
                                               37.4 4214.3 1841.3
## - Year
                                        1
                                              454.2 4631.1 1996.8
                                             1052.8 5229.6 2197.2
## - `HIV/AIDS`
                                        1
## - Country
                                      132
                                            17811.9 21988.8 4303.5
##
## Step: AIC=1826.79
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `percentage expenditure` + `Hepatitis B` + Measles + `under-five deaths` +
##
##
       `Total expenditure` + `HIV/AIDS` + GDP + Population + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - `percentage expenditure`
                                        1
                                                0.9 4178.3 1825.1
## - Population
                                        1
                                                1.0 4178.4 1825.2
## - GDP
                                                1.3 4178.8 1825.3
                                        1
## - Measles
                                        1
                                                1.5 4178.9 1825.4
## - `Total expenditure`
                                        1
                                                1.9 4179.3 1825.5
## - `Adult Mortality`
                                                4.0 4181.4 1826.4
                                        1
                                                     4177.4 1826.8
## <none>
## - `Hepatitis B`
                                        1
                                                6.8 4184.2 1827.5
## - `under-five deaths`
                                        1
                                                6.8 4184.3 1827.5
## - `Income composition of resources` 1
                                                7.7 4185.1 1827.8
                                               16.5 4193.9 1831.3
## - Alcohol
                                        1
## - `thinness 5-9 years`
                                        1
                                               19.8 4197.3 1832.6
## - Schooling
                                        1
                                               37.7 4215.1 1839.6
## - Year
                                             453.9 4631.3 1994.9
                                        1
## - `HIV/AIDS`
                                        1
                                            1058.7 5236.1 2197.3
## - Country
                                      132 17986.0 22163.4 4314.6
##
## Step: AIC=1825.13
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `Hepatitis B` + Measles + `under-five deaths` + `Total expenditure` +
##
       `HIV/AIDS` + GDP + Population + `thinness 5-9 years` + `Income composition of res
ources` +
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - GDP
                                        1
                                                0.8 4179.1 1823.4
## - Population
                                        1
                                                1.0 4179.2 1823.5
```

```
1.5 4179.8 1823.7
## - Measles
                                         1
## - `Total expenditure`
                                                 1.9 4180.2 1823.9
                                         1
                                                 4.0 4182.2 1824.7
## - `Adult Mortality`
                                         1
## <none>
                                                      4178.3 1825.1
## - `under-five deaths`
                                         1
                                                 6.9 4185.2 1825.8
## - `Hepatitis B`
                                        1
                                                 6.9 4185.2 1825.8
## - `Income composition of resources`
                                       1
                                                7.7 4186.0 1826.2
## - Alcohol
                                         1
                                                16.2 4194.5 1829.5
## - `thinness 5-9 years`
                                               19.8 4198.1 1830.9
                                         1
                                                38.3 4216.5 1838.2
## - Schooling
                                         1
## - Year
                                         1
                                               456.7 4635.0 1994.2
## - `HIV/AIDS`
                                             1057.9 5236.1 2195.3
                                        1
## - Country
                                       132
                                             18018.1 22196.4 4315.0
##
## Step: AIC=1823.44
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + Measles + `under-five deaths` + `Total expenditure` +
##
##
       `HIV/AIDS` + Population + `thinness 5-9 years` + `Income composition of resources
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                                AIC
## - Population
                                         1
                                                 1.0 4180.0 1821.8
## - Measles
                                         1
                                                 1.5 4180.6 1822.0
## - `Total expenditure`
                                         1
                                                 1.9 4181.0 1822.2
## - `Adult Mortality`
                                                3.9 4183.0 1823.0
                                        1
## <none>
                                                      4179.1 1823.4
## - `Hepatitis B`
                                        1
                                                 6.8 4185.9 1824.1
## - `under-five deaths`
                                        1
                                                6.8 4185.9 1824.1
## - `Income composition of resources`
                                        1
                                                7.5 4186.6 1824.4
## - Alcohol
                                        1
                                               16.0 4195.1 1827.7
## - `thinness 5-9 years`
                                        1
                                               19.8 4198.9 1829.2
## - Schooling
                                         1
                                                37.8 4216.8 1836.3
## - Year
                                         1
                                               479.7 4658.7 2000.6
## - `HIV/AIDS`
                                             1057.2 5236.3 2193.3
                                         1
                                             18877.3 23056.3 4375.7
## - Country
                                       132
##
## Step: AIC=1821.82
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + Measles + `under-five deaths` + `Total expenditure` +
##
##
      `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
                                       Df Sum of Sq
                                                         RSS
                                                                AIC
##
## - Measles
                                        1
                                                 1.3 4181.3 1820.3
## - `Total expenditure`
                                        1
                                                 1.9 4181.9 1820.6
## - `Adult Mortality`
                                                 3.8 4183.9 1821.3
## <none>
                                                     4180.0 1821.8
## - `under-five deaths`
                                                 5.9 4185.9 1822.1
                                        1
## - `Hepatitis B`
                                         1
                                                 6.9 4187.0 1822.5
## - `Income composition of resources`
                                       1
                                                7.5 4187.5 1822.8
## - Alcohol
                                         1
                                               16.0 4196.0 1826.1
```

```
## - `thinness 5-9 years`
                                               19.4 4199.4 1827.4
                                        1
## - Schooling
                                               38.2 4218.3 1834.8
                                        1
## - Year
                                               481.2 4661.3 1999.5
                                        1
## - `HIV/AIDS`
                                        1
                                             1057.0 5237.0 2191.6
                                             18943.2 23123.2 4378.5
## - Country
                                      132
##
## Step: AIC=1820.34
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `Total expenditure` +
##
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - `Total expenditure`
                                                1.8 4183.2 1819.0
                                        1
## - `Adult Mortality`
                                        1
                                                3.8 4185.1 1819.8
## <none>
                                                     4181.3 1820.3
## - `under-five deaths`
                                        1
                                                6.9 4188.3 1821.1
## - `Hepatitis B`
                                        1
                                                7.0 4188.3 1821.1
## - `Income composition of resources`
                                                7.4 4188.8 1821.3
                                        1
## - Alcohol
                                        1
                                               16.0 4197.3 1824.6
## - `thinness 5-9 years`
                                        1
                                               19.8 4201.2 1826.1
## - Schooling
                                        1
                                               39.0 4220.3 1833.6
## - Year
                                        1
                                              482.0 4663.3 1998.2
## - `HIV/AIDS`
                                             1056.0 5237.3 2189.6
                                        1
## - Country
                                      132 18949.3 23130.6 4377.0
##
## Step: AIC=1819.05
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - `Adult Mortality`
                                                3.8 4187.0 1818.6
## <none>
                                                     4183.2 1819.0
## - `Hepatitis B`
                                        1
                                                6.7 4189.9 1819.7
## - `under-five deaths`
                                        1
                                                6.9 4190.1 1819.8
## - `Income composition of resources` 1
                                                7.5 4190.7 1820.0
## - Alcohol
                                               15.8 4199.0 1823.3
                                        1
## - `thinness 5-9 years`
                                               19.7 4202.9 1824.8
                                        1
## - Schooling
                                        1
                                               39.2 4222.3 1832.4
## - Year
                                        1
                                              480.2 4663.3 1996.2
## - `HIV/AIDS`
                                             1054.2 5237.3 2187.7
                                        1
## - Country
                                      132
                                             19069.7 23252.8 4383.7
##
## Step: AIC=1818.55
## `Life expectancy` ~ Country + Year + Alcohol + `Hepatitis B` +
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                        RSS
                                                               AIC
## <none>
                                                     4187.0 1818.6
## - `Hepatitis B`
                                        1
                                                6.5 4193.5 1819.1
```

```
## - `under-five deaths`
                                         1
                                                 6.6 4193.6 1819.1
## - `Income composition of resources`
                                         1
                                                 7.7 4194.7 1819.6
                                                15.9 4202.9 1822.8
## - Alcohol
                                         1
## - `thinness 5-9 years`
                                         1
                                                19.8 4206.8 1824.4
## - Schooling
                                         1
                                                39.5 4226.5 1832.1
## - Year
                                         1
                                               486.6 4673.5 1997.8
## - `HIV/AIDS`
                                              1104.8 5291.8 2202.7
                                         1
## - Country
                                       132
                                             24235.1 28422.1 4712.7
```

```
corr_mod_2_back_aic = step(corr_removed_model_2, direction = "backward")
```

```
## Start: AIC=1837.09
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `Income composition of resources` + Schooling
##
##
## Step: AIC=1837.09
   `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
       `under-five deaths` + Polio + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## - Polio
                                         1
                                                 0.4 4188.7 1835.3
## - Population
                                         1
                                                 0.5 4188.8 1835.3
## - BMI
                                         1
                                                 0.6 4189.0 1835.3
## - `percentage expenditure`
                                         1
                                                 0.7 4189.1 1835.4
                                                 0.7 4189.1 1835.4
## - Diphtheria
                                         1
## - GDP
                                         1
                                                 1.2 4189.5 1835.6
## - Measles
                                         1
                                                 1.8 4190.2 1835.8
## - `Total expenditure`
                                         1
                                                 1.9 4190.3 1835.8
## - `Adult Mortality`
                                         1
                                                 3.9 4192.3 1836.6
## - `Hepatitis B`
                                                 4.5 4192.8 1836.9
## <none>
                                                      4188.3 1837.1
## - `under-five deaths`
                                         1
                                                 6.6 4194.9 1837.7
## - `Income composition of resources`
                                         1
                                                 7.7 4196.0 1838.1
## - `thinness 1-19 years`
                                         1
                                                 7.7 4196.0 1838.1
## - Alcohol
                                         1
                                                17.0 4205.4 1841.8
## - Schooling
                                         1
                                                38.2 4226.5 1850.1
## - Year
                                               448.0 4636.3 2002.6
                                         1
## - `HIV/AIDS`
                                         1
                                              1036.4 5224.8 2199.7
                                             17376.8 21565.1 4275.4
## - Country
                                       132
##
## Step: AIC=1835.25
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
       `under-five deaths` + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 AIC
## - Diphtheria
                                         1
                                                 0.5 4189.2 1833.4
## - Population
                                         1
                                                 0.5 4189.3 1833.5
## - BMI
                                         1
                                                 0.6 4189.4 1833.5
## - `percentage expenditure`
                                         1
                                                 0.7 4189.5 1833.5
## - GDP
                                         1
                                                 1.2 4189.9 1833.7
## - Measles
                                         1
                                                 1.8 4190.6 1834.0
## - `Total expenditure`
                                                 2.0 4190.7 1834.0
                                         1
## - `Adult Mortality`
                                         1
                                                 3.9 4192.7 1834.8
```

```
## - `Hepatitis B`
                                                4.2 4193.0 1834.9
                                        1
## <none>
                                                     4188.7 1835.3
## - `under-five deaths`
                                        1
                                                6.5 4195.3 1835.8
## - `thinness 1-19 years`
                                                7.4 4196.2 1836.2
                                        1
## - `Income composition of resources`
                                        1
                                                7.7 4196.4 1836.3
## - Alcohol
                                        1
                                               17.0 4205.7 1839.9
## - Schooling
                                        1
                                               38.1 4226.8 1848.2
## - Year
                                        1
                                              448.0 4636.8 2000.8
## - `HIV/AIDS`
                                            1036.2 5225.0 2197.8
                                        1
                                            17404.2 21593.0 4275.6
## - Country
                                      132
##
## Step: AIC=1833.44
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
##
      `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + Population + `thinness 1-19 years` + `Income composition of resources` +
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - Population
                                        1
                                                0.5 4189.8 1831.7
                                                0.6 4189.9 1831.7
## - BMI
                                        1
## - `percentage expenditure`
                                        1
                                                0.7 4189.9 1831.7
## - GDP
                                        1
                                               1.2 4190.4 1831.9
## - Measles
                                        1
                                                1.8 4191.1 1832.2
## - `Total expenditure`
                                        1
                                                1.9 4191.2 1832.2
## - `Adult Mortality`
                                        1
                                               3.9 4193.1 1833.0
## <none>
                                                     4189.2 1833.4
## - `under-five deaths`
                                        1
                                                6.6 4195.8 1834.0
## - `Hepatitis B`
                                        1
                                                7.3 4196.6 1834.3
## - `thinness 1-19 years`
                                        1
                                                7.4 4196.6 1834.3
                                               8.1 4197.3 1834.6
## - `Income composition of resources` 1
## - Alcohol
                                        1
                                               17.0 4206.2 1838.1
## - Schooling
                                        1
                                               38.4 4227.6 1846.5
## - Year
                                        1
                                             447.7 4636.9 1998.9
## - `HIV/AIDS`
                                             1041.7 5230.9 2197.6
                                        1
                                            17615.7 21804.9 4289.7
## - Country
                                      132
##
## Step: AIC=1831.66
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
      `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
##
      `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
      GDP + `thinness 1-19 years` + `Income composition of resources` +
##
##
      Schooling
##
                                                        RSS
##
                                       Df Sum of Sq
                                                               AIC
## - BMI
                                        1
                                                0.7 4190.4 1829.9
## - `percentage expenditure`
                                                0.7 4190.5 1829.9
                                        1
## - GDP
                                        1
                                               1.1 4190.9 1830.1
## - Measles
                                        1
                                               1.6 4191.4 1830.3
## - `Total expenditure`
                                        1
                                                2.0 4191.7 1830.4
## - `Adult Mortality`
                                        1
                                                3.8 4193.6 1831.2
## <none>
                                                     4189.8 1831.7
```

```
## - `under-five deaths`
                                         1
                                                 6.0 4195.8 1832.0
## - `thinness 1-19 years`
                                         1
                                                 7.3 4197.1 1832.5
## - `Hepatitis B`
                                        1
                                                7.4 4197.2 1832.6
## - `Income composition of resources`
                                                8.1 4197.8 1832.8
                                       1
## - Alcohol
                                         1
                                               17.0 4206.8 1836.3
## - Schooling
                                         1
                                                38.7 4228.5 1844.8
## - Year
                                         1
                                               449.1 4638.9 1997.6
## - `HIV/AIDS`
                                         1
                                              1041.8 5231.6 2195.8
                                            17666.8 21856.6 4291.6
## - Country
                                       132
##
## Step: AIC=1829.91
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `percentage expenditure` + `Hepatitis B` + Measles + `under-five deaths` +
       `Total expenditure` + `HIV/AIDS` + GDP + `thinness 1-19 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                                                AIC
                                        Df Sum of Sq
                                                        RSS
## - `percentage expenditure`
                                         1
                                                 0.8 4191.2 1828.2
## - GDP
                                         1
                                                 1.3 4191.7 1828.4
## - Measles
                                         1
                                                 1.7 4192.1 1828.6
## - `Total expenditure`
                                         1
                                                 1.8 4192.3 1828.6
## - `Adult Mortality`
                                                 3.8 4194.2 1829.4
## <none>
                                                      4190.4 1829.9
## - `under-five deaths`
                                                 6.0 4196.5 1830.3
                                         1
## - `Hepatitis B`
                                         1
                                                 7.2 4197.7 1830.8
## - `thinness 1-19 years`
                                                7.4 4197.8 1830.8
                                        1
## - `Income composition of resources`
                                        1
                                                7.8 4198.2 1831.0
## - Alcohol
                                         1
                                               17.0 4207.4 1834.6
## - Schooling
                                         1
                                                38.8 4229.2 1843.1
## - Year
                                         1
                                               449.2 4639.6 1995.8
## - `HIV/AIDS`
                                         1
                                             1046.6 5237.0 2195.6
                                             18049.9 22240.3 4318.3
## - Country
                                       132
##
## Step: AIC=1828.23
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + Measles + `under-five deaths` + `Total expenditure` +
##
       `HIV/AIDS` + GDP + `thinness 1-19 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - GDP
                                         1
                                                 0.8 4192.0 1826.5
                                                 1.7 4192.9 1826.9
## - Measles
                                         1
## - `Total expenditure`
                                        1
                                                 1.9 4193.1 1827.0
## - `Adult Mortality`
                                                 3.8 4195.0 1827.7
## <none>
                                                      4191.2 1828.2
## - `under-five deaths`
                                        1
                                                 6.1 4197.3 1828.6
## - `Hepatitis B`
                                         1
                                                 7.3 4198.5 1829.1
## - `thinness 1-19 years`
                                        1
                                                7.4 4198.6 1829.1
## - `Income composition of resources`
                                                7.8 4199.0 1829.3
                                        1
                                                16.7 4207.9 1832.8
## - Alcohol
                                         1
## - Schooling
                                         1
                                                39.3 4230.5 1841.6
## - Year
                                         1
                                               452.0 4643.2 1995.1
```

```
## - `HIV/AIDS`
                                              1045.8 5237.0 2193.6
                                         1
## - Country
                                       132
                                             18083.2 22274.4 4318.8
##
## Step: AIC=1826.53
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `Hepatitis B` + Measles + `under-five deaths` + `Total expenditure` +
       `HIV/AIDS` + `thinness 1-19 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Measles
                                         1
                                                 1.7 4193.7 1825.2
## - `Total expenditure`
                                                 1.8 4193.8 1825.3
                                         1
## - `Adult Mortality`
                                         1
                                                 3.8 4195.8 1826.0
                                                      4192.0 1826.5
## <none>
## - `under-five deaths`
                                         1
                                                 6.1 4198.1 1826.9
## - `Hepatitis B`
                                         1
                                                 7.2 4199.2 1827.4
## - `thinness 1-19 years`
                                         1
                                                7.4 4199.4 1827.4
## - `Income composition of resources`
                                        1
                                                7.6 4199.6 1827.5
## - Alcohol
                                                16.5 4208.5 1831.0
                                         1
## - Schooling
                                         1
                                                38.8 4230.8 1839.7
## - Year
                                         1
                                               474.9 4666.9 2001.5
## - `HIV/AIDS`
                                         1
                                              1045.2 5237.2 2191.6
## - Country
                                       132
                                             18953.6 23145.6 4380.1
##
## Step: AIC=1825.2
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `Hepatitis B` + `under-five deaths` + `Total expenditure` +
##
       `HIV/AIDS` + `thinness 1-19 years` + `Income composition of resources` +
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Total expenditure`
                                         1
                                                 1.7 4195.4 1823.9
## - `Adult Mortality`
                                         1
                                                 3.7 4197.4 1824.7
## <none>
                                                      4193.7 1825.2
## - `under-five deaths`
                                         1
                                                 7.2 4200.9 1826.0
## - `Hepatitis B`
                                         1
                                                 7.3 4201.0 1826.1
## - `thinness 1-19 years`
                                                7.5 4201.2 1826.1
                                        1
## - `Income composition of resources`
                                                7.6 4201.3 1826.2
                                        1
## - Alcohol
                                         1
                                                16.4 4210.1 1829.6
## - Schooling
                                         1
                                                39.7 4233.4 1838.7
## - Year
                                         1
                                               475.5 4669.2 2000.3
## - `HIV/AIDS`
                                             1043.8 5237.5 2189.7
                                         1
## - Country
                                       132
                                             18960.2 23153.9 4378.6
##
## Step: AIC=1823.88
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 1-19 years` +
##
##
       `Income composition of resources` + Schooling
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Adult Mortality`
                                         1
                                                 3.7 4199.2 1823.3
## <none>
                                                      4195.4 1823.9
```

```
## - `Hepatitis B`
                                                 7.1 4202.5 1824.6
                                         1
## - `under-five deaths`
                                         1
                                                 7.2 4202.6 1824.7
## - `thinness 1-19 years`
                                         1
                                                 7.4 4202.9 1824.8
## - `Income composition of resources`
                                         1
                                                 7.7 4203.1 1824.9
## - Alcohol
                                                16.3 4211.7 1828.3
                                         1
                                                39.8 4235.3 1837.5
## - Schooling
                                         1
## - Year
                                         1
                                               473.8 4669.2 1998.3
## - `HIV/AIDS`
                                         1
                                              1042.1 5237.5 2187.7
## - Country
                                             19087.0 23282.4 4385.8
                                       132
##
## Step: AIC=1823.34
## `Life expectancy` ~ Country + Year + Alcohol + `Hepatitis B` +
##
       `under-five deaths` + `HIV/AIDS` + `thinness 1-19 years` +
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## <none>
                                                      4199.2 1823.3
## - `Hepatitis B`
                                         1
                                                 6.8 4206.0 1824.0
## - `under-five deaths`
                                         1
                                                 6.9 4206.0 1824.0
## - `thinness 1-19 years`
                                         1
                                                 7.7 4206.8 1824.4
## - `Income composition of resources`
                                         1
                                                 7.9 4207.0 1824.4
## - Alcohol
                                         1
                                                16.4 4215.5 1827.8
## - Schooling
                                         1
                                                40.2 4239.4 1837.1
## - Year
                                               480.2 4679.3 1999.9
                                         1
## - `HIV/AIDS`
                                              1092.7 5291.9 2202.7
                                         1
## - Country
                                       132
                                             24329.7 28528.8 4718.9
```

```
corr_mod_3_back_aic = step(corr_removed_model_3, direction = "backward")
```

```
## Start: AIC=1824.98
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
## Step: AIC=1824.98
  `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Polio
                                         1
                                                 0.1 4147.8 1823.0
## - Diphtheria
                                         1
                                                 0.2 4147.9 1823.1
## - Population
                                         1
                                                 0.3 4147.9 1823.1
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.0 1823.1
## - BMI
                                         1
                                                 0.5 4148.1 1823.2
## - `percentage expenditure`
                                                 1.1 4148.7 1823.4
                                         1
## - GDP
                                         1
                                                 1.6 4149.3 1823.6
## - `Total expenditure`
                                         1
                                                 1.9 4149.6 1823.7
## - Measles
                                         1
                                                 2.8 4150.5 1824.1
## - `Adult Mortality`
                                         1
                                                 3.9 4151.6 1824.5
                                                 4.8 4152.4 1824.9
## - `Hepatitis B`
## <none>
                                                      4147.6 1825.0
## - `Income composition of resources`
                                         1
                                                 7.6 4155.2 1826.0
                                                12.5 4160.1 1827.9
## - `thinness 5-9 years`
                                         1
## - Alcohol
                                                12.8 4160.4 1828.1
                                         1
## - `infant deaths`
                                         1
                                                28.4 4176.1 1834.2
## - `under-five deaths`
                                                32.1 4179.7 1835.7
                                         1
## - Schooling
                                         1
                                                37.0 4184.6 1837.6
## - Year
                                         1
                                               456.5 4604.1 1995.2
## - `HIV/AIDS`
                                         1
                                             1016.8 5164.4 2184.5
## - Country
                                             16527.0 20674.7 4209.9
                                       132
##
## Step: AIC=1823.04
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
       BMI + `under-five deaths` + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
       Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Diphtheria
                                         1
                                                 0.2 4147.9 1821.1
## - Population
                                                 0.3 4148.0 1821.2
                                         1
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.1 1821.2
```

```
0.5 4148.3 1821.2
## - BMI
                                         1
## - `percentage expenditure`
                                                 1.1 4148.8 1821.5
                                         1
## - GDP
                                         1
                                                 1.6 4149.4 1821.7
## - `Total expenditure`
                                         1
                                                 2.0 4149.7 1821.8
## - Measles
                                         1
                                                 2.9 4150.6 1822.2
## - `Adult Mortality`
                                         1
                                                 3.9 4151.7 1822.6
## - `Hepatitis B`
                                                 4.7 4152.4 1822.9
                                         1
                                                      4147.8 1823.0
## <none>
## - `Income composition of resources`
                                                7.6 4155.4 1824.1
                                         1
## - `thinness 5-9 years`
                                                12.6 4160.3 1826.0
                                         1
## - Alcohol
                                         1
                                                12.8 4160.5 1826.1
## - `infant deaths`
                                                28.6 4176.4 1832.4
                                         1
## - `under-five deaths`
                                         1
                                                32.2 4180.0 1833.8
## - Schooling
                                                36.9 4184.7 1835.6
                                         1
## - Year
                                         1
                                               456.6 4604.4 1993.2
## - `HIV/AIDS`
                                         1
                                              1016.7 5164.4 2182.5
## - Country
                                       132
                                             16542.4 20690.1 4209.1
##
## Step: AIC=1821.1
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + Population + `thinness 1-19 years` + `thinness 5-9 years` +
##
      `Income composition of resources` + Schooling
##
                                        Df Sum of Sq
##
                                                         RSS
                                                                AIC
## - Population
                                         1
                                                 0.3 4148.2 1819.2
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.2 1819.2
## - BMI
                                         1
                                                 0.5 4148.4 1819.3
## - `percentage expenditure`
                                         1
                                                 1.1 4149.0 1819.5
## - GDP
                                         1
                                                 1.6 4149.5 1819.7
## - `Total expenditure`
                                         1
                                                 2.0 4149.9 1819.9
## - Measles
                                         1
                                                 2.8 4150.8 1820.2
## - `Adult Mortality`
                                         1
                                                 3.9 4151.8 1820.7
                                                      4147.9 1821.1
## <none>
## - `Hepatitis B`
                                                 7.1 4155.0 1821.9
                                         1
## - `Income composition of resources`
                                                7.9 4155.8 1822.2
                                        1
## - `thinness 5-9 years`
                                                12.6 4160.5 1824.1
                                         1
## - Alcohol
                                         1
                                               12.8 4160.7 1824.2
## - `infant deaths`
                                         1
                                                28.9 4176.9 1830.6
## - `under-five deaths`
                                         1
                                                32.6 4180.5 1832.0
## - Schooling
                                         1
                                                37.1 4185.0 1833.8
## - Year
                                         1
                                               456.9 4604.9 1991.4
## - `HIV/AIDS`
                                              1020.4 5168.3 2181.8
                                         1
                                       132
## - Country
                                             16656.3 20804.2 4216.2
##
## Step: AIC=1819.21
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + `thinness 1-19 years` + `thinness 5-9 years` + `Income composition of reso
urces` +
```

