In [4]:
```
'''
CS 418: Final Project
Title - US Census Demographic Data - DATA PROCESSING
Authors: Anusha Sagi, Fatima Kahack, Lydia Tse
Description: The following is code to analyze the US Census Data and preprocess it.
'''
```

Out[4]:
```
'\nCS 418: Final Project\nTitle - US Census Demographic Data - DATA PROCESSING\nAuthors: Anusha Sagi, Fatima Kahack, Ly
dia Tse\nDescription: The following is code to analyze the US Census Data and preprocess it.\n'
```

In [5]:
```
# Load libraries
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
```

In [6]:
```
# Load US Census Demographic Data
census_data = pd.read_csv('census_train_data.csv')
census_data.head()
```

Out[6]:

	CountyId	State	County	TotalPop	Men	Women	Hispanic	White	Black	Native	...	Walk	OtherTransp	WorkAtHome	MeanCommute	Employed	Privat
0	1001	Alabama	Autauga County	55036	26899	28137	2.7	75.4	18.9	0.3	...	0.6	1.3	2.5	25.8	24112	
1	1003	Alabama	Baldwin County	203360	99527	103833	4.4	83.1	9.5	0.8	...	0.8	1.1	5.6	27.0	89527	
2	1007	Alabama	Bibb County	22580	12251	10329	2.4	74.6	22.0	0.4	...	0.3	1.7	1.5	30.0	8171	
3	1009	Alabama	Blount County	57667	28490	29177	9.0	87.4	1.5	0.3	...	0.4	0.4	2.1	35.0	21380	
4	1011	Alabama	Bullock County	10478	5616	4862	0.3	21.6	75.6	1.0	...	6.2	1.7	3.0	29.8	4290	

5 rows × 37 columns

In [7]:
```
#no.of variables
census_data.shape
```

Out[7]:
```
(2427, 37)
```

In [8]:
```
#type of variables
census_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2427 entries, 0 to 2426
Data columns (total 37 columns):
CountyId            2427 non-null int64
State               2427 non-null object
County              2427 non-null object
TotalPop            2427 non-null int64
Men                 2427 non-null int64
Women               2427 non-null int64
Hispanic            2427 non-null float64
White               2427 non-null float64
Black               2427 non-null float64
Native              2427 non-null float64
Asian               2427 non-null float64
Pacific             2427 non-null float64
VotingAgeCitizen    2427 non-null int64
Income              2427 non-null int64
IncomeErr           2427 non-null int64
IncomePerCap        2427 non-null int64
IncomePerCapErr     2427 non-null int64
Poverty             2427 non-null float64
ChildPoverty        2426 non-null float64
Professional        2427 non-null float64
Service             2427 non-null float64
Office              2427 non-null float64
Construction        2427 non-null float64
Production          2427 non-null float64
Drive               2427 non-null float64
Carpool             2427 non-null float64
Transit             2427 non-null float64
Walk                2427 non-null float64
OtherTransp         2427 non-null float64
WorkAtHome          2427 non-null float64
MeanCommute         2427 non-null float64
Employed            2427 non-null int64
PrivateWork         2427 non-null float64
PublicWork          2427 non-null float64
SelfEmployed        2427 non-null float64
FamilyWork          2427 non-null float64
Unemployment        2427 non-null float64
dtypes: float64(25), int64(10), object(2)
memory usage: 701.7+ KB
```

In [9]:
```
#Irrelevant & Redundant attributes
census_data = census_data.drop(['IncomeErr', 'IncomePerCapErr'], axis=1)
census_data.head()
```

Out[9]:

	CountyId	State	County	TotalPop	Men	Women	Hispanic	White	Black	Native	...	Walk	OtherTransp	WorkAtHome	MeanCommute	Employed	Privat
0	1001	Alabama	Autauga County	55036	26899	28137	2.7	75.4	18.9	0.3	...	0.6	1.3	2.5	25.8	24112	
1	1003	Alabama	Baldwin County	203360	99527	103833	4.4	83.1	9.5	0.8	...	0.8	1.1	5.6	27.0	89527	
2	1007	Alabama	Bibb County	22580	12251	10329	2.4	74.6	22.0	0.4	...	0.3	1.7	1.5	30.0	8171	
3	1009	Alabama	Blount County	57667	28490	29177	9.0	87.4	1.5	0.3	...	0.4	0.4	2.1	35.0	21380	
4	1011	Alabama	Bullock County	10478	5616	4862	0.3	21.6	75.6	1.0	...	6.2	1.7	3.0	29.8	4290	

5 rows × 35 columns

In [10]:

```
# Count missing values
num_rows = census_data.shape[0]
print(num_rows - census_data.count())
```

```
CountyId            0
State               0
County              0
TotalPop            0
Men                 0
Women               0
Hispanic            0
White               0
Black               0
Native              0
Asian               0
Pacific             0
VotingAgeCitizen    0
Income              0
IncomePerCap        0
Poverty             0
ChildPoverty        1
Professional        0
Service             0
Office              0
Construction        0
Production          0
Drive               0
Carpool             0
Transit             0
Walk                0
OtherTransp         0
WorkAtHome          0
MeanCommute         0
Employed            0
PrivateWork         0
PublicWork          0
SelfEmployed        0
FamilyWork          0
Unemployment        0
dtype: int64
```

