In [1]:

```
import pandas as pd
import numpy as np
from sklearn import preprocessing
import matplotlib.pyplot as plt
import seaborn as sns
sns.set(style="white")#white background for seaborn plots
sns.set(style="whitegrid",color_codes=True)
import warnings
warnings.simplefilter(action="ignore")
```

In [2]:

```
df=pd.read_csv(r"C:\Users\saranya\Downloads\heart disease (1).csv")
df
```

Out[2]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalent
0	1	39	4.0	0	0.0	0.0	0	
1	0	46	2.0	0	0.0	0.0	0	
2	1	48	1.0	1	20.0	0.0	0	
3	0	61	3.0	1	30.0	0.0	0	
4	0	46	3.0	1	23.0	0.0	0	
...	...	...	...	...	...	...	...	
4233	1	50	1.0	1	1.0	0.0	0	
4234	1	51	3.0	1	43.0	0.0	0	
4235	0	48	2.0	1	20.0	NaN	0	
4236	0	44	1.0	1	15.0	0.0	0	
4237	0	52	2.0	0	0.0	0.0	0	

4238 rows × 16 columns

In [3]:

```
df.head()
```

Out[3]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp
0	1	39	4.0	0	0.0	0.0	0	0
1	0	46	2.0	0	0.0	0.0	0	0
2	1	48	1.0	1	20.0	0.0	0	0
3	0	61	3.0	1	30.0	0.0	0	1
4	0	46	3.0	1	23.0	0.0	0	0

In [4]:

```
df.shape
```

Out[4]:

```
(4238, 16)
```

In [5]:

```
df.describe()
```

Out[5]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	pre
count	4238.000000	4238.000000	4133.000000	4238.000000	4209.000000	4185.000000	
mean	0.429212	49.584946	1.978950	0.494101	9.003089	0.029630	
std	0.495022	8.572160	1.019791	0.500024	11.920094	0.169584	
min	0.000000	32.000000	1.000000	0.000000	0.000000	0.000000	
25%	0.000000	42.000000	1.000000	0.000000	0.000000	0.000000	
50%	0.000000	49.000000	2.000000	0.000000	0.000000	0.000000	
75%	1.000000	56.000000	3.000000	1.000000	20.000000	0.000000	
max	1.000000	70.000000	4.000000	1.000000	70.000000	1.000000	

In [6]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4238 entries, 0 to 4237
Data columns (total 16 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   male             4238 non-null   int64  
 1   age              4238 non-null   int64  
 2   education        4133 non-null   float64
 3   currentSmoker    4238 non-null   int64  
 4   cigsPerDay       4209 non-null   float64
 5   BPMeds           4185 non-null   float64
 6   prevalentStroke  4238 non-null   int64  
 7   prevalentHyp     4238 non-null   int64  
 8   diabetes         4238 non-null   int64  
 9   totChol          4188 non-null   float64
 10  sysBP            4238 non-null   float64
 11  diaBP            4238 non-null   float64
 12  BMI              4219 non-null   float64
 13  heartRate        4237 non-null   float64
 14  glucose          3850 non-null   float64
 15  TenYearCHD       4238 non-null   int64  
dtypes: float64(9), int64(7)
memory usage: 529.9 KB
```

In [7]:

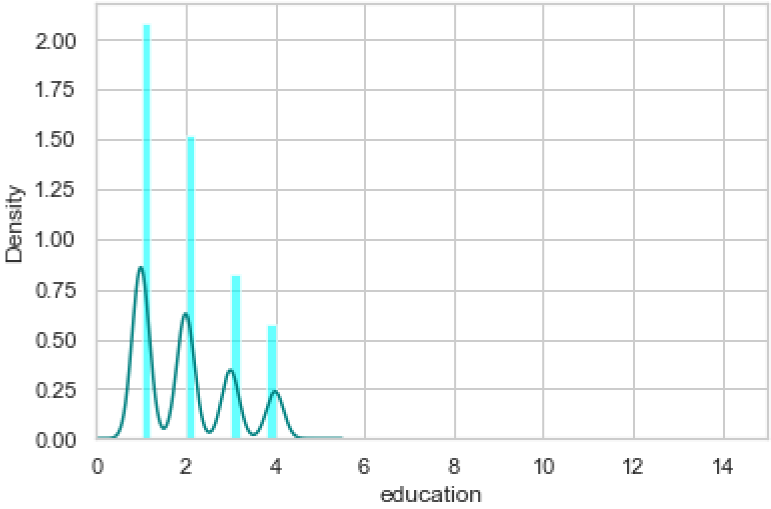
```
df.isnull().sum()
```

Out[7]:

```
male                 0
age                  0
education          105
currentSmoker        0
cigsPerDay          29
BPMeds              53
prevalentStroke      0
prevalentHyp         0
diabetes             0
totChol             50
sysBP                0
diaBP                0
BMI                 19
heartRate            1
glucose            388
TenYearCHD           0
dtype: int64
```

In [8]:

```
ax = df["education"].hist(bins=15, density=True, stacked=True, color='cyan', alpha=0.6)
df["education"].plot(kind='density', color='teal')
ax.set(xlabel='education')
plt.xlim(-0,15)
plt.show()
```



In [9]:

```
print(df["education"].mean(skipna=True))
print(df["education"].median(skipna=True))
```

```
1.9789499153157513
2.0
```

In [10]:

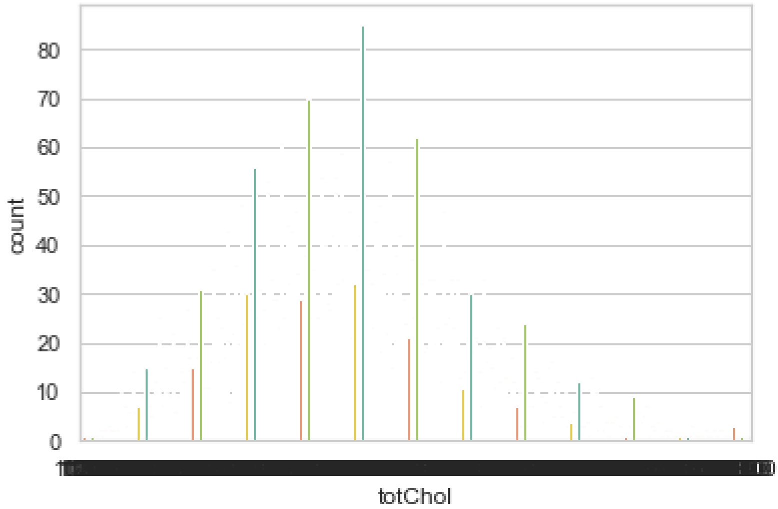
```
print((df['glucose'].isnull().sum()/df.shape[0])*100)
print((df['totChol'].isnull().sum()/df.shape[0])*100)
```

```
9.155261915998112
1.1798017932987257
```

In [11]:

```
print(df['totChol'].value_counts())
sns.countplot(x='totChol', data=df, palette='Set2')
plt.show()
```

```
240.0    85
220.0    70
260.0    62
210.0    61
232.0    59
         ..
392.0     1
405.0     1
359.0     1
398.0     1
119.0     1
Name: totChol, Length: 248, dtype: int64
```



In [12]:

```
print(df['totChol'].value_counts().idxmax())
```

```
240.0
```

In [13]:

```
data = df.copy()
data["education"].fillna(df["education"].median(skipna=True), inplace=True)
data["totChol"].fillna(df['totChol'].value_counts().idxmax(), inplace=True)
data.drop('glucose', axis=1, inplace=True)
```

In [14]:

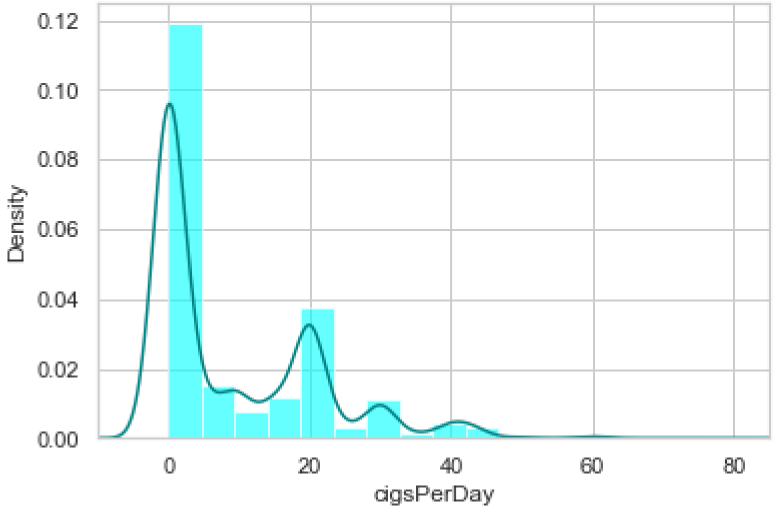
```
data.isnull().sum()
```

Out[14]:

```
male                0
age                 0
education           0
currentSmoker       0
cigsPerDay         29
BPMeds             53
prevalentStroke     0
prevalentHyp        0
diabetes            0
totChol             0
sysBP               0
diaBP               0
BMI                19
heartRate           1
TenYearCHD          0
dtype: int64
```

In [15]:

```
ax = df["cigsPerDay"].hist(bins=15, density=True, stacked=True, color='cyan', alpha=0.6)
df["cigsPerDay"].plot(kind='density', color='teal')
ax.set(xlabel='cigsPerDay')
plt.xlim(-10,85)
plt.show()
```



In [16]:

```
print(df["cigsPerDay"].mean(skipna=True))
print(df["cigsPerDay"].median(skipna=True))
print((df['BPMeds'].isnull().sum()/df.shape[0])*100)
```

```
9.003088619624615
0.0
1.2505899008966492
```

In [17]:

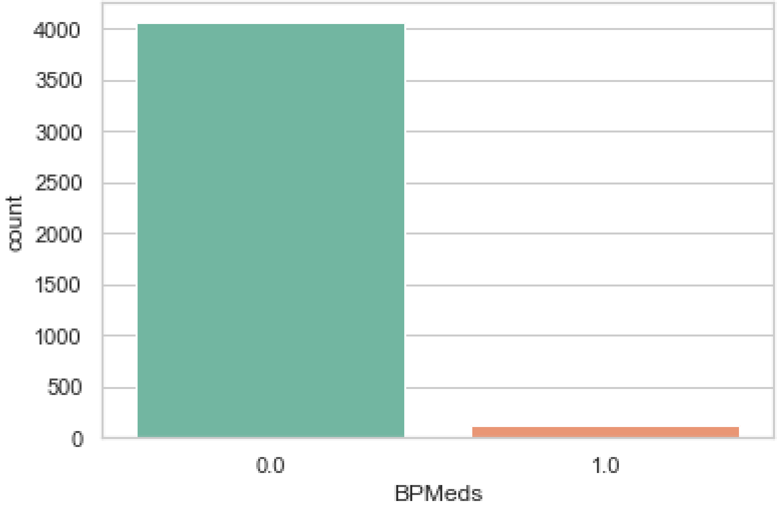
```
print((df['BMI'].isnull().sum()/df.shape[0])*100)
print((df['heartRate'].isnull().sum()/df.shape[0])*100)
```

```
0.4483246814535158
0.023596035865974516
```

In [18]:

```
print(df['BPMeds'].value_counts())
sns.countplot(x='BPMeds', data=df, palette='Set2')
plt.show()
```

```
0.0    4061
1.0     124
Name: BPMeds, dtype: int64
```



In [19]:

```
print(df['heartRate'].value_counts().idxmax())
```

```
75.0
```

In [20]:

```
data = df.copy()
data["cigsPerDay"].fillna(df["cigsPerDay"].median(skipna=True), inplace=True)
data["BPMeds"].fillna(df['BPMeds'].value_counts().idxmax(), inplace=True)
data["education"].fillna(df["education"].median(skipna=True), inplace=True)
data["totChol"].fillna(df['totChol'].value_counts().idxmax(), inplace=True)
data.drop('glucose', axis=1, inplace=True)
data.drop('BMI', axis=1, inplace=True)
data.drop('heartRate', axis=1, inplace=True)
```

In [21]:

```
data.isnull().sum()
```

Out[21]:

```
male               0
age                0
education          0
currentSmoker      0
cigsPerDay         0
BPMeds             0
prevalentStroke    0
prevalentHyp       0
diabetes           0
totChol            0
sysBP              0
diaBP              0
TenYearCHD         0
dtype: int64
```

In [22]:

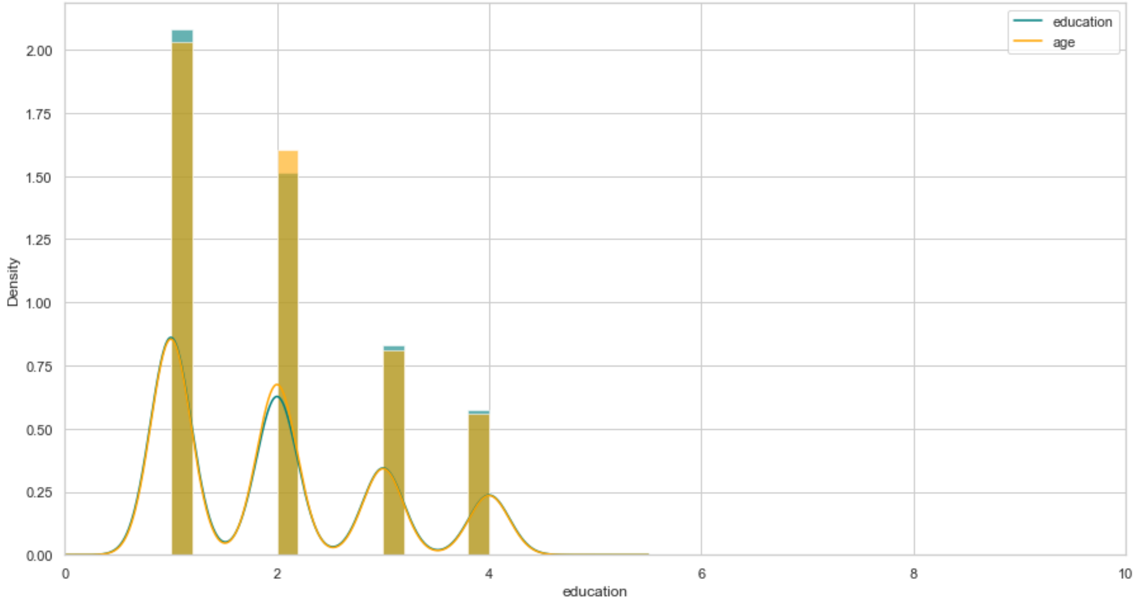
```
data.head()
```

Out[22]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp
0	1	39	4.0	0	0.0	0.0	0	0
1	0	46	2.0	0	0.0	0.0	0	0
2	1	48	1.0	1	20.0	0.0	0	0
3	0	61	3.0	1	30.0	0.0	0	1
4	0	46	3.0	1	23.0	0.0	0	0

In [23]:

```
plt.figure(figsize=(15,8))
ax = df["education"].hist(bins=15, density=True, stacked=True, color='teal', alpha=0.6)
df["education"].plot(kind='density', color='teal')
ax = data["education"].hist(bins=15, density=True, stacked=True, color='orange', alpha=0
data["education"].plot(kind='density', color='orange')
ax.legend(['education','age'])
ax.set(xlabel='education')
plt.xlim(-0,10)
plt.show()
```



In [24]:

```
data['Disease']=np.where((data['prevalentHyp']+ data["prevalentStroke"])>0, 0, 1)
data.drop('prevalentHyp', axis=1, inplace=True)
data.drop('prevalentStroke', axis=1, inplace=True)
```

In [25]:

```
training=pd.get_dummies(data, columns=["currentSmoker","totChol","sysBP"])
training.drop('TenYearCHD', axis=1, inplace=True)
training.drop('male', axis=1, inplace=True)
training.drop('diaBP', axis=1, inplace=True)
final_train = training
final_train.head()
```

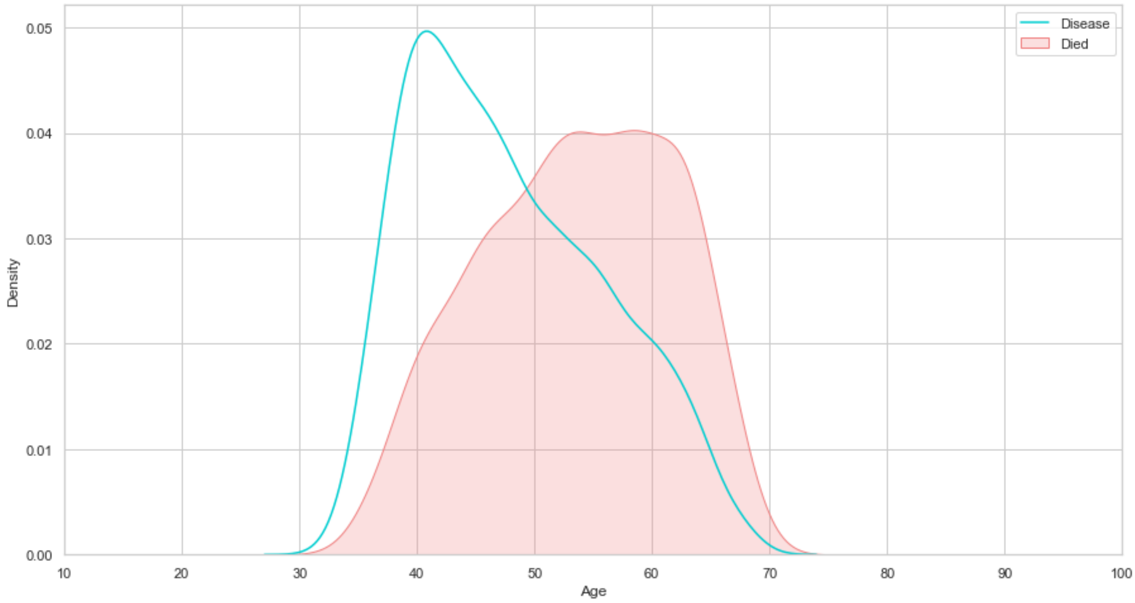
Out[25]:

	age	education	cigsPerDay	BPMeds	diabetes	Disease	currentSmoker_0	currentSmoker
0	39	4.0	0.0	0.0	0	1	1	
1	46	2.0	0.0	0.0	0	1	1	
2	48	1.0	20.0	0.0	0	1	0	
3	61	3.0	30.0	0.0	0	0	0	
4	46	3.0	23.0	0.0	0	1	0	

5 rows × 490 columns

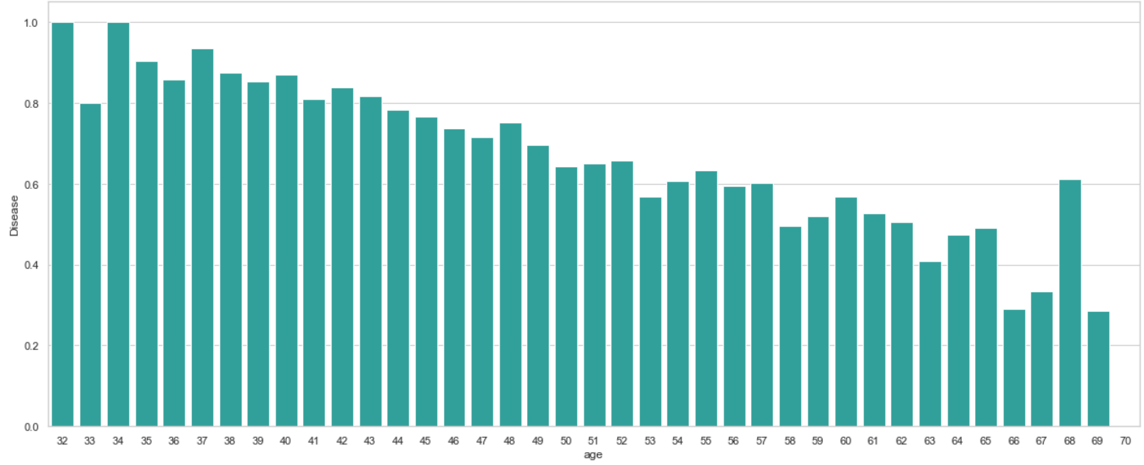
In [26]:

```
#EDA
plt.figure(figsize=(15,8))
ax = sns.kdeplot(final_train["age"][final_train.Disease == 1], color="darkturquoise")
sns.kdeplot(final_train["age"][final_train.Disease == 0], color="lightcoral",
            shade=True)
plt.legend(['Disease', 'Died'])
ax.set(xlabel='Age')
plt.xlim(10,100)
plt.show()
```



In [27]:

```
import matplotlib.pyplot as plt
plt.figure(figsize=(20,8))
avg_survival_byage = final_train[["age","Disease"]].groupby(['age'],
                                                            as_index=False).mean()
g= sns.barplot(x='age', y='Disease', data=avg_survival_byage, color="LightSeaGreen")
plt.show()
```



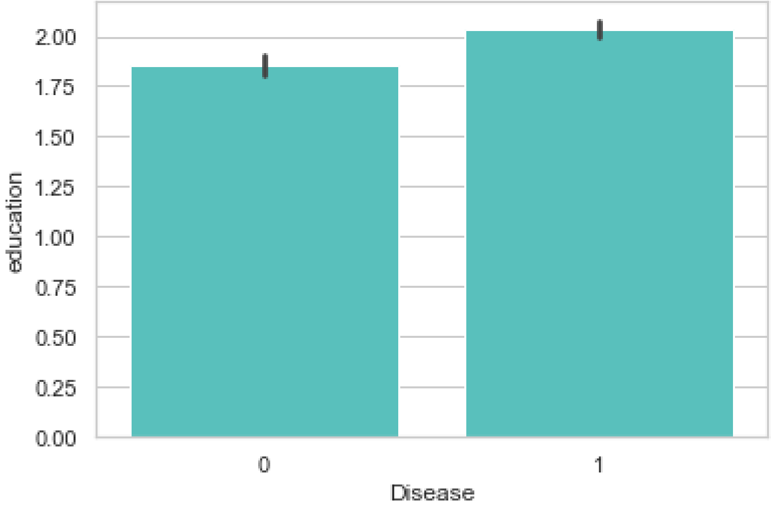
In [28]:

```
final_train['IsMinor']=np.where(final_train['age']<=16, 1, 0)
print(final_train['IsMinor'])
```

```
0       0
1       0
2       0
3       0
4       0
       ..
4233    0
4234    0
4235    0
4236    0
4237    0
Name: IsMinor, Length: 4238, dtype: int32
```

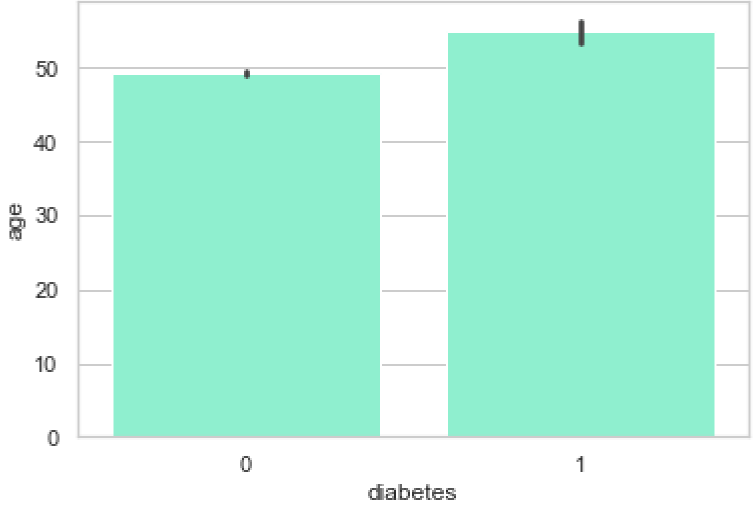
In [29]:

```
sns.barplot(x='Disease', y='education', data=final_train, color="mediumturquoise")
plt.show()
```



In [30]:

```
import seaborn as sns
import matplotlib.pyplot as plt
# Assuming 'train_df' is your DataFrame containing the data
sns.barplot(x='diabetes', y='age', data=df, color='aquamarine')
plt.show()
```



In [ ]:

In [ ]: