Problem statement:To predict and analyze which gender has a high chance of survival at the time of disaster

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")
sns.set(style="whitegrid",color_codes=True)
import warnings
warnings.simplefilter(action='ignore')
```

In [2]:
```
train_df=pd.read_csv(r"C:\Users\91903\Downloads\train.gender_submission.csv")
train_df
```

Out[2]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	E
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	
...	...	...	...	...	...	...	...	...	...	...	...	
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.0000	NaN	
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.0000	B42	
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.4500	NaN	
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.0000	C148	
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	NaN	

891 rows × 12 columns

In [3]:
```
test_df=pd.read_csv(r"C:\Users\91903\Downloads\test.gender_submission.csv")
test_df
```

Out[3]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarke
0	892	3	Kelly, Mr. James	male	34.5	0	0	330911	7.8292	NaN	(
1	893	3	Wilkes, Mrs. James (Ellen Needs)	female	47.0	1	0	363272	7.0000	NaN	ς
2	894	2	Myles, Mr. Thomas Francis	male	62.0	0	0	240276	9.6875	NaN	(
3	895	3	Wirz, Mr. Albert	male	27.0	0	0	315154	8.6625	NaN	ς
4	896	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	female	22.0	1	1	3101298	12.2875	NaN	ς
...	...	...	...	...	...	...	...	...	...	...	..
413	1305	3	Spector, Mr. Woolf	male	NaN	0	0	A.5. 3236	8.0500	NaN	ς
414	1306	1	Oliva y Ocana, Dona. Fermina	female	39.0	0	0	PC 17758	108.9000	C105	(
415	1307	3	Saether, Mr. Simon Sivertsen	male	38.5	0	0	SOTON/O.Q. 3101262	7.2500	NaN	ς
416	1308	3	Ware, Mr. Frederick	male	NaN	0	0	359309	8.0500	NaN	ς
417	1309	3	Peter, Master. Michael J	male	NaN	1	1	2668	22.3583	NaN	(

418 rows × 11 columns

In [4]:
```
train_df.shape
```

Out[4]:
```
(891, 12)
```

In [5]:
```
train_df.head()
```

Out[5]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Emb
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	

In [6]:
```
test_df.shape
```

Out[6]:
```
(418, 11)
```

In [7]:

```
train_df.describe
```

Out[7]:

```
<bound method NDFrame.describe of      PassengerId  Survived  Pclass
0              1         0       3  \
1              2         1       1
2              3         1       3
3              4         1       1
4              5         0       3
..           ...       ...     ...
886          887         0       2
887          888         1       1
888          889         0       3
889          890         1       1
890          891         0       3

                                                  Name     Sex   Age  SibSp
0                              Braund, Mr. Owen Harris    male  22.0      1  \
1    Cumings, Mrs. John Bradley (Florence Briggs Th...  female  38.0      1
2                               Heikkinen, Miss. Laina  female  26.0      0
3         Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0      1
4                             Allen, Mr. William Henry    male  35.0      0
..                                                 ...     ...   ...    ...
886                              Montvila, Rev. Juozas    male  27.0      0
887                       Graham, Miss. Margaret Edith  female  19.0      0
888           Johnston, Miss. Catherine Helen "Carrie"  female   NaN      1
889                              Behr, Mr. Karl Howell    male  26.0      0
890                                Dooley, Mr. Patrick    male  32.0      0

     Parch            Ticket     Fare Cabin Embarked
0        0         A/5 21171   7.2500   NaN        S
1        0          PC 17599  71.2833   C85        C
2        0  STON/O2. 3101282   7.9250   NaN        S
3        0            113803  53.1000  C123        S
4        0            373450   8.0500   NaN        S
..     ...               ...      ...   ...      ...
886      0            211536  13.0000   NaN        S
887      0            112053  30.0000   B42        S
888      2        W./C. 6607  23.4500   NaN        S
889      0            111369  30.0000  C148        C
890      0            370376   7.7500   NaN        Q

[891 rows x 12 columns]>
```

In [8]:
```
train_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   PassengerId  891 non-null    int64
 1   Survived     891 non-null    int64
 2   Pclass       891 non-null    int64
 3   Name         891 non-null    object
 4   Sex          891 non-null    object
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64
 7   Parch        891 non-null    int64
 8   Ticket       891 non-null    object
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object
 11  Embarked     889 non-null    object
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

In [9]:
```
test_df.describe
```

Out[9]:
```
<bound method NDFrame.describe of      PassengerId  Pclass
Name
0            892       3                              Kelly, Mr. James  \
1            893       3              Wilkes, Mrs. James (Ellen Needs)
2            894       2                     Myles, Mr. Thomas Francis
3            895       3                              Wirz, Mr. Albert
4            896       3  Hirvonen, Mrs. Alexander (Helga E Lindqvist)
..           ...     ...                                           ...
413         1305       3                            Spector, Mr. Woolf
414         1306       1                  Oliva y Ocana, Dona. Fermina
415         1307       3                  Saether, Mr. Simon Sivertsen
416         1308       3                           Ware, Mr. Frederick
417         1309       3                      Peter, Master. Michael J

        Sex   Age  SibSp  Parch              Ticket      Fare Cabin Embarked
0      male  34.5      0      0              330911    7.8292   NaN        Q
1    female  47.0      1      0              363272    7.0000   NaN        S
2      male  62.0      0      0              240276    9.6875   NaN        Q
3      male  27.0      0      0              315154    8.6625   NaN        S
4    female  22.0      1      1             3101298   12.2875   NaN        S
..      ...   ...    ...    ...                 ...       ...   ...      ...
413    male   NaN      0      0           A.5. 3236    8.0500   NaN        S
414  female  39.0      0      0            PC 17758  108.9000  C105        C
415    male  38.5      0      0  SOTON/O.Q. 3101262    7.2500   NaN        S
416    male   NaN      0      0              359309    8.0500   NaN        S
417    male   NaN      1      1                2668   22.3583   NaN        C

[418 rows x 11 columns]>
```

In [10]:

```
test_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 11 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  418 non-null    int64  
 1   Pclass       418 non-null    int64  
 2   Name         418 non-null    object 
 3   Sex          418 non-null    object 
 4   Age          332 non-null    float64
 5   SibSp        418 non-null    int64  
 6   Parch        418 non-null    int64  
 7   Ticket       418 non-null    object 
 8   Fare         417 non-null    float64
 9   Cabin        91 non-null     object 
 10  Embarked     418 non-null    object 
dtypes: float64(2), int64(4), object(5)
memory usage: 36.0+ KB
```

To find the missing values

In [11]:

```
train_df.isnull().sum()
```

Out[11]:

```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

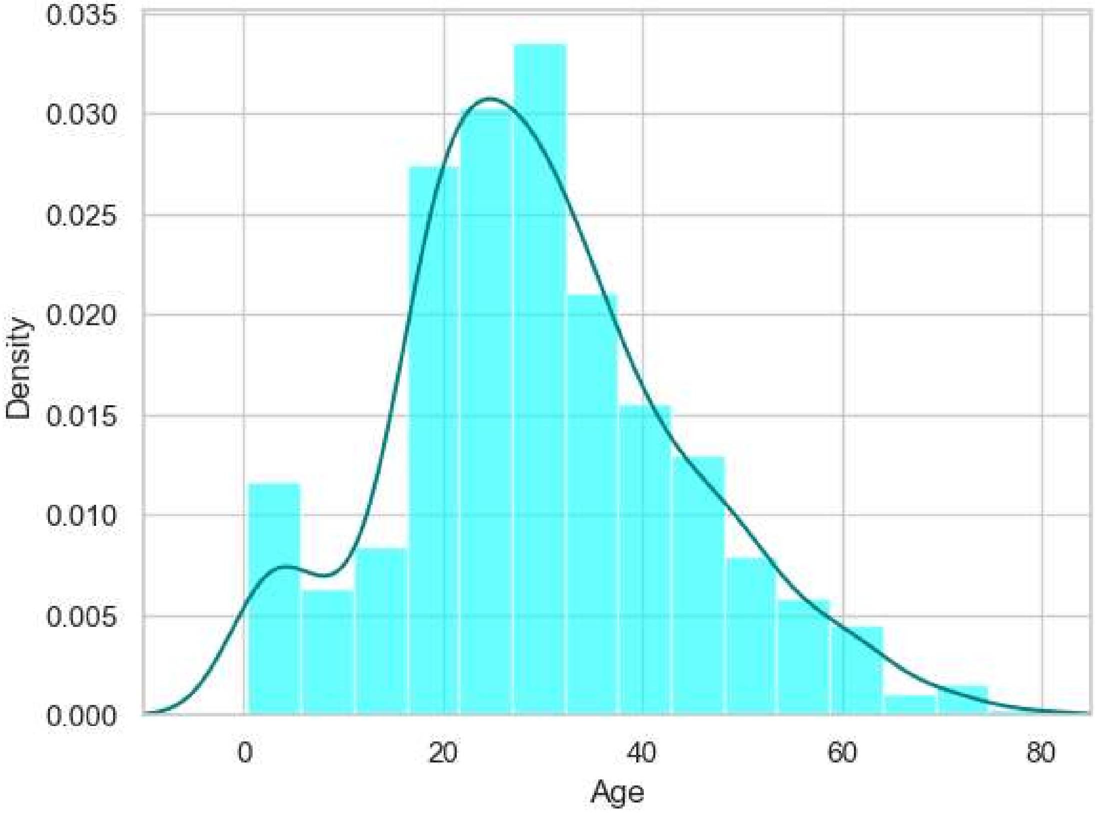
In [12]:

```
test_df.isnull().sum()
```

Out[12]:

```
PassengerId      0
Pclass           0
Name             0
Sex              0
Age             86
SibSp            0
Parch            0
Ticket           0
Fare             1
Cabin          327
Embarked         0
dtype: int64
```

In [13]:
```
ax=train_df["Age"].hist(bins=15,density=True,stacked=True,color='cyan',alpha=0.6)
train_df["Age"].plot(kind='density',color='teal')
ax.set(xlabel='Age')
plt.xlim(-10,85)
plt.show()
```



In [14]:
```
print(train_df["Age"].mean(skipna=True))
print(train_df["Age"].median(skipna=True))
```

```
29.69911764705882
28.0
```

In [15]:
```
print((train_df['Cabin'].isnull().sum()/train_df.shape[0]*100))
```

```
77.10437710437711
```

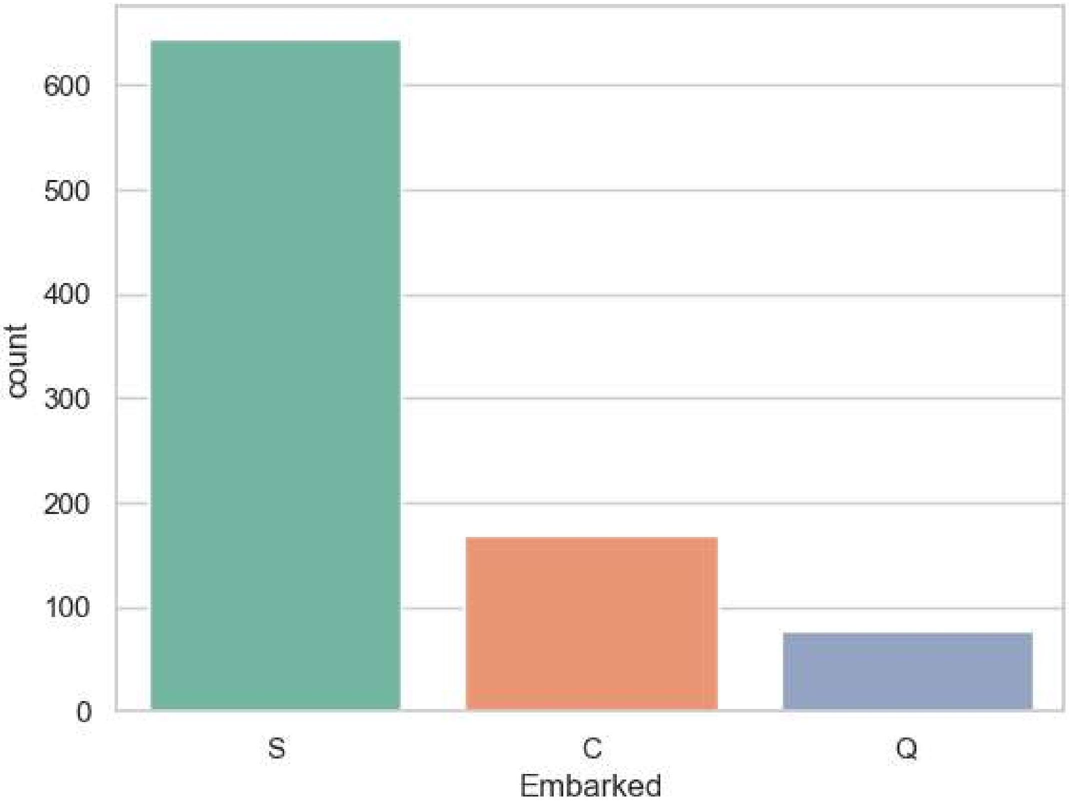
In [16]:
```
print((train_df['Embarked'].isnull().sum()/train_df.shape[0]*100))
```

```
0.22446689113355783
```

In [17]:

```
print('Boarded passengers grouped by part of embarketion (C = Cherbourg,Q=Queenstown,
print(train_df['Embarked'].value_counts())
sns.countplot(x='Embarked',data=train_df,palette='Set2')
plt.show()
```

```
Boarded passengers grouped by part of embarketion (C = Cherbourg,Q=Queenstown,S=Sout
hampton):
Embarked
S    644
C    168
Q     77
Name: count, dtype: int64
```



In [18]:

```
print(train_df['Embarked'].value_counts().idxmax())
```

```
S
```

In [19]:

```
train_data=train_df.copy()
train_data["Age"].fillna(train_df["Age"].median(skipna=True),inplace=True)
train_data["Embarked"].fillna(train_df["Embarked"].value_counts().idxmax(),inplace=Tru
train_data.drop('Cabin',axis=1,inplace=True)
```

In [20]:
```
train_data.isnull().sum()
```

Out[20]:
```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Embarked       0
dtype: int64
```

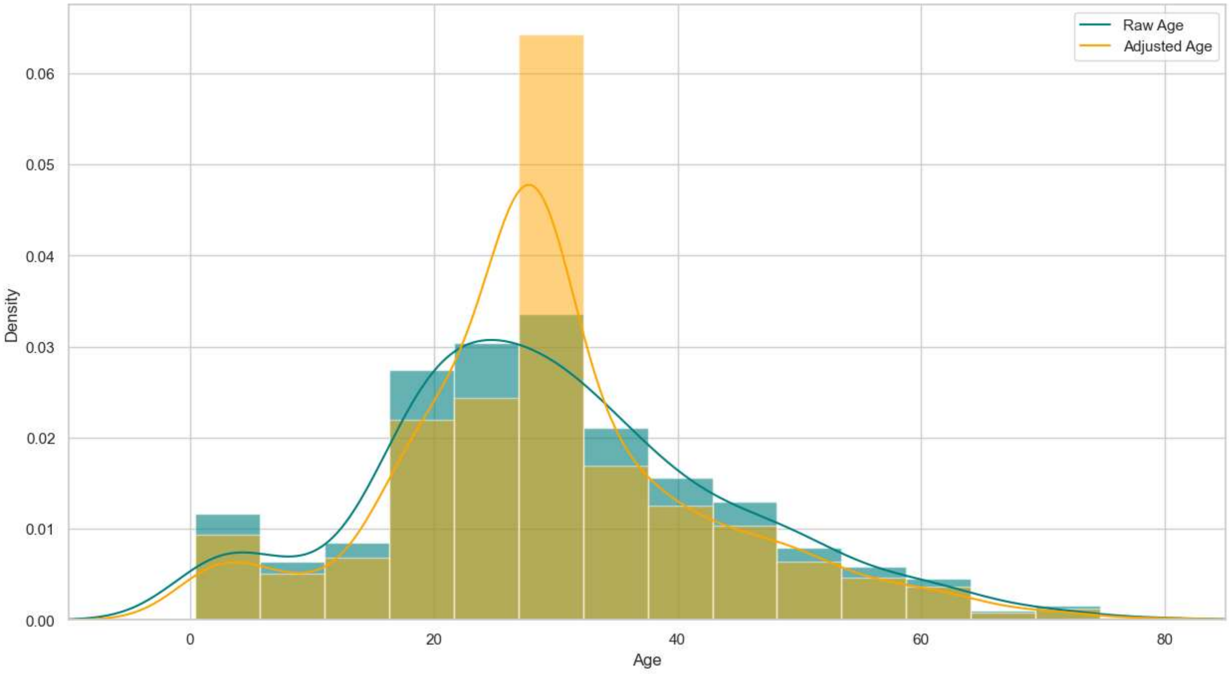
In [21]:
```
train_data.head()
```

Out[21]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	S

In [22]:

```
plt.figure(figsize=(15,8))
ax=train_df["Age"].hist(bins=15,density=True,stacked=True,color='teal',alpha=0.6)
train_df["Age"].plot(kind='density',color='teal')
ax=train_data["Age"].hist(bins=15,density=True,stacked=True,color='orange',alpha=0.5)
train_data["Age"].plot(kind='density',color='orange')
ax.legend(["Raw Age","Adjusted Age"])
ax.set(xlabel='Age')
plt.xlim(-10,85)
plt.show()
```



In [23]:

```
train_data['TravelAlone']=np.where((train_data["SibSp"]+train_data["Parch"])>0,0,1)
train_data.drop('SibSp',axis=1,inplace=True)
train_data.drop('Parch',axis=1,inplace=True)
```

In [24]:

```
training=pd.get_dummies(train_data,columns=["Pclass","Embarked","Sex"])
training.drop("Sex_female",axis=1,inplace=True)
training.drop("PassengerId",axis=1,inplace=True)
training.drop("Name",axis=1,inplace=True)
training.drop("Ticket",axis=1,inplace=True)

final_train=training
final_train.head()
```

Out[24]:

	Survived	Age	Fare	TravelAlone	Pclass_1	Pclass_2	Pclass_3	Embarked_C	Embarked_Q	Embar
0	0	22.0	7.2500	0	False	False	True	False	False	
1	1	38.0	71.2833	0	True	False	False	True	False	
2	1	26.0	7.9250	1	False	False	True	False	False	
3	1	35.0	53.1000	0	True	False	False	False	False	
4	0	35.0	8.0500	1	False	False	True	False	False	

In [25]:
```
test_df.isnull().sum()
```

Out[25]:
```
PassengerId      0
Pclass           0
Name             0
Sex              0
Age             86
SibSp            0
Parch            0
Ticket           0
Fare             1
Cabin          327
Embarked         0
dtype: int64
```

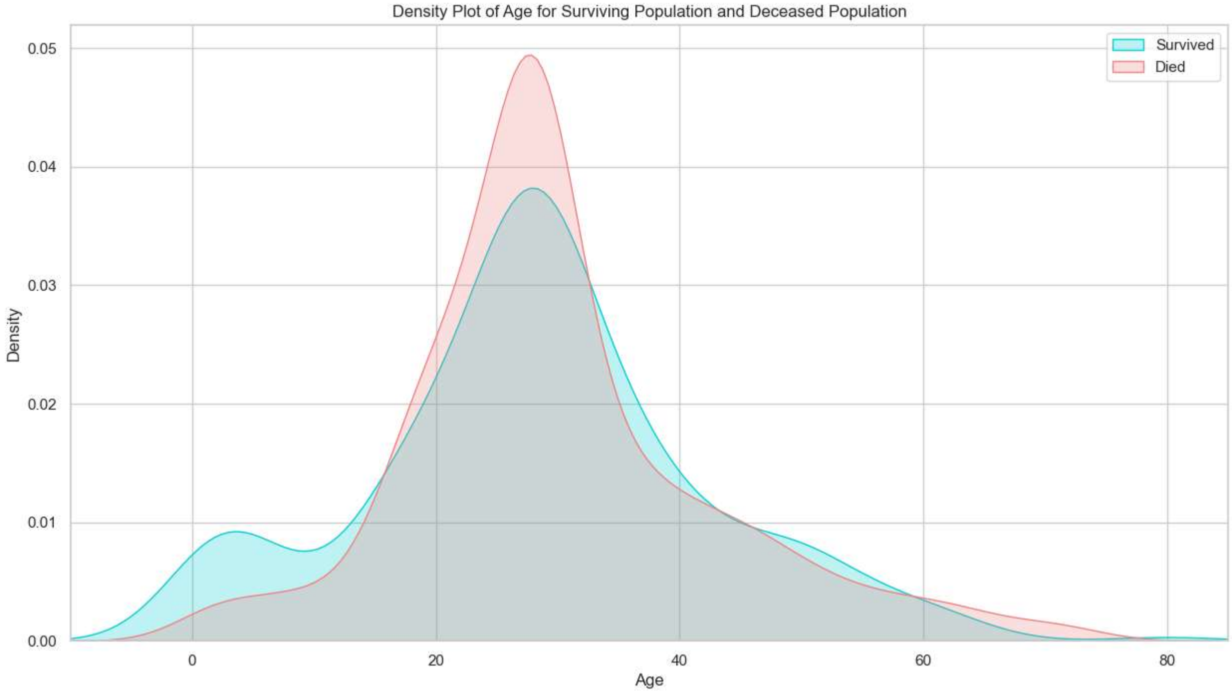
In [31]:
```
test_data=test_df.copy()
test_data["Age"].fillna(train_df["Age"].median(skipna=True),inplace=True)
test_data["Fare"].fillna(train_df["Fare"].median(skipna=True),inplace=True)
test_data.drop('Cabin',axis=1,inplace=True)

test_data['TravelAlone']=np.where((test_data["SibSp"]+test_data["Parch"])>0,0,1)

test_data.drop("SibSp",axis=1,inplace=True)
test_data.drop("Parch",axis=1,inplace=True)

testing=pd.get_dummies(train_data,columns=["Pclass","Embarked","Sex"])
testing.drop("Sex_female",axis=1,inplace=True)
testing.drop("PassengerId",axis=1,inplace=True)
testing.drop("Name",axis=1,inplace=True)
testing.drop("Ticket",axis=1,inplace=True)

final_test=testing
final_test.head()
```

Out[31]:

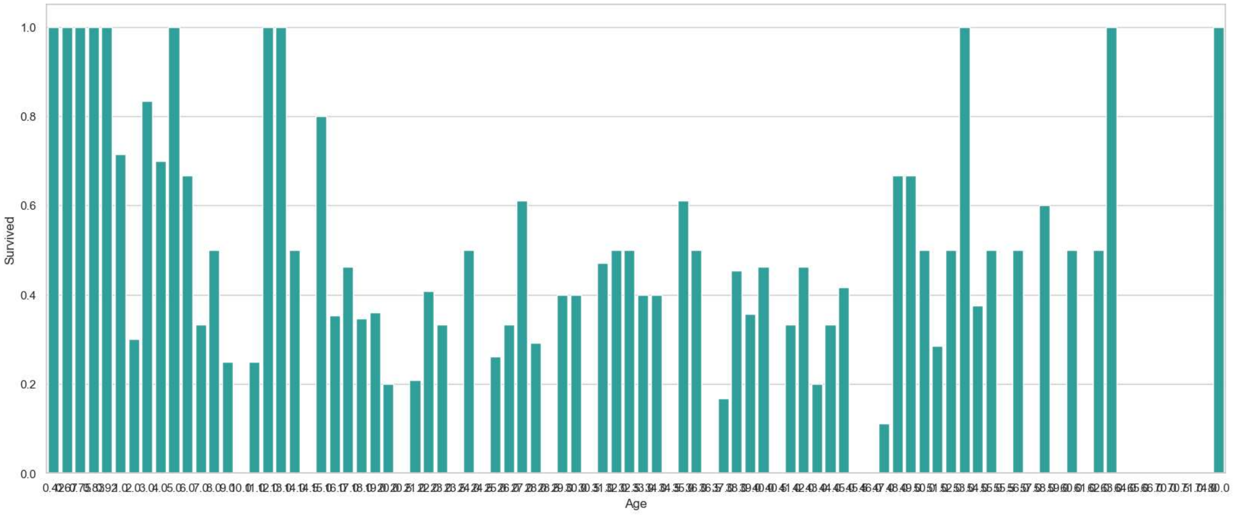
	Survived	Age	Fare	TravelAlone	Pclass_1	Pclass_2	Pclass_3	Embarked_C	Embarked_Q	Embar
0	0	22.0	7.2500	0	False	False	True	False	False	
1	1	38.0	71.2833	0	True	False	False	True	False	
2	1	26.0	7.9250	1	False	False	True	False	False	
3	1	35.0	53.1000	0	True	False	False	False	False	
4	0	35.0	8.0500	1	False	False	True	False	False	

Exploratory data analysis

In [32]:
```
plt.figure(figsize=(15,8))
ax = sns.kdeplot(final_train["Age"][final_train.Survived == 1], color="darkturquoise"
sns.kdeplot(final_train["Age"][final_train.Survived == 0], color="lightcoral", shade=
plt.legend(['Survived', 'Died'])
plt.title('Density Plot of Age for Surviving Population and Deceased Population')
ax.set(xlabel='Age')
plt.xlim(-10,85)
plt.show()
```



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



In [34]:

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

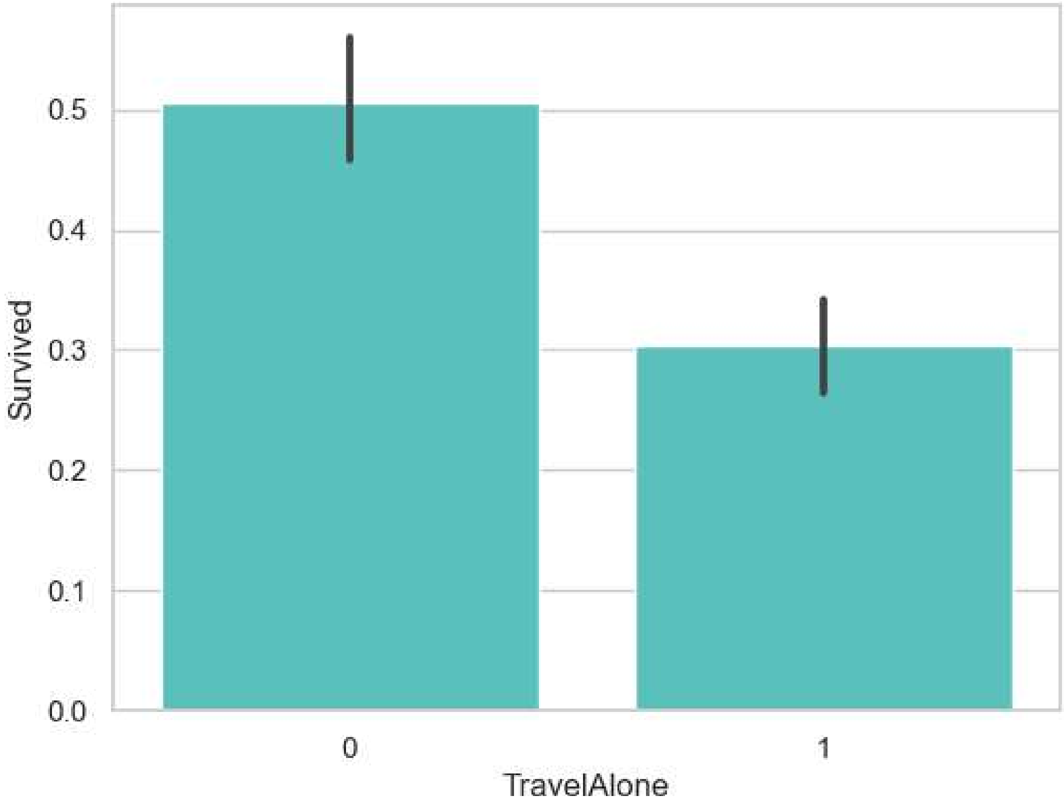
```
0      0
1      0
2      0
3      0
4      0
      ..
886    0
887    0
888    0
889    0
890    0
Name: IsMinor, Length: 891, dtype: int32
```

In [35]:

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

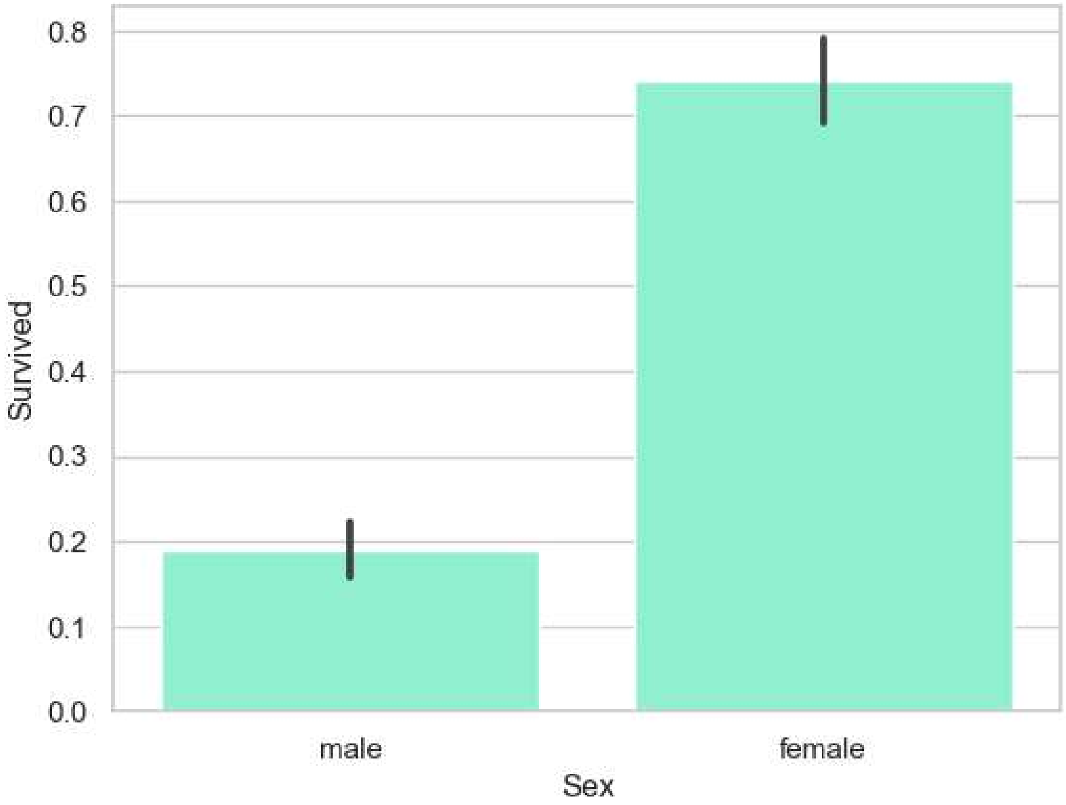
```
0      0
1      0
2      0
3      0
4      0
      ..
886    0
887    0
888    0
889    0
890    0
Name: IsMinor, Length: 891, dtype: int32
```

In [31]:
```
sns.barplot(x='TravelAlone', y='Survived', data=final_train, color="mediumturquoise")
plt.show()
```



In [32]:

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



In [ ]:

```
```