In [1]:
```
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:
```
df_suicide = pd.read_csv("suicide-rates-1985-to-2016-dataset.csv")
```

In [3]:
```
df_suicide.head()
```

Out[3]:

	country	year	sex	age	suicides_no	population	suicides/100k pop	country-year	HDI for year	gdp_for_year ($)	gdp_per_capita ($)	generation
0	Albania	1987	male	15-24 years	21	312900	6.71	Albania1987	NaN	2,156,624,900	796	Generation X
1	Albania	1987	male	35-54 years	16	308000	5.19	Albania1987	NaN	2,156,624,900	796	Silent
2	Albania	1987	female	15-24 years	14	289700	4.83	Albania1987	NaN	2,156,624,900	796	Generation X
3	Albania	1987	male	75+ years	1	21800	4.59	Albania1987	NaN	2,156,624,900	796	G.I. Generation
4	Albania	1987	male	25-34 years	9	274300	3.28	Albania1987	NaN	2,156,624,900	796	Boomers

In [4]:
```
df_country = pd.read_csv("countryContinent.csv", encoding='ISO-8859-1')
df_country.head()
```

Out[4]:

	country	code_2	code_3	country_code	iso_3166_2	continent	sub_region	region_code	sub_region_code
0	Afghanistan	AF	AFG	4	ISO 3166-2:AF	Asia	Southern Asia	142.0	34.0
1	Åland Islands	AX	ALA	248	ISO 3166-2:AX	Europe	Northern Europe	150.0	154.0
2	Albania	AL	ALB	8	ISO 3166-2:AL	Europe	Southern Europe	150.0	39.0
3	Algeria	DZ	DZA	12	ISO 3166-2:DZ	Africa	Northern Africa	2.0	15.0
4	American Samoa	AS	ASM	16	ISO 3166-2:AS	Oceania	Polynesia	9.0	61.0

In [5]:
```
def find_mismatch (array_1, array_2, only_out=True):
    for i in array_1.unique():
         if i in array_2.unique():
            pass
         else:
            print("Not have :",i)


find_mismatch(df_suicide.country, df_country.country, True)
```

```
Not have : Macau
Not have : Republic of Korea
Not have : Saint Vincent and Grenadines
Not have : United Kingdom
Not have : United States
```

In [6]:
```
df_country.loc[df_country.country.str.contains("Maca"),'country'] = 'Macau'
df_country.loc[118,'country'] = 'Republic of Korea'
df_country.loc[df_country.country.str.contains("Vincent"),'country'] = 'Saint Vincent and Grenadines'
df_country.loc[df_country.country.str.contains("King"),'country'] = 'United Kingdom'
df_country.loc[df_country.country.str.contains("United States of America"),'country'] = 'United States'

find_mismatch(df_suicide.country, df_country.country, True)
```

In [7]:
```
df_suicide_new = df_suicide.merge(df_country[['country', 'continent']])
df_suicide_new.head()
```

Out[7]:

	country	year	sex	age	suicides_no	population	suicides/100k pop	country-year	HDI for year	gdp_for_year ($)	gdp_per_capita ($)	generation	continent
0	Albania	1987	male	15-24 years	21	312900	6.71	Albania1987	NaN	2,156,624,900	796	Generation X	Europe
1	Albania	1987	male	35-54 years	16	308000	5.19	Albania1987	NaN	2,156,624,900	796	Silent	Europe
2	Albania	1987	female	15-24 years	14	289700	4.83	Albania1987	NaN	2,156,624,900	796	Generation X	Europe
3	Albania	1987	male	75+ years	1	21800	4.59	Albania1987	NaN	2,156,624,900	796	G.I. Generation	Europe
4	Albania	1987	male	25-34 years	9	274300	3.28	Albania1987	NaN	2,156,624,900	796	Boomers	Europe

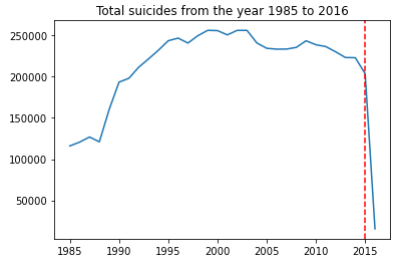
In [8]:
```
df_suicide_new.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 27820 entries, 0 to 27819
Data columns (total 13 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   country             27820 non-null  object 
 1   year                27820 non-null  int64  
 2   sex                 27820 non-null  object 
 3   age                 27820 non-null  object 
 4   suicides_no         27820 non-null  int64  
 5   population          27820 non-null  int64  
 6   suicides/100k pop   27820 non-null  float64
 7   country-year        27820 non-null  object 
 8   HDI for year        8364 non-null   float64
 9    gdp_for_year ($)   27820 non-null  object 
 10  gdp_per_capita ($)  27820 non-null  int64  
 11  generation          27820 non-null  object 
 12  continent           27820 non-null  object 
dtypes: float64(2), int64(4), object(7)
memory usage: 3.0+ MB
```

In [9]:
```
# make plot for total suicide number by year
year = df_suicide['year'].sort_values().unique()
df = df_suicide[['year', 'suicides_no']].groupby(['year']).sum()
df.reset_index(inplace=True) # reset index


plt.plot(df['year'], df['suicides_no'])
plt.title("Total suicides from the year 1985 to 2016")
plt.axvline(x = 2015, color = 'red', ls = '--')
```

Out[9]:
```
<matplotlib.lines.Line2D at 0x261e42ba3d0>
```



In [10]:
```
#  drop year = 2016
print('before 2016 data drop:  ',df_suicide_new.shape)
df_suicide_new.drop(df_suicide_new[df_suicide_new['year'] == 2016].index, inplace = True)
print('after  2016 data drop:  ',df_suicide_new.shape)
```

```
before 2016 data drop:   (27820, 13)
after  2016 data drop:   (27660, 13)
```

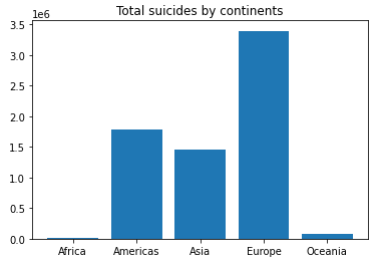
In [11]:
```
# make sure all year = 2016 is dropped
len(df_suicide_new[df_suicide_new['year'] == 2016])
```

Out[11]:
```
0
```

In [12]:
```
continent = df_suicide_new[['continent', 'suicides_no']].groupby(['continent']).sum()
continent.reset_index(inplace=True)

plt.bar(continent['continent'], continent['suicides_no'])
plt.title("Total suicides by continents")
```

Out[12]:
```
Text(0.5, 1.0, 'Total suicides by continents')
```



In [13]:
```
df_suicide_new['country'].unique()
```

Out[13]:
```
array(['Albania', 'Antigua and Barbuda', 'Argentina', 'Armenia', 'Aruba',
       'Australia', 'Austria', 'Azerbaijan', 'Bahamas', 'Bahrain',
       'Barbados', 'Belarus', 'Belgium', 'Belize',
       'Bosnia and Herzegovina', 'Brazil', 'Bulgaria', 'Cabo Verde',
       'Canada', 'Chile', 'Colombia', 'Costa Rica', 'Croatia', 'Cuba',
       'Cyprus', 'Czech Republic', 'Denmark', 'Dominica', 'Ecuador',
       'El Salvador', 'Estonia', 'Fiji', 'Finland', 'France', 'Georgia',
       'Germany', 'Greece', 'Grenada', 'Guatemala', 'Guyana', 'Hungary',
       'Iceland', 'Ireland', 'Israel', 'Italy', 'Jamaica', 'Japan',
       'Kazakhstan', 'Kiribati', 'Kuwait', 'Kyrgyzstan', 'Latvia',
       'Lithuania', 'Luxembourg', 'Macau', 'Maldives', 'Malta',
       'Mauritius', 'Mexico', 'Montenegro', 'Netherlands', 'New Zealand',
       'Nicaragua', 'Norway', 'Oman', 'Panama', 'Paraguay', 'Philippines',
       'Poland', 'Portugal', 'Puerto Rico', 'Qatar', 'Republic of Korea',
       'Romania', 'Russian Federation', 'Saint Kitts and Nevis',
       'Saint Lucia', 'Saint Vincent and Grenadines', 'San Marino',
       'Serbia', 'Seychelles', 'Singapore', 'Slovakia', 'Slovenia',
       'South Africa', 'Spain', 'Sri Lanka', 'Suriname', 'Sweden',
       'Switzerland', 'Thailand', 'Trinidad and Tobago', 'Turkey',
       'Turkmenistan', 'Ukraine', 'United Arab Emirates',
       'United Kingdom', 'United States', 'Uruguay', 'Uzbekistan'],
      dtype=object)
```

In [14]:
```
df_suicide_new['year'].sort_values().unique()
```

Out[14]:
```
array([1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995,
       1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006,
       2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015], dtype=int64)
```

In [15]:
```
# rename column
df_suicide_new = df_suicide_new.rename(columns = {' gdp_for_year ($) ': 'gdp_for_year ($)'}, inplace = False)
df_suicide_new.info() # wrong type for 'gdp_for_year ($)' column
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 27660 entries, 0 to 27819
Data columns (total 13 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   country             27660 non-null  object
 1   year                27660 non-null  int64
 2   sex                 27660 non-null  object
 3   age                 27660 non-null  object
 4   suicides_no         27660 non-null  int64
 5   population          27660 non-null  int64
 6   suicides/100k pop   27660 non-null  float64
 7   country-year        27660 non-null  object
 8   HDI for year        8364 non-null   float64
 9   gdp_for_year ($)    27660 non-null  object
 10  gdp_per_capita ($)  27660 non-null  int64
 11  generation          27660 non-null  object
 12  continent           27660 non-null  object
dtypes: float64(2), int64(4), object(7)
memory usage: 3.0+ MB
```

In [16]:
```
# Remove thousand separator for string at column 'gdp_for_year ($)' and change to int data type
for i, row in df_suicide_new.iterrows():
    ifor_val = int("".join(row['gdp_for_year ($)'].split(',')))
    df_suicide_new.at[i,'gdp_for_year ($)'] = ifor_val

# change data type of dataframe
df_suicide_new['gdp_for_year ($)'] = pd.to_numeric(df_suicide_new['gdp_for_year ($)']) # change data type
df_suicide_new['gdp_for_year ($)']
```

Out[16]:
```
0         2156624900
1         2156624900
2         2156624900
3         2156624900
4         2156624900
             ...
27815    63067077179
27816    63067077179
27817    63067077179
27818    63067077179
27819    63067077179
Name: gdp_for_year ($), Length: 27660, dtype: int64
```

In [17]:
```
# calculate average gdp by grouping country and finding the average
average_gdp = df_suicide_new[['country', 'gdp_for_year ($)']].groupby(['country']).mean()
average_gdp.reset_index(inplace=True)
average_gdp = average_gdp.rename(columns = {'gdp_for_year ($)': 'average_gdp'}, inplace = False)
df_suicide_new = df_suicide_new.merge(average_gdp[['country', 'average_gdp']])

# calculate total suicide by grouping country and finding the sum
total_suicides = df_suicide_new[['country', 'suicides_no']].groupby(['country']).sum()
total_suicides.reset_index(inplace=True)
total_suicides = total_suicides.rename(columns = {'suicides_no': 'total_suicides'}, inplace = False)
df_suicide_new = df_suicide_new.merge(total_suicides[['country', 'total_suicides']])

# calculate the average gdp per capita by grouping country and finding the average
average_gdp_per_capita = df_suicide_new[['country', 'gdp_per_capita ($)']].groupby(['country']).mean()
average_gdp_per_capita.reset_index(inplace=True)
average_gdp_per_capita = average_gdp_per_capita.rename(columns = {'gdp_per_capita ($)': 'average_gdp_per_capita'}, inplace = False)
df_suicide_new = df_suicide_new.merge(average_gdp_per_capita[['country', 'average_gdp_per_capita']])

# rounding to 2 d.p.
df_suicide_new = df_suicide_new.round({'average_gdp': 2, 'average_gdp_per_capita': 2})
df_suicide_new.reset_index(inplace = True)
df_suicide_new.info()

# the value found here has also been verified by tableau software
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 27660 entries, 0 to 27659
Data columns (total 17 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   index                 27660 non-null  int64
 1   country               27660 non-null  object
 2   year                  27660 non-null  int64
 3   sex                   27660 non-null  object
 4   age                   27660 non-null  object
 5   suicides_no           27660 non-null  int64
 6   population            27660 non-null  int64
 7   suicides/100k pop     27660 non-null  float64
 8   country-year          27660 non-null  object
 9   HDI for year          8364 non-null   float64
 10  gdp_for_year ($)      27660 non-null  int64
 11  gdp_per_capita ($)    27660 non-null  int64
 12  generation            27660 non-null  object
 13  continent             27660 non-null  object
 14  average_gdp           27660 non-null  float64
 15  total_suicides        27660 non-null  int64
 16  average_gdp_per_capita  27660 non-null  float64
dtypes: float64(4), int64(7), object(6)
memory usage: 3.6+ MB
```

In [18]:
```
# rename column to help with vega-lite
df_suicide_new = df_suicide_new.rename(columns = {'suicides/100k pop': 'suicides_per_100k_pop', \
                                                  'gdp_for_year ($)': 'gdp_for_year', \
                                                  'gdp_per_capita ($)': 'gdp_per_capita', \
                                                  'HDI for year': 'hdi_for_year', \
                                                  'country-year': 'country_year'}, inplace = False)
```

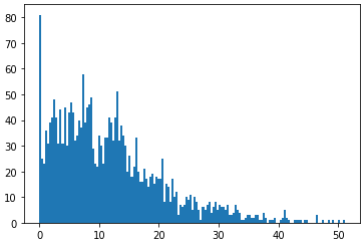
In [19]:
```
# find total_suicide by country and year
total_suicide_per_year = df_suicide_new[['country', 'year', 'suicides_no']].groupby(['country', 'year']).sum()
total_suicide_per_year.reset_index(inplace=True)

# find total population by country and year
total_population_per_year = df_suicide_new[['country', 'year', 'population']].groupby(['country', 'year']).sum()
total_population_per_year.reset_index(inplace=True)

per_country_per_year = total_suicide_per_year.merge(total_population_per_year[['country', 'year', 'population']])
per_country_per_year['suicide_per_100k_pop_year_country'] = (per_country_per_year['suicides_no'] / per_country_per_year['population']) * 100000
per_country_per_year = per_country_per_year.rename(columns = {'suicides_no': 'suicides_per_year', 'population': 'population_per_year'}, inplace = False)
per_country_per_year = per_country_per_year.round({'suicide_per_100k_pop_per_year': 2})

# merge into dataset
df_suicide_new = df_suicide_new.merge(per_country_per_year[['country', 'year', 'suicides_per_year', 'population_per_year', 'suicide_per_100k_pop_year_country']])

# plot distribution
plt.hist(per_country_per_year['suicide_per_100k_pop_year_country'], bins=150)
plt.show()
```



In [20]:
```
# find the total_suicide_per_100k_pop_per_year_per_continent
total_suicide_continent_year = df_suicide_new[['continent', 'year', 'suicides_per_year']].groupby(['continent', 'year']).sum()
total_suicide_continent_year = total_suicide_continent_year.reset_index()
total_population_continent_year = df_suicide_new[['continent', 'year', 'population_per_year']].groupby(['continent', 'year']).sum()
total_population_continent_year = total_population_continent_year.reset_index()

# merge it
per_continent_per_year = total_suicide_continent_year.merge(total_population_continent_year[['continent', 'year', 'population_per_year']])
per_continent_per_year['suicide_per_100k_pop_year_continent'] = (per_continent_per_year['suicides_per_year'] / per_continent_per_year['population_per_year']) * 100000

# merge into dataset
df_suicide_new = df_suicide_new.merge(per_continent_per_year[['continent', 'year', 'suicide_per_100k_pop_year_continent']])

# calculate the average suicide per 100k population by grouping country and finding the average
average_suicides_per_100k_pop = df_suicide_new[['country', 'suicide_per_100k_pop_year_country']].groupby(['country']).mean()
average_suicides_per_100k_pop.reset_index(inplace=True)
average_suicides_per_100k_pop = average_suicides_per_100k_pop.rename(columns = {'suicide_per_100k_pop_year_country': 'average_suicides_per_100k_pop'}, inplace = False)
df_suicide_new = df_suicide_new.merge(average_suicides_per_100k_pop[['country', 'average_suicides_per_100k_pop']])

# change to 2 d.p
df_suicide_new = df_suicide_new.round({'suicide_per_100k_pop_year_country': 2, 'suicide_per_100k_pop_year_continent': 2, 'average_suicides_per_100k_pop': 2})
```

In [21]:
```
# example record
df_suicide_new.loc[df_suicide_new['country'] == 'United States'].head(1)
```

Out[21]:

	index	country	year	sex	age	suicides_no	population	suicides_per_100k_pop	country_year	hdi_for_year	...	generation	continent	average_gdp	total_suicides	average_gdp_per_capita	suicides_pe
17616	26688	United States	1985	male	75+ years	2177	4064000	53.57	United States1985	0.841	...	G.I. Generation	Americas	1.051071e+13	1034013	39269.61	

1 rows × 22 columns

In [22]:
```
df_suicide_new.head()
```

Out[22]:

	index	country	year	sex	age	suicides_no	population	suicides_per_100k_pop	country_year	hdi_for_year	...	generation	continent	average_gdp	total_suicides	average_gdp_per_capita	suicides_per_y
0	0	Albania	1987	male	15-24 years	21	312900	6.71	Albania1987	NaN	...	Generation X	Europe	5.211661e+09	1970	1859.05	
1	1	Albania	1987	male	35-54 years	16	308000	5.19	Albania1987	NaN	...	Silent	Europe	5.211661e+09	1970	1859.05	
2	2	Albania	1987	female	15-24 years	14	289700	4.83	Albania1987	NaN	...	Generation X	Europe	5.211661e+09	1970	1859.05	
3	3	Albania	1987	male	75+ years	1	21800	4.59	Albania1987	NaN	...	G.I. Generation	Europe	5.211661e+09	1970	1859.05	
4	4	Albania	1987	male	25-34 years	9	274300	3.28	Albania1987	NaN	...	Boomers	Europe	5.211661e+09	1970	1859.05	

5 rows × 22 columns

Making a new dataset suitable for Bubble plot

In [23]:
```
# Find the highest population in each country
df_bubble_plot = df_suicide_new[['country','year', 'population']].groupby(['country', 'year']).sum()
df_bubble_plot.reset_index(inplace=True)
df_bubble_plot = df_bubble_plot[['country', 'population']].groupby(['country']).max()
df_bubble_plot.reset_index(inplace=True)

# Match each country to their respective continent
df_bubble_plot = df_bubble_plot.merge(df_country[['country', 'continent']])
# Add the extra column we found above
df_bubble_plot = df_bubble_plot.merge(average_gdp[['country', 'average_gdp']])
df_bubble_plot = df_bubble_plot.merge(total_suicides[['country', 'total_suicides']])
df_bubble_plot = df_bubble_plot.merge(average_gdp_per_capita[['country', 'average_gdp_per_capita']])
df_bubble_plot = df_bubble_plot.merge(average_suicides_per_100k_pop[['country', 'average_suicides_per_100k_pop']])

# Round to 2 d.p place
df_bubble_plot = df_bubble_plot.round({'average_gdp': 2, 'average_gdp_per_capita': 2, 'average_suicides_per_100k_pop': 2})

df_bubble_plot
```

Out[23]:

	country	population	continent	average_gdp	total_suicides	average_gdp_per_capita	average_suicides_per_100k_pop
0	Albania	3029700	Europe	5.211661e+09	1970	1859.05	3.14
1	Antigua and Barbuda	91889	Americas	8.035452e+08	11	10448.19	0.54
2	Argentina	39699624	Americas	2.742565e+11	82219	7914.10	7.91
3	Armenia	3610516	Asia	5.207441e+09	1838	1807.46	2.46
4	Aruba	95488	Americas	2.196223e+09	101	24221.64	8.10
...	...	...	...	...	...	...	...
95	United Arab Emirates	7839736	Asia	2.532432e+11	622	42162.00	1.75
96	United Kingdom	61082942	Europe	1.816067e+12	136805	31908.35	7.88
97	United States	300078511	Americas	1.051071e+13	1034013	39269.61	12.84
98	Uruguay	3190795	Americas	2.337827e+10	13138	7622.07	15.50
99	Uzbekistan	27313507	Asia	2.286003e+10	34803	976.18	7.23

100 rows × 7 columns

In [24]:
```
# export both dataset
df_suicide_new.to_csv('suicide-rates-1985-to-2015-dataset-cleaned.csv', index=False)
df_bubble_plot.to_csv('suicide-rates-1985-to-2015-dataset-cleaned-bubbleplot.csv', index=False)
```