

In [1]:

```
import numpy as np
import pandas as pd
from numpy import cov
from scipy.stats import pearsonr
from scipy.stats import spearmanr
import matplotlib.pyplot as pp
```

In [2]:

```
a = pd.read_csv("2015.csv")
a
```

Out[2]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.6655
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.6287
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.6493
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.6697
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.6329
...
153	Rwanda	Sub-Saharan Africa	154	3.465	0.03464	0.22208	0.77370	0.42864	0.5920
154	Benin	Sub-Saharan Africa	155	3.340	0.03656	0.28665	0.35386	0.31910	0.4845
155	Syria	Middle East and Northern Africa	156	3.006	0.05015	0.66320	0.47489	0.72193	0.1568
156	Burundi	Sub-Saharan Africa	157	2.905	0.08658	0.01530	0.41587	0.22396	0.1185
157	Togo	Sub-Saharan Africa	158	2.839	0.06727	0.20868	0.13995	0.28443	0.3645

158 rows × 12 columns

In [3]:

```
a.head()
```

Out[3]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.66557
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.62877
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.64938
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.66973
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.63297

In [4]:

a.head(10)

Out[4]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.66557
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.62877
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.64938
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.66973
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.63297
5	Finland	Western Europe	6	7.406	0.03140	1.29025	1.31826	0.88911	0.64169
6	Netherlands	Western Europe	7	7.378	0.02799	1.32944	1.28017	0.89284	0.61576
7	Sweden	Western Europe	8	7.364	0.03157	1.33171	1.28907	0.91087	0.65980
8	New Zealand	Australia and New Zealand	9	7.286	0.03371	1.25018	1.31967	0.90837	0.63938
9	Australia	Australia and New Zealand	10	7.284	0.04083	1.33358	1.30923	0.93156	0.65124

In [5]: `a.tail()`

Out[5]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
153	Rwanda	Sub-Saharan Africa	154	3.465	0.03464	0.22208	0.77370	0.42864	0.59201
154	Benin	Sub-Saharan Africa	155	3.340	0.03656	0.28665	0.35386	0.31910	0.48450
155	Syria	Middle East and Northern Africa	156	3.006	0.05015	0.66320	0.47489	0.72193	0.15684
156	Burundi	Sub-Saharan Africa	157	2.905	0.08658	0.01530	0.41587	0.22396	0.11850
157	Togo	Sub-Saharan Africa	158	2.839	0.06727	0.20868	0.13995	0.28443	0.36453

In [6]: `a.tail(10)`

Out[6]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
148	Chad	Sub-Saharan Africa	149	3.667	0.03830	0.34193	0.76062	0.15010	0.2350
149	Guinea	Sub-Saharan Africa	150	3.656	0.03590	0.17417	0.46475	0.24009	0.3772
150	Ivory Coast	Sub-Saharan Africa	151	3.655	0.05141	0.46534	0.77115	0.15185	0.4686
151	Burkina Faso	Sub-Saharan Africa	152	3.587	0.04324	0.25812	0.85188	0.27125	0.3949
152	Afghanistan	Southern Asia	153	3.575	0.03084	0.31982	0.30285	0.30335	0.2341
153	Rwanda	Sub-Saharan Africa	154	3.465	0.03464	0.22208	0.77370	0.42864	0.5920

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
154	Benin	Sub-Saharan Africa	155	3.340	0.03656	0.28665	0.35386	0.31910	0.4845
155	Syria	Middle East and Northern Africa	156	3.006	0.05015	0.66320	0.47489	0.72193	0.1568
		Sub-							

In [7]:

a.columns

```
Out[7]: Index(['Country', 'Region', 'Happiness Rank', 'Happiness Score',
       'Standard Error', 'Economy (GDP per Capita)', 'Family',
       'Health (Life Expectancy)', 'Freedom', 'Trust (Government Corruption)',
       'Generosity', 'Dystopia Residual'],
      dtype='object')
```

In [8]:

a.index

```
Out[8]: RangeIndex(start=0, stop=158, step=1)
```

In [9]:

a.describe()

Out[9]:

	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom	(Government Corruption)
count	158.000000	158.000000	158.000000	158.000000	158.000000	158.000000	158.000000	158.00
mean	79.493671	5.375734	0.047885	0.846137	0.991046	0.630259	0.428615	0.14
std	45.754363	1.145010	0.017146	0.403121	0.272369	0.247078	0.150693	0.12
min	1.000000	2.839000	0.018480	0.000000	0.000000	0.000000	0.000000	0.00
25%	40.250000	4.526000	0.037268	0.545808	0.856823	0.439185	0.328330	0.06
50%	79.500000	5.232500	0.043940	0.910245	1.029510	0.696705	0.435515	0.10
75%	118.750000	6.243750	0.052300	1.158448	1.214405	0.811013	0.549092	0.18
max	158.000000	7.587000	0.136930	1.690420	1.402230	1.025250	0.669730	0.55

In [10]:

a[0:2]

Out[10]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.66557

Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
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In [12]: `a["Happiness Rank"]`

```
Out[12]: 0      1
         1      2
         2      3
         3      4
         4      5
         ...
        153    154
        154    155
        155    156
        156    157
        157    158
Name: Happiness Rank, Length: 158, dtype: int64
```

In [13]: `a.iloc[0:5]`

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.66557
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.62877
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.64938
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.66973
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.63297

In [14]: `a.loc["Happiness Rank":"Happiness Score"]`

Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom	(Gove Cor)
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In [15]: `pd.isna(a)`

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom	(C
0	False	False	False	False	False	False	False	False	False	False

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom	(C)
1	False	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	False	False	False
4	False	False	False	False	False	False	False	False	False	False
...
153	False	False	False	False	False	False	False	False	False	False
154	False	False	False	False	False	False	False	False	False	False
155	False	False	False	False	False	False	False	False	False	False
156	False	False	False	False	False	False	False	False	False	False

In [16]:

a.fillna(5)

Out[16]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.6655
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.6287
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.6493
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.6697
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.6329
...
153	Rwanda	Sub-Saharan Africa	154	3.465	0.03464	0.22208	0.77370	0.42864	0.5920
154	Benin	Sub-Saharan Africa	155	3.340	0.03656	0.28665	0.35386	0.31910	0.4845
155	Syria	Middle East and Northern Africa	156	3.006	0.05015	0.66320	0.47489	0.72193	0.1568
156	Burundi	Sub-Saharan Africa	157	2.905	0.08658	0.01530	0.41587	0.22396	0.1185

Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedor
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In [17]:

`a.dropna()`

Out[17]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedor
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.6655
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.6287
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.6493
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.6697
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.6329
...
153	Rwanda	Sub-Saharan Africa	154	3.465	0.03464	0.22208	0.77370	0.42864	0.5920
154	Benin	Sub-Saharan Africa	155	3.340	0.03656	0.28665	0.35386	0.31910	0.4845
155	Syria	Middle East and Northern Africa	156	3.006	0.05015	0.66320	0.47489	0.72193	0.1568
156	Burundi	Sub-Saharan Africa	157	2.905	0.08658	0.01530	0.41587	0.22396	0.1185
157	Togo	Sub-Saharan Africa	158	2.839	0.06727	0.20868	0.13995	0.28443	0.3645

158 rows × 12 columns

In [20]:

`a.drop(5)`

Out[20]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedor
0	Switzerland	Western	1	7.587	0.03411	1.39651	1.34951	0.94143	0.6655

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedor
		Europe							
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.6287
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.6493
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.6697
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.6329
...
153	Rwanda	Sub-Saharan Africa	154	3.465	0.03464	0.22208	0.77370	0.42864	0.5920
154	Benin	Sub-Saharan Africa	155	3.340	0.03656	0.28665	0.35386	0.31910	0.4845
155	Syria	Middle East and Northern Africa	156	3.006	0.05015	0.66320	0.47489	0.72193	0.1568
156	Burundi	Sub-Saharan Africa	157	2.905	0.08658	0.01530	0.41587	0.22396	0.1185
157	Togo	Sub-Saharan	158	2.839	0.06727	0.20868	0.13995	0.28443	0.3645

In [19]:

`a.shape`

Out[19]: (158, 12)

In [21]:

`a.size`

Out[21]: 1896

In [22]:

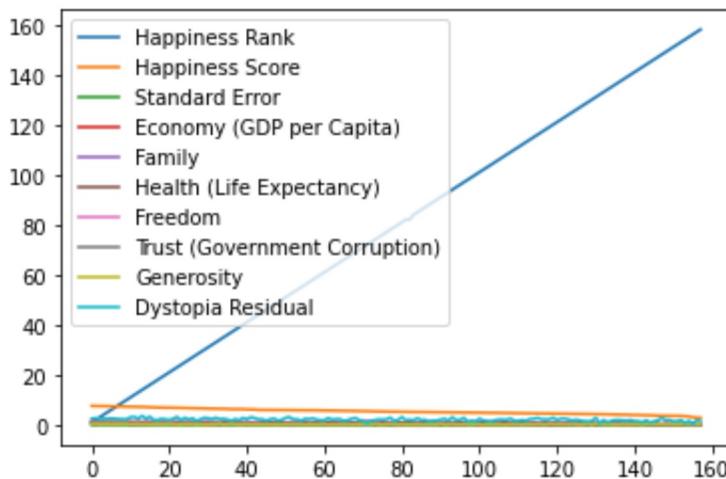
`a.plot()`

Out[22]: <AxesSubplot:>



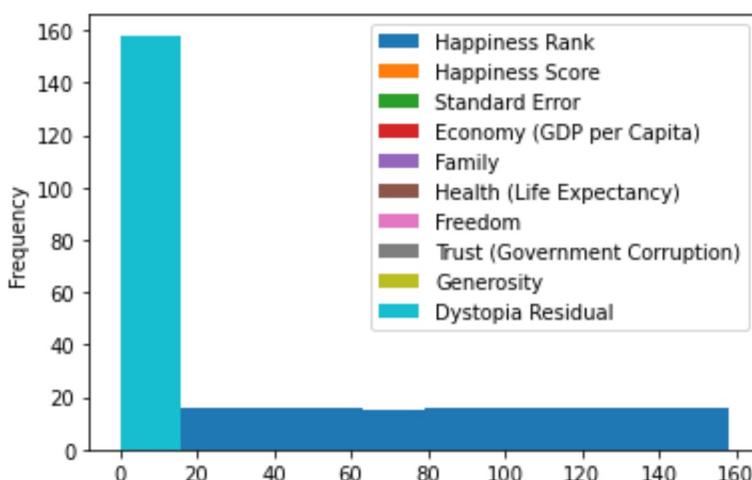
In [23]: `a.plot.line()`

Out[23]: <AxesSubplot:>



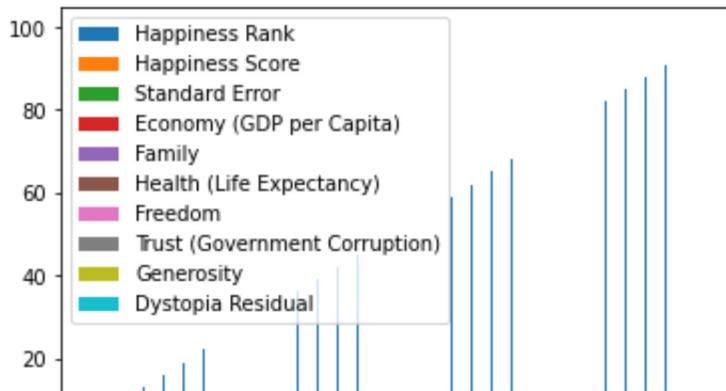
In [24]: `a.plot.hist()`

Out[24]: <AxesSubplot:ylabel='Frequency'>



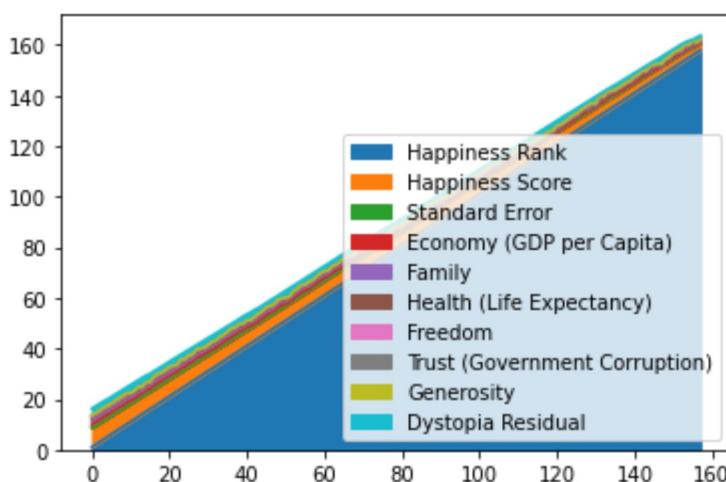
In [26]: `b = a.head(100)
b.plot.bar()`

Out[26]: <AxesSubplot:>



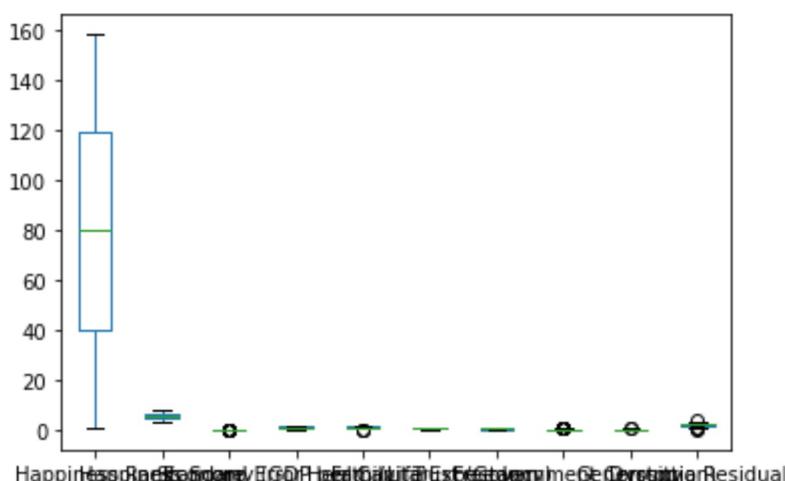
In [27]: `a.plot.area()`

Out[27]: <AxesSubplot:>



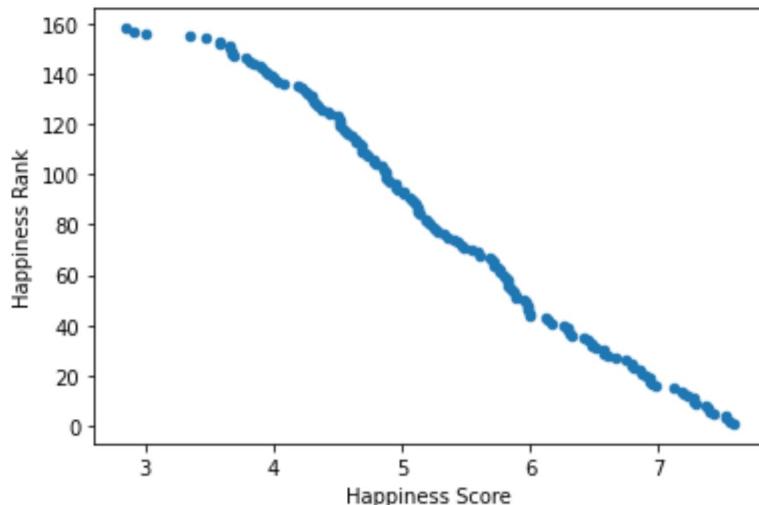
In [28]: `a.plot.box()`

Out[28]: <AxesSubplot:>



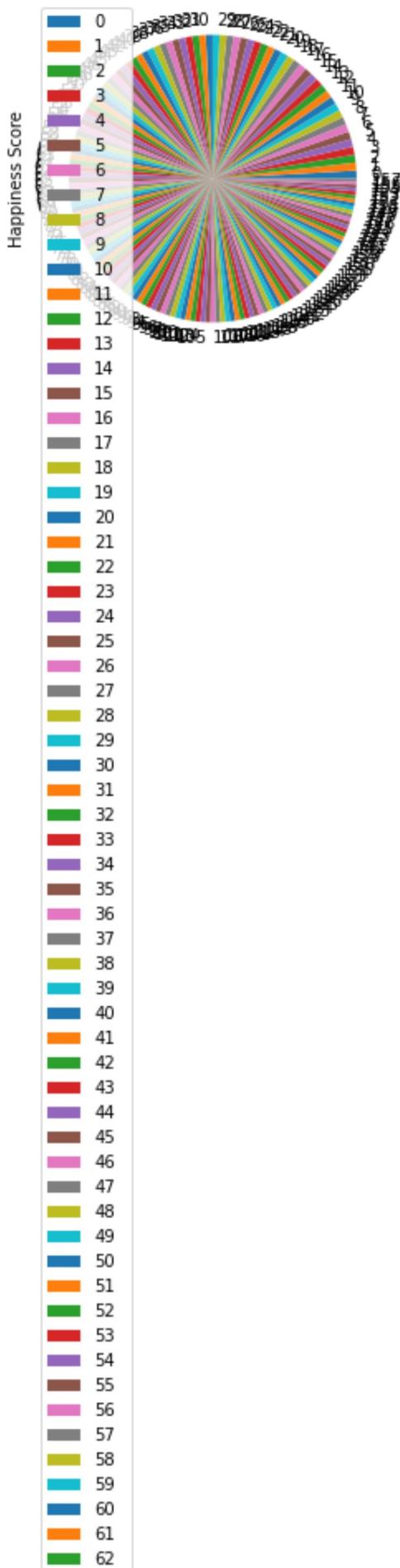
In [29]: `a.plot.scatter(x = "Happiness Score", y = "Happiness Rank")`

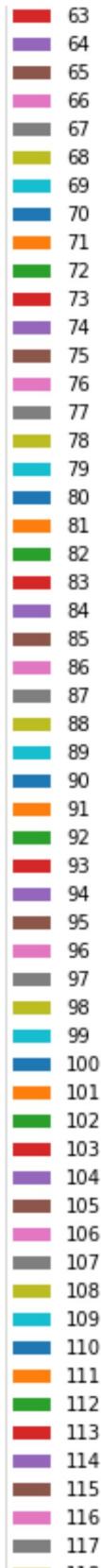
Out[29]: <AxesSubplot:xlabel='Happiness Score', ylabel='Happiness Rank'>



In [30]:
a.plot.pie(y = "Happiness Score")

Out[30]: <AxesSubplot:ylabel='Happiness Score'>





In [31]:

a.cov()

Out[31]:

Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom (Gov Cor)
----------------	-----------------	----------------	--------------------------	--------	--------------------------	-------------------

	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom	(Gov Cor)
Happiness Rank	2093.461743	-51.975613	0.124358	-14.483883	-9.142720	-8.316021	-3.839647	-
Happiness Score	-51.975613	1.311048	-0.003480	0.360476	0.230969	0.204881	0.098042	
Standard Error	0.124358	-0.003480	0.000294	-0.001504	-0.000564	-0.001315	-0.000335	-
Economy (GDP per Capita)	-14.483883	0.360476	-0.001504	0.162506	0.070852	0.081323	0.022495	
Family	-9.142720	0.230969	-0.000564	0.070852	0.074185	0.035741	0.018122	
Health (Life Expectancy)	-8.316021	0.204881	-0.001315	0.081323	0.035741	0.061047	0.013422	
Freedom	-3.839647	0.098042	-0.000335	0.022495	0.018122	0.013422	0.022708	
Trust (Government Corruption)	-2.044785	0.054316	-0.000367	0.014898	0.006722	0.007365	0.008927	
Generosity	0.0078242	0.0026156	0.000102	0.000524	0.002020	0.002201	0.007128	
Dystopia Residual	0.000102	0.000524	0.000102	0.000524	0.000200	0.000201	0.0007128	

In [32]:

`a.sum()`

Out[32]:

Country	Switzerland
Region	Iceland
Happiness Rank	Denmark
Happiness Score	Norway
Standard Error	Canada
Economy (GDP per Capita)	Finland
Family	Ne...
Health (Life Expectancy)	Western Europe
Freedom	Western Europe
Trust (Government Corruption)	Western Europe
Generosity	West...
Dystopia Residual	12560

dtype: object

In [33]:

`a.mean()`

Out[33]:

Happiness Rank	79.493671
Happiness Score	5.375734
Standard Error	0.047885
Economy (GDP per Capita)	0.846137
Family	0.991046
Health (Life Expectancy)	0.630259
Freedom	0.428615
Trust (Government Corruption)	0.143422
Generosity	0.237296
Dystopia Residual	2.098977

dtype: float64

```
In [34]: a.median()
```

```
Out[34]: Happiness Rank      79.500000
Happiness Score       5.232500
Standard Error        0.043940
Economy (GDP per Capita) 0.910245
Family                  1.029510
Health (Life Expectancy) 0.696705
Freedom                 0.435515
Trust (Government Corruption) 0.107220
Generosity              0.216130
Dystopia Residual      2.095415
dtype: float64
```

```
In [35]: a.min()
```

```
Out[35]: Country           Afghanistan
Region            Australia and New Zealand
Happiness Rank     1
Happiness Score    2.839
Standard Error     0.01848
Economy (GDP per Capita) 0.0
Family             0.0
Health (Life Expectancy) 0.0
Freedom            0.0
Trust (Government Corruption) 0.0
Generosity          0.0
Dystopia Residual  0.32858
dtype: object
```

```
In [36]: a.max()
```

```
Out[36]: Country           Zimbabwe
Region            Western Europe
Happiness Rank     158
Happiness Score    7.587
Standard Error     0.13693
Economy (GDP per Capita) 1.69042
Family             1.40223
Health (Life Expectancy) 1.02525
Freedom            0.66973
Trust (Government Corruption) 0.55191
Generosity          0.79588
Dystopia Residual  3.60214
dtype: object
```

```
In [37]: a.count()
```

```
Out[37]: Country      158
Region       158
Happiness Rank 158
Happiness Score 158
Standard Error 158
Economy (GDP per Capita) 158
Family        158
Health (Life Expectancy) 158
Freedom       158
```

```
Trust (Government Corruption)    158
Generosity                      158
Dystopia Residual              158
dtvne.int64
```

```
In [38]: print(pearsonr(a['Happiness Score'],a['Happiness Rank']))
```

```
(-0.9921053148284924, 1.4013759581587442e-142)
```

```
In [39]: print(spearmanr(a['Happiness Score'],a['Happiness Rank']))
```

```
SpearmanrResult(correlation=-0.9999999999999999, pvalue=0.0)
```