```
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `thinness 1-19 years`
                                        1
                                                 0.3 4148.5 1817.3
## - BMI
                                         1
                                                 0.5 4148.7 1817.4
## - `percentage expenditure`
                                         1
                                                 1.1 4149.3 1817.6
## - GDP
                                        1
                                                 1.6 4149.8 1817.9
## - `Total expenditure`
                                         1
                                                 1.9 4150.1 1818.0
                                                 3.0 4151.2 1818.4
## - Measles
                                         1
## - `Adult Mortality`
                                                 4.0 4152.2 1818.8
                                         1
                                                      4148.2 1819.2
## <none>
## - `Hepatitis B`
                                                 7.0 4155.2 1820.0
                                         1
## - `Income composition of resources`
                                         1
                                                7.9 4156.1 1820.4
## - Alcohol
                                         1
                                                12.9 4161.1 1822.3
## - `thinness 5-9 years`
                                         1
                                                12.9 4161.1 1822.3
## - `infant deaths`
                                         1
                                                29.6 4177.8 1828.9
## - `under-five deaths`
                                         1
                                                32.9 4181.1 1830.2
## - Schooling
                                         1
                                                36.9 4185.1 1831.8
## - Year
                                         1
                                               456.7 4604.9 1989.4
## - `HIV/AIDS`
                                         1
                                             1021.7 5169.9 2180.3
                                             16656.9 20805.1 4214.3
## - Country
                                       132
##
## Step: AIC=1817.32
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
##
      GDP + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - BMI
                                         1
                                                 0.5 4149.0 1815.5
## - `percentage expenditure`
                                         1
                                                 1.1 4149.5 1815.7
## - GDP
                                         1
                                                 1.6 4150.1 1816.0
## - `Total expenditure`
                                         1
                                                 1.9 4150.4 1816.1
## - Measles
                                         1
                                                 2.9 4151.4 1816.5
## - `Adult Mortality`
                                                 4.0 4152.5 1816.9
                                         1
## <none>
                                                      4148.5 1817.3
## - `Hepatitis B`
                                                 7.1 4155.6 1818.1
                                         1
## - `Income composition of resources`
                                                7.9 4156.4 1818.5
                                        1
## - Alcohol
                                        1
                                                12.8 4161.3 1820.4
## - `thinness 5-9 years`
                                         1
                                                22.2 4170.7 1824.1
## - `infant deaths`
                                                29.4 4177.9 1827.0
                                         1
## - `under-five deaths`
                                        1
                                                32.7 4181.2 1828.3
## - Schooling
                                         1
                                                36.8 4185.3 1829.9
## - Year
                                         1
                                               456.5 4605.0 1987.5
## - `HIV/AIDS`
                                             1021.7 5170.1 2178.4
                                         1
                                             16656.6 20805.1 4212.3
## - Country
                                       132
##
## Step: AIC=1815.52
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
```

```
GDP + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                                AIC
## - `percentage expenditure`
                                        1
                                                 1.2 4150.2 1814.0
## - GDP
                                        1
                                                 1.7 4150.7 1814.2
## - `Total expenditure`
                                        1
                                                1.8 4150.8 1814.3
## - Measles
                                        1
                                                3.0 4152.0 1814.7
## - `Adult Mortality`
                                        1
                                                4.0 4153.0 1815.1
                                                      4149.0 1815.5
## <none>
## - `Hepatitis B`
                                        1
                                                6.9 4155.9 1816.3
## - `Income composition of resources`
                                        1
                                                7.7 4156.6 1816.6
## - Alcohol
                                        1
                                               12.8 4161.8 1818.6
## - `thinness 5-9 years`
                                        1
                                                22.4 4171.4 1822.4
## - `infant deaths`
                                        1
                                               29.4 4178.4 1825.2
## - `under-five deaths`
                                        1
                                               32.7 4181.7 1826.5
## - Schooling
                                        1
                                               36.8 4185.8 1828.1
## - Year
                                        1
                                              456.8 4605.8 1985.8
## - `HIV/AIDS`
                                             1026.4 5175.4 2178.0
                                        1
## - Country
                                       132 16982.3 21131.3 4235.9
##
## Step: AIC=1813.99
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
       `Total expenditure` + `HIV/AIDS` + GDP + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
##
                                       Df Sum of Sq
                                                               AIC
                                                        RSS
## - GDP
                                        1
                                                 0.9 4151.0 1812.3
## - `Total expenditure`
                                        1
                                                1.9 4152.1 1812.7
## - Measles
                                        1
                                                3.0 4153.2 1813.2
## - `Adult Mortality`
                                        1
                                                4.0 4154.1 1813.6
## <none>
                                                      4150.2 1814.0
## - `Hepatitis B`
                                        1
                                                7.0 4157.2 1814.8
## - `Income composition of resources`
                                                7.7 4157.8 1815.0
                                        1
                                                12.5 4162.7 1817.0
## - Alcohol
                                        1
## - `thinness 5-9 years`
                                        1
                                               22.3 4172.5 1820.8
## - `infant deaths`
                                               29.1 4179.2 1823.5
                                        1
## - `under-five deaths`
                                               32.4 4182.5 1824.8
                                        1
## - Schooling
                                        1
                                               37.5 4187.6 1826.8
## - Year
                                        1
                                               459.9 4610.1 1985.3
## - `HIV/AIDS`
                                             1025.3 5175.4 2176.0
                                        1
## - Country
                                       132
                                             17019.7 21169.8 4236.9
##
## Step: AIC=1812.34
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
##
       `Total expenditure` + `HIV/AIDS` + `thinness 5-9 years` +
       `Income composition of resources` + Schooling
##
##
##
                                       Df Sum of Sq
                                                        RSS
## - `Total expenditure`
                                         1
                                                 1.8 4152.9 1811.1
```

```
## - Measles
                                        1
                                                3.0 4154.0 1811.5
## - `Adult Mortality`
                                        1
                                                3.9 4155.0 1811.9
## <none>
                                                     4151.0 1812.3
## - `Hepatitis B`
                                        1
                                                6.9 4158.0 1813.1
## - `Income composition of resources`
                                        1
                                                7.5 4158.5 1813.3
## - Alcohol
                                        1
                                               12.3 4163.3 1815.2
## - `thinness 5-9 years`
                                        1
                                               22.3 4173.4 1819.2
## - `infant deaths`
                                        1
                                               29.0 4180.0 1821.8
## - `under-five deaths`
                                               32.3 4183.3 1823.1
                                        1
## - Schooling
                                               37.0 4188.0 1825.0
                                        1
                                              483.5 4634.5 1992.0
## - Year
                                        1
## - `HIV/AIDS`
                                             1024.5 5175.5 2174.1
                                        1
## - Country
                                      132
                                            17885.0 22036.0 4301.0
##
## Step: AIC=1811.06
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
      `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
                                       Df Sum of Sq
                                                               AIC
                                                        RSS
## - Measles
                                                2.9 4155.7 1810.2
## - `Adult Mortality`
                                        1
                                                3.9 4156.8 1810.6
## <none>
                                                     4152.9 1811.1
## - `Hepatitis B`
                                                6.7 4159.6 1811.7
                                        1
## - `Income composition of resources`
                                               7.6 4160.4 1812.1
                                        1
## - Alcohol
                                        1
                                               12.2 4165.0 1813.9
## - `thinness 5-9 years`
                                        1
                                               22.2 4175.1 1817.9
## - `infant deaths`
                                        1
                                               29.1 4181.9 1820.6
## - `under-five deaths`
                                        1
                                               32.4 4185.2 1821.9
                                               37.2 4190.0 1823.8
## - Schooling
                                        1
## - Year
                                        1
                                              481.7 4634.5 1990.0
## - `HIV/AIDS`
                                        1
                                             1022.7 5175.5 2172.1
## - Country
                                      132
                                            18014.7 22167.6 4308.9
##
## Step: AIC=1810.2
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + `under-five deaths` + `HIV/AIDS` +
##
      `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - `Adult Mortality`
                                        1
                                                3.9 4159.6 1809.7
## <none>
                                                     4155.7 1810.2
## - `Hepatitis B`
                                        1
                                                6.8 4162.5 1810.9
## - `Income composition of resources`
                                                7.5 4163.2 1811.2
                                      1
                                               12.2 4167.9 1813.0
## - Alcohol
                                        1
## - `thinness 5-9 years`
                                        1
                                               22.8 4178.5 1817.2
## - `infant deaths`
                                               27.4 4183.2 1819.0
                                        1
## - `under-five deaths`
                                               31.0 4186.7 1820.4
                                        1
## - Schooling
                                        1
                                               38.3 4194.0 1823.3
## - Year
                                        1
                                              482.8 4638.5 1989.4
```

```
## - `HIV/AIDS`
                                              1021.8 5177.5 2170.7
                                         1
## - Country
                                       132
                                             18052.6 22208.3 4309.9
##
## Step: AIC=1809.74
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
##
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## <none>
                                                      4159.6 1809.7
## - `Hepatitis B`
                                                 6.6 4166.2 1810.3
                                         1
## - `Income composition of resources`
                                                 7.7 4167.3 1810.8
                                        1
## - Alcohol
                                         1
                                                12.3 4171.9 1812.6
## - `thinness 5-9 years`
                                         1
                                                22.9 4182.5 1816.8
## - `infant deaths`
                                        1
                                                27.4 4187.0 1818.6
## - `under-five deaths`
                                        1
                                                30.8 4190.4 1819.9
## - Schooling
                                         1
                                                38.6 4198.2 1823.0
## - Year
                                         1
                                               489.2 4648.8 1991.1
## - `HIV/AIDS`
                                         1
                                              1071.3 5230.9 2185.6
## - Country
                                       132
                                             22622.6 26782.2 4616.7
```

```
corr_mod_1_back_bic = step(corr_removed_model_1, direction = "backward", k = log(n))
```

```
## Start: AIC=2650.84
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
## Step: AIC=2650.84
  `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
       `under-five deaths` + Polio + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `thinness 1-19 years`
                                         1
                                                 0.1 4176.1 2643.5
## - Polio
                                         1
                                                 0.3 4176.4 2643.6
## - BMI
                                                 0.5 4176.6 2643.6
                                         1
## - Diphtheria
                                         1
                                                 0.7 4176.8 2643.7
## - `percentage expenditure`
                                         1
                                                 0.8 4176.9 2643.8
## - Population
                                         1
                                                 0.9 4176.9 2643.8
## - GDP
                                         1
                                                 1.3 4177.3 2643.9
                                                 1.5 4177.6 2644.0
## - Measles
                                         1
## - `Total expenditure`
                                         1
                                                 2.0 4178.0 2644.2
## - `Adult Mortality`
                                         1
                                                 4.0 4180.1 2645.0
## - `Hepatitis B`
                                         1
                                                 4.2 4180.2 2645.1
## - `under-five deaths`
                                         1
                                                 6.8 4182.9 2646.1
## - `Income composition of resources`
                                         1
                                                7.5 4183.5 2646.4
## - `thinness 5-9 years`
                                         1
                                                12.3 4188.3 2648.3
## - Alcohol
                                                16.6 4192.6 2650.0
                                         1
## <none>
                                                      4176.1 2650.8
## - Schooling
                                                37.5 4213.6 2658.2
                                         1
## - Year
                                         1
                                               453.5 4629.5 2813.4
## - `HIV/AIDS`
                                         1
                                              1047.7 5223.7 3012.6
## - Country
                                       132
                                             17387.2 21563.3 4380.0
##
## Step: AIC=2643.47
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
       `under-five deaths` + Polio + `Total expenditure` + Diphtheria +
##
##
       `HIV/AIDS` + GDP + Population + `thinness 5-9 years` + `Income composition of res
ources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Polio
                                         1
                                                 0.3 4176.4 2636.2
## - BMI
                                         1
                                                 0.5 4176.6 2636.3
## - Diphtheria
                                                 0.7 4176.8 2636.3
                                         1
## - `percentage expenditure`
                                         1
                                                 0.8 4176.9 2636.4
```

```
8/4/23, 1:26 AM
                                                  project_code.knit
   ## - Population
                                                         4177.1 2636.4
                                             1
                                                     0.9
   ## - GDP
                                             1
                                                     1.3 4177.4 2636.6
                                             1
                                                     1.5 4177.6 2636.7
   ## - Measles
   ## - `Total expenditure`
                                             1
                                                     2.0 4178.1 2636.8
   ## - `Adult Mortality`
                                             1
                                                     4.1 4180.2 2637.7
   ## - `Hepatitis B`
                                             1
                                                     4.2 4180.3 2637.7
   ## - `under-five deaths`
                                             1
                                                     6.8 4182.9 2638.7
   ## - `Income composition of resources`
                                                     7.5 4183.6 2639.0
                                             1
                                                    16.5 4192.7 2642.6
   ## - Alcohol
                                             1
   ## <none>
                                                          4176.1 2643.5
   ## - `thinness 5-9 years`
                                             1
                                                    19.9 4196.0 2643.9
   ## - Schooling
                                                    37.5 4213.6 2650.8
                                             1
   ## - Year
                                             1
                                                   453.7 4629.8 2806.1
   ## - `HIV/AIDS`
                                                 1048.3 5224.4 3005.4
                                             1
   ## - Country
                                           132
                                                 17387.8 21563.9 4372.7
   ##
   ## Step: AIC=2636.17
   ## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
          `percentage expenditure` + `Hepatitis B` + Measles + BMI +
   ##
   ##
          `under-five deaths` + `Total expenditure` + Diphtheria +
   ##
          `HIV/AIDS` + GDP + Population + `thinness 5-9 years` + `Income composition of res
   ources` +
   ##
          Schooling
   ##
   ##
                                            Df Sum of Sq
                                                             RSS
                                                                    AIC
   ## - BMI
                                                     0.5 4176.9 2629.0
                                             1
   ## - Diphtheria
                                             1
                                                     0.5 4176.9 2629.0
                                                     0.8 4177.2 2629.1
   ## - `percentage expenditure`
                                             1
   ## - Population
                                            1
                                                     0.9 4177.3 2629.1
   ## - GDP
                                             1
                                                     1.3 4177.7 2629.3
                                                     1.5 4177.9 2629.4
   ## - Measles
                                             1
   ## - `Total expenditure`
                                             1
                                                     2.0 4178.4 2629.6
   ## - `Hepatitis B`
                                             1
                                                     4.0 4180.4 2630.3
   ## - `Adult Mortality`
                                            1
                                                     4.0 4180.5 2630.4
   ## - `under-five deaths`
                                                     6.8 4183.2 2631.4
                                            1
   ## - `Income composition of resources`
                                                    7.5 4183.9 2631.7
   ## - Alcohol
                                                    16.5 4192.9 2635.3
                                            1
   ## <none>
                                                          4176.4 2636.2
   ## - `thinness 5-9 years`
                                                    19.8 4196.2 2636.6
                                             1
   ## - Schooling
                                             1
                                                    37.4 4213.8 2643.4
   ## - Year
                                             1
                                                   453.9 4630.3 2798.9
   ## - `HIV/AIDS`
                                                 1048.2 5224.7 2998.0
                                             1
   ## - Country
                                           132
                                                 17414.4 21590.8 4367.3
   ##
   ## Step: AIC=2628.95
   ## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
           `percentage expenditure` + `Hepatitis B` + Measles + `under-five deaths` +
   ##
   ##
          `Total expenditure` + Diphtheria + `HIV/AIDS` + GDP + Population +
          `thinness 5-9 years` + `Income composition of resources` +
   ##
          Schooling
   ##
   ##
   ##
                                           Df Sum of Sq
                                                             RSS
                                                                    AIC
```

```
## - Diphtheria
                                        1
                                                0.5 4177.4 2621.8
## - `percentage expenditure`
                                        1
                                                0.9 4177.8 2621.9
                                        1
                                                0.9 4177.8 2621.9
## - Population
## - GDP
                                        1
                                                1.4 4178.3 2622.1
## - Measles
                                        1
                                                1.6 4178.4 2622.2
## - `Total expenditure`
                                        1
                                                1.9 4178.8 2622.3
## - `Hepatitis B`
                                        1
                                                3.8 4180.7 2623.1
## - `Adult Mortality`
                                        1
                                                4.1 4180.9 2623.1
## - `under-five deaths`
                                                6.8 4183.7 2624.2
                                        1
## - `Income composition of resources`
                                                7.2 4184.1 2624.4
                                       1
                                               16.5 4193.4 2628.0
## - Alcohol
                                        1
## <none>
                                                     4176.9 2629.0
## - `thinness 5-9 years`
                                        1
                                               19.9 4196.8 2629.4
## - Schooling
                                        1
                                               37.4 4214.3 2636.2
## - Year
                                        1
                                              454.2 4631.1 2791.8
                                             1052.8 5229.6 2992.2
## - `HIV/AIDS`
                                        1
## - Country
                                      132
                                            17811.9 21988.8 4390.0
##
## Step: AIC=2621.75
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `percentage expenditure` + `Hepatitis B` + Measles + `under-five deaths` +
##
##
       `Total expenditure` + `HIV/AIDS` + GDP + Population + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
                                                        RSS
                                       Df Sum of Sq
                                                               AIC
## - `percentage expenditure`
                                        1
                                                0.9 4178.3 2614.7
## - Population
                                        1
                                                1.0 4178.4 2614.7
## - GDP
                                                1.3 4178.8 2614.9
                                        1
## - Measles
                                        1
                                                1.5 4178.9 2614.9
## - `Total expenditure`
                                        1
                                                1.9 4179.3 2615.1
## - `Adult Mortality`
                                        1
                                                4.0 4181.4 2615.9
## - `Hepatitis B`
                                        1
                                                6.8 4184.2 2617.0
## - `under-five deaths`
                                        1
                                                6.8 4184.3 2617.0
## - `Income composition of resources` 1
                                               7.7 4185.1 2617.4
## - Alcohol
                                        1
                                               16.5 4193.9 2620.9
                                                     4177.4 2621.8
## <none>
## - `thinness 5-9 years`
                                        1
                                               19.8 4197.3 2622.2
## - Schooling
                                               37.7 4215.1 2629.2
                                        1
## - Year
                                              453.9 4631.3 2784.4
                                        1
## - `HIV/AIDS`
                                        1
                                            1058.7 5236.1 2986.8
## - Country
                                      132 17986.0 22163.4 4395.7
##
## Step: AIC=2614.68
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `Hepatitis B` + Measles + `under-five deaths` + `Total expenditure` +
##
       `HIV/AIDS` + GDP + Population + `thinness 5-9 years` + `Income composition of res
ources` +
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - GDP
                                        1
                                                0.8 4179.1 2607.6
## - Population
                                        1
                                                1.0 4179.2 2607.7
```

```
1.5 4179.8 2607.9
## - Measles
                                         1
## - `Total expenditure`
                                         1
                                                 1.9 4180.2 2608.0
## - `Adult Mortality`
                                         1
                                                 4.0 4182.2 2608.8
## - `under-five deaths`
                                         1
                                                 6.9 4185.2 2610.0
## - `Hepatitis B`
                                         1
                                                 6.9 4185.2 2610.0
## - `Income composition of resources`
                                         1
                                                7.7 4186.0 2610.3
## - Alcohol
                                                16.2 4194.5 2613.7
                                         1
## <none>
                                                      4178.3 2614.7
## - `thinness 5-9 years`
                                                19.8 4198.1 2615.1
                                         1
                                                38.3 4216.5 2622.3
## - Schooling
                                         1
## - Year
                                         1
                                               456.7 4635.0 2778.3
## - `HIV/AIDS`
                                             1057.9 5236.1 2979.4
                                         1
## - Country
                                       132
                                             18018.1 22196.4 4390.7
##
## Step: AIC=2607.59
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + Measles + `under-five deaths` + `Total expenditure` +
##
##
       `HIV/AIDS` + Population + `thinness 5-9 years` + `Income composition of resources
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Population
                                         1
                                                 1.0 4180.0 2600.6
## - Measles
                                         1
                                                 1.5 4180.6 2600.8
## - `Total expenditure`
                                                 1.9 4181.0 2600.9
                                         1
## - `Adult Mortality`
                                                 3.9 4183.0 2601.7
                                         1
## - `Hepatitis B`
                                         1
                                                 6.8 4185.9 2602.9
                                                 6.8 4185.9 2602.9
## - `under-five deaths`
                                         1
## - `Income composition of resources`
                                        1
                                                 7.5 4186.6 2603.1
## - Alcohol
                                         1
                                                16.0 4195.1 2606.5
## <none>
                                                      4179.1 2607.6
## - `thinness 5-9 years`
                                         1
                                                19.8 4198.9 2608.0
## - Schooling
                                         1
                                                37.8 4216.8 2615.0
## - Year
                                         1
                                               479.7 4658.7 2779.4
## - `HIV/AIDS`
                                              1057.2 5236.3 2972.1
                                         1
                                             18877.3 23056.3 4446.0
## - Country
                                       132
##
## Step: AIC=2600.56
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `Hepatitis B` + Measles + `under-five deaths` + `Total expenditure` +
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
##
                                                 1.3 4181.3 2593.7
## - Measles
                                         1
## - `Total expenditure`
                                         1
                                                 1.9 4181.9 2593.9
## - `Adult Mortality`
                                                 3.8 4183.9 2594.7
## - `under-five deaths`
                                        1
                                                 5.9 4185.9 2595.5
## - `Hepatitis B`
                                         1
                                                 6.9 4187.0 2595.9
## - `Income composition of resources`
                                                 7.5 4187.5 2596.1
                                         1
## - Alcohol
                                         1
                                                16.0 4196.0 2599.4
## <none>
                                                      4180.0 2600.6
```

```
## - `thinness 5-9 years`
                                                19.4 4199.4 2600.8
                                         1
## - Schooling
                                                38.2 4218.3 2608.2
                                         1
## - Year
                                               481.2 4661.3 2772.8
                                         1
## - `HIV/AIDS`
                                        1
                                              1057.0 5237.0 2964.9
                                             18943.2 23123.2 4443.4
## - Country
                                       132
##
## Step: AIC=2593.67
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `Total expenditure` +
##
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Total expenditure`
                                                 1.8 4183.2 2587.0
                                         1
## - `Adult Mortality`
                                         1
                                                 3.8 4185.1 2587.8
## - `under-five deaths`
                                         1
                                                 6.9 4188.3 2589.0
## - `Hepatitis B`
                                         1
                                                7.0 4188.3 2589.0
## - `Income composition of resources`
                                       1
                                                7.4 4188.8 2589.2
## - Alcohol
                                                16.0 4197.3 2592.5
                                         1
## <none>
                                                      4181.3 2593.7
## - `thinness 5-9 years`
                                                19.8 4201.2 2594.1
                                         1
## - Schooling
                                         1
                                                39.0 4220.3 2601.6
## - Year
                                        1
                                               482.0 4663.3 2766.2
## - `HIV/AIDS`
                                             1056.0 5237.3 2957.6
                                        1
## - Country
                                             18949.3 23130.6 4436.5
                                       132
##
## Step: AIC=2586.97
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                        RSS
                                                                AIC
## - `Adult Mortality`
                                         1
                                                 3.8 4187.0 2581.1
## - `Hepatitis B`
                                         1
                                                 6.7 4189.9 2582.2
## - `under-five deaths`
                                                6.9 4190.1 2582.3
                                        1
## - `Income composition of resources`
                                                7.5 4190.7 2582.5
                                        1
## - Alcohol
                                               15.8 4199.0 2585.8
                                        1
## <none>
                                                      4183.2 2587.0
                                               19.7 4202.9 2587.3
## - `thinness 5-9 years`
                                         1
## - Schooling
                                         1
                                                39.2 4222.3 2594.9
## - Year
                                         1
                                               480.2 4663.3 2758.8
## - `HIV/AIDS`
                                             1054.2 5237.3 2950.2
                                        1
## - Country
                                       132
                                             19069.7 23252.8 4437.8
##
## Step: AIC=2581.07
## `Life expectancy` ~ Country + Year + Alcohol + `Hepatitis B` +
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Hepatitis B`
                                         1
                                                 6.5 4193.5 2576.2
## - `under-five deaths`
                                         1
                                                 6.6 4193.6 2576.3
```

```
## - Income composition of resources 1
                                               7.7 4194.7 2576.7
## - Alcohol
                                       1
                                              15.9 4202.9 2579.9
## <none>
                                                    4187.0 2581.1
## - `thinness 5-9 years`
                                       1
                                              19.8 4206.8 2581.5
## - Schooling
                                       1
                                              39.5 4226.5 2589.2
## - Year
                                       1
                                             486.6 4673.5 2754.9
## - `HIV/AIDS`
                                       1
                                            1104.8 5291.8 2959.8
## - Country
                                      132
                                            24235.1 28422.1 4761.4
##
## Step: AIC=2576.23
## `Life expectancy` ~ Country + Year + Alcohol + `under-five deaths` +
      `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                      Df Sum of Sq
                                                       RSS
                                                              AIC
## - `Income composition of resources`
                                       1
                                               7.9 4201.4 2571.9
                                               8.3 4201.7 2572.1
## - `under-five deaths`
                                       1
## - Alcohol
                                       1
                                              15.7 4209.2 2575.0
## <none>
                                                    4193.5 2576.2
## - `thinness 5-9 years`
                                       1
                                              20.7 4214.2 2576.9
## - Schooling
                                              39.6 4233.1 2584.3
                                       1
## - Year
                                             512.2 4705.7 2758.9
                                       1
## - `HIV/AIDS`
                                       1
                                            1109.8 5303.3 2956.0
                                            24271.8 28465.2 4756.5
## - Country
                                      132
##
## Step: AIC=2571.94
## `Life expectancy` ~ Country + Year + Alcohol + `under-five deaths` +
      `HIV/AIDS` + `thinness 5-9 years` + Schooling
##
##
##
                          Df Sum of Sq
                                       RSS
## - `under-five deaths`
                          1
                                 8.0 4209 2567.7
## - Alcohol
                          1
                                 15.0 4216 2570.4
## <none>
                                       4201 2571.9
## - `thinness 5-9 years` 1
                                20.9 4222 2572.7
## - Schooling
                         1
                                 39.4 4241 2579.9
## - Year
                                643.2 4845 2799.4
                          1
## - `HIV/AIDS`
                          1
                              1103.8 5305 2949.2
## - Country
                        132 28764.7 32966 4991.1
##
## Step: AIC=2567.66
## `Life expectancy` ~ Country + Year + Alcohol + `HIV/AIDS` + `thinness 5-9 years` +
##
      Schooling
##
                          Df Sum of Sq RSS
## - Alcohol
                           1
                                 13.6 4223 2565.6
## <none>
                                        4209 2567.7
## - `thinness 5-9 years` 1
                                 20.9 4230 2568.4
## - Schooling
                          1
                                 44.2 4254 2577.5
## - Year
                          1
                                658.7 4868 2800.0
## - `HIV/AIDS`
                               1103.4 5313 2944.1
                          1
## - Country
                         132
                              28758.4 32968 4983.8
##
```

```
## Step: AIC=2565.59
## `Life expectancy` ~ Country + Year + `HIV/AIDS` + `thinness 5-9 years` +
       Schooling
##
##
##
                          Df Sum of Sq RSS
                                                AIC
## <none>
                                        4223 2565.6
## - `thinness 5-9 years` 1
                                  20.9 4244 2566.3
## - Schooling
                                  42.1 4265 2574.6
                           1
## - Year
                           1
                                 699.4 4922 2810.9
## - `HIV/AIDS`
                           1
                                1139.0 5362 2952.0
## - Country
                         132
                               28811.4 33034 4979.7
```

```
corr_mod_2_back_bic = step(corr_removed_model_2, direction = "backward", k = log(n))
```

```
## Start: AIC=2648.28
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `Income composition of resources` + Schooling
##
##
## Step: AIC=2648.28
   `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
       `under-five deaths` + Polio + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## - Polio
                                         1
                                                 0.4 4188.7 2641.0
## - Population
                                         1
                                                 0.5 4188.8 2641.1
## - BMI
                                         1
                                                 0.6 4189.0 2641.1
## - `percentage expenditure`
                                         1
                                                 0.7 4189.1 2641.2
                                                 0.7 4189.1 2641.2
## - Diphtheria
                                         1
## - GDP
                                         1
                                                 1.2 4189.5 2641.3
## - Measles
                                         1
                                                 1.8 4190.2 2641.6
## - `Total expenditure`
                                                 1.9 4190.3 2641.6
                                         1
## - `Adult Mortality`
                                                 3.9 4192.3 2642.4
                                         1
## - `Hepatitis B`
                                         1
                                                 4.5 4192.8 2642.6
## - `under-five deaths`
                                                 6.6 4194.9 2643.4
                                         1
## - Income composition of resources
                                       1
                                                 7.7 4196.0 2643.9
                                                 7.7 4196.0 2643.9
## - `thinness 1-19 years`
                                         1
## - Alcohol
                                         1
                                                17.0 4205.4 2647.6
## <none>
                                                      4188.3 2648.3
## - Schooling
                                                38.2 4226.5 2655.8
                                         1
## - Year
                                               448.0 4636.3 2808.4
                                         1
## - `HIV/AIDS`
                                         1
                                              1036.4 5224.8 3005.5
                                             17376.8 21565.1 4372.8
## - Country
                                       132
##
## Step: AIC=2641.03
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
       `under-five deaths` + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Diphtheria
                                         1
                                                 0.5 4189.2 2633.8
## - Population
                                         1
                                                 0.5 4189.3 2633.8
## - BMI
                                         1
                                                 0.6 4189.4 2633.9
## - `percentage expenditure`
                                         1
                                                 0.7 4189.5 2633.9
## - GDP
                                         1
                                                 1.2 4189.9 2634.1
## - Measles
                                         1
                                                 1.8 4190.6 2634.4
## - `Total expenditure`
                                                 2.0 4190.7 2634.4
                                         1
## - `Adult Mortality`
                                         1
                                                 3.9 4192.7 2635.2
```

```
## - `Hepatitis B`
                                                4.2 4193.0 2635.3
                                        1
## - `under-five deaths`
                                        1
                                                6.5 4195.3 2636.2
## - `thinness 1-19 years`
                                                7.4 4196.2 2636.6
                                        1
## - `Income composition of resources`
                                               7.7 4196.4 2636.6
                                      1
## - Alcohol
                                        1
                                               17.0 4205.7 2640.3
## <none>
                                                     4188.7 2641.0
## - Schooling
                                        1
                                               38.1 4226.8 2648.5
## - Year
                                        1
                                              448.0 4636.8 2801.2
## - `HIV/AIDS`
                                             1036.2 5225.0 2998.1
                                        1
                                            17404.2 21593.0 4367.5
## - Country
                                      132
##
## Step: AIC=2633.82
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
##
       `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + Population + `thinness 1-19 years` + `Income composition of resources` +
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - Population
                                        1
                                                0.5 4189.8 2626.6
                                                0.6 4189.9 2626.7
## - BMI
                                        1
## - `percentage expenditure`
                                        1
                                                0.7 4189.9 2626.7
## - GDP
                                        1
                                                1.2 4190.4 2626.9
## - Measles
                                        1
                                                1.8 4191.1 2627.1
## - `Total expenditure`
                                                1.9 4191.2 2627.2
                                        1
## - `Adult Mortality`
                                        1
                                                3.9 4193.1 2627.9
## - `under-five deaths`
                                        1
                                                6.6 4195.8 2629.0
## - `Hepatitis B`
                                        1
                                                7.3 4196.6 2629.3
## - `thinness 1-19 years`
                                        1
                                               7.4 4196.6 2629.3
## - `Income composition of resources`
                                      1
                                                8.1 4197.3 2629.6
## - Alcohol
                                        1
                                               17.0 4206.2 2633.1
## <none>
                                                     4189.2 2633.8
## - Schooling
                                        1
                                               38.4 4227.6 2641.4
## - Year
                                        1
                                              447.7 4636.9 2793.8
## - `HIV/AIDS`
                                             1041.7 5230.9 2992.6
                                        1
                                            17615.7 21804.9 4376.2
## - Country
                                      132
##
## Step: AIC=2626.62
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `percentage expenditure` + `Hepatitis B` + Measles + BMI +
##
##
       `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
      GDP + `thinness 1-19 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - BMI
                                        1
                                                0.7 4190.4 2619.5
## - `percentage expenditure`
                                                0.7 4190.5 2619.5
## - GDP
                                        1
                                                1.1 4190.9 2619.7
## - Measles
                                                1.6 4191.4 2619.9
                                        1
                                                2.0 4191.7 2620.0
## - `Total expenditure`
                                        1
## - `Adult Mortality`
                                        1
                                                3.8 4193.6 2620.7
## - `under-five deaths`
                                        1
                                                6.0 4195.8 2621.6
```

```
7.3 4197.1 2622.1
## - `thinness 1-19 years`
                                         1
## - `Hepatitis B`
                                                 7.4 4197.2 2622.1
                                         1
                                                8.1 4197.8 2622.4
## - `Income composition of resources`
                                         1
## - Alcohol
                                                17.0 4206.8 2625.9
                                         1
## <none>
                                                      4189.8 2626.6
## - Schooling
                                         1
                                                38.7 4228.5 2634.4
## - Year
                                         1
                                               449.1 4638.9 2787.1
## - `HIV/AIDS`
                                              1041.8 5231.6 2985.4
                                         1
                                             17666.8 21856.6 4372.7
## - Country
                                       132
##
## Step: AIC=2619.47
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `percentage expenditure` + `Hepatitis B` + Measles + `under-five deaths` +
       `Total expenditure` + `HIV/AIDS` + GDP + `thinness 1-19 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                                                AIC
                                        Df Sum of Sq
                                                         RSS
## - `percentage expenditure`
                                         1
                                                 0.8 4191.2 2612.4
## - GDP
                                         1
                                                 1.3 4191.7 2612.6
## - Measles
                                         1
                                                 1.7 4192.1 2612.7
## - `Total expenditure`
                                                 1.8 4192.3 2612.8
                                         1
## - `Adult Mortality`
                                                 3.8 4194.2 2613.6
## - `under-five deaths`
                                         1
                                                 6.0 4196.5 2614.4
## - `Hepatitis B`
                                         1
                                                 7.2 4197.7 2614.9
                                                 7.4 4197.8 2615.0
## - `thinness 1-19 years`
## - `Income composition of resources`
                                                7.8 4198.2 2615.1
                                        1
## - Alcohol
                                         1
                                                17.0 4207.4 2618.7
## <none>
                                                      4190.4 2619.5
## - Schooling
                                         1
                                                38.8 4229.2 2627.2
## - Year
                                         1
                                               449.2 4639.6 2780.0
## - `HIV/AIDS`
                                         1
                                             1046.6 5237.0 2979.7
## - Country
                                             18049.9 22240.3 4394.0
                                       132
##
## Step: AIC=2612.37
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + Measles + `under-five deaths` + `Total expenditure` +
##
       `HIV/AIDS` + GDP + `thinness 1-19 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - GDP
                                         1
                                                 0.8 4192.0 2605.3
## - Measles
                                         1
                                                 1.7 4192.9 2605.6
## - `Total expenditure`
                                         1
                                                 1.9 4193.1 2605.7
## - `Adult Mortality`
                                         1
                                                 3.8 4195.0 2606.5
## - `under-five deaths`
                                         1
                                                 6.1 4197.3 2607.4
## - `Hepatitis B`
                                         1
                                                 7.3 4198.5 2607.8
## - `thinness 1-19 years`
                                                 7.4 4198.6 2607.9
                                         1
## - Income composition of resources 1
                                                7.8 4199.0 2608.0
## - Alcohol
                                                16.7 4207.9 2611.5
                                         1
## <none>
                                                      4191.2 2612.4
## - Schooling
                                         1
                                                39.3 4230.5 2620.4
## - Year
                                         1
                                               452.0 4643.2 2773.8
```

```
## - `HIV/AIDS`
                                              1045.8 5237.0 2972.3
                                        1
## - Country
                                       132
                                             18083.2 22274.4 4389.1
##
## Step: AIC=2605.28
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `Hepatitis B` + Measles + `under-five deaths` + `Total expenditure` +
       `HIV/AIDS` + `thinness 1-19 years` + `Income composition of resources` +
##
      Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Measles
                                         1
                                                 1.7 4193.7 2598.5
## - `Total expenditure`
                                                 1.8 4193.8 2598.6
                                         1
## - `Adult Mortality`
                                         1
                                                 3.8 4195.8 2599.3
## - `under-five deaths`
                                         1
                                                 6.1 4198.1 2600.2
## - `Hepatitis B`
                                        1
                                                7.2 4199.2 2600.7
## - `thinness 1-19 years`
                                         1
                                                7.4 4199.4 2600.8
                                                7.6 4199.6 2600.9
## - `Income composition of resources`
                                        1
## - Alcohol
                                         1
                                               16.5 4208.5 2604.3
## <none>
                                                      4192.0 2605.3
## - Schooling
                                         1
                                               38.8 4230.8 2613.1
                                               474.9 4666.9 2774.8
## - Year
                                         1
## - `HIV/AIDS`
                                              1045.2 5237.2 2964.9
## - Country
                                       132
                                             18953.6 23145.6 4445.0
##
## Step: AIC=2598.53
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
##
       `Hepatitis B` + `under-five deaths` + `Total expenditure` +
##
       `HIV/AIDS` + `thinness 1-19 years` + `Income composition of resources` +
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                               AIC
## - `Total expenditure`
                                         1
                                                 1.7 4195.4 2591.8
## - `Adult Mortality`
                                         1
                                                 3.7 4197.4 2592.6
## - `under-five deaths`
                                        1
                                                 7.2 4200.9 2594.0
## - `Hepatitis B`
                                        1
                                                 7.3 4201.0 2594.0
                                                7.5 4201.2 2594.1
## - `thinness 1-19 years`
## - `Income composition of resources` 1
                                                7.6 4201.3 2594.1
## - Alcohol
                                                16.4 4210.1 2597.6
                                         1
## <none>
                                                      4193.7 2598.5
## - Schooling
                                         1
                                                39.7 4233.4 2606.6
## - Year
                                         1
                                               475.5 4669.2 2768.2
## - `HIV/AIDS`
                                             1043.8 5237.5 2957.6
                                         1
## - Country
                                       132
                                             18960.2 23153.9 4438.1
##
## Step: AIC=2591.8
## `Life expectancy` ~ Country + Year + `Adult Mortality` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 1-19 years` +
##
##
       `Income composition of resources` + Schooling
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Adult Mortality`
                                         1
                                                 3.7 4199.2 2585.9
## - `Hepatitis B`
                                         1
                                                 7.1 4202.5 2587.2
```

```
## - `under-five deaths`
                                                 7.2 4202.6 2587.2
                                         1
## - `thinness 1-19 years`
                                                 7.4 4202.9 2587.3
                                         1
                                                7.7 4203.1 2587.4
## - `Income composition of resources`
                                         1
## - Alcohol
                                                16.3 4211.7 2590.8
                                         1
## <none>
                                                      4195.4 2591.8
                                                39.8 4235.3 2600.0
## - Schooling
                                         1
## - Year
                                         1
                                               473.8 4669.2 2760.8
## - `HIV/AIDS`
                                              1042.1 5237.5 2950.2
                                         1
                                             19087.0 23282.4 4439.9
## - Country
                                       132
##
## Step: AIC=2585.86
## `Life expectancy` ~ Country + Year + Alcohol + `Hepatitis B` +
##
       `under-five deaths` + `HIV/AIDS` + `thinness 1-19 years` +
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Hepatitis B`
                                         1
                                                 6.8 4206.0 2581.1
## - `under-five deaths`
                                         1
                                                 6.9 4206.0 2581.2
## - `thinness 1-19 years`
                                                 7.7 4206.8 2581.5
                                         1
## - `Income composition of resources`
                                         1
                                                7.9 4207.0 2581.5
## - Alcohol
                                         1
                                                16.4 4215.5 2584.9
## <none>
                                                      4199.2 2585.9
## - Schooling
                                         1
                                                40.2 4239.4 2594.2
## - Year
                                         1
                                               480.2 4679.3 2757.0
## - `HIV/AIDS`
                                         1
                                              1092.7 5291.9 2959.8
## - Country
                                             24329.7 28528.8 4767.6
                                       132
##
## Step: AIC=2581.13
## `Life expectancy` ~ Country + Year + Alcohol + `under-five deaths` +
##
       `HIV/AIDS` + `thinness 1-19 years` + `Income composition of resources` +
##
       Schooling
##
                                        Df Sum of Sq
                                                         RSS
## - `Income composition of resources`
                                         1
                                                 8.1 4214.1 2576.9
## - `thinness 1-19 years`
                                         1
                                                 8.2 4214.2 2576.9
## - `under-five deaths`
                                                8.6 4214.6 2577.1
                                         1
## - Alcohol
                                         1
                                                16.2 4222.1 2580.0
                                                      4206.0 2581.1
## <none>
## - Schooling
                                                40.3 4246.2 2589.4
                                         1
## - Year
                                         1
                                               506.0 4711.9 2761.0
## - `HIV/AIDS`
                                         1
                                              1097.7 5303.6 2956.1
                                             24365.5 28571.4 4762.6
## - Country
                                       132
##
## Step: AIC=2576.9
## `Life expectancy` ~ Country + Year + Alcohol + `under-five deaths` +
       `HIV/AIDS` + `thinness 1-19 years` + Schooling
##
##
##
                             Df Sum of Sq RSS
## - `thinness 1-19 years`
                              1
                                      8.3 4222 2572.7
## - `under-five deaths`
                                      8.3 4222 2572.8
                              1
## - Alcohol
                              1
                                     15.5 4230 2575.5
## <none>
                                           4214 2576.9
```

```
## - Schooling
                           1
                                  40.1 4254 2585.1
## - Year
                            1
                                  636.1 4850 2801.3
## - `HIV/AIDS`
                                 1091.5 5306 2949.3
                           1
## - Country
                         132
                                28893.8 33108 4998.2
##
## Step: AIC=2572.72
## `Life expectancy` ~ Country + Year + Alcohol + `under-five deaths` +
##
      `HIV/AIDS` + Schooling
##
##
                        Df Sum of Sq RSS
                                             AIC
## - `under-five deaths`
                                 7.9 4230 2568.4
                         1
## - Alcohol
                                15.0 4237 2571.2
                         1
## <none>
                                      4222 2572.7
## - Schooling
                         1
                                39.7 4262 2580.8
## - Year
                         1
                               628.8 4851 2794.2
## - `HIV/AIDS`
                         1
                              1083.2 5306 2941.9
## - Country
                  132 29448.8 33671 5018.6
##
## Step: AIC=2568.41
## `Life expectancy` ~ Country + Year + Alcohol + `HIV/AIDS` + Schooling
##
##
               Df Sum of Sq
                              RSS
                                     AIC
## - Alcohol
               1
                      13.7 4244 2566.3
## <none>
                             4230 2568.4
## - Schooling 1
                       44.5 4275 2578.3
## - Year
                1
                     644.1 4874 2794.7
## - `HIV/AIDS` 1
                    1082.9 5313 2936.9
## - Country 132 29640.5 33871 5021.0
##
## Step: AIC=2566.31
## `Life expectancy` ~ Country + Year + `HIV/AIDS` + Schooling
##
##
                Df Sum of Sa
                              RSS
                                     AIC
## <none>
                             4244 2566.3
## - Schooling 1
                      42.4 4286 2575.3
## - Year
                     684.3 4928 2805.4
                1
## - `HIV/AIDS` 1
                    1118.5 5362 2944.6
## - Country 132 29642.9 33887 5014.3
```

```
corr_mod_3_back_bic = step(corr_removed_model_3, direction = "backward", k = log(n))
```

```
## Start: AIC=2646.98
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
## Step: AIC=2646.98
  `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Polio
                                         1
                                                 0.1 4147.8 2639.6
## - Diphtheria
                                         1
                                                 0.2 4147.9 2639.7
                                                 0.3 4147.9 2639.7
## - Population
                                         1
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.0 2639.7
## - BMI
                                         1
                                                 0.5 4148.1 2639.8
## - `percentage expenditure`
                                                 1.1 4148.7 2640.0
                                         1
## - GDP
                                         1
                                                 1.6 4149.3 2640.2
## - `Total expenditure`
                                         1
                                                 1.9 4149.6 2640.3
## - Measles
                                         1
                                                 2.8 4150.5 2640.7
## - `Adult Mortality`
                                         1
                                                 3.9 4151.6 2641.1
                                                 4.8 4152.4 2641.5
## - `Hepatitis B`
## - `Income composition of resources`
                                       1
                                                7.6 4155.2 2642.6
## - `thinness 5-9 years`
                                         1
                                                12.5 4160.1 2644.5
## - Alcohol
                                         1
                                                12.8 4160.4 2644.7
## <none>
                                                      4147.6 2647.0
## - `infant deaths`
                                         1
                                                28.4 4176.1 2650.8
## - `under-five deaths`
                                                32.1 4179.7 2652.3
                                         1
## - Schooling
                                         1
                                                37.0 4184.6 2654.2
## - Year
                                         1
                                               456.5 4604.1 2811.8
## - `HIV/AIDS`
                                         1
                                             1016.8 5164.4 3001.1
## - Country
                                             16527.0 20674.7 4318.0
                                       132
##
## Step: AIC=2639.63
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
       BMI + `under-five deaths` + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Diphtheria
                                         1
                                                 0.2 4147.9 2632.3
## - Population
                                                 0.3 4148.0 2632.3
                                         1
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.1 2632.3
```

```
0.5 4148.3 2632.4
## - BMI
                                         1
## - `percentage expenditure`
                                         1
                                                 1.1 4148.8 2632.6
## - GDP
                                         1
                                                 1.6 4149.4 2632.9
## - `Total expenditure`
                                        1
                                                 2.0 4149.7 2633.0
## - Measles
                                         1
                                                 2.9 4150.6 2633.4
## - `Adult Mortality`
                                         1
                                                 3.9 4151.7 2633.8
## - `Hepatitis B`
                                                4.7 4152.4 2634.1
                                         1
## - `Income composition of resources`
                                                7.6 4155.4 2635.2
                                        1
## - `thinness 5-9 years`
                                                12.6 4160.3 2637.2
                                         1
## - Alcohol
                                                12.8 4160.5 2637.3
                                         1
## <none>
                                                      4147.8 2639.6
## - `infant deaths`
                                                28.6 4176.4 2643.6
                                         1
## - `under-five deaths`
                                         1
                                                32.2 4180.0 2645.0
## - Schooling
                                                36.9 4184.7 2646.8
                                         1
## - Year
                                         1
                                               456.6 4604.4 2804.4
## - `HIV/AIDS`
                                         1
                                              1016.7 5164.4 2993.7
## - Country
                                       132
                                             16542.4 20690.1 4311.9
##
## Step: AIC=2632.29
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + Population + `thinness 1-19 years` + `thinness 5-9 years` +
##
      `Income composition of resources` + Schooling
##
                                        Df Sum of Sq
##
                                                        RSS
                                                                AIC
## - Population
                                         1
                                                 0.3 4148.2 2625.0
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.2 2625.0
## - BMI
                                        1
                                                 0.5 4148.4 2625.1
## - `percentage expenditure`
                                         1
                                                 1.1 4149.0 2625.3
## - GDP
                                        1
                                                1.6 4149.5 2625.5
## - `Total expenditure`
                                                2.0 4149.9 2625.7
                                         1
## - Measles
                                         1
                                                2.8 4150.8 2626.0
## - `Adult Mortality`
                                        1
                                                3.9 4151.8 2626.4
## - `Hepatitis B`
                                                7.1 4155.0 2627.7
                                        1
                                       1
                                                7.9 4155.8 2628.0
## - `Income composition of resources`
## - `thinness 5-9 years`
                                               12.6 4160.5 2629.9
                                        1
## - Alcohol
                                                12.8 4160.7 2629.9
                                         1
## <none>
                                                      4147.9 2632.3
## - `infant deaths`
                                        1
                                                28.9 4176.9 2636.3
## - `under-five deaths`
                                         1
                                                32.6 4180.5 2637.8
## - Schooling
                                         1
                                                37.1 4185.0 2639.6
## - Year
                                         1
                                               456.9 4604.9 2797.2
## - `HIV/AIDS`
                                         1
                                              1020.4 5168.3 2987.6
                                       132
## - Country
                                             16656.3 20804.2 4313.5
##
## Step: AIC=2624.99
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + `thinness 1-19 years` + `thinness 5-9 years` + `Income composition of reso
urces` +
```

```
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.5 2617.7
## - BMI
                                         1
                                                 0.5 4148.7 2617.8
## - `percentage expenditure`
                                         1
                                                 1.1 4149.3 2618.0
## - GDP
                                         1
                                                 1.6 4149.8 2618.2
## - `Total expenditure`
                                         1
                                                 1.9 4150.1 2618.4
                                                 3.0 4151.2 2618.8
## - Measles
                                         1
## - `Adult Mortality`
                                                 4.0 4152.2 2619.2
                                         1
                                                 7.0 4155.2 2620.4
## - `Hepatitis B`
                                         1
## - `Income composition of resources`
                                                 7.9 4156.1 2620.7
                                         1
## - Alcohol
                                         1
                                                12.9 4161.1 2622.7
## - `thinness 5-9 years`
                                         1
                                                12.9 4161.1 2622.7
## <none>
                                                      4148.2 2625.0
## - `infant deaths`
                                         1
                                                29.6 4177.8 2629.3
## - `under-five deaths`
                                         1
                                                32.9 4181.1 2630.6
## - Schooling
                                         1
                                                36.9 4185.1 2632.2
## - Year
                                         1
                                               456.7 4604.9 2789.8
## - `HIV/AIDS`
                                         1
                                              1021.7 5169.9 2980.7
                                             16656.9 20805.1 4306.2
## - Country
                                       132
##
## Step: AIC=2617.69
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
       BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
##
       GDP + `thinness 5-9 years` + `Income composition of resources` +
       Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - BMI
                                         1
                                                 0.5 4149.0 2610.5
## - `percentage expenditure`
                                         1
                                                 1.1 4149.5 2610.7
## - GDP
                                         1
                                                 1.6 4150.1 2610.9
## - `Total expenditure`
                                         1
                                                 1.9 4150.4 2611.1
## - Measles
                                         1
                                                 2.9 4151.4 2611.5
## - `Adult Mortality`
                                                 4.0 4152.5 2611.9
                                         1
## - `Hepatitis B`
                                                 7.1 4155.6 2613.1
                                         1
## - `Income composition of resources`
                                                 7.9 4156.4 2613.4
                                         1
## - Alcohol
                                                12.8 4161.3 2615.4
                                         1
## <none>
                                                      4148.5 2617.7
## - `thinness 5-9 years`
                                         1
                                                22.2 4170.7 2619.1
## - `infant deaths`
                                                29.4 4177.9 2621.9
                                         1
## - `under-five deaths`
                                         1
                                                32.7 4181.2 2623.2
## - Schooling
                                         1
                                                36.8 4185.3 2624.9
## - Year
                                         1
                                               456.5 4605.0 2782.4
## - `HIV/AIDS`
                                              1021.7 5170.1 2973.3
                                         1
                                             16656.6 20805.1 4298.8
## - Country
                                       132
##
## Step: AIC=2610.49
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
```

```
GDP + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                       Df Sum of Sq
                                                                AIC
                                                        RSS
## - `percentage expenditure`
                                        1
                                                 1.2 4150.2 2603.5
## - GDP
                                        1
                                                 1.7 4150.7 2603.8
## - `Total expenditure`
                                                1.8 4150.8 2603.8
                                        1
## - Measles
                                        1
                                                3.0 4152.0 2604.3
## - `Adult Mortality`
                                                4.0 4153.0 2604.7
                                        1
## - `Hepatitis B`
                                                6.9 4155.9 2605.8
                                        1
## - `Income composition of resources`
                                        1
                                                7.7 4156.6 2606.1
## - Alcohol
                                               12.8 4161.8 2608.2
                                        1
## <none>
                                                      4149.0 2610.5
## - `thinness 5-9 years`
                                        1
                                               22.4 4171.4 2611.9
## - `infant deaths`
                                        1
                                                29.4 4178.4 2614.7
## - `under-five deaths`
                                        1
                                                32.7 4181.7 2616.0
## - Schooling
                                        1
                                               36.8 4185.8 2617.7
## - Year
                                        1
                                               456.8 4605.8 2775.3
## - `HIV/AIDS`
                                             1026.4 5175.4 2967.6
                                        1
## - Country
                                       132 16982.3 21131.3 4317.0
##
## Step: AIC=2603.55
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
       `Total expenditure` + `HIV/AIDS` + GDP + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - GDP
                                        1
                                                 0.9 4151.0 2596.5
## - `Total expenditure`
                                        1
                                                1.9 4152.1 2596.9
## - Measles
                                        1
                                                3.0 4153.2 2597.3
## - `Adult Mortality`
                                        1
                                                4.0 4154.1 2597.7
## - `Hepatitis B`
                                        1
                                                7.0 4157.2 2598.9
## - `Income composition of resources`
                                       1
                                                7.7 4157.8 2599.2
## - Alcohol
                                        1
                                               12.5 4162.7 2601.1
## <none>
                                                      4150.2 2603.5
## - `thinness 5-9 years`
                                        1
                                               22.3 4172.5 2605.0
## - `infant deaths`
                                                29.1 4179.2 2607.7
                                        1
## - `under-five deaths`
                                        1
                                               32.4 4182.5 2609.0
## - Schooling
                                        1
                                               37.5 4187.6 2611.0
## - Year
                                        1
                                               459.9 4610.1 2769.5
## - `HIV/AIDS`
                                             1025.3 5175.4 2960.2
                                        1
## - Country
                                       132
                                             17019.7 21169.8 4312.6
##
## Step: AIC=2596.49
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
##
       `Total expenditure` + `HIV/AIDS` + `thinness 5-9 years` +
       `Income composition of resources` + Schooling
##
##
##
                                       Df Sum of Sq
                                                        RSS
## - `Total expenditure`
                                         1
                                                 1.8 4152.9 2589.8
```

```
## - Measles
                                                3.0 4154.0 2590.3
                                        1
## - `Adult Mortality`
                                        1
                                                3.9 4155.0 2590.6
## - `Hepatitis B`
                                        1
                                                6.9 4158.0 2591.8
## - `Income composition of resources`
                                               7.5 4158.5 2592.0
                                      1
## - Alcohol
                                        1
                                               12.3 4163.3 2594.0
## <none>
                                                     4151.0 2596.5
## - `thinness 5-9 years`
                                        1
                                               22.3 4173.4 2597.9
## - `infant deaths`
                                        1
                                               29.0 4180.0 2600.6
## - `under-five deaths`
                                               32.3 4183.3 2601.9
                                        1
## - Schooling
                                               37.0 4188.0 2603.7
                                        1
                                              483.5 4634.5 2770.8
## - Year
                                        1
## - `HIV/AIDS`
                                            1024.5 5175.5 2952.8
                                        1
## - Country
                                      132
                                            17885.0 22036.0 4371.4
##
## Step: AIC=2589.8
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
      `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - Measles
                                                2.9 4155.7 2583.5
## - `Adult Mortality`
                                        1
                                                3.9 4156.8 2584.0
## - `Hepatitis B`
                                        1
                                                6.7 4159.6 2585.1
                                               7.6 4160.4 2585.4
## - `Income composition of resources`
                                      1
## - Alcohol
                                               12.2 4165.0 2587.2
                                        1
## <none>
                                                     4152.9 2589.8
## - `thinness 5-9 years`
                                        1
                                               22.2 4175.1 2591.2
## - `infant deaths`
                                        1
                                               29.1 4181.9 2593.9
## - `under-five deaths`
                                        1
                                               32.4 4185.2 2595.2
                                               37.2 4190.0 2597.1
## - Schooling
                                        1
## - Year
                                        1
                                              481.7 4634.5 2763.3
## - `HIV/AIDS`
                                        1
                                            1022.7 5175.5 2945.4
## - Country
                                      132
                                            18014.7 22167.6 4373.8
##
## Step: AIC=2583.53
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + `under-five deaths` + `HIV/AIDS` +
##
      `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - `Adult Mortality`
                                        1
                                                3.9 4159.6 2577.7
## - `Hepatitis B`
                                                6.8 4162.5 2578.8
## - `Income composition of resources` 1
                                               7.5 4163.2 2579.1
## - Alcohol
                                        1
                                               12.2 4167.9 2581.0
## <none>
                                                     4155.7 2583.5
## - `thinness 5-9 years`
                                        1
                                               22.8 4178.5 2585.1
## - `infant deaths`
                                               27.4 4183.2 2587.0
                                        1
## - `under-five deaths`
                                               31.0 4186.7 2588.4
                                        1
## - Schooling
                                        1
                                               38.3 4194.0 2591.2
## - Year
                                        1
                                              482.8 4638.5 2757.4
```

```
## - `HIV/AIDS`
                                             1021.8 5177.5 2938.6
                                         1
## - Country
                                       132
                                             18052.6 22208.3 4369.4
##
## Step: AIC=2577.67
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
                                         1
                                                 6.6 4166.2 2572.9
## - `Hepatitis B`
                                                 7.7 4167.3 2573.3
## - `Income composition of resources`
                                         1
## - Alcohol
                                                12.3 4171.9 2575.1
                                         1
## <none>
                                                      4159.6 2577.7
## - `thinness 5-9 years`
                                         1
                                                22.9 4182.5 2579.3
## - `infant deaths`
                                         1
                                                27.4 4187.0 2581.1
## - `under-five deaths`
                                         1
                                                30.8 4190.4 2582.4
## - Schooling
                                         1
                                                38.6 4198.2 2585.5
## - Year
                                         1
                                               489.2 4648.8 2753.6
## - `HIV/AIDS`
                                              1071.3 5230.9 2948.2
                                         1
## - Country
                                       132
                                             22622.6 26782.2 4670.8
##
## Step: AIC=2572.86
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
##
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Income composition of resources`
                                         1
                                                 7.9 4174.1 2568.6
## - Alcohol
                                         1
                                                12.1 4178.3 2570.2
## <none>
                                                      4166.2 2572.9
## - `thinness 5-9 years`
                                                23.8 4190.0 2574.9
                                         1
## - `infant deaths`
                                         1
                                                27.3 4193.5 2576.2
## - `under-five deaths`
                                         1
                                                31.2 4197.4 2577.8
## - Schooling
                                         1
                                                38.7 4204.8 2580.7
## - Year
                                         1
                                               515.0 4681.2 2757.7
## - `HIV/AIDS`
                                              1076.3 5242.5 2944.4
                                         1
## - Country
                                       132
                                             22626.1 26792.3 4664.0
##
## Step: AIC=2568.59
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
##
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
       Schooling
##
                           Df Sum of Sq
                                            RSS
                                                   AIC
## - Alcohol
                            1
                                   11.5 4185.6 2565.7
## <none>
                                         4174.1 2568.6
## - `thinness 5-9 years`
                                  24.1 4198.2 2570.7
                            1
## - `infant deaths`
                            1
                                  27.3 4201.4 2571.9
## - `under-five deaths`
                            1
                                  31.1 4205.2 2573.4
                                  38.5 4212.6 2576.3
## - Schooling
                            1
## - Year
                            1
                                  646.6 4820.7 2798.7
## - `HIV/AIDS`
                            1
                                 1070.3 5244.4 2937.6
```

```
## - Country
                          132
                                26354.1 30528.2 4871.8
##
## Step: AIC=2565.72
## `Life expectancy` ~ Country + Year + `infant deaths` + `under-five deaths` +
       `HIV/AIDS` + `thinness 5-9 years` + Schooling
##
##
##
                           Df Sum of Sq
                                            RSS
                                                    AIC
## <none>
                                          4185.6 2565.7
## - `thinness 5-9 years`
                                   24.3 4209.9 2567.9
                            1
## - `infant deaths`
                            1
                                   30.8 4216.4 2570.4
## - `under-five deaths`
                                   34.4 4220.0 2571.8
                            1
## - Schooling
                            1
                                   37.0 4222.6 2572.8
                                  686.5 4872.1 2808.7
## - Year
                            1
## - `HIV/AIDS`
                            1
                                 1099.8 5285.4 2943.0
## - Country
                          132
                                26345.0 30530.7 4864.6
```

```
metrics_corr_mod_1_back_aic = calc_model_metrics(corr_mod_1_back_aic)
metrics_corr_mod_2_back_aic = calc_model_metrics(corr_mod_2_back_aic)
metrics_corr_mod_3_back_aic = calc_model_metrics(corr_mod_3_back_aic)

metrics_corr_mod_1_back_bic = calc_model_metrics(corr_mod_1_back_bic)
metrics_corr_mod_2_back_bic = calc_model_metrics(corr_mod_2_back_bic)
metrics_corr_mod_3_back_bic = calc_model_metrics(corr_mod_3_back_bic)
```

```
# AIC and BIC for models with log transformations
tranform_mod_1_back_aic = step(log_transform_1, direction = "backward")
```

```
## Start: AIC=1827.61
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(Population) + log(GDP)
##
##
## Step: AIC=1827.61
  `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(Population) + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 AIC
## - log(Population)
                                         1
                                                 0.0 4144.2 1825.6
## - Polio
                                         1
                                                 0.2 4144.4 1825.7
## - Diphtheria
                                                 0.2 4144.4 1825.7
                                         1
## - Population
                                         1
                                                 0.2 4144.4 1825.7
## - BMI
                                         1
                                                 0.5 4144.7 1825.8
## - `thinness 1-19 years`
                                                 0.5 4144.7 1825.8
                                         1
                                                 1.7 4145.9 1826.3
## - `Total expenditure`
                                         1
                                                 2.0 4146.2 1826.4
## - `percentage expenditure`
                                         1
## - Measles
                                         1
                                                 2.8 4147.0 1826.7
## - log(GDP)
                                         1
                                                 3.4 4147.6 1827.0
## - GDP
                                                 3.5 4147.7 1827.0
                                         1
                                                 3.6 4147.8 1827.0
## - `Adult Mortality`
                                         1
## - `Hepatitis B`
                                         1
                                                 4.8 4148.9 1827.5
## <none>
                                                      4144.2 1827.6
## - `Income composition of resources`
                                                 7.8 4151.9 1828.7
                                         1
## - `thinness 5-9 years`
                                         1
                                                12.3 4156.5 1830.5
## - Alcohol
                                         1
                                                12.5 4156.6 1830.6
## - `infant deaths`
                                                28.3 4172.4 1836.8
                                         1
## - `under-five deaths`
                                                32.1 4176.3 1838.3
                                         1
## - Schooling
                                         1
                                                37.7 4181.8 1840.5
## - Year
                                         1
                                               458.5 4602.6 1998.6
## - `HIV/AIDS`
                                              1018.6 5162.8 2188.0
                                         1
## - Country
                                       132
                                             16162.9 20307.1 4184.3
##
## Step: AIC=1825.61
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
       BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 AIC
## - Polio
                                                 0.2 4144.4 1823.7
```

```
## - Diphtheria
                                                 0.2 4144.4 1823.7
                                         1
## - Population
                                         1
                                                 0.2 4144.4 1823.7
## - BMI
                                         1
                                                 0.5 4144.7 1823.8
## - `thinness 1-19 years`
                                         1
                                                 0.5 4144.7 1823.8
## - `Total expenditure`
                                         1
                                                 1.8 4145.9 1824.3
## - `percentage expenditure`
                                         1
                                                 2.0 4146.2 1824.4
## - Measles
                                         1
                                                 2.8 4147.0 1824.7
## - log(GDP)
                                         1
                                                 3.4 4147.6 1825.0
## - GDP
                                                 3.5 4147.7 1825.0
                                         1
## - `Adult Mortality`
                                         1
                                                 3.6 4147.8 1825.0
## - `Hepatitis B`
                                                 4.7 4148.9 1825.5
                                                      4144.2 1825.6
## <none>
## - `Income composition of resources`
                                         1
                                                 7.7 4151.9 1826.7
## - `thinness 5-9 years`
                                         1
                                                12.3 4156.5 1828.5
## - Alcohol
                                         1
                                                12.5 4156.7 1828.6
                                                28.3 4172.5 1834.8
## - `infant deaths`
                                         1
## - `under-five deaths`
                                         1
                                                32.1 4176.3 1836.3
## - Schooling
                                         1
                                                37.7 4181.9 1838.6
## - Year
                                         1
                                               460.0 4604.1 1997.2
## - `HIV/AIDS`
                                         1
                                              1019.8 5163.9 2186.4
## - Country
                                       132
                                             16240.4 20384.6 4188.6
##
## Step: AIC=1823.68
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
      BMI + `under-five deaths` + `Total expenditure` + Diphtheria +
##
##
      `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
       `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling + log(GDP)
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
                                                 0.1 4144.5 1821.7
## - Diphtheria
                                         1
## - Population
                                         1
                                                 0.2 4144.6 1821.8
## - `thinness 1-19 years`
                                         1
                                                 0.4 4144.8 1821.9
## - BMI
                                         1
                                                 0.5 4144.8 1821.9
## - `Total expenditure`
                                         1
                                                 1.8 4146.1 1822.4
## - `percentage expenditure`
                                         1
                                                 2.0 4146.3 1822.5
## - Measles
                                                 2.8 4147.2 1822.8
                                         1
## - log(GDP)
                                         1
                                                 3.4 4147.8 1823.0
## - GDP
                                         1
                                                 3.4 4147.8 1823.1
## - `Adult Mortality`
                                         1
                                                 3.6 4148.0 1823.1
## - `Hepatitis B`
                                         1
                                                 4.6 4149.0 1823.5
## <none>
                                                      4144.4 1823.7
## - `Income composition of resources`
                                                7.8 4152.1 1824.8
                                         1
## - `thinness 5-9 years`
                                         1
                                                12.4 4156.8 1826.6
## - Alcohol
                                         1
                                                12.4 4156.8 1826.6
## - `infant deaths`
                                         1
                                                28.5 4172.8 1833.0
## - `under-five deaths`
                                         1
                                                32.3 4176.6 1834.5
## - Schooling
                                                37.6 4182.0 1836.6
                                         1
## - Year
                                         1
                                               460.0 4604.3 1995.2
## - `HIV/AIDS`
                                         1
                                              1019.6 5164.0 2184.4
## - Country
                                       132
                                             16258.6 20403.0 4188.1
```

```
##
## Step: AIC=1821.73
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
##
      GDP + Population + `thinness 1-19 years` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
                                         1
                                                 0.2 4144.7 1819.8
## - Population
## - `thinness 1-19 years`
                                         1
                                                 0.4 4144.9 1819.9
                                                 0.5 4145.0 1819.9
## - BMI
                                         1
## - `Total expenditure`
                                         1
                                                 1.8 4146.2 1820.4
                                         1
                                                 2.0 4146.4 1820.5
## - `percentage expenditure`
## - Measles
                                        1
                                                 2.8 4147.3 1820.8
## - log(GDP)
                                         1
                                                 3.4 4147.9 1821.1
## - GDP
                                         1
                                                3.4 4147.9 1821.1
## - `Adult Mortality`
                                         1
                                                3.6 4148.1 1821.2
## <none>
                                                      4144.5 1821.7
## - `Hepatitis B`
                                         1
                                                6.9 4151.3 1822.5
## - `Income composition of resources`
                                                8.0 4152.5 1822.9
                                        1
## - `thinness 5-9 years`
                                                12.4 4156.9 1824.7
## - Alcohol
                                         1
                                                12.4 4156.9 1824.7
## - `infant deaths`
                                        1
                                                28.8 4173.3 1831.1
## - `under-five deaths`
                                                32.6 4177.1 1832.7
                                         1
## - Schooling
                                         1
                                                37.8 4182.3 1834.7
## - Year
                                         1
                                               460.4 4604.8 1993.4
## - `HIV/AIDS`
                                         1
                                             1023.3 5167.8 2183.6
## - Country
                                       132
                                             16382.1 20526.6 4196.0
##
## Step: AIC=1819.82
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
      GDP + `thinness 1-19 years` + `thinness 5-9 years` + `Income composition of reso
##
      Schooling + log(GDP)
##
##
##
                                       Df Sum of Sq
                                                         RSS
                                                                AIC
                                        1
## - `thinness 1-19 years`
                                                 0.4 4145.1 1818.0
## - BMI
                                         1
                                                 0.5 4145.2 1818.0
## - `Total expenditure`
                                                 1.8 4146.4 1818.5
                                         1
## - `percentage expenditure`
                                        1
                                                 2.0 4146.7 1818.6
## - Measles
                                         1
                                                 2.9 4147.6 1819.0
## - GDP
                                        1
                                                3.5 4148.2 1819.2
## - log(GDP)
                                         1
                                                3.5 4148.2 1819.2
## - `Adult Mortality`
                                                 3.6 4148.3 1819.3
                                         1
## <none>
                                                      4144.7 1819.8
## - `Hepatitis B`
                                                6.8 4151.5 1820.5
                                        1
## - Income composition of resources
                                                8.0 4152.7 1821.0
                                        1
## - Alcohol
                                        1
                                                12.5 4157.2 1822.8
## - `thinness 5-9 years`
                                         1
                                                12.7 4157.4 1822.9
```

```
## - `infant deaths`
                                         1
                                                29.6 4174.3 1829.6
## - `under-five deaths`
                                                33.1 4177.8 1830.9
                                         1
                                                37.7 4182.4 1832.7
## - Schooling
                                         1
## - Year
                                         1
                                               460.2 4604.9 1991.4
## - `HIV/AIDS`
                                         1
                                              1024.6 5169.3 2182.1
## - Country
                                       132
                                             16383.5 20528.2 4194.2
##
## Step: AIC=1817.98
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
      GDP + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - BMI
                                         1
                                                 0.5 4145.6 1816.2
## - `Total expenditure`
                                         1
                                                 1.8 4146.9 1816.7
## - `percentage expenditure`
                                         1
                                                 2.0 4147.1 1816.8
## - Measles
                                                 2.9 4148.0 1817.1
                                         1
## - log(GDP)
                                         1
                                                 3.4 4148.5 1817.3
## - GDP
                                         1
                                                 3.4 4148.5 1817.3
## - `Adult Mortality`
                                                 3.7 4148.8 1817.4
## <none>
                                                      4145.1 1818.0
## - `Hepatitis B`
                                                 6.9 4152.0 1818.7
                                         1
                                                 8.0 4153.1 1819.2
## - `Income composition of resources`
                                         1
## - Alcohol
                                                12.4 4157.5 1820.9
                                         1
## - `thinness 5-9 years`
                                         1
                                                22.7 4167.8 1825.0
## - `infant deaths`
                                         1
                                                29.4 4174.5 1827.6
## - `under-five deaths`
                                         1
                                                32.8 4177.9 1829.0
## - Schooling
                                         1
                                                37.5 4182.6 1830.8
## - Year
                                         1
                                               459.8 4604.9 1989.5
## - `HIV/AIDS`
                                         1
                                             1024.4 5169.5 2180.2
## - Country
                                       132
                                             16383.8 20528.9 4192.2
##
## Step: AIC=1816.17
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
      `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Total expenditure`
                                         1
                                                 1.7 4147.2 1814.8
## - `percentage expenditure`
                                         1
                                                 2.1 4147.7 1815.0
## - Measles
                                         1
                                                 2.9 4148.5 1815.3
## - log(GDP)
                                         1
                                                 3.4 4149.0 1815.5
## - GDP
                                         1
                                                 3.6 4149.2 1815.6
## - `Adult Mortality`
                                         1
                                                 3.7 4149.2 1815.6
## <none>
                                                      4145.6 1816.2
## - `Hepatitis B`
                                                 6.7 4152.3 1816.8
                                         1
## - `Income composition of resources`
                                        1
                                                7.8 4153.4 1817.3
## - Alcohol
                                         1
                                                12.4 4158.0 1819.1
```

```
22.8 4168.4 1823.2
## - `thinness 5-9 years`
                                         1
## - `infant deaths`
                                         1
                                                29.4 4175.0 1825.8
## - `under-five deaths`
                                                32.8 4178.4 1827.2
                                         1
## - Schooling
                                         1
                                                37.6 4183.1 1829.0
                                               460.2 4605.8 1987.8
## - Year
                                         1
## - `HIV/AIDS`
                                             1029.2 5174.7 2179.8
                                         1
                                             16644.6 20790.2 4211.1
## - Country
                                       132
##
## Step: AIC=1814.83
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
       `under-five deaths` + `HIV/AIDS` + GDP + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
## - `percentage expenditure`
                                         1
                                                 2.2 4149.4 1813.7
## - Measles
                                         1
                                                 2.8 4150.0 1813.9
## - log(GDP)
                                         1
                                                 3.6 4150.8 1814.3
## - `Adult Mortality`
                                         1
                                                 3.7 4150.9 1814.3
## - GDP
                                         1
                                                 3.7 4150.9 1814.3
## <none>
                                                      4147.2 1814.8
## - `Hepatitis B`
                                         1
                                                 6.5 4153.7 1815.4
## - `Income composition of resources`
                                         1
                                                7.9 4155.1 1816.0
## - Alcohol
                                         1
                                                12.3 4159.6 1817.7
## - `thinness 5-9 years`
                                         1
                                                22.7 4170.0 1821.8
## - `infant deaths`
                                         1
                                                29.5 4176.7 1824.5
## - `under-five deaths`
                                         1
                                                32.9 4180.2 1825.9
## - Schooling
                                         1
                                                37.7 4185.0 1827.8
## - Year
                                         1
                                               458.6 4605.8 1985.8
## - `HIV/AIDS`
                                         1
                                              1027.5 5174.7 2177.8
                                             16735.1 20882.3 4216.4
## - Country
                                       132
##
## Step: AIC=1813.71
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
       `HIV/AIDS` + GDP + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling + log(GDP)
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - GDP
                                         1
                                                 2.5 4152.0 1812.7
## - log(GDP)
                                         1
                                                 2.6 4152.1 1812.7
## - Measles
                                         1
                                                 2.8 4152.2 1812.8
## - `Adult Mortality`
                                         1
                                                 3.7 4153.1 1813.2
## <none>
                                                      4149.4 1813.7
## - `Hepatitis B`
                                         1
                                                 6.7 4156.1 1814.3
## - `Income composition of resources`
                                         1
                                                7.9 4157.3 1814.8
                                         1
                                                12.0 4161.4 1816.5
## - Alcohol
## - `thinness 5-9 years`
                                         1
                                                22.6 4172.0 1820.6
## - `infant deaths`
                                                29.0 4178.5 1823.2
                                         1
## - `under-five deaths`
                                                32.5 4181.9 1824.6
                                         1
## - Schooling
                                         1
                                                38.4 4187.9 1826.9
## - Year
                                         1
                                               460.3 4609.8 1985.2
```

```
## - `HIV/AIDS`
                                             1025.4 5174.8 2175.9
                                        1
## - Country
                                       132
                                             16841.6 20991.0 4222.9
##
## Step: AIC=1812.71
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                        RSS
                                                               AIC
## - log(GDP)
                                         1
                                                 0.9 4152.9 1811.1
                                                2.8 4154.8 1811.8
## - Measles
                                        1
## - `Adult Mortality`
                                        1
                                                3.8 4155.7 1812.2
                                                      4152.0 1812.7
## <none>
## - `Hepatitis B`
                                        1
                                                6.6 4158.5 1813.3
## - `Income composition of resources`
                                        1
                                                7.5 4159.5 1813.7
## - Alcohol
                                        1
                                               11.8 4163.8 1815.4
## - `thinness 5-9 years`
                                        1
                                                22.4 4174.4 1819.6
## - `infant deaths`
                                                29.0 4180.9 1822.2
                                        1
## - `under-five deaths`
                                        1
                                               32.3 4184.3 1823.5
## - Schooling
                                        1
                                               37.2 4189.2 1825.4
## - Year
                                               473.2 4625.2 1988.7
                                        1
## - `HIV/AIDS`
                                        1
                                            1022.9 5174.9 2173.9
                                            17153.1 21305.1 4245.4
## - Country
                                       132
##
## Step: AIC=1811.06
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
      `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - Measles
                                        1
                                                2.9 4155.7 1810.2
## - `Adult Mortality`
                                        1
                                                3.9 4156.8 1810.6
                                                      4152.9 1811.1
## <none>
## - `Hepatitis B`
                                                6.7 4159.6 1811.7
## - `Income composition of resources`
                                                7.6 4160.4 1812.1
                                        1
## - Alcohol
                                               12.2 4165.0 1813.9
                                        1
## - `thinness 5-9 years`
                                               22.2 4175.1 1817.9
                                        1
## - `infant deaths`
                                        1
                                               29.1 4181.9 1820.6
## - `under-five deaths`
                                        1
                                               32.4 4185.2 1821.9
## - Schooling
                                               37.2 4190.0 1823.8
                                        1
## - Year
                                        1
                                              481.7 4634.5 1990.0
## - `HIV/AIDS`
                                        1
                                             1022.7 5175.5 2172.1
## - Country
                                       132
                                             18014.7 22167.6 4308.9
##
## Step: AIC=1810.2
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + `under-five deaths` + `HIV/AIDS` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
```