In [11]:

```
#Fill the NA value in 'ChildPoverty' column to 0
census_data['ChildPoverty'] = census_data['ChildPoverty'].fillna(0)
```

In [12]:

```
#Convert men & women columns to percent women
census_data['TotalPop'] = census_data['TotalPop'].astype(float)
census_data['Women'] = census_data['Women'].astype(float)
```

In [13]:

```
census_data['Percent_Women'] = (census_data['Women'] / census_data['TotalPop']) *100
census_data.head()
```

Out[13]:

	CountyId	State	County	TotalPop	Men	Women	Hispanic	White	Black	Native	...	OtherTransp	WorkAtHome	MeanCommute	Employed	PrivateWor
0	1001	Alabama	Autauga County	55036.0	26899	28137.0	2.7	75.4	18.9	0.3	...	1.3	2.5	25.8	24112	74.
1	1003	Alabama	Baldwin County	203360.0	99527	103833.0	4.4	83.1	9.5	0.8	...	1.1	5.6	27.0	89527	80.
2	1007	Alabama	Bibb County	22580.0	12251	10329.0	2.4	74.6	22.0	0.4	...	1.7	1.5	30.0	8171	76.
3	1009	Alabama	Blount County	57667.0	28490	29177.0	9.0	87.4	1.5	0.3	...	0.4	2.1	35.0	21380	83.
4	1011	Alabama	Bullock County	10478.0	5616	4862.0	0.3	21.6	75.6	1.0	...	1.7	3.0	29.8	4290	81.

5 rows × 36 columns

In [14]:

```
#drop men & women columns
census_data = census_data.drop(['Men', 'Women'], axis=1)
census_data.head()
```

Out[14]:

	CountyId	State	County	TotalPop	Hispanic	White	Black	Native	Asian	Pacific	...	OtherTransp	WorkAtHome	MeanCommute	Employed	PrivateWork
0	1001	Alabama	Autauga County	55036.0	2.7	75.4	18.9	0.3	0.9	0.0	...	1.3	2.5	25.8	24112	74.1
1	1003	Alabama	Baldwin County	203360.0	4.4	83.1	9.5	0.8	0.7	0.0	...	1.1	5.6	27.0	89527	80.7
2	1007	Alabama	Bibb County	22580.0	2.4	74.6	22.0	0.4	0.0	0.0	...	1.7	1.5	30.0	8171	76.0
3	1009	Alabama	Blount County	57667.0	9.0	87.4	1.5	0.3	0.1	0.0	...	0.4	2.1	35.0	21380	83.9
4	1011	Alabama	Bullock County	10478.0	0.3	21.6	75.6	1.0	0.7	0.0	...	1.7	3.0	29.8	4290	81.4

5 rows × 34 columns

In [15]:

```
#drop % Pacific - lot of zeros(Other related columns have necessary data)
census_data = census_data.drop(['Pacific'], axis=1)
census_data.head()
```

Out[15]:

	CountyId	State	County	TotalPop	Hispanic	White	Black	Native	Asian	VotingAgeCitizen	...	OtherTransp	WorkAtHome	MeanCommute	Employed	Priv
0	1001	Alabama	Autauga County	55036.0	2.7	75.4	18.9	0.3	0.9	41016	...	1.3	2.5	25.8	24112	
1	1003	Alabama	Baldwin County	203360.0	4.4	83.1	9.5	0.8	0.7	155376	...	1.1	5.6	27.0	89527	
2	1007	Alabama	Bibb County	22580.0	2.4	74.6	22.0	0.4	0.0	17662	...	1.7	1.5	30.0	8171	
3	1009	Alabama	Blount County	57667.0	9.0	87.4	1.5	0.3	0.1	42513	...	0.4	2.1	35.0	21380	
4	1011	Alabama	Bullock County	10478.0	0.3	21.6	75.6	1.0	0.7	8212	...	1.7	3.0	29.8	4290	

5 rows × 33 columns

In [16]:

```
#drop Transit & FamilyWork - lot of zeros(Other related columns have necessary data)
census_data = census_data.drop(['Transit', 'FamilyWork'], axis=1)
census_data.head()
```

Out[16]:

	CountyId	State	County	TotalPop	Hispanic	White	Black	Native	Asian	VotingAgeCitizen	...	Walk	OtherTransp	WorkAtHome	MeanCommute	Employe
0	1001	Alabama	Autauga County	55036.0	2.7	75.4	18.9	0.3	0.9	41016	...	0.6	1.3	2.5	25.8	2411
1	1003	Alabama	Baldwin County	203360.0	4.4	83.1	9.5	0.8	0.7	155376	...	0.8	1.1	5.6	27.0	8952
2	1007	Alabama	Bibb County	22580.0	2.4	74.6	22.0	0.4	0.0	17662	...	0.3	1.7	1.5	30.0	817
3	1009	Alabama	Blount County	57667.0	9.0	87.4	1.5	0.3	0.1	42513	...	0.4	0.4	2.1	35.0	2138
4	1011	Alabama	Bullock County	10478.0	0.3	21.6	75.6	1.0	0.7	8212	...	6.2	1.7	3.0	29.8	429

5 rows × 31 columns

In [17]:

```
#drop Employed column - redundant (We have unemployed %)
census_data = census_data.drop(['Employed'], axis=1)
census_data.head()
```

Out[17]:

	CountyId	State	County	TotalPop	Hispanic	White	Black	Native	Asian	VotingAgeCitizen	...	Carpool	Walk	OtherTransp	WorkAtHome	MeanCommute
0	1001	Alabama	Autauga County	55036.0	2.7	75.4	18.9	0.3	0.9	41016	...	9.6	0.6	1.3	2.5	25.8
1	1003	Alabama	Baldwin County	203360.0	4.4	83.1	9.5	0.8	0.7	155376	...	7.6	0.8	1.1	5.6	27.0
2	1007	Alabama	Bibb County	22580.0	2.4	74.6	22.0	0.4	0.0	17662	...	9.5	0.3	1.7	1.5	30.0
3	1009	Alabama	Blount County	57667.0	9.0	87.4	1.5	0.3	0.1	42513	...	10.2	0.4	0.4	2.1	35.0
4	1011	Alabama	Bullock County	10478.0	0.3	21.6	75.6	1.0	0.7	8212	...	15.7	6.2	1.7	3.0	29.8

5 rows × 30 columns

In [18]:
```
poverty_mean = census_data['Poverty'].mean()
poverty_median = census_data['Poverty'].median()
print(poverty_mean)
print(poverty_median)
```

```
16.691100123609427
15.3
```

In [19]:
```
childPoverty_mean = census_data['ChildPoverty'].mean()
childPoverty_median = census_data['ChildPoverty'].median()
print(childPoverty_mean)
print(childPoverty_median)
```

```
22.929666254635404
21.3
```

In [20]:
```
# Calculate Poverty category variable
census_data['Poverty Category'] = np.where(census_data['Poverty']>poverty_mean, '1', '0')
census_data.head()
```

Out[20]:

	CountyId	State	County	TotalPop	Hispanic	White	Black	Native	Asian	VotingAgeCitizen	...	Walk	OtherTransp	WorkAtHome	MeanCommute	PrivateW
0	1001	Alabama	Autauga County	55036.0	2.7	75.4	18.9	0.3	0.9	41016	...	0.6	1.3	2.5	25.8	
1	1003	Alabama	Baldwin County	203360.0	4.4	83.1	9.5	0.8	0.7	155376	...	0.8	1.1	5.6	27.0	
2	1007	Alabama	Bibb County	22580.0	2.4	74.6	22.0	0.4	0.0	17662	...	0.3	1.7	1.5	30.0	
3	1009	Alabama	Blount County	57667.0	9.0	87.4	1.5	0.3	0.1	42513	...	0.4	0.4	2.1	35.0	
4	1011	Alabama	Bullock County	10478.0	0.3	21.6	75.6	1.0	0.7	8212	...	6.2	1.7	3.0	29.8	

5 rows × 31 columns

In [21]:
```
# Calculate Child Poverty category variable
census_data['Child_Poverty Category'] = np.where(census_data['ChildPoverty']>childPoverty_mean, '1', '0')
census_data.head()
```

Out[21]:

	CountyId	State	County	TotalPop	Hispanic	White	Black	Native	Asian	VotingAgeCitizen	...	OtherTransp	WorkAtHome	MeanCommute	PrivateWork	F
0	1001	Alabama	Autauga County	55036.0	2.7	75.4	18.9	0.3	0.9	41016	...	1.3	2.5	25.8	74.1	
1	1003	Alabama	Baldwin County	203360.0	4.4	83.1	9.5	0.8	0.7	155376	...	1.1	5.6	27.0	80.7	
2	1007	Alabama	Bibb County	22580.0	2.4	74.6	22.0	0.4	0.0	17662	...	1.7	1.5	30.0	76.0	
3	1009	Alabama	Blount County	57667.0	9.0	87.4	1.5	0.3	0.1	42513	...	0.4	2.1	35.0	83.9	
4	1011	Alabama	Bullock County	10478.0	0.3	21.6	75.6	1.0	0.7	8212	...	1.7	3.0	29.8	81.4	

5 rows × 32 columns

In [22]:

```
#type of variables
census_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2427 entries, 0 to 2426
Data columns (total 32 columns):
CountyId                  2427 non-null int64
State                     2427 non-null object
County                    2427 non-null object
TotalPop                  2427 non-null float64
Hispanic                  2427 non-null float64
White                     2427 non-null float64
Black                     2427 non-null float64
Native                    2427 non-null float64
Asian                     2427 non-null float64
VotingAgeCitizen          2427 non-null int64
Income                    2427 non-null int64
IncomePerCap              2427 non-null int64
Poverty                   2427 non-null float64
ChildPoverty              2427 non-null float64
Professional              2427 non-null float64
Service                   2427 non-null float64
Office                    2427 non-null float64
Construction              2427 non-null float64
Production                2427 non-null float64
Drive                     2427 non-null float64
Carpool                   2427 non-null float64
Walk                      2427 non-null float64
OtherTransp               2427 non-null float64
WorkAtHome                2427 non-null float64
MeanCommute               2427 non-null float64
PrivateWork               2427 non-null float64
PublicWork                2427 non-null float64
SelfEmployed              2427 non-null float64
Unemployment              2427 non-null float64
Percent_Women             2427 non-null float64
Poverty Category          2427 non-null object
Child_Poverty Category    2427 non-null object
dtypes: float64(24), int64(4), object(4)
memory usage: 606.9+ KB
```

