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')
df=pd.read_csv(r"C:\Users\DELL\Downloads\framingham.csv")
df
```

Out[2]:

```
      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 [3]:
```
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 [4]:
```
df.head()
```

Out[4]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	dia
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.tail()
```

Out[5]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp
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

In [7]:
```
df.shape
```

Out[7]:
```
(4238, 16)
```

In [8]:
```
df.describe()
```

Out[8]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevaler
count	4238.000000	4238.000000	4133.000000	4238.000000	4209.000000	4185.000000	4238
mean	0.429212	49.584946	1.978950	0.494101	9.003089	0.029630	0
std	0.495022	8.572160	1.019791	0.500024	11.920094	0.169584	0
min	0.000000	32.000000	1.000000	0.000000	0.000000	0.000000	0
25%	0.000000	42.000000	1.000000	0.000000	0.000000	0.000000	0
50%	0.000000	49.000000	2.000000	0.000000	0.000000	0.000000	0
75%	1.000000	56.000000	3.000000	1.000000	20.000000	0.000000	0
max	1.000000	70.000000	4.000000	1.000000	70.000000	1.000000	1

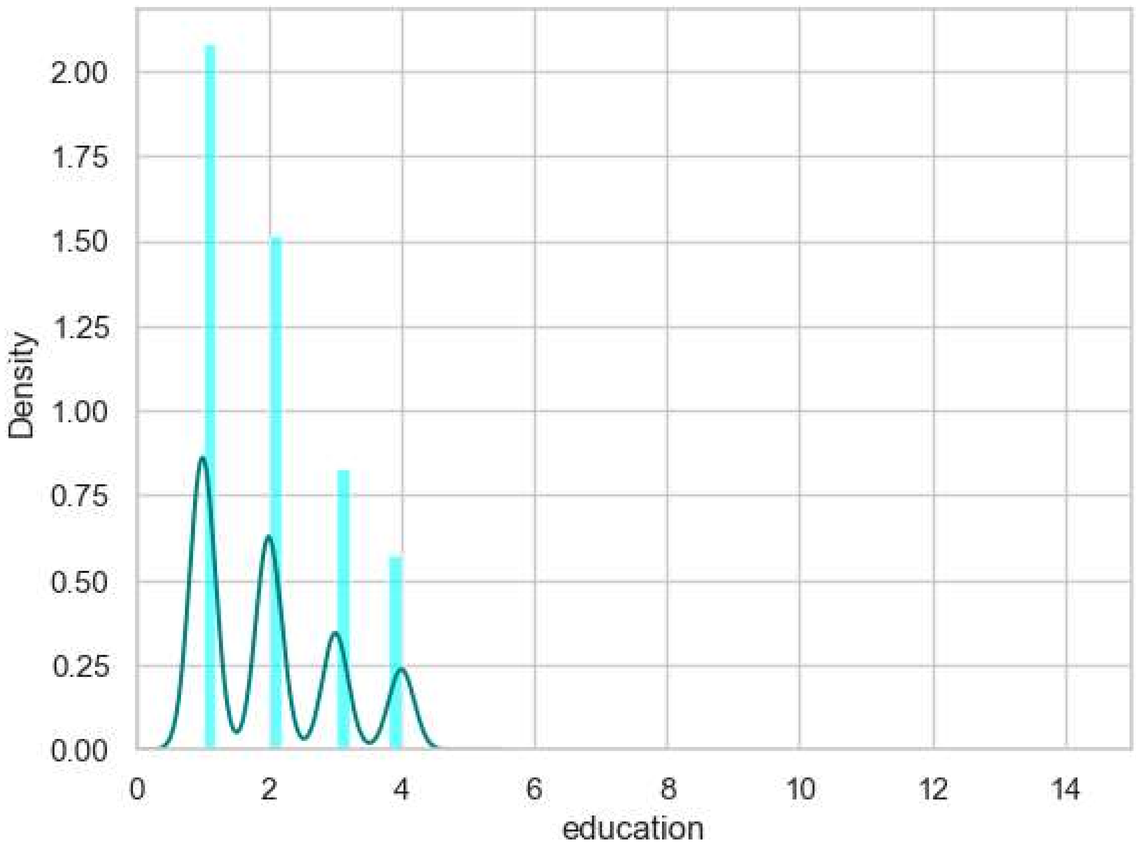
In [9]:
```
df.isnull().any()
```

Out[9]:
```
male               False
age                False
education           True
currentSmoker      False
cigsPerDay          True
BPMeds              True
prevalentStroke    False
prevalentHyp       False
diabetes           False
totChol             True
sysBP              False
diaBP              False
BMI                 True
heartRate           True
glucose             True
TenYearCHD         False
dtype: bool
```

In [10]:
```
df.describe().any()
```

Out[10]:
```
male                 True
age                  True
education            True
currentSmoker        True
cigsPerDay           True
BPMeds               True
prevalentStroke      True
prevalentHyp         True
diabetes             True
totChol              True
sysBP                True
diaBP                True
BMI                  True
heartRate            True
glucose              True
TenYearCHD           True
dtype: bool
```

In [11]:
```
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 [12]:

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

```
1.9789499153157513
2.0
```

In [13]:

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

```
9.155261915998112
```

In [14]:

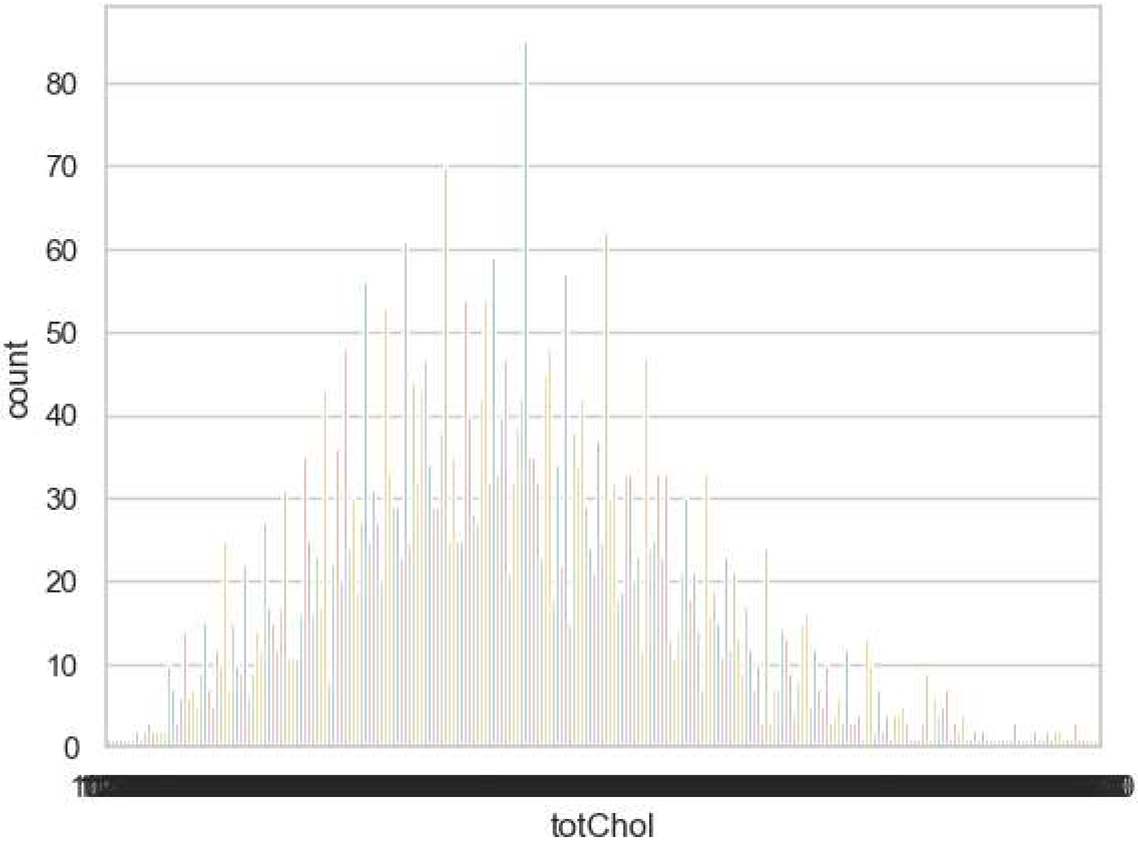
```
print((df['totChol'].isnull().sum()/df.shape[0]*100))
```

```
1.1798017932987257
```

In [15]:

```
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 [16]:

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

```
240.0
```

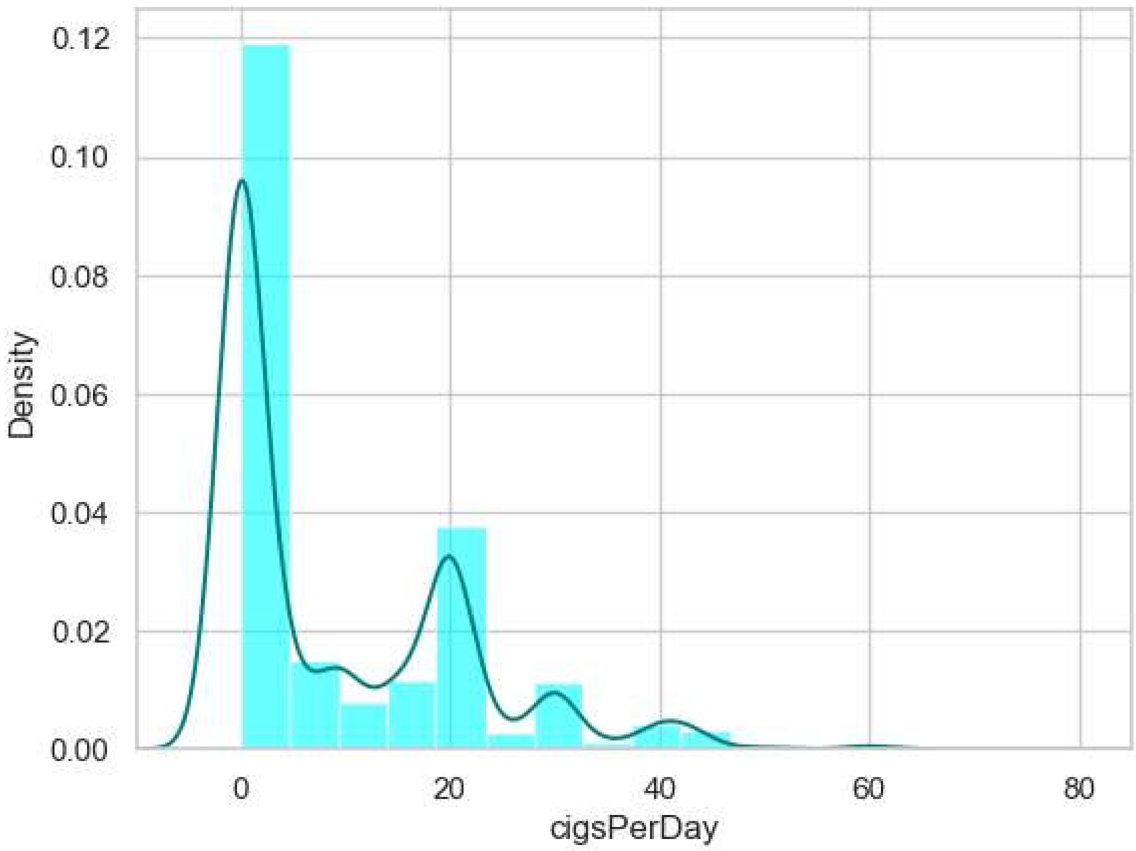
In [17]:

```
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]:
```
df.isnull().any()
```

Out[18]:
```
male               False
age                False
education           True
currentSmoker      False
cigsPerDay          True
BPMeds              True
prevalentStroke    False
prevalentHyp       False
diabetes           False
totChol             True
sysBP              False
diaBP              False
BMI                 True
heartRate           True
glucose             True
TenYearCHD         False
dtype: bool
```

In [19]:
```
ax=df["cigsPerDay"].hist(bins=15,density=True,stacked=True,color='cyan',alpha=0
df["cigsPerDay"].plot(kind='density',color='teal')
ax.set(xlabel='cigsPerDay')
plt.xlim(-10,85)
plt.show()
```



In [20]:
```
print(df["cigsPerDay"].mean(skipna=True))
print(df["cigsPerDay"].median(skipna=True))
```

```
9.003088619624615
0.0
```

In [21]:
```
print((df['BPMeds'].isnull().sum()/df.shape[0]*100))
```

```
1.2505899008966492
```

In [22]:
```
print((df['BMI'].isnull().sum()/df.shape[0]*100))
```

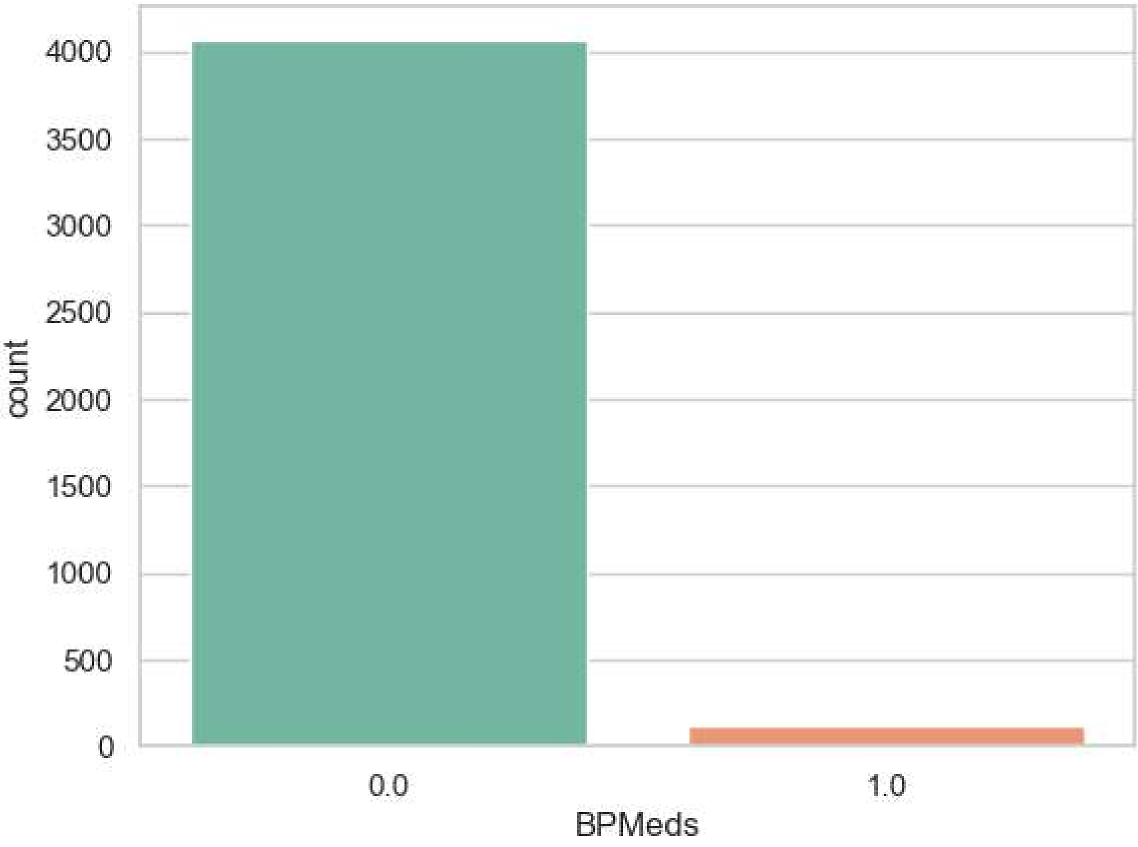
```
0.4483246814535158
```

In [23]:
```
print((df['heartRate'].isnull().sum()/df.shape[0]*100))
```

```
0.023596035865974516
```

In [24]:
```
print(df['BPMeds'].value_counts())
sns.countplot(x='BPMeds',data=df,palette='Set2')
plt.show()
```

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



In [25]:
```
print(df['heartRate'].value_counts().idxmax())
```

```
75.0
```

In [26]:
```
data=df.copy()
data["cigsPerDay"].fillna(df["cigsPerDay"].median(skipna=True),inplace=True)
data["BPMeds"].fillna(df["BPMeds"].median(skipna=True),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 [27]:
```
df.isnull().sum()
```

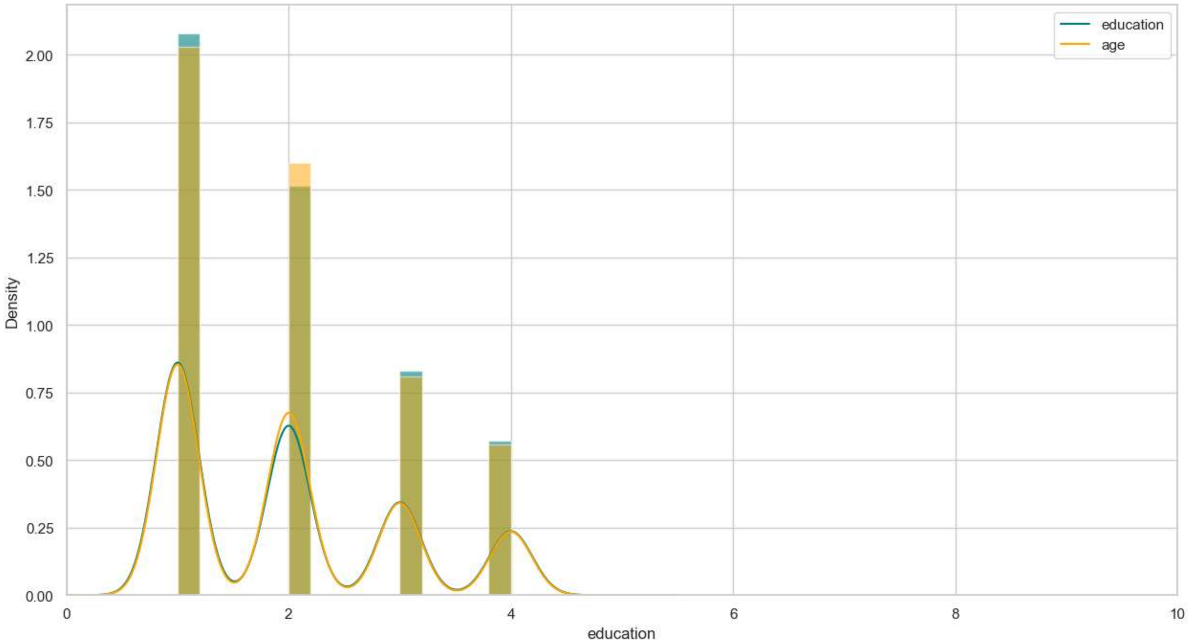
Out[27]:
```
male                0
age                 0
education         105
currentSmoker       0
cigsPerDay         29
BPMeds             53
prevalentStroke     0
prevalentHyp        0
diabetes            0
totChol            50
sysBP               0
diaBP               0
BMI                19
heartRate           1
glucose           388
TenYearCHD          0
dtype: int64
```

In [28]:
```
df.head()
```

Out[28]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	dia
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 [29]:
```
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',alph
data["education"].plot(kind='density',color='orange')
ax.legend(["education","age"])
ax.set(xlabel='education')
plt.xlim(-0,10)
plt.show()
```



In [30]:
```
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)
```

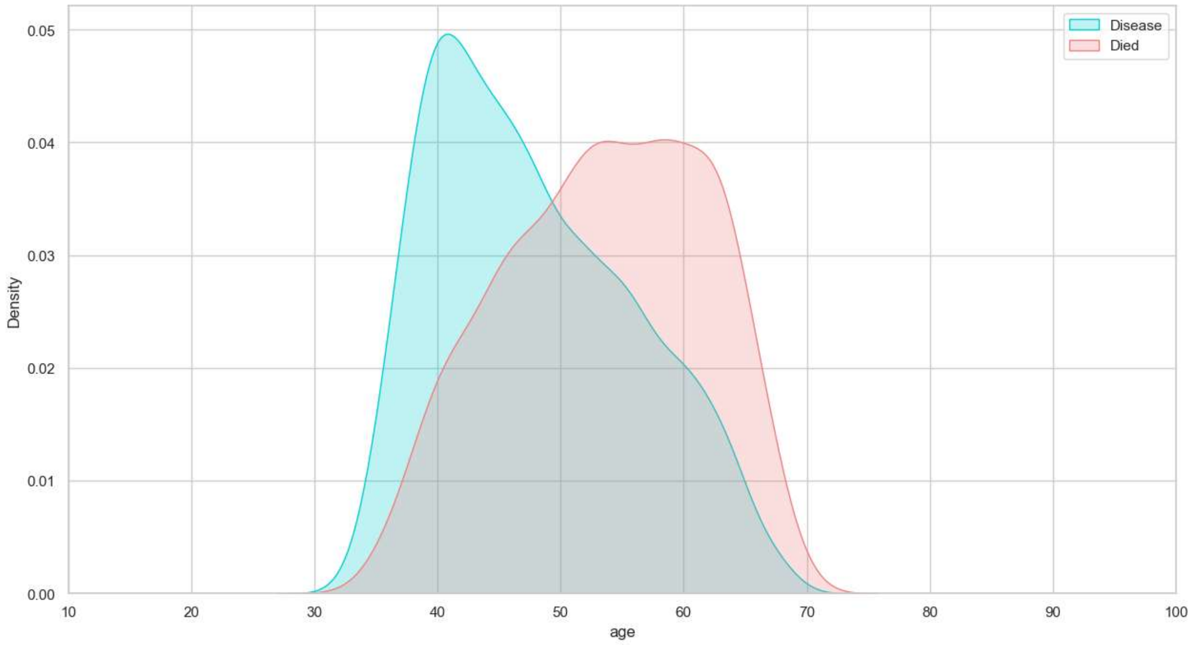
In [31]:
```
training=pd.get_dummies(data,columns=["currentSmoker","totChol","sysBP"])
training.drop("TenYearCHD",axis=1,inplace=True)
training.drop("male",axis=1,inplace=True)
training.drop("diaBP",axis=1,inplace=True)

final_train=training
final_train.head()
```

Out[31]:

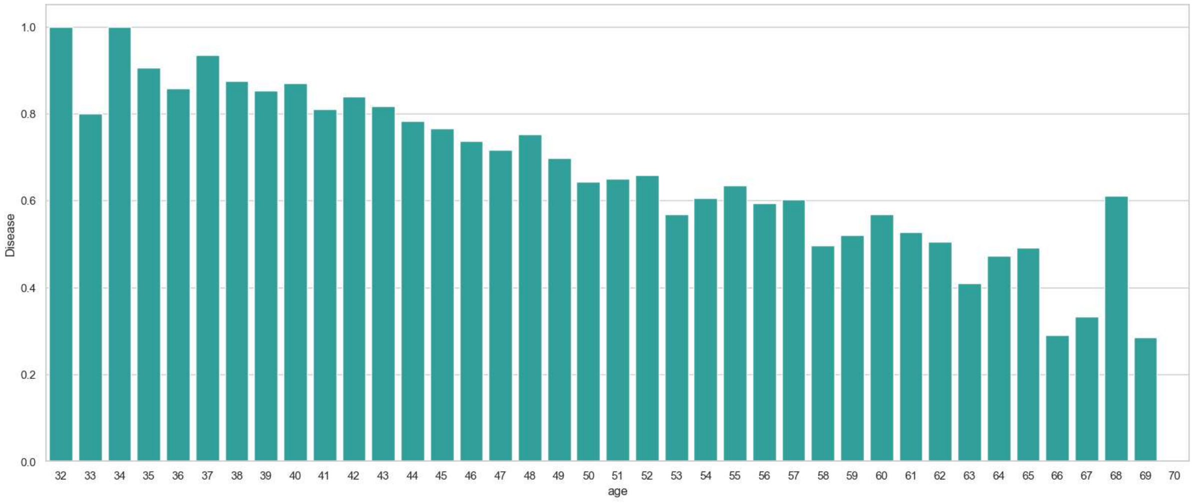
	age	education	cigsPerDay	BPMeds	diabetes	Disease	currentSmoker_0	currentSmoker_1	t
0	39	4.0	0.0	0.0	0	1	True	False	
1	46	2.0	0.0	0.0	0	1	True	False	
2	48	1.0	20.0	0.0	0	1	False	True	
3	61	3.0	30.0	0.0	0	0	False	True	
4	46	3.0	23.0	0.0	0	1	False	True	

5 rows × 490 columns

In [32]:
```
plt.figure(figsize=(15,8))
ax=sns.kdeplot(final_train["age"][final_train.Disease== 1], color="darkturquois
sns.kdeplot(final_train["age"][final_train.Disease == 0], color="lightcoral", s
plt.legend(['Disease', 'Died'])
ax.set(xlabel='age')
plt.xlim(10,100)
plt.show()
```



In [33]:
```
plt.figure(figsize=(20,8))
avg_survival_byage = final_train[["age", "Disease"]].groupby(['age'], as_index=
g = sns.barplot(x='age', y='Disease', data=avg_survival_byage, color="LightSeaG
plt.show()
```



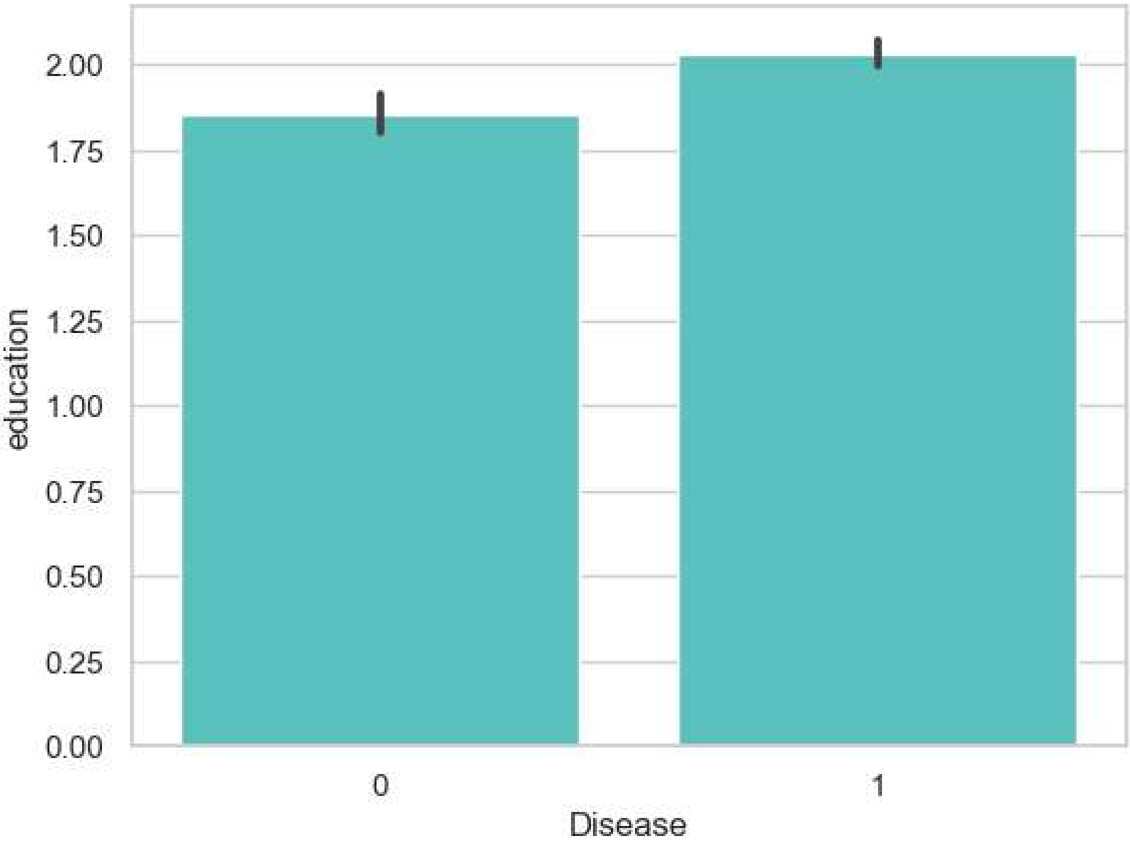
In [34]:

```
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
```

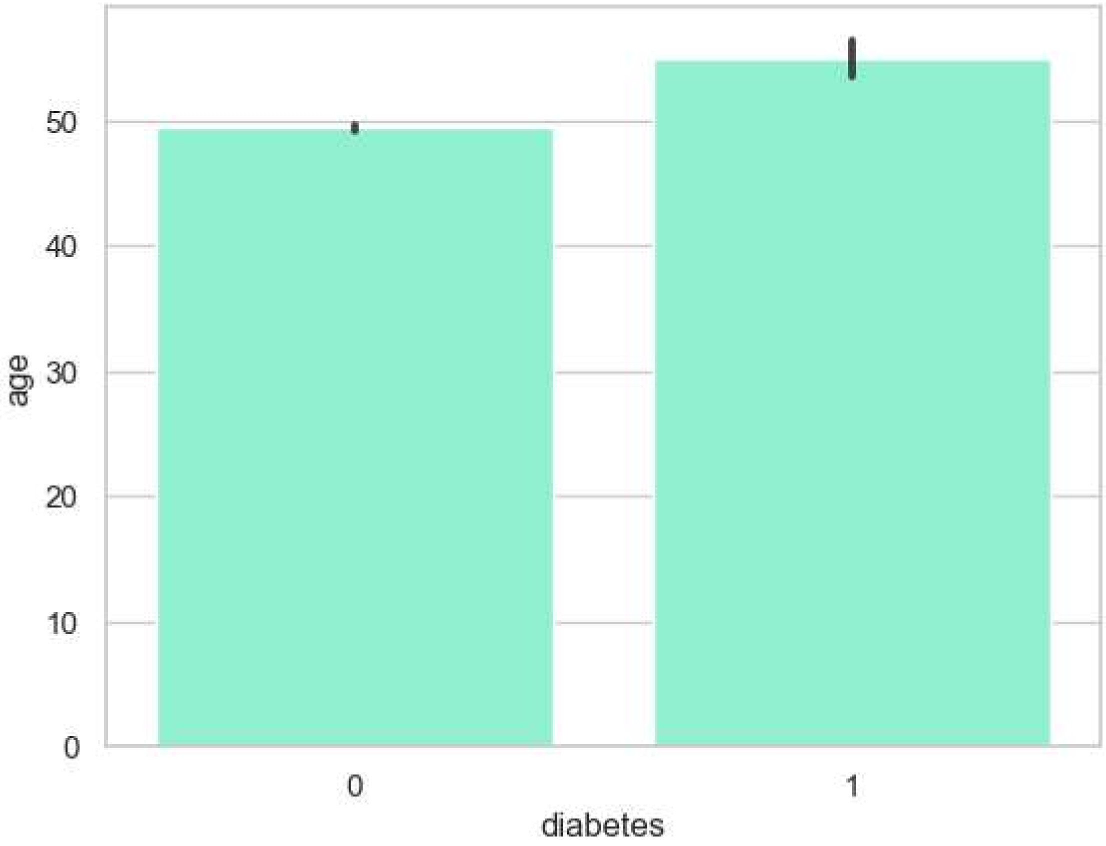
In [35]:

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



In [36]:

```
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 [ ]: