What was the mortality impact of Covid19 on different countries and how to reduce it?

First of all I will start by analyzing the differences in mortality per country in France, Spain, Britain and lastly New Zealand.
Secondly, I will attempt to analyze the different approaches by these countries to adapt to the pandemic.
Lastly I will review the effects of Vitamin D with regards to Covid19.

Part I: Countries Analysis

In [2]:
```
import pandas as pd
import requests
import numpy as np
import matplotlib.pyplot as plt
import requests
url = "https://api.covid19api.com/summary"
payload = {}
headers= {}
response = requests.request("GET", url, headers=headers, data = payload)
json=response.json()
jsonfileneeded=json['Countries']
Df1=pd.DataFrame(jsonfileneeded)
Df1=Df1.drop(['ID','Premium','NewDeaths','Slug','NewConfirmed','NewRecovered','CountryCode','Date'],axis=1)
France=Df1[Df1['Country']=='France']
New_Zealand=Df1[Df1['Country']=='New Zealand']
Spain=Df1[Df1['Country']=='Spain']
United_Kingdom=Df1[Df1['Country']=='United Kingdom']
Df=pd.DataFrame()
Df=pd.concat([France,New_Zealand,Spain,United_Kingdom])
Df=Df.rename(columns={'TotalConfirmed':'Total Cases','TotalDeaths':'Total Mortality Present Day','TotalRecovered':'Total Recovered Present Day'})
Df=Df.reset_index(drop=True)
### Total population references at bottom of page.
Df['Population']=pd.Series([67422241,5101400,47351567,66796807])
df = Df.style.set_table_styles([dict(selector='th', props=[('text-align', 'center')])])
df.set_properties(**{'text-align': 'center'}).hide_index()
df
```

Country	Total Cases	Total Mortality Present Day	Total Recovered Present Day	Population
France	3400324	79571	240200	67422241
New Zealand	2322	25	2230	5101400
Spain	2989085	62295	150376	47351567
United Kingdom	3971315	113014	10323	66796807

Calculating infection ratio:

In [3]:
```
Total_Population_France=Df.iloc[0]['Population']
Total_Cases_France=Df.iloc[0]['Total Cases']
Infection_Ratio_France=round((Total_Cases_France/Total_Population_France)*100,2)
Total_Population_New_Zealand=Df.iloc[1]['Population']
Total_Cases_New_Zealand=Df.iloc[1]['Total Cases']
Infection_Ratio_New_Zealand=round((Total_Cases_New_Zealand/Total_Population_New_Zealand)*100,2)
Total_Population_Spain=Df.iloc[2]['Population']
Total_Cases_Spain=Df.iloc[2]['Total Cases']
Infection_Ratio_Spain=round((Total_Cases_Spain/Total_Population_Spain)*100,2)
Total_Population_United_Kingdom=Df.iloc[3]['Population']
Total_Cases_United_Kingdom=Df.iloc[3]['Total Cases']
Infection_Ratio_United_Kingdom=round((Total_Cases_United_Kingdom/Total_Population_United_Kingdom)*100,2)
Infection_Ratio={'Country':['France','New Zealand','Spain','United Kingdom'],'Infection Ratio':[Infection_Ratio_France,Infection_Ratio_New_Zealand,Infection_Ratio_Spain,Infection_Ratio_United_Kingdom]}
Df_Infection_Ratio=pd.DataFrame(Infection_Ratio)
Df['Infection Ratio']=Df_Infection_Ratio['Infection Ratio'].astype('str') +'%'
for i in Df['Country'].unique():
    sub_df = Df.loc[Df['Country']== i]
    Total_Population_France=sub_df['Population'].iloc[0]
    Total_Cases_France=sub_df['Total Cases'].iloc[0]
    Infection_Ratio_France=round((Total_Cases_France/Total_Population_France)*100,2)
    print('The infection ratio in',i,' is:',Infection_Ratio_France,'%')
```

```
The infection ratio in France  is: 5.04 %
The infection ratio in New Zealand  is: 0.05 %
The infection ratio in Spain is: 6.31 %
The infection ratio in United Kingdom  is: 5.95 %
```

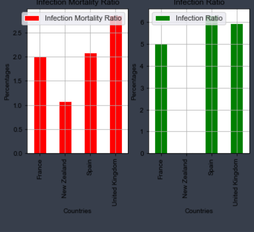
Calculating Infection Mortality Ratio:

In [4]:
```
Total_Mortality_France=Df.iloc[0]['Total Mortality Present Day']
Total_Mortality_New_Zealand=Df.iloc[1]['Total Mortality Present Day']
Total_Mortality_Spain=Df.iloc[2]['Total Mortality Present Day']
Total_Mortality_United_Kingdom=Df.iloc[3]['Total Mortality Present Day']
Infection_Mortality_Ratio_France=round((Total_Mortality_France/Total_Cases_France)*100,2)
Infection_Mortality_Ratio_New_Zealand=round((Total_Mortality_New_Zealand/Total_Cases_New_Zealand)*100,2)
Infection_Mortality_Ratio_Spain=round((Total_Mortality_Spain/Total_Cases_Spain)*100,2)
Infection_Mortality_Ratio_United_Kingdom=round((Total_Mortality_United_Kingdom/Total_Cases_United_Kingdom)*100,2)
Infection_Mortality_Ratio={'Country':['France','New Zealand','Spain','United Kingdom'],'Infection Mortality Ratio':[Infection_Mortality_Ratio_France,Infection_Mortality_Ratio_New_Zealand,Infection_Mortality_Ratio_Spain,Infection_Mortality_Ratio_United_Kingdom]}
Df_Infection_Mortality_Ratio=pd.DataFrame(Infection_Mortality_Ratio)
Df['Infection Mortality Ratio']=Df_Infection_Mortality_Ratio['Infection Mortality Ratio'].astype('str')+'%'
df = Df.style.set_table_styles([dict(selector='th', props=[('text-align', 'center')])])
df.set_properties(**{'text-align': 'center'}).hide_index()
df
```

Country	Total Cases	Total Mortality Present Day	Total Recovered Present Day	Population	Infection Ratio	Infection Mortality Ratio
France	3400324	79571	240200	67422241	5.04%	2.0%
New Zealand	2322	25	2230	5101400	0.05%	1.08%
Spain	2989085	62295	150376	47351567	6.31%	2.08%
United Kingdom	3971315	113014	10323	66796807	5.95%	2.85%

Plotting results:

In [5]:
```
fig, (ax1,ax2) = plt.subplots(1,2,sharex=False,sharey=False)
sns.set(rc={'figure.figsize':(10,6)})
Df_Infection_Mortality_Ratio.plot(kind='bar',x='Country',y='Infection Mortality Ratio',color='red', ax=ax1)
ax1.set_title('Infection Mortality Ratio')
ax1.set(xlabel='Countries',ylabel='Percentages')
Df_Infection_Ratio.plot(kind='bar',x='Country',y='Infection Ratio',color='green', ax=ax2)
ax2.set_title('Infection Ratio')
ax2.set(xlabel='Countries',ylabel='Percentages')
plt.show()
```



From the data we can see that the infection ratio and subsequent mortality ratio is lower in New Zealand, moreover we can see that the mortality ratio is lower in Spain than in France and the United, this may be linked to higher Vitamin D levels due to higher amounts of sunlight which will be reviewed in the third part of the project.

Part two additional analysis:

To continue and complete my analysis I will attempt to look into how the different countries approached and handled the pandemic.
I will start by comparing the different methods imposed by the different countries and creating bins for those values such as Strong, Moderate and Weak. Variables that would affect this and examples would be how long the lockdown lasted, the subsequent curfew, the hours of the curfew and the restrictions such as the opening of bars and restaurants and the timing of the face mask being imposed on citizens.
I will as well look into the timing of the lockdown and attempt to analyze how it impacted the spread of the virus and if it was affected by certain events, for instance in Madrid, Spain there was a Women's rights march that occurred around the time of the onset of the pandemic which thousands have attended. Moreover, I will look into the border closures of each country with respect to other countries where the virus was spreading at a faster rate, and within the country if transportation was permitted from different regions of the same country.
I will as well look into the economic situation of each country and how the government may have loosened the restrictions in order to avoid economic issues as well as the general social responsibility of the citizens of each country if possible.
I will attempt to see which variables have a strong correlation with the reduction of infections and attempt to build a regression model without overfitting the model.

Part three Vitamin D analysis:

I will try to analyze the postive effects of Vitamin D on the virus by doing the following:
- Review the hours per day of sunlight for all countries.
- Review the effects of Vitamin D sufficient people that contracted the virus and their probability of hopsitalization and mortality.
- Review the effects of Vitamin D deficient people that contracted the virus their probability of hospitalization and mortality.
- Review the effects of Vitamin D supplementation on hospitalized people due to Covid19 and the probability of recovery and mortality compared to patients that are not supplemented.

Total poulation data references:
France: www.insee.fr
New Zealand: www.stats.govt.nz
Spain: www.ine.es
United Kingdom: www.ons.gov.uk

In [ ]: