T5 project Week3

Qurrah

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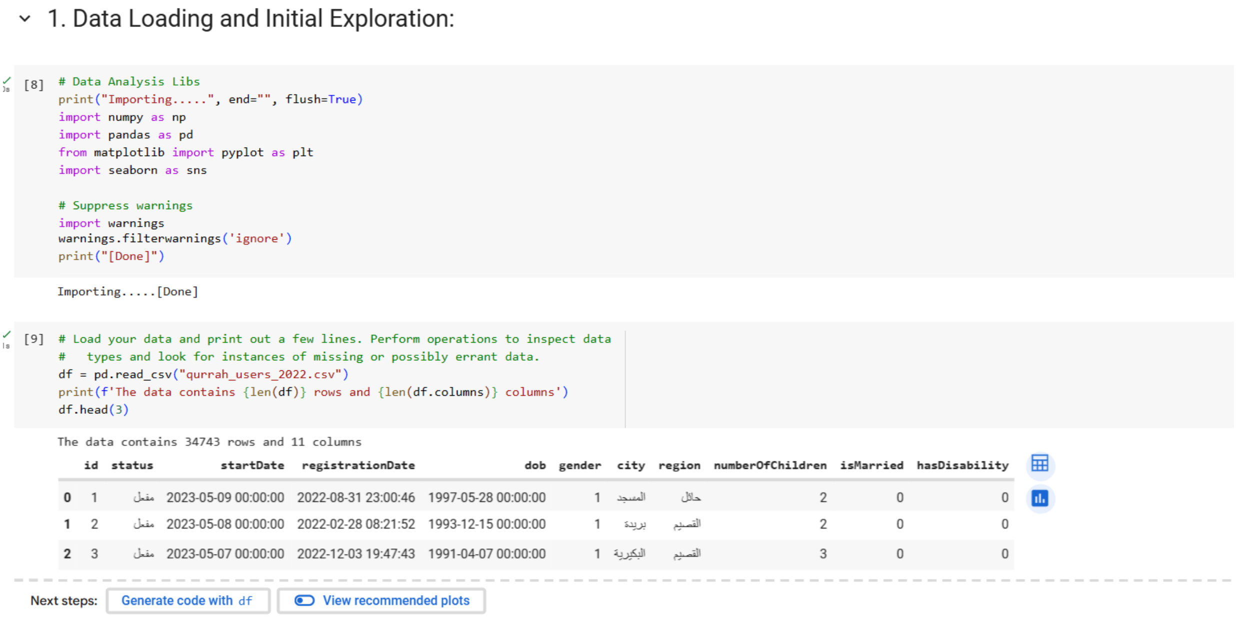
1. Data Loading and Initial Exploration:

- Successfully loaded the dataset into a DataFrame and displayed the first few rows to understand its structure and contents.



1. Data Loading and Initial Exploration:

```
[8] # Data Analysis Libs
    print("Importing.....", end="", flush=True)
    import numpy as np
    import pandas as pd
    from matplotlib import pyplot as plt
    import seaborn as sns

    # Suppress warnings
    import warnings
    warnings.filterwarnings('ignore')
    print("[Done]")
```

```
Importing.....[Done]
```

```
[9] # Load your data and print out a few lines. Perform operations to inspect data
    #   types and look for instances of missing or possibly errant data.
    df = pd.read_csv("qurrah_users_2022.csv")
    print(f'The data contains {len(df)} rows and {len(df.columns)} columns')
    df.head(3)
```

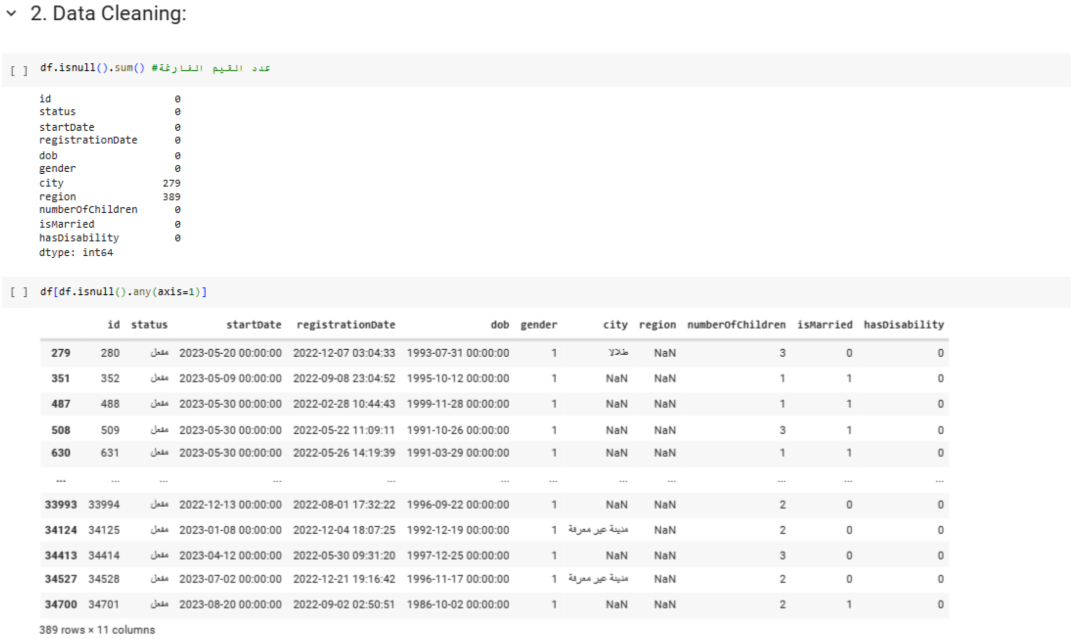
```
The data contains 34743 rows and 11 columns
```

	id	status	startDate	registrationDate	dob	gender	city	region	numberOfChildren	isMarried	hasDisability
0	1	مفعل	2023-05-09 00:00:00	2022-08-31 23:00:46	1997-05-28 00:00:00	1	المسجد	حائل	2	0	0
1	2	مفعل	2023-05-08 00:00:00	2022-02-28 08:21:52	1993-12-15 00:00:00	1	بريدة	القصيم	2	0	0
2	3	مفعل	2023-05-07 00:00:00	2022-12-03 19:47:43	1991-04-07 00:00:00	1	البكيرية	القصيم	3	0	0

2. Data Cleaning:

- Checked for missing value and drop 'gender' column

-Delete the null value



2. Data Cleaning:

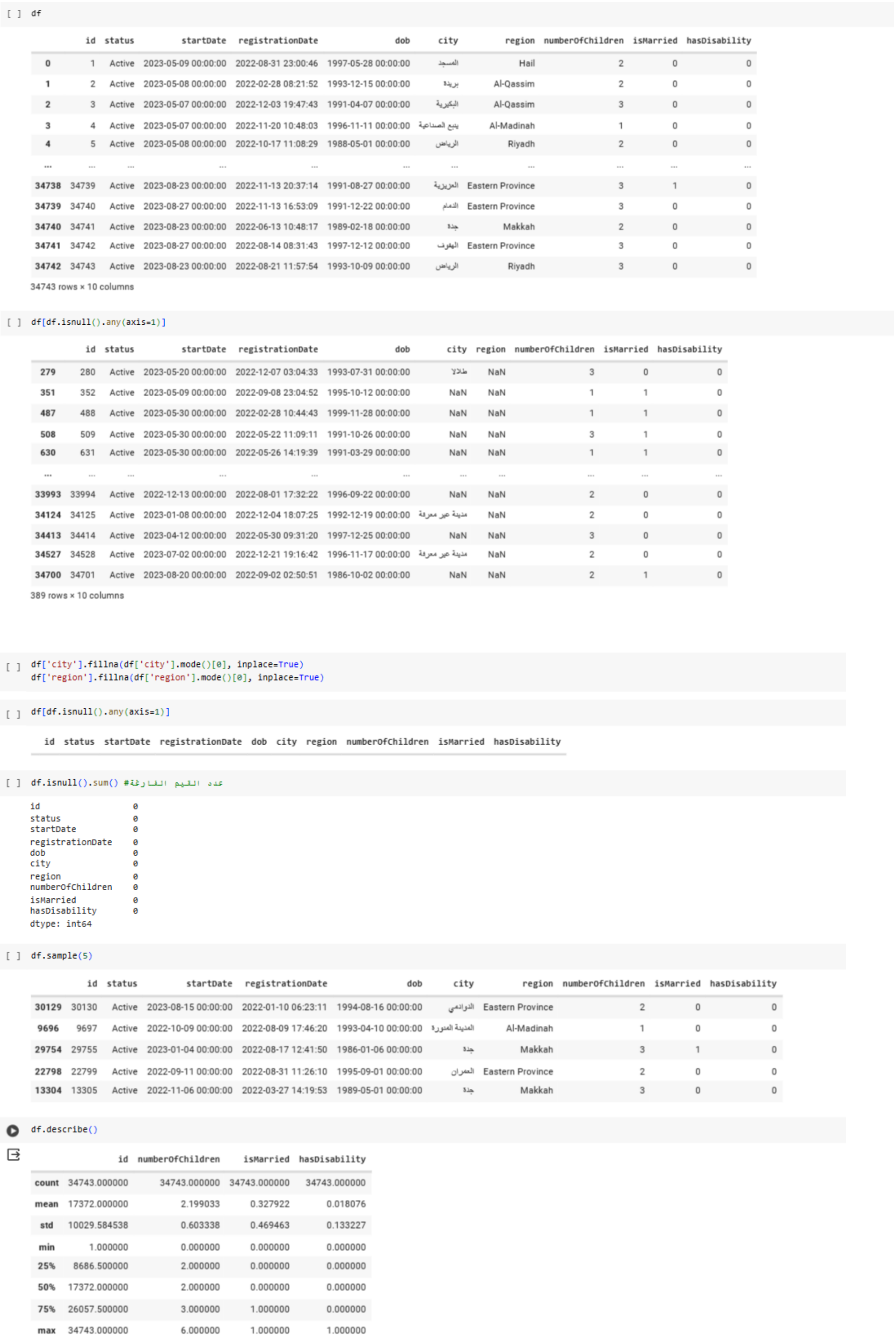
```
[ ] df.isnull().sum() #عدد القيم الفارغة
```

```
id                  0
status              0
startDate           0
registrationDate    0
dob                 0
gender              0
city              279
region            389
numberOfChildren    0
isMarried           0
hasDisability       0
dtype: int64
```

```
[ ] df[df.isnull().any(axis=1)]
```

	id	status	startDate	registrationDate	dob	gender	city	region	numberOfChildren	isMarried	hasDisability
279	280	مفعل	2023-05-20 00:00:00	2022-12-07 03:04:33	1993-07-31 00:00:00	1	طلالا	NaN	3	0	0
351	352	مفعل	2023-05-09 00:00:00	2022-09-08 23:04:52	1995-10-12 00:00:00	1	NaN	NaN	1	1	0
487	488	مفعل	2023-05-30 00:00:00	2022-02-28 10:44:43	1999-11-28 00:00:00	1	NaN	NaN	1	1	0
508	509	مفعل	2023-05-30 00:00:00	2022-05-22 11:09:11	1991-10-26 00:00:00	1	NaN	NaN	3	1	0
630	631	مفعل	2023-05-30 00:00:00	2022-05-26 14:19:39	1991-03-29 00:00:00	1	NaN	NaN	1	1	0
...	...	...	...	...	...	...	...	...	...	...	...
33993	33994	مفعل	2022-12-13 00:00:00	2022-08-01 17:32:22	1996-09-22 00:00:00	1	NaN	NaN	2	0	0
34124	34125	مفعل	2023-01-08 00:00:00	2022-12-04 18:07:25	1992-12-19 00:00:00	1	مدينة عير معرفة	NaN	2	0	0
34413	34414	مفعل	2023-04-12 00:00:00	2022-05-30 09:31:20	1997-12-25 00:00:00	1	NaN	NaN	3	0	0
34527	34528	مفعل	2023-07-02 00:00:00	2022-12-21 19:16:42	1996-11-17 00:00:00	1	مدينة عير معرفة	NaN	2	0	0
34700	34701	مفعل	2023-08-20 00:00:00	2022-09-02 02:50:51	1986-10-02 00:00:00	1	NaN	NaN	2	1	0

389 rows × 11 columns



```
[ ] df
```

	id	status	startDate	registrationDate	dob	city	region	numberOfChildren	isMarried	hasDisability
0	1	Active	2023-05-09 00:00:00	2022-08-31 23:00:46	1997-05-28 00:00:00	المسجد	Hail	2	0	0
1	2	Active	2023-05-08 00:00:00	2022-02-28 08:21:52	1993-12-15 00:00:00	بريدة	Al-Qassim	2	0	0
2	3	Active	2023-05-07 00:00:00	2022-12-03 19:47:43	1991-04-07 00:00:00	البكيرية	Al-Qassim	3	0	0
3	4	Active	2023-05-07 00:00:00	2022-11-20 10:48:03	1996-11-11 00:00:00	ينبع الصناعية	Al-Madinah	1	0	0
4	5	Active	2023-05-08 00:00:00	2022-10-17 11:08:29	1988-05-01 00:00:00	الرياض	Riyadh	2	0	0
...	...	...	...	...	...	...	...	...	...	...
34738	34739	Active	2023-08-23 00:00:00	2022-11-13 20:37:14	1991-08-27 00:00:00	العزيزية	Eastern Province	3	1	0
34739	34740	Active	2023-08-27 00:00:00	2022-11-13 16:53:09	1991-12-22 00:00:00	الدمام	Eastern Province	3	0	0
34740	34741	Active	2023-08-23 00:00:00	2022-06-13 10:48:17	1989-02-18 00:00:00	جدة	Makkah	2	0	0
34741	34742	Active	2023-08-27 00:00:00	2022-08-14 08:31:43	1997-12-12 00:00:00	الهفوف	Eastern Province	3	0	0
34742	34743	Active	2023-08-23 00:00:00	2022-08-21 11:57:54	1993-10-09 00:00:00	الرياض	Riyadh	3	0	0

34743 rows × 10 columns

```
[ ] df[df.isnull().any(axis=1)]
```

	id	status	startDate	registrationDate	dob	city	region	numberOfChildren	isMarried	hasDisability
279	280	Active	2023-05-20 00:00:00	2022-12-07 03:04:33	1993-07-31 00:00:00	طلالا	NaN	3	0	0
351	352	Active	2023-05-09 00:00:00	2022-09-08 23:04:52	1995-10-12 00:00:00	NaN	NaN	1	1	0
487	488	Active	2023-05-30 00:00:00	2022-02-28 10:44:43	1999-11-28 00:00:00	NaN	NaN	1	1	0
508	509	Active	2023-05-30 00:00:00	2022-05-22 11:09:11	1991-10-26 00:00:00	NaN	NaN	3	1	0
630	631	Active	2023-05-30 00:00:00	2022-05-26 14:19:39	1991-03-29 00:00:00	NaN	NaN	1	1	0
...	...	...	...	...	...	...	...	...	...	...
33993	33994	Active	2022-12-13 00:00:00	2022-08-01 17:32:22	1996-09-22 00:00:00	NaN	NaN	2	0	0
34124	34125	Active	2023-01-08 00:00:00	2022-12-04 18:07:25	1992-12-19 00:00:00	مدينة عير معرفة	NaN	2	0	0
34413	34414	Active	2023-04-12 00:00:00	2022-05-30 09:31:20	1997-12-25 00:00:00	NaN	NaN	3	0	0
34527	34528	Active	2023-07-02 00:00:00	2022-12-21 19:16:42	1996-11-17 00:00:00	مدينة عير معرفة	NaN	2	0	0
34700	34701	Active	2023-08-20 00:00:00	2022-09-02 02:50:51	1986-10-02 00:00:00	NaN	NaN	2	1	0

389 rows × 10 columns

```
[ ] df['city'].fillna(df['city'].mode()[0], inplace=True)
    df['region'].fillna(df['region'].mode()[0], inplace=True)
```

```
[ ] df[df.isnull().any(axis=1)]
```

id	status	startDate	registrationDate	dob	city	region	numberOfChildren	isMarried	hasDisability

```
[ ] df.isnull().sum() #عدد القيم الفارغة
```

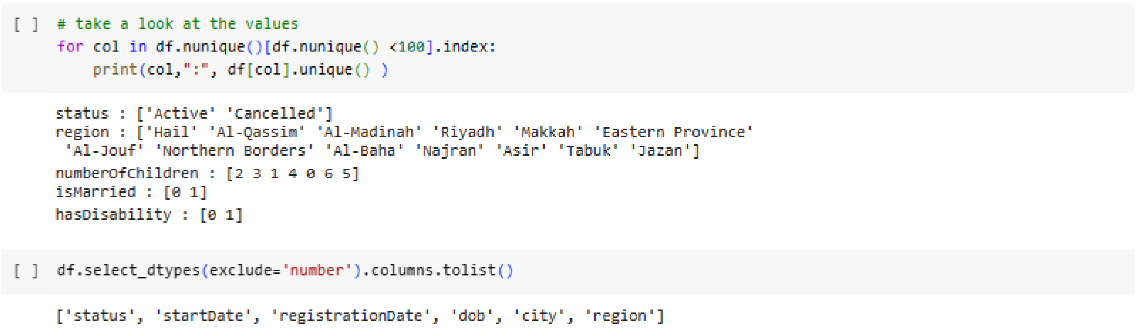
```
id                  0
status              0
startDate           0
registrationDate    0
dob                 0
city                0
region              0
numberOfChildren    0
isMarried           0
hasDisability       0
dtype: int64
```

```
[ ] df.sample(5)
```

	id	status	startDate	registrationDate	dob	city	region	numberOfChildren	isMarried	hasDisability
30129	30130	Active	2023-08-15 00:00:00	2022-01-10 06:23:11	1994-08-16 00:00:00	الدوادمي	Eastern Province	2	0	0
9696	9697	Active	2022-10-09 00:00:00	2022-08-09 17:46:20	1993-04-10 00:00:00	المدينة المنورة	Al-Madinah	1	0	0
29754	29755	Active	2023-01-04 00:00:00	2022-08-17 12:41:50	1986-01-06 00:00:00	جدة	Makkah	3	1	0
22798	22799	Active	2022-09-11 00:00:00	2022-08-31 11:26:10	1995-09-01 00:00:00	العمران	Eastern Province	2	0	0
13304	13305	Active	2022-11-06 00:00:00	2022-03-27 14:19:53	1989-05-01 00:00:00	جدة	Makkah	3	0	0

```
df.describe()
```

	id	numberOfChildren	isMarried	hasDisability
count	34743.000000	34743.000000	34743.000000	34743.000000
mean	17372.000000	2.199033	0.327922	0.018076
std	10029.584538	0.603338	0.469463	0.133227
min	1.000000	0.000000	0.000000	0.000000
25%	8686.500000	2.000000	0.000000	0.000000
50%	17372.000000	2.000000	0.000000	0.000000
75%	26057.500000	3.000000	1.000000	0.000000
max	34743.000000	6.000000	1.000000	1.000000



```
[ ]  # take a look at the values
     for col in df.nunique()[df.nunique() <100].index:
         print(col,":", df[col].unique() )

     status : ['Active' 'Cancelled']
     region : ['Hail' 'Al-Qassim' 'Al-Madinah' 'Riyadh' 'Makkah' 'Eastern Province'
      'Al-Jouf' 'Northern Borders' 'Al-Baha' 'Najran' 'Asir' 'Tabuk' 'Jazan']
     numberOfChildren : [2 3 1 4 0 6 5]
     isMarried : [0 1]
     hasDisability : [0 1]
```

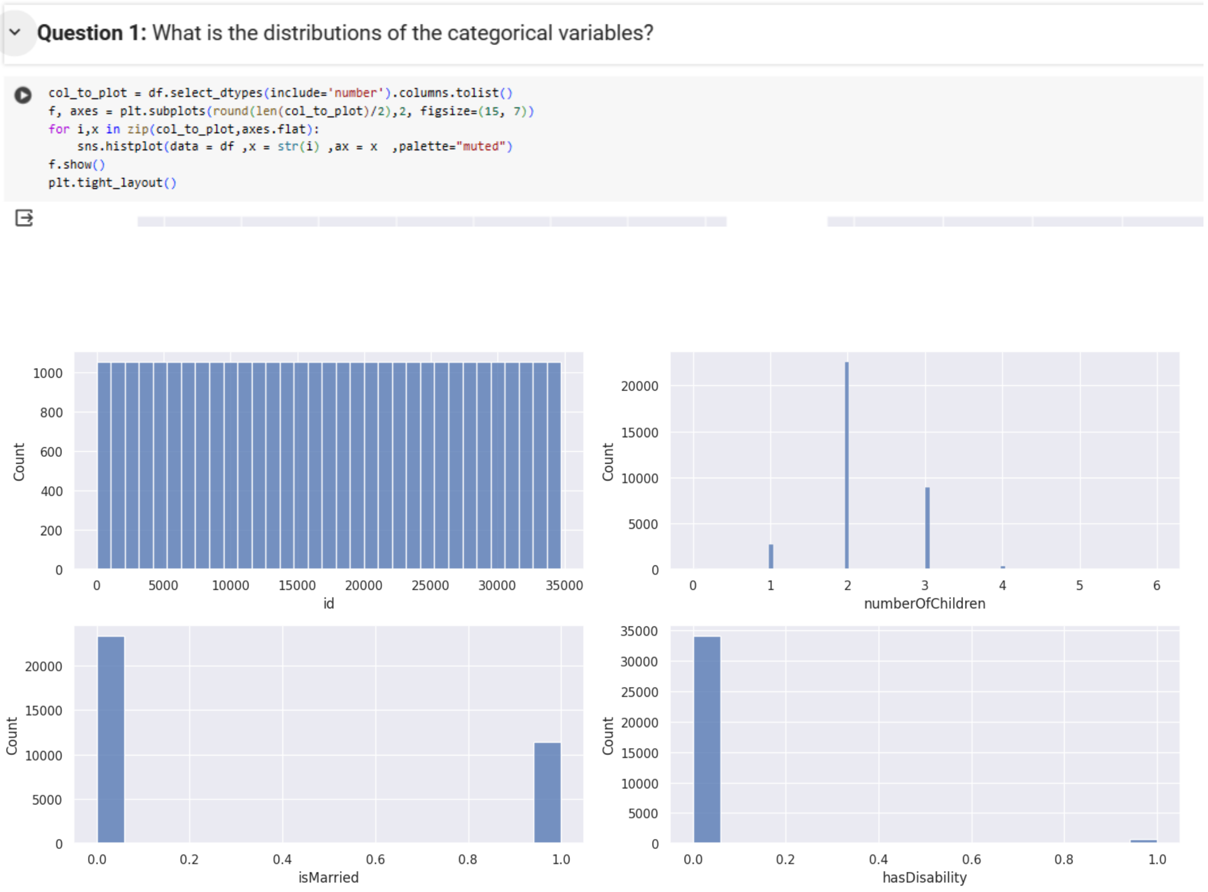
```
[ ]  df.select_dtypes(exclude='number').columns.tolist()

     ['status', 'startDate', 'registrationDate', 'dob', 'city', 'region']
```

3. Exploratory Data Analysis:

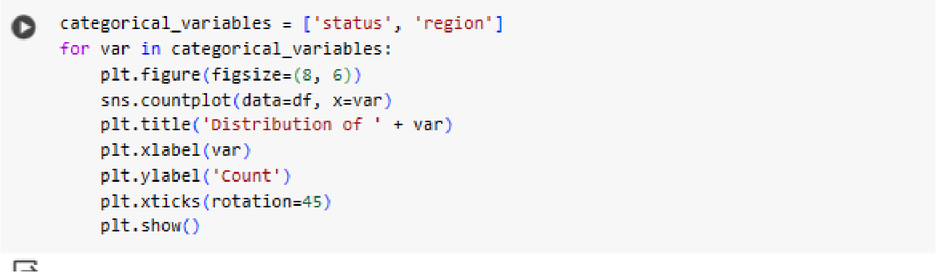
- Conducted univariate analysis using `df.describe()` to understand the distribution of numerical variables.

- Visualized the data using various plots

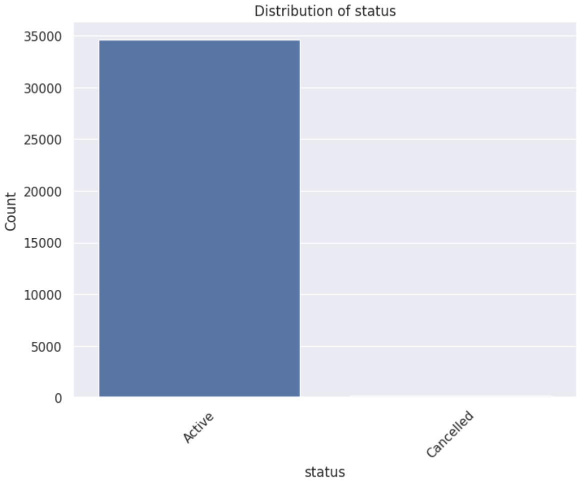


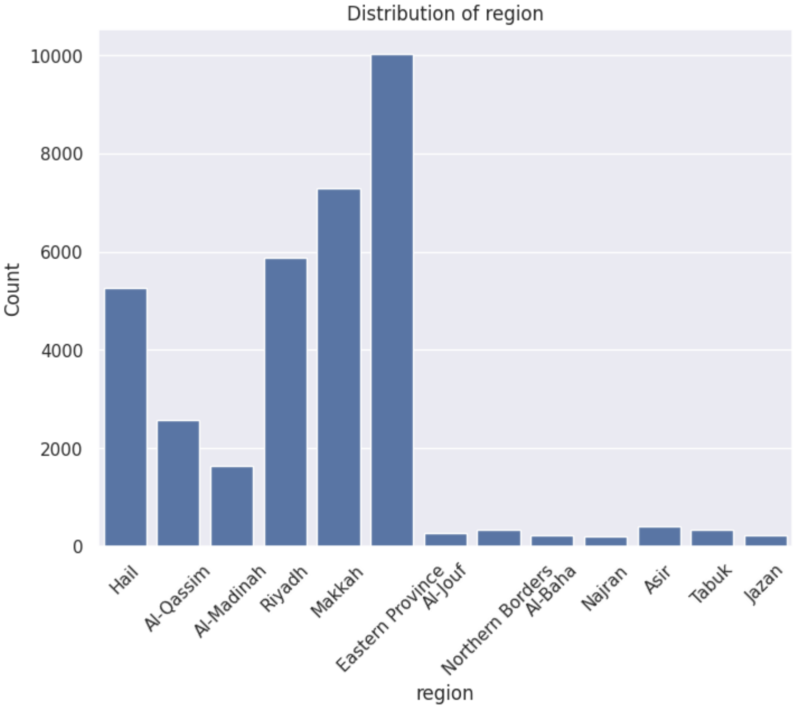
Question 1: What is the distributions of the categorical variables?

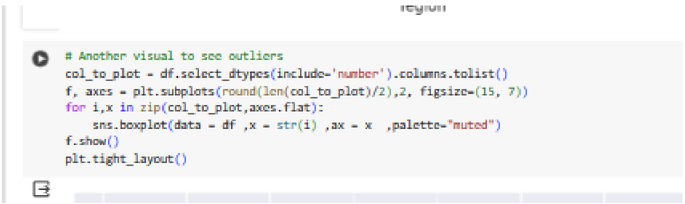
```
col_to_plot = df.select_dtypes(include='number').columns.tolist()
f, axes = plt.subplots(round(len(col_to_plot)/2),2, figsize=(15, 7))
for i,x in zip(col_to_plot,axes.flat):
    sns.histplot(data = df ,x = str(i) ,ax = x  ,palette="muted")
f.show()
plt.tight_layout()
```



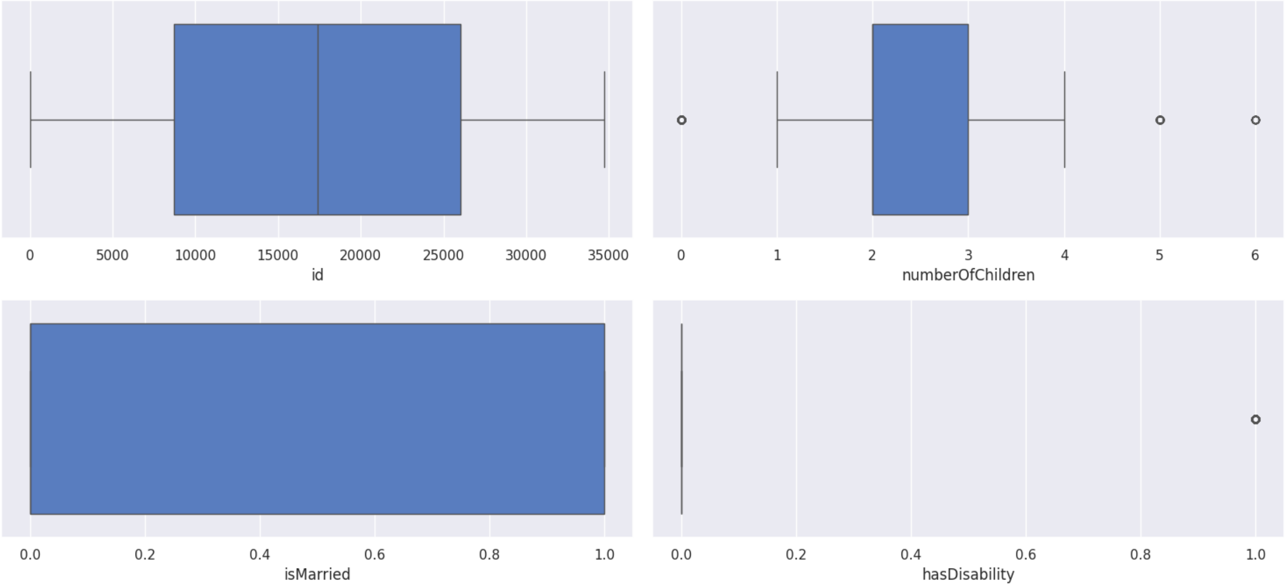
```
categorical_variables = ['status', 'region']
for var in categorical_variables:
    plt.figure(figsize=(8, 6))
    sns.countplot(data=df, x=var)
    plt.title('Distribution of ' + var)
    plt.xlabel(var)
    plt.ylabel('Count')
    plt.xticks(rotation=45)
    plt.show()
```

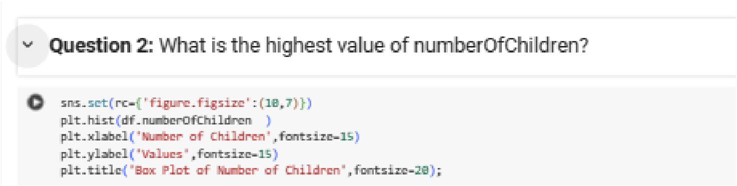






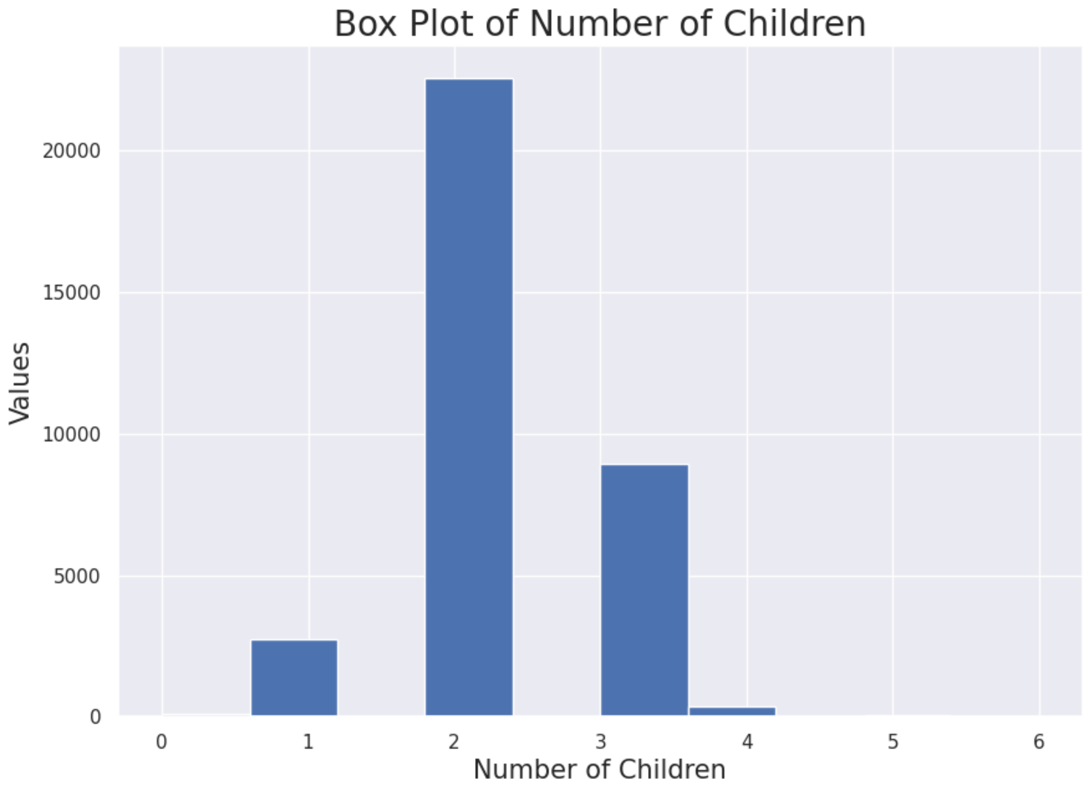
```
# Another visual to see outliers
col_to_plot = df.select_dtypes(include='number').columns.tolist()
f, axes = plt.subplots(round(len(col_to_plot)/2),2, figsize=(15, 7))
for i,x in zip(col_to_plot,axes.flat):
    sns.boxplot(data = df ,x = str(i) ,ax = x  ,palette="muted")
f.show()
plt.tight_layout()
```

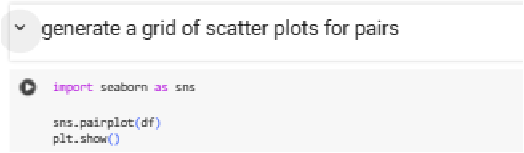




Question 2: What is the highest value of numberOfChildren?

```
sns.set(rc={'figure.figsize':(10,7)})
plt.hist(df.numberOfChildren  )
plt.xlabel('Number of Children',fontsize=15)
plt.ylabel('Values',fontsize=15)
plt.title('Box Plot of Number of Children',fontsize=20);
```

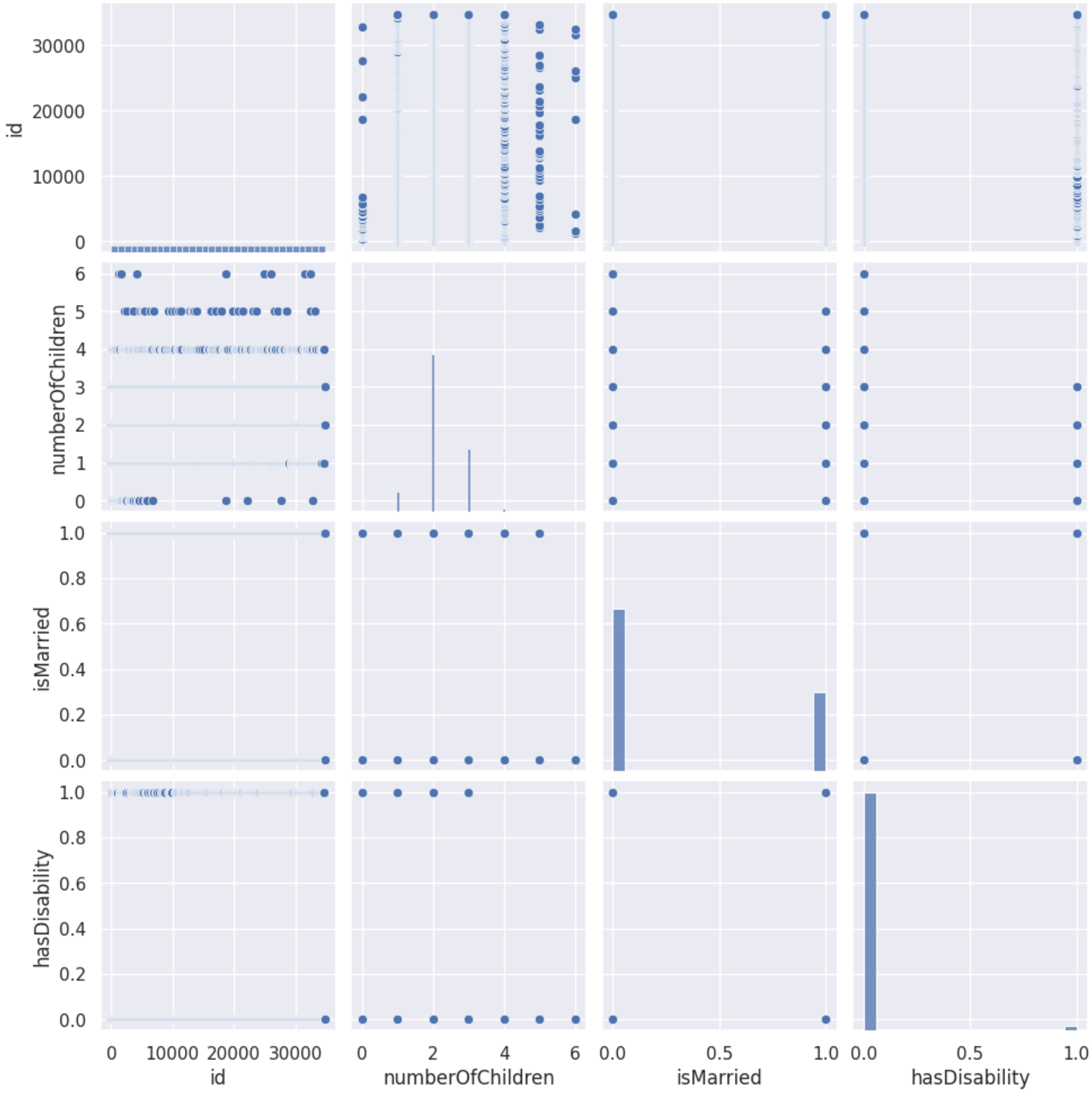


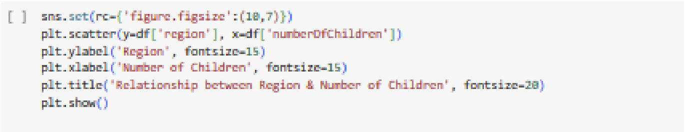


generate a grid of scatter plots for pairs

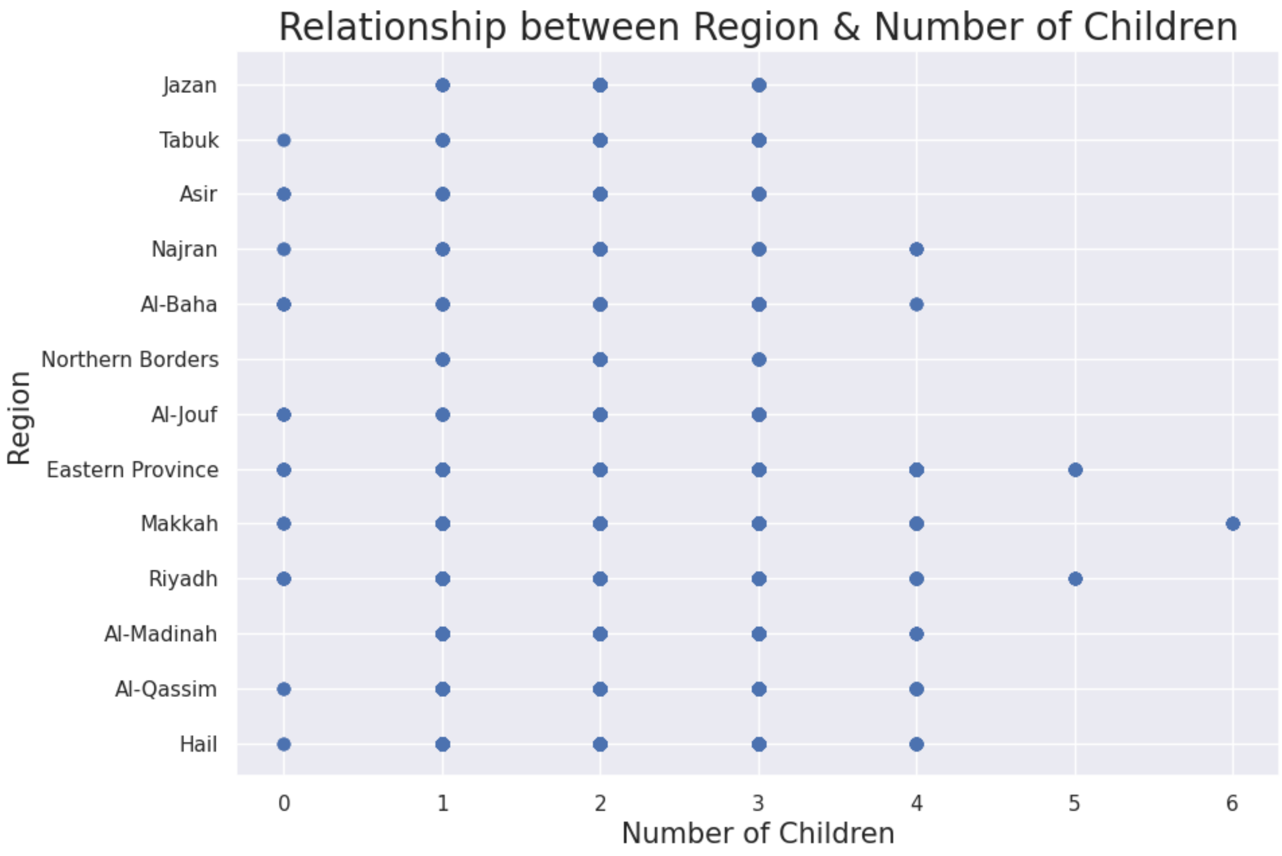
```
import seaborn as sns

sns.pairplot(df)
plt.show()
```



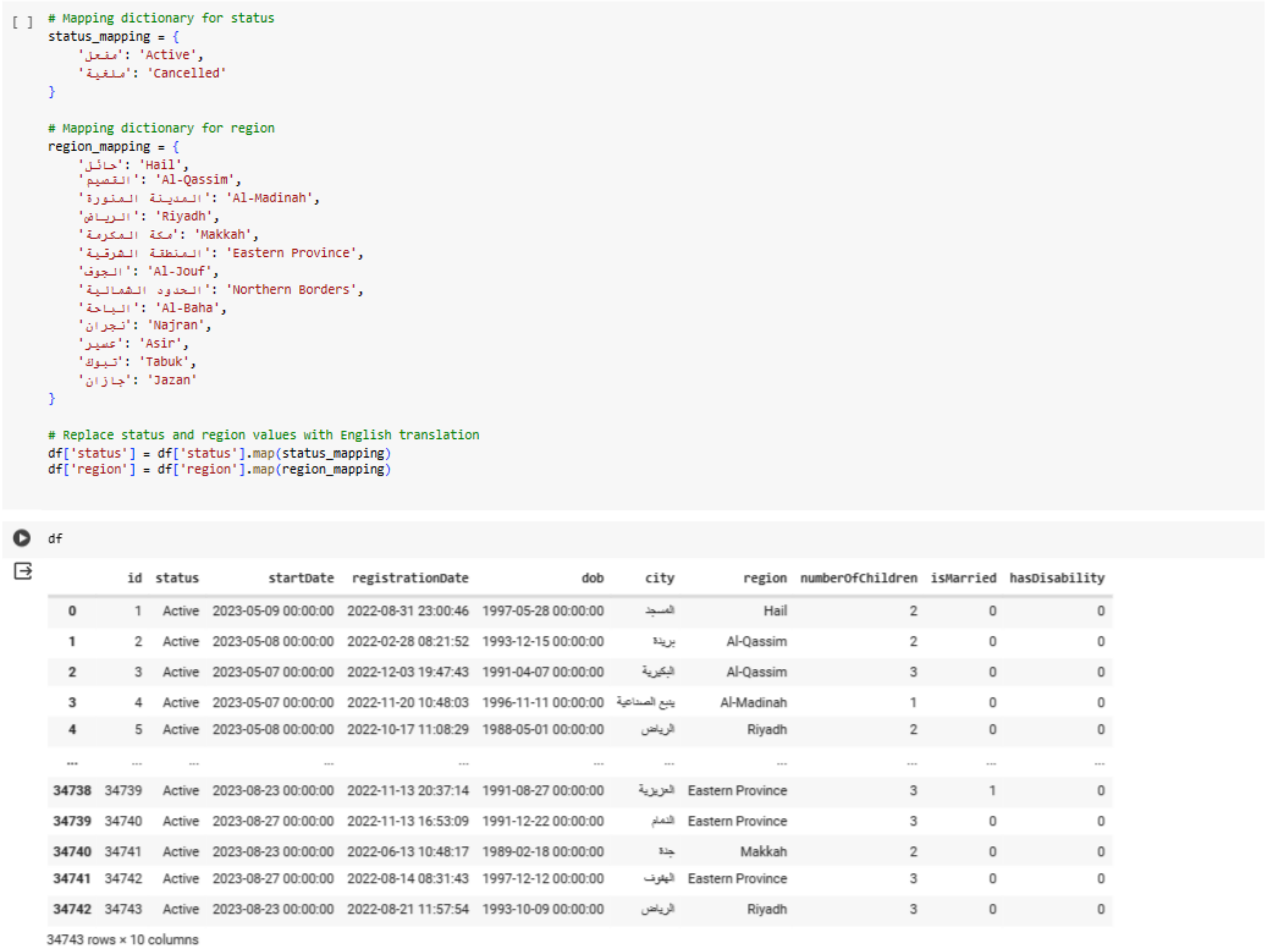


```
[ ]  sns.set(rc={'figure.figsize':(10,7)})
     plt.scatter(y=df['region'], x=df['numberOfChildren'])
     plt.ylabel('Region', fontsize=15)
     plt.xlabel('Number of Children', fontsize=15)
     plt.title('Relationship between Region & Number of Children', fontsize=20)
     plt.show()
```



4. Feature Engineering:

- Translated categorical variables (`status` and `region`) from Arabic to English for easier interpretation.



```
[ ] # Mapping dictionary for status
    status_mapping = {
        'مفعل': 'Active',
        'ملغية': 'Cancelled'
    }

    # Mapping dictionary for region
    region_mapping = {
        'حائل': 'Hail',
        'القصيم': 'Al-Qassim',
        'المدينة المنورة': 'Al-Madinah',
        'الرياض': 'Riyadh',
        'مكة المكرمة': 'Makkah',
        'المنطقة الشرقية': 'Eastern Province',
        'الجوف': 'Al-Jouf',
        'الحدود الشمالية': 'Northern Borders',
        'الباحة': 'Al-Baha',
        'نجران': 'Najran',
        'عسير': 'Asir',
        'تبوك': 'Tabuk',
        'جازان': 'Jazan'
    }

    # Replace status and region values with English translation
    df['status'] = df['status'].map(status_mapping)
    df['region'] = df['region'].map(region_mapping)
```

```
df
```

	id	status	startDate	registrationDate	dob	city	region	numberOfChildren	isMarried	hasDisability
0	1	Active	2023-05-09 00:00:00	2022-08-31 23:00:46	1997-05-28 00:00:00	المسجد	Hail	2	0	0
1	2	Active	2023-05-08 00:00:00	2022-02-28 08:21:52	1993-12-15 00:00:00	بريدة	Al-Qassim	2	0	0
2	3	Active	2023-05-07 00:00:00	2022-12-03 19:47:43	1991-04-07 00:00:00	البكيرية	Al-Qassim	3	0	0
3	4	Active	2023-05-07 00:00:00	2022-11-20 10:48:03	1996-11-11 00:00:00	ينبع الصناعية	Al-Madinah	1	0	0
4	5	Active	2023-05-08 00:00:00	2022-10-17 11:08:29	1988-05-01 00:00:00	الرياض	Riyadh	2	0	0
...	...	...	...	...	...	...	...	...	...	...
34738	34739	Active	2023-08-23 00:00:00	2022-11-13 20:37:14	1991-08-27 00:00:00	العزيزية	Eastern Province	3	1	0
34739	34740	Active	2023-08-27 00:00:00	2022-11-13 16:53:09	1991-12-22 00:00:00	الدمام	Eastern Province	3	0	0
34740	34741	Active	2023-08-23 00:00:00	2022-06-13 10:48:17	1989-02-18 00:00:00	جدة	Makkah	2	0	0
34741	34742	Active	2023-08-27 00:00:00	2022-08-14 08:31:43	1997-12-12 00:00:00	الهفوف	Eastern Province	3	0	0
34742	34743	Active	2023-08-23 00:00:00	2022-08-21 11:57:54	1993-10-09 00:00:00	الرياض	Riyadh	3	0	0

34743 rows × 10 columns

Conclusion:

Findings from Exploratory Data Analysis:

1. Data Distribution:

- Identified outliers in numerical variables like "number of children."
- Observed even distribution among categories for categorical variables such as "status" and "region."

2. Statistical Analysis:

- Noted the range of the "number of children" variable and its most common value.
- Acknowledged rare outliers in numerical variables, though minimal.

3. Insights and Patterns:

- No evident relationship between the number of children and the region.
- Balanced distribution of beneficiaries across active and canceled statuses.

Recommendations:

1. Improve Data Quality:

- Address missing data and ensure completeness, especially in crucial columns like "city" and "region."

- Validate data accuracy and conduct additional cleaning if needed.

2. Enhance Support Programs:

- Sustain support for the "Qurrah" program, focusing on empowering working women.

- Consider tailored support for women with more children to facilitate their participation in the workforce.