Did the financial crisis of 2008 have an impact on the number of households composed by single parent or two parents and did this have an impact on the educational attainment of the children brought up in these housholds?

In [2]:
```
#Importing Packages

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
from IPython.display import display
import geopandas as gpd
```

In [3]:
```
data_url_1 = "https://datacenter.kidscount.org/rawdata.axd?ind=105&loc=1"

data_url_2 = "https://datacenter.kidscount.org/rawdata.axd?ind=111&loc=1"

data_url_3 = "https://datacenter.kidscount.org/rawdata.axd?ind=6294&loc=1"
```

In [4]:
```
# Importing the data

# Data containing the household structure of various states in the US over several years
child_pop_household_type = pd.read_excel(data_url_1)
child_neither_parent = pd.read_excel(data_url_2)

# Data containing the education statistics of adults between 25 and 34 in various states in the US ov
er different years
edu_pop_25_to_34 = pd.read_excel(data_url_3)
```

In [5]:
```
child_pop_household_type.head()
```

Out[5]:

	LocationType	Location	Household Type	TimeFrame	DataFormat	Data
0	State	California	Married-couple Households	2000	Number	6433000
1	State	California	Father only Households	2000	Number	627000
2	State	California	Mother only Households	2000	Number	2037000
3	Nation	United States	Married-couple Households	2000	Number	49775000
4	Nation	United States	Father only Households	2000	Number	4457000

In [6]:
```
# Cleaning the child_pop_household_type data

# making location the index
child_pop_household_type_1 = child_pop_household_type.set_index(['Location'])

# dropping the fields with United States with them
child_pop_household_type_1 = child_pop_household_type_1.drop(['United States'])

# dropping N.A
child_pop_household_type_1 = child_pop_household_type_1[child_pop_household_type_1.Data != 'N.A.']

# dropping the fields with Number in them
child_pop_household_type_1 = child_pop_household_type_1[child_pop_household_type_1.DataFormat != 'Num
ber']

# dropping the DataFormat field
child_pop_household_type_1 = child_pop_household_type_1.drop(['DataFormat'], axis = 1)

# dropping the LocationType field
child_pop_household_type_1 = child_pop_household_type_1.drop(['LocationType'], axis = 1)
```

In [8]:
```
# Cleaning the child_neither_parent data using the same process as that of child_pop_household_type d
ata

child_neither_parent_1 = child_neither_parent.set_index(['Location'])
child_neither_parent_1 = child_neither_parent_1.drop(['United States'])
child_neither_parent_1 = child_neither_parent_1[child_neither_parent_1.Data != 'N.A.']
child_neither_parent_1 = child_neither_parent_1[child_neither_parent_1.DataFormat != 'Number']
child_neither_parent_1 = child_neither_parent_1.drop(['DataFormat'], axis = 1)
child_neither_parent_1 = child_neither_parent_1.drop(['LocationType'], axis = 1)
```

In [9]:
```
child_neither_parent_1.shape
```

Out[9]:
```
(931, 2)
```

In [10]:
```
#Creating a list for the child_neither_parent data
Household_Type = []
for i in range(931):
    Household_Type.append('Neither parent Households')

#Adding the Household_Type list to the child_neither_parent_new data
child_neither_parent_1['Household Type'] = Household_Type

##Changing the order of columns
child_neither_parent_1 = child_neither_parent_1[['Household Type','TimeFrame', 'Data']]
```

In [11]:
```
## Combining the child_pop_household_type and child_neither_parent_new datasets together
Household_structure = child_pop_household_type_1.append(child_neither_parent_1)

## Reseting the index
Household_structure = Household_structure.reset_index()

## Changing the string type to float type
Household_structure['Data'] = pd.to_numeric(Household_structure['Data'], errors = 'coerce')
```

In [12]:
```
Household_structure.head(15)
```

Out[12]:

	Location	Household Type	TimeFrame	Data
0	Wyoming	Married-couple Households	2000	0.75
1	Wyoming	Father only Households	2000	0.10
2	Wyoming	Mother only Households	2000	0.14
3	West Virginia	Married-couple Households	2000	0.72
4	West Virginia	Father only Households	2000	0.04
5	West Virginia	Mother only Households	2000	0.23
6	Wisconsin	Married-couple Households	2000	0.73
7	Wisconsin	Father only Households	2000	0.06
8	Wisconsin	Mother only Households	2000	0.19
9	Montana	Married-couple Households	2000	0.77
10	Montana	Father only Households	2000	0.08
11	Montana	Mother only Households	2000	0.15
12	South Carolina	Married-couple Households	2000	0.64
13	South Carolina	Father only Households	2000	0.05
14	South Carolina	Mother only Households	2000	0.30

In [13]:
```
## Cleaning the edu_pop_25_to_34_new
edu_pop_25_to_34_1 = edu_pop_25_to_34.set_index(['Location'])
edu_pop_25_to_34_1 = edu_pop_25_to_34_1.drop(['United States'])
edu_pop_25_to_34_1 = edu_pop_25_to_34_1[edu_pop_25_to_34_1.DataFormat != 'Number']
edu_pop_25_to_34_1 = edu_pop_25_to_34_1.drop(['DataFormat'], axis = 1)
edu_pop_25_to_34_1 = edu_pop_25_to_34_1.drop(['LocationType'], axis = 1)
edu_pop_25_to_34_1 = edu_pop_25_to_34_1.reset_index()
```

In [14]:
```
edu_pop_25_to_34_1.head(15)
```

Out[14]:

	Location	Education	TimeFrame	Data
0	Alabama	Not a high school graduate	2000	0.17
1	Alabama	High school diploma or GED	2000	0.52
2	Alabama	Associate's Degree	2000	0.08
3	Alabama	Bachelor's Degree	2000	0.18
4	Alabama	Graduate degree	2000	0.05
5	Alabama	Not a high school graduate	2001	0.14
6	Alabama	High school diploma or GED	2001	0.56
7	Alabama	Associate's Degree	2001	0.08
8	Alabama	Bachelor's Degree	2001	0.17
9	Alabama	Graduate degree	2001	0.05
10	Alabama	Not a high school graduate	2002	0.14
11	Alabama	High school diploma or GED	2002	0.54
12	Alabama	Associate's Degree	2002	0.08
13	Alabama	Bachelor's Degree	2002	0.17
14	Alabama	Graduate degree	2002	0.06

In [15]:
```
## grouping the edu_pop_25_to_34_new data by the education type for all the years from 2000 to 2017 a
nd
## then taking the average percentage of education level in different states over the years.

# grouping the edu_pop_25_to_34_new data by not a high school graduate education level and taking the
average
no_highschool_avg = edu_pop_25_to_34_1.loc[(edu_pop_25_to_34_1['Education'].str.contains('Not a high
 school graduate'))]
no_highschool_avg = no_highschool_avg.groupby('Location').agg({'TimeFrame':np.mean, 'Data':np.mean})

# repeating the grouping part for other education levels
high_school_avg = edu_pop_25_to_34_1.loc[(edu_pop_25_to_34_1['Education'].str.contains('High school d
iploma or GED'))]
high_school_avg = high_school_avg.groupby('Location').agg({'TimeFrame':np.mean, 'Data':np.mean})

associate_avg = edu_pop_25_to_34_1.loc[(edu_pop_25_to_34_1['Education'].str.contains("Associate's Deg
ree"))]
associate_avg = associate_avg.groupby('Location').agg({'TimeFrame':np.mean, 'Data':np.mean})

bachelor_avg = edu_pop_25_to_34_1.loc[(edu_pop_25_to_34_1['Education'].str.contains("Bachelor's Degre
e"))]
bachelor_avg = bachelor_avg.groupby('Location').agg({'TimeFrame':np.mean, 'Data':np.mean})

grad_avg = edu_pop_25_to_34_1.loc[(edu_pop_25_to_34_1['Education'].str.contains('Graduate degree'))]
grad_avg = grad_avg.groupby('Location').agg({'TimeFrame':np.mean, 'Data':np.mean})
```

In [16]:
```
## sorting the data from highest to lowest and finding the state with the highest and the lowest perc
entage of
## adults who are not high school graduates
no_highschool_avg = no_highschool_avg.sort_values('Data', ascending = False)
print(no_highschool_avg.head(1)) ## gives us Texas
print(no_highschool_avg.tail(1)) ## gives us North Dakota

## repeating the sorting part for other education levels
high_school_avg = high_school_avg.sort_values('Data', ascending = False)
print(high_school_avg.head(1)) ## gives us Alaska
print(high_school_avg.tail(1)) ## gives us District of Columbia

associate_avg = associate_avg.sort_values('Data', ascending = False)
print(associate_avg.head(1)) ## gives us North Dakota
print(associate_avg.tail(1)) ## gives us District of Columbia

bachelor_avg = bachelor_avg.sort_values('Data', ascending = False)
print(bachelor_avg.head(1)) ## gives us District of Columbia
print(bachelor_avg.tail(1)) ## gives us New Mexico

grad_avg = grad_avg.sort_values('Data', ascending = False)
print(grad_avg.head(1)) ## gives us District of Columbia
print(grad_avg.tail(1)) ## gives us Nevada
```

```
          TimeFrame      Data
Location
Texas        2008.5  0.178333
             TimeFrame      Data
Location
North Dakota     2008.5  0.043889
          TimeFrame      Data
Location
Alaska       2008.5  0.603889
                     TimeFrame      Data
Location
District of Columbia     2008.5  0.258889
             TimeFrame      Data
Location
North Dakota     2008.5  0.148889
                     TimeFrame      Data
Location
District of Columbia     2008.5  0.024444
                     TimeFrame      Data
Location
District of Columbia     2008.5  0.328889
           TimeFrame      Data
Location
New Mexico     2008.5  0.151111
                     TimeFrame      Data
Location
District of Columbia     2008.5  0.304444
          TimeFrame      Data
Location
Nevada       2008.5  0.049444
```

In [17]:
```
## Showing the states with the highest and the lowest percentage of different education levels

select_state_degree = pd.DataFrame({ "Education Level": ["No_highschool", "High_school_diploma_or_GED","Associates", "Bachelors", "Graduate"],
                                    "Highest_percentage_state": ['Texas', 'Alaska', 'North Dakota', 'District of Columbia', 'District of Columbia'],
                                    "Lowest_percentage_state": ['North Dakota', "District of Columbia", "District of Columbia", "New Mexico", "Nevada"]})
select_state_degree
```

Out[17]:

	Education Level	Highest_percentage_state	Lowest_percentage_state
0	No_highschool	Texas	North Dakota
1	High_school_diploma_or_GED	Alaska	District of Columbia
2	Associates	North Dakota	District of Columbia
3	Bachelors	District of Columbia	New Mexico
4	Graduate	District of Columbia	Nevada

In [18]:
```
## Selecting the states of Alaska, New York, Nevada, New Mexico, North Dakota and Texas
## and finding out the average household structure of those states over the years

Alaska_edu = Household_structure.loc[(Household_structure['Location'].str.contains('Alaska'))]
Alaska_edu = Alaska_edu.groupby('Household Type').agg({'TimeFrame':np.mean, 'Data':np.mean})

New_York_edu = Household_structure.loc[(Household_structure['Location'].str.contains('New York'))]
New_York_edu = New_York_edu.groupby('Household Type').agg({'TimeFrame':np.mean, 'Data':np.mean})

New_Mexico_edu = Household_structure.loc[(Household_structure['Location'].str.contains('New Mexico'
))]
New_Mexico_edu = New_Mexico_edu.groupby('Household Type').agg({'TimeFrame':np.mean, 'Data':np.mean})

Nevada_edu = Household_structure.loc[(Household_structure['Location'].str.contains('Nevada'))]
Nevada_edu = Nevada_edu.groupby('Household Type').agg({'TimeFrame':np.mean, 'Data':np.mean})

North_Dakota_edu = Household_structure.loc[(Household_structure['Location'].str.contains('North Dakot
a'))]
North_Dakota_edu = North_Dakota_edu.groupby('Household Type').agg({'TimeFrame':np.mean, 'Data':np.mea
n})

Texas_edu = Household_structure.loc[(Household_structure['Location'].str.contains('Texas'))]
Texas_edu = Texas_edu.groupby('Household Type').agg({'TimeFrame':np.mean, 'Data':np.mean})
```

In [19]:
```
## Showing the household structure of the different states

# Merging the state_edu datasets for different states to be combined
merge1 = pd.merge(Alaska_edu, New_York_edu, on ='Household Type', how = 'inner')
merge2 = pd.merge(New_Mexico_edu, Nevada_edu,on ='Household Type', how = 'inner' )
merge3 = pd.merge(North_Dakota_edu, Texas_edu,on ='Household Type', how = 'inner')
merge4 = pd.merge(merge1,merge2, on ='Household Type', how = 'inner')
select_state_household = pd.merge(merge4,merge3, on ='Household Type', how = 'inner')

# Cleaning the select_state_household dataset
select_state_household = select_state_household.drop(columns = ['TimeFrame_x_x', 'TimeFrame_y_x', 'Ti
meFrame_x_y', 'TimeFrame_y_y', 'TimeFrame_x', 'TimeFrame_y'], axis = 1)
select_state_household = select_state_household.rename(index = str, columns = {"Data_x_x": "Alaska",
"Data_y_x": "New York", "Data_x_y": "New Mexico", "Data_y_y": "Nevada", "Data_x": "North Dakota", "Da
ta_y": "Texas" })
select_state_household = select_state_household.transpose()
```

In [20]:
```
select_state_household
```

Out[20]:

Household Type	Father only Households	Married-couple Households	Mother only Households	Neither parent Households
Alaska	0.091667	0.692222	0.206111	0.058889
New York	0.068333	0.650556	0.276111	0.050000
New Mexico	0.093889	0.615556	0.285556	0.063333
Nevada	0.091111	0.655000	0.244444	0.058333
North Dakota	0.069444	0.742778	0.178333	0.041111
Texas	0.062778	0.678333	0.251111	0.055556

In [21]:
```
#Randomly chose two states
## Making a dataset for New York and North Dakota to understand the household structure trends in the
two states

# Dataset for New York
New_York_household = Household_structure.loc[Household_structure['Location'].str.contains('New York'
)]

# dropping location and making a pivot table
New_York_household = New_York_household.drop(['Location'], axis = 1)
New_York_household = New_York_household.pivot_table(index = 'TimeFrame', columns = 'Household Type')

# removing the data field on the top
New_York_household.columns = New_York_household.columns.droplevel(0)
New_York_household = New_York_household.reset_index().rename_axis(None, axis = 1)

# renaming the columns
New_York_household.columns = New_York_household.columns.str.strip().str.lower().str.replace(' ', '_')
.str.replace("-","_")

#assigning the year as index
New_York_household = New_York_household.set_index(['timeframe'])

# Repeating the process for North Dakota
North_Dakota_household = Household_structure.loc[Household_structure['Location'].str.contains('North
 Dakota')]
North_Dakota_household = North_Dakota_household.drop(['Location'], axis = 1)
North_Dakota_household = North_Dakota_household.pivot_table(index = 'TimeFrame', columns = 'Household
Type')
North_Dakota_household.columns = North_Dakota_household.columns.droplevel(0)
North_Dakota_household = North_Dakota_household.reset_index().rename_axis(None, axis = 1)
North_Dakota_household.columns = North_Dakota_household.columns.str.strip().str.lower().str.replace('
', '_').str.replace("-","_")
North_Dakota_household = North_Dakota_household.set_index(['timeframe'])
```

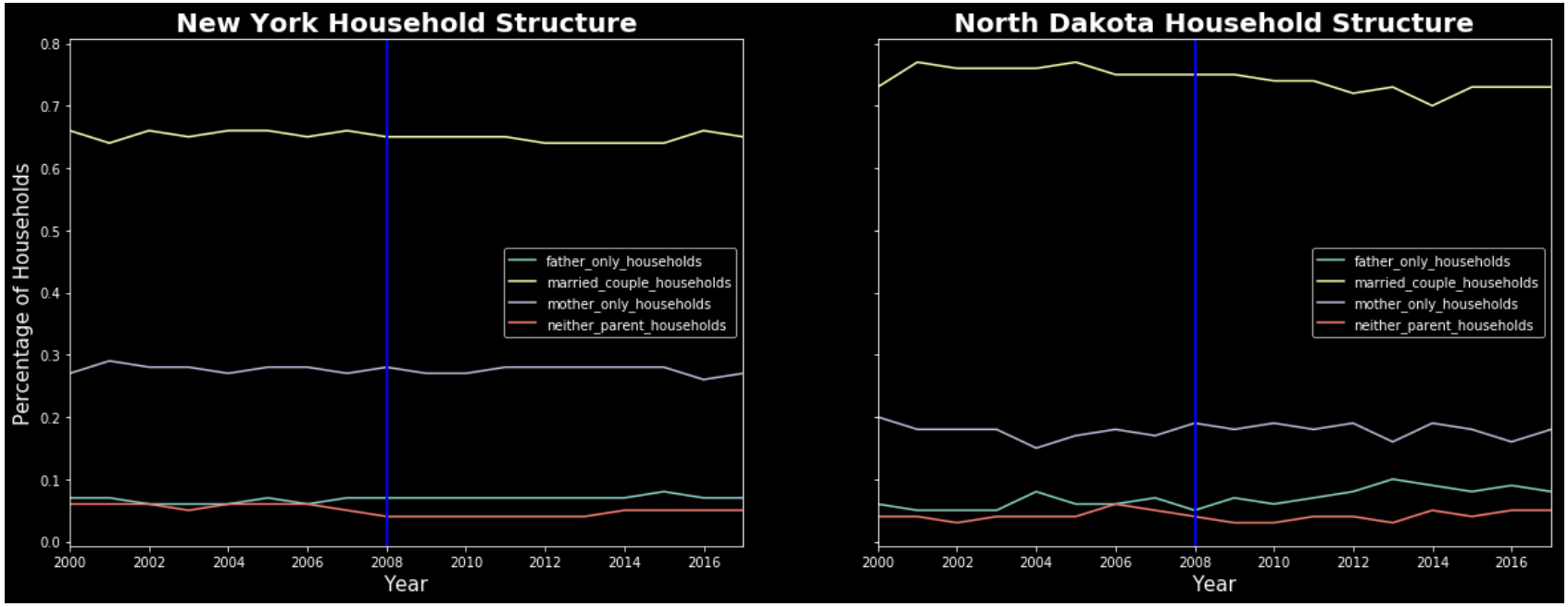
In [25]:
```
## Making a dataset for New York and North Dakota to understand the education level trends in the two
states

## Making a dataset for New York and cleaning it
New_York_education = edu_pop_25_to_34_1.loc[edu_pop_25_to_34_1['Location'].str.contains('New York')]

# dropping location and making a pivot table
New_York_education = New_York_education.drop(['Location'], axis = 1)
New_York_education = New_York_education.pivot_table(index = 'TimeFrame', columns = 'Education')

# reseting the index
New_York_education.columns = New_York_education.columns.droplevel(0)
New_York_education = New_York_education.reset_index().rename_axis(None, axis = 1)

# renaming the columns
New_York_education.columns = New_York_education.columns.str.strip().str.lower().str.replace(' ', '_')
.str.replace("-","_").str.replace("'", "")

# reseting the index
New_York_education = New_York_education.set_index(['timeframe'])

# Repeating the process for North Dakota
North_Dakota_education = edu_pop_25_to_34_1.loc[edu_pop_25_to_34_1['Location'].str.contains('North Da
kota')]
North_Dakota_education = North_Dakota_education.drop(['Location'], axis = 1)
North_Dakota_education = North_Dakota_education.pivot_table(index = 'TimeFrame', columns = 'Educatio
n')
North_Dakota_education.columns = North_Dakota_education.columns.droplevel(0)
North_Dakota_education = North_Dakota_education.reset_index().rename_axis(None, axis = 1)
North_Dakota_education.columns = North_Dakota_education.columns.str.strip().str.lower().str.replace('
', '_').str.replace("-","_").str.replace("'", "")
North_Dakota_education = North_Dakota_education.set_index(['timeframe'])
```

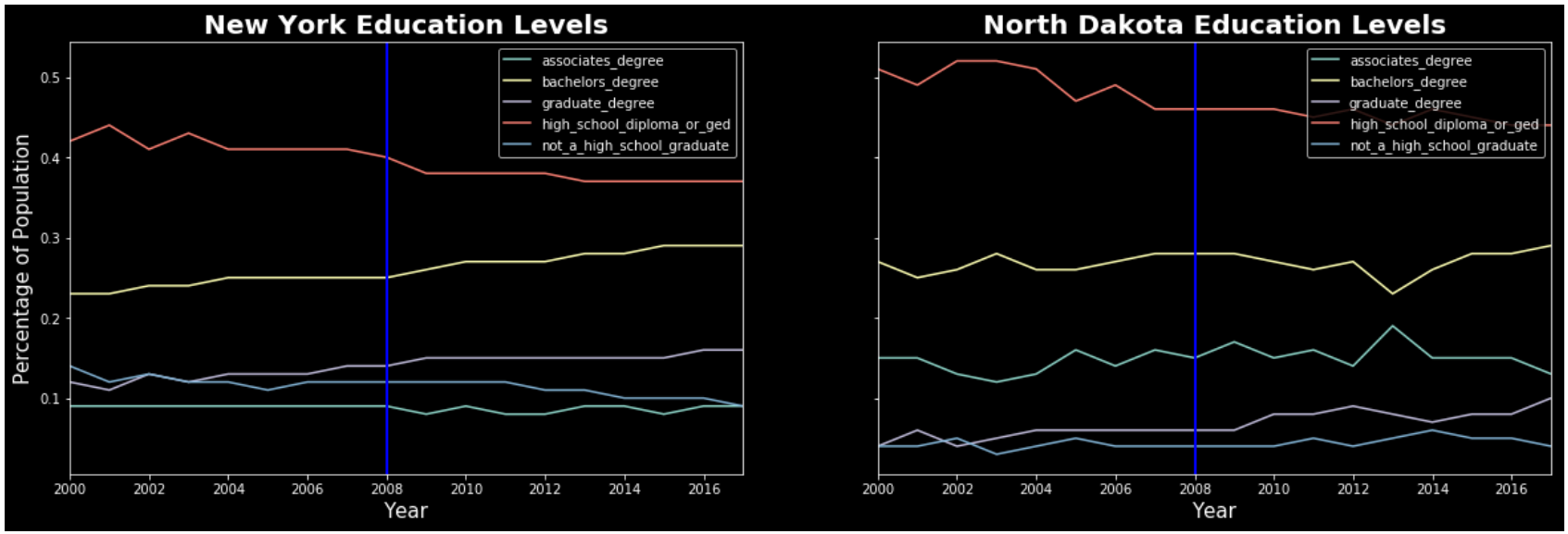
In [26]:
```
North_Dakota_education
```

Out[26]:

timeframe	associates_degree	bachelors_degree	graduate_degree	high_school_diploma_or_ged	not_a_high_school_graduate
2000	0.15	0.27	0.04	0.51	0.04
2001	0.15	0.25	0.06	0.49	0.04
2002	0.13	0.26	0.04	0.52	0.05
2003	0.12	0.28	0.05	0.52	0.03
2004	0.13	0.26	0.06	0.51	0.04
2005	0.16	0.26	0.06	0.47	0.05
2006	0.14	0.27	0.06	0.49	0.04
2007	0.16	0.28	0.06	0.46	0.04
2008	0.15	0.28	0.06	0.46	0.04
2009	0.17	0.28	0.06	0.46	0.04
2010	0.15	0.27	0.08	0.46	0.04
2011	0.16	0.26	0.08	0.45	0.05
2012	0.14	0.27	0.09	0.46	0.04
2013	0.19	0.23	0.08	0.44	0.05
2014	0.15	0.26	0.07	0.46	0.06
2015	0.15	0.28	0.08	0.45	0.05
2016	0.15	0.28	0.08	0.44	0.05
2017	0.13	0.29	0.10	0.44	0.04

In [34]:
```
plt.style.use('dark_background')
fig, (ax, ax2) = plt.subplots(ncols=2, sharey=True)

New_York_household.plot(ax = ax, figsize = (20,7))
ax.set_xlim(2000,2017)
ax.set_title('New York Household Structure', fontsize = 20, fontweight = 'bold')
ax.set_xlabel('Year', fontsize = 15)
ax.set_ylabel('Percentage of Households', fontsize = 15)

ax.axvline(x = 2008, color='b',linewidth=2)
message = 'Financial Crisis'

North_Dakota_household.plot(ax = ax2, figsize = (20,7))
ax2.set_xlim(2000,2017)
ax2.set_title('North Dakota Household Structure', fontsize = 20, fontweight = 'bold' )
ax2.set_xlabel('Year', fontsize = 15)
ax2.set_ylabel('Percentage of Households', fontsize = 15)

ax2.axvline(x = 2008, color='b',linewidth=2)
message = 'Financial Crisis'

plt.style.use('dark_background')
fig, (ax, ax2) = plt.subplots(ncols=2, sharey=True)

New_York_education.plot(ax = ax, figsize = (20,6))
ax.set_xlim(2000,2017)
ax.set_title('New York Education Levels', fontsize = 20, fontweight = 'bold')
ax.set_xlabel('Year', fontsize = 15)
ax.set_ylabel('Percentage of Population', fontsize = 15)

ax.axvline(x = 2008, color='b',linewidth=2)
message = 'Financial Crisis'

North_Dakota_education.plot(ax = ax2, figsize = (20,6))
ax2.set_xlim(2000,2017)
ax2.set_title('North Dakota Education Levels', fontsize = 20, fontweight = 'bold')
ax2.set_xlabel('Year', fontsize = 15)
ax2.set_ylabel('Percentage of Population', fontsize = 15)

ax2.axvline(x = 2008, color='b',linewidth=2)
message = 'Financial Crisis'
```





As the graphs show, the financial crisis had no effect on the household structure of educational attainment of the children in New York or North Dakota.

In [ ]: