In [1]:

```
import pandas as pd
```

In [2]:

```
df = pd.read_csv('internet.csv')
```

In [3]:

```
df.head()
```

Out[3]:

	Unnamed: 0	Entity	Code	Year	Cellular Subscription	Internet Users(%)	No. of Internet Users	Broadband Subscription
0	0	Afghanistan	AFG	1980	0.0	0.0	0	0.0
1	1	Afghanistan	AFG	1981	0.0	0.0	0	0.0
2	2	Afghanistan	AFG	1982	0.0	0.0	0	0.0
3	3	Afghanistan	AFG	1983	0.0	0.0	0	0.0
4	4	Afghanistan	AFG	1984	0.0	0.0	0	0.0

In [4]:

```
df.tail()
```

Out[4]:

	Unnamed: 0	Entity	Code	Year	Cellular Subscription	Internet Users(%)	No. of Internet Users	Broadband Subscription
8862	8862	Zimbabwe	ZWE	2016	91.793457	23.119989	3341464	1.217633
8863	8863	Zimbabwe	ZWE	2017	98.985077	24.400000	3599269	1.315694
8864	8864	Zimbabwe	ZWE	2018	89.404869	25.000000	3763048	1.406322
8865	8865	Zimbabwe	ZWE	2019	90.102287	25.100000	3854006	1.395818
8866	8866	Zimbabwe	ZWE	2020	88.755806	29.299999	4591211	1.368916

In [5]:

```
df.shape
```

Out[5]:

```
(8867, 8)
```

In [6]:

```
df.columns
```

Out[6]:

```
Index(['Unnamed: 0', 'Entity', 'Code', 'Year', 'Cellular Subscription',
       'Internet Users(%)', 'No. of Internet Users', 'Broadband Subscripti
on'],
      dtype='object')
```

In [7]:

```
df.duplicated().sum()
```

Out[7]:

```
0
```

In [8]:

```
df.isnull().sum()
```

Out[8]:

```
Unnamed: 0               0
Entity                   0
Code                     0
Year                     0
Cellular Subscription    0
Internet Users(%)        0
No. of Internet Users    0
Broadband Subscription   0
dtype: int64
```

In [9]:

```
df = df.drop('Unnamed: 0', axis = 1)
```

In [10]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8867 entries, 0 to 8866
Data columns (total 7 columns):
 #   Column                  Non-Null Count  Dtype  
---  ------                  --------------  -----  
 0   Entity                  8867 non-null   object 
 1   Code                    8867 non-null   object 
 2   Year                    8867 non-null   int64  
 3   Cellular Subscription   8867 non-null   float64
 4   Internet Users(%)       8867 non-null   float64
 5   No. of Internet Users   8867 non-null   int64  
 6   Broadband Subscription  8867 non-null   float64
dtypes: float64(3), int64(2), object(2)
memory usage: 485.0+ KB
```

In [11]:

```
df.describe()
```

Out[11]:

	Year	Cellular Subscription	Internet Users(%)	No. of Internet Users	Broadband Subscription
count	8867.000000	8867.000000	8867.000000	8.867000e+03	8867.000000
mean	2000.151799	39.989614	17.043606	1.089138e+07	4.440695
std	11.812151	51.981410	26.883498	1.248841e+08	9.755705
min	1980.000000	0.000000	0.000000	0.000000e+00	0.000000
25%	1990.000000	0.000000	0.000000	0.000000e+00	0.000000
50%	2000.000000	5.501357	0.855662	1.004700e+04	0.000000
75%	2010.000000	82.231594	25.449939	8.664195e+05	2.007603
max	2020.000000	436.103027	100.000000	4.699886e+09	78.524361

In [12]:

```
df.nunique()
```

Out[12]:

```
Entity                    229
Code                      216
Year                       41
Cellular Subscription    6344
Internet Users(%)        4702
No. of Internet Users    5058
Broadband Subscription   3858
dtype: int64
```

In [13]:

```
obj_cols = df.select_dtypes(include=['object']).columns
```

In [14]:

```
num_cols = df.select_dtypes(include=['int64', 'float64']).columns
```

In [15]:

```
import matplotlib.pyplot as plt
import seaborn as sns
```

In [16]:

```
import numpy as np
```

In [17]:

```
import warnings
warnings.filterwarnings('ignore')
```

In [18]:

```
df['Entity'].unique()
```

Out[18]:

```
array(['Afghanistan', 'Albania', 'Algeria', 'American Samoa', 'Andorra',
       'Angola', 'Antigua and Barbuda', 'Argentina', 'Armenia', 'Aruba',
       'Australia', 'Austria', 'Azerbaijan', 'Bahamas', 'Bahrain',
       'Bangladesh', 'Barbados', 'Belarus', 'Belgium', 'Belize', 'Benin',
       'Bermuda', 'Bhutan', 'Bolivia', 'Bosnia and Herzegovina',
       'Botswana', 'Brazil', 'British Virgin Islands', 'Brunei',
       'Bulgaria', 'Burkina Faso', 'Burundi', 'Cambodia', 'Cameroon',
       'Canada', 'Cape Verde', 'Cayman Islands',
       'Central African Republic', 'Chad', 'Chile', 'China', 'Colombia',
       'Comoros', 'Congo', 'Costa Rica', "Cote d'Ivoire", 'Croatia',
       'Cuba', 'Curacao', 'Cyprus', 'Czechia',
       'Democratic Republic of Congo', 'Denmark', 'Djibouti', 'Dominica',
       'Dominican Republic', 'East Asia and Pacific', 'Ecuador', 'Egypt',
       'El Salvador', 'Equatorial Guinea', 'Eritrea', 'Estonia',
       'Eswatini', 'Ethiopia', 'Europe and Central Asia',
       'European Union', 'Faeroe Islands', 'Fiji', 'Finland', 'France',
       'French Polynesia', 'Gabon', 'Gambia', 'Georgia', 'Germany',
       'Ghana', 'Gibraltar', 'Greece', 'Greenland', 'Grenada', 'Guam',
       'Guatemala', 'Guinea', 'Guinea-Bissau', 'Guyana', 'Haiti',
       'High income', 'Honduras', 'Hong Kong', 'Hungary', 'Iceland',
       'India', 'Indonesia', 'Iran', 'Iraq', 'Ireland', 'Israel', 'Italy',
       'Jamaica', 'Japan', 'Jordan', 'Kazakhstan', 'Kenya', 'Kiribati',
       'Kosovo', 'Kuwait', 'Kyrgyzstan', 'Laos',
       'Latin America and Caribbean', 'Latvia', 'Lebanon', 'Lesotho',
       'Liberia', 'Libya', 'Liechtenstein', 'Lithuania',
       'Low and middle income', 'Low income', 'Lower middle income',
       'Luxembourg', 'Macao', 'Madagascar', 'Malawi', 'Malaysia',
       'Maldives', 'Mali', 'Malta', 'Marshall Islands', 'Mauritania',
       'Mauritius', 'Mexico', 'Micronesia (country)',
       'Middle East and North Africa', 'Middle income', 'Moldova',
       'Monaco', 'Mongolia', 'Montenegro', 'Morocco', 'Mozambique',
       'Myanmar', 'Namibia', 'Nauru', 'Nepal', 'Netherlands',
       'New Caledonia', 'New Zealand', 'Nicaragua', 'Niger', 'Nigeria',
       'North America', 'North Korea', 'North Macedonia',
       'Northern Mariana Islands', 'Norway', 'Oman', 'Pakistan', 'Palau',
       'Palestine', 'Panama', 'Papua New Guinea', 'Paraguay', 'Peru',
       'Philippines', 'Poland', 'Portugal', 'Puerto Rico', 'Qatar',
       'Romania', 'Russia', 'Rwanda', 'Saint Kitts and Nevis',
       'Saint Lucia', 'Saint Vincent and the Grenadines', 'Samoa',
       'San Marino', 'Sao Tome and Principe', 'Saudi Arabia', 'Senegal',
       'Serbia', 'Seychelles', 'Sierra Leone', 'Singapore',
       'Sint Maarten (Dutch part)', 'Slovakia', 'Slovenia',
       'Solomon Islands', 'Somalia', 'South Africa', 'South Asia',
       'South Korea', 'South Sudan', 'Spain', 'Sri Lanka',
       'Sub-Saharan Africa', 'Sudan', 'Suriname', 'Sweden', 'Switzerland',
       'Syria', 'Tajikistan', 'Tanzania', 'Thailand', 'Timor', 'Togo',
       'Tonga', 'Trinidad and Tobago', 'Tunisia', 'Turkey',
       'Turkmenistan', 'Turks and Caicos Islands', 'Tuvalu', 'Uganda',
       'Ukraine', 'United Arab Emirates', 'United Kingdom',
       'United States', 'United States Virgin Islands',
       'Upper middle income', 'Uruguay', 'Uzbekistan', 'Vanuatu',
       'Venezuela', 'Vietnam', 'World', 'Yemen', 'Zambia', 'Zimbabwe'],
      dtype=object)
```

In [19]:

```
df['Entity'].value_counts()
```

Out[19]:

```
Afghanistan                  41
Mongolia                     41
Mali                         41
Malta                        41
Mauritania                   41
                             ..
Palau                        16
Curacao                      12
South Sudan                  11
Kosovo                        6
Sint Maarten (Dutch part)     1
Name: Entity, Length: 229, dtype: int64
```

In [20]:

```
df['Code'].unique()
```

Out[20]:

```
array(['AFG', 'ALB', 'DZA', 'ASM', 'AND', 'AGO', 'ATG', 'ARG', 'ARM',
       'ABW', 'AUS', 'AUT', 'AZE', 'BHS', 'BHR', 'BGD', 'BRB', 'BLR',
       'BEL', 'BLZ', 'BEN', 'BMU', 'BTN', 'BOL', 'BIH', 'BWA', 'BRA',
       'VGB', 'BRN', 'BGR', 'BFA', 'BDI', 'KHM', 'CMR', 'CAN', 'CPV',
       'CYM', 'CAF', 'TCD', 'CHL', 'CHN', 'COL', 'COM', 'COG', 'CRI',
       'CIV', 'HRV', 'CUB', 'CUW', 'CYP', 'CZE', 'COD', 'DNK', 'DJI',
       'DMA', 'DOM', 'Region', 'ECU', 'EGY', 'SLV', 'GNQ', 'ERI', 'EST',
       'SWZ', 'ETH', 'FRO', 'FJI', 'FIN', 'FRA', 'PYF', 'GAB', 'GMB',
       'GEO', 'DEU', 'GHA', 'GIB', 'GRC', 'GRL', 'GRD', 'GUM', 'GTM',
       'GIN', 'GNB', 'GUY', 'HTI', 'HND', 'HKG', 'HUN', 'ISL', 'IND',
       'IDN', 'IRN', 'IRQ', 'IRL', 'ISR', 'ITA', 'JAM', 'JPN', 'JOR',
       'KAZ', 'KEN', 'KIR', 'OWID_KOS', 'KWT', 'KGZ', 'LAO', 'LVA', 'LBN',
       'LSO', 'LBR', 'LBY', 'LIE', 'LTU', 'LUX', 'MAC', 'MDG', 'MWI',
       'MYS', 'MDV', 'MLI', 'MLT', 'MHL', 'MRT', 'MUS', 'MEX', 'FSM',
       'MDA', 'MCO', 'MNG', 'MNE', 'MAR', 'MOZ', 'MMR', 'NAM', 'NRU',
       'NPL', 'NLD', 'NCL', 'NZL', 'NIC', 'NER', 'NGA', 'PRK', 'MKD',
       'MNP', 'NOR', 'OMN', 'PAK', 'PLW', 'PSE', 'PAN', 'PNG', 'PRY',
       'PER', 'PHL', 'POL', 'PRT', 'PRI', 'QAT', 'ROU', 'RUS', 'RWA',
       'KNA', 'LCA', 'VCT', 'WSM', 'SMR', 'STP', 'SAU', 'SEN', 'SRB',
       'SYC', 'SLE', 'SGP', 'SXM', 'SVK', 'SVN', 'SLB', 'SOM', 'ZAF',
       'KOR', 'SSD', 'ESP', 'LKA', 'SDN', 'SUR', 'SWE', 'CHE', 'SYR',
       'TJK', 'TZA', 'THA', 'TLS', 'TGO', 'TON', 'TTO', 'TUN', 'TUR',
       'TKM', 'TCA', 'TUV', 'UGA', 'UKR', 'ARE', 'GBR', 'USA', 'VIR',
       'URY', 'UZB', 'VUT', 'VEN', 'VNM', 'OWID_WRL', 'YEM', 'ZMB', 'ZW
E'],
      dtype=object)
```

In [21]:

```
df['Entity'].value_counts()
```

Out[21]:

```
Afghanistan                  41
Mongolia                     41
Mali                         41
Malta                        41
Mauritania                   41
                             ..
Palau                        16
Curacao                      12
South Sudan                  11
Kosovo                        6
Sint Maarten (Dutch part)     1
Name: Entity, Length: 229, dtype: int64
```

In [22]:

```
df['Year'].unique()
```

Out[22]:

```
array([1980, 1981, 1982, 1983, 1984, 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, 2016, 2017, 2018, 2019, 2020], dtype=int64)
```

In [23]:

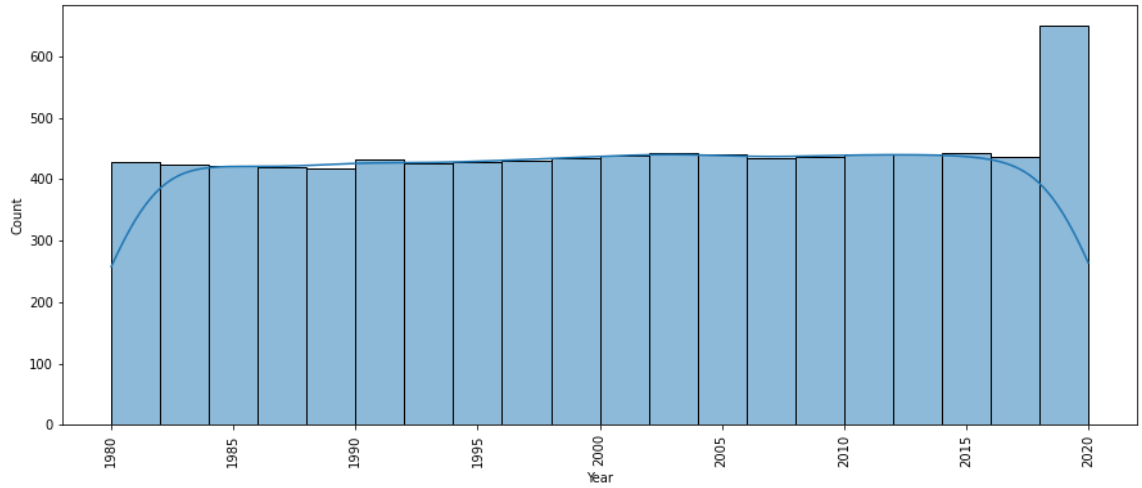
```
df['Year'].value_counts()
```

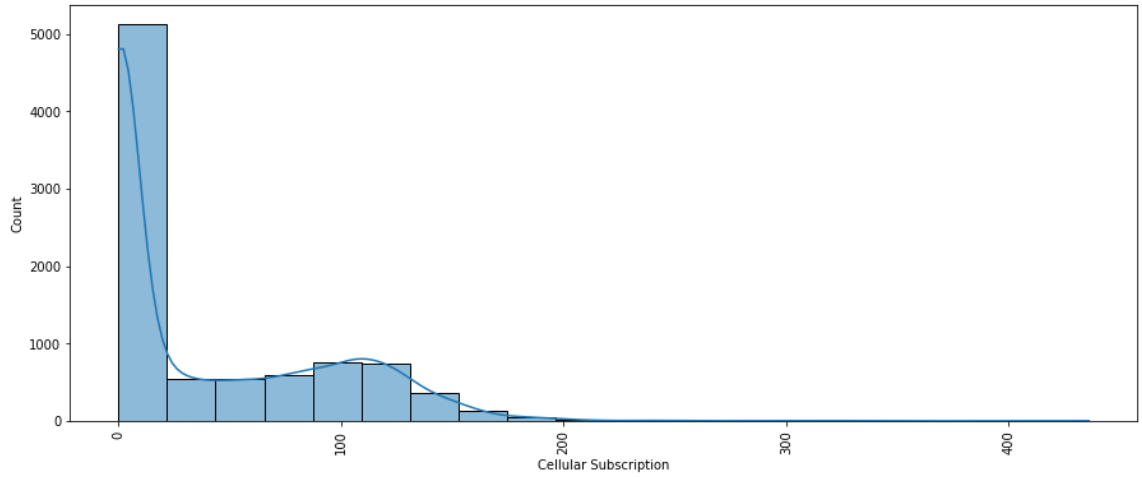
Out[23]:

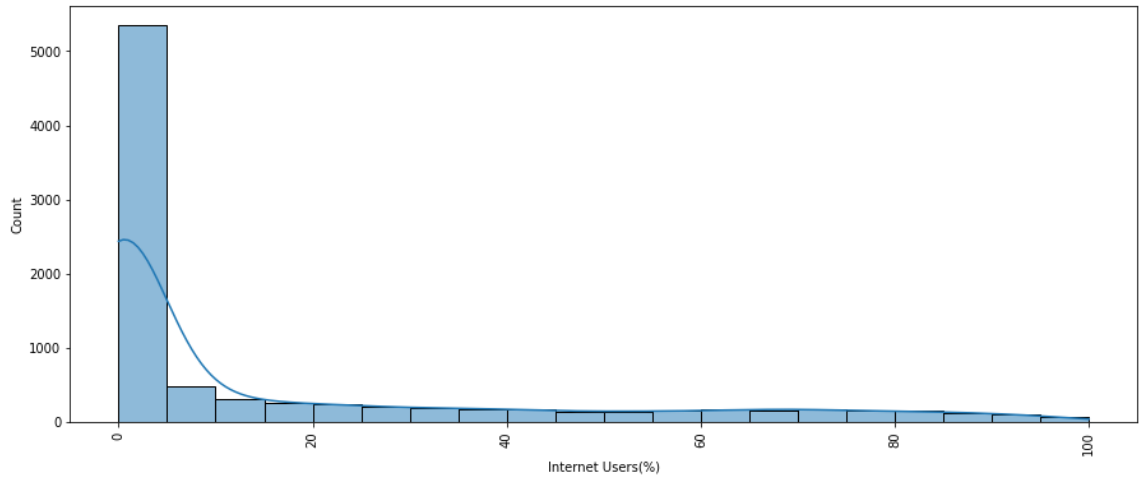
```
2020    223
2019    223
2015    222
2012    222
2010    222
1990    222
2004    222
2003    221
2002    221
2014    220
2001    219
2017    219
2013    219
2009    219
2007    219
2005    219
2000    219
1999    218
2011    218
2016    217
1998    217
2008    217
2006    216
1996    216
1997    215
1980    215
1995    215
1992    213
1993    213
1994    213
1981    213
1982    213
1983    212
1991    211
1986    211
1984    211
1988    210
1985    210
1987    209
1989    208
2018    205
Name: Year, dtype: int64
```

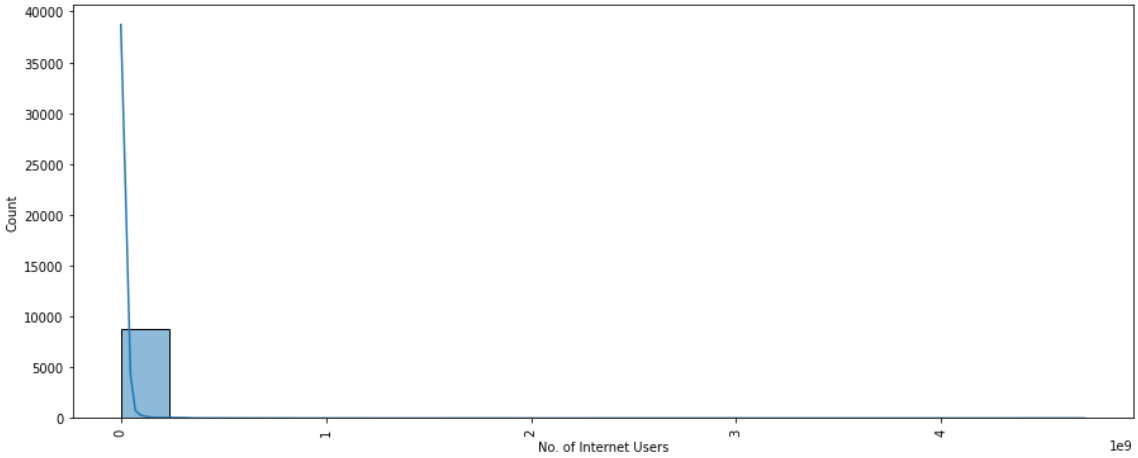
In [24]:

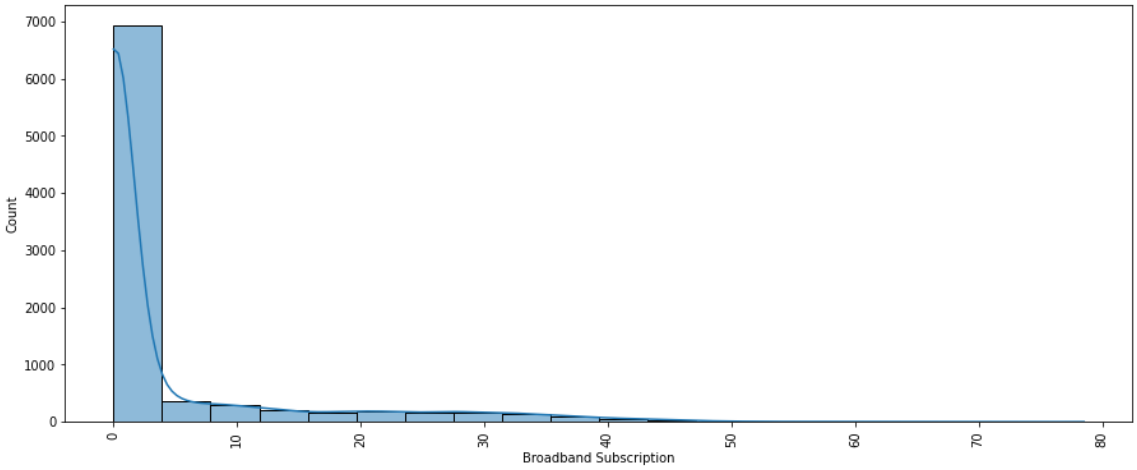
```
for i in num_cols:
    plt.figure(figsize=(15,6))
    sns.histplot(df[i], kde = True, bins = 20, palette = 'hls')
    plt.xticks(rotation = 90)
    plt.show()
```





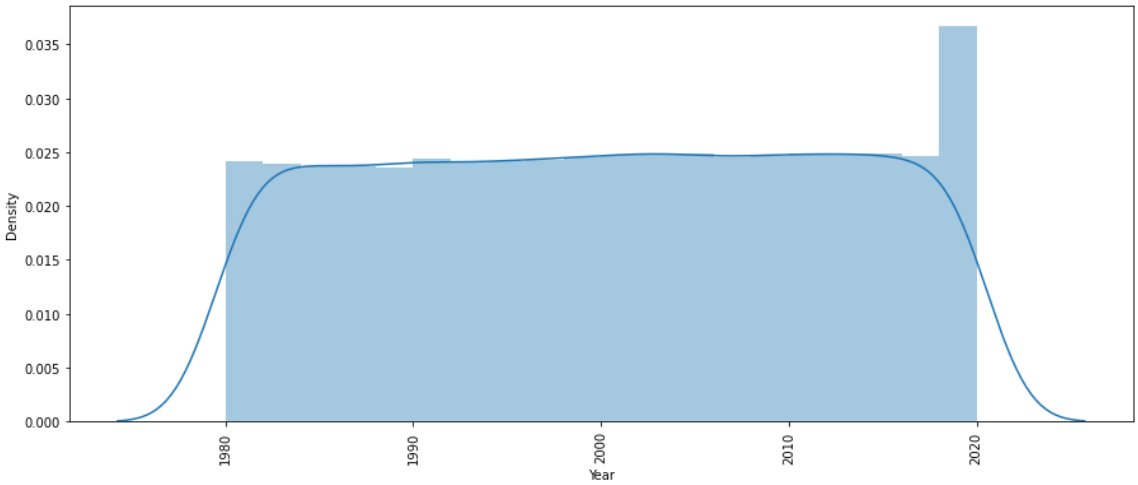


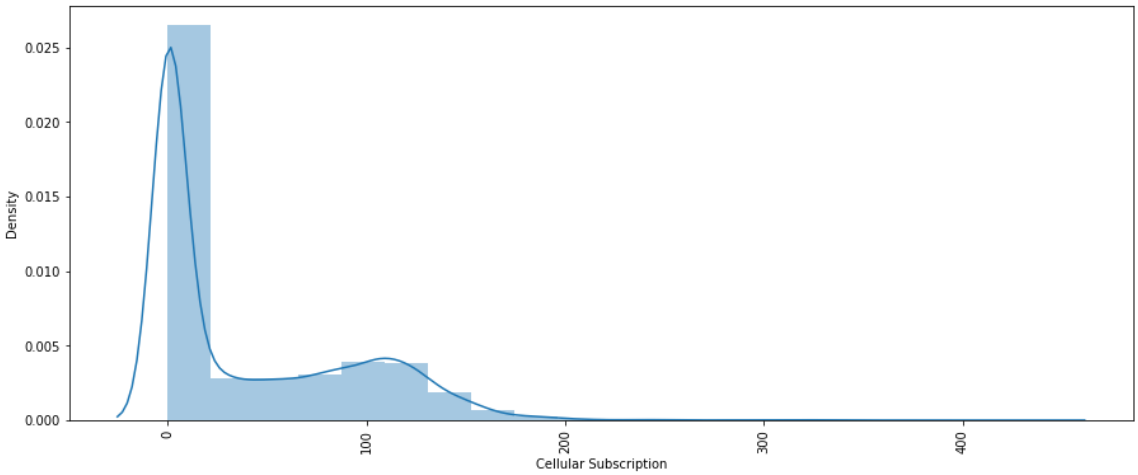

Count
No. of Internet Users
1e9

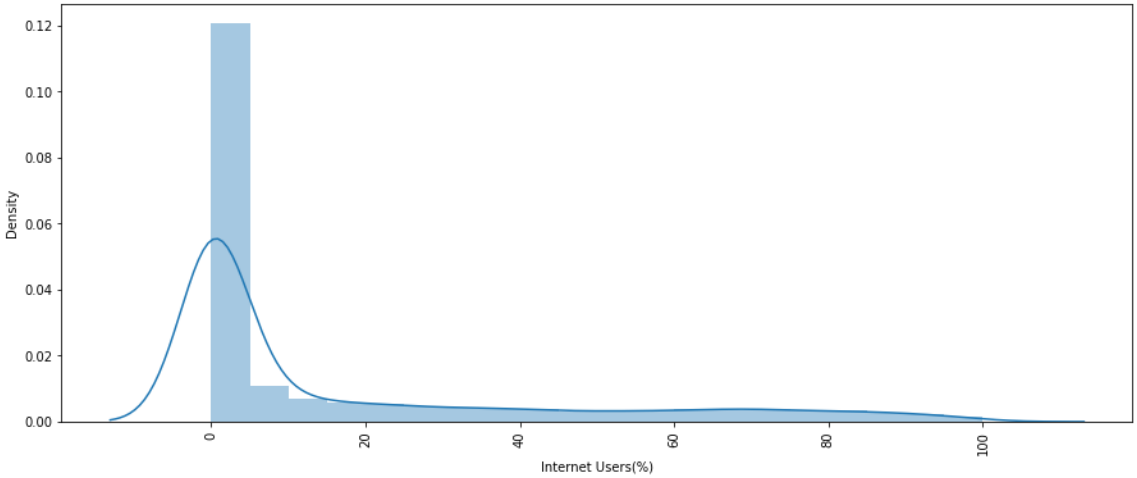

Count
Broadband Subscription

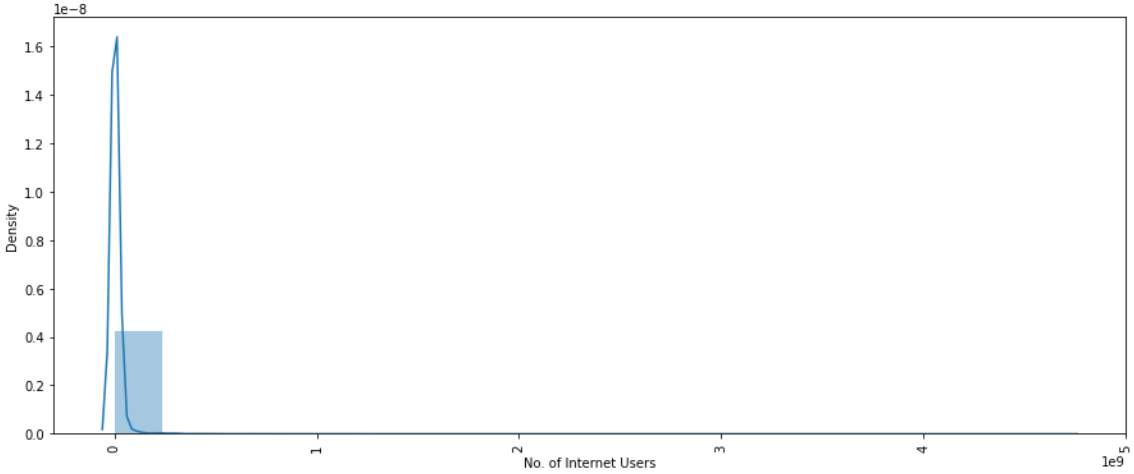
In [25]:

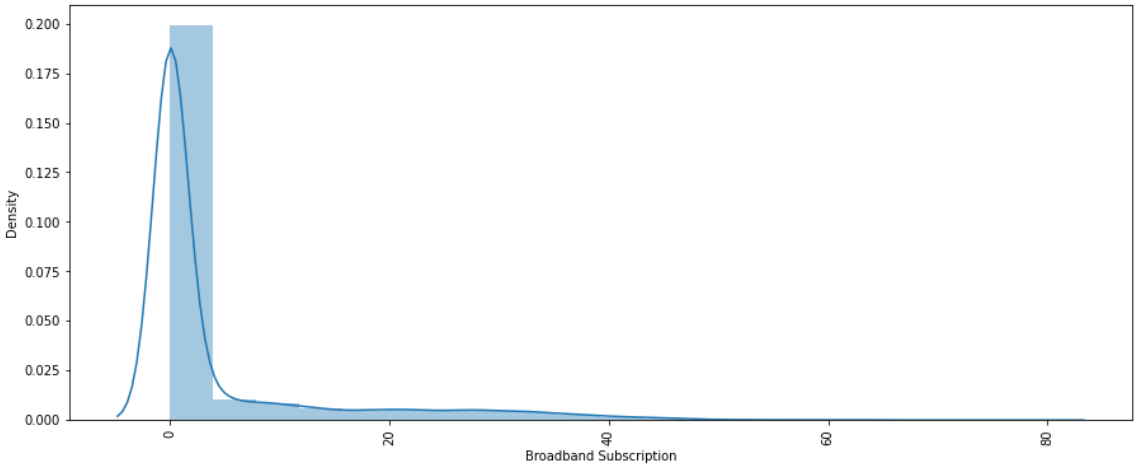
```
for i in num_cols:
    plt.figure(figsize=(15,6))
    sns.distplot(df[i], kde = True, bins = 20)
    plt.xticks(rotation = 90)
    plt.show()
```





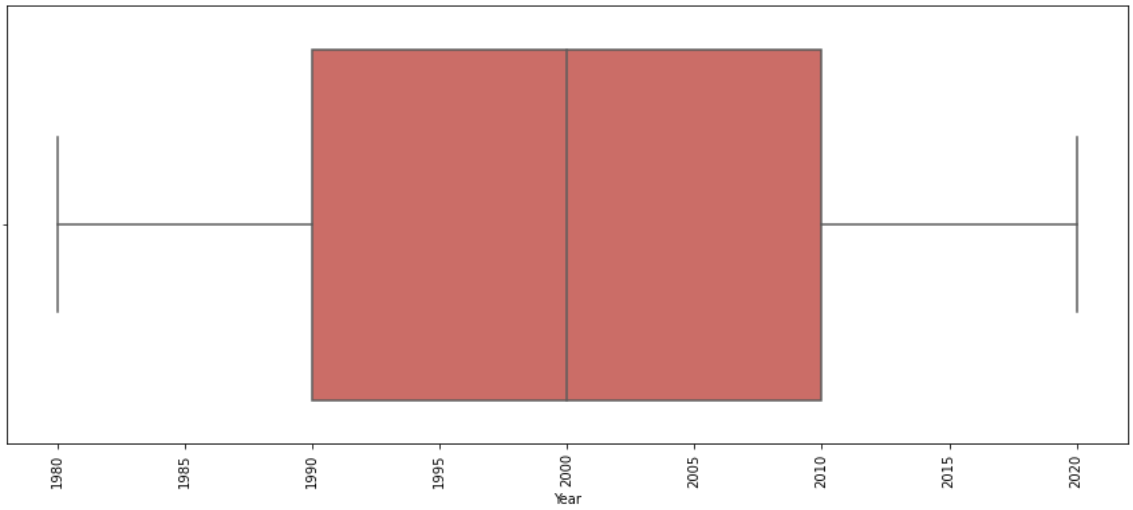


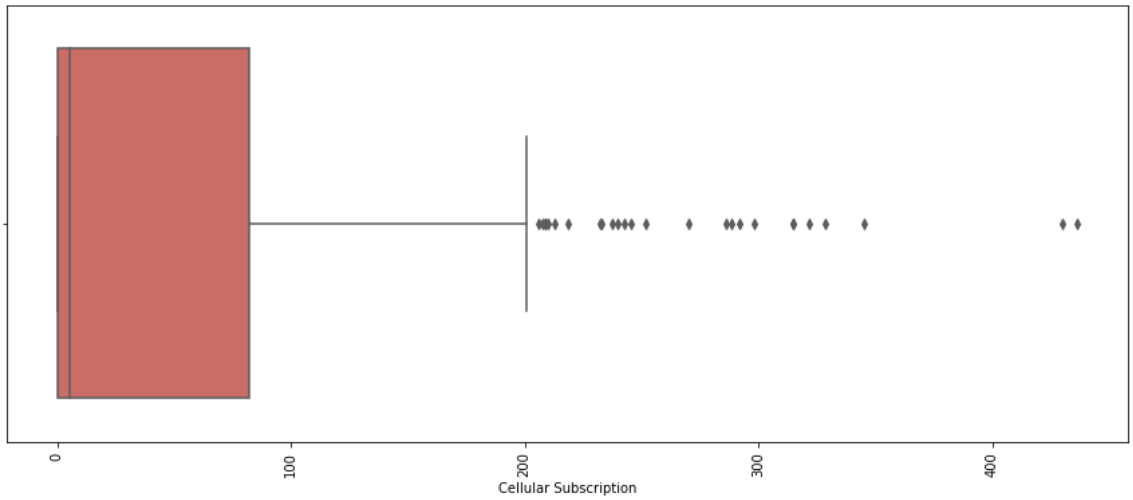

1e−8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Density
0
1
2
3
4
1e9
No. of Internet Users

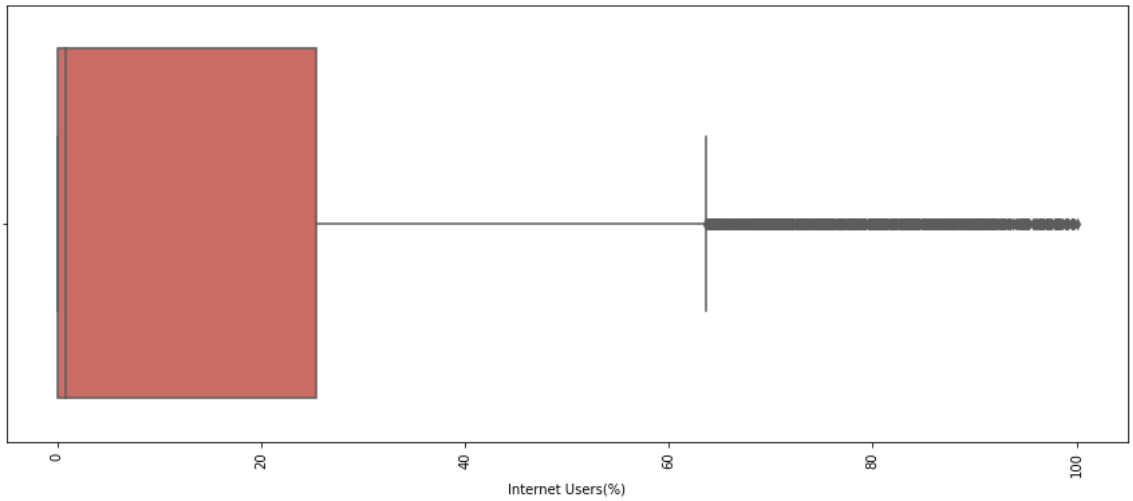

0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
Density
0
20
40
60
80
Broadband Subscription

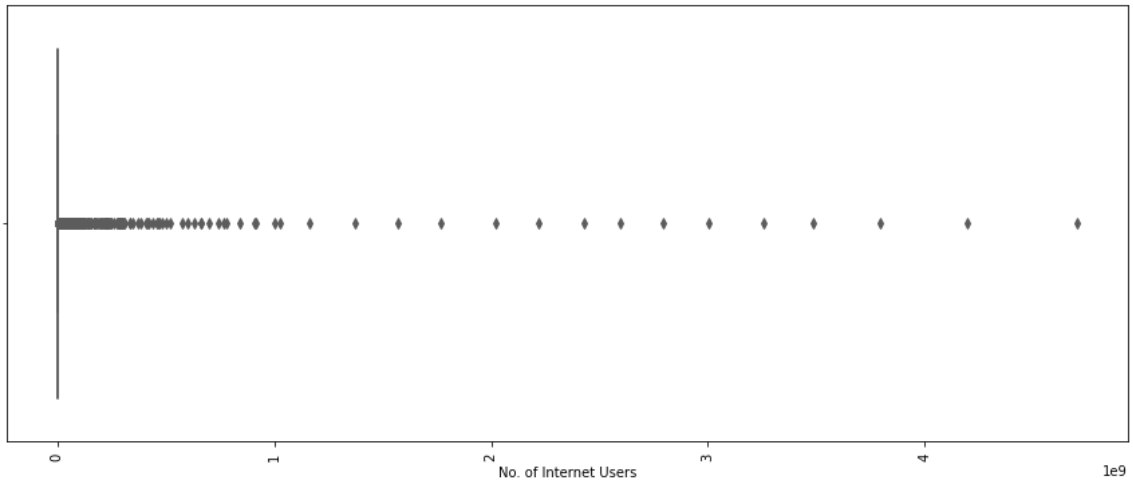
In [26]:

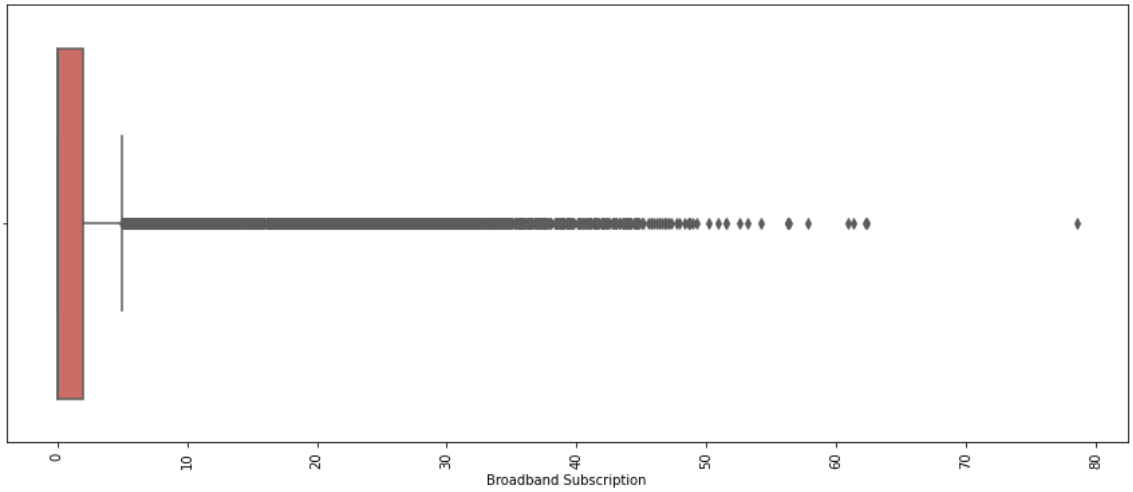
```
for i in num_cols:
    plt.figure(figsize=(15,6))
    sns.boxplot(df[i], data = df, palette = 'hls')
    plt.xticks(rotation = 90)
    plt.show()
```





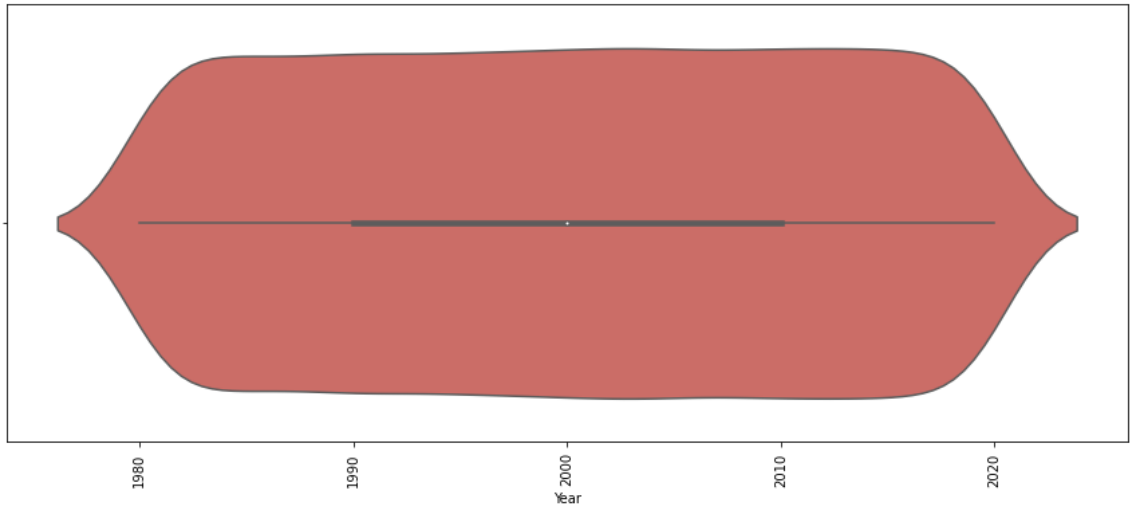


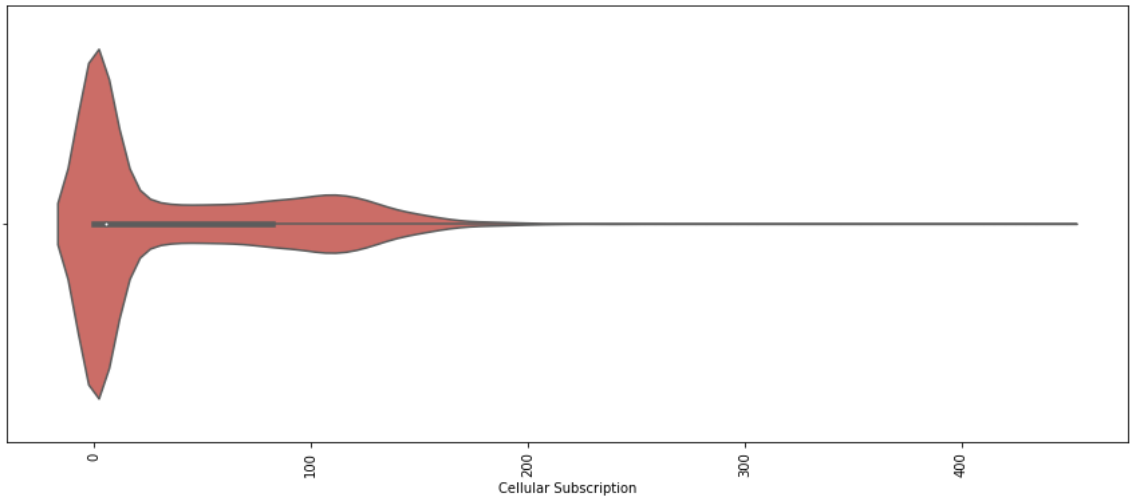

0
1
2
3
4
No. of Internet Users
1e9

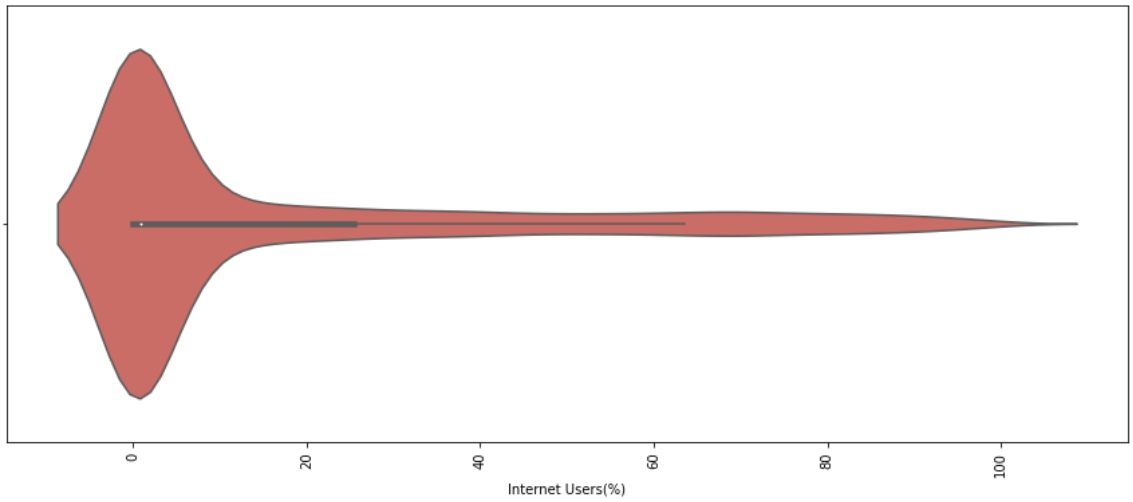

0
10
20
30
40
50
60
70
80
Broadband Subscription

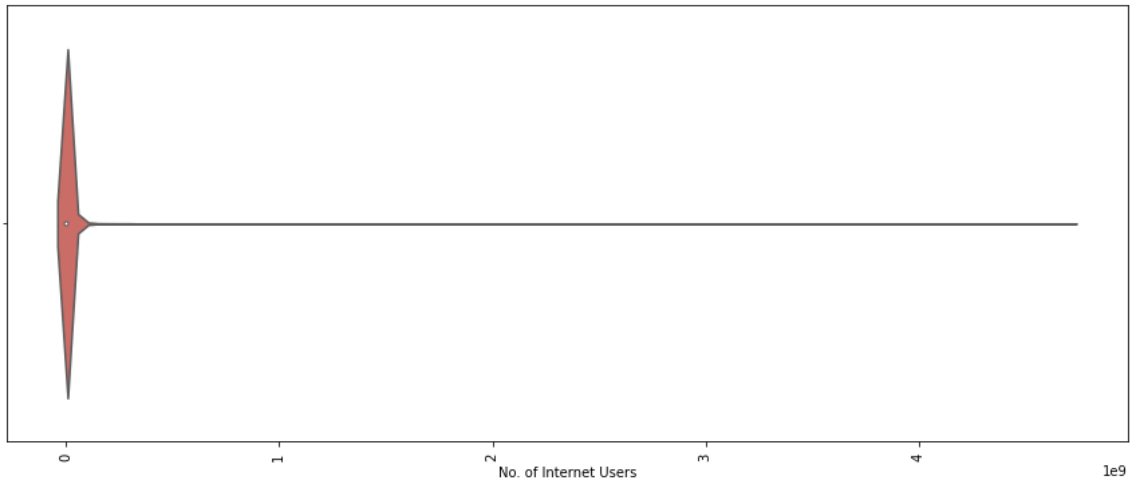
In [27]:

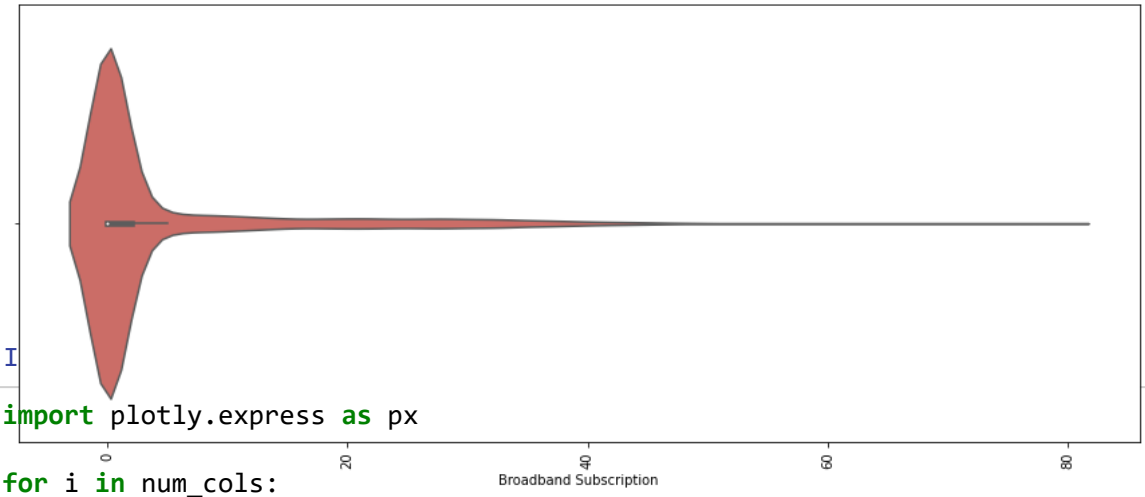
```
for i in num_cols:
    plt.figure(figsize=(15,6))
    sns.violinplot(df[i], data = df, palette = 'hls')
    plt.xticks(rotation = 90)
    plt.show()
```









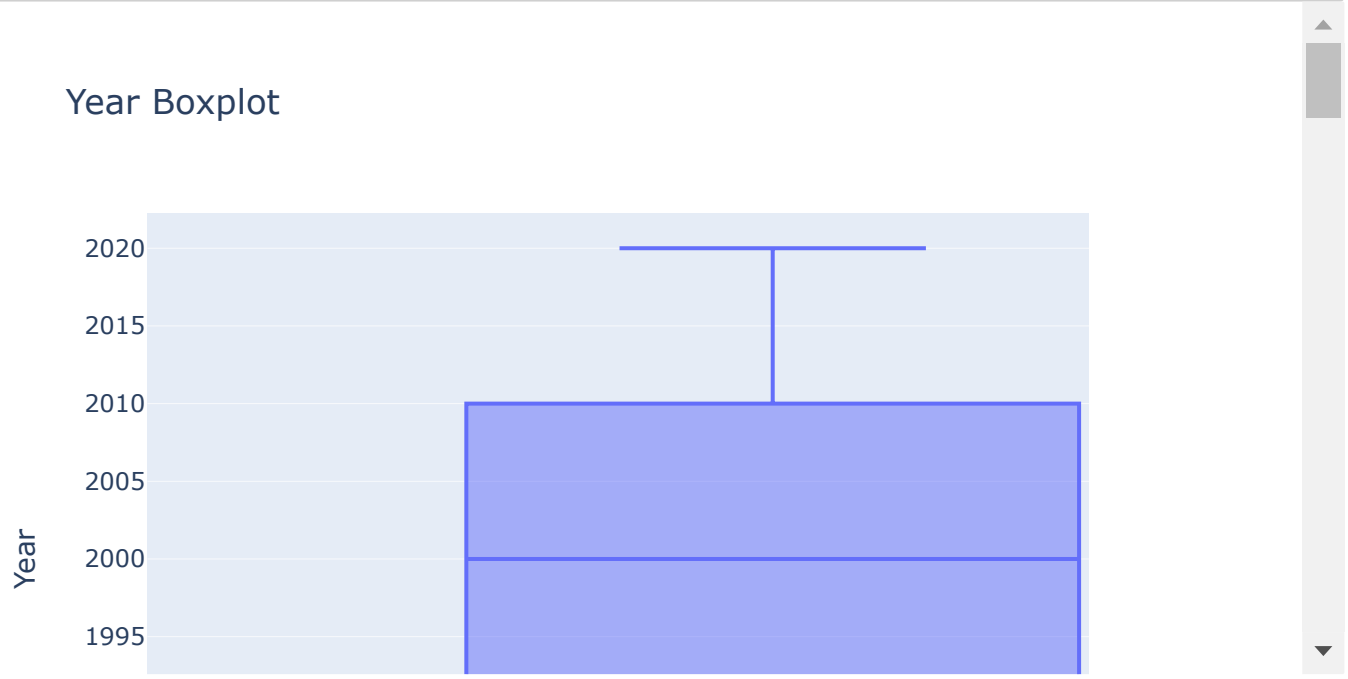


I

```
import plotly.express as px
for i in num_cols:
    fig = px.histogram(df, x=i, nbins=20)
    fig.show()
```

In [29]:

```
for col in num_cols:
    fig = px.box(df, y=col, title=f"{col} Boxplot")
    fig.show()
```

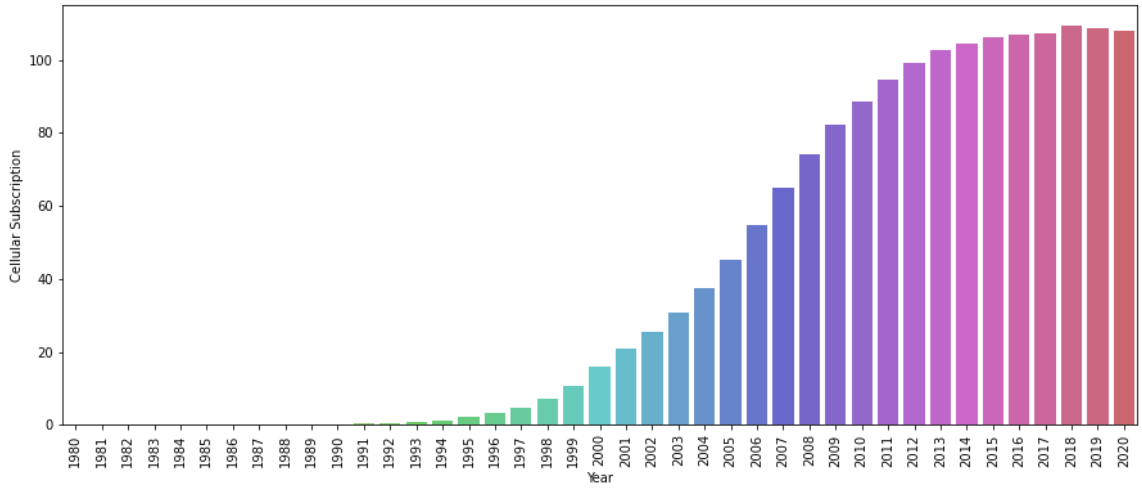


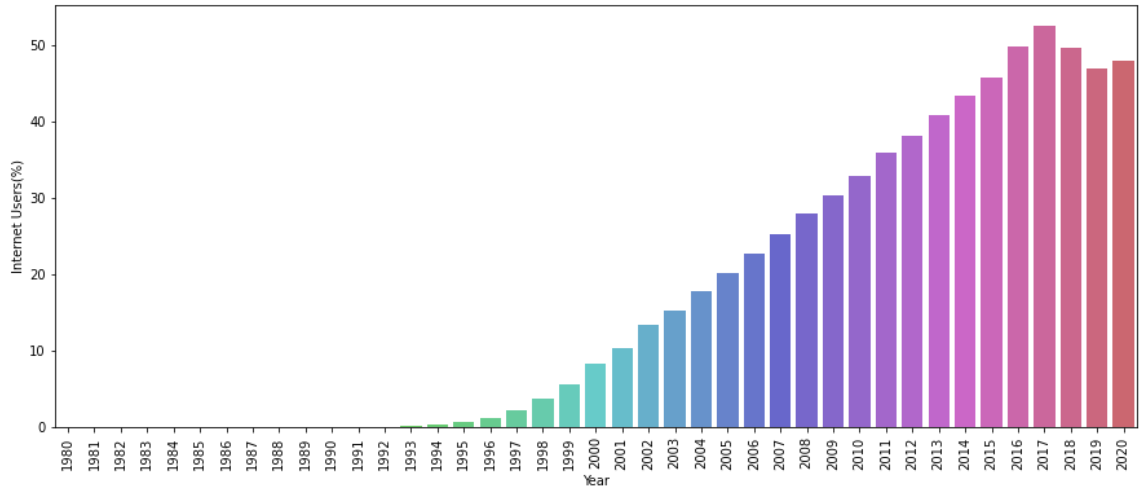
In [30]:

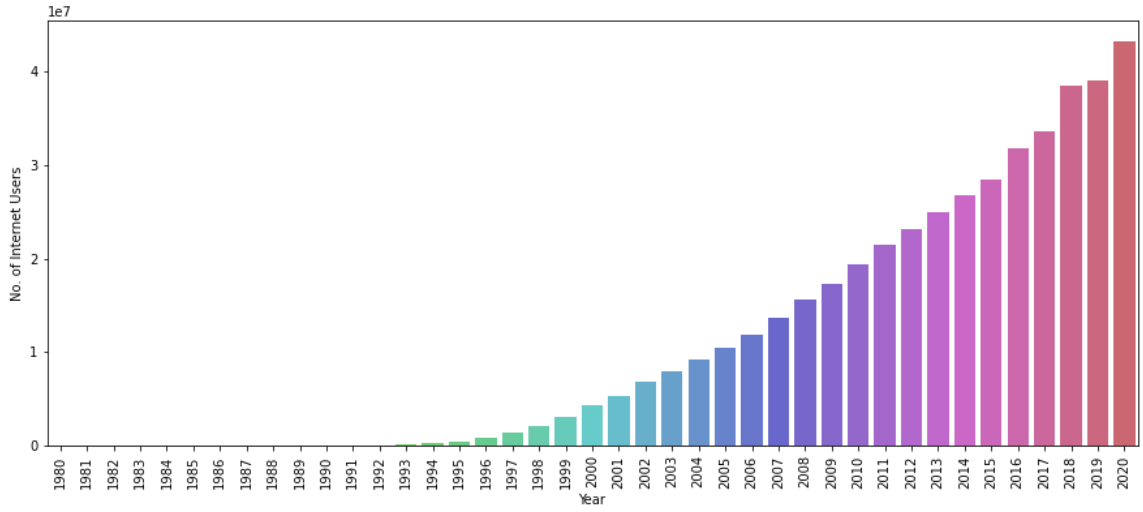
```
for col in num_cols:
    fig = px.violin(df, y=col, title=f"{col} Boxplot")
    fig.show()
```

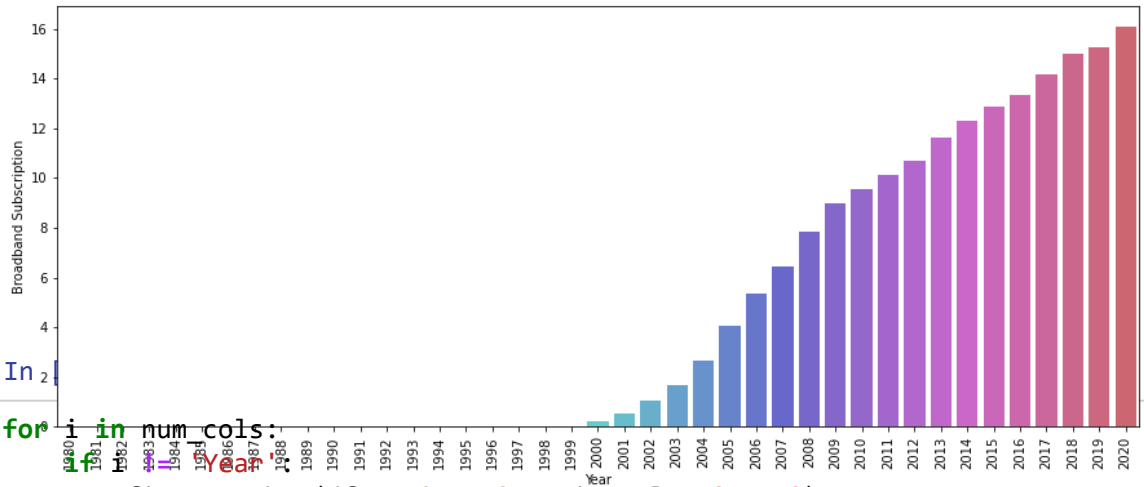
In [31]:

```
for i in num_cols:
    if i != 'Year':
        plt.figure(figsize=(15,6))
        sns.barplot(x = df['Year'], y = df[i], data = df, ci = None, palette = 'hls')
        plt.xticks(rotation = 90)
        plt.show()
```



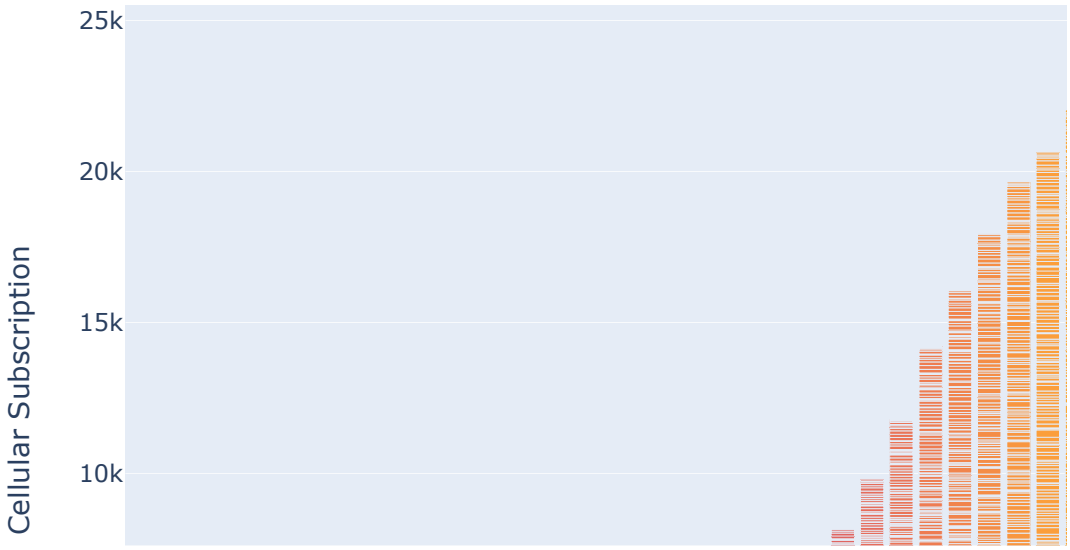






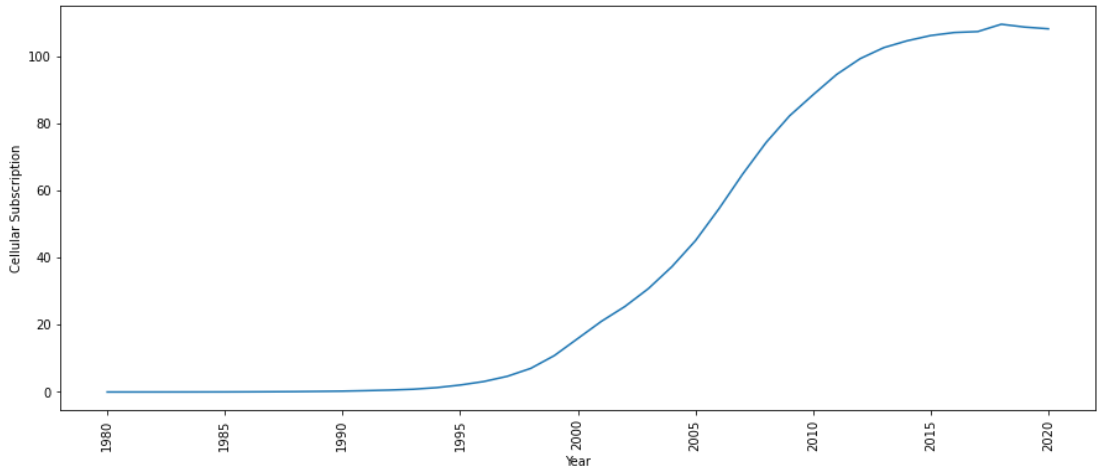
In [ ]:

```
for i in num_cols:
    if i != 'Year':
        fig = px.bar(df, x='Year', y=i, color='Year')
        fig.show()
```



In [33]:

```
for i in num_cols:
    for j in num_cols:
        if i != j:
            plt.figure(figsize=(15,6))
            sns.lineplot(x = df[i], y = df[j], data = df, ci = None, palette = 'hls')
            plt.xticks(rotation = 90)
            plt.show()
```



In [34]:

```
temp=df[~(df['Code']=='Region')]
```

In [35]:

```
temp1= temp.groupby(['Entity','Year']).sum().reset_index()
```

In [36]:

```
df1=temp1[(temp1['Entity']=='India')|(temp1['Entity']=='China')|(temp1['Entity']=='Unite
```

In [37]:

```
df1
```

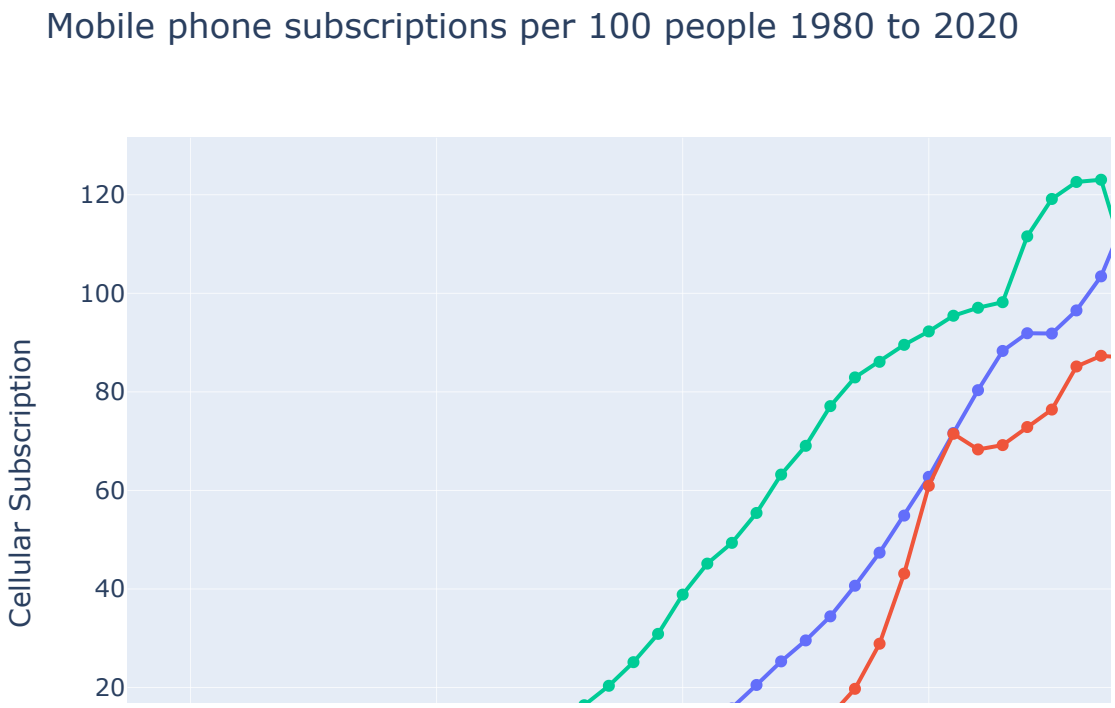
Out[37]:

	Entity	Year	Cellular Subscription	Internet Users(%)	No. of Internet Users	Broadband Subscription
1579	China	1980	0.000000	0.000000	0	0.000000
1580	China	1981	0.000000	0.000000	0	0.000000
1581	China	1982	0.000000	0.000000	0	0.000000
1582	China	1983	0.000000	0.000000	0	0.000000
1583	China	1984	0.000000	0.000000	0	0.000000
...	...	...	...	...	...	...
7900	United States	2016	122.594551	85.544418	279910069	32.727173
7901	United States	2017	123.044838	87.274887	287824925	33.283627
7902	United States	2018	106.464684	88.498901	293940279	33.860367
7903	United States	2019	108.092651	89.430283	298983035	34.725369
7904	United States	2020	106.185554	90.900002	305371298	36.608768

120 rows × 6 columns

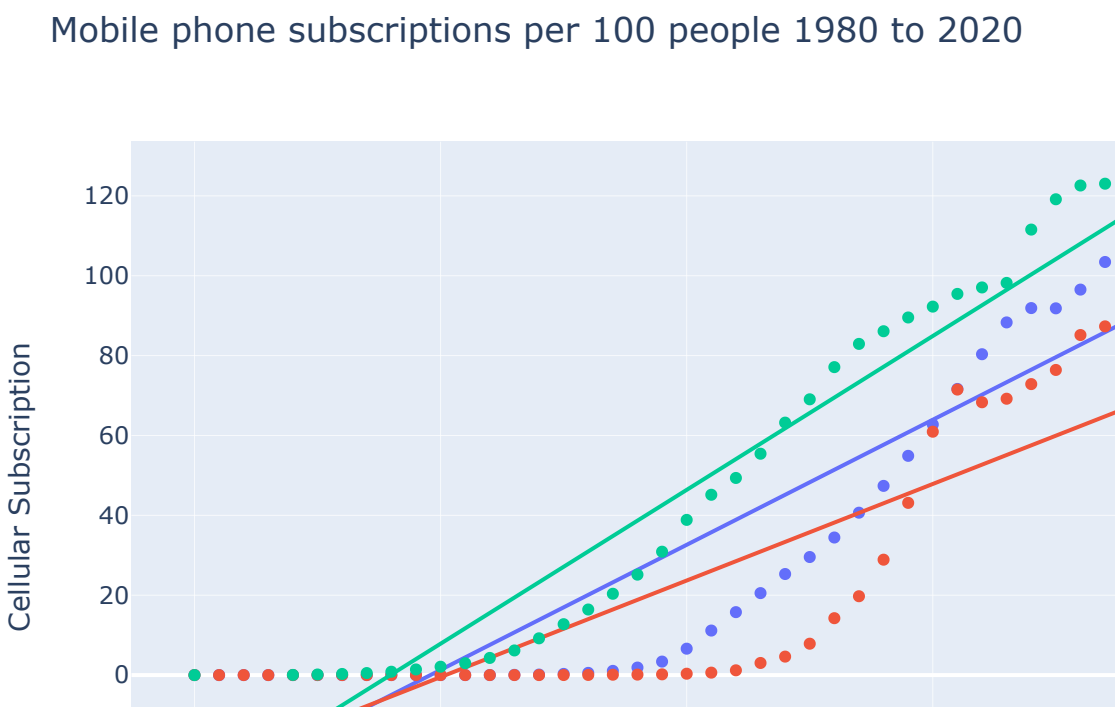
In [38]:

```
fig = px.line(df1, x='Year', y='Cellular Subscription', color='Entity', markers=True,
              title='Mobile phone subscriptions per 100 people 1980 to 2020')
fig.update_layout(hovermode='x unified')
fig.show()
```



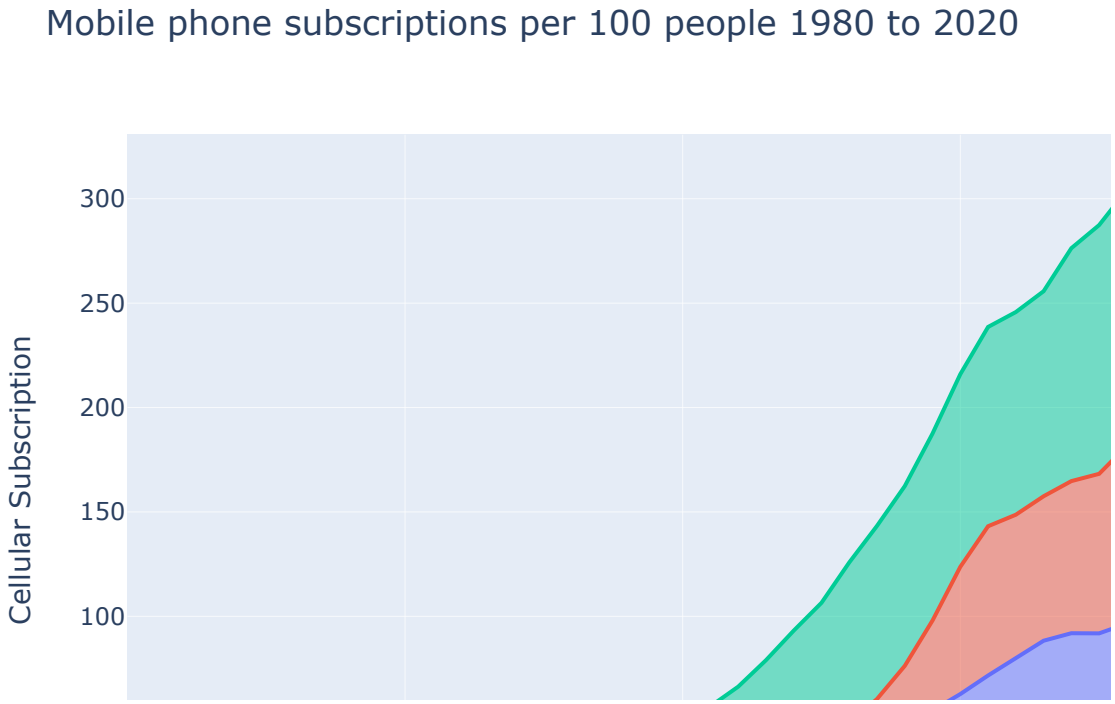
In [39]:

```
fig = px.scatter(df1, x="Year", y="Cellular Subscription", color="Entity", trendline="ol
fig.show()
```



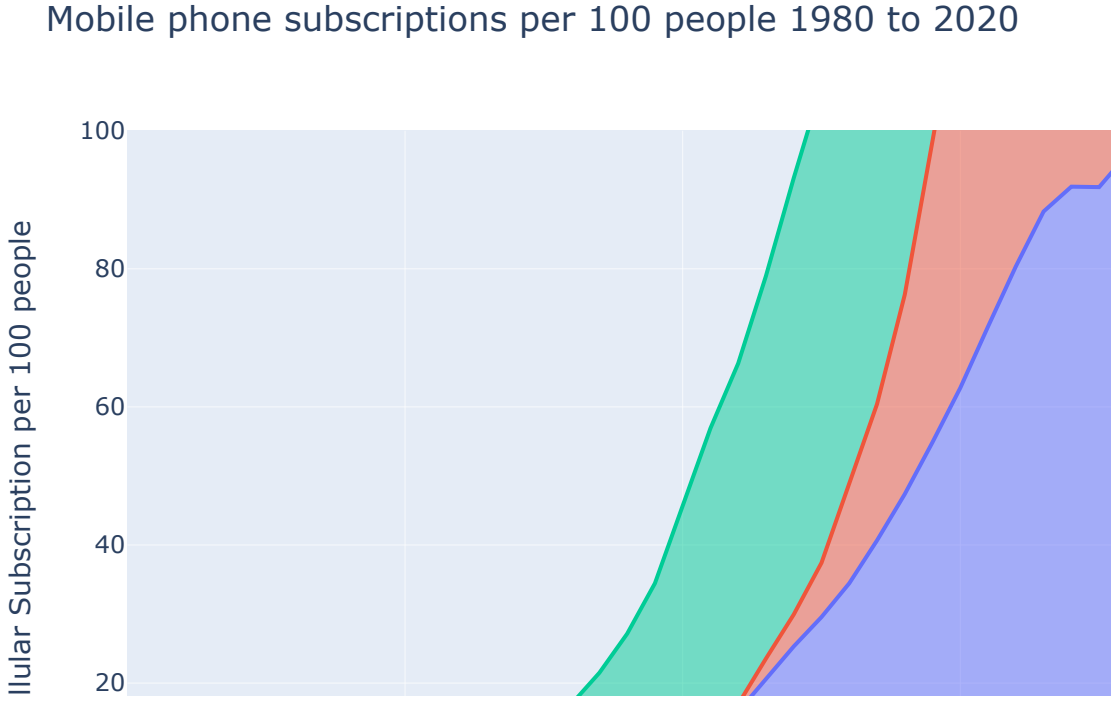
In [40]:

```
fig = px.area(df1, x="Year", y="Cellular Subscription", color="Entity", title="Mobile ph
fig.show()
```



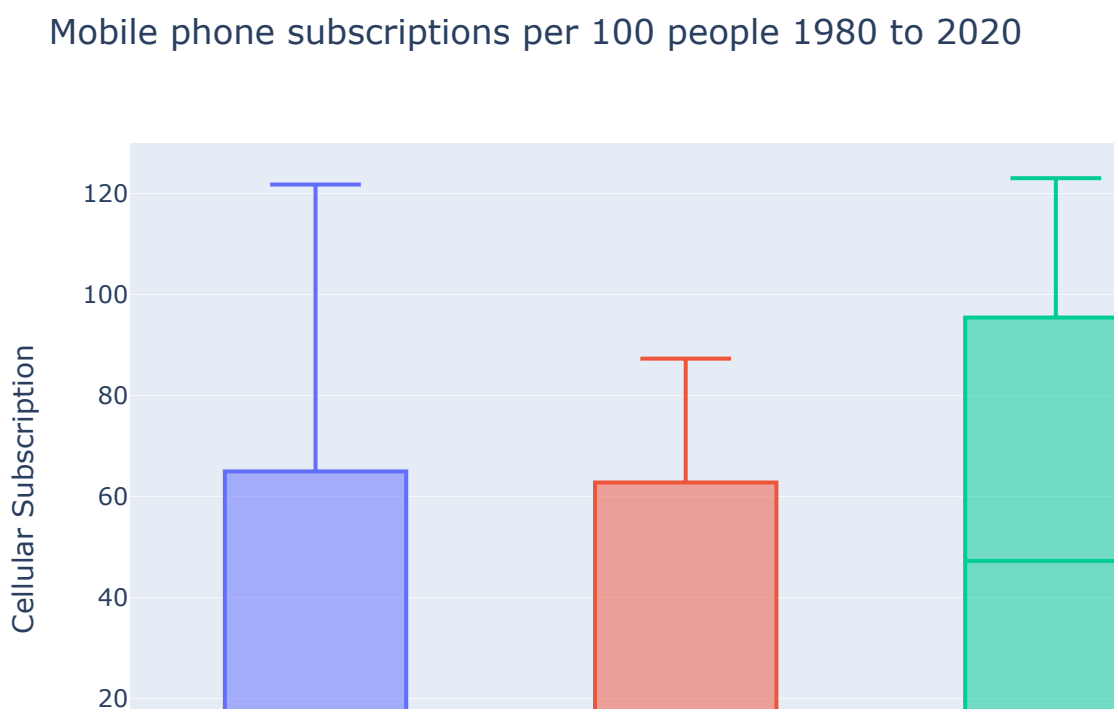
In [41]:

```
fig = px.area(df1, x="Year", y="Cellular Subscription", color="Entity", title="Mobile ph
             labels={"Year":"Year", "Cellular Subscription":"Cellular Subscription per 1
fig.update_layout(yaxis_range=[0,100])
fig.show()
```



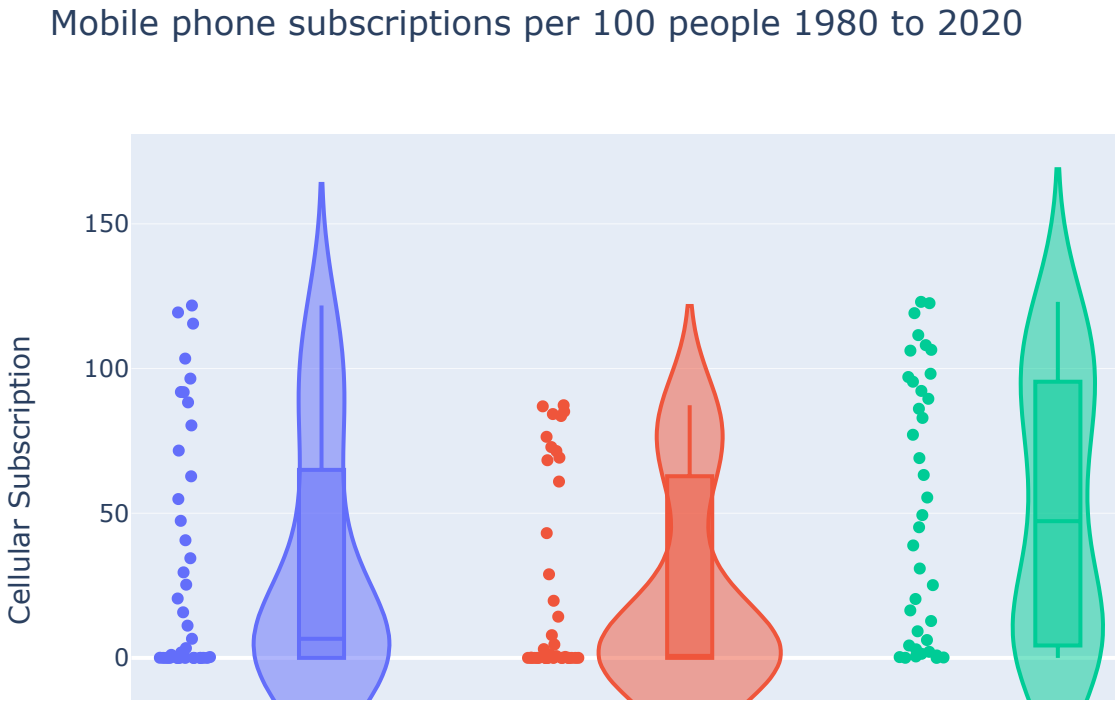
In [42]:

```
fig = px.box(df1, x="Entity", y="Cellular Subscription", color="Entity", title="Mobile p
fig.show()
```



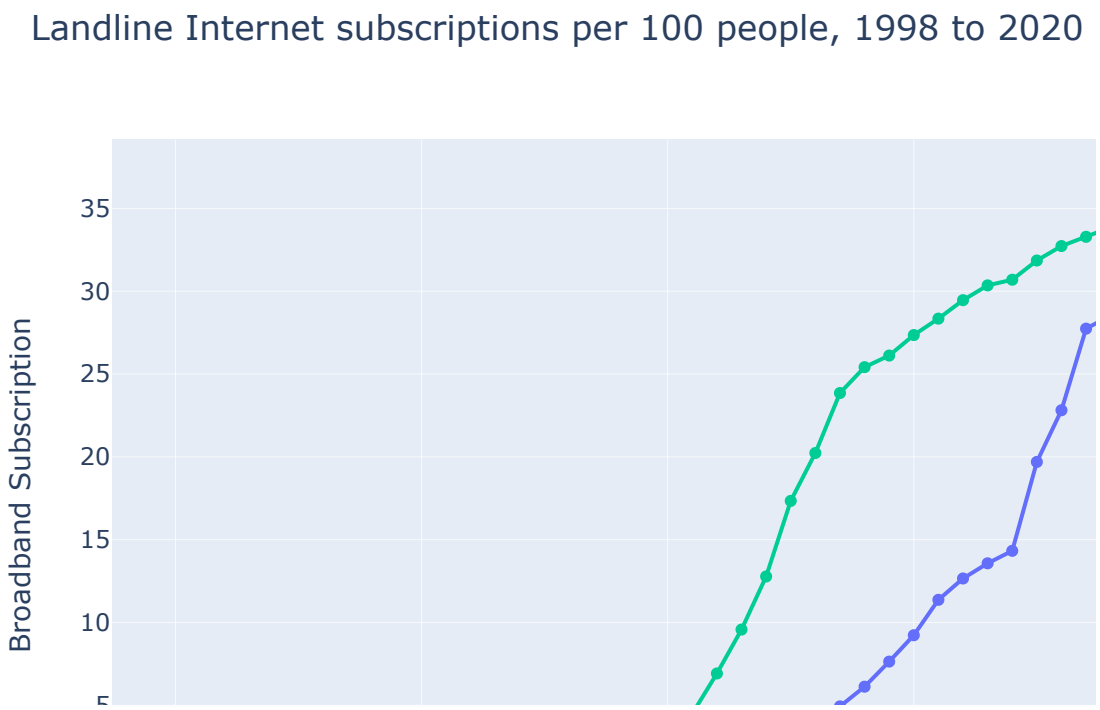
In [43]:

```
fig = px.violin(df1, x="Entity", y="Cellular Subscription", color="Entity", box=True, po
fig.show()
```



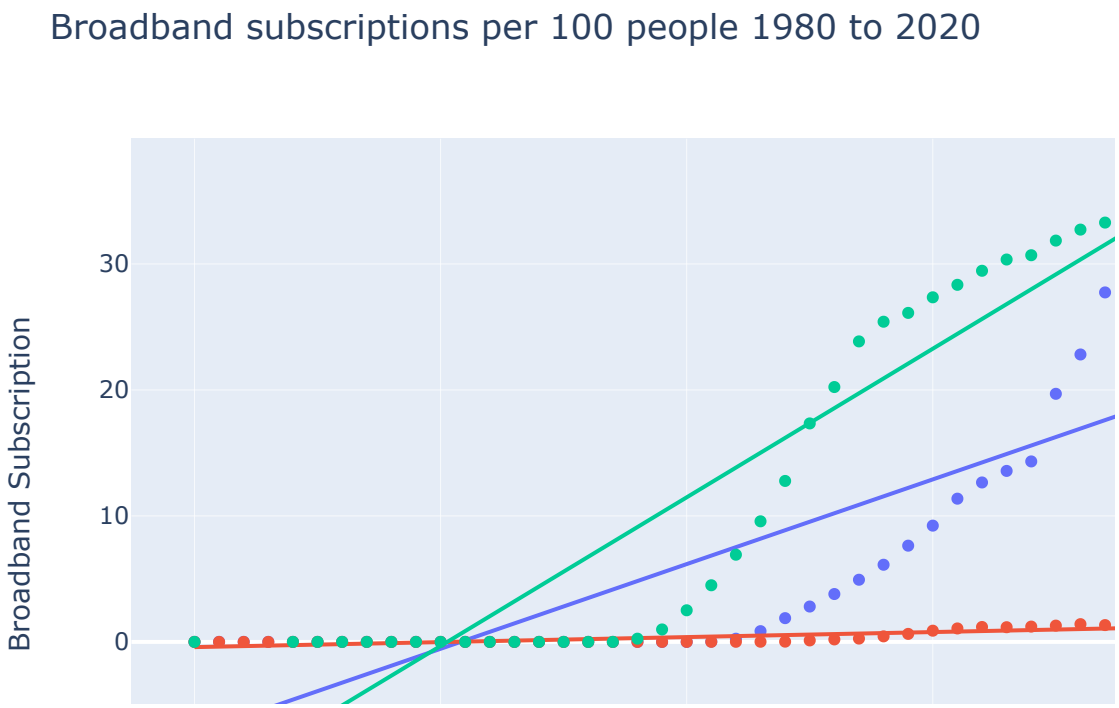
In [44]:

```
fig = px.line(df1, x='Year', y='Broadband Subscription', color='Entity', markers=True,
              title='Landline Internet subscriptions per 100 people, 1998 to 2020')
fig.update_layout(hovermode='x unified')
fig.show()
```



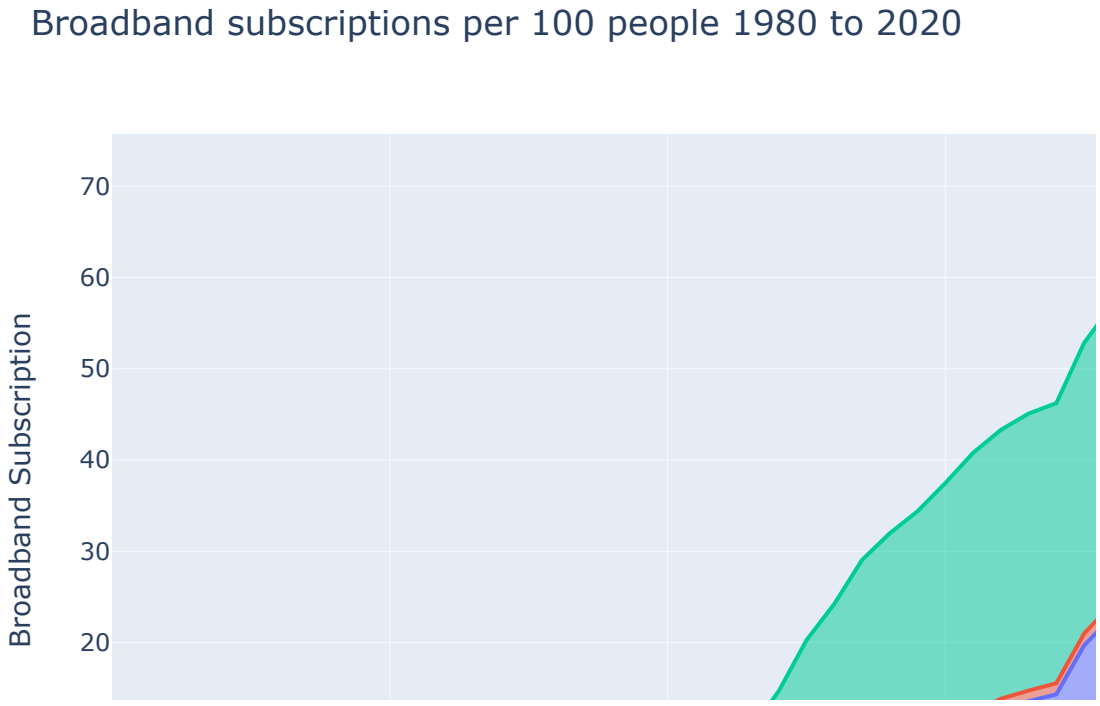
In [45]:

```
fig = px.scatter(df1, x="Year", y="Broadband Subscription", color="Entity", trendline="o
fig.show()
```



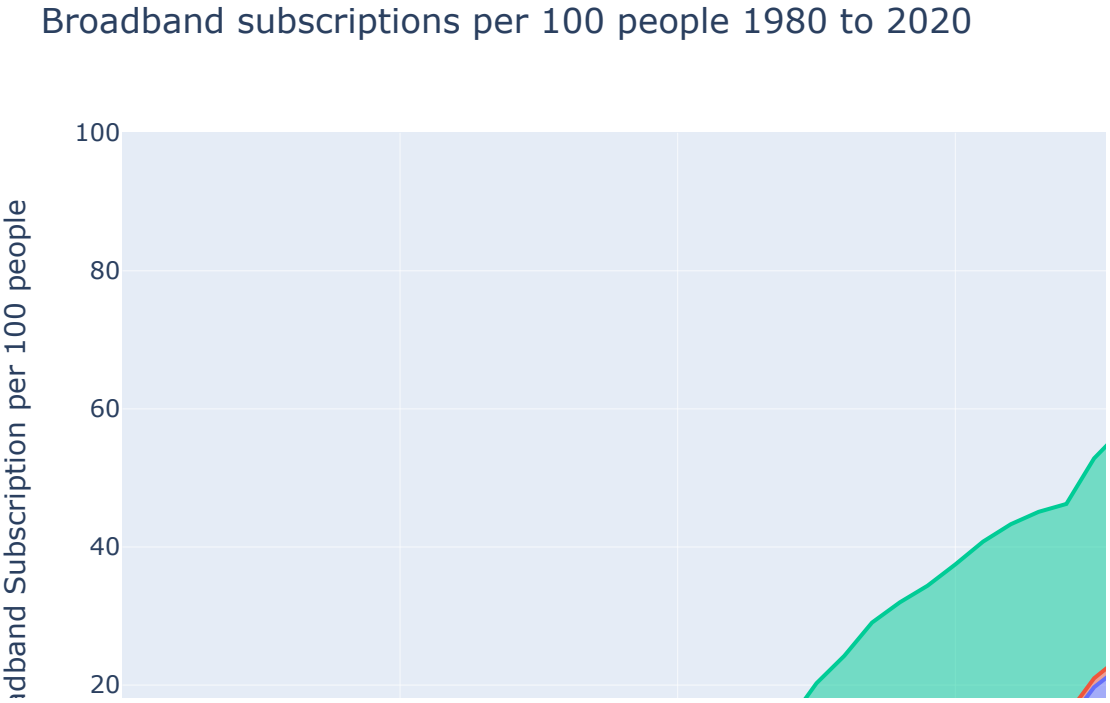
In [46]:

```
fig = px.area(df1, x="Year", y="Broadband Subscription", color="Entity", title="Broadban
fig.show()
```



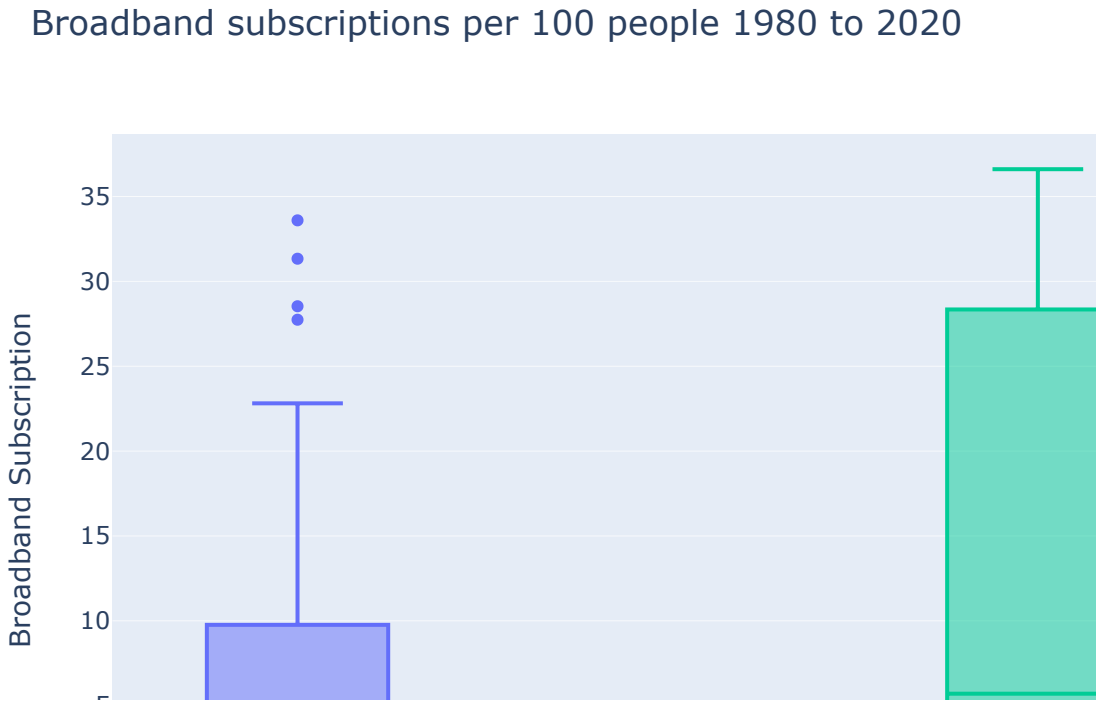
In [47]:

```
fig = px.area(df1, x="Year", y="Broadband Subscription", color="Entity", title="Broadban
             labels={"Year":"Year", "Broadband Subscription":"Broadband Subscription per
fig.update_layout(yaxis_range=[0,100])
fig.show()
```



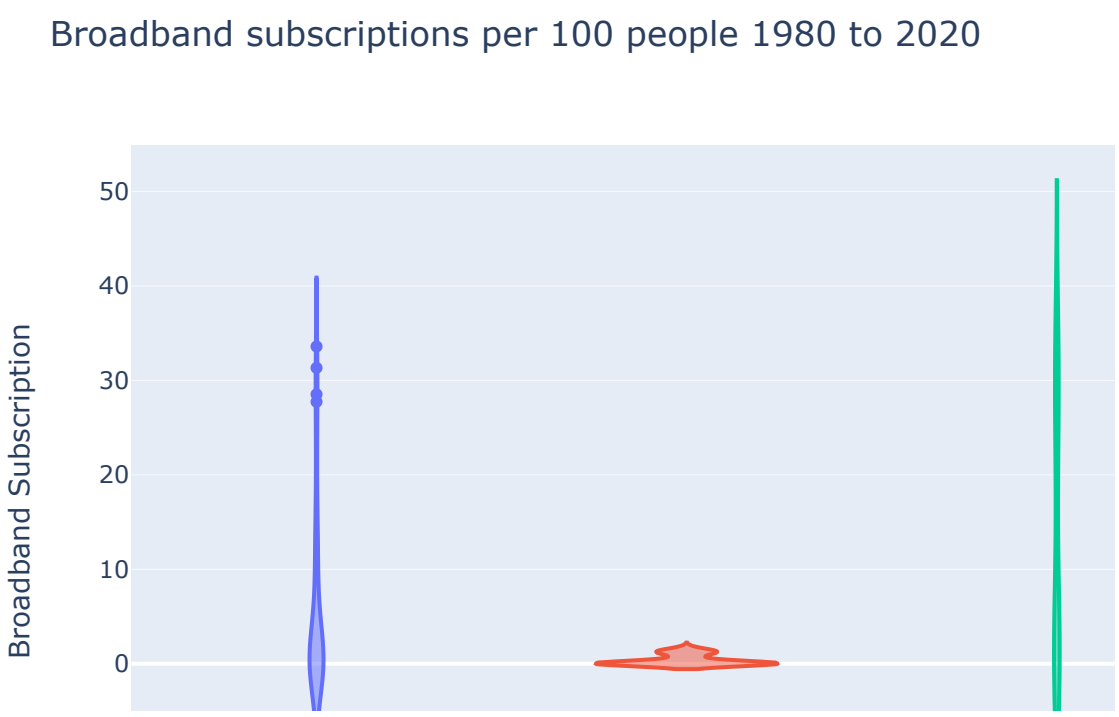
In [48]:

```
fig = px.box(df1, x="Entity", y="Broadband Subscription", color="Entity", title="Broadba
fig.show()
```



In [49]:

```
fig = px.violin(df1, x="Entity", y="Broadband Subscription", color="Entity", title="Broa
fig.show()
```



In [50]:

```
df2 = df[df['Code']=='Region']
```

In [51]:

```
df2['Entity'].unique()
```

Out[51]:

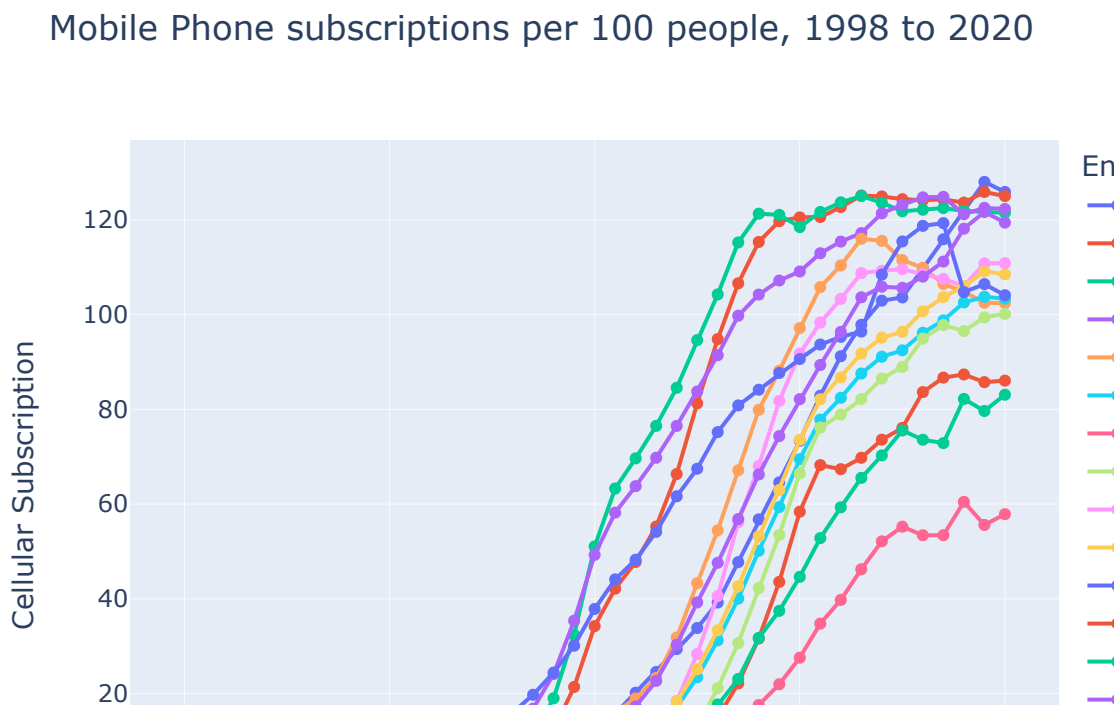
```
array(['East Asia and Pacific', 'Europe and Central Asia',
       'European Union', 'High income', 'Latin America and Caribbean',
       'Low and middle income', 'Low income', 'Lower middle income',
       'Middle East and North Africa', 'Middle income', 'North America',
       'South Asia', 'Sub-Saharan Africa', 'Upper middle income'],
      dtype=object)
```

In [52]:

```
temp=df2[(df2['Entity']=='East Asia and Pacific')|(df2['Entity']=='Europe and Central As
```

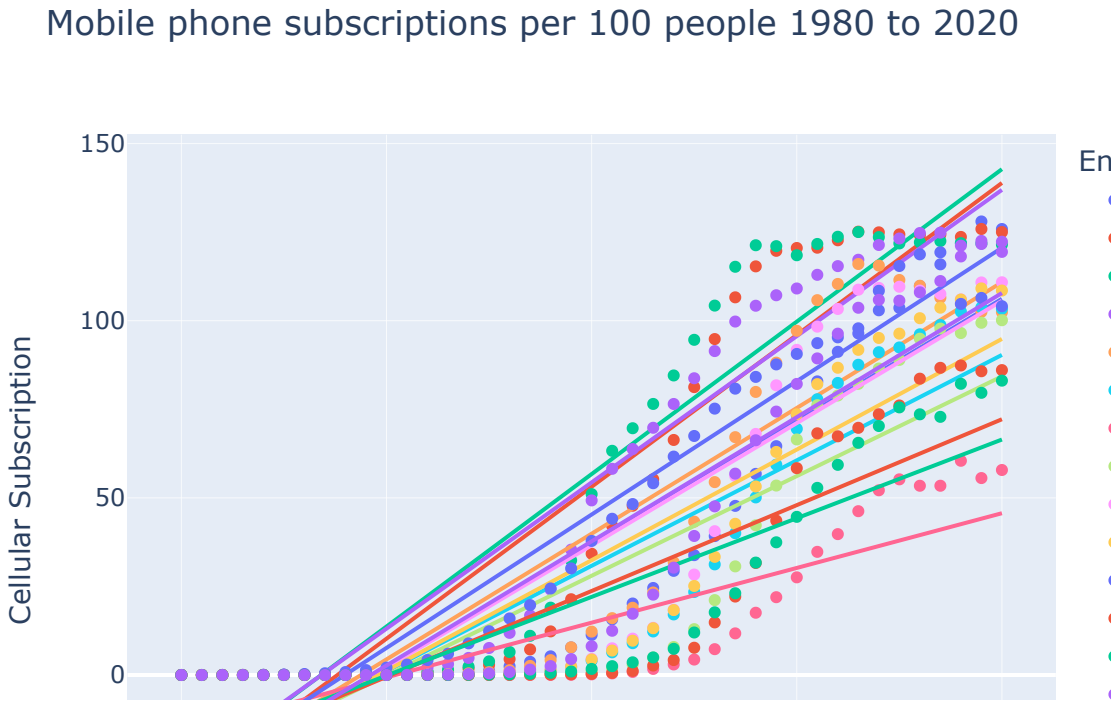
In [53]:

```
fig = px.line(df2, x='Year', y='Cellular Subscription', color='Entity', markers=True,
              title='Mobile Phone subscriptions per 100 people, 1998 to 2020')
fig.update_layout(hovermode='x unified')
fig.show()
```



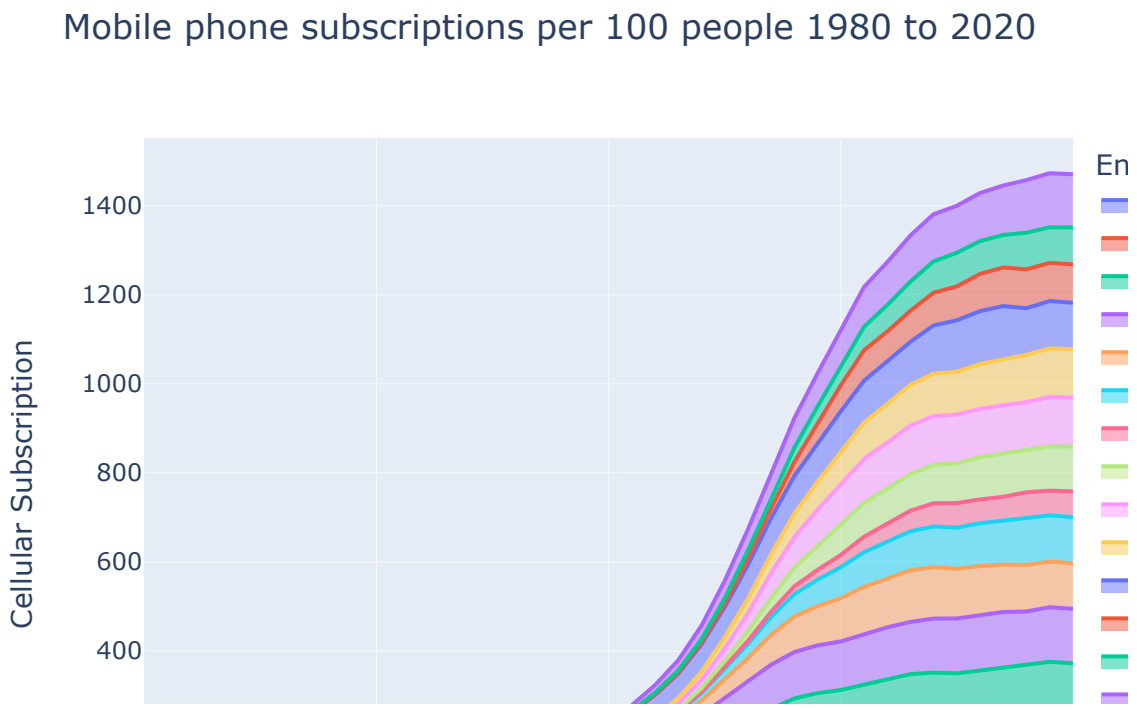
In [54]:

```
fig = px.scatter(df2, x="Year", y="Cellular Subscription", color="Entity", trendline="ol
fig.show()
```



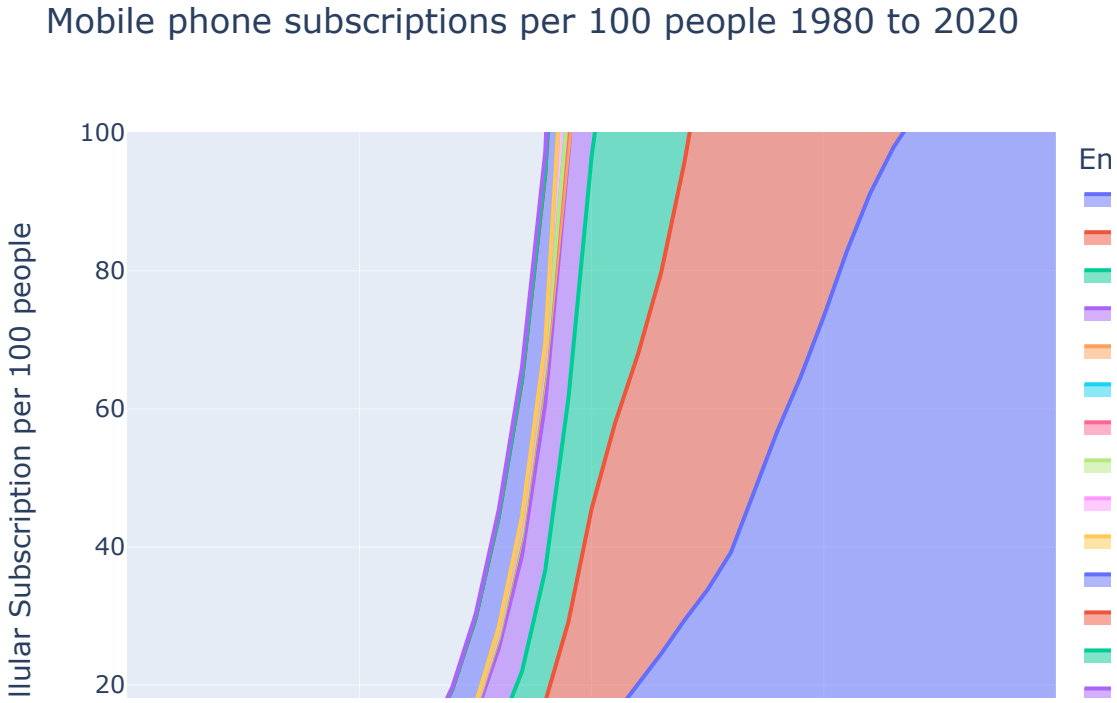
In [55]:

```
fig = px.area(df2, x="Year", y="Cellular Subscription", color="Entity", title="Mobile ph
fig.show()
```



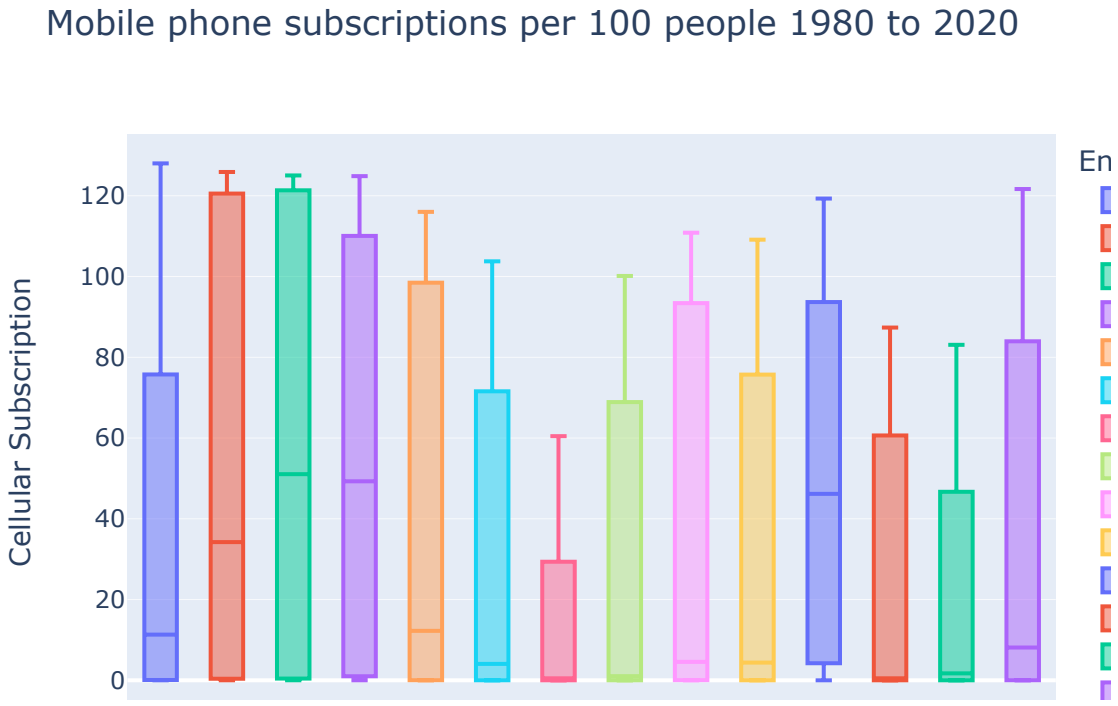
In [56]:

```
fig = px.area(df2, x="Year", y="Cellular Subscription", color="Entity", title="Mobile ph
             labels={"Year":"Year", "Cellular Subscription":"Cellular Subscription per 1
fig.update_layout(yaxis_range=[0,100])
fig.show()
```



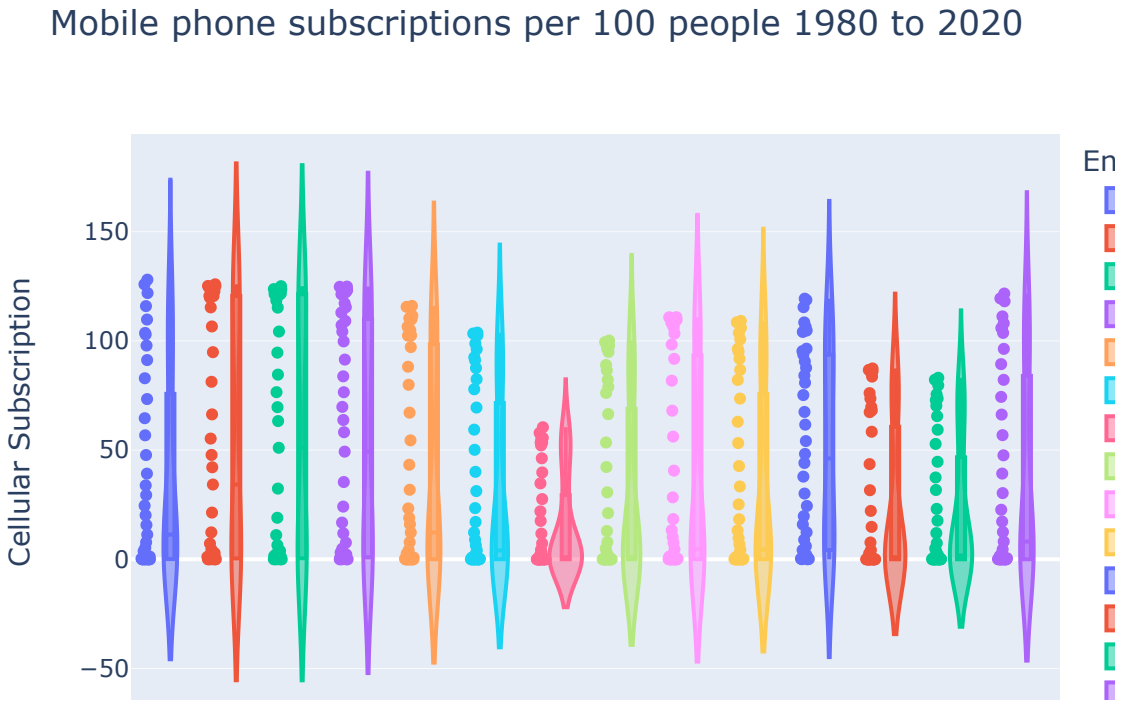
In [57]:

```
fig = px.box(df2, x="Entity", y="Cellular Subscription", color="Entity", title="Mobile p
fig.show()
```



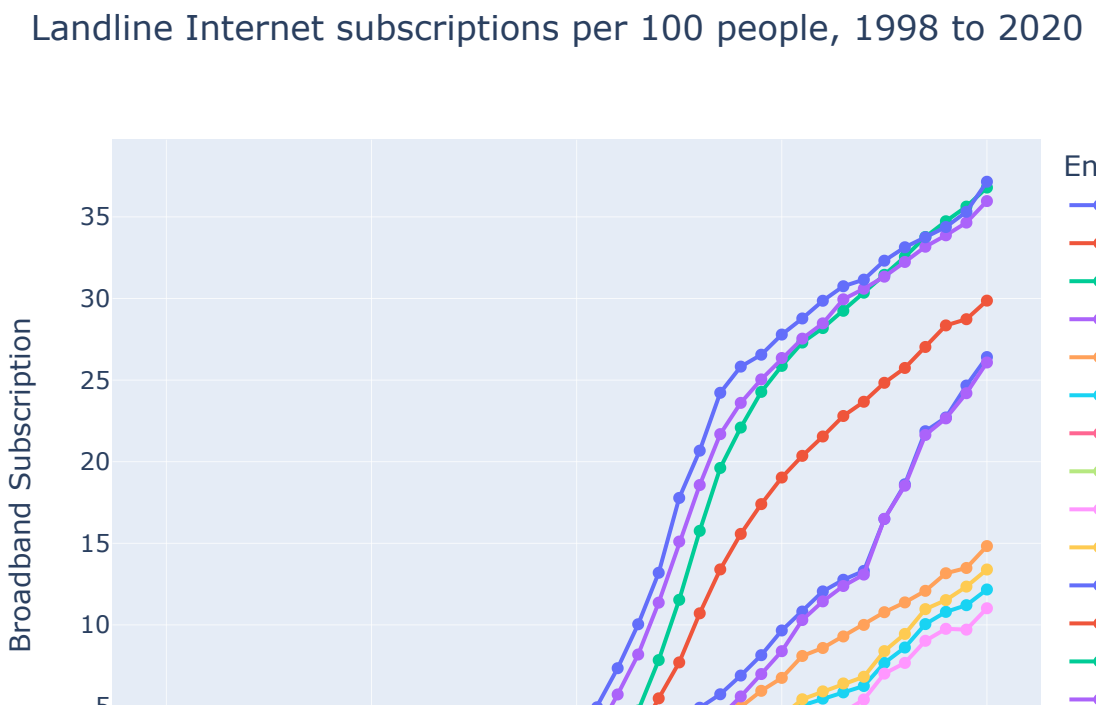
In [58]:

```
fig = px.violin(df2, x="Entity", y="Cellular Subscription", color="Entity", box=True, po
fig.show()
```



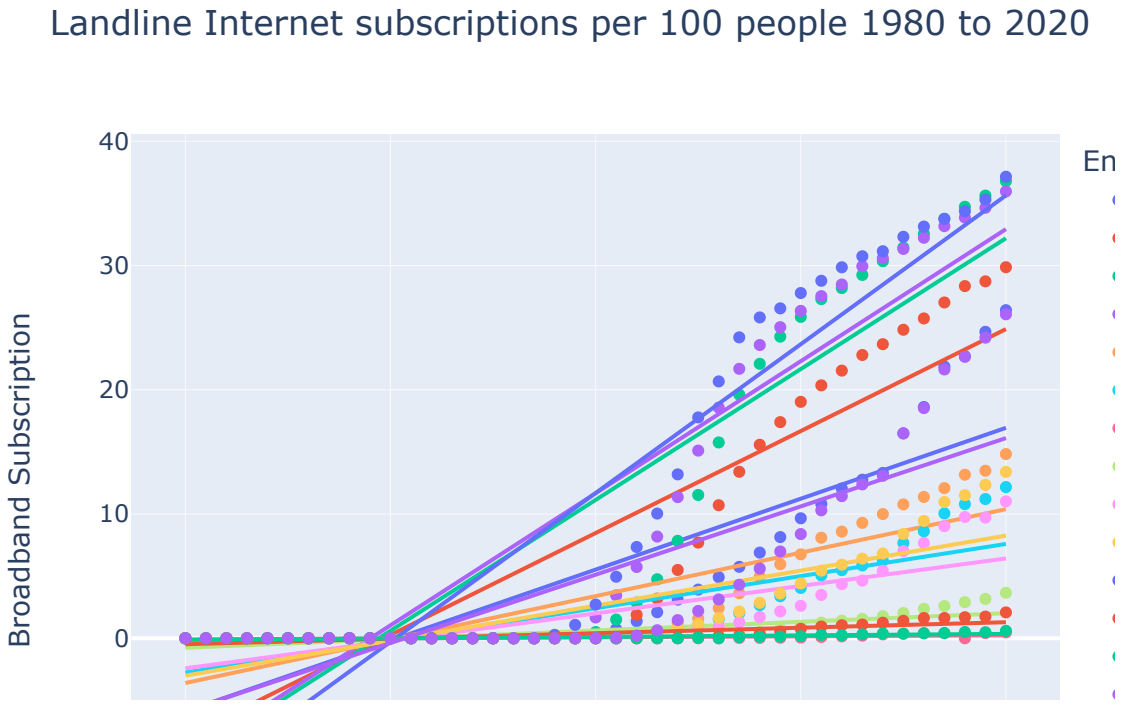
In [59]:

```
fig = px.line(df2, x='Year', y='Broadband Subscription', color='Entity', markers=True,
              title='Landline Internet subscriptions per 100 people, 1998 to 2020')
fig.update_layout(hovermode='x unified')
fig.show()
```



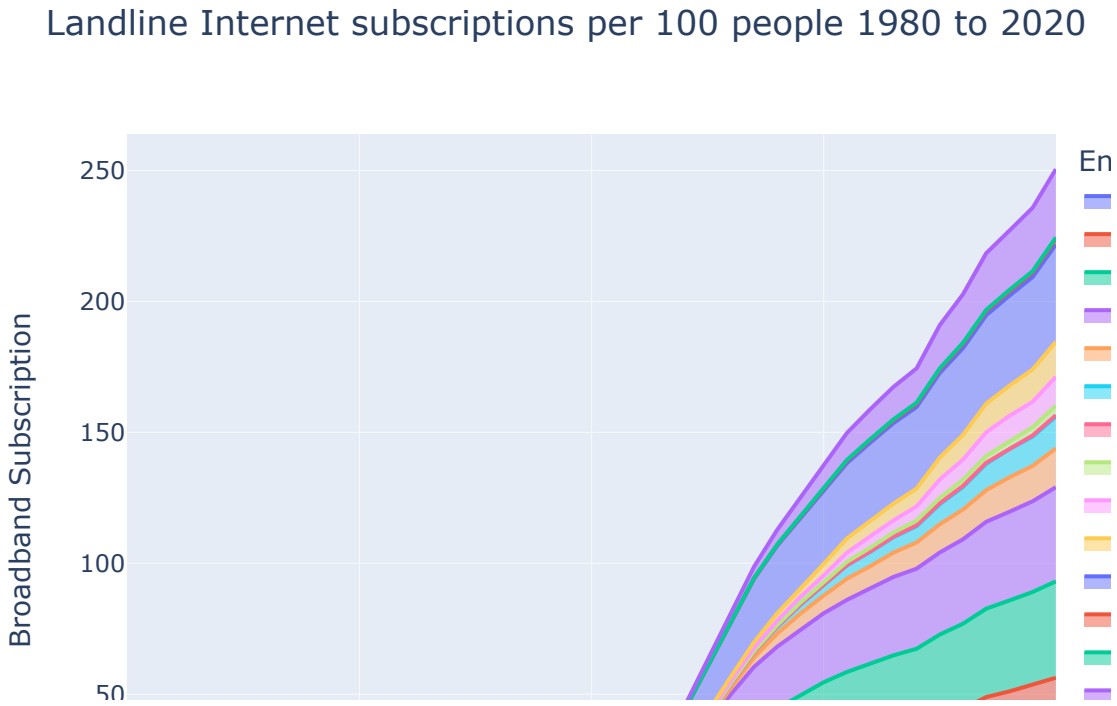
In [60]:

```
fig = px.scatter(df2, x="Year", y="Broadband Subscription", color="Entity", trendline="o
fig.show()
```



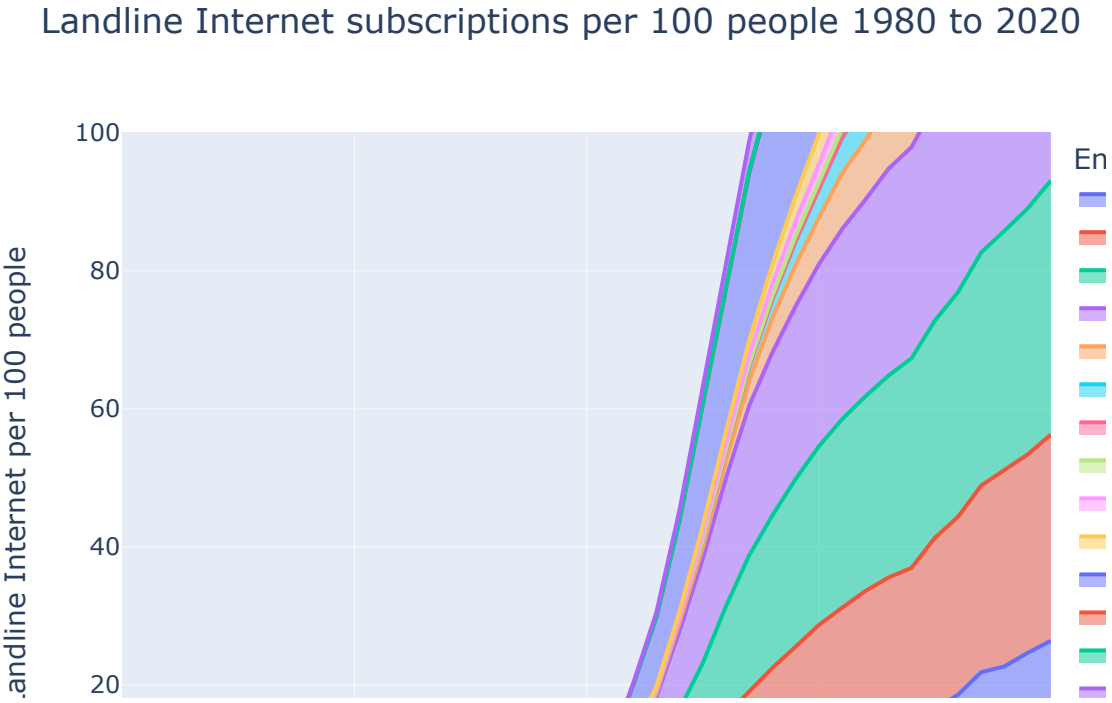
In [61]:

```
fig = px.area(df2, x="Year", y="Broadband Subscription", color="Entity", title="Landline
fig.show()
```



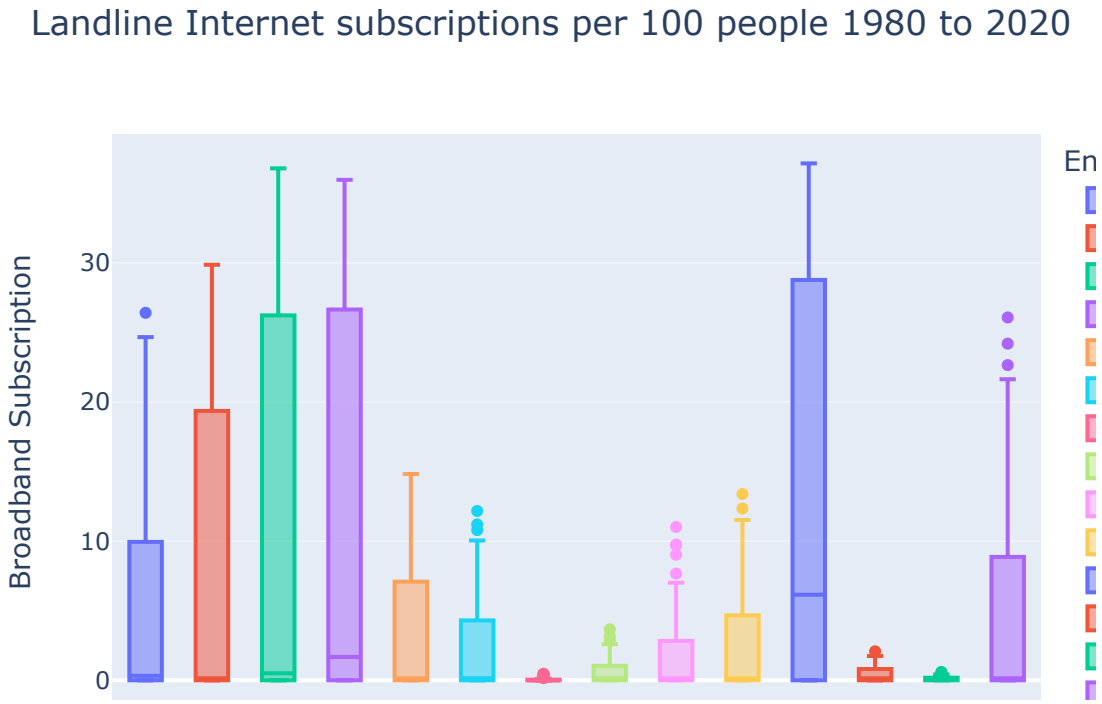
In [62]:

```
fig = px.area(df2, x="Year", y="Broadband Subscription", color="Entity", title="Landline
             labels={"Year":"Year", "Broadband Subscription":"Landline Internet per 100
fig.update_layout(yaxis_range=[0,100])
fig.show()
```



In [63]:

```
fig = px.box(df2, x="Entity", y="Broadband Subscription", color="Entity", title="Landlin
fig.show()
```



In [64]:

```
fig = px.violin(df2, x="Entity", y="Broadband Subscription", color="Entity", title="Land
fig.show()
```