```
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Adult Mortality`
                                         1
                                                  3.9 4159.6 1809.7
## <none>
                                                       4155.7 1810.2
## - `Hepatitis B`
                                                  6.8
                                                      4162.5 1810.9
                                         1
## - `Income composition of resources`
                                         1
                                                 7.5 4163.2 1811.2
## - Alcohol
                                         1
                                                12.2 4167.9 1813.0
## - `thinness 5-9 years`
                                         1
                                                22.8 4178.5 1817.2
## - `infant deaths`
                                         1
                                                27.4 4183.2 1819.0
## - `under-five deaths`
                                                31.0 4186.7 1820.4
                                         1
## - Schooling
                                                 38.3 4194.0 1823.3
                                         1
## - Year
                                         1
                                               482.8 4638.5 1989.4
## - `HIV/AIDS`
                                              1021.8 5177.5 2170.7
                                         1
## - Country
                                       132
                                             18052.6 22208.3 4309.9
##
## Step: AIC=1809.74
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
##
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 AIC
## <none>
                                                       4159.6 1809.7
## - `Hepatitis B`
                                                  6.6 4166.2 1810.3
                                         1
## - `Income composition of resources`
                                         1
                                                 7.7 4167.3 1810.8
## - Alcohol
                                         1
                                                12.3 4171.9 1812.6
## - `thinness 5-9 years`
                                         1
                                                 22.9 4182.5 1816.8
## - `infant deaths`
                                         1
                                                27.4 4187.0 1818.6
## - `under-five deaths`
                                         1
                                                30.8 4190.4 1819.9
## - Schooling
                                         1
                                                38.6 4198.2 1823.0
## - Year
                                         1
                                               489.2 4648.8 1991.1
## - `HIV/AIDS`
                                         1
                                              1071.3 5230.9 2185.6
## - Country
                                             22622.6 26782.2 4616.7
                                       132
```

```
tranform_mod_2_back_aic = step(log_transform_2, direction = "backward")
```

```
## Start: AIC=1825.61
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(GDP)
##
##
## Step: AIC=1825.61
  `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Polio
                                         1
                                                 0.2 4144.4 1823.7
## - Diphtheria
                                         1
                                                 0.2 4144.4 1823.7
## - Population
                                                 0.2 4144.4 1823.7
                                         1
## - BMI
                                         1
                                                 0.5 4144.7 1823.8
## - `thinness 1-19 years`
                                         1
                                                 0.5 4144.7 1823.8
## - `Total expenditure`
                                                 1.8 4145.9 1824.3
                                         1
## - `percentage expenditure`
                                         1
                                                 2.0 4146.2 1824.4
## - Measles
                                         1
                                                 2.8 4147.0 1824.7
## - log(GDP)
                                         1
                                                 3.4 4147.6 1825.0
## - GDP
                                         1
                                                 3.5 4147.7 1825.0
## - `Adult Mortality`
                                         1
                                                 3.6 4147.8 1825.0
## - `Hepatitis B`
                                         1
                                                 4.7 4148.9 1825.5
## <none>
                                                      4144.2 1825.6
## - `Income composition of resources`
                                                 7.7 4151.9 1826.7
                                         1
## - `thinness 5-9 years`
                                                12.3 4156.5 1828.5
                                         1
## - Alcohol
                                         1
                                                12.5 4156.7 1828.6
## - `infant deaths`
                                         1
                                                28.3 4172.5 1834.8
## - `under-five deaths`
                                         1
                                                32.1 4176.3 1836.3
## - Schooling
                                         1
                                                37.7 4181.9 1838.6
## - Year
                                         1
                                               460.0 4604.1 1997.2
## - `HIV/AIDS`
                                         1
                                              1019.8 5163.9 2186.4
                                             16240.4 20384.6 4188.6
## - Country
                                       132
##
## Step: AIC=1823.68
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
       `thinness 5-9 years` + `Income composition of resources` +
##
##
       Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## - Diphtheria
                                                 0.1 4144.5 1821.7
                                         1
## - Population
                                         1
                                                 0.2 4144.6 1821.8
```

```
0.4 4144.8 1821.9
## - `thinness 1-19 years`
                                         1
## - BMI
                                         1
                                                 0.5 4144.8 1821.9
## - `Total expenditure`
                                         1
                                                 1.8 4146.1 1822.4
## - `percentage expenditure`
                                        1
                                                 2.0 4146.3 1822.5
## - Measles
                                         1
                                                 2.8 4147.2 1822.8
## - log(GDP)
                                        1
                                                3.4 4147.8 1823.0
## - GDP
                                        1
                                                3.4 4147.8 1823.1
## - `Adult Mortality`
                                         1
                                                 3.6 4148.0 1823.1
## - `Hepatitis B`
                                                 4.6 4149.0 1823.5
                                         1
## <none>
                                                      4144.4 1823.7
## - `Income composition of resources`
                                         1
                                                7.8 4152.1 1824.8
                                                12.4 4156.8 1826.6
## - `thinness 5-9 years`
                                         1
## - Alcohol
                                         1
                                                12.4 4156.8 1826.6
## - `infant deaths`
                                         1
                                                28.5 4172.8 1833.0
## - `under-five deaths`
                                         1
                                                32.3 4176.6 1834.5
## - Schooling
                                         1
                                                37.6 4182.0 1836.6
## - Year
                                        1
                                              460.0 4604.3 1995.2
## - `HIV/AIDS`
                                        1
                                             1019.6 5164.0 2184.4
## - Country
                                       132
                                             16258.6 20403.0 4188.1
##
## Step: AIC=1821.73
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + Population + `thinness 1-19 years` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling + log(GDP)
##
##
##
                                        Df Sum of Sq
                                                                AIC
                                                         RSS
## - Population
                                         1
                                                 0.2 4144.7 1819.8
## - `thinness 1-19 years`
                                         1
                                                 0.4 4144.9 1819.9
## - BMI
                                        1
                                                 0.5 4145.0 1819.9
## - `Total expenditure`
                                        1
                                                 1.8 4146.2 1820.4
## - `percentage expenditure`
                                        1
                                                 2.0 4146.4 1820.5
## - Measles
                                        1
                                                 2.8 4147.3 1820.8
## - log(GDP)
                                         1
                                                3.4 4147.9 1821.1
                                                3.4 4147.9 1821.1
## - GDP
                                         1
## - `Adult Mortality`
                                                3.6 4148.1 1821.2
## <none>
                                                      4144.5 1821.7
## - `Hepatitis B`
                                                6.9 4151.3 1822.5
                                         1
## - `Income composition of resources`
                                       1
                                                8.0 4152.5 1822.9
## - `thinness 5-9 years`
                                         1
                                               12.4 4156.9 1824.7
## - Alcohol
                                               12.4 4156.9 1824.7
                                         1
## - `infant deaths`
                                        1
                                                28.8 4173.3 1831.1
## - `under-five deaths`
                                         1
                                                32.6 4177.1 1832.7
## - Schooling
                                        1
                                               37.8 4182.3 1834.7
## - Year
                                               460.4 4604.8 1993.4
                                         1
## - `HIV/AIDS`
                                              1023.3 5167.8 2183.6
                                         1
## - Country
                                       132
                                             16382.1 20526.6 4196.0
##
## Step: AIC=1819.82
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
```

```
BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
##
       GDP + `thinness 1-19 years` + `thinness 5-9 years` + `Income composition of reso
urces` +
##
      Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `thinness 1-19 years`
                                         1
                                                 0.4 4145.1 1818.0
## - BMI
                                         1
                                                 0.5 4145.2 1818.0
## - `Total expenditure`
                                         1
                                                 1.8 4146.4 1818.5
## - `percentage expenditure`
                                         1
                                                 2.0 4146.7 1818.6
## - Measles
                                         1
                                                 2.9 4147.6 1819.0
## - GDP
                                         1
                                                 3.5 4148.2 1819.2
## - log(GDP)
                                         1
                                                 3.5 4148.2 1819.2
## - `Adult Mortality`
                                         1
                                                 3.6 4148.3 1819.3
## <none>
                                                      4144.7 1819.8
## - `Hepatitis B`
                                         1
                                                 6.8 4151.5 1820.5
## - `Income composition of resources`
                                                8.0 4152.7 1821.0
                                         1
## - Alcohol
                                         1
                                                12.5 4157.2 1822.8
## - `thinness 5-9 years`
                                         1
                                                12.7 4157.4 1822.9
## - `infant deaths`
                                         1
                                                29.6 4174.3 1829.6
## - `under-five deaths`
                                         1
                                                33.1 4177.8 1830.9
## - Schooling
                                         1
                                                37.7 4182.4 1832.7
## - Year
                                         1
                                               460.2 4604.9 1991.4
## - `HIV/AIDS`
                                         1
                                             1024.6 5169.3 2182.1
## - Country
                                       132
                                             16383.5 20528.2 4194.2
##
## Step: AIC=1817.98
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
      GDP + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling + log(GDP)
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - BMI
                                         1
                                                 0.5 4145.6 1816.2
## - `Total expenditure`
                                         1
                                                 1.8 4146.9 1816.7
## - `percentage expenditure`
                                                 2.0 4147.1 1816.8
                                         1
                                                 2.9 4148.0 1817.1
## - Measles
                                         1
## - log(GDP)
                                         1
                                                 3.4 4148.5 1817.3
## - GDP
                                         1
                                                3.4 4148.5 1817.3
## - `Adult Mortality`
                                         1
                                                 3.7 4148.8 1817.4
                                                      4145.1 1818.0
## <none>
## - `Hepatitis B`
                                         1
                                                 6.9 4152.0 1818.7
## - `Income composition of resources`
                                                 8.0 4153.1 1819.2
                                         1
## - Alcohol
                                         1
                                                12.4 4157.5 1820.9
## - `thinness 5-9 years`
                                         1
                                                22.7 4167.8 1825.0
## - `infant deaths`
                                         1
                                                29.4 4174.5 1827.6
## - `under-five deaths`
                                         1
                                                32.8 4177.9 1829.0
## - Schooling
                                         1
                                                37.5 4182.6 1830.8
## - Year
                                               459.8 4604.9 1989.5
                                         1
## - `HIV/AIDS`
                                         1
                                              1024.4 5169.5 2180.2
## - Country
                                       132
                                             16383.8 20528.9 4192.2
```

```
##
## Step: AIC=1816.17
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
##
       GDP + `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
                                         1
                                                 1.7 4147.2 1814.8
## - `Total expenditure`
## - `percentage expenditure`
                                         1
                                                 2.1 4147.7 1815.0
                                                 2.9 4148.5 1815.3
## - Measles
                                         1
## - log(GDP)
                                         1
                                                 3.4 4149.0 1815.5
## - GDP
                                         1
                                                 3.6 4149.2 1815.6
## - `Adult Mortality`
                                         1
                                                 3.7 4149.2 1815.6
## <none>
                                                      4145.6 1816.2
## - `Hepatitis B`
                                                 6.7 4152.3 1816.8
                                         1
## - `Income composition of resources`
                                                 7.8 4153.4 1817.3
## - Alcohol
                                                12.4 4158.0 1819.1
                                         1
## - `thinness 5-9 years`
                                         1
                                                22.8 4168.4 1823.2
## - `infant deaths`
                                         1
                                                29.4 4175.0 1825.8
## - `under-five deaths`
                                         1
                                                32.8 4178.4 1827.2
## - Schooling
                                         1
                                                37.6 4183.1 1829.0
## - Year
                                               460.2 4605.8 1987.8
                                         1
## - `HIV/AIDS`
                                              1029.2 5174.7 2179.8
                                         1
## - Country
                                             16644.6 20790.2 4211.1
                                       132
##
## Step: AIC=1814.83
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
       `under-five deaths` + `HIV/AIDS` + GDP + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
                                                 2.2 4149.4 1813.7
## - `percentage expenditure`
                                         1
                                         1
                                                 2.8 4150.0 1813.9
## - Measles
## - log(GDP)
                                         1
                                                 3.6 4150.8 1814.3
## - `Adult Mortality`
                                                 3.7 4150.9 1814.3
                                         1
## - GDP
                                         1
                                                 3.7 4150.9 1814.3
## <none>
                                                      4147.2 1814.8
## - `Hepatitis B`
                                         1
                                                 6.5 4153.7 1815.4
## - `Income composition of resources`
                                                 7.9 4155.1 1816.0
                                         1
## - Alcohol
                                         1
                                                12.3 4159.6 1817.7
## - `thinness 5-9 years`
                                         1
                                                22.7 4170.0 1821.8
## - `infant deaths`
                                         1
                                                29.5 4176.7 1824.5
## - `under-five deaths`
                                         1
                                                32.9 4180.2 1825.9
## - Schooling
                                         1
                                                37.7 4185.0 1827.8
## - Year
                                         1
                                               458.6 4605.8 1985.8
## - `HIV/AIDS`
                                              1027.5 5174.7 2177.8
                                         1
                                             16735.1 20882.3 4216.4
## - Country
                                       132
##
## Step: AIC=1813.71
```

```
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
       `HIV/AIDS` + GDP + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
                                         1
## - GDP
                                                 2.5 4152.0 1812.7
                                         1
                                                 2.6 4152.1 1812.7
## - log(GDP)
                                                 2.8 4152.2 1812.8
## - Measles
                                         1
## - `Adult Mortality`
                                                 3.7 4153.1 1813.2
                                         1
## <none>
                                                      4149.4 1813.7
## - `Hepatitis B`
                                                 6.7 4156.1 1814.3
                                         1
## - `Income composition of resources`
                                         1
                                                7.9 4157.3 1814.8
## - Alcohol
                                         1
                                                12.0 4161.4 1816.5
## - `thinness 5-9 years`
                                         1
                                                22.6 4172.0 1820.6
## - `infant deaths`
                                         1
                                                29.0 4178.5 1823.2
## - `under-five deaths`
                                         1
                                                32.5 4181.9 1824.6
## - Schooling
                                         1
                                                38.4 4187.9 1826.9
## - Year
                                         1
                                               460.3 4609.8 1985.2
## - `HIV/AIDS`
                                         1
                                             1025.4 5174.8 2175.9
                                             16841.6 20991.0 4222.9
## - Country
                                       132
##
## Step: AIC=1812.71
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
      `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - log(GDP)
                                         1
                                                 0.9 4152.9 1811.1
                                                 2.8 4154.8 1811.8
## - Measles
                                         1
## - `Adult Mortality`
                                         1
                                                 3.8 4155.7 1812.2
## <none>
                                                      4152.0 1812.7
## - `Hepatitis B`
                                         1
                                                 6.6 4158.5 1813.3
## - `Income composition of resources`
                                                7.5 4159.5 1813.7
                                        1
## - Alcohol
                                         1
                                                11.8 4163.8 1815.4
## - `thinness 5-9 years`
                                         1
                                                22.4 4174.4 1819.6
## - `infant deaths`
                                                29.0 4180.9 1822.2
                                         1
## - `under-five deaths`
                                                32.3 4184.3 1823.5
                                         1
## - Schooling
                                         1
                                                37.2 4189.2 1825.4
## - Year
                                         1
                                               473.2 4625.2 1988.7
## - `HIV/AIDS`
                                             1022.9 5174.9 2173.9
                                         1
## - Country
                                       132
                                             17153.1 21305.1 4245.4
##
## Step: AIC=1811.06
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
##
      `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
      Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
## - Measles
                                         1
                                                 2.9 4155.7 1810.2
```

```
## - `Adult Mortality`
                                                 3.9 4156.8 1810.6
                                         1
## <none>
                                                      4152.9 1811.1
## - `Hepatitis B`
                                                 6.7 4159.6 1811.7
                                         1
## - `Income composition of resources`
                                                7.6 4160.4 1812.1
                                        1
## - Alcohol
                                         1
                                                12.2 4165.0 1813.9
## - `thinness 5-9 years`
                                                22.2 4175.1 1817.9
                                         1
## - `infant deaths`
                                         1
                                                29.1 4181.9 1820.6
## - `under-five deaths`
                                         1
                                                32.4 4185.2 1821.9
                                               37.2 4190.0 1823.8
## - Schooling
                                        1
## - Year
                                        1
                                               481.7 4634.5 1990.0
## - `HIV/AIDS`
                                              1022.7 5175.5 2172.1
                                         1
## - Country
                                       132
                                             18014.7 22167.6 4308.9
##
## Step: AIC=1810.2
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `Hepatitis B` + `under-five deaths` + `HIV/AIDS` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                                AIC
## - `Adult Mortality`
                                         1
                                                 3.9 4159.6 1809.7
## <none>
                                                      4155.7 1810.2
## - `Hepatitis B`
                                        1
                                                6.8 4162.5 1810.9
## - `Income composition of resources`
                                        1
                                                7.5 4163.2 1811.2
## - Alcohol
                                         1
                                                12.2 4167.9 1813.0
## - `thinness 5-9 years`
                                        1
                                               22.8 4178.5 1817.2
## - `infant deaths`
                                        1
                                               27.4 4183.2 1819.0
## - `under-five deaths`
                                        1
                                               31.0 4186.7 1820.4
## - Schooling
                                        1
                                                38.3 4194.0 1823.3
## - Year
                                         1
                                               482.8 4638.5 1989.4
## - `HIV/AIDS`
                                             1021.8 5177.5 2170.7
                                        1
## - Country
                                             18052.6 22208.3 4309.9
                                       132
##
## Step: AIC=1809.74
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                       RSS
                                                               AIC
## <none>
                                                      4159.6 1809.7
## - `Hepatitis B`
                                         1
                                                 6.6 4166.2 1810.3
## - `Income composition of resources`
                                                7.7 4167.3 1810.8
                                        1
## - Alcohol
                                        1
                                               12.3 4171.9 1812.6
## - `thinness 5-9 years`
                                         1
                                                22.9 4182.5 1816.8
## - `infant deaths`
                                        1
                                               27.4 4187.0 1818.6
## - `under-five deaths`
                                        1
                                               30.8 4190.4 1819.9
## - Schooling
                                         1
                                                38.6 4198.2 1823.0
## - Year
                                        1
                                               489.2 4648.8 1991.1
## - `HIV/AIDS`
                                             1071.3 5230.9 2185.6
                                         1
                                             22622.6 26782.2 4616.7
## - Country
                                       132
```

tranform\_mod\_3\_back\_aic = step(log\_transform\_3, direction = "backward")

```
## Start: AIC=1826.98
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(Population)
##
##
## Step: AIC=1826.98
  `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(Population)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - log(Population)
                                         1
                                                 0.0 4147.6 1825.0
## - Polio
                                         1
                                                 0.1 4147.8 1825.0
## - Diphtheria
                                                 0.2 4147.9 1825.1
                                         1
## - Population
                                         1
                                                 0.3 4147.9 1825.1
## - `thinness 1-19 years`
                                         1
                                                 0.3 4147.9 1825.1
## - BMI
                                         1
                                                 0.5 4148.1 1825.2
## - `percentage expenditure`
                                                 1.1 4148.7 1825.4
                                         1
## - GDP
                                         1
                                                 1.6 4149.3 1825.6
## - `Total expenditure`
                                         1
                                                 1.9 4149.5 1825.7
## - Measles
                                         1
                                                 2.8 4150.5 1826.1
## - `Adult Mortality`
                                         1
                                                 3.9 4151.6 1826.5
## - `Hepatitis B`
                                         1
                                                 4.8 4152.4 1826.9
## <none>
                                                      4147.6 1827.0
## - `Income composition of resources`
                                                 7.6 4155.2 1828.0
                                         1
## - `thinness 5-9 years`
                                                12.5 4160.1 1829.9
                                         1
## - Alcohol
                                         1
                                                12.8 4160.4 1830.1
## - `infant deaths`
                                                28.4 4176.0 1836.2
                                         1
## - `under-five deaths`
                                         1
                                                32.0 4179.6 1837.7
## - Schooling
                                         1
                                                36.9 4184.5 1839.6
## - Year
                                         1
                                               455.0 4602.6 1996.6
## - `HIV/AIDS`
                                         1
                                              1015.7 5163.3 2186.2
                                             16446.2 20593.8 4205.4
## - Country
                                       132
##
## Step: AIC=1824.98
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## - Polio
                                                 0.1 4147.8 1823.0
                                         1
## - Diphtheria
                                         1
                                                 0.2 4147.9 1823.1
```

```
## - Population
                                        1
                                                0.3 4147.9 1823.1
## - `thinness 1-19 years`
                                        1
                                                0.3 4148.0 1823.1
## - BMI
                                        1
                                                0.5 4148.1 1823.2
## - `percentage expenditure`
                                        1
                                                1.1 4148.7 1823.4
## - GDP
                                        1
                                                1.6 4149.3 1823.6
## - `Total expenditure`
                                        1
                                                1.9 4149.6 1823.7
## - Measles
                                        1
                                                2.8 4150.5 1824.1
## - `Adult Mortality`
                                        1
                                                3.9 4151.6 1824.5
## - `Hepatitis B`
                                                4.8 4152.4 1824.9
                                        1
## <none>
                                                     4147.6 1825.0
                                               7.6 4155.2 1826.0
## - `Income composition of resources`
                                        1
## - `thinness 5-9 years`
                                               12.5 4160.1 1827.9
                                        1
## - Alcohol
                                        1
                                               12.8 4160.4 1828.1
## - `infant deaths`
                                        1
                                               28.4 4176.1 1834.2
## - `under-five deaths`
                                        1
                                               32.1 4179.7 1835.7
## - Schooling
                                        1
                                               37.0 4184.6 1837.6
## - Year
                                        1
                                             456.5 4604.1 1995.2
## - `HIV/AIDS`
                                        1
                                            1016.8 5164.4 2184.5
## - Country
                                      132
                                            16527.0 20674.7 4209.9
##
## Step: AIC=1823.04
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
      BMI + `under-five deaths` + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
      `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - Diphtheria
                                        1
                                                0.2 4147.9 1821.1
                                                0.3 4148.0 1821.2
## - Population
                                        1
## - `thinness 1-19 years`
                                        1
                                                0.3 4148.1 1821.2
## - BMI
                                        1
                                                0.5 4148.3 1821.2
## - `percentage expenditure`
                                        1
                                                1.1 4148.8 1821.5
## - GDP
                                        1
                                               1.6 4149.4 1821.7
## - `Total expenditure`
                                        1
                                               2.0 4149.7 1821.8
## - Measles
                                        1
                                               2.9 4150.6 1822.2
## - `Adult Mortality`
                                                3.9 4151.7 1822.6
                                        1
## - `Hepatitis B`
                                        1
                                                4.7 4152.4 1822.9
## <none>
                                                     4147.8 1823.0
## - Income composition of resources 1
                                               7.6 4155.4 1824.1
## - `thinness 5-9 years`
                                               12.6 4160.3 1826.0
                                        1
## - Alcohol
                                        1
                                               12.8 4160.5 1826.1
## - `infant deaths`
                                        1
                                               28.6 4176.4 1832.4
## - `under-five deaths`
                                        1
                                               32.2 4180.0 1833.8
## - Schooling
                                               36.9 4184.7 1835.6
                                        1
## - Year
                                              456.6 4604.4 1993.2
                                        1
## - `HIV/AIDS`
                                        1
                                            1016.7 5164.4 2182.5
## - Country
                                      132
                                            16542.4 20690.1 4209.1
##
## Step: AIC=1821.1
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
```

```
Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
       BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
       GDP + Population + `thinness 1-19 years` + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Population
                                         1
                                                 0.3 4148.2 1819.2
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.2 1819.2
                                                 0.5 4148.4 1819.3
## - BMI
                                         1
## - `percentage expenditure`
                                         1
                                                 1.1 4149.0 1819.5
## - GDP
                                         1
                                                 1.6 4149.5 1819.7
## - `Total expenditure`
                                         1
                                                 2.0 4149.9 1819.9
## - Measles
                                         1
                                                 2.8 4150.8 1820.2
## - `Adult Mortality`
                                         1
                                                 3.9 4151.8 1820.7
## <none>
                                                      4147.9 1821.1
## - `Hepatitis B`
                                         1
                                                 7.1 4155.0 1821.9
## - `Income composition of resources`
                                                7.9 4155.8 1822.2
                                         1
## - `thinness 5-9 years`
                                         1
                                                12.6 4160.5 1824.1
## - Alcohol
                                         1
                                                12.8 4160.7 1824.2
## - `infant deaths`
                                         1
                                                28.9 4176.9 1830.6
## - `under-five deaths`
                                         1
                                                32.6 4180.5 1832.0
## - Schooling
                                         1
                                                37.1 4185.0 1833.8
## - Year
                                         1
                                               456.9 4604.9 1991.4
## - `HIV/AIDS`
                                         1
                                             1020.4 5168.3 2181.8
                                             16656.3 20804.2 4216.2
## - Country
                                       132
##
## Step: AIC=1819.21
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
      GDP + `thinness 1-19 years` + `thinness 5-9 years` + `Income composition of reso
##
urces` +
      Schooling
##
##
                                        Df Sum of Sq
##
                                                         RSS
                                                                AIC
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.5 1817.3
## - BMI
                                                 0.5 4148.7 1817.4
                                         1
## - `percentage expenditure`
                                                 1.1 4149.3 1817.6
                                         1
## - GDP
                                         1
                                                 1.6 4149.8 1817.9
## - `Total expenditure`
                                         1
                                                1.9 4150.1 1818.0
## - Measles
                                         1
                                                 3.0 4151.2 1818.4
## - `Adult Mortality`
                                                 4.0 4152.2 1818.8
                                         1
## <none>
                                                      4148.2 1819.2
## - `Hepatitis B`
                                         1
                                                 7.0 4155.2 1820.0
## - `Income composition of resources`
                                       1
                                                 7.9 4156.1 1820.4
## - Alcohol
                                         1
                                                12.9 4161.1 1822.3
## - `thinness 5-9 years`
                                         1
                                                12.9 4161.1 1822.3
## - `infant deaths`
                                         1
                                                29.6 4177.8 1828.9
## - `under-five deaths`
                                                32.9 4181.1 1830.2
                                         1
## - Schooling
                                         1
                                                36.9 4185.1 1831.8
## - Year
                                         1
                                               456.7 4604.9 1989.4
## - `HIV/AIDS`
                                         1
                                              1021.7 5169.9 2180.3
```

```
16656.9 20805.1 4214.3
## - Country
                                       132
##
## Step: AIC=1817.32
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
##
                                       Df Sum of Sq
                                                        RSS
                                                                AIC
## - BMI
                                         1
                                                 0.5 4149.0 1815.5
## - `percentage expenditure`
                                        1
                                                1.1 4149.5 1815.7
## - GDP
                                        1
                                                1.6 4150.1 1816.0
## - `Total expenditure`
                                        1
                                                1.9 4150.4 1816.1
## - Measles
                                        1
                                                2.9 4151.4 1816.5
## - `Adult Mortality`
                                                4.0 4152.5 1816.9
## <none>
                                                      4148.5 1817.3
## - `Hepatitis B`
                                        1
                                                7.1 4155.6 1818.1
## - `Income composition of resources`
                                                7.9 4156.4 1818.5
                                        1
## - Alcohol
                                        1
                                               12.8 4161.3 1820.4
## - `thinness 5-9 years`
                                        1
                                                22.2 4170.7 1824.1
## - `infant deaths`
                                         1
                                                29.4 4177.9 1827.0
## - `under-five deaths`
                                        1
                                               32.7 4181.2 1828.3
## - Schooling
                                        1
                                               36.8 4185.3 1829.9
## - Year
                                         1
                                               456.5 4605.0 1987.5
## - `HIV/AIDS`
                                        1
                                             1021.7 5170.1 2178.4
## - Country
                                       132
                                             16656.6 20805.1 4212.3
##
## Step: AIC=1815.52
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
      `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
                                       Df Sum of Sq
                                                         RSS
                                                                AIC
## - `percentage expenditure`
                                        1
                                                1.2 4150.2 1814.0
                                                1.7 4150.7 1814.2
## - GDP
                                        1
## - `Total expenditure`
                                        1
                                                1.8 4150.8 1814.3
## - Measles
                                        1
                                                3.0 4152.0 1814.7
## - `Adult Mortality`
                                        1
                                                4.0 4153.0 1815.1
## <none>
                                                      4149.0 1815.5
## - `Hepatitis B`
                                        1
                                                6.9 4155.9 1816.3
## - `Income composition of resources`
                                        1
                                                7.7 4156.6 1816.6
## - Alcohol
                                        1
                                               12.8 4161.8 1818.6
## - `thinness 5-9 years`
                                        1
                                               22.4 4171.4 1822.4
## - `infant deaths`
                                                29.4 4178.4 1825.2
                                        1
## - `under-five deaths`
                                        1
                                                32.7 4181.7 1826.5
## - Schooling
                                               36.8 4185.8 1828.1
                                         1
## - Year
                                         1
                                               456.8 4605.8 1985.8
## - `HIV/AIDS`
                                        1
                                              1026.4 5175.4 2178.0
## - Country
                                       132
                                             16982.3 21131.3 4235.9
```

```
##
## Step: AIC=1813.99
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
       `Total expenditure` + `HIV/AIDS` + GDP + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
                                                 0.9 4151.0 1812.3
## - GDP
                                         1
## - `Total expenditure`
                                         1
                                                 1.9 4152.1 1812.7
## - Measles
                                         1
                                                 3.0 4153.2 1813.2
## - `Adult Mortality`
                                                 4.0 4154.1 1813.6
                                         1
## <none>
                                                      4150.2 1814.0
## - `Hepatitis B`
                                                 7.0 4157.2 1814.8
                                         1
## - `Income composition of resources`
                                         1
                                                7.7 4157.8 1815.0
## - Alcohol
                                         1
                                                12.5 4162.7 1817.0
## - `thinness 5-9 years`
                                         1
                                                22.3 4172.5 1820.8
## - `infant deaths`
                                                29.1 4179.2 1823.5
                                         1
## - `under-five deaths`
                                                32.4 4182.5 1824.8
                                         1
## - Schooling
                                         1
                                                37.5 4187.6 1826.8
## - Year
                                               459.9 4610.1 1985.3
                                         1
## - `HIV/AIDS`
                                         1
                                              1025.3 5175.4 2176.0
## - Country
                                       132
                                             17019.7 21169.8 4236.9
##
## Step: AIC=1812.34
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
       `Total expenditure` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Total expenditure`
                                         1
                                                 1.8 4152.9 1811.1
## - Measles
                                         1
                                                 3.0 4154.0 1811.5
## - `Adult Mortality`
                                         1
                                                 3.9 4155.0 1811.9
## <none>
                                                      4151.0 1812.3
## - `Hepatitis B`
                                                 6.9 4158.0 1813.1
                                         1
## - `Income composition of resources`
                                                7.5 4158.5 1813.3
                                         1
## - Alcohol
                                                12.3 4163.3 1815.2
                                         1
## - `thinness 5-9 years`
                                         1
                                                22.3 4173.4 1819.2
## - `infant deaths`
                                         1
                                                29.0 4180.0 1821.8
## - `under-five deaths`
                                         1
                                                32.3 4183.3 1823.1
## - Schooling
                                         1
                                                37.0 4188.0 1825.0
## - Year
                                         1
                                               483.5 4634.5 1992.0
## - `HIV/AIDS`
                                         1
                                              1024.5 5175.5 2174.1
## - Country
                                       132
                                             17885.0 22036.0 4301.0
##
## Step: AIC=1811.06
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
```

```
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
                                                 2.9 4155.7 1810.2
## - Measles
                                         1
## - `Adult Mortality`
                                         1
                                                 3.9 4156.8 1810.6
                                                      4152.9 1811.1
## <none>
## - `Hepatitis B`
                                         1
                                                 6.7 4159.6 1811.7
## - `Income composition of resources`
                                         1
                                                 7.6 4160.4 1812.1
## - Alcohol
                                         1
                                                12.2 4165.0 1813.9
## - `thinness 5-9 years`
                                         1
                                                22.2 4175.1 1817.9
## - `infant deaths`
                                                29.1 4181.9 1820.6
                                         1
## - `under-five deaths`
                                                32.4 4185.2 1821.9
                                         1
## - Schooling
                                         1
                                                37.2 4190.0 1823.8
                                               481.7 4634.5 1990.0
## - Year
                                         1
## - `HIV/AIDS`
                                         1
                                              1022.7 5175.5 2172.1
                                       132
                                             18014.7 22167.6 4308.9
## - Country
##
## Step: AIC=1810.2
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `Hepatitis B` + `under-five deaths` + `HIV/AIDS` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Adult Mortality`
                                         1
                                                 3.9 4159.6 1809.7
## <none>
                                                      4155.7 1810.2
## - `Hepatitis B`
                                         1
                                                 6.8 4162.5 1810.9
## - `Income composition of resources`
                                                 7.5 4163.2 1811.2
                                         1
## - Alcohol
                                         1
                                                12.2 4167.9 1813.0
## - `thinness 5-9 years`
                                         1
                                                22.8 4178.5 1817.2
## - `infant deaths`
                                         1
                                                27.4 4183.2 1819.0
## - `under-five deaths`
                                         1
                                                31.0 4186.7 1820.4
## - Schooling
                                         1
                                                38.3 4194.0 1823.3
## - Year
                                         1
                                               482.8 4638.5 1989.4
## - `HIV/AIDS`
                                         1
                                              1021.8 5177.5 2170.7
## - Country
                                       132
                                             18052.6 22208.3 4309.9
##
## Step: AIC=1809.74
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## <none>
                                                      4159.6 1809.7
## - `Hepatitis B`
                                         1
                                                 6.6 4166.2 1810.3
## - `Income composition of resources`
                                                 7.7 4167.3 1810.8
                                         1
## - Alcohol
                                         1
                                                12.3 4171.9 1812.6
## - `thinness 5-9 years`
                                         1
                                                22.9 4182.5 1816.8
## - `infant deaths`
                                         1
                                                27.4 4187.0 1818.6
## - `under-five deaths`
                                         1
                                                30.8 4190.4 1819.9
## - Schooling
                                                38.6 4198.2 1823.0
                                         1
## - Year
                                               489.2 4648.8 1991.1
                                         1
## - `HIV/AIDS`
                                         1
                                              1071.3 5230.9 2185.6
## - Country
                                       132
                                             22622.6 26782.2 4616.7
```

 $tranform\_mod\_1\_back\_bic = step(log\_transform\_1, direction = "backward", k = log(n))$ 

```
## Start: AIC=2660.43
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(Population) + log(GDP)
##
##
## Step: AIC=2660.43
  `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(Population) + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 AIC
## - log(Population)
                                         1
                                                 0.0 4144.2 2653.0
## - Polio
                                         1
                                                 0.2 4144.4 2653.1
                                                 0.2 4144.4 2653.1
## - Diphtheria
                                         1
## - Population
                                         1
                                                 0.2 4144.4 2653.1
## - BMI
                                         1
                                                 0.5 4144.7 2653.2
## - `thinness 1-19 years`
                                                 0.5 4144.7 2653.2
                                         1
                                                 1.7 4145.9 2653.7
## - `Total expenditure`
                                         1
                                                 2.0 4146.2 2653.8
## - `percentage expenditure`
                                         1
## - Measles
                                         1
                                                 2.8 4147.0 2654.1
## - log(GDP)
                                         1
                                                 3.4 4147.6 2654.4
## - GDP
                                                 3.5 4147.7 2654.4
                                         1
## - `Adult Mortality`
                                         1
                                                 3.6 4147.8 2654.5
## - `Hepatitis B`
                                         1
                                                 4.8 4148.9 2654.9
## - Income composition of resources
                                                 7.8 4151.9 2656.1
                                         1
## - `thinness 5-9 years`
                                                12.3 4156.5 2657.9
                                         1
## - Alcohol
                                         1
                                                12.5 4156.6 2658.0
## <none>
                                                      4144.2 2660.4
## - `infant deaths`
                                                28.3 4172.4 2664.2
                                         1
## - `under-five deaths`
                                                32.1 4176.3 2665.8
                                         1
## - Schooling
                                         1
                                                37.7 4181.8 2667.9
## - Year
                                         1
                                               458.5 4602.6 2826.0
## - `HIV/AIDS`
                                              1018.6 5162.8 3015.4
                                         1
## - Country
                                       132
                                             16162.9 20307.1 4303.3
##
## Step: AIC=2653.03
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
       BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 AIC
## - Polio
                                                 0.2 4144.4 2645.7
```

```
## - Diphtheria
                                                 0.2 4144.4 2645.7
                                         1
## - Population
                                         1
                                                 0.2 4144.4 2645.7
                                        1
                                                 0.5 4144.7 2645.8
## - BMI
## - `thinness 1-19 years`
                                        1
                                                0.5 4144.7 2645.8
## - `Total expenditure`
                                        1
                                                1.8 4145.9 2646.3
## - `percentage expenditure`
                                        1
                                                2.0 4146.2 2646.4
## - Measles
                                        1
                                                2.8 4147.0 2646.7
## - log(GDP)
                                         1
                                                3.4 4147.6 2647.0
## - GDP
                                                3.5 4147.7 2647.0
                                        1
## - `Adult Mortality`
                                                3.6 4147.8 2647.1
                                        1
## - `Hepatitis B`
                                        1
                                                4.7 4148.9 2647.5
## - `Income composition of resources`
                                                7.7 4151.9 2648.7
                                        1
## - `thinness 5-9 years`
                                        1
                                               12.3 4156.5 2650.5
## - Alcohol
                                         1
                                                12.5 4156.7 2650.6
## <none>
                                                     4144.2 2653.0
## - `infant deaths`
                                        1
                                                28.3 4172.5 2656.8
## - `under-five deaths`
                                        1
                                                32.1 4176.3 2658.4
## - Schooling
                                        1
                                                37.7 4181.9 2660.6
## - Year
                                        1
                                               460.0 4604.1 2819.2
## - `HIV/AIDS`
                                        1
                                             1019.8 5163.9 3008.4
## - Country
                                       132
                                             16240.4 20384.6 4302.2
##
## Step: AIC=2645.69
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
      BMI + `under-five deaths` + `Total expenditure` + Diphtheria +
##
##
      `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
       `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling + log(GDP)
##
##
##
                                       Df Sum of Sq
                                                        RSS
                                                                AIC
                                                0.1 4144.5 2638.3
## - Diphtheria
                                        1
## - Population
                                        1
                                                0.2 4144.6 2638.4
## - `thinness 1-19 years`
                                        1
                                                0.4 4144.8 2638.5
## - BMI
                                        1
                                                0.5 4144.8 2638.5
## - `Total expenditure`
                                        1
                                                1.8 4146.1 2639.0
## - `percentage expenditure`
                                        1
                                                2.0 4146.3 2639.1
## - Measles
                                                2.8 4147.2 2639.4
                                        1
## - log(GDP)
                                        1
                                                3.4 4147.8 2639.6
## - GDP
                                        1
                                                3.4 4147.8 2639.7
## - `Adult Mortality`
                                        1
                                                3.6 4148.0 2639.7
## - `Hepatitis B`
                                        1
                                                4.6 4149.0 2640.1
## - Income composition of resources
                                      1
                                                7.8 4152.1 2641.4
## - `thinness 5-9 years`
                                                12.4 4156.8 2643.2
## - Alcohol
                                        1
                                                12.4 4156.8 2643.2
## <none>
                                                      4144.4 2645.7
## - `infant deaths`
                                                28.5 4172.8 2649.6
                                        1
## - `under-five deaths`
                                        1
                                                32.3 4176.6 2651.1
## - Schooling
                                                37.6 4182.0 2653.2
                                        1
## - Year
                                               460.0 4604.3 2811.8
                                        1
## - `HIV/AIDS`
                                        1
                                              1019.6 5164.0 3001.0
## - Country
                                       132
                                             16258.6 20403.0 4296.2
```

```
##
## Step: AIC=2638.33
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
##
      GDP + Population + `thinness 1-19 years` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
                                         1
                                                 0.2 4144.7 2631.0
## - Population
## - `thinness 1-19 years`
                                         1
                                                 0.4 4144.9 2631.1
                                                 0.5 4145.0 2631.1
## - BMI
                                         1
## - `Total expenditure`
                                         1
                                                 1.8 4146.2 2631.6
                                         1
                                                 2.0 4146.4 2631.7
## - `percentage expenditure`
## - Measles
                                         1
                                                 2.8 4147.3 2632.0
## - log(GDP)
                                         1
                                                 3.4 4147.9 2632.3
## - GDP
                                         1
                                                 3.4 4147.9 2632.3
                                                 3.6 4148.1 2632.3
## - `Adult Mortality`
                                         1
## - `Hepatitis B`
                                                 6.9 4151.3 2633.6
                                         1
## - `Income composition of resources`
                                        1
                                                8.0 4152.5 2634.1
## - `thinness 5-9 years`
                                         1
                                                12.4 4156.9 2635.9
## - Alcohol
                                         1
                                                12.4 4156.9 2635.9
## <none>
                                                      4144.5 2638.3
## - `infant deaths`
                                                28.8 4173.3 2642.3
                                         1
## - `under-five deaths`
                                                32.6 4177.1 2643.9
                                         1
## - Schooling
                                                37.8 4182.3 2645.9
                                         1
## - Year
                                         1
                                               460.4 4604.8 2804.6
## - `HIV/AIDS`
                                         1
                                             1023.3 5167.8 2994.8
## - Country
                                       132
                                             16382.1 20526.6 4298.8
##
## Step: AIC=2631.01
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
      GDP + `thinness 1-19 years` + `thinness 5-9 years` + `Income composition of reso
##
      Schooling + log(GDP)
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
                                         1
## - `thinness 1-19 years`
                                                 0.4 4145.1 2623.8
## - BMI
                                         1
                                                 0.5 4145.2 2623.8
## - `Total expenditure`
                                                 1.8 4146.4 2624.3
                                         1
## - `percentage expenditure`
                                         1
                                                 2.0 4146.7 2624.4
## - Measles
                                         1
                                                 2.9 4147.6 2624.8
## - GDP
                                         1
                                                 3.5 4148.2 2625.0
## - log(GDP)
                                         1
                                                 3.5 4148.2 2625.0
## - `Adult Mortality`
                                                 3.6 4148.3 2625.0
                                         1
## - `Hepatitis B`
                                         1
                                                6.8 4151.5 2626.3
## - Income composition of resources
                                                8.0 4152.7 2626.8
                                        1
## - Alcohol
                                         1
                                                12.5 4157.2 2628.6
## - `thinness 5-9 years`
                                         1
                                                12.7 4157.4 2628.6
## <none>
                                                      4144.7 2631.0
```

```
## - `infant deaths`
                                         1
                                                29.6 4174.3 2635.3
## - `under-five deaths`
                                                33.1 4177.8 2636.7
                                         1
                                                37.7 4182.4 2638.5
## - Schooling
                                         1
## - Year
                                         1
                                               460.2 4604.9 2797.2
## - `HIV/AIDS`
                                         1
                                              1024.6 5169.3 2987.9
## - Country
                                       132
                                             16383.5 20528.2 4291.5
##
## Step: AIC=2623.76
##
  `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
       GDP + `thinness 5-9 years` + `Income composition of resources` +
##
##
       Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - BMI
                                         1
                                                 0.5 4145.6 2616.5
## - `Total expenditure`
                                         1
                                                 1.8 4146.9 2617.1
## - `percentage expenditure`
                                         1
                                                 2.0 4147.1 2617.1
## - Measles
                                                 2.9 4148.0 2617.5
                                         1
## - log(GDP)
                                         1
                                                 3.4 4148.5 2617.7
## - GDP
                                         1
                                                 3.4 4148.5 2617.7
## - `Adult Mortality`
                                                 3.7 4148.8 2617.8
## - `Hepatitis B`
                                         1
                                                 6.9 4152.0 2619.1
## - `Income composition of resources`
                                         1
                                                 8.0 4153.1 2619.5
## - Alcohol
                                                12.4 4157.5 2621.3
## <none>
                                                      4145.1 2623.8
## - `thinness 5-9 years`
                                                22.7 4167.8 2625.3
                                         1
                                                29.4 4174.5 2628.0
## - `infant deaths`
                                         1
## - `under-five deaths`
                                         1
                                                32.8 4177.9 2629.4
## - Schooling
                                         1
                                                37.5 4182.6 2631.2
## - Year
                                         1
                                               459.8 4604.9 2789.8
## - `HIV/AIDS`
                                         1
                                              1024.4 5169.5 2980.5
## - Country
                                       132
                                             16383.8 20528.9 4284.2
##
## Step: AIC=2616.54
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(GDP)
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Total expenditure`
                                         1
                                                 1.7 4147.2 2609.8
## - `percentage expenditure`
                                         1
                                                 2.1 4147.7 2610.0
## - Measles
                                         1
                                                 2.9 4148.5 2610.3
## - log(GDP)
                                         1
                                                 3.4 4149.0 2610.5
## - GDP
                                         1
                                                 3.6 4149.2 2610.6
## - `Adult Mortality`
                                         1
                                                 3.7 4149.2 2610.6
## - `Hepatitis B`
                                                 6.7 4152.3 2611.8
                                         1
## - `Income composition of resources`
                                                 7.8 4153.4 2612.2
                                         1
## - Alcohol
                                         1
                                                12.4 4158.0 2614.1
## <none>
                                                      4145.6 2616.5
```

```
## - `thinness 5-9 years`
                                                22.8 4168.4 2618.2
                                        1
## - `infant deaths`
                                         1
                                                29.4 4175.0 2620.8
## - `under-five deaths`
                                                32.8 4178.4 2622.1
                                         1
## - Schooling
                                         1
                                                37.6 4183.1 2624.0
                                               460.2 4605.8 2782.7
## - Year
                                         1
## - `HIV/AIDS`
                                             1029.2 5174.7 2974.8
                                        1
                                             16644.6 20790.2 4297.6
## - Country
                                       132
##
## Step: AIC=2609.79
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
      `under-five deaths` + `HIV/AIDS` + GDP + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling + log(GDP)
##
##
                                       Df Sum of Sq
                                                         RSS
## - `percentage expenditure`
                                         1
                                                 2.2 4149.4 2603.3
## - Measles
                                         1
                                                 2.8 4150.0 2603.5
## - log(GDP)
                                         1
                                                 3.6 4150.8 2603.8
## - `Adult Mortality`
                                         1
                                                 3.7 4150.9 2603.8
## - GDP
                                         1
                                                3.7 4150.9 2603.9
## - `Hepatitis B`
                                                6.5 4153.7 2605.0
                                        1
## - `Income composition of resources`
                                                7.9 4155.1 2605.5
## - Alcohol
                                         1
                                                12.3 4159.6 2607.3
## <none>
                                                      4147.2 2609.8
## - `thinness 5-9 years`
                                                22.7 4170.0 2611.4
                                         1
## - `infant deaths`
                                        1
                                               29.5 4176.7 2614.1
## - `under-five deaths`
                                         1
                                               32.9 4180.2 2615.4
## - Schooling
                                        1
                                               37.7 4185.0 2617.3
## - Year
                                        1
                                               458.6 4605.8 2775.3
## - `HIV/AIDS`
                                        1
                                             1027.5 5174.7 2967.4
                                             16735.1 20882.3 4297.5
## - Country
                                       132
##
## Step: AIC=2603.26
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
       `HIV/AIDS` + GDP + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling + log(GDP)
##
##
##
                                        Df Sum of Sq
                                                        RSS
                                                               AIC
## - GDP
                                         1
                                                 2.5 4152.0 2596.9
## - log(GDP)
                                         1
                                                 2.6 4152.1 2596.9
## - Measles
                                         1
                                                 2.8 4152.2 2597.0
## - `Adult Mortality`
                                        1
                                                3.7 4153.1 2597.3
## - `Hepatitis B`
                                                 6.7 4156.1 2598.5
## - `Income composition of resources` 1
                                                7.9 4157.3 2599.0
## - Alcohol
                                        1
                                               12.0 4161.4 2600.6
## <none>
                                                      4149.4 2603.3
## - `thinness 5-9 years`
                                        1
                                                22.6 4172.0 2604.8
## - `infant deaths`
                                                29.0 4178.5 2607.4
                                         1
## - `under-five deaths`
                                                32.5 4181.9 2608.7
                                         1
## - Schooling
                                        1
                                                38.4 4187.9 2611.1
## - Year
                                         1
                                               460.3 4609.8 2769.3
```

```
## - `HIV/AIDS`
                                             1025.4 5174.8 2960.0
                                        1
## - Country
                                       132
                                             16841.6 20991.0 4298.6
##
## Step: AIC=2596.86
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling + log(GDP)
##
                                                         RSS
##
                                        Df Sum of Sq
                                                               AIC
## - log(GDP)
                                         1
                                                 0.9 4152.9 2589.8
                                                 2.8 4154.8 2590.6
## - Measles
                                         1
## - `Adult Mortality`
                                         1
                                                 3.8 4155.7 2590.9
## - `Hepatitis B`
                                                6.6 4158.5 2592.1
                                         1
## - `Income composition of resources`
                                       1
                                                7.5 4159.5 2592.4
## - Alcohol
                                         1
                                                11.8 4163.8 2594.1
## <none>
                                                      4152.0 2596.9
                                                22.4 4174.4 2598.3
## - `thinness 5-9 years`
                                         1
## - `infant deaths`
                                                29.0 4180.9 2600.9
                                         1
## - `under-five deaths`
                                         1
                                                32.3 4184.3 2602.2
## - Schooling
                                         1
                                                37.2 4189.2 2604.2
## - Year
                                               473.2 4625.2 2767.4
                                         1
## - `HIV/AIDS`
                                        1
                                             1022.9 5174.9 2952.6
## - Country
                                             17153.1 21305.1 4315.7
                                       132
##
## Step: AIC=2589.8
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
      `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Measles
                                         1
                                                 2.9 4155.7 2583.5
## - `Adult Mortality`
                                        1
                                                 3.9 4156.8 2584.0
## - `Hepatitis B`
                                                 6.7 4159.6 2585.1
                                        1
## - `Income composition of resources`
                                                7.6 4160.4 2585.4
## - Alcohol
                                               12.2 4165.0 2587.2
                                        1
## <none>
                                                      4152.9 2589.8
## - `thinness 5-9 years`
                                                22.2 4175.1 2591.2
                                        1
## - `infant deaths`
                                        1
                                                29.1 4181.9 2593.9
## - `under-five deaths`
                                         1
                                                32.4 4185.2 2595.2
## - Schooling
                                                37.2 4190.0 2597.1
                                         1
## - Year
                                         1
                                               481.7 4634.5 2763.3
## - `HIV/AIDS`
                                         1
                                              1022.7 5175.5 2945.4
                                       132
## - Country
                                             18014.7 22167.6 4373.8
##
## Step: AIC=2583.53
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + `under-five deaths` + `HIV/AIDS` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
```

```
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Adult Mortality`
                                         1
                                                 3.9 4159.6 2577.7
## - `Hepatitis B`
                                         1
                                                 6.8 4162.5 2578.8
## - `Income composition of resources`
                                                 7.5 4163.2 2579.1
                                       1
## - Alcohol
                                         1
                                                12.2 4167.9 2581.0
## <none>
                                                      4155.7 2583.5
## - `thinness 5-9 years`
                                         1
                                                22.8 4178.5 2585.1
## - `infant deaths`
                                         1
                                                27.4 4183.2 2587.0
## - `under-five deaths`
                                                31.0 4186.7 2588.4
                                         1
## - Schooling
                                                38.3 4194.0 2591.2
                                         1
## - Year
                                         1
                                               482.8 4638.5 2757.4
## - `HIV/AIDS`
                                             1021.8 5177.5 2938.6
                                         1
## - Country
                                       132
                                             18052.6 22208.3 4369.4
##
## Step: AIC=2577.67
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Hepatitis B`
                                         1
                                                 6.6 4166.2 2572.9
## - `Income composition of resources`
                                         1
                                                 7.7 4167.3 2573.3
## - Alcohol
                                         1
                                                12.3 4171.9 2575.1
## <none>
                                                      4159.6 2577.7
## - `thinness 5-9 years`
                                                22.9 4182.5 2579.3
                                         1
## - `infant deaths`
                                                27.4 4187.0 2581.1
                                         1
## - `under-five deaths`
                                         1
                                                30.8 4190.4 2582.4
## - Schooling
                                         1
                                                38.6 4198.2 2585.5
## - Year
                                         1
                                               489.2 4648.8 2753.6
## - `HIV/AIDS`
                                         1
                                              1071.3 5230.9 2948.2
                                       132
                                             22622.6 26782.2 4670.8
## - Country
##
## Step: AIC=2572.86
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Income composition of resources`
                                                 7.9 4174.1 2568.6
                                         1
## - Alcohol
                                         1
                                                12.1 4178.3 2570.2
## <none>
                                                      4166.2 2572.9
## - `thinness 5-9 years`
                                                23.8 4190.0 2574.9
                                         1
## - `infant deaths`
                                         1
                                                27.3 4193.5 2576.2
## - `under-five deaths`
                                         1
                                                31.2 4197.4 2577.8
## - Schooling
                                         1
                                                38.7 4204.8 2580.7
## - Year
                                               515.0 4681.2 2757.7
                                         1
## - `HIV/AIDS`
                                              1076.3 5242.5 2944.4
                                         1
## - Country
                                       132
                                             22626.1 26792.3 4664.0
##
## Step: AIC=2568.59
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
##
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
```

```
##
      Schooling
##
##
                          Df Sum of Sq
                                           RSS
                                                  AIC
## - Alcohol
                                  11.5 4185.6 2565.7
## <none>
                                        4174.1 2568.6
## - `thinness 5-9 years`
                                  24.1 4198.2 2570.7
                           1
## - `infant deaths`
                                  27.3 4201.4 2571.9
                           1
## - `under-five deaths`
                           1
                                  31.1 4205.2 2573.4
## - Schooling
                           1
                                  38.5 4212.6 2576.3
                          1
                                 646.6 4820.7 2798.7
## - Year
## - `HIV/AIDS`
                                1070.3 5244.4 2937.6
                           1
## - Country
                         132
                               26354.1 30528.2 4871.8
##
## Step: AIC=2565.72
## `Life expectancy` ~ Country + Year + `infant deaths` + `under-five deaths` +
##
       `HIV/AIDS` + `thinness 5-9 years` + Schooling
##
##
                          Df Sum of Sq
                                           RSS
## <none>
                                        4185.6 2565.7
## - `thinness 5-9 years`
                           1
                                  24.3 4209.9 2567.9
## - `infant deaths`
                           1
                                  30.8 4216.4 2570.4
## - `under-five deaths`
                           1
                                  34.4 4220.0 2571.8
## - Schooling
                           1
                                  37.0 4222.6 2572.8
## - Year
                           1
                                 686.5 4872.1 2808.7
## - `HIV/AIDS`
                           1
                                1099.8 5285.4 2943.0
## - Country
                         132
                               26345.0 30530.7 4864.6
```

```
tranform_mod_2_back_bic = step(log_transform_2, direction = "backward", k = log(n))
```

```
## Start: AIC=2653.03
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(GDP)
##
##
## Step: AIC=2653.03
  `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Polio
                                         1
                                                 0.2 4144.4 2645.7
## - Diphtheria
                                         1
                                                 0.2 4144.4 2645.7
                                                 0.2 4144.4 2645.7
## - Population
                                         1
## - BMI
                                         1
                                                 0.5 4144.7 2645.8
## - `thinness 1-19 years`
                                         1
                                                 0.5 4144.7 2645.8
## - `Total expenditure`
                                                 1.8 4145.9 2646.3
                                         1
                                                 2.0 4146.2 2646.4
## - `percentage expenditure`
                                         1
## - Measles
                                         1
                                                 2.8 4147.0 2646.7
## - log(GDP)
                                         1
                                                 3.4 4147.6 2647.0
## - GDP
                                         1
                                                 3.5 4147.7 2647.0
                                                 3.6 4147.8 2647.1
## - `Adult Mortality`
                                         1
## - `Hepatitis B`
                                         1
                                                 4.7 4148.9 2647.5
                                                 7.7 4151.9 2648.7
## - `Income composition of resources`
                                         1
## - `thinness 5-9 years`
                                         1
                                                12.3 4156.5 2650.5
## - Alcohol
                                         1
                                                12.5 4156.7 2650.6
## <none>
                                                      4144.2 2653.0
## - `infant deaths`
                                                28.3 4172.5 2656.8
                                         1
## - `under-five deaths`
                                         1
                                                32.1 4176.3 2658.4
## - Schooling
                                         1
                                                37.7 4181.9 2660.6
## - Year
                                         1
                                               460.0 4604.1 2819.2
## - `HIV/AIDS`
                                         1
                                              1019.8 5163.9 3008.4
                                             16240.4 20384.6 4302.2
## - Country
                                       132
##
## Step: AIC=2645.69
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + `Total expenditure` + Diphtheria +
##
       `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
       `thinness 5-9 years` + `Income composition of resources` +
##
##
       Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## - Diphtheria
                                                 0.1 4144.5 2638.3
                                         1
## - Population
                                         1
                                                 0.2 4144.6 2638.4
```

```
## - `thinness 1-19 years`
                                                 0.4 4144.8 2638.5
                                        1
## - BMI
                                        1
                                                0.5 4144.8 2638.5
## - `Total expenditure`
                                                1.8 4146.1 2639.0
                                        1
## - `percentage expenditure`
                                        1
                                                2.0 4146.3 2639.1
                                                2.8 4147.2 2639.4
## - Measles
                                        1
## - log(GDP)
                                        1
                                                3.4 4147.8 2639.6
## - GDP
                                        1
                                                3.4 4147.8 2639.7
## - `Adult Mortality`
                                        1
                                                3.6 4148.0 2639.7
                                                4.6 4149.0 2640.1
## - `Hepatitis B`
                                        1
## - `Income composition of resources`
                                                7.8 4152.1 2641.4
                                        1
## - `thinness 5-9 years`
                                         1
                                               12.4 4156.8 2643.2
## - Alcohol
                                        1
                                               12.4 4156.8 2643.2
## <none>
                                                     4144.4 2645.7
## - `infant deaths`
                                        1
                                               28.5 4172.8 2649.6
## - `under-five deaths`
                                        1
                                               32.3 4176.6 2651.1
## - Schooling
                                        1
                                               37.6 4182.0 2653.2
## - Year
                                        1
                                              460.0 4604.3 2811.8
## - `HIV/AIDS`
                                        1
                                             1019.6 5164.0 3001.0
## - Country
                                      132
                                             16258.6 20403.0 4296.2
##
## Step: AIC=2638.33
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + Population + `thinness 1-19 years` + `thinness 5-9 years` +
##
      `Income composition of resources` + Schooling + log(GDP)
##
##
##
                                        Df Sum of Sq
                                                               AIC
                                                        RSS
## - Population
                                        1
                                                0.2 4144.7 2631.0
## - `thinness 1-19 years`
                                        1
                                                0.4 4144.9 2631.1
## - BMI
                                        1
                                                0.5 4145.0 2631.1
## - `Total expenditure`
                                        1
                                                1.8 4146.2 2631.6
## - `percentage expenditure`
                                        1
                                                2.0 4146.4 2631.7
## - Measles
                                        1
                                                2.8 4147.3 2632.0
                                                3.4 4147.9 2632.3
## - log(GDP)
                                        1
                                        1
                                                3.4 4147.9 2632.3
## - GDP
## - `Adult Mortality`
                                                3.6 4148.1 2632.3
## - `Hepatitis B`
                                                6.9 4151.3 2633.6
                                        1
## - `Income composition of resources`
                                      1
                                               8.0 4152.5 2634.1
## - `thinness 5-9 years`
                                        1
                                               12.4 4156.9 2635.9
## - Alcohol
                                        1
                                               12.4 4156.9 2635.9
## <none>
                                                     4144.5 2638.3
## - `infant deaths`
                                        1
                                               28.8 4173.3 2642.3
## - `under-five deaths`
                                        1
                                               32.6 4177.1 2643.9
## - Schooling
                                        1
                                               37.8 4182.3 2645.9
## - Year
                                        1
                                              460.4 4604.8 2804.6
## - `HIV/AIDS`
                                             1023.3 5167.8 2994.8
                                        1
## - Country
                                      132
                                             16382.1 20526.6 4298.8
##
## Step: AIC=2631.01
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
```

```
BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
##
       GDP + `thinness 1-19 years` + `thinness 5-9 years` + `Income composition of reso
urces` +
##
      Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `thinness 1-19 years`
                                         1
                                                 0.4 4145.1 2623.8
## - BMI
                                         1
                                                 0.5 4145.2 2623.8
## - `Total expenditure`
                                                 1.8 4146.4 2624.3
                                         1
                                                 2.0 4146.7 2624.4
## - `percentage expenditure`
                                         1
## - Measles
                                         1
                                                 2.9 4147.6 2624.8
## - GDP
                                                 3.5 4148.2 2625.0
                                         1
## - log(GDP)
                                         1
                                                 3.5 4148.2 2625.0
## - `Adult Mortality`
                                         1
                                                 3.6 4148.3 2625.0
## - `Hepatitis B`
                                         1
                                                 6.8 4151.5 2626.3
## - `Income composition of resources`
                                         1
                                                 8.0 4152.7 2626.8
## - Alcohol
                                         1
                                                12.5 4157.2 2628.6
## - `thinness 5-9 years`
                                        1
                                                12.7 4157.4 2628.6
## <none>
                                                      4144.7 2631.0
## - `infant deaths`
                                         1
                                                29.6 4174.3 2635.3
## - `under-five deaths`
                                                33.1 4177.8 2636.7
                                         1
## - Schooling
                                         1
                                                37.7 4182.4 2638.5
## - Year
                                         1
                                               460.2 4604.9 2797.2
## - `HIV/AIDS`
                                         1
                                              1024.6 5169.3 2987.9
## - Country
                                       132
                                             16383.5 20528.2 4291.5
##
## Step: AIC=2623.76
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
      GDP + `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling + log(GDP)
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## - BMI
                                         1
                                                 0.5 4145.6 2616.5
## - `Total expenditure`
                                         1
                                                 1.8 4146.9 2617.1
## - `percentage expenditure`
                                                 2.0 4147.1 2617.1
                                         1
                                                 2.9 4148.0 2617.5
## - Measles
                                         1
## - log(GDP)
                                         1
                                                 3.4 4148.5 2617.7
## - GDP
                                         1
                                                3.4 4148.5 2617.7
## - `Adult Mortality`
                                        1
                                                 3.7 4148.8 2617.8
## - `Hepatitis B`
                                         1
                                                 6.9 4152.0 2619.1
## - `Income composition of resources` 1
                                                8.0 4153.1 2619.5
## - Alcohol
                                         1
                                                12.4 4157.5 2621.3
## <none>
                                                      4145.1 2623.8
## - `thinness 5-9 years`
                                                22.7 4167.8 2625.3
                                         1
## - `infant deaths`
                                         1
                                                29.4 4174.5 2628.0
## - `under-five deaths`
                                         1
                                                32.8 4177.9 2629.4
## - Schooling
                                                37.5 4182.6 2631.2
                                         1
## - Year
                                               459.8 4604.9 2789.8
                                         1
## - `HIV/AIDS`
                                         1
                                              1024.4 5169.5 2980.5
## - Country
                                       132
                                             16383.8 20528.9 4284.2
```

```
##
## Step: AIC=2616.54
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
##
       GDP + `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 ATC
                                         1
                                                 1.7 4147.2 2609.8
## - `Total expenditure`
## - `percentage expenditure`
                                         1
                                                 2.1 4147.7 2610.0
                                                 2.9 4148.5 2610.3
## - Measles
                                         1
## - log(GDP)
                                         1
                                                 3.4 4149.0 2610.5
## - GDP
                                         1
                                                 3.6 4149.2 2610.6
## - `Adult Mortality`
                                         1
                                                 3.7 4149.2 2610.6
## - `Hepatitis B`
                                         1
                                                 6.7 4152.3 2611.8
## - `Income composition of resources`
                                                 7.8 4153.4 2612.2
                                         1
## - Alcohol
                                         1
                                                12.4 4158.0 2614.1
## <none>
                                                      4145.6 2616.5
## - `thinness 5-9 years`
                                         1
                                                22.8 4168.4 2618.2
## - `infant deaths`
                                                29.4 4175.0 2620.8
                                         1
## - `under-five deaths`
                                         1
                                                32.8 4178.4 2622.1
## - Schooling
                                         1
                                                37.6 4183.1 2624.0
## - Year
                                               460.2 4605.8 2782.7
                                         1
## - `HIV/AIDS`
                                              1029.2 5174.7 2974.8
                                         1
## - Country
                                             16644.6 20790.2 4297.6
                                       132
##
## Step: AIC=2609.79
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
       `under-five deaths` + `HIV/AIDS` + GDP + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
                                                 2.2 4149.4 2603.3
## - `percentage expenditure`
                                         1
                                         1
## - Measles
                                                 2.8 4150.0 2603.5
## - log(GDP)
                                                 3.6 4150.8 2603.8
                                         1
## - `Adult Mortality`
                                                 3.7 4150.9 2603.8
                                         1
## - GDP
                                                 3.7 4150.9 2603.9
                                         1
## - `Hepatitis B`
                                         1
                                                 6.5 4153.7 2605.0
## - `Income composition of resources`
                                                 7.9 4155.1 2605.5
                                         1
## - Alcohol
                                         1
                                                12.3 4159.6 2607.3
## <none>
                                                      4147.2 2609.8
## - `thinness 5-9 years`
                                         1
                                                22.7 4170.0 2611.4
## - `infant deaths`
                                         1
                                                29.5 4176.7 2614.1
## - `under-five deaths`
                                         1
                                                32.9 4180.2 2615.4
## - Schooling
                                         1
                                                37.7 4185.0 2617.3
## - Year
                                         1
                                               458.6 4605.8 2775.3
## - `HIV/AIDS`
                                              1027.5 5174.7 2967.4
                                         1
                                             16735.1 20882.3 4297.5
## - Country
                                       132
##
## Step: AIC=2603.26
```

```
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
       `HIV/AIDS` + GDP + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling + log(GDP)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - GDP
                                         1
                                                 2.5 4152.0 2596.9
## - log(GDP)
                                         1
                                                 2.6 4152.1 2596.9
                                                 2.8 4152.2 2597.0
## - Measles
                                         1
                                                 3.7 4153.1 2597.3
## - `Adult Mortality`
                                         1
## - `Hepatitis B`
                                         1
                                                 6.7 4156.1 2598.5
## - `Income composition of resources`
                                                7.9 4157.3 2599.0
                                         1
## - Alcohol
                                         1
                                                12.0 4161.4 2600.6
                                                      4149.4 2603.3
## <none>
## - `thinness 5-9 years`
                                         1
                                                22.6 4172.0 2604.8
## - `infant deaths`
                                         1
                                                29.0 4178.5 2607.4
## - `under-five deaths`
                                         1
                                                32.5 4181.9 2608.7
## - Schooling
                                         1
                                                38.4 4187.9 2611.1
## - Year
                                         1
                                               460.3 4609.8 2769.3
## - `HIV/AIDS`
                                         1
                                             1025.4 5174.8 2960.0
## - Country
                                       132
                                             16841.6 20991.0 4298.6
##
## Step: AIC=2596.86
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
      `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling + log(GDP)
##
##
                                        Df Sum of Sa
                                                         RSS
                                                                AIC
## - log(GDP)
                                         1
                                                 0.9 4152.9 2589.8
                                                 2.8 4154.8 2590.6
## - Measles
                                         1
## - `Adult Mortality`
                                         1
                                                 3.8 4155.7 2590.9
## - `Hepatitis B`
                                                 6.6 4158.5 2592.1
                                         1
## - `Income composition of resources`
                                         1
                                                7.5 4159.5 2592.4
## - Alcohol
                                         1
                                                11.8 4163.8 2594.1
## <none>
                                                      4152.0 2596.9
## - `thinness 5-9 years`
                                         1
                                                22.4 4174.4 2598.3
## - `infant deaths`
                                                29.0 4180.9 2600.9
                                         1
## - `under-five deaths`
                                         1
                                                32.3 4184.3 2602.2
## - Schooling
                                         1
                                                37.2 4189.2 2604.2
## - Year
                                         1
                                               473.2 4625.2 2767.4
## - `HIV/AIDS`
                                             1022.9 5174.9 2952.6
                                         1
## - Country
                                       132
                                             17153.1 21305.1 4315.7
##
## Step: AIC=2589.8
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
##
      `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
      Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
## - Measles
                                         1
                                                 2.9 4155.7 2583.5
```

```
3.9 4156.8 2584.0
## - `Adult Mortality`
                                         1
## - `Hepatitis B`
                                                 6.7 4159.6 2585.1
                                         1
                                                 7.6 4160.4 2585.4
## - `Income composition of resources`
                                         1
## - Alcohol
                                                12.2 4165.0 2587.2
## <none>
                                                      4152.9 2589.8
## - `thinness 5-9 years`
                                         1
                                                22.2 4175.1 2591.2
## - `infant deaths`
                                                29.1 4181.9 2593.9
                                         1
## - `under-five deaths`
                                         1
                                                32.4 4185.2 2595.2
                                                37.2 4190.0 2597.1
## - Schooling
                                         1
## - Year
                                               481.7 4634.5 2763.3
                                         1
## - `HIV/AIDS`
                                         1
                                              1022.7 5175.5 2945.4
## - Country
                                       132
                                             18014.7 22167.6 4373.8
##
## Step: AIC=2583.53
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `Hepatitis B` + `under-five deaths` + `HIV/AIDS` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling
##
                                        Df Sum of Sq
##
                                                         RSS
                                                                AIC
                                         1
                                                 3.9 4159.6 2577.7
## - `Adult Mortality`
## - `Hepatitis B`
                                         1
                                                 6.8 4162.5 2578.8
## - `Income composition of resources`
                                         1
                                                 7.5 4163.2 2579.1
## - Alcohol
                                         1
                                                12.2 4167.9 2581.0
## <none>
                                                      4155.7 2583.5
## - `thinness 5-9 years`
                                                22.8 4178.5 2585.1
                                         1
## - `infant deaths`
                                         1
                                                27.4 4183.2 2587.0
## - `under-five deaths`
                                         1
                                                31.0 4186.7 2588.4
## - Schooling
                                         1
                                                38.3 4194.0 2591.2
## - Year
                                         1
                                               482.8 4638.5 2757.4
## - `HIV/AIDS`
                                         1
                                             1021.8 5177.5 2938.6
                                             18052.6 22208.3 4369.4
## - Country
                                       132
##
## Step: AIC=2577.67
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Hepatitis B`
                                         1
                                                 6.6 4166.2 2572.9
## - `Income composition of resources`
                                                 7.7 4167.3 2573.3
                                         1
## - Alcohol
                                         1
                                                12.3 4171.9 2575.1
## <none>
                                                      4159.6 2577.7
## - `thinness 5-9 years`
                                         1
                                                22.9 4182.5 2579.3
## - `infant deaths`
                                         1
                                                27.4 4187.0 2581.1
## - `under-five deaths`
                                         1
                                                30.8 4190.4 2582.4
## - Schooling
                                                38.6 4198.2 2585.5
                                         1
## - Year
                                         1
                                               489.2 4648.8 2753.6
## - `HIV/AIDS`
                                              1071.3 5230.9 2948.2
                                         1
                                       132 22622.6 26782.2 4670.8
## - Country
##
## Step: AIC=2572.86
```

```
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
##
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Income composition of resources`
                                         1
                                                 7.9 4174.1 2568.6
## - Alcohol
                                                12.1 4178.3 2570.2
                                         1
## <none>
                                                      4166.2 2572.9
## - `thinness 5-9 years`
                                                23.8 4190.0 2574.9
                                         1
## - `infant deaths`
                                                27.3 4193.5 2576.2
                                         1
## - `under-five deaths`
                                                31.2 4197.4 2577.8
                                         1
## - Schooling
                                        1
                                                38.7 4204.8 2580.7
## - Year
                                        1
                                               515.0 4681.2 2757.7
## - `HIV/AIDS`
                                         1
                                             1076.3 5242.5 2944.4
## - Country
                                       132
                                             22626.1 26792.3 4664.0
##
## Step: AIC=2568.59
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
      Schooling
##
##
                           Df Sum of Sq
                                            RSS
                                                   AIC
## - Alcohol
                                   11.5 4185.6 2565.7
## <none>
                                         4174.1 2568.6
## - `thinness 5-9 years` 1
                                   24.1 4198.2 2570.7
## - `infant deaths`
                                  27.3 4201.4 2571.9
                           1
## - `under-five deaths`
                           1
                                  31.1 4205.2 2573.4
                                  38.5 4212.6 2576.3
## - Schooling
                           1
## - Year
                           1
                                  646.6 4820.7 2798.7
## - `HIV/AIDS`
                           1
                                1070.3 5244.4 2937.6
## - Country
                                26354.1 30528.2 4871.8
                         132
##
## Step: AIC=2565.72
## `Life expectancy` ~ Country + Year + `infant deaths` + `under-five deaths` +
       `HIV/AIDS` + `thinness 5-9 years` + Schooling
##
##
##
                           Df Sum of Sq
                                            RSS
                                                   AIC
## <none>
                                         4185.6 2565.7
## - `thinness 5-9 years`
                                   24.3 4209.9 2567.9
                           1
## - `infant deaths`
                           1
                                  30.8 4216.4 2570.4
## - `under-five deaths`
                           1
                                  34.4 4220.0 2571.8
## - Schooling
                           1
                                  37.0 4222.6 2572.8
## - Year
                           1
                                  686.5 4872.1 2808.7
## - `HIV/AIDS`
                           1
                                1099.8 5285.4 2943.0
## - Country
                          132
                               26345.0 30530.7 4864.6
```

```
tranform_mod_3_back_bic = step(log_transform_3, direction = "backward", k = log(n))
```

```
## Start: AIC=2654.39
## `Life expectancy` ~ Country + Year + Status + `Adult Mortality` +
##
       `infant deaths` + Alcohol + `percentage expenditure` + `Hepatitis B` +
##
       Measles + BMI + `under-five deaths` + Polio + `Total expenditure` +
##
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
       Schooling + log(Population)
##
##
## Step: AIC=2654.39
  `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
       BMI + `under-five deaths` + Polio + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling + log(Population)
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - log(Population)
                                         1
                                                 0.0 4147.6 2647.0
## - Polio
                                         1
                                                 0.1 4147.8 2647.0
## - Diphtheria
                                                 0.2 4147.9 2647.1
                                         1
## - Population
                                         1
                                                 0.3 4147.9 2647.1
## - `thinness 1-19 years`
                                         1
                                                 0.3 4147.9 2647.1
## - BMI
                                         1
                                                 0.5 4148.1 2647.2
## - `percentage expenditure`
                                                 1.1 4148.7 2647.4
                                         1
## - GDP
                                         1
                                                 1.6 4149.3 2647.6
## - `Total expenditure`
                                         1
                                                 1.9 4149.5 2647.7
## - Measles
                                         1
                                                 2.8 4150.5 2648.1
## - `Adult Mortality`
                                         1
                                                 3.9 4151.6 2648.5
## - `Hepatitis B`
                                         1
                                                 4.8 4152.4 2648.9
                                                 7.6 4155.2 2650.0
## - Income composition of resources 1
## - `thinness 5-9 years`
                                         1
                                                12.5 4160.1 2651.9
## - Alcohol
                                                12.8 4160.4 2652.1
                                         1
## <none>
                                                      4147.6 2654.4
## - `infant deaths`
                                                28.4 4176.0 2658.2
                                         1
## - `under-five deaths`
                                         1
                                                32.0 4179.6 2659.7
## - Schooling
                                         1
                                                36.9 4184.5 2661.6
## - Year
                                         1
                                               455.0 4602.6 2818.6
## - `HIV/AIDS`
                                         1
                                              1015.7 5163.3 3008.2
                                             16446.2 20593.8 4319.0
## - Country
                                       132
##
## Step: AIC=2646.98
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
      BMI + `under-five deaths` + Polio + `Total expenditure` +
       Diphtheria + `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
       `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## - Polio
                                                 0.1 4147.8 2639.6
                                         1
## - Diphtheria
                                         1
                                                 0.2 4147.9 2639.7
```

```
## - Population
                                        1
                                                0.3 4147.9 2639.7
## - `thinness 1-19 years`
                                        1
                                                0.3 4148.0 2639.7
                                                0.5 4148.1 2639.8
## - BMI
                                        1
## - `percentage expenditure`
                                        1
                                               1.1 4148.7 2640.0
## - GDP
                                        1
                                                1.6 4149.3 2640.2
## - `Total expenditure`
                                        1
                                                1.9 4149.6 2640.3
## - Measles
                                        1
                                                2.8 4150.5 2640.7
## - `Adult Mortality`
                                        1
                                                3.9 4151.6 2641.1
                                                4.8 4152.4 2641.5
## - `Hepatitis B`
                                        1
## - `Income composition of resources`
                                               7.6 4155.2 2642.6
                                      1
                                               12.5 4160.1 2644.5
## - `thinness 5-9 years`
                                        1
## - Alcohol
                                        1
                                               12.8 4160.4 2644.7
## <none>
                                                     4147.6 2647.0
## - `infant deaths`
                                        1
                                               28.4 4176.1 2650.8
## - `under-five deaths`
                                        1
                                               32.1 4179.7 2652.3
## - Schooling
                                        1
                                               37.0 4184.6 2654.2
## - Year
                                        1
                                              456.5 4604.1 2811.8
## - `HIV/AIDS`
                                        1
                                            1016.8 5164.4 3001.1
## - Country
                                      132
                                            16527.0 20674.7 4318.0
##
## Step: AIC=2639.63
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
      BMI + `under-five deaths` + `Total expenditure` + Diphtheria +
##
      `HIV/AIDS` + GDP + Population + `thinness 1-19 years` +
##
      `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                       Df Sum of Sq
                                                        RSS
                                                               AIC
## - Diphtheria
                                        1
                                                0.2 4147.9 2632.3
                                                0.3 4148.0 2632.3
## - Population
                                        1
## - `thinness 1-19 years`
                                        1
                                                0.3 4148.1 2632.3
## - BMI
                                        1
                                                0.5 4148.3 2632.4
## - `percentage expenditure`
                                        1
                                               1.1 4148.8 2632.6
## - GDP
                                        1
                                               1.6 4149.4 2632.9
## - `Total expenditure`
                                        1
                                               2.0 4149.7 2633.0
## - Measles
                                        1
                                               2.9 4150.6 2633.4
## - `Adult Mortality`
                                               3.9 4151.7 2633.8
                                        1
## - `Hepatitis B`
                                               4.7 4152.4 2634.1
                                        1
## - `Income composition of resources` 1
                                               7.6 4155.4 2635.2
## - `thinness 5-9 years`
                                        1
                                               12.6 4160.3 2637.2
## - Alcohol
                                               12.8 4160.5 2637.3
                                        1
## <none>
                                                     4147.8 2639.6
## - `infant deaths`
                                        1
                                               28.6 4176.4 2643.6
## - `under-five deaths`
                                        1
                                               32.2 4180.0 2645.0
## - Schooling
                                               36.9 4184.7 2646.8
                                        1
## - Year
                                              456.6 4604.4 2804.4
                                        1
## - `HIV/AIDS`
                                        1
                                            1016.7 5164.4 2993.7
## - Country
                                            16542.4 20690.1 4311.9
                                      132
##
## Step: AIC=2632.29
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
```

```
Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
       BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
       GDP + Population + `thinness 1-19 years` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Population
                                         1
                                                 0.3 4148.2 2625.0
## - `thinness 1-19 years`
                                         1
                                                 0.3 4148.2 2625.0
                                                 0.5 4148.4 2625.1
## - BMI
                                         1
## - `percentage expenditure`
                                                 1.1 4149.0 2625.3
                                         1
## - GDP
                                         1
                                                 1.6 4149.5 2625.5
## - `Total expenditure`
                                         1
                                                 2.0 4149.9 2625.7
## - Measles
                                         1
                                                 2.8 4150.8 2626.0
## - `Adult Mortality`
                                         1
                                                 3.9 4151.8 2626.4
## - `Hepatitis B`
                                         1
                                                 7.1 4155.0 2627.7
## - `Income composition of resources`
                                         1
                                                 7.9 4155.8 2628.0
## - `thinness 5-9 years`
                                         1
                                                12.6 4160.5 2629.9
## - Alcohol
                                         1
                                                12.8 4160.7 2629.9
## <none>
                                                      4147.9 2632.3
## - `infant deaths`
                                         1
                                                28.9 4176.9 2636.3
## - `under-five deaths`
                                                32.6 4180.5 2637.8
                                         1
## - Schooling
                                         1
                                                37.1 4185.0 2639.6
## - Year
                                         1
                                               456.9 4604.9 2797.2
## - `HIV/AIDS`
                                         1
                                              1020.4 5168.3 2987.6
                                             16656.3 20804.2 4313.5
## - Country
                                       132
##
## Step: AIC=2624.99
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
##
       BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
       GDP + `thinness 1-19 years` + `thinness 5-9 years` + `Income composition of reso
##
urces` +
       Schooling
##
##
                                        Df Sum of Sq
##
                                                         RSS
                                                                AIC
## - `thinness 1-19 years`
                                                 0.3 4148.5 2617.7
                                         1
## - BMI
                                                 0.5 4148.7 2617.8
                                         1
## - `percentage expenditure`
                                                 1.1 4149.3 2618.0
                                         1
## - GDP
                                         1
                                                 1.6 4149.8 2618.2
## - `Total expenditure`
                                         1
                                                 1.9 4150.1 2618.4
## - Measles
                                         1
                                                 3.0 4151.2 2618.8
## - `Adult Mortality`
                                                 4.0 4152.2 2619.2
                                         1
## - `Hepatitis B`
                                         1
                                                 7.0 4155.2 2620.4
## - `Income composition of resources`
                                                 7.9 4156.1 2620.7
                                         1
## - Alcohol
                                         1
                                                12.9 4161.1 2622.7
## - `thinness 5-9 years`
                                         1
                                                12.9 4161.1 2622.7
## <none>
                                                      4148.2 2625.0
## - `infant deaths`
                                         1
                                                29.6 4177.8 2629.3
## - `under-five deaths`
                                         1
                                                32.9 4181.1 2630.6
## - Schooling
                                         1
                                                36.9 4185.1 2632.2
## - Year
                                         1
                                               456.7 4604.9 2789.8
## - `HIV/AIDS`
                                         1
                                              1021.7 5169.9 2980.7
```

```
16656.9 20805.1 4306.2
## - Country
                                       132
##
## Step: AIC=2617.69
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
      BMI + `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - BMI
                                         1
                                                 0.5 4149.0 2610.5
## - `percentage expenditure`
                                         1
                                                 1.1 4149.5 2610.7
## - GDP
                                         1
                                                 1.6 4150.1 2610.9
## - `Total expenditure`
                                         1
                                                 1.9 4150.4 2611.1
## - Measles
                                         1
                                                 2.9 4151.4 2611.5
## - `Adult Mortality`
                                         1
                                                 4.0 4152.5 2611.9
## - `Hepatitis B`
                                         1
                                                7.1 4155.6 2613.1
## - `Income composition of resources`
                                       1
                                                7.9 4156.4 2613.4
## - Alcohol
                                                12.8 4161.3 2615.4
## <none>
                                                      4148.5 2617.7
## - `thinness 5-9 years`
                                                22.2 4170.7 2619.1
                                         1
## - `infant deaths`
                                         1
                                                29.4 4177.9 2621.9
## - `under-five deaths`
                                         1
                                                32.7 4181.2 2623.2
## - Schooling
                                         1
                                                36.8 4185.3 2624.9
## - Year
                                         1
                                               456.5 4605.0 2782.4
## - `HIV/AIDS`
                                         1
                                             1021.7 5170.1 2973.3
## - Country
                                       132
                                             16656.6 20805.1 4298.8
##
## Step: AIC=2610.49
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `percentage expenditure` + `Hepatitis B` + Measles +
##
      `under-five deaths` + `Total expenditure` + `HIV/AIDS` +
##
      GDP + `thinness 5-9 years` + `Income composition of resources` +
##
##
      Schooling
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `percentage expenditure`
                                                 1.2 4150.2 2603.5
                                                 1.7 4150.7 2603.8
## - GDP
                                         1
## - `Total expenditure`
                                         1
                                                 1.8 4150.8 2603.8
## - Measles
                                        1
                                                3.0 4152.0 2604.3
## - `Adult Mortality`
                                        1
                                                 4.0 4153.0 2604.7
## - `Hepatitis B`
                                         1
                                                 6.9 4155.9 2605.8
## - `Income composition of resources` 1
                                                7.7 4156.6 2606.1
## - Alcohol
                                         1
                                                12.8 4161.8 2608.2
## <none>
                                                      4149.0 2610.5
## - `thinness 5-9 years`
                                                22.4 4171.4 2611.9
                                         1
## - `infant deaths`
                                                29.4 4178.4 2614.7
                                         1
## - `under-five deaths`
                                         1
                                                32.7 4181.7 2616.0
## - Schooling
                                                36.8 4185.8 2617.7
                                         1
## - Year
                                         1
                                               456.8 4605.8 2775.3
## - `HIV/AIDS`
                                         1
                                              1026.4 5175.4 2967.6
## - Country
                                       132
                                             16982.3 21131.3 4317.0
```

```
##
## Step: AIC=2603.55
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
       `Total expenditure` + `HIV/AIDS` + GDP + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                 AIC
## - GDP
                                                 0.9 4151.0 2596.5
                                         1
## - `Total expenditure`
                                         1
                                                 1.9 4152.1 2596.9
                                                 3.0 4153.2 2597.3
## - Measles
                                         1
## - `Adult Mortality`
                                                 4.0 4154.1 2597.7
                                         1
## - `Hepatitis B`
                                         1
                                                 7.0 4157.2 2598.9
## - `Income composition of resources`
                                                 7.7 4157.8 2599.2
                                         1
## - Alcohol
                                         1
                                                12.5 4162.7 2601.1
## <none>
                                                      4150.2 2603.5
## - `thinness 5-9 years`
                                         1
                                                22.3 4172.5 2605.0
## - `infant deaths`
                                         1
                                                29.1 4179.2 2607.7
## - `under-five deaths`
                                                32.4 4182.5 2609.0
                                         1
## - Schooling
                                         1
                                                37.5 4187.6 2611.0
## - Year
                                               459.9 4610.1 2769.5
                                         1
## - `HIV/AIDS`
                                         1
                                              1025.3 5175.4 2960.2
## - Country
                                       132
                                             17019.7 21169.8 4312.6
##
## Step: AIC=2596.49
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
##
       Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
       `Total expenditure` + `HIV/AIDS` + `thinness 5-9 years` +
##
##
       `Income composition of resources` + Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Total expenditure`
                                         1
                                                 1.8 4152.9 2589.8
## - Measles
                                         1
                                                 3.0 4154.0 2590.3
## - `Adult Mortality`
                                         1
                                                 3.9 4155.0 2590.6
## - `Hepatitis B`
                                                 6.9 4158.0 2591.8
                                         1
## - `Income composition of resources`
                                                 7.5 4158.5 2592.0
## - Alcohol
                                                12.3 4163.3 2594.0
                                         1
## <none>
                                                      4151.0 2596.5
## - `thinness 5-9 years`
                                         1
                                                22.3 4173.4 2597.9
## - `infant deaths`
                                         1
                                                29.0 4180.0 2600.6
## - `under-five deaths`
                                         1
                                                32.3 4183.3 2601.9
## - Schooling
                                                37.0 4188.0 2603.7
                                         1
## - Year
                                         1
                                               483.5 4634.5 2770.8
## - `HIV/AIDS`
                                         1
                                              1024.5 5175.5 2952.8
                                       132
## - Country
                                             17885.0 22036.0 4371.4
##
## Step: AIC=2589.8
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
      Alcohol + `Hepatitis B` + Measles + `under-five deaths` +
##
       `HIV/AIDS` + `thinness 5-9 years` + `Income composition of resources` +
##
##
       Schooling
##
```

```
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - Measles
                                         1
                                                 2.9 4155.7 2583.5
## - `Adult Mortality`
                                         1
                                                 3.9 4156.8 2584.0
## - `Hepatitis B`
                                         1
                                                 6.7 4159.6 2585.1
## - `Income composition of resources`
                                         1
                                                 7.6 4160.4 2585.4
## - Alcohol
                                         1
                                                12.2 4165.0 2587.2
## <none>
                                                      4152.9 2589.8
## - `thinness 5-9 years`
                                         1
                                                22.2 4175.1 2591.2
## - `infant deaths`
                                                29.1 4181.9 2593.9
                                         1
## - `under-five deaths`
                                                32.4 4185.2 2595.2
                                         1
## - Schooling
                                         1
                                                37.2 4190.0 2597.1
                                               481.7 4634.5 2763.3
## - Year
                                         1
## - `HIV/AIDS`
                                         1
                                              1022.7 5175.5 2945.4
                                       132
                                             18014.7 22167.6 4373.8
## - Country
##
## Step: AIC=2583.53
## `Life expectancy` ~ Country + Year + `Adult Mortality` + `infant deaths` +
       Alcohol + `Hepatitis B` + `under-five deaths` + `HIV/AIDS` +
##
##
       `thinness 5-9 years` + `Income composition of resources` +
##
      Schooling
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Adult Mortality`
                                         1
                                                 3.9 4159.6 2577.7
## - `Hepatitis B`
                                         1
                                                 6.8 4162.5 2578.8
## - `Income composition of resources`
                                                 7.5 4163.2 2579.1
                                         1
## - Alcohol
                                                12.2 4167.9 2581.0
                                         1
## <none>
                                                      4155.7 2583.5
## - `thinness 5-9 years`
                                         1
                                                22.8 4178.5 2585.1
## - `infant deaths`
                                         1
                                                27.4 4183.2 2587.0
## - `under-five deaths`
                                         1
                                                31.0 4186.7 2588.4
## - Schooling
                                         1
                                                38.3 4194.0 2591.2
## - Year
                                         1
                                               482.8 4638.5 2757.4
## - `HIV/AIDS`
                                         1
                                              1021.8 5177.5 2938.6
## - Country
                                       132
                                             18052.6 22208.3 4369.4
##
## Step: AIC=2577.67
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
       `Hepatitis B` + `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
##
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                ATC
## - `Hepatitis B`
                                                 6.6 4166.2 2572.9
                                         1
## - `Income composition of resources`
                                         1
                                                 7.7 4167.3 2573.3
## - Alcohol
                                         1
                                                12.3 4171.9 2575.1
## <none>
                                                      4159.6 2577.7
## - `thinness 5-9 years`
                                                22.9 4182.5 2579.3
                                         1
## - `infant deaths`
                                         1
                                                27.4 4187.0 2581.1
## - `under-five deaths`
                                         1
                                                30.8 4190.4 2582.4
## - Schooling
                                                38.6 4198.2 2585.5
                                         1
## - Year
                                         1
                                               489.2 4648.8 2753.6
## - `HIV/AIDS`
                                         1
                                              1071.3 5230.9 2948.2
## - Country
                                       132
                                             22622.6 26782.2 4670.8
```

```
##
## Step: AIC=2572.86
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
       `Income composition of resources` + Schooling
##
##
##
                                        Df Sum of Sq
                                                         RSS
                                                                AIC
## - `Income composition of resources`
                                         1
                                                 7.9 4174.1 2568.6
                                                12.1 4178.3 2570.2
## - Alcohol
                                         1
## <none>
                                                      4166.2 2572.9
## - `thinness 5-9 years`
                                         1
                                                23.8 4190.0 2574.9
## - `infant deaths`
                                                27.3 4193.5 2576.2
                                         1
                                                31.2 4197.4 2577.8
## - `under-five deaths`
                                         1
## - Schooling
                                         1
                                                38.7 4204.8 2580.7
## - Year
                                         1
                                               515.0 4681.2 2757.7
## - `HIV/AIDS`
                                         1
                                              1076.3 5242.5 2944.4
## - Country
                                       132
                                             22626.1 26792.3 4664.0
##
## Step: AIC=2568.59
## `Life expectancy` ~ Country + Year + `infant deaths` + Alcohol +
##
       `under-five deaths` + `HIV/AIDS` + `thinness 5-9 years` +
       Schooling
##
##
##
                           Df Sum of Sq
                                            RSS
                                                   ATC
## - Alcohol
                            1
                                   11.5 4185.6 2565.7
## <none>
                                         4174.1 2568.6
## - `thinness 5-9 years`
                            1
                                   24.1 4198.2 2570.7
## - `infant deaths`
                            1
                                   27.3 4201.4 2571.9
## - `under-five deaths`
                           1
                                  31.1 4205.2 2573.4
## - Schooling
                            1
                                   38.5 4212.6 2576.3
## - Year
                           1
                                  646.6 4820.7 2798.7
## - `HIV/AIDS`
                                 1070.3 5244.4 2937.6
                            1
## - Country
                          132
                                26354.1 30528.2 4871.8
##
## Step: AIC=2565.72
## `Life expectancy` ~ Country + Year + `infant deaths` + `under-five deaths` +
##
       `HIV/AIDS` + `thinness 5-9 years` + Schooling
##
##
                           Df Sum of Sq
                                            RSS
                                                   AIC
## <none>
                                         4185.6 2565.7
## - `thinness 5-9 years`
                            1
                                   24.3 4209.9 2567.9
## - `infant deaths`
                                   30.8 4216.4 2570.4
                            1
## - `under-five deaths`
                           1
                                  34.4 4220.0 2571.8
## - Schooling
                            1
                                   37.0 4222.6 2572.8
## - Year
                            1
                                  686.5 4872.1 2808.7
## - `HIV/AIDS`
                           1
                                1099.8 5285.4 2943.0
## - Country
                                26345.0 30530.7 4864.6
                          132
```

```
metrics_tranform_mod_1_back_aic = calc_model_metrics(tranform_mod_1_back_aic)
metrics_tranform_mod_2_back_aic = calc_model_metrics(tranform_mod_2_back_aic)
metrics_tranform_mod_3_back_aic = calc_model_metrics(tranform_mod_3_back_aic)

metrics_tranform_mod_1_back_bic = calc_model_metrics(tranform_mod_1_back_bic)
metrics_tranform_mod_2_back_bic = calc_model_metrics(tranform_mod_2_back_bic)
metrics_tranform_mod_3_back_bic = calc_model_metrics(tranform_mod_3_back_bic)
```

```
additive_model_summary = data.frame(
    Variables_Log_Transformed = c("additive AIC", "Additive BIC"),

Adjusted_R_Squared =
    c(metrics_additive_mod_back_aic$Adj_R_Squared, metrics_additive_mod_back_bic$Adj_R_Squ
    ared),

RMSE = c(metrics_additive_mod_back_aic$RMSE, metrics_additive_mod_back_bic$RMSE),

LOOCV_RMSE =
    c(metrics_additive_mod_back_aic$LOOCV_RMSE, metrics_additive_mod_back_bic$LOOCV_RMSE),

AIC = c(metrics_additive_mod_back_aic$AIC, metrics_additive_mod_back_bic$AIC)

)

knitr::kable(additive_model_summary, caption = "Additive_model_AIC and BIC Summary", dig
    its = 4)
```

## Additive model AIC and BIC Summary

Variables_Log_Transformed	Adjusted_R_Squared	RMSE I	LOOCV_RMSE	AIC
additive AIC	0.9643	1.5882	1.7430	1809.740
Additive BIC	0.9642	1.5932	1.7455	1814.022

```
corr_model_summary = data.frame(
 Variables Log Transformed = c("corr AIC model 1", "corr AIC model 2", "corr AIC model
3",
                               "corr BIC model 1", "corr BIC model 2", "corr BIC model 3"
),
  Adjusted R Squared =
  c(metrics corr mod 1 back aic$Adj R Squared, metrics corr mod 2 back aic$Adj R Square
d,
    metrics corr mod 3 back aic$Adj R Squared,
    metrics_corr_mod_1_back_bic$Adj_R_Squared, metrics_corr_mod_2_back_bic$Adj_R_Square
d,
    metrics_corr_mod_3_back_bic$Adj_R_Squared
    ),
  RMSE =
      c(metrics corr mod 1 back aic$RMSE, metrics corr mod 2 back aic$RMSE,
    metrics_corr_mod_3_back_aic$RMSE,
    metrics corr_mod_1_back_bic$RMSE, metrics_corr_mod_2_back_bic$RMSE,
    metrics_corr_mod_3_back_bic$RMSE
    ),
  LOOCV RMSE =
    c(metrics_corr_mod_1_back_aic$LOOCV_RMSE, metrics_corr_mod_2_back_aic$LOOCV_RMSE,
    metrics_corr_mod_3_back_aic$LOOCV_RMSE,
    metrics corr mod 1 back bic$LOOCV_RMSE, metrics_corr_mod_2_back_bic$LOOCV_RMSE,
    metrics corr mod 3 back bic$LOOCV RMSE
    ),
  AIC = c(metrics corr mod 1 back aic$AIC, metrics corr mod 2 back aic$AIC,
    metrics corr mod 3 back aic$AIC,
    metrics corr mod 1 back bic$AIC, metrics corr mod 2 back bic$AIC,
    metrics corr mod 3 back bic$AIC
    )
)
knitr::kable(corr_model_summary, caption = "correlation transformed model AIC and BIC Su
mmary", digits = 4)
```

correlation transformed model AIC and BIC Summary

Variables_Log_Transformed	Adjusted_R_Squared	RMSE LC	OCV_RMSE	AIC
corr AIC model 1	0.9641	1.5935	1.7457	1818.552
corr AIC model 2	0.9640	1.5958	1.7484	1823.343
corr AIC model 3	0.9643	1.5882	1.7430	1809.740
corr BIC model 1	0.9639	1.6003	1.7497	1824.704
corr BIC model 2	0.9638	1.6043	1.7531	1830.836
corr BIC model 3	0.9642	1.5932	1.7455	1814.022

```
transform_model_summary = data.frame(
  Variables Log Transformed = c("Log transform AIC model 1", "Log transform AIC model
2", "Log transform AIC model 3",
                               "Log transform BIC model 1", "Log transformBIC model 2",
"Log transform BIC model 3" ),
 Adjusted R Squared =
  c(metrics tranform mod 1 back aic$Adj R Squared, metrics tranform mod 2 back aic$Adj R
_Squared, metrics_tranform_mod_3_back_aic$Adj_R_Squared,
    metrics_tranform_mod_1_back_bic$Adj_R_Squared, metrics_tranform_mod_2_back_bic$Adj_R
_Squared, metrics_tranform_mod_3_back_bic$Adj_R_Squared
    ),
  RMSE =
      c(metrics_tranform_mod_1_back_aic$RMSE, metrics_tranform_mod_2_back_aic$RMSE,
    metrics tranform mod 3 back aic$RMSE,
    metrics_tranform_mod_1_back_bic$RMSE, metrics_tranform_mod_2_back_bic$RMSE,
    metrics tranform mod 3 back bic$RMSE
    ),
  LOOCV RMSE =
    c(metrics_tranform_mod_1_back_aic$LOOCV_RMSE, metrics_tranform_mod_2_back_aic$LOOCV_
RMSE,
    metrics_tranform_mod_3_back_aic$LOOCV_RMSE,
    metrics tranform mod 1 back bic$LOOCV RMSE, metrics tranform mod 2 back bic$LOOCV RM
SE,
    metrics tranform mod 3 back bic$LOOCV RMSE
    ),
 AIC = c(metrics tranform mod 1_back_aic$AIC, metrics_tranform_mod_2_back_aic$AIC,
    metrics tranform mod 3 back aic$AIC,
    metrics tranform mod 1 back bic$AIC, metrics tranform mod 2 back bic$AIC,
    metrics tranform mod 3 back bic$AIC
    )
)
knitr::kable(transform model summary, caption = "log transformation model AIC and BIC Su
mmary", digits = 4)
```

log transformation model AIC and BIC Summary

Variables_Log_Transformed	Adjusted_R_Squared	RMSE I	LOOCV_RMSE	AIC
Log transform AIC model 1	0.9643	1.5882	1.7430	1809.740
Log transform AIC model 2	0.9643	1.5882	1.7430	1809.740
Log transform AIC model 3	0.9643	1.5882	1.7430	1809.740
Log transform BIC model 1	0.9642	1.5932	1.7455	1814.022
Log transformBIC model 2	0.9642	1.5932	1.7455	1814.022

Variables\_Log\_TransformedAdjusted\_R\_SquaredRMSELOOCV\_RMSEAICLog transform BIC model 30.96421.59321.74551814.022

## Results

**Discussions** 

**Appendix** 

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