

```
library(gapminder)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##   filter, lag

## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union
```

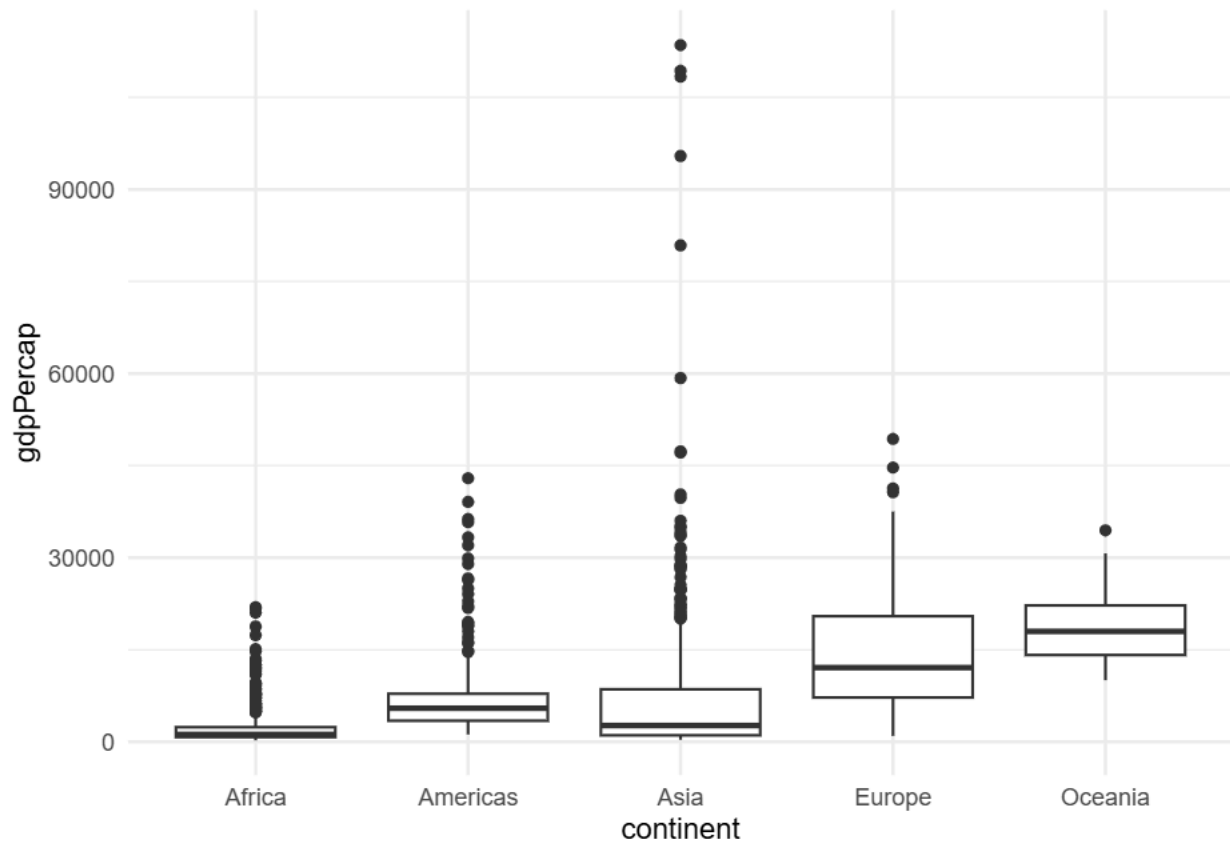
```
library(ggplot2)
data("gapminder")
head(gapminder)
```

```
## # A tibble: 6 x 6
##   country    continent  year lifeExp      pop gdpPercap
##   <fct>      <fct>    <int>  <dbl>    <int>    <dbl>
## 1 Afghanistan Asia      1952   28.8  8425333    779.
## 2 Afghanistan Asia      1957   30.3  9240934    821.
## 3 Afghanistan Asia      1962   32.0 10267083    853.
## 4 Afghanistan Asia      1967   34.0 11537966    836.
## 5 Afghanistan Asia      1972   36.1 13079460    740.
## 6 Afghanistan Asia      1977   38.4 14880372    786.
```

```
anova_model <- aov(gdpPercap ~ continent, data = gapminder)
summary(anova_model)
```

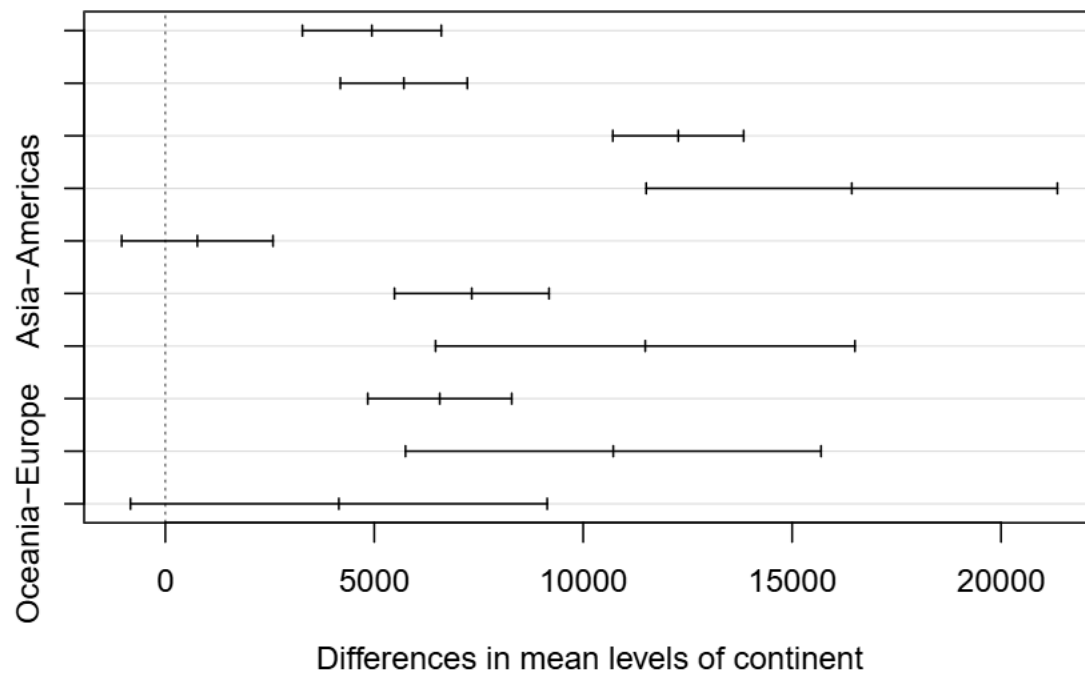
```
##              Df    Sum Sq  Mean Sq F value Pr(>F)
## continent      4 3.799e+10 9.498e+09   126.6 <2e-16 ***
## Residuals    1699 1.275e+11 7.504e+07
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
ggplot(gapminder, aes(x = continent, y = gdpPercap)) +
  geom_boxplot() +
  theme_minimal()
```

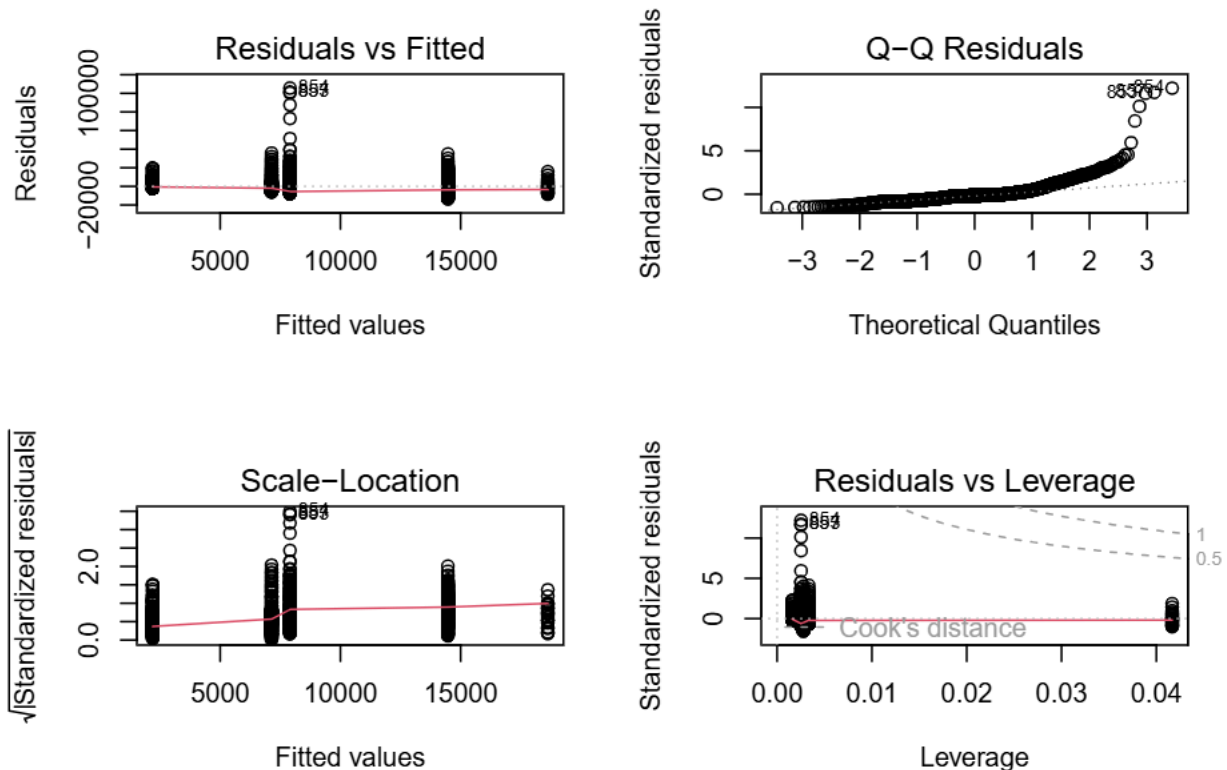


```
plot(TukeyHSD(anova_model))
```

95% family-wise confidence level



```
par(mfrow = c(2,2))
plot(anova_model)
```



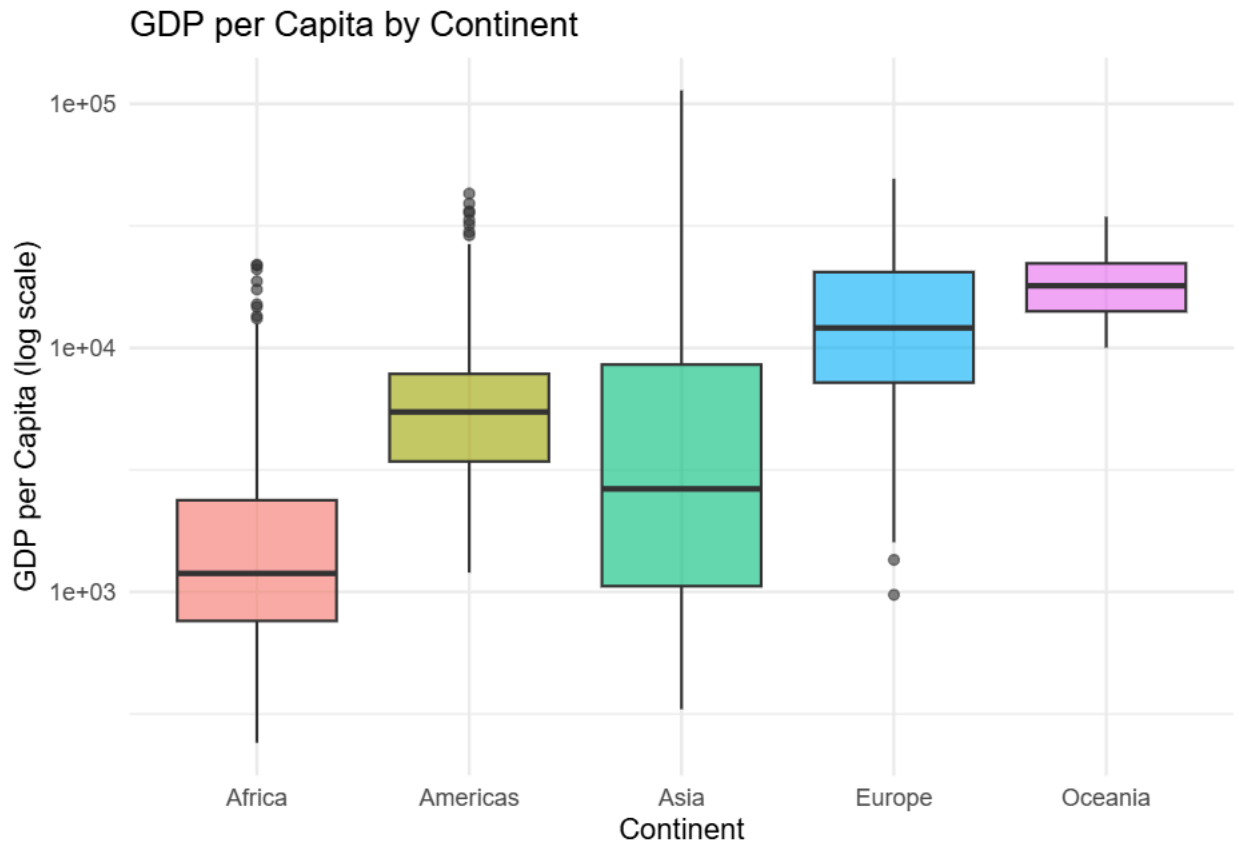
```
tukey <- TukeyHSD(anova_model)
print(tukey)
```

```
## Tukey multiple comparisons of means
## 95% family-wise confidence level
##
## Fit: aov(formula = gdpPercap ~ continent, data = gapminder)
##
## $continent
##
```

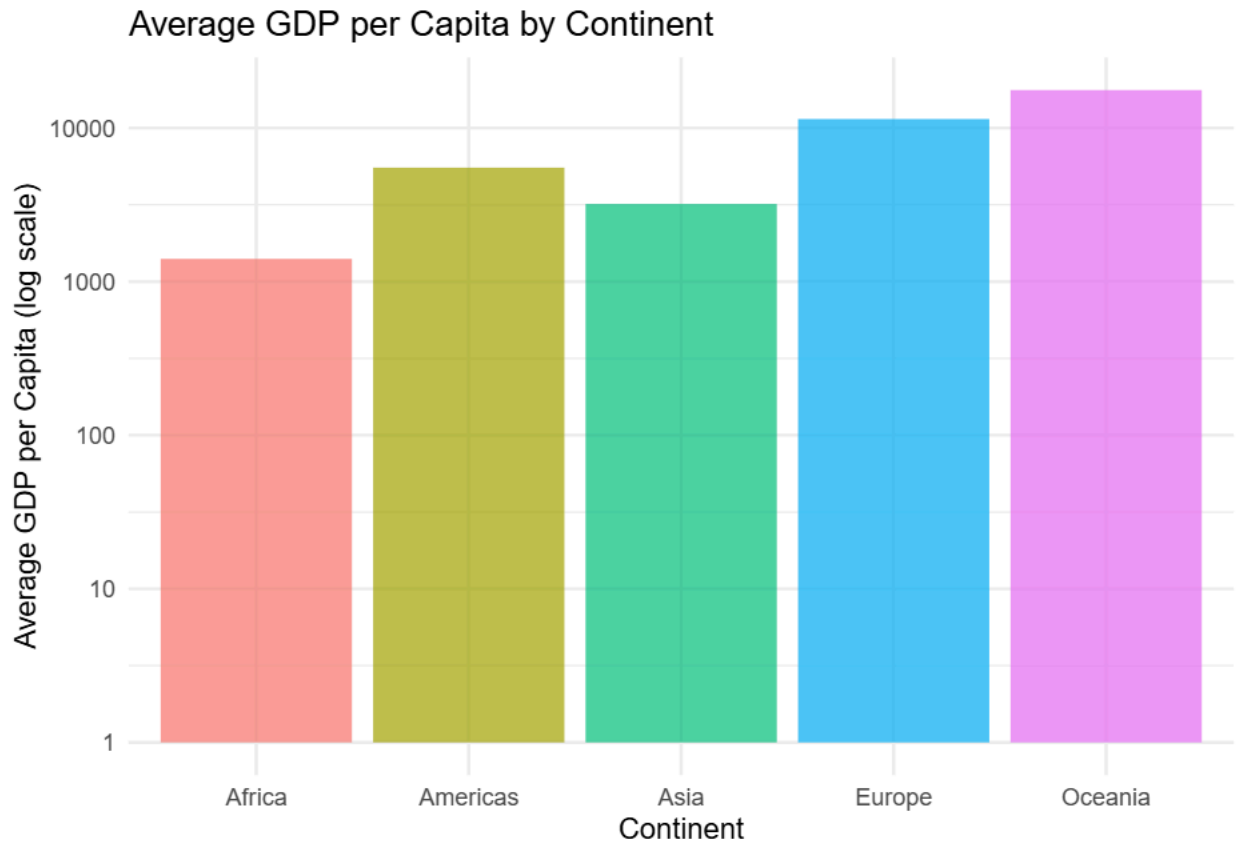
	diff	lwr	upr	p adj
Americas-Africa	4942.3558	3280.4806	6604.231	0.0000000
Asia-Africa	5708.3958	4188.6340	7228.158	0.0000000
Europe-Africa	12275.7210	10710.1623	13841.280	0.0000000
Oceania-Africa	16427.8546	11507.4034	21348.306	0.0000000
Asia-Americas	766.0401	-1044.5150	2576.595	0.7767582
Europe-Americas	7333.3652	5484.2011	9182.529	0.0000000
Oceania-Americas	11485.4989	6467.6035	16503.394	0.0000000
Europe-Asia	6567.3251	4844.7530	8289.897	0.0000000
Oceania-Asia	10719.4588	5746.8215	15692.096	0.0000000
Oceania-Europe	4152.1337	-834.6909	9138.958	0.1539474

```
# Create a boxplot to visualize GDP per capita by continent
ggplot(gapminder, aes(x = continent, y = gdpPercap)) +
  geom_boxplot(aes(fill = continent), alpha = 0.6) +
  scale_y_log10() + # Use log scale for better visualization
  labs(title = "GDP per Capita by Continent",
       x = "Continent",
```

```
y = "GDP per Capita (log scale)" +  
theme_minimal() +  
theme(legend.position = "none")
```



```
ggplot(gapminder, aes(x = continent, y = gdpPercap, fill = continent)) +  
  geom_bar(stat = "summary", fun = "mean", alpha = 0.7) + # Bar chart showing the mean GDP per capita  
  scale_y_log10() + # Use log scale for better visualization  
  labs(title = "Average GDP per Capita by Continent",  
        x = "Continent",  
        y = "Average GDP per Capita (log scale)") +  
  theme_minimal() +  
  theme(legend.position = "none")
```



#The chart shows the average GDP per capita for each continent, with a logarithmic scale on the y-axis for better visibility of both high and low values.

#The bars are colored based on the continent, and we use a simple, minimal theme to make the plot look clean.

#The use of summary statistics (mean) for each continent allows us to visualize how the average GDP per capita compares across continents.