MSDS-593: Homework 1 Notebook

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Data Sources

`cereal.csv` and `usa_mortality_rates.csv` files are being imported from my fork of the `msds593` repository on Github

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import matplotlib.pylab as pylab

%matplotlib inline
%config InlineBackend.figure_format = 'retina'
```

In [16]:

```
url = 'https://raw.githubusercontent.com/jpnski/msds593/master/homework/hw1/cereal.csv'

cereal_data = pd.read_csv(url)
cereal_data.head(5)
```

Out[16]:

	name	mfr	type	calories	protein	fat	sodium	fiber	carbo	sugars	potass
0	100% Bran	N	C	70	4	1	130	10.0	5.0	6	280
1	100% Natural Bran	Q	C	120	3	5	15	2.0	8.0	8	135
2	All-Bran	K	C	70	4	1	260	9.0	7.0	5	320
3	All-Bran with Extra Fiber	K	C	50	4	0	140	14.0	8.0	0	330
4	Almond Delight	R	C	110	2	2	200	1.0	14.0	8	-1

```
In [17]: cereal_data.columns
```

```
Out[17]: Index(['name', 'mfr', 'type', 'calories', 'protein', 'fat', 'sodium',
'fiber',
       'carbo', 'sugars', 'potass', 'vitamins', 'shelf', 'weight', 'c
ups',
       'rating'],
      dtype='object')
```

```
In [18]: cereal_data.shape
```

```
Out[18]: (77, 16)
```

Objective

- School will be purchasing a lot of cereal to feed students
- Boss wants to choose a manufacturer and a product
- Wants to prepare presentation for the executive team

```
In [19]: cereal_data['name']
```

```
Out[19]:
0                     100% Bran
1              100% Natural Bran
2                      All-Bran
3     All-Bran with Extra Fiber
4                Almond Delight
                ...
72                      Triples
73                         Trix
74                   Wheat Chex
75                     Wheaties
76           Wheaties Honey Gold
Name: name, Length: 77, dtype: object
```

```
In [20]: print('There are', len(cereal_data['name'].unique()), 'unique cereal
s')
```

```
There are 77 unique cereals
```

Methods of Exploring the Data

- Break dataset into subsets by manufacturer, compare data of each manufacturer
    - To learn about which manufacturer makes higher rated/healthier products, etc. among all the manufacturers available

In [21]:

```python
#selecting a subset of the data where manufacturer=='N' for Nabisco brand
nabisco = cereal_data[cereal_data['mfr']=='N']
nabisco
```

Out[21]:

	name	mfr	type	calories	protein	fat	sodium	fiber	carbo	sugars	pota
0	100% Bran	N	C	70	4	1	130	10.0	5.0	6	2
20	Cream of Wheat (Quick)	N	H	100	3	0	80	1.0	21.0	0	
63	Shredded Wheat	N	C	80	2	0	0	3.0	16.0	0	
64	Shredded Wheat 'n'Bran	N	C	90	3	0	0	4.0	19.0	0	1
65	Shredded Wheat spoon size	N	C	90	3	0	0	3.0	20.0	0	1
68	Strawberry Fruit Wheats	N	C	90	2	0	15	3.0	15.0	5	

- For a specific manufacturer, sort their products by their rating to see what are their top products

In [22]:

```python
#top three cereals made by Post manufacturer, as indicated by their 'rating'
nabisco = nabisco.sort_values(by='rating', ascending=False)
nabisco.head(3)
```

Out[22]:

	name	mfr	type	calories	protein	fat	sodium	fiber	carbo	sugars	potas
64	Shredded Wheat 'n'Bran	N	C	90	3	0	0	4.0	19.0	0	14
65	Shredded Wheat spoon size	N	C	90	3	0	0	3.0	20.0	0	12
0	100% Bran	N	C	70	4	1	130	10.0	5.0	6	28

- Calculate statistics of the data to quantitatively compare between manufacturers

In [23]:
```
nabisco_mean_rating = nabisco['rating'].mean()
nabisco_mean_rating
```

Out[23]:
```
67.96856716666666
```

In [24]:
```
manufacturer_list = np.unique(cereal_data['mfr'].values)
manufacturer_list = pd.Series(manufacturer_list)
manufacturer_list
```

Out[24]:
```
0    A
1    G
2    K
3    N
4    P
5    Q
6    R
dtype: object
```

In [25]:
```
#get a series of the mean cereal ratings for all of the 7 manufacture
rs
mean_ratings = list()

for x in manufacturer_list:
    products = cereal_data[cereal_data['mfr']==x]
    product_mean_rating = products['rating'].mean()
    print(x, '\'s mean rating is', product_mean_rating) #verify mean
 corresponds to right mfr
    mean_ratings.append(product_mean_rating)

mean_ratings = pd.Series(mean_ratings)
```

```
A 's mean rating is 54.850917
G 's mean rating is 34.48585168181818
K 's mean rating is 44.03846234782609
N 's mean rating is 67.96856716666666
P 's mean rating is 41.70574411111111
Q 's mean rating is 42.915989875
R 's mean rating is 41.54299712500001
```

In [26]:

```
mfg_ratings = pd.DataFrame({
    'manufacturer': manufacturer_list,
    'mean_rating': mean_ratings
    })

mfg_ratings=mfg_ratings.sort_values(by='mean_rating', ascending=False
)
mfg_ratings
```

Out[26]:

	manufacturer	mean_rating
3	N	67.968567
0	A	54.850917
2	K	44.038462
5	Q	42.915990
4	P	41.705744
6	R	41.542997
1	G	34.485852

Practice Basic Matplotlib

In [27]:

```
url2 = 'https://raw.githubusercontent.com/jpnski/msds593/master/homew
ork/hw1/usa_mortality_rates.csv'

mortal_data = pd.read_csv(url2)
mortal_data = mortal_data.drop(columns=
                               ['Country Name',
                               'Country Code',
                               'Indicator Name',
                               'Indicator Code'])

mortal_data = mortal_data.iloc[:,:-1] #drop NaN 2019 val
mortal_data
```

Out[27]:

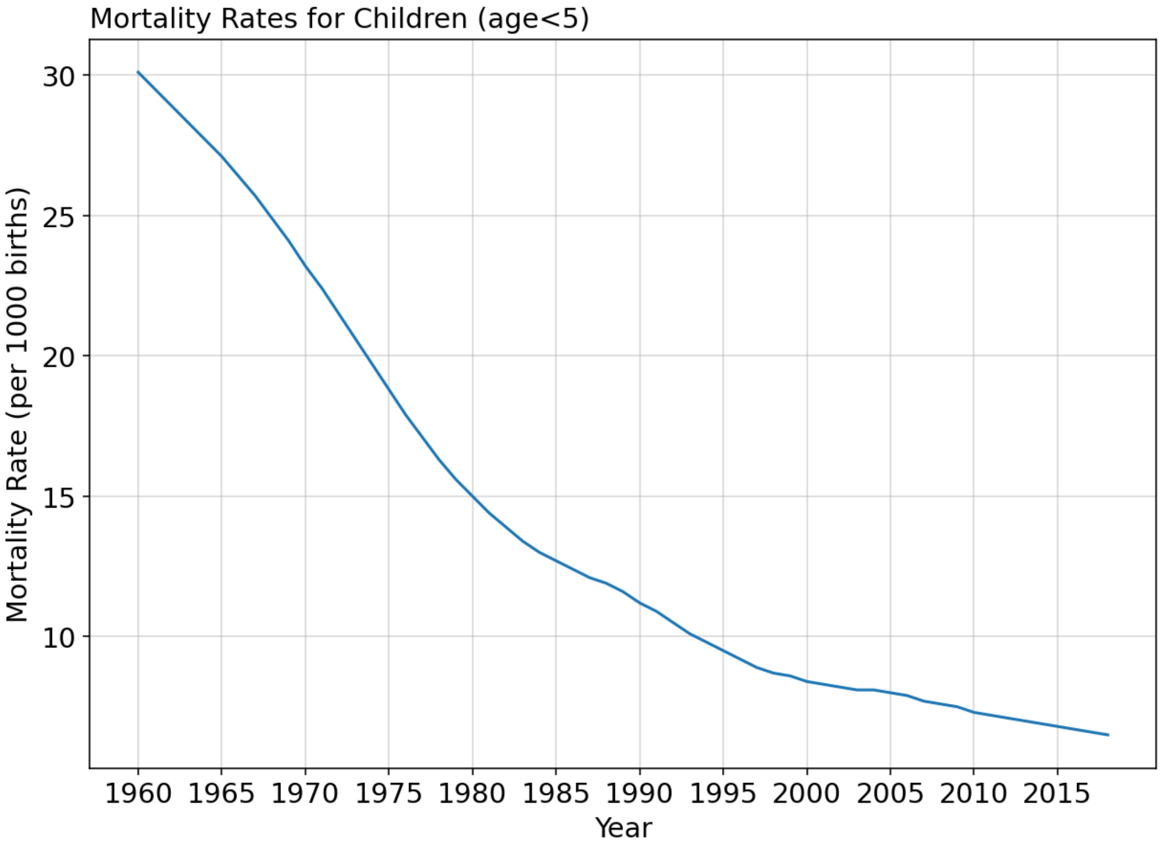
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	19
0	30.1	29.5	28.9	28.3	27.7	27.1	26.4	25.7	24.9	24.1	23.2	22.4	2

In [28]:

```
#set some global rcparams for plotting
params = {'legend.fontsize': 'large',
          'figure.figsize': (10, 7),
          'axes.labelsize': 'x-large',
          'axes.titlesize':'x-large',
          'xtick.labelsize':'x-large',
          'ytick.labelsize':'x-large'}

pylab.rcParams.update(params)
```

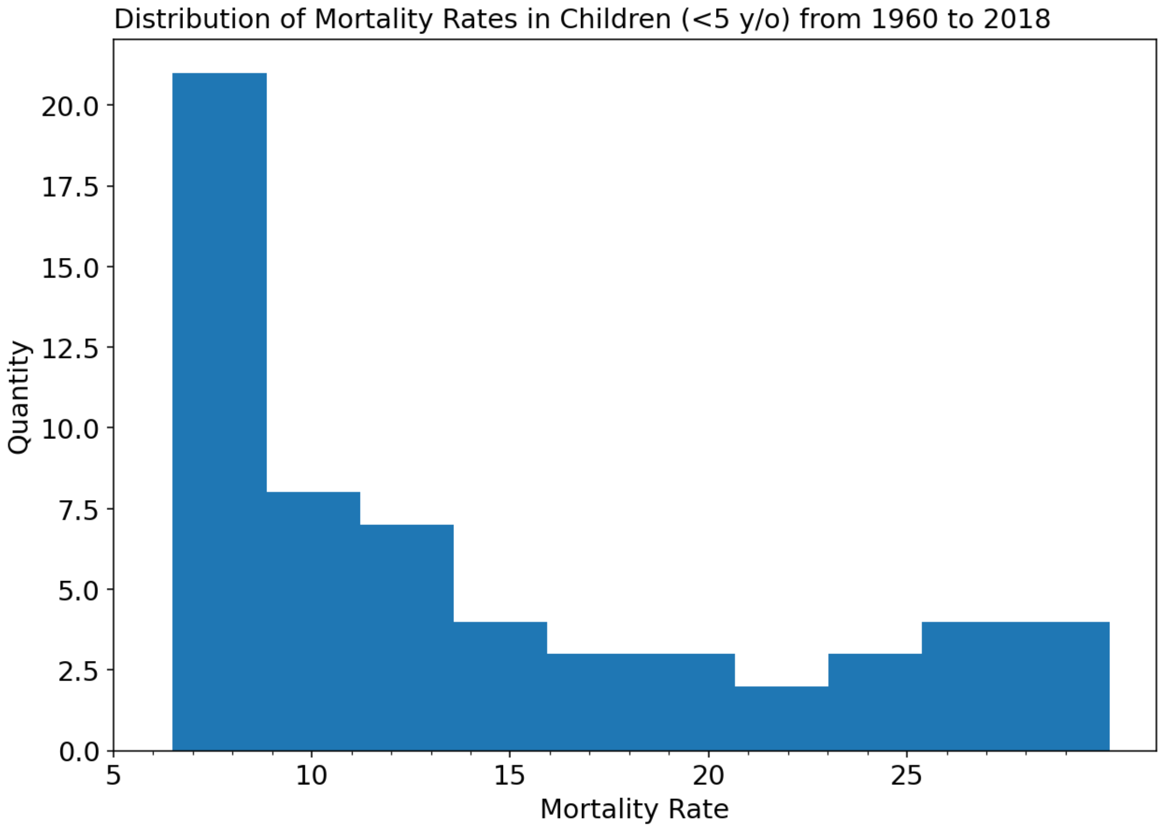
In [29]:

```
#plot 1/3: line plot of mortality rate vs. years
years = mortal_data.columns
rates = mortal_data.iloc[0]

fig, ax = plt.subplots()

ax.plot(rates)
ax.grid(alpha=0.50)
ax.set_xticks(years[::5])
ax.set_xticklabels(years[::5])

ax.set_xlabel('Year')
ax.set_ylabel('Mortality Rate (per 1000 births)')
ax.set_title('Mortality Rates for Children (age<5)',
             loc='left')

plt.show()
```



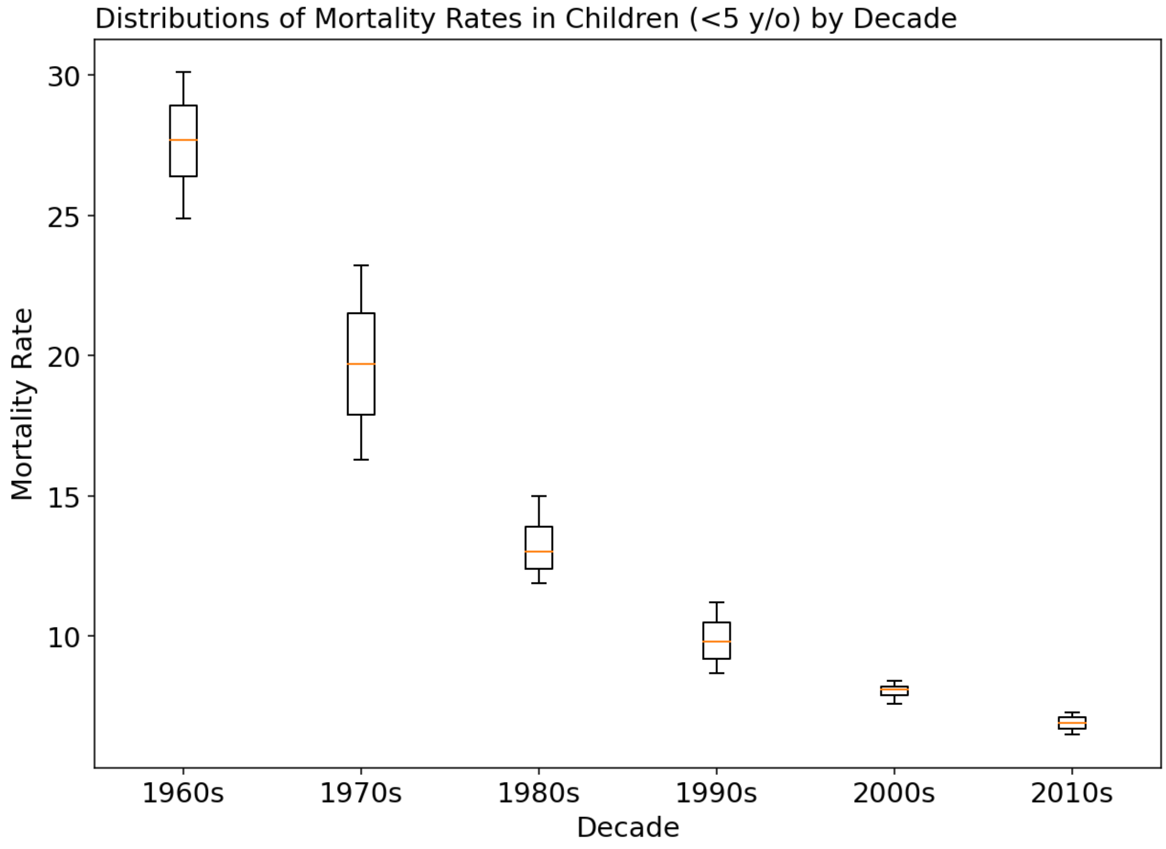
In [30]:

```
#plot 2/3: histogram of mortality rates from 1960-2018
fig, ax = plt.subplots()

ax.hist(rates, bins=10)

maj_ticks = np.arange(5,30,5)
min_ticks = np.arange(5,30,1)
ax.set_xticks(maj_ticks)
ax.set_xticks(min_ticks, minor=True)

ax.set_xlabel('Mortality Rate')
ax.set_ylabel('Quantity')
ax.set_title('Distribution of Mortality Rates in Children (<5 y/o) fr
om 1960 to 2018',
             loc='left')

plt.show()
```



In [31]:

```
#plot 3/3: Box and whisker plots of mortality rates during each decade
indexes = [0, 10, 20, 30, 40, 50]
labels = (['1960s','1970s','1980s','1990s','2000s','2010s'])

fig, ax = plt.subplots()

decade_list = list()

for x in indexes:
    decade_data = mortal_data.iloc[:, x:x+9]
    decade_list.append(decade_data)

for i in range(len(decade_list)):
    ax.boxplot(decade_list[i], positions = [i])

ax.get_xaxis().set_tick_params(direction='out')
ax.set_xticks(np.arange(0, len(labels)))
ax.set_xticklabels(labels)

ax.set_xlabel('Decade')
ax.set_ylabel('Mortality Rate')
ax.set_title('Distributions of Mortality Rates in Children (<5 y/o) by Decade',
             loc='left')

plt.show()
```

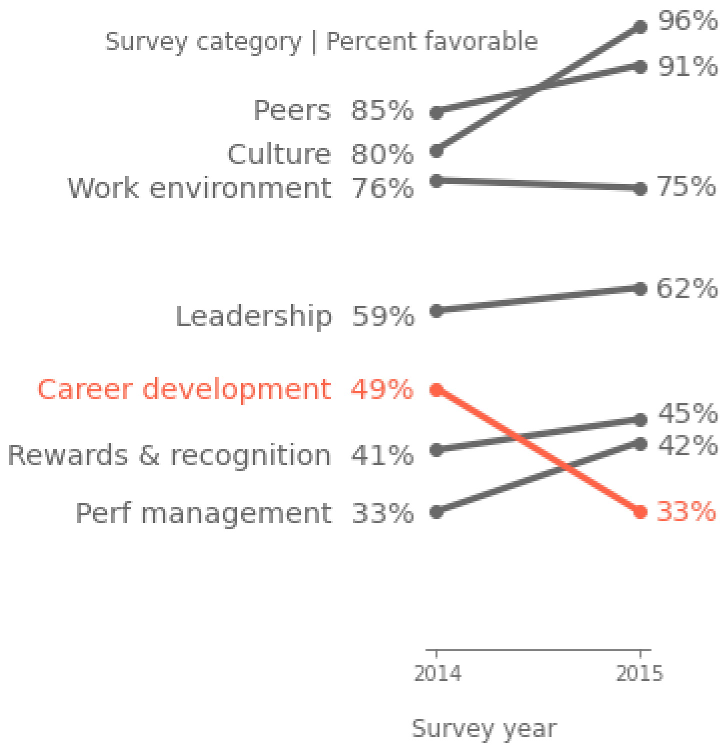


Slopegraph

In [ ]:

```
fig, ax = plt.subplots(nrows=1, ncols=1, figsize=(2,6))
plt.ylim(0.15,1)

ax.set_xticks([2014,2015])
ax.set_yticks([])
ax.tick_params(axis='x', colors='dimgrey')

ax.spines['top'].set_visible(False)
ax.spines['right'].set_visible(False)
ax.spines['bottom'].set_visible(True)
ax.spines['bottom'].set_color('dimgrey')
ax.spines['left'].set_visible(False)

x1, y1 = [2014, 2015], [0.85, 0.91]
x2, y2 = [2014, 2015], [0.80, 0.96]
x3, y3 = [2014, 2015], [0.76, 0.75]
x4, y4 = [2014, 2015], [0.59, 0.62]
x5, y5 = [2014, 2015], [0.49, 0.33]
x6, y6 = [2014, 2015], [0.41, 0.45]
x7, y7 = [2014, 2015], [0.33, 0.42]

plt.plot(x1, y1, x2, y2, x3, y3, x4, y4, x6, y6, x7, y7,
         marker = 'o', c = 'dimgrey',linewidth = 3.3)
plt.plot(x5, y5, marker = 'o', c = 'tomato',linewidth = 3.3)


ax.text(0.5, 1.06, 'Employee feedback over time',
        horizontalalignment='right',
        verticalalignment='top',
        fontsize = 'xx-large',
        transform=ax.transAxes)

ax.text(0.5, 0.95, 'Survey category | Percent favorable',
        horizontalalignment='right',
        verticalalignment='top',
        fontsize = 'large',
        c = 'dimgrey',
        transform=ax.transAxes)

ax.text(0.58, -0.1, 'Survey year',
        horizontalalignment='right',
        verticalalignment='top',
        fontsize = 'large',
        c = 'dimgrey',
        transform=ax.transAxes)

ax.text(-0.05, 0.845, 'Peers  85%',
        horizontalalignment='right',
        verticalalignment='top',
        fontsize = 'x-large',
        c = 'dimgrey',
        transform=ax.transAxes)

ax.text(-0.05, 0.78, 'Culture  80%',
        horizontalalignment='right',
        verticalalignment='top',
        fontsize = 'x-large',
        c = 'dimgrey',
        transform=ax.transAxes)

ax.text(-0.05, 0.725, 'Work environment  76%',
        horizontalalignment='right',
        verticalalignment='top',
        fontsize = 'x-large',
        c = 'dimgrey',
        transform=ax.transAxes)

ax.text(-0.05, 0.53, 'Leadership  59%',
        horizontalalignment='right',
        verticalalignment='top',
        fontsize = 'x-large',
        c = 'dimgrey',
        transform=ax.transAxes)

ax.text(-0.05, 0.42, 'Career development  49%',
        horizontalalignment='right',
        verticalalignment='top',
        fontsize = 'x-large',
        c = 'tomato',
        transform=ax.transAxes)

ax.text(-0.05, 0.32, 'Rewards & recognition  41%',
        horizontalalignment='right',
        verticalalignment='top',
        fontsize = 'x-large',
        c = 'dimgrey',
        transform=ax.transAxes)

ax.text(-0.05, 0.23, 'Perf management  33%',
        horizontalalignment='right',
        verticalalignment='top',
        fontsize = 'x-large',
        c = 'dimgrey',
        transform=ax.transAxes)

ax.text(1.03, 0.95, '96%', fontsize = 'x-large', c = 'dimgrey', transform=ax.transAxes)
ax.text(1.03, 0.88, '91%', fontsize = 'x-large', c = 'dimgrey', transform=ax.transAxes)
ax.text(1.03, 0.695, '75%', fontsize = 'x-large', c = 'dimgrey', transform=ax.transAxes)
ax.text(1.03, 0.54, '62%', fontsize = 'x-large', c = 'dimgrey', transform=ax.transAxes)
ax.text(1.03, 0.35, '45%', fontsize = 'x-large', c = 'dimgrey', transform=ax.transAxes)
ax.text(1.03, 0.3, '42%', fontsize = 'x-large', c = 'dimgrey', transform=ax.transAxes)
ax.text(1.03, 0.2, '33%', fontsize = 'x-large', c = 'tomato', transform=ax.transAxes)


plt.show()
```

Employee feedback over time


Survey category | Percent favorable
Peers 85%
Culture 80%
Work environment 76%
Leadership 59%
Career development 49%
Rewards & recognition 41%
Perf management 33%
96%
91%
75%
62%
45%
42%
33%
2014
2015
Survey year