In [1]:
```
import pandas as pd
```

In [2]:
```
pd.__version__
```

Out[2]:
```
'2.2.2'
```

In [3]:
```
df = pd.read_csv(r"C:\Users\Lenovo\Downloads\dataset.csv")
```

In [4]:
```
df
```

Out[4]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
0	Aruba	ABW	10.244	78.9	High income
1	Afghanistan	AFG	35.253	5.9	Low income
2	Angola	AGO	45.985	19.1	Upper middle income
3	Albania	ALB	12.877	57.2	Upper middle income
4	United Arab Emirates	ARE	11.044	88.0	High income
...	...	...	...	...	...
190	Yemen, Rep.	YEM	32.947	20.0	Lower middle income
191	South Africa	ZAF	20.850	46.5	Upper middle income
192	Congo, Dem. Rep.	COD	42.394	2.2	Low income
193	Zambia	ZMB	40.471	15.4	Lower middle income
194	Zimbabwe	ZWE	35.715	18.5	Low income

195 rows × 5 columns

In [5]:
```
id(df)
```

Out[5]:
```
2482609976480
```

In [6]:
```
len(df)
```

Out[6]:
```
195
```

In [7]:
```
df.columns
```

Out[7]:
```
Index(['CountryName', 'CountryCode', 'BirthRate', 'InternetUsers',
       'IncomeGroup'],
      dtype='object')
```

In [8]:
```
len(df.columns)
```

Out[8]: 5

In [9]:
```
df.isnull()
```

Out[9]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
0	False	False	False	False	False
1	False	False	False	False	False
2	False	False	False	False	False
3	False	False	False	False	False
4	False	False	False	False	False
...	...	...	...	...	...
190	False	False	False	False	False
191	False	False	False	False	False
192	False	False	False	False	False
193	False	False	False	False	False
194	False	False	False	False	False

195 rows × 5 columns

In [10]:
```
df.isna()
```

Out[10]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
0	False	False	False	False	False
1	False	False	False	False	False
2	False	False	False	False	False
3	False	False	False	False	False
4	False	False	False	False	False
...	...	...	...	...	...
190	False	False	False	False	False
191	False	False	False	False	False
192	False	False	False	False	False
193	False	False	False	False	False
194	False	False	False	False	False

195 rows × 5 columns

In [11]:
```
df.isnull().sum()
```

Out[11]:
```
CountryName      0
CountryCode      0
BirthRate        0
InternetUsers    0
IncomeGroup      0
dtype: int64
```

In [12]:
```
df.isna().sum()
```

Out[12]:
```
CountryName      0
CountryCode      0
BirthRate        0
InternetUsers    0
IncomeGroup      0
dtype: int64
```

In [13]:
```
df.head()
```

Out[13]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
0	Aruba	ABW	10.244	78.9	High income
1	Afghanistan	AFG	35.253	5.9	Low income
2	Angola	AGO	45.985	19.1	Upper middle income
3	Albania	ALB	12.877	57.2	Upper middle income
4	United Arab Emirates	ARE	11.044	88.0	High income

In [14]:
```
df.tail()
```

Out[14]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
190	Yemen, Rep.	YEM	32.947	20.0	Lower middle income
191	South Africa	ZAF	20.850	46.5	Upper middle income
192	Congo, Dem. Rep.	COD	42.394	2.2	Low income
193	Zambia	ZMB	40.471	15.4	Lower middle income
194	Zimbabwe	ZWE	35.715	18.5	Low income

In [15]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 195 entries, 0 to 194
Data columns (total 5 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   CountryName    195 non-null    object 
 1   CountryCode    195 non-null    object 
 2   BirthRate      195 non-null    float64
 3   InternetUsers  195 non-null    float64
 4   IncomeGroup    195 non-null    object 
dtypes: float64(2), object(3)
memory usage: 7.7+ KB
```

In [16]:
```
df[:]
```

Out[16]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
0	Aruba	ABW	10.244	78.9	High income
1	Afghanistan	AFG	35.253	5.9	Low income
2	Angola	AGO	45.985	19.1	Upper middle income
3	Albania	ALB	12.877	57.2	Upper middle income
4	United Arab Emirates	ARE	11.044	88.0	High income
...	...	...	...	...	...
190	Yemen, Rep.	YEM	32.947	20.0	Lower middle income
191	South Africa	ZAF	20.850	46.5	Upper middle income
192	Congo, Dem. Rep.	COD	42.394	2.2	Low income
193	Zambia	ZMB	40.471	15.4	Lower middle income
194	Zimbabwe	ZWE	35.715	18.5	Low income

195 rows × 5 columns

In [17]:
```
df[1:10]
```

Out[17]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
1	Afghanistan	AFG	35.253	5.9000	Low income
2	Angola	AGO	45.985	19.1000	Upper middle income
3	Albania	ALB	12.877	57.2000	Upper middle income
4	United Arab Emirates	ARE	11.044	88.0000	High income
5	Argentina	ARG	17.716	59.9000	High income
6	Armenia	ARM	13.308	41.9000	Lower middle income
7	Antigua and Barbuda	ATG	16.447	63.4000	High income
8	Australia	AUS	13.200	83.0000	High income
9	Austria	AUT	9.400	80.6188	High income

In [18]:
```
df[100:195]
```

Out[18]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
100	Libya	LBY	21.425	16.5	Upper middle income
101	St. Lucia	LCA	15.430	46.2	Upper middle income
102	Liechtenstein	LIE	9.200	93.8	High income
103	Sri Lanka	LKA	17.863	21.9	Lower middle income
104	Lesotho	LSO	28.738	5.0	Lower middle income
...	...	...	...	...	...
190	Yemen, Rep.	YEM	32.947	20.0	Lower middle income
191	South Africa	ZAF	20.850	46.5	Upper middle income
192	Congo, Dem. Rep.	COD	42.394	2.2	Low income
193	Zambia	ZMB	40.471	15.4	Lower middle income
194	Zimbabwe	ZWE	35.715	18.5	Low income

95 rows × 5 columns

In [19]:
```
df[1:190:10]
```

Out[19]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
1	Afghanistan	AFG	35.253	5.9000	Low income
11	Burundi	BDI	44.151	1.3000	Low income
21	Belize	BLZ	23.092	33.6000	Upper middle income
31	Switzerland	CHE	10.200	86.3400	High income
41	Cuba	CUB	10.400	27.9300	Upper middle income
51	Egypt, Arab Rep.	EGY	28.032	29.4000	Lower middle income
61	United Kingdom	GBR	12.200	89.8441	High income
71	Guatemala	GTM	27.465	19.7000	Lower middle income
81	Ireland	IRL	15.000	78.2477	High income
91	Kenya	KEN	35.194	39.0000	Lower middle income
101	St. Lucia	LCA	15.430	46.2000	Upper middle income
111	Madagascar	MDG	34.686	3.0000	Low income
121	Mauritania	MRT	33.801	6.2000	Lower middle income
131	Norway	NOR	11.600	95.0534	High income
141	Puerto Rico	PRI	10.800	73.9000	High income
151	Senegal	SEN	38.533	13.1000	Lower middle income
161	Slovak Republic	SVK	10.100	77.8826	High income
171	Turkmenistan	TKM	21.322	9.6000	Upper middle income
181	United States	USA	12.500	84.2000	High income

In [20]:
```
df.head(2)
```

Out[20]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
0	Aruba	ABW	10.244	78.9	High income
1	Afghanistan	AFG	35.253	5.9	Low income

In [21]:
```
df.describe()
```

Out[21]:

	BirthRate	InternetUsers
count	195.000000	195.000000
mean	21.469928	42.076471
std	10.605467	29.030788
min	7.900000	0.900000
25%	12.120500	14.520000
50%	19.680000	41.000000
75%	29.759500	66.225000
max	49.661000	96.546800

In [22]:
```
df['CountryName']
```

Out[22]:
```
0                    Aruba
1              Afghanistan
2                   Angola
3                  Albania
4      United Arab Emirates
               ...
190             Yemen, Rep.
191            South Africa
192       Congo, Dem. Rep.
193                  Zambia
194                Zimbabwe
Name: CountryName, Length: 195, dtype: object
```

In [23]:
```
df['IncomeGroup']
```

Out[23]:
```
0             High income
1              Low income
2      Upper middle income
3      Upper middle income
4             High income
              ...
190    Lower middle income
191    Upper middle income
192             Low income
193    Lower middle income
194             Low income
Name: IncomeGroup, Length: 195, dtype: object
```

In [24]:
```
df['BirthRate']
```

Out[24]:
```
0      10.244
1      35.253
2      45.985
3      12.877
4      11.044
        ...
190    32.947
191    20.850
192    42.394
193    40.471
194    35.715
Name: BirthRate, Length: 195, dtype: float64
```

In [25]:
```
df[['CountryName','CountryCode','BirthRate']]
```

Out[25]:

	CountryName	CountryCode	BirthRate
0	Aruba	ABW	10.244
1	Afghanistan	AFG	35.253
2	Angola	AGO	45.985
3	Albania	ALB	12.877
4	United Arab Emirates	ARE	11.044
...	...	...	...
190	Yemen, Rep.	YEM	32.947
191	South Africa	ZAF	20.850
192	Congo, Dem. Rep.	COD	42.394
193	Zambia	ZMB	40.471
194	Zimbabwe	ZWE	35.715

195 rows × 3 columns

In [26]:
```
df_cat = df[['CountryName','CountryCode','IncomeGroup']]
df_cat
```

Out[26]:

	CountryName	CountryCode	IncomeGroup
0	Aruba	ABW	High income
1	Afghanistan	AFG	Low income
2	Angola	AGO	Upper middle income
3	Albania	ALB	Upper middle income
4	United Arab Emirates	ARE	High income
...	...	...	...
190	Yemen, Rep.	YEM	Lower middle income
191	South Africa	ZAF	Upper middle income
192	Congo, Dem. Rep.	COD	Low income
193	Zambia	ZMB	Lower middle income
194	Zimbabwe	ZWE	Low income

195 rows × 3 columns

In [27]:
```
print(len(df.columns))
print(len(df_cat.columns))
```

```
5
3
```

In [28]:
```
print(df.columns)
```

```
Index(['CountryName', 'CountryCode', 'BirthRate', 'InternetUsers',
       'IncomeGroup'],
      dtype='object')
```

In [29]:
```
print(df_cat.columns)
```

```
Index(['CountryName', 'CountryCode', 'IncomeGroup'], dtype='object')
```

In [30]:
```
df_cat.describe()
```

Out[30]:

	CountryName	CountryCode	IncomeGroup
count	195	195	195
unique	195	195	4
top	Aruba	ABW	High income
freq	1	1	67

In [31]:
```
df_num = df[['BirthRate','InternetUsers']]
df_num
```

Out[31]:

	BirthRate	InternetUsers
0	10.244	78.9
1	35.253	5.9
2	45.985	19.1
3	12.877	57.2
4	11.044	88.0
...	...	...
190	32.947	20.0
191	20.850	46.5
192	42.394	2.2
193	40.471	15.4
194	35.715	18.5

195 rows × 2 columns

In [32]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 195 entries, 0 to 194
Data columns (total 5 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   CountryName    195 non-null    object 
 1   CountryCode    195 non-null    object 
 2   BirthRate      195 non-null    float64
 3   InternetUsers  195 non-null    float64
 4   IncomeGroup    195 non-null    object 
dtypes: float64(2), object(3)
memory usage: 7.7+ KB
```

In [33]:
```
df_cat.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 195 entries, 0 to 194
Data columns (total 3 columns):
 #   Column       Non-Null Count  Dtype 
---  ------       --------------  ----- 
 0   CountryName  195 non-null    object
 1   CountryCode  195 non-null    object
 2   IncomeGroup  195 non-null    object
dtypes: object(3)
memory usage: 4.7+ KB
```

In [34]:
```
df_num.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 195 entries, 0 to 194
Data columns (total 2 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   BirthRate      195 non-null    float64
 1   InternetUsers  195 non-null    float64
dtypes: float64(2)
memory usage: 3.2 KB
```

In [35]:
```
df.describe()
```

Out[35]:

	BirthRate	InternetUsers
count	195.000000	195.000000
mean	21.469928	42.076471
std	10.605467	29.030788
min	7.900000	0.900000
25%	12.120500	14.520000
50%	19.680000	41.000000
75%	29.759500	66.225000
max	49.661000	96.546800

In [36]:
```
df.describe().transpose()
```

Out[36]:

	count	mean	std	min	25%	50%	75%	max
BirthRate	195.0	21.469928	10.605467	7.9	12.1205	19.68	29.7595	49.6610
InternetUsers	195.0	42.076471	29.030788	0.9	14.5200	41.00	66.2250	96.5468

In [37]:
```
df.describe().T
```

Out[37]:

	count	mean	std	min	25%	50%	75%	max
BirthRate	195.0	21.469928	10.605467	7.9	12.1205	19.68	29.7595	49.6610
InternetUsers	195.0	42.076471	29.030788	0.9	14.5200	41.00	66.2250	96.5468

In [38]:
```
df.columns
```

Out[38]:
```
Index(['CountryName', 'CountryCode', 'BirthRate', 'InternetUsers',
       'IncomeGroup'],
      dtype='object')
```

In [39]:
```
df.columns = ['A','B','C','D','E']
df.columns
```

Out[39]:
```
Index(['A', 'B', 'C', 'D', 'E'], dtype='object')
```

In [40]:
```
df.columns = ['CountryName','CountryCode','BirthRate','InternetUsers','IncomeGro
df.columns
```

Out[40]:
```
Index(['CountryName', 'CountryCode', 'BirthRate', 'InternetUsers',
       'IncomeGroup'],
      dtype='object')
```

In [41]:
```
df.head(1)
```

Out[41]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
0	Aruba	ABW	10.244	78.9	High income

In [42]:
```
df[['CountryCode','BirthRate','InternetUsers']][4:8]
```

Out[42]:

	CountryCode	BirthRate	InternetUsers
4	ARE	11.044	88.0
5	ARG	17.716	59.9
6	ARM	13.308	41.9
7	ATG	16.447	63.4

In [43]:
```
df[4:8][['CountryCode','BirthRate','InternetUsers']]
```

Out[43]:

	CountryCode	BirthRate	InternetUsers
4	ARE	11.044	88.0
5	ARG	17.716	59.9
6	ARM	13.308	41.9
7	ATG	16.447	63.4

In [44]:
```
df.BirthRate * df.InternetUsers
```

Out[44]:
```
0      808.2516
1      207.9927
2      878.3135
3      736.5644
4      971.8720
         ...
190    658.9400
191    969.5250
192     93.2668
193    623.2534
194    660.7275
Length: 195, dtype: float64
```

In [45]:
```
df['Prod'] = df.BirthRate * df.InternetUsers
```

In [46]:
```
df.head()
```

Out[46]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup	Prod
0	Aruba	ABW	10.244	78.9	High income	808.2516
1	Afghanistan	AFG	35.253	5.9	Low income	207.9927
2	Angola	AGO	45.985	19.1	Upper middle income	878.3135
3	Albania	ALB	12.877	57.2	Upper middle income	736.5644
4	United Arab Emirates	ARE	11.044	88.0	High income	971.8720

In [47]:
```
df = df.drop('Prod', axis = 1)
```

In [48]:
```
df.head()
```

Out[48]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
0	Aruba	ABW	10.244	78.9	High income
1	Afghanistan	AFG	35.253	5.9	Low income
2	Angola	AGO	45.985	19.1	Upper middle income
3	Albania	ALB	12.877	57.2	Upper middle income
4	United Arab Emirates	ARE	11.044	88.0	High income

In [49]:
```
df[df.InternetUsers<2]
```

Out[49]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
11	Burundi	BDI	44.151	1.3	Low income
52	Eritrea	ERI	34.800	0.9	Low income
55	Ethiopia	ETH	32.925	1.9	Low income
64	Guinea	GIN	37.337	1.6	Low income
117	Myanmar	MMR	18.119	1.6	Lower middle income
127	Niger	NER	49.661	1.7	Low income
154	Sierra Leone	SLE	36.729	1.7	Low income
156	Somalia	SOM	43.891	1.5	Low income
172	Timor-Leste	TLS	35.755	1.1	Lower middle income

In [50]:
```
len(df[df.InternetUsers<2])
```

Out[50]:
```
9
```

In [51]:
```
df.BirthRate>40
```

Out[51]:
```
0      False
1      False
2       True
3      False
4      False
       ...
190    False
191    False
192     True
193     True
194    False
Name: BirthRate, Length: 195, dtype: bool
```

In [52]:
```
len(df.BirthRate>40)
```

Out[52]:
```
195
```

In [53]:
```
Filter1 = df.InternetUsers<2
```

In [54]:
```
Filter2 = df.BirthRate>40
```

In [55]:
```
df[Filter1 & Filter2]
```

Out[55]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
11	Burundi	BDI	44.151	1.3	Low income
127	Niger	NER	49.661	1.7	Low income
156	Somalia	SOM	43.891	1.5	Low income

In [56]:
```
df[df.IncomeGroup == 'High income']
```

Out[56]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
0	Aruba	ABW	10.244	78.90	High income
4	United Arab Emirates	ARE	11.044	88.00	High income
5	Argentina	ARG	17.716	59.90	High income
7	Antigua and Barbuda	ATG	16.447	63.40	High income
8	Australia	AUS	13.200	83.00	High income
...	...	...	...	...	...
174	Trinidad and Tobago	TTO	14.590	63.80	High income
180	Uruguay	URY	14.374	57.69	High income
181	United States	USA	12.500	84.20	High income
184	Venezuela, RB	VEN	19.842	54.90	High income
185	Virgin Islands (U.S.)	VIR	10.700	45.30	High income

67 rows × 5 columns

In [57]:
```
df[df.IncomeGroup == 'Low income']
```

Out[57]:

	CountryName	CountryCode	BirthRate	InternetUsers	IncomeGroup
1	Afghanistan	AFG	35.253	5.90	Low income
11	Burundi	BDI	44.151	1.30	Low income
13	Benin	BEN	36.440	4.90	Low income
14	Burkina Faso	BFA	40.551	9.10	Low income
29	Central African Republic	CAF	34.076	3.50	Low income
38	Comoros	COM	34.326	6.50	Low income
52	Eritrea	ERI	34.800	0.90	Low income
55	Ethiopia	ETH	32.925	1.90	Low income
64	Guinea	GIN	37.337	1.60	Low income
65	Gambia, The	GMB	42.525	14.00	Low income
66	Guinea-Bissau	GNB	37.503	3.10	Low income
77	Haiti	HTI	25.345	10.60	Low income
93	Cambodia	KHM	24.462	6.80	Low income
99	Liberia	LBR	35.521	3.20	Low income
111	Madagascar	MDG	34.686	3.00	Low income
115	Mali	MLI	44.138	3.50	Low income
120	Mozambique	MOZ	39.705	5.40	Low income
123	Malawi	MWI	39.459	5.05	Low income
127	Niger	NER	49.661	1.70	Low income
132	Nepal	NPL	20.923	13.30	Low income
148	Rwanda	RWA	32.689	9.00	Low income
154	Sierra Leone	SLE	36.729	1.70	Low income
156	Somalia	SOM	43.891	1.50	Low income
158	South Sudan	SSD	37.126	14.10	Low income
167	Chad	TCD	45.745	2.30	Low income
168	Togo	TGO	36.080	4.50	Low income
177	Tanzania	TZA	39.518	4.40	Low income
178	Uganda	UGA	43.474	16.20	Low income
192	Congo, Dem. Rep.	COD	42.394	2.20	Low income
194	Zimbabwe	ZWE	35.715	18.50	Low income

In [58]:
```
df.IncomeGroup.unique()
```

Out[58]:
```
array(['High income', 'Low income', 'Upper middle income',
       'Lower middle income'], dtype=object)
```

In [59]:
```
df.IncomeGroup.nunique()
```

Out[59]:
```
4
```

In [60]:
```
import matplotlib.pyplot as plt
import seaborn as sns
```

In [61]:
```
%matplotlib inline
plt.rcParams['figure.figsize'] = 6,2
```

In [62]:
```
import warnings
warnings.filterwarnings('ignore')
```

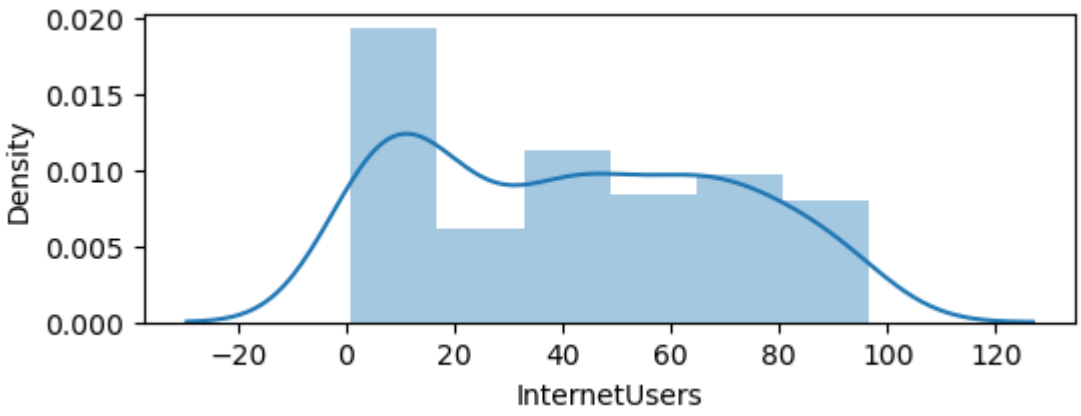
In [63]:
```
df.columns
```

Out[63]:
```
Index(['CountryName', 'CountryCode', 'BirthRate', 'InternetUsers',
       'IncomeGroup'],
      dtype='object')
```

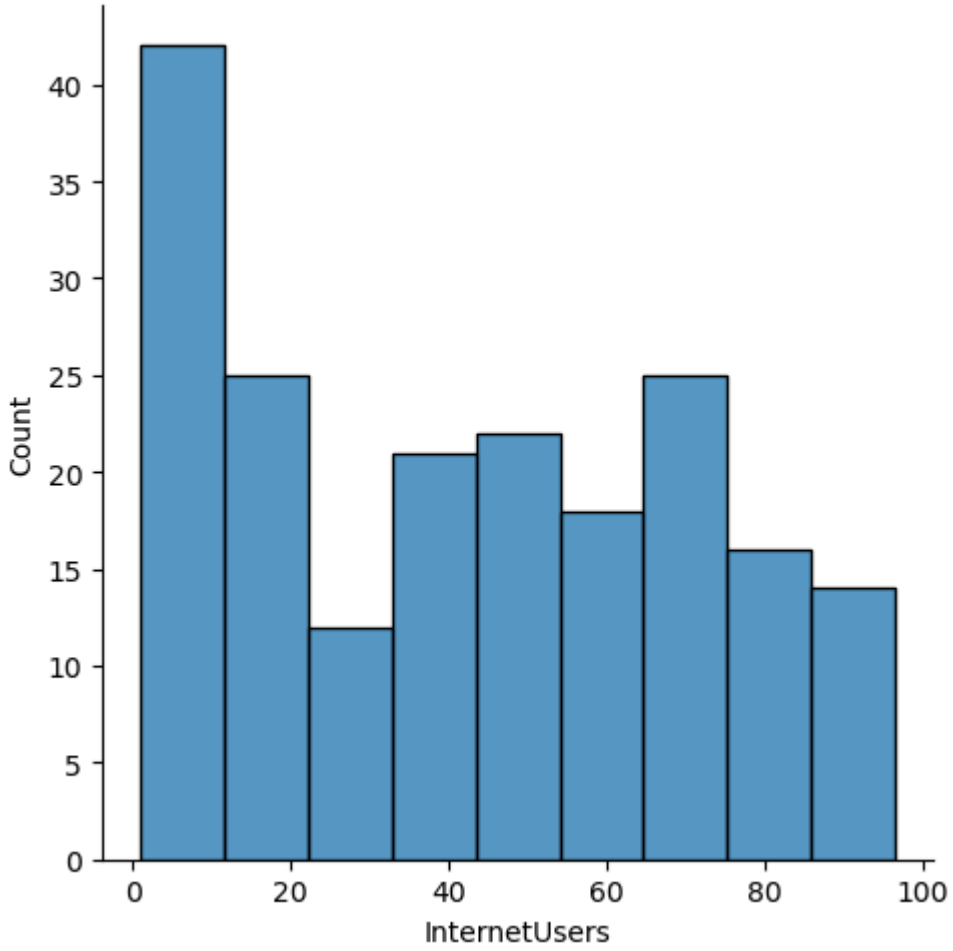
In [64]:
```
df['InternetUsers']
```

Out[64]:
```
0      78.9
1       5.9
2      19.1
3      57.2
4      88.0
       ...
190    20.0
191    46.5
192     2.2
193    15.4
194    18.5
Name: InternetUsers, Length: 195, dtype: float64
```

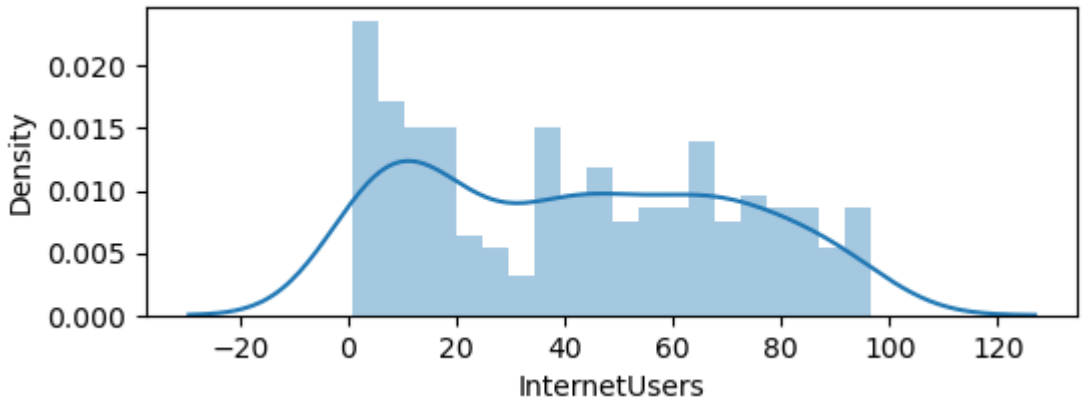
In [65]:
```
vis1 = sns.distplot(df['InternetUsers'])
plt.show(vis1)
```



In [66]:
```
vis2 = sns.displot(df['InternetUsers'])
plt.show(vis2)
```

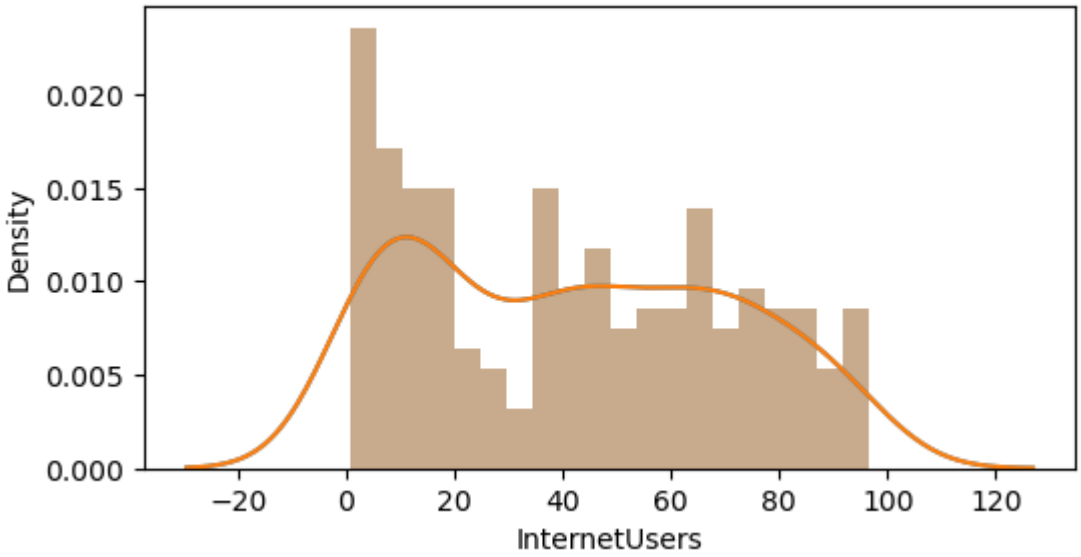


In [71]:
```
vis4 = sns.distplot(df['InternetUsers'], bins = 20)
plt.show(vis4)
```

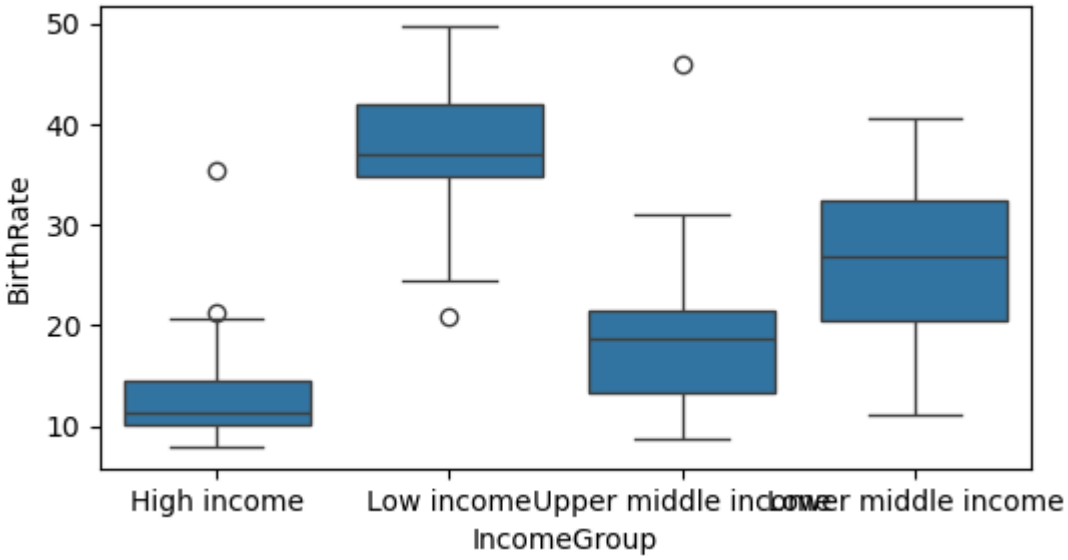


In [75]:
```
plt.rcParams['figure.figsize'] = 6,3
```

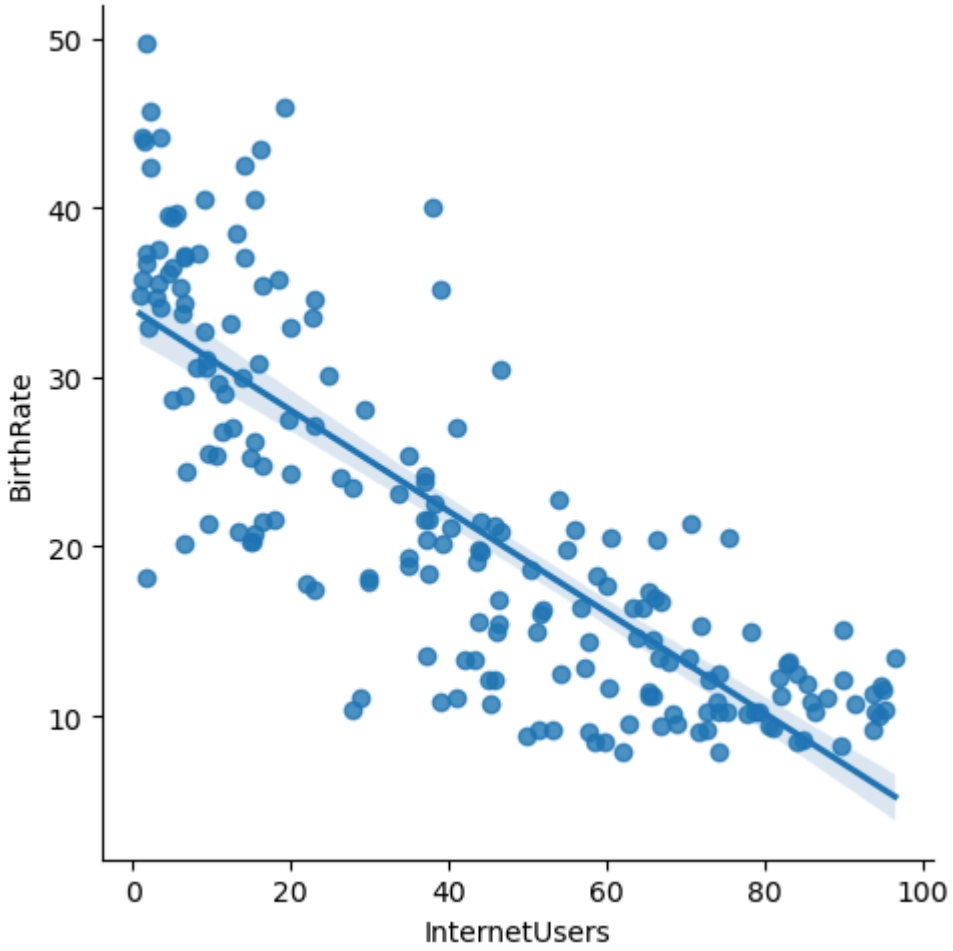
In [77]:
```
vis5 = sns.distplot(df['InternetUsers'], bins = 20)
plt.show(vis5)
```



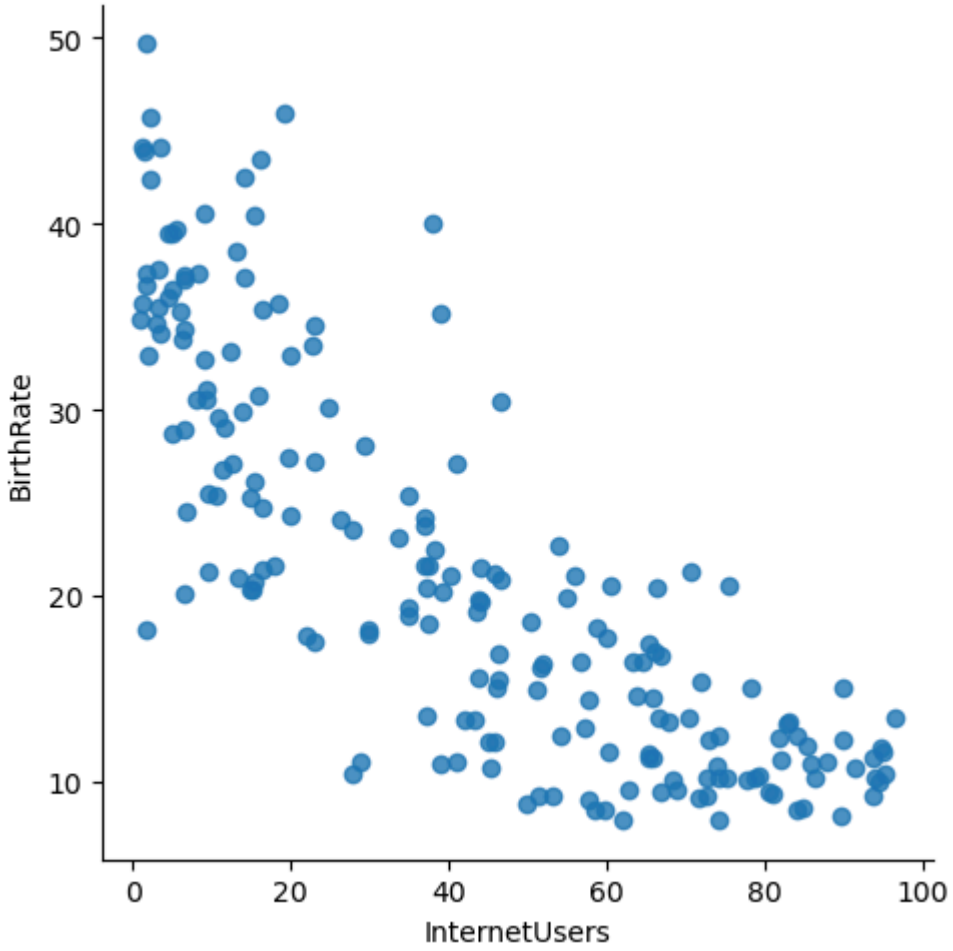
In [86]:
```
vis6 = sns.boxplot(data = df, x='IncomeGroup", y="BirthRate")
plt.show(vis6)
```



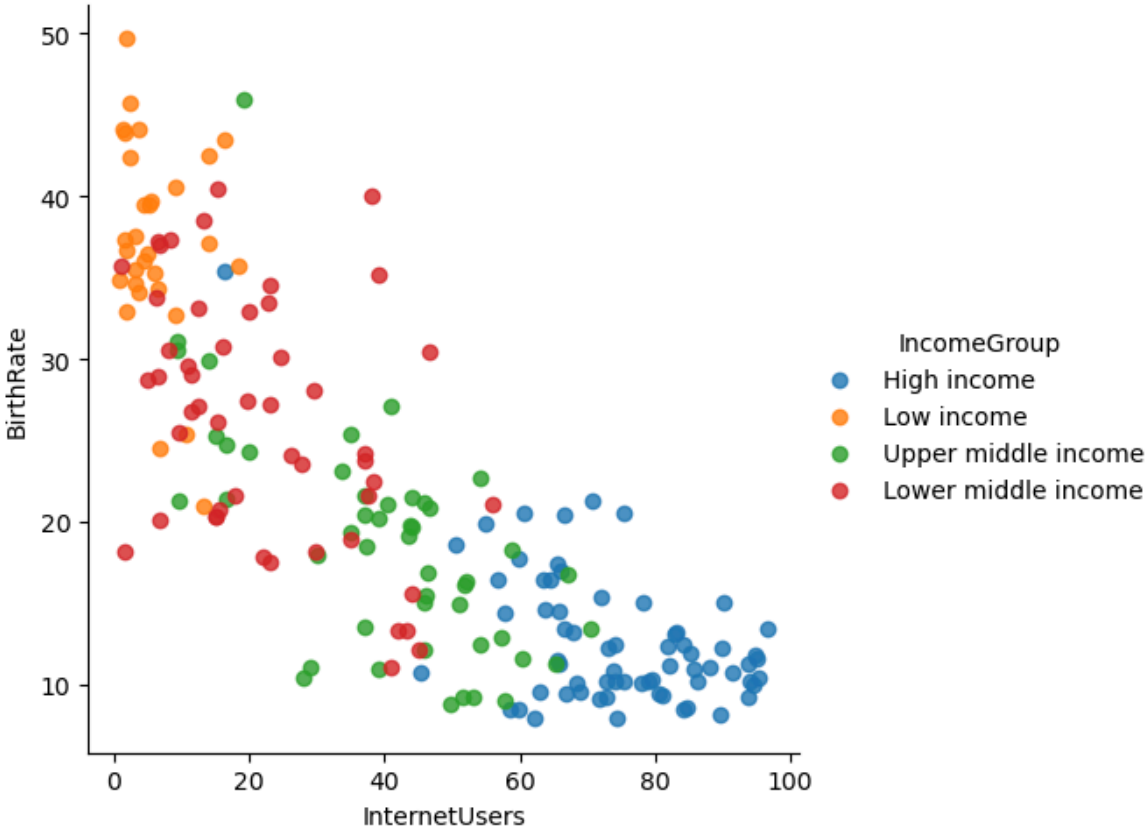
In [91]:
```
vis7 = sns.lmplot(data = df, x='InternetUsers', y='BirthRate')
plt.show(vis7)
```



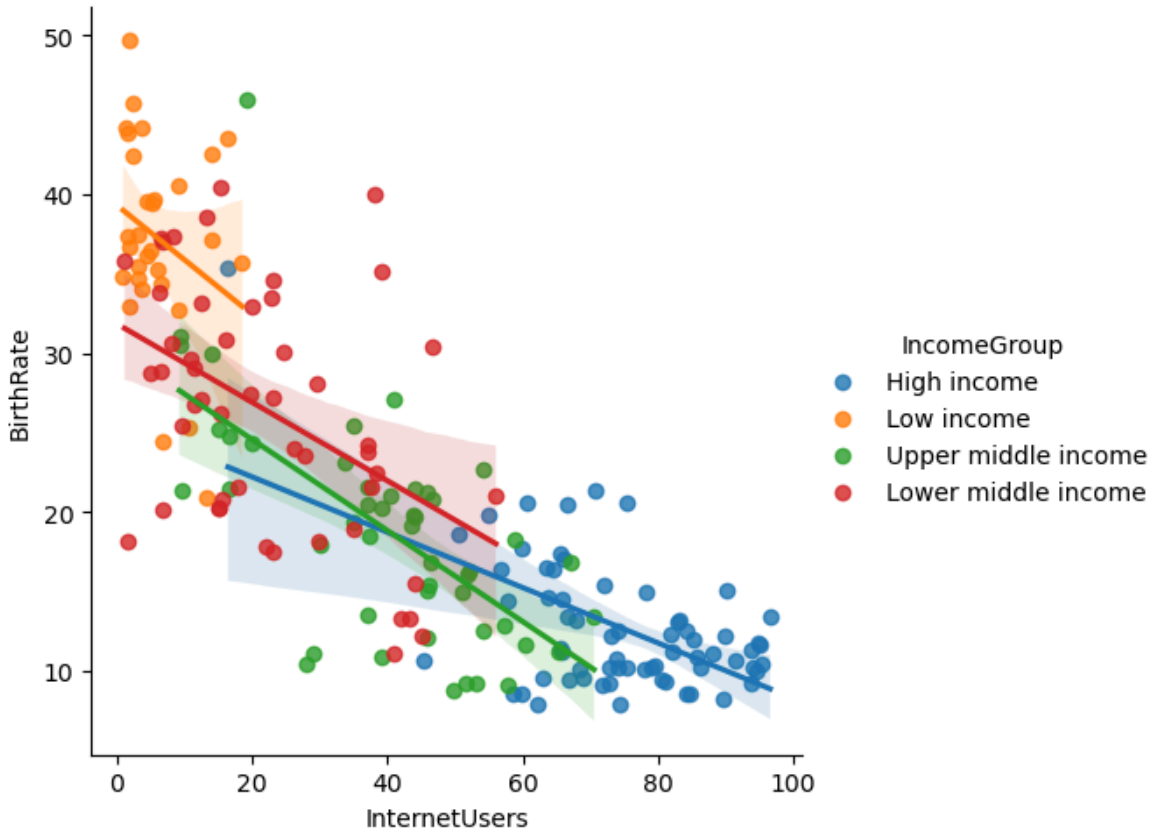
In [95]:
```
vis8 = sns.lmplot(data= df, x='InternetUsers', y='BirthRate', fit_reg = False)
plt.show(vis8)
```



In [96]:
```
vis9 = sns.lmplot(data=df, x='InternetUsers', y='BirthRate', fit_reg=False, hue=
plt.show(vis9)
```



In [97]:
```
vis10 = sns.lmplot(data=df, x='InternetUsers', y='BirthRate', fit_reg=True, hue=
plt.show(vis10)
```



In [ ]:
```

```