In [23]:

```
#Arranging columns
census_data = census_data[['CountyId', 'State', 'County', 'TotalPop', 'Percent_Women', 'Hispanic', 'White', 'Black', 'Native', 'Asian', 'VotingAgeCitizen', 'Income', 'IncomePerCap', 'Professional', 'Service', 'Office', 'Construction', 'Production', 'Drive', 'Carpool', 'Walk', 'OtherTransp', 'WorkAtHome', 'MeanCommute', 'PrivateWork', 'PublicWork', 'SelfEmployed', 'Unemployment', 'Poverty', 'ChildPoverty', 'Poverty Category', 'Child_Poverty Category']]
census_data.head()
```

Out[23]:

	CountyId	State	County	TotalPop	Percent_Women	Hispanic	White	Black	Native	Asian	...	WorkAtHome	MeanCommute	PrivateWork	PublicWork	Se
0	1001	Alabama	Autauga County	55036.0	51.124718	2.7	75.4	18.9	0.3	0.9	...	2.5	25.8	74.1	20.2	
1	1003	Alabama	Baldwin County	203360.0	51.058714	4.4	83.1	9.5	0.8	0.7	...	5.6	27.0	80.7	12.9	
2	1007	Alabama	Bibb County	22580.0	45.744021	2.4	74.6	22.0	0.4	0.0	...	1.5	30.0	76.0	17.4	
3	1009	Alabama	Blount County	57667.0	50.595661	9.0	87.4	1.5	0.3	0.1	...	2.1	35.0	83.9	11.9	
4	1011	Alabama	Bullock County	10478.0	46.401985	0.3	21.6	75.6	1.0	0.7	...	3.0	29.8	81.4	13.6	

5 rows × 32 columns

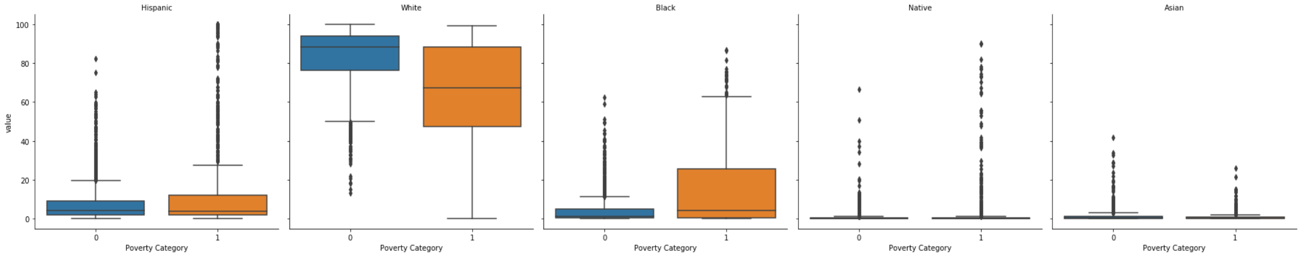
```
In [25]: #Descriptive Statistics
         census_data.describe().transpose()
```

Out[25]:

	count	mean	std	min	25%	50%	75%	max
CountyId	2427.0	31584.119489	16286.815957	1001.000000	19046.000000	30059.000000	47018.000000	7.215300e+04
TotalPop	2427.0	100277.147507	338543.745227	74.000000	11264.000000	25625.000000	66275.000000	1.010572e+07
Percent_Women	2427.0	49.997184	2.338260	19.166215	49.495212	50.432776	51.144426	5.663391e+01
Hispanic	2427.0	11.403296	19.532931	0.000000	2.100000	4.100000	9.900000	9.990000e+01
White	2427.0	74.983890	23.100311	0.000000	63.450000	83.800000	92.800000	1.000000e+02
Black	2427.0	8.547796	14.205141	0.000000	0.500000	1.900000	8.950000	8.690000e+01
Native	2427.0	1.732674	7.250648	0.000000	0.100000	0.300000	0.600000	9.030000e+01
Asian	2427.0	1.282118	2.628246	0.000000	0.200000	0.600000	1.200000	4.180000e+01
VotingAgeCitizen	2427.0	70967.882159	218772.977868	59.000000	8524.000000	19425.000000	50359.000000	6.218279e+06
Income	2427.0	49057.969922	13641.123656	11680.000000	40893.000000	47873.000000	55613.000000	1.175150e+05
IncomePerCap	2427.0	25711.307787	6629.901586	7047.000000	21669.500000	25208.000000	29038.000000	6.952900e+04
Professional	2427.0	31.536259	6.542366	11.400000	27.300000	30.500000	34.900000	6.900000e+01
Service	2427.0	18.133704	3.699940	0.000000	15.700000	17.800000	20.100000	4.640000e+01
Office	2427.0	21.897775	3.181856	4.800000	20.000000	22.100000	23.900000	3.720000e+01
Construction	2427.0	12.625010	4.156398	0.000000	9.800000	12.200000	14.800000	3.640000e+01
Production	2427.0	15.807499	5.846940	0.000000	11.450000	15.100000	19.600000	4.870000e+01
Drive	2427.0	79.589864	7.742675	4.600000	77.250000	81.000000	84.100000	9.720000e+01
Carpool	2427.0	9.842027	2.981947	0.000000	8.000000	9.500000	11.200000	2.930000e+01
Walk	2427.0	3.271240	3.941989	0.000000	1.400000	2.300000	3.900000	5.920000e+01
OtherTransp	2427.0	1.622744	1.758607	0.000000	0.850000	1.300000	1.900000	4.320000e+01
WorkAtHome	2427.0	4.736918	3.062729	0.000000	2.900000	4.100000	5.700000	2.960000e+01
MeanCommute	2427.0	23.479810	5.699332	5.100000	19.600000	23.200000	26.900000	4.510000e+01
PrivateWork	2427.0	74.883024	7.528646	31.100000	71.200000	76.100000	80.200000	8.880000e+01
PublicWork	2427.0	17.012320	6.274180	5.500000	12.700000	15.800000	19.850000	6.480000e+01
SelfEmployed	2427.0	7.832550	3.850969	0.000000	5.300000	6.900000	9.300000	3.680000e+01
Unemployment	2427.0	6.637495	3.820341	0.000000	4.400000	6.100000	7.900000	4.090000e+01
Poverty	2427.0	16.691100	8.271944	2.800000	11.300000	15.300000	19.800000	6.520000e+01
ChildPoverty	2427.0	22.929666	11.841825	0.000000	14.900000	21.300000	28.700000	8.280000e+01

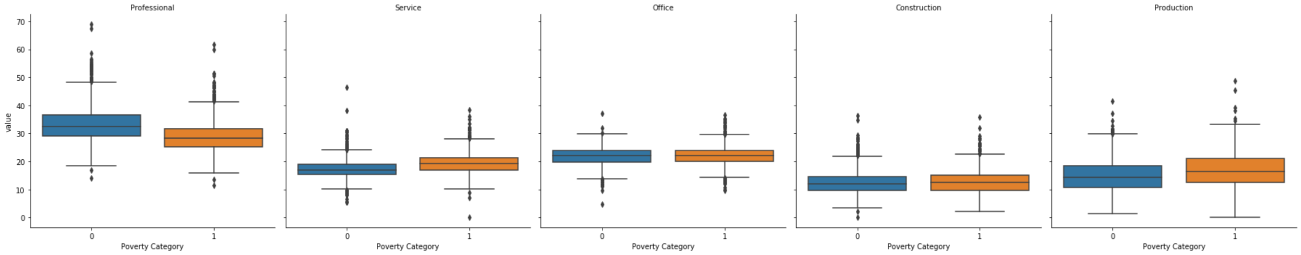
```
In [26]: df_race_melt = census_data.melt(id_vars = 'Poverty Category',
                           value_vars = ['Hispanic',
                                         'White',
                                         'Black',
                                         'Native',
                                         'Asian'],
                           var_name = 'columns')
```

```
In [27]: a = sns.catplot(data = df_race_melt,
                            x = 'Poverty Category',
                            y = 'value',
                            kind = 'box', # type of plot
                            col = 'columns',
                            col_order = ['Hispanic', #order of boxplots
                                         'White',
                                         'Black',
                                         'Native',
                                         'Asian']).set_titles('{col_name}') # remove 'column = ' part of title
         plt.show()
```



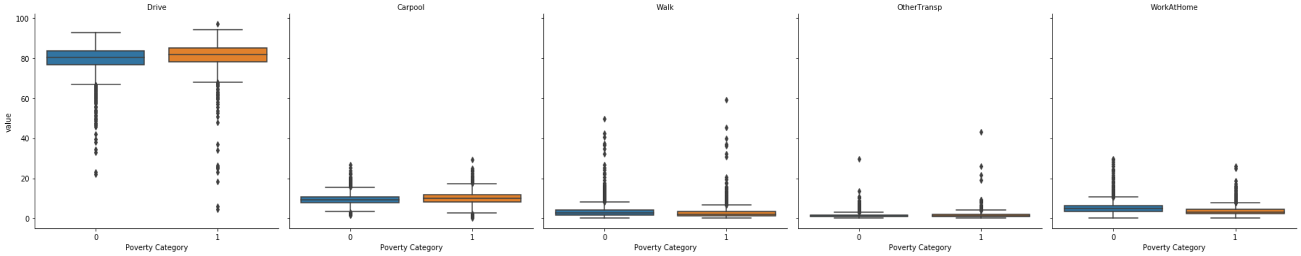
In [28]:
```
df_occp_melt = census_data.melt(id_vars = 'Poverty Category',
                  value_vars = ['Professional',
                                'Service',
                                'Office',
                                'Construction',
                                'Production'],
                  var_name = 'columns')
```

In [29]:
```
a = sns.catplot(data = df_occp_melt,
                   x = 'Poverty Category',
                   y = 'value',
                   kind = 'box', # type of plot
                   col = 'columns',
                   col_order = ['Professional', #order of boxplots
                                'Service',
                                'Office',
                                'Construction',
                                'Production']).set_titles('{col_name}') # remove 'column = ' part of title
plt.show()
```



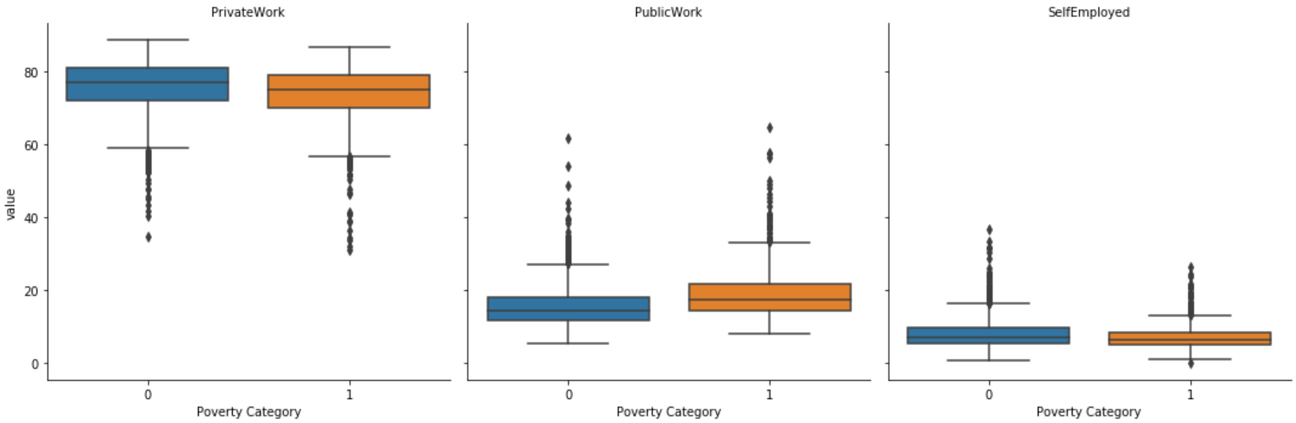
In [30]:
```
df_trans_melt = census_data.melt(id_vars = 'Poverty Category',
                  value_vars = ['Drive',
                                'Carpool',
                                'Walk',
                                'OtherTransp',
                                'WorkAtHome'],
                  var_name = 'columns')
```

In [31]:
```
a = sns.catplot(data = df_trans_melt,
                   x = 'Poverty Category',
                   y = 'value',
                   kind = 'box', # type of plot
                   col = 'columns',
                   col_order = ['Drive', #order of boxplots
                                'Carpool',
                                'Walk',
                                'OtherTransp',
                                'WorkAtHome']).set_titles('{col_name}') # remove 'column = ' part of title
plt.show()
```



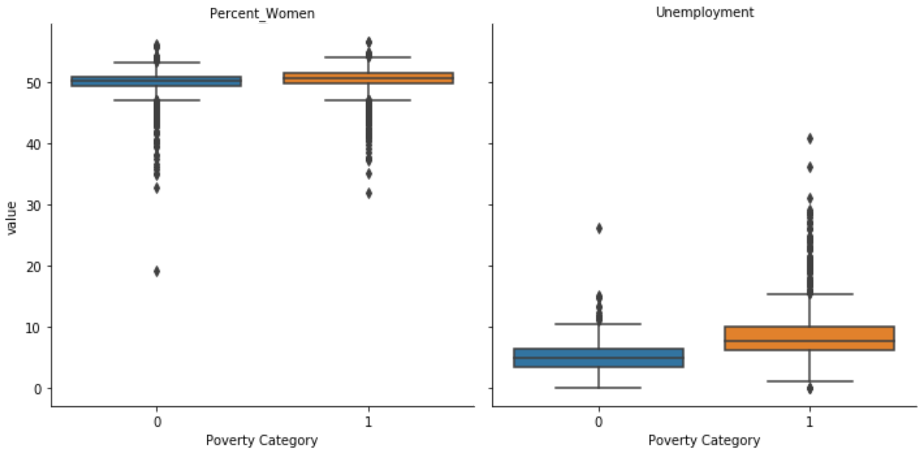
In [32]:
```
df_work_melt = census_data.melt(id_vars = 'Poverty Category',
                  value_vars = ['PrivateWork',
                                'PublicWork',
                                'SelfEmployed'],
                  var_name = 'columns')
```

```
In [33]: a = sns.catplot(data = df_work_melt,
                         x = 'Poverty Category',
                         y = 'value',
                         kind = 'box', # type of plot
                         col = 'columns',
                         col_order = ['PrivateWork', #order of boxplots
                                      'PublicWork',
                                      'SelfEmployed']).set_titles('{col_name}') # remove 'column = ' part of title
         plt.show()
```

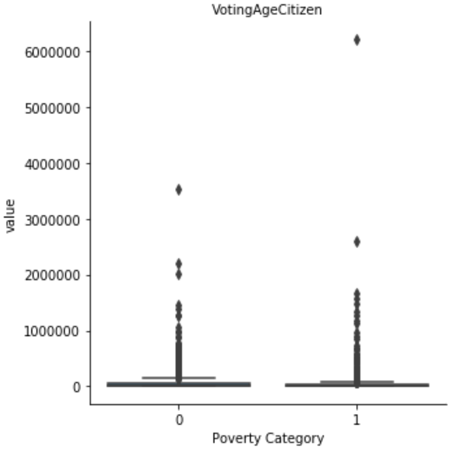


```
In [34]: df_factors_melt = census_data.melt(id_vars = 'Poverty Category',
                                    value_vars = ['Percent_Women',
                                                  'Unemployment'],
                                    var_name = 'columns')
```

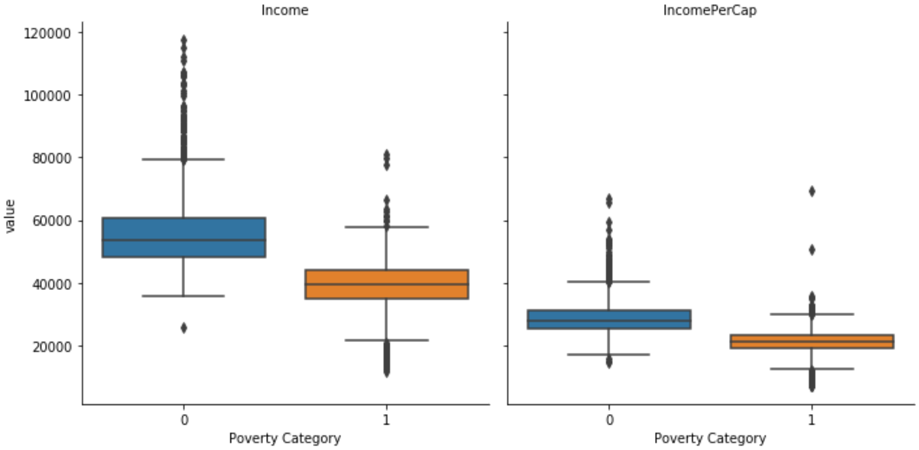
```
In [35]: a = sns.catplot(data = df_factors_melt,
                         x = 'Poverty Category',
                         y = 'value',
                         kind = 'box', # type of plot
                         col = 'columns',
                         col_order = ['Percent_Women', #order of boxplots
                                      'Unemployment']).set_titles('{col_name}') # remove 'column = ' part of title
         plt.show()
```



```
In [36]: df_citizen_melt = census_data.melt(id_vars = 'Poverty Category',
                            value_vars = ['VotingAgeCitizen'],
                            var_name = 'columns')
         a = sns.catplot(data = df_citizen_melt,
                             x = 'Poverty Category',
                             y = 'value',
                             kind = 'box', # type of plot
                             col = 'columns',
                             col_order = ['VotingAgeCitizen']).set_titles('{col_name}') # remove 'column = ' part of title
         plt.show()
```



```
In [37]: df_income_melt = census_data.melt(id_vars = 'Poverty Category',
                            value_vars = ['Income',
                                          'IncomePerCap'],
                            var_name = 'columns')
         a = sns.catplot(data = df_income_melt,
                             x = 'Poverty Category',
                             y = 'value',
                             kind = 'box', # type of plot
                             col = 'columns',
                             col_order = ['Income',
                                          'IncomePerCap']).set_titles('{col_name}') # remove 'column = ' part of title
         plt.show()
```



In [38]:
```
#drop Native, Asian - Not important
census_data = census_data.drop(['Native', 'Asian'], axis=1)
census_data.head()
```

Out[38]:

	CountyId	State	County	TotalPop	Percent_Women	Hispanic	White	Black	VotingAgeCitizen	Income	...	WorkAtHome	MeanCommute	PrivateWork	Pub
0	1001	Alabama	Autauga County	55036.0	51.124718	2.7	75.4	18.9	41016	55317	...	2.5	25.8	74.1	
1	1003	Alabama	Baldwin County	203360.0	51.058714	4.4	83.1	9.5	155376	52562	...	5.6	27.0	80.7	
2	1007	Alabama	Bibb County	22580.0	45.744021	2.4	74.6	22.0	17662	43404	...	1.5	30.0	76.0	
3	1009	Alabama	Blount County	57667.0	50.595661	9.0	87.4	1.5	42513	47412	...	2.1	35.0	83.9	
4	1011	Alabama	Bullock County	10478.0	46.401985	0.3	21.6	75.6	8212	29655	...	3.0	29.8	81.4	

5 rows × 30 columns

In [39]:
```
#drop Office, Construction - Not important
census_data = census_data.drop(['Office', 'Construction'], axis=1)
census_data.head()
```

Out[39]:

	CountyId	State	County	TotalPop	Percent_Women	Hispanic	White	Black	VotingAgeCitizen	Income	...	WorkAtHome	MeanCommute	PrivateWork	Pub
0	1001	Alabama	Autauga County	55036.0	51.124718	2.7	75.4	18.9	41016	55317	...	2.5	25.8	74.1	
1	1003	Alabama	Baldwin County	203360.0	51.058714	4.4	83.1	9.5	155376	52562	...	5.6	27.0	80.7	
2	1007	Alabama	Bibb County	22580.0	45.744021	2.4	74.6	22.0	17662	43404	...	1.5	30.0	76.0	
3	1009	Alabama	Blount County	57667.0	50.595661	9.0	87.4	1.5	42513	47412	...	2.1	35.0	83.9	
4	1011	Alabama	Bullock County	10478.0	46.401985	0.3	21.6	75.6	8212	29655	...	3.0	29.8	81.4	

5 rows × 28 columns

In [40]:
```
#drop Drive, Walk, OtherTransp - Not important
census_data = census_data.drop(['Drive', 'Walk', 'OtherTransp'], axis=1)
census_data.head()
```

Out[40]:

	CountyId	State	County	TotalPop	Percent_Women	Hispanic	White	Black	VotingAgeCitizen	Income	...	WorkAtHome	MeanCommute	PrivateWork	Pub
0	1001	Alabama	Autauga County	55036.0	51.124718	2.7	75.4	18.9	41016	55317	...	2.5	25.8	74.1	
1	1003	Alabama	Baldwin County	203360.0	51.058714	4.4	83.1	9.5	155376	52562	...	5.6	27.0	80.7	
2	1007	Alabama	Bibb County	22580.0	45.744021	2.4	74.6	22.0	17662	43404	...	1.5	30.0	76.0	
3	1009	Alabama	Blount County	57667.0	50.595661	9.0	87.4	1.5	42513	47412	...	2.1	35.0	83.9	
4	1011	Alabama	Bullock County	10478.0	46.401985	0.3	21.6	75.6	8212	29655	...	3.0	29.8	81.4	

5 rows × 25 columns

In [41]:
```
#drop VotingAgeCitizen- Not important
census_data = census_data.drop(['VotingAgeCitizen'], axis=1)
census_data.head()
```

Out[41]:

	CountyId	State	County	TotalPop	Percent_Women	Hispanic	White	Black	Income	IncomePerCap	...	WorkAtHome	MeanCommute	PrivateWork	Public
0	1001	Alabama	Autauga County	55036.0	51.124718	2.7	75.4	18.9	55317	27824	...	2.5	25.8	74.1	
1	1003	Alabama	Baldwin County	203360.0	51.058714	4.4	83.1	9.5	52562	29364	...	5.6	27.0	80.7	
2	1007	Alabama	Bibb County	22580.0	45.744021	2.4	74.6	22.0	43404	20911	...	1.5	30.0	76.0	
3	1009	Alabama	Blount County	57667.0	50.595661	9.0	87.4	1.5	47412	22021	...	2.1	35.0	83.9	
4	1011	Alabama	Bullock County	10478.0	46.401985	0.3	21.6	75.6	29655	20856	...	3.0	29.8	81.4	

5 rows × 24 columns

In [42]:
```
#Inter-quartile range for data
Q1 = census_data.quantile(0.25)
Q3 = census_data.quantile(0.75)
IQR = Q3 - Q1
```

In [43]:
```
#Information about outliers for each column
((census_data < (Q1 - 1.5 * IQR)) | (census_data > (Q3 + 1.5 * IQR))).sum()
```

Out[43]:
```
Black                     341
Carpool                   108
ChildPoverty               83
Child_Poverty Category      0
County                      0
CountyId                    0
Hispanic                  319
Income                    131
IncomePerCap              112
MeanCommute                36
Percent_Women             215
Poverty                   100
Poverty Category            0
PrivateWork                72
Production                 14
Professional               76
PublicWork                 82
SelfEmployed              118
Service                    71
State                       0
TotalPop                  326
Unemployment              112
White                      97
WorkAtHome                122
dtype: int64
```

In [44]:
```
census_data.to_csv("train_dp_output.csv")
census_data
```

Out[44]:

	CountyId	State	County	TotalPop	Percent_Women	Hispanic	White	Black	Income	IncomePerCap	...	WorkAtHome	MeanCommute	PrivateWork	F
0	1001	Alabama	Autauga County	55036.0	51.124718	2.7	75.4	18.9	55317	27824	...	2.5	25.8	74.1	
1	1003	Alabama	Baldwin County	203360.0	51.058714	4.4	83.1	9.5	52562	29364	...	5.6	27.0	80.7	
2	1007	Alabama	Bibb County	22580.0	45.744021	2.4	74.6	22.0	43404	20911	...	1.5	30.0	76.0	
3	1009	Alabama	Blount County	57667.0	50.595661	9.0	87.4	1.5	47412	22021	...	2.1	35.0	83.9	
4	1011	Alabama	Bullock County	10478.0	46.401985	0.3	21.6	75.6	29655	20856	...	3.0	29.8	81.4	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2422	72143	Puerto Rico	Vega Alta Municipio	38589.0	52.393169	98.6	0.9	0.0	18053	10492	...	1.8	33.9	77.0	
2423	72145	Puerto Rico	Vega Baja Municipio	54754.0	52.023596	96.7	3.1	0.1	18900	10197	...	0.9	31.6	76.2	
2424	72147	Puerto Rico	Vieques Municipio	8931.0	51.282051	95.7	4.0	0.0	16261	11136	...	1.7	14.9	40.7	
2425	72149	Puerto Rico	Villalba Municipio	23659.0	51.350437	99.7	0.2	0.1	19893	10449	...	2.8	28.4	59.2	
2426	72153	Puerto Rico	Yauco Municipio	37585.0	51.970201	99.8	0.2	0.0	14451	8124	...	5.0	24.4	66.4	

2427 rows × 24 columns

In [ ]:

In [ ]:

In [ ]:

In [ ]: