In [2]:
```
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")
sns.set(style="whitegrid",color_codes=True)
import warnings
warnings.simplefilter(action='ignore')
```

In [3]:
```
df=pd.read_csv(r"C:\Users\rubin\Downloads\archive (1).zip")
df
```

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
...	...	...	...	...	...	...	...	...
4233	1	50	1.0	1	1.0	0.0	0	1
4234	1	51	3.0	1	43.0	0.0	0	0
4235	0	48	2.0	1	20.0	NaN	0	0
4236	0	44	1.0	1	15.0	0.0	0	0
4237	0	52	2.0	0	0.0	0.0	0	0

4238 rows × 16 columns

In [4]:
```
df.head()
```

Out[4]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	di
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 [5]:
```
df.shape
```

Out[5]:
```
(4238, 16)
```

In [6]:
```
df.describe
```

Out[6]:
```
<bound method NDFrame.describe of       male  age  education  currentSmoker
cigsPerDay  BPMeds
0        1   39        4.0              0         0.0     0.0  \
1        0   46        2.0              0         0.0     0.0
2        1   48        1.0              1        20.0     0.0
3        0   61        3.0              1        30.0     0.0
4        0   46        3.0              1        23.0     0.0
...    ...  ...        ...            ...         ...     ...
4233     1   50        1.0              1         1.0     0.0
4234     1   51        3.0              1        43.0     0.0
4235     0   48        2.0              1        20.0     NaN
4236     0   44        1.0              1        15.0     0.0
4237     0   52        2.0              0         0.0     0.0

      prevalentStroke  prevalentHyp  diabetes  totChol  sysBP  diaBP    BMI
0                   0             0         0    195.0  106.0   70.0  26.97
\
1                   0             0         0    250.0  121.0   81.0  28.73
2                   0             0         0    245.0  127.5   80.0  25.34
3                   0             1         0    225.0  150.0   95.0  28.58
4                   0             0         0    285.0  130.0   84.0  23.10
...               ...           ...       ...      ...    ...    ...    ...
4233                0             1         0    313.0  179.0   92.0  25.97
4234                0             0         0    207.0  126.5   80.0  19.71
4235                0             0         0    248.0  131.0   72.0  22.00
4236                0             0         0    210.0  126.5   87.0  19.16
4237                0             0         0    269.0  133.5   83.0  21.47

      heartRate  glucose  TenYearCHD
0          80.0     77.0           0
1          95.0     76.0           0
2          75.0     70.0           0
3          65.0    103.0           1
4          85.0     85.0           0
...         ...      ...         ...
4233       66.0     86.0           1
4234       65.0     68.0           0
4235       84.0     86.0           0
4236       86.0      NaN           0
4237       80.0    107.0           0

[4238 rows x 16 columns]>
```

In [7]:
```
df.info()
```

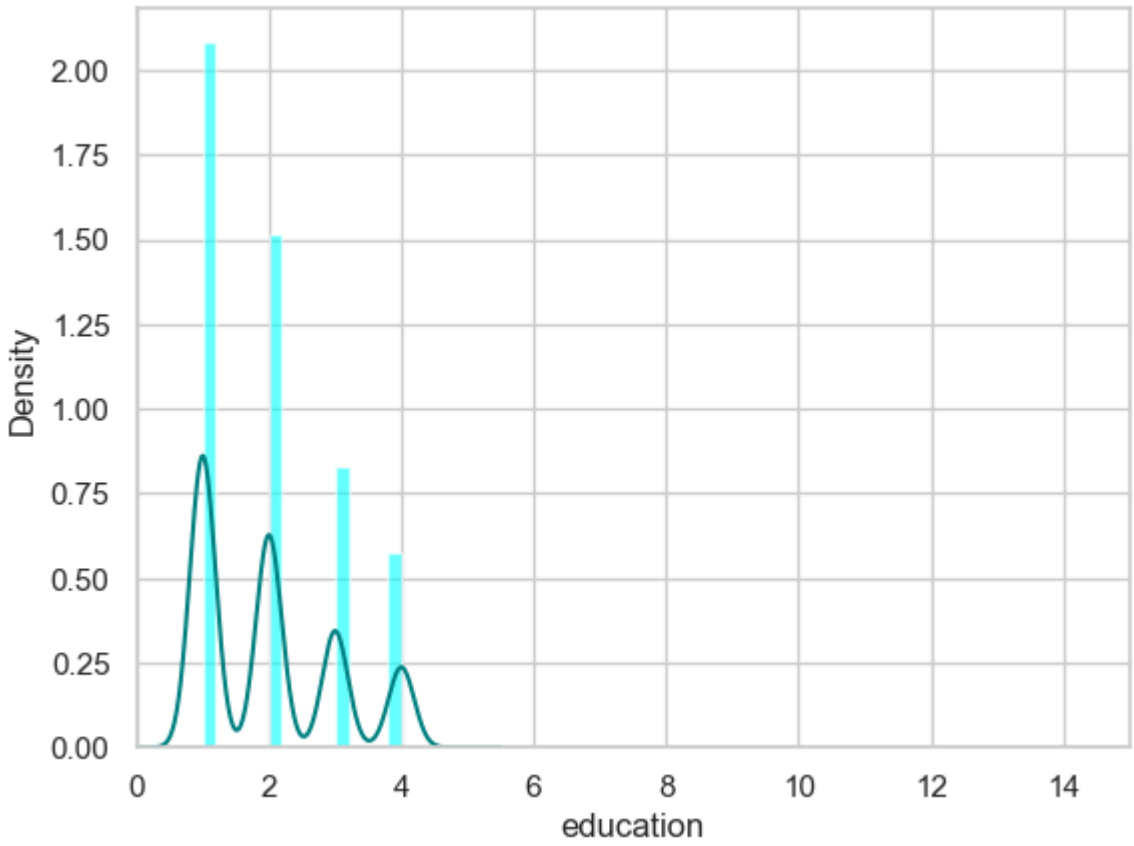
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4238 entries, 0 to 4237
Data columns (total 16 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   male             4238 non-null   int64  
 1   age              4238 non-null   int64  
 2   education        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
```

TO FIND MISSING VALUES

In [8]:
```
df.isnull().sum()
```

Out[8]:
```
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 [9]:
```
ax=df["education"].hist(bins=15,density=True,stacked=True,color='cyan',alpha=0
df["education"].plot(kind='density',color='teal')
ax.set(xlabel='education')
plt.xlim(-0,15)
plt.show()
```



In [10]:
```
print(df["education"].mean(skipna=True))
print(df["education"].median(skipna=True))
```

```
1.9789499153157513
2.0
```

In [11]:
```
print(df['glucose'].isnull().sum()/df.shape[0]*100)
```

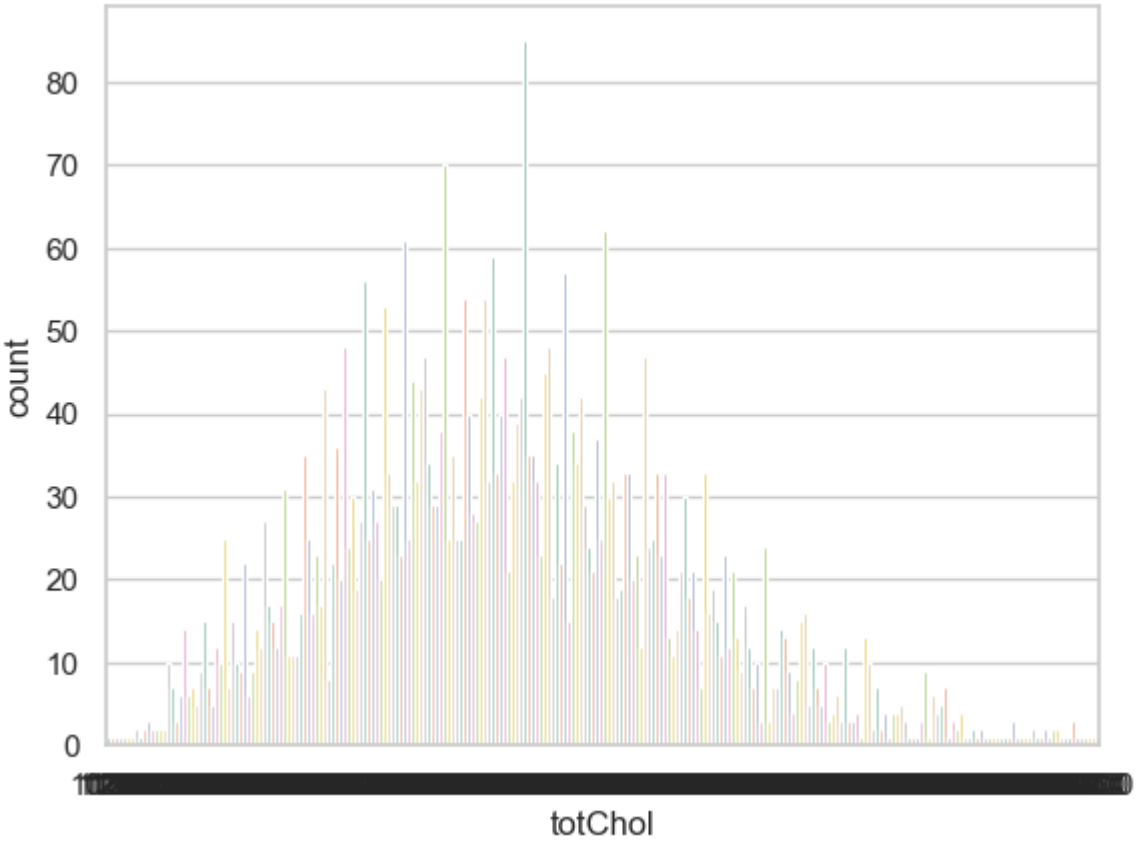
```
9.155261915998112
```

In [12]:
```
print(df['totChol'].isnull().sum()/df.shape[0]*100)
```

```
1.1798017932987257
```

In [13]:
```
print(df['totChol'].value_counts())
sns.countplot(x='totChol',data=df,palette='Set2')
plt.show()
```

```
totChol
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: count, Length: 248, dtype: int64
```



In [14]:
```
print(df['totChol'].value_counts().idxmax())
```

```
240.0
```

In [15]:
```
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 [18]:
```
data.isnull().sum()
```

Out[18]:
```
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 [16]:
```
pd.set_option('display.max_rows',4238)
pd.set_option('display.max_columns',16)
```

In [17]:
```
pd.set_option('display.width',50)
```

In [7]:
```
print('This DataFrame has %d Rows and %d Columns'%(df.shape))
```

```
This DataFrame has 4238 Rows and 16 Columns
```

In [9]:
```
features_matrix=df.iloc[:,0:15]
```

In [10]:
```
target_vector=df.iloc[:,-2]
```

In [11]:
```
print('The Features Matrix Has %d Rows And %d Column(s)'%(features_matrix.shap
```

```
The Features Matrix Has 4238 Rows And 15 Column(s)
```

In [12]:
```
print('The Target Matrix Has %d Rows And %d Column(s)'%(np.array(target_vector
```

```
The Target Matrix Has 4238 Rows And 1 Column(s)
```

In [17]:
```
df['education'].mean()
```

Out[17]:
```
1.9789499153157513
```

In [18]:
```
df['cigsPerDay'].mean()
```

Out[18]:
```
9.003088619624615
```

In [19]:
```
df['heartRate'].median()
```

Out[19]:
```
75.0
```

In [20]:
```
df['BPMeds'].mean()
```

Out[20]:
```
0.02962962962962963
```

In [21]:
```
df["glucose"].fillna(df["glucose"].median(skipna=True),inplace=True)
df
```

14	0	39	2.0	1	9.0	0.0	0
15	0	38	2.0	1	20.0	0.0	0
16	1	48	3.0	1	10.0	0.0	0
17	0	46	2.0	1	20.0	0.0	0
18	0	38	2.0	1	5.0	0.0	0
19	1	41	2.0	0	0.0	0.0	0
20	0	42	2.0	1	30.0	0.0	0
21	0	43	1.0	0	0.0	0.0	0
22	0	52	1.0	0	0.0	0.0	0
23	0	52	3.0	1	20.0	0.0	0
24	1	44	2.0	1	30.0	0.0	0
25	1	47	4.0	1	20.0	0.0	0
26	0	60	1.0	0	0.0	0.0	0

In [22]:
```
df.isnull().sum()
```

Out[22]:
```
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             0
TenYearCHD          0
dtype: int64
```

In [23]:
```
df['education'].fillna(df['education'].median(skipna=True),inplace=True)
```

In [24]:
```
df['totChol'].fillna(df['totChol'].median(skipna=True),inplace=True)
```

In [25]:
```
df['BMI'].fillna(df['BMI'].median(skipna=True),inplace=True)
```

In [26]:
```
df['heartRate'].fillna(df['heartRate'].median(skipna=True),inplace=True)
```

In [27]:
```
df['BPMeds'].fillna(df['BPMeds'].median(skipna=True),inplace=True)
```

In [28]:
```
df['cigsPerDay'].fillna(df['cigsPerDay'].median(skipna=True),inplace=True)
```

In [29]:
```
df.isnull().sum()
```

Out[29]:
```
male               0
age                0
education          0
currentSmoker      0
cigsPerDay         0
BPMeds             0
prevalentStroke    0
prevalentHyp       0
diabetes           0
totChol            0
sysBP              0
diaBP              0
BMI                0
heartRate          0
glucose            0
TenYearCHD         0
dtype: int64
```

In [30]:
```
df.drop('glucose',axis=1,inplace=True)
```

In [31]:
```
df.isnull().sum()
```

Out[31]:
```
male               0
age                0
education          0
currentSmoker      0
cigsPerDay         0
BPMeds             0
prevalentStroke    0
prevalentHyp       0
diabetes           0
totChol            0
sysBP              0
diaBP              0
BMI                0
heartRate          0
TenYearCHD         0
dtype: int64
```

In [33]:
```
print(df["cigsPerDay"].mean(skipna=True))
print(df["cigsPerDay"].median(skipna=True))
```

```
8.941481831052384
0.0
```

In [38]:
```
print((df['BPMeds'].isnull().sum()/df.shape[0]*100))
```

```
0.0
```

In [40]:
```
print((df['BMI'].isnull().sum()/df.shape[0]*100))
```

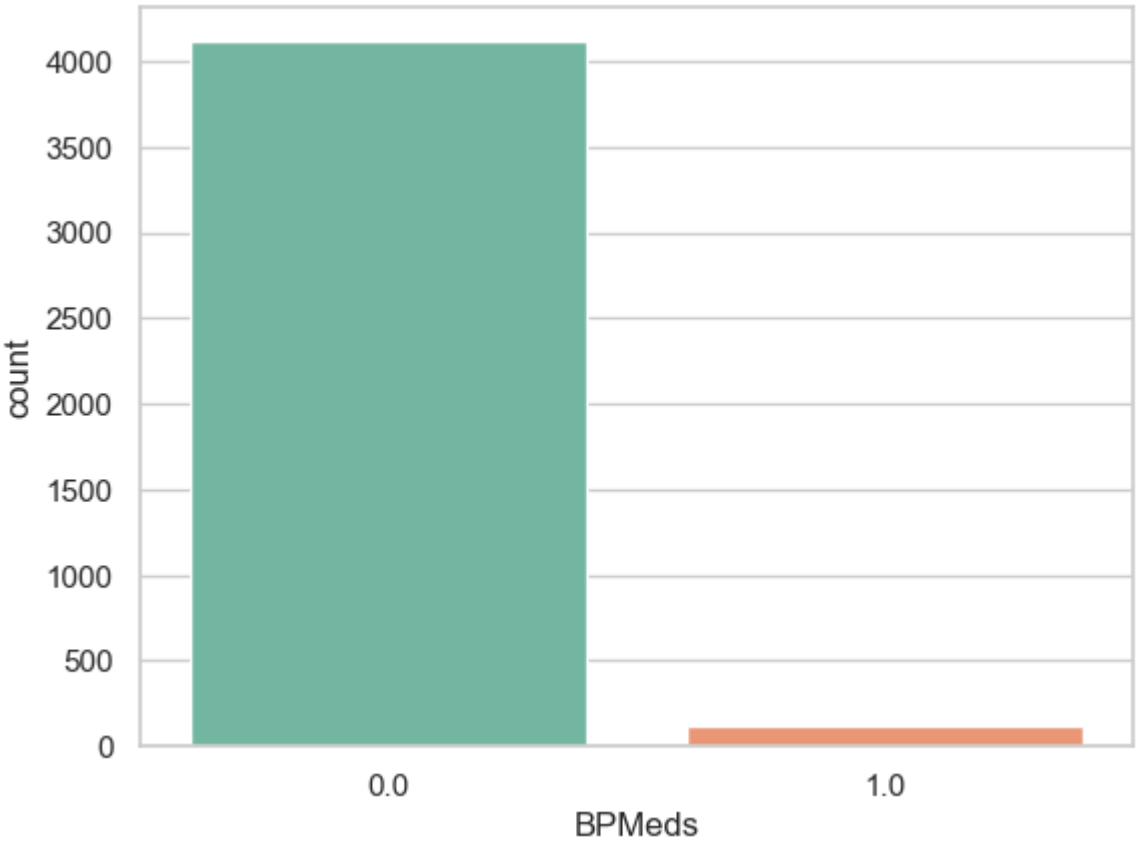
```
0.0
```

In [41]:
```
print((df['heartRate'].isnull().sum()/df.shape[0]*100))
```

```
0.0
```

In [45]:
```
print(df['BPMeds'].value_counts())
sns.countplot(x='BPMeds',data=df,palette='Set2')
plt.show()
```

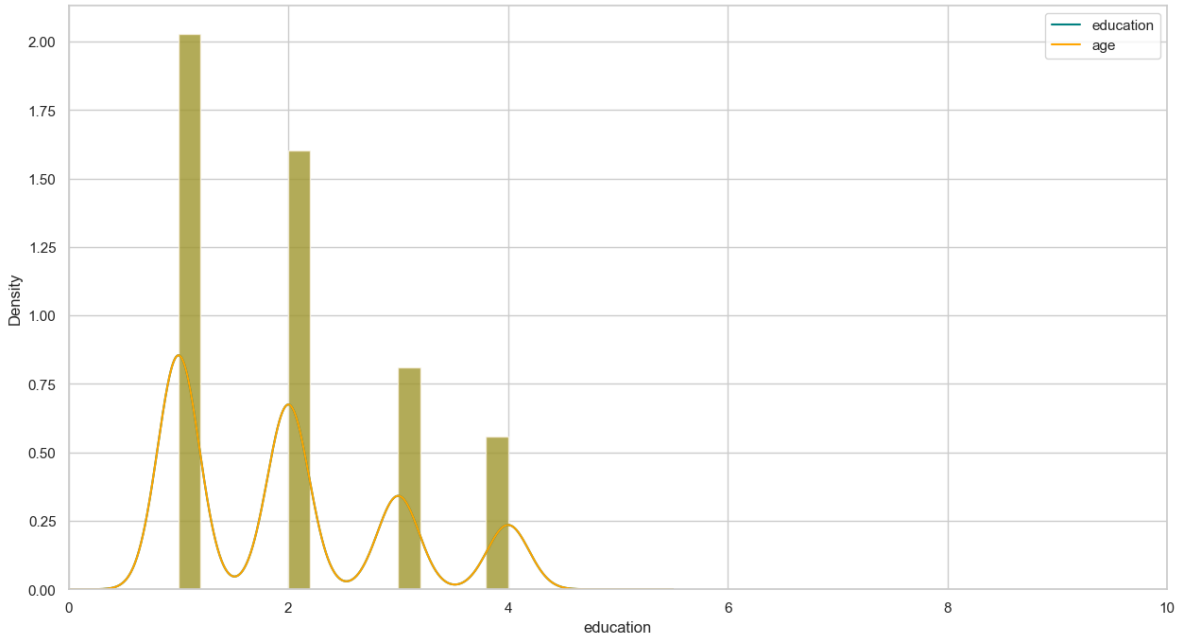
```
BPMeds
0.0    4114
1.0     124
Name: count, dtype: int64
```



In [47]:
```
print(df['heartRate'].value_counts().idxmax())
```

```
75.0
```

In [54]:
```
plt.figure(figsize=(15,8))
ax=df["education"].hist(bins=15,density=True,stacked=True,color='teal',alpha=0
df["education"].plot(kind='density',color='teal')
ax=data["education"].hist(bins=15,density=True,stacked=True,color='orange',alp
data["education"].plot(kind='density',color='orange')
ax.legend(["education","age"])
ax.set(xlabel='education')
plt.xlim(-0,10)
plt.show()
```



In [55]:
```
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 [56]:
```
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()
```

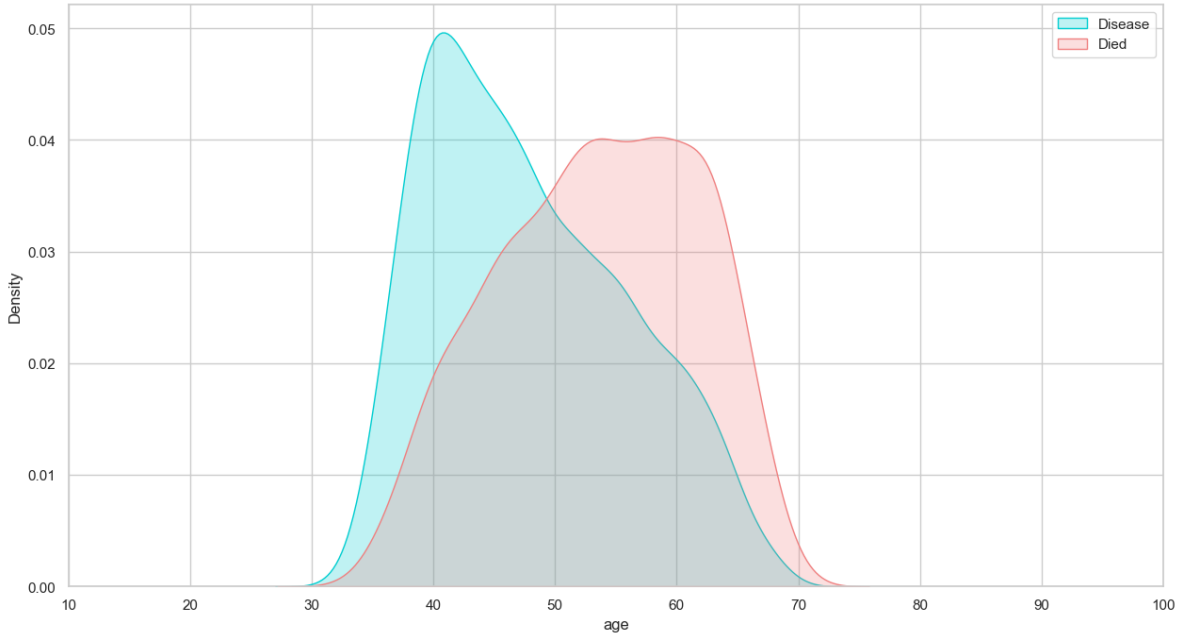
Out[56]:

	age	education	cigsPerDay	BPMeds	diabetes	BMI	heartRate	Disease	...	sysBP_220.0
0	39	4.0	0.0	0.0	0	26.97	80.0	1	...	False
1	46	2.0	0.0	0.0	0	28.73	95.0	1	...	False
2	48	1.0	20.0	0.0	0	25.34	75.0	1	...	False
3	61	3.0	30.0	0.0	0	28.58	65.0	0	...	False
4	46	3.0	23.0	0.0	0	23.10	85.0	1	...	False

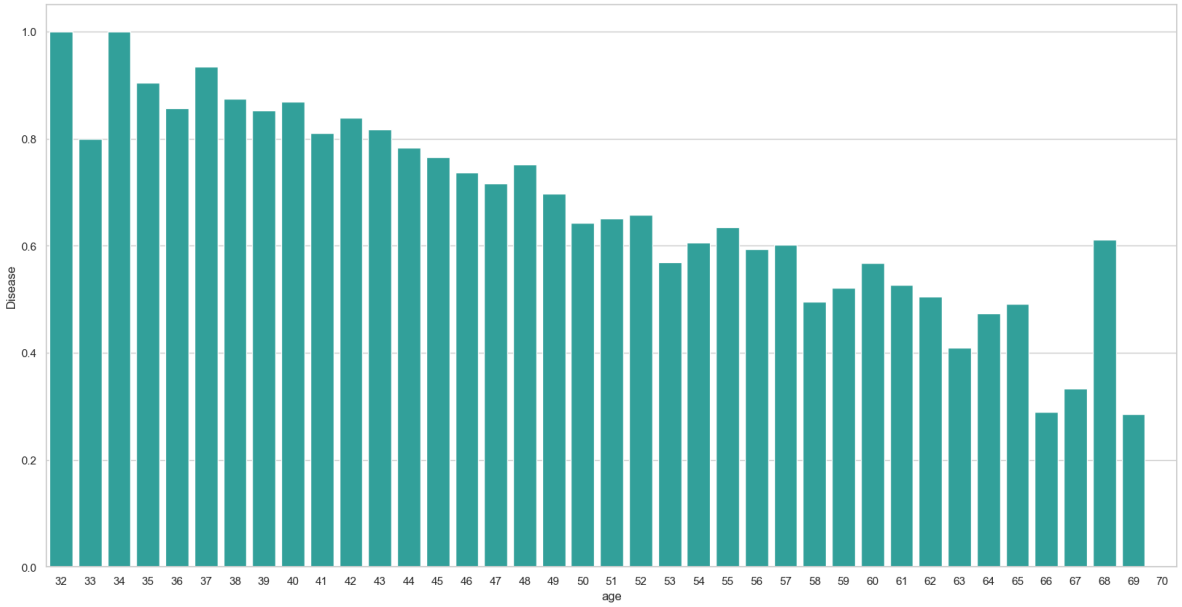
5 rows × 492 columns

EXPLORATORY DATA ANALYSIS

In [62]:
```
plt.figure(figsize=(15,8))
ax = sns.kdeplot(final_train["age"][final_train.Disease == 1],color="darkturqu
sns.kdeplot(final_train["age"][final_train.Disease == 0],color="lightcoral",sh
plt.legend(['Disease','Died'])
ax.set(xlabel='age')
plt.xlim(10,100)
plt.show()
```



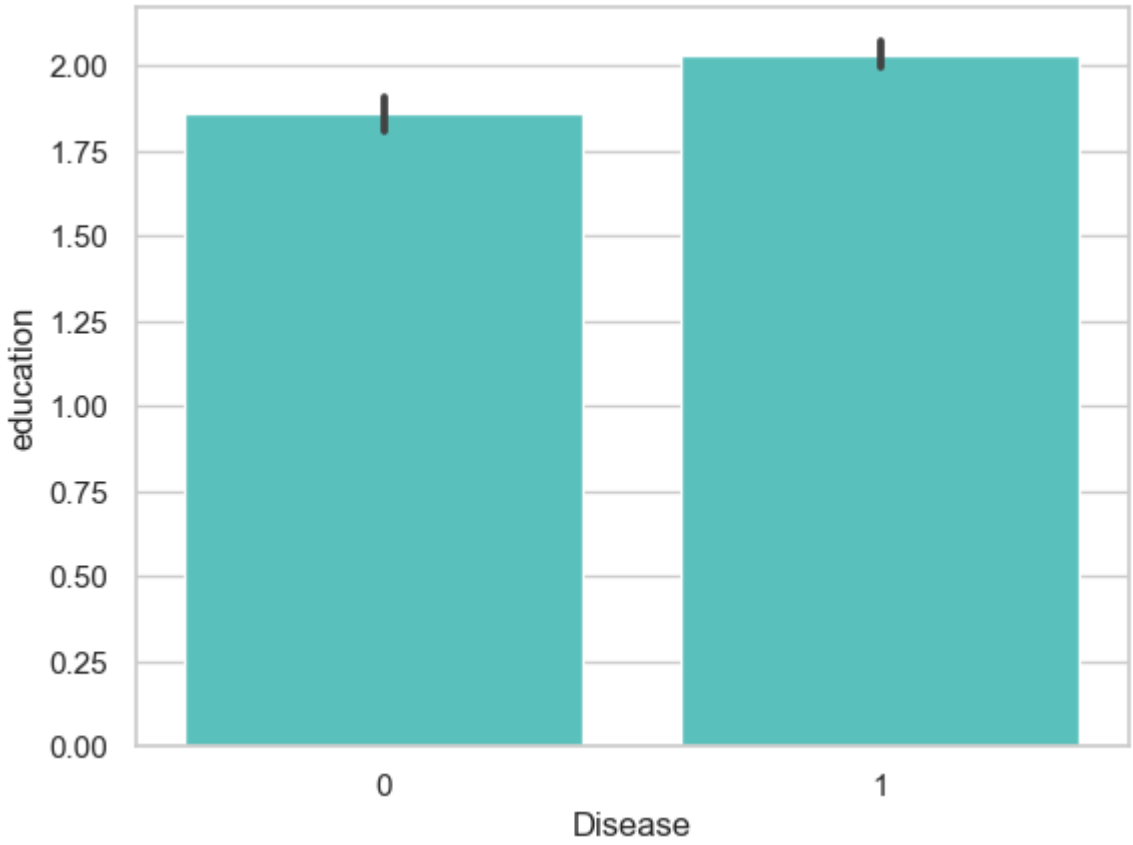
In [64]:
```
plt.figure(figsize=(20,10))
avg_survival_byage=final_train[["age","Disease"]].groupby(['age'],as_index=Fal
g=sns.barplot(x='age',y='Disease',data=avg_survival_byage,color="LightSeaGreen
plt.show()
```



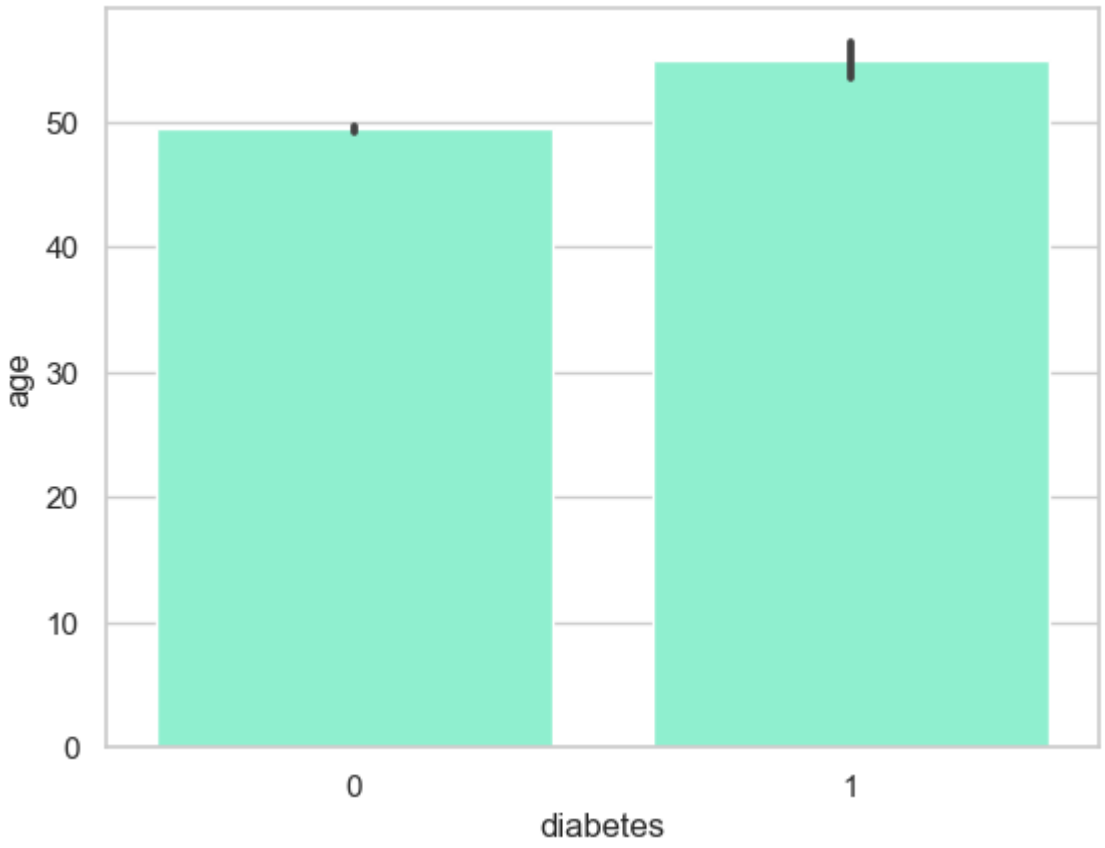
In [68]:
```
final_train['IsMinor']=np.where(final_train['age']<=16,1,0)
print(final_train['IsMinor'])
```

```
29      0
30      0
31      0
32      0
33      0
34      0
35      0
36      0
37      0
38      0
39      0
40      0
41      0
42      0
43      0
44      0
45      0
46      0
47      0
48      0
```

In [69]:
```
sns.barplot(x='Disease',y='education',data=final_train,color="mediumturquoise"
plt.show()
```



In [71]:
```
import seaborn as sns
import matplotlib.pyplot as plt
sns.barplot(x='diabetes',y='age',data=df,color="aquamarine")
plt.show()
```



In [ ]: