Introduction:

Germany, a country known for its rich history and diverse culture, has undergone significant demographic changes over the years. In this project, we delve into the demographic trends of marriages, births, and deaths in Germany from 1950 to 2022. By analyzing various datasets publicly available from **German Federal Statistical Office**, we aim to gain insights into how these key aspects of population dynamics have evolved over time.

Our exploration begins with an examination of marriage statistics, uncovering trends in the number of marriages each year and exploring differences across different states in Germany. We then turn our attention to birth statistics, investigating patterns in the number of births and gender disparities in newborns. Finally, we explore death statistics, analyzing trends in mortality rates and gender disparities in life expectancy.

Through visualizations such as line charts, bar graphs, and pie charts, we aim to present a comprehensive overview of Germany's demographic landscape. By understanding these trends, we can gain valuable insights into the social and economic dynamics shaping the German population.

Dataset from : https://www-genesis.destatis.de/genesis/online/data?operation=sprachwechsel&language=en

Importing Libraries & Datasets

In [78]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from statsmodels.tsa.arima.model import ARIMA  # used for time series ana
```

Marriages analysis

In [79]:
```
df_marriage= pd.read_csv('/Users/rising.volkan007/Downloads/Germany Data/
```

In [80]:
```
df_marriage.head()
```

Out[80]:

	Year	Marriages	Marriages per 1000 inhabitants
0	1950	750452	11.0
1	1951	718166	10.4
2	1952	659779	9.5
3	1953	620121	8.9
4	1954	605392	8.7

In [81]:
```
df_marriage.info()
```

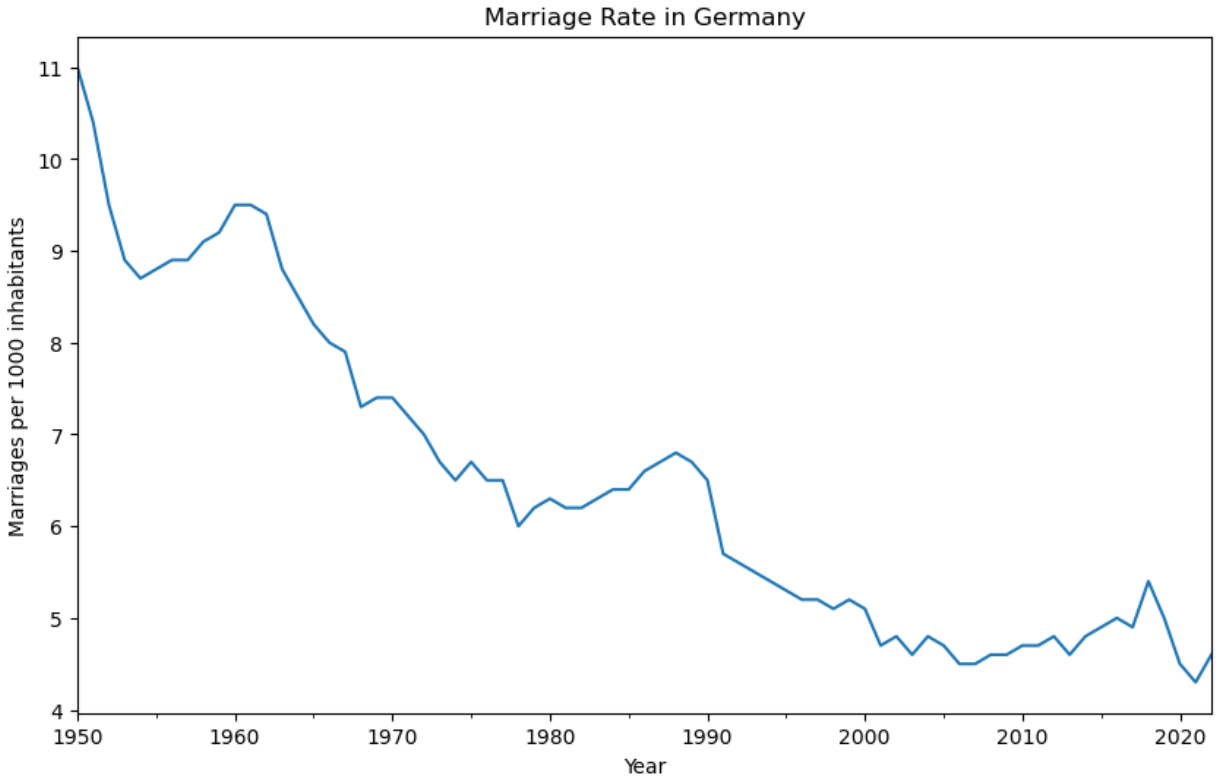
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 73 entries, 0 to 72
Data columns (total 3 columns):
 #   Column                          Non-Null Count  Dtype  
---  ------                          --------------  -----  
 0   Year                            73 non-null     int64  
 1   Marriages                       73 non-null     int64  
 2   Marriages per 1000 inhabitants  73 non-null     float64
dtypes: float64(1), int64(2)
memory usage: 1.8 KB
```

In [82]:
```
# Convert 'Year' to datetime index
df_marriage['Year'] = pd.to_datetime(df_marriage['Year'], format='%Y')
df_marriage.set_index('Year', inplace=True)
```

In [83]:
```
# Plot the number of marriages conducted per year
plt.figure(figsize=(10, 6))
plt.scatter(df_marriage.index, df_marriage['Marriages'], color='green', a
plt.title('Number of Marriages Conducted per Year')
plt.xlabel('Year')
plt.ylabel('Number of Marriages')
plt.grid(True)
plt.show()
```

In this scatter plot we can observe that the number of marriages per year is decreasing significantly.

In [84]:
```
# Plot the time series
df_marriage['Marriages per 1000 inhabitants'].plot(figsize=(10, 6))
plt.xlabel('Year')
plt.ylabel('Marriages per 1000 inhabitants')
plt.title('Marriage Rate in Germany')
plt.show()
```



In the above chart we can also notice that per 1000 inhabitants the marriage percentage is also decreasing. Now it is a matter of concerning and look forward what reasons behind of people in Germany getting less marriages per year.

How do personal characteristics such as gender, education, or income affect the probability of certain life events occurring? A Leibniz Institute for Financial Research SAFE study examined these likelihoods using German Socio-Economic Panel (SOEP) data. The two authors' study, Raimond Maurer and Sehrish Usman, shows that education and income significantly influence the likelihood of getting married, having children, and average life expectancy [1].

In Germany, marriage rates have declined significantly since 1991, with only 51.0% of adults married in 2019 compared to 60.2% in 1991. However, there are indications of stabilization, particularly among families with children, as the proportion of births within wedlock increased from a low of 64.5% in 2016 to 66.9% in 2020. Additionally, there has been a recent uptick in the number of marriages [2].

source_1: https://safe-frankfurt.de/news-latest/all-news/news-view/education-and-income-have-different-effects-on-the-life-cycle-in-germany.html

source_2: https://www.iwkoeln.de/en/studies/wido-geis-thoene-negativtrend-gestoppt-entwicklungen-bei-verheirateten-und-einstellungen-zur-ehe-515380.html

In [85]:

```
# Fit ARIMA model
model = ARIMA(df_marriage['Marriages per 1000 inhabitants'], order=(5,1,0
model_fit = model.fit()
```

```
/Users/rising.volkan007/anaconda3/lib/python3.11/site-packages/statsmodel
s/tsa/base/tsa_model.py:473: ValueWarning: No frequency information was p
rovided, so inferred frequency AS-JAN will be used.
  self._init_dates(dates, freq)
/Users/rising.volkan007/anaconda3/lib/python3.11/site-packages/statsmodel
s/tsa/base/tsa_model.py:473: ValueWarning: No frequency information was p
rovided, so inferred frequency AS-JAN will be used.
  self._init_dates(dates, freq)
/Users/rising.volkan007/anaconda3/lib/python3.11/site-packages/statsmodel
s/tsa/base/tsa_model.py:473: ValueWarning: No frequency information was p
rovided, so inferred frequency AS-JAN will be used.
  self._init_dates(dates, freq)
```

In [86]:

```
# Forecast
forecast = model_fit.forecast(steps=5) # Adjust steps for how many period
print(forecast)
```

```
2023-01-01    4.680414
2024-01-01    4.727601
2025-01-01    4.712037
2026-01-01    4.737568
2027-01-01    4.742740
Freq: AS-JAN, Name: predicted_mean, dtype: float64
```

Marriages in States

In [11]:
```
df_marriage_states= pd.read_csv('/Users/rising.volkan007/Downloads/German
```

In [12]:
```
df_marriage_states.head()
```

Out[12]:

	German States	1990	1991	1992	1993	1994	1995	1996	1997	1998	...
0	Baden-Württemberg	61448	59373	60724	59885	59591	58198	57898	57094	55693	...
1	Bayern	74387	72651	72247	70475	69401	67075	66767	65419	64065	...
2	Berlin	21850	18130	17895	17111	17269	16383	15813	15399	14526	...
3	Brandenburg	16814	8328	7901	7901	8502	8775	8756	8709	9266	...
4	Bremen	4338	4264	4005	3969	3859	3561	3509	3553	3477	...

5 rows × 34 columns

In [13]:
```
df_marriage_states.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 16 entries, 0 to 15
Data columns (total 34 columns):
 #   Column          Non-Null Count  Dtype 
---  ------          --------------  ----- 
 0   German States   16 non-null     object
 1   1990            16 non-null     int64 
 2   1991            16 non-null     int64 
 3   1992            16 non-null     int64 
 4   1993            16 non-null     int64 
 5   1994            16 non-null     int64 
 6   1995            16 non-null     int64 
 7   1996            16 non-null     int64 
 8   1997            16 non-null     int64 
 9   1998            16 non-null     int64 
 10  1999            16 non-null     int64 
 11  2000            16 non-null     int64 
 12  2001            16 non-null     int64 
 13  2002            16 non-null     int64 
 14  2003            16 non-null     int64 
 15  2004            16 non-null     int64 
 16  2005            16 non-null     int64 
 17  2006            16 non-null     int64 
 18  2007            16 non-null     int64 
 19  2008            16 non-null     int64 
 20  2009            16 non-null     int64 
 21  2010            16 non-null     int64 
 22  2011            16 non-null     int64 
 23  2012            16 non-null     int64 
 24  2013            16 non-null     int64 
 25  2014            16 non-null     int64 
 26  2015            16 non-null     int64 
 27  2016            16 non-null     int64 
 28  2017            16 non-null     int64 
 29  2018            16 non-null     int64 
 30  2019            16 non-null     int64 
 31  2020            16 non-null     int64 
 32  2021            16 non-null     int64 
 33  2022            16 non-null     int64 
dtypes: int64(33), object(1)
memory usage: 4.4+ KB
```

In [14]:

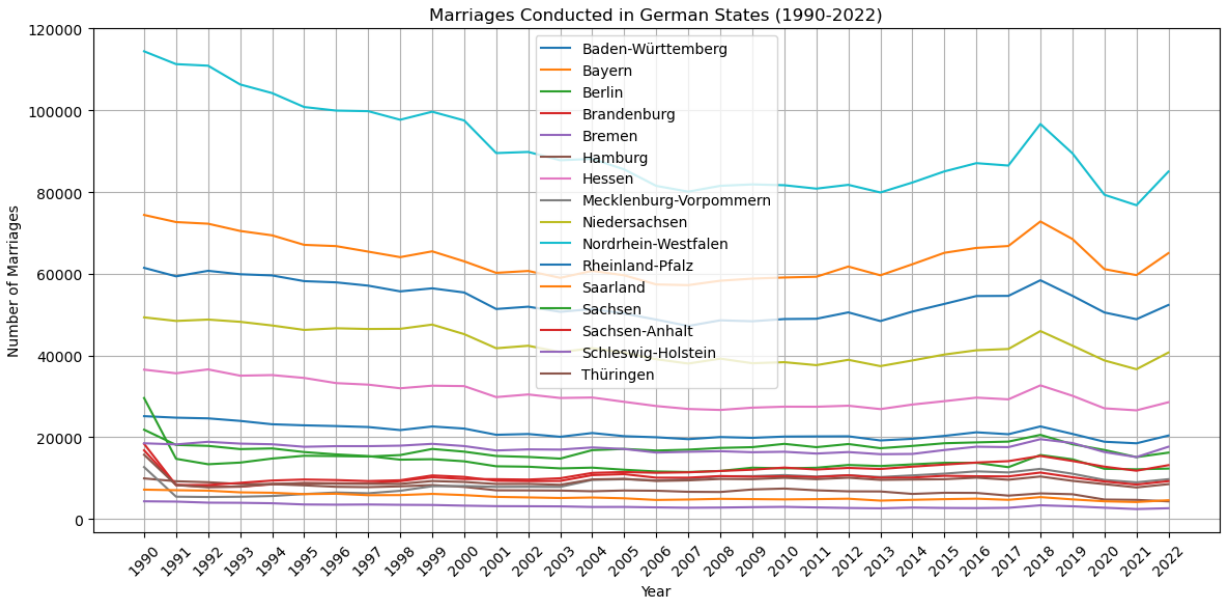
```
# Set 'German States' column as index for easier analysis
df_marriage_states.set_index('German States', inplace=True)

# Calculate summary statistics for each state
summary_stats = df_marriage_states.describe()

# Display summary statistics
print(summary_stats)
```

```
                1990           1991           1992           1993  \
count       16.00000       16.000000      16.000000      16.000000   
mean     32274.25000    28393.187500   28339.250000   27662.812500   
std      29478.15969    30323.486511   30449.400455   29366.317797   
min       4338.00000     4264.000000    4005.000000    3969.000000   
25%      14973.25000     8304.750000    7866.500000    7941.500000   
50%      20190.00000    16430.500000   15650.000000   15459.500000   
75%      39741.00000    38854.750000   39649.750000   38364.250000   
max     114422.00000   111286.000000  110904.000000  106315.000000   
```

```
                1994          1995          1996          1997          1
998  \
count      16.000000      16.00000     16.000000     16.000000     16.000
000
mean    27515.250000   26908.37500  26706.062500  26423.500000  26088.750
000
std     28726.688134   27737.57521  27551.372349  27380.032364  26714.800
658
min      3859.000000    3561.00000   3509.000000   3553.000000   3477.000
000
25%      8528.250000    8641.75000   8456.000000   8414.250000   8441.750
000
50%     16032.000000   15928.50000  15607.500000  15343.000000  15087.000
000
75%     38248.500000   37454.50000  36605.500000  36280.250000  35627.000
000
max    104200.000000  100793.00000  99922.000000  99779.000000  97679.000
000

                1999  ...          2013          2014          2015  \
count      16.000000  ...     16.000000     16.000000     16.000000
mean    26917.125000  ...  23353.437500  24122.000000  25007.187500
std     27060.626859  ...  22045.614817  22943.700245  23804.761437
min      3438.000000  ...   2619.000000   2800.000000   2708.000000
25%      9046.500000  ...   9956.750000  10026.000000  10364.750000
50%     15890.000000  ...  14412.000000  14647.500000  15319.500000
75%     36357.750000  ...  29521.750000  30704.750000  31685.000000
max     99645.000000  ...  79895.000000  82322.000000  85045.000000

                2016          2017          2018          2019          20
20  \
count      16.000000     16.000000     16.000000     16.000000     16.0000
00
mean    25651.625000  25466.625000  28091.625000  26020.250000  23331.5000
00
std     24396.627696  24472.716904  26931.905284  25126.683757  22563.3767
48
min      2677.000000   2744.000000   3360.000000   3117.000000   2765.0000
00
25%     10377.500000  10221.000000  11129.000000   9998.250000   9024.5000
00
50%     15752.000000  15874.500000  17593.500000  16452.000000  14596.0000
00
75%     32593.750000  32361.000000  36025.500000  33218.500000  30010.7500
00
max     87060.000000  86475.000000  96643.000000  89476.000000  79325.0000
00

                2021          2022
count      16.000000     16.000000
mean    22361.562500  24421.437500
std     21969.443625  24160.271602
min      2439.000000   2642.000000
25%      8252.250000   9083.000000
50%     13655.500000  14712.000000
75%     29104.000000  31614.250000
max     76771.000000  85008.000000

[8 rows x 33 columns]
```

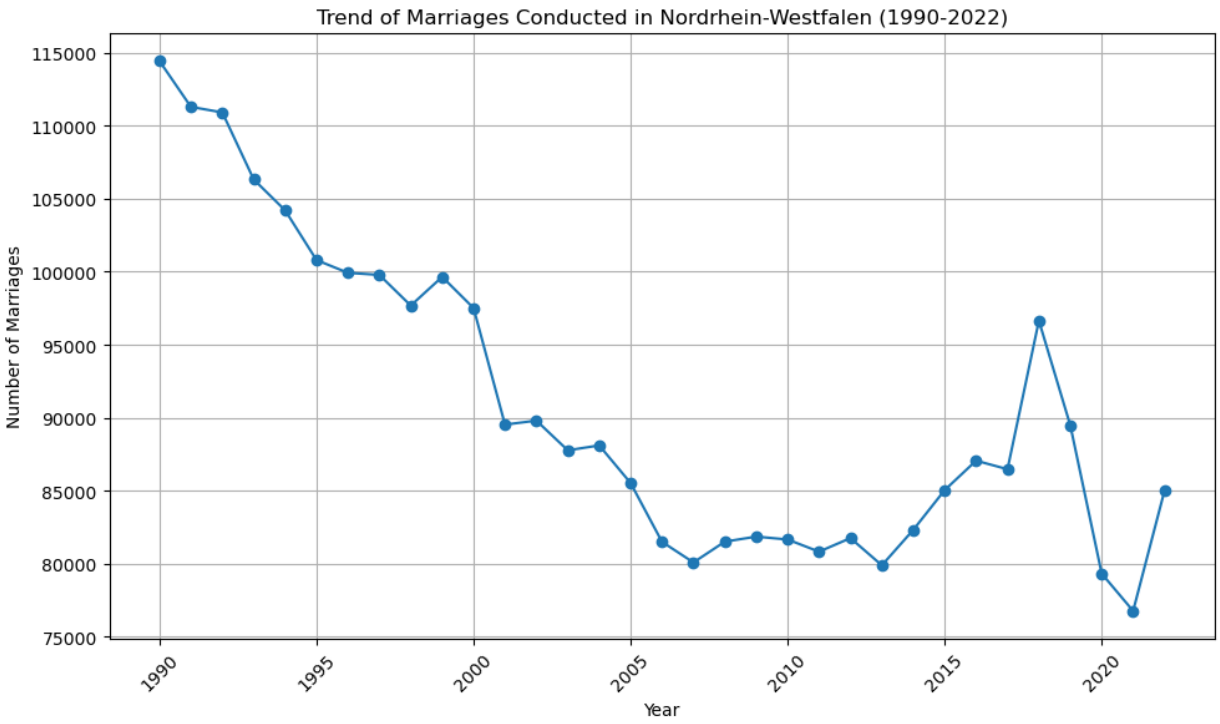
In [15]:
```
# Calculate the overall trend (mean) of marriages conducted in each state
mean_trend = df_marriage_states.mean(axis=1)
```

In [16]:
```
# Plot the trend for each state over the years
plt.figure(figsize=(12, 6))
for state in df_marriage_states.index:
    plt.plot(df_marriage_states.columns, df_marriage_states.loc[state], l

plt.title('Marriages Conducted in German States (1990-2022)')
plt.xlabel('Year')
plt.ylabel('Number of Marriages')
plt.legend()
plt.grid(True)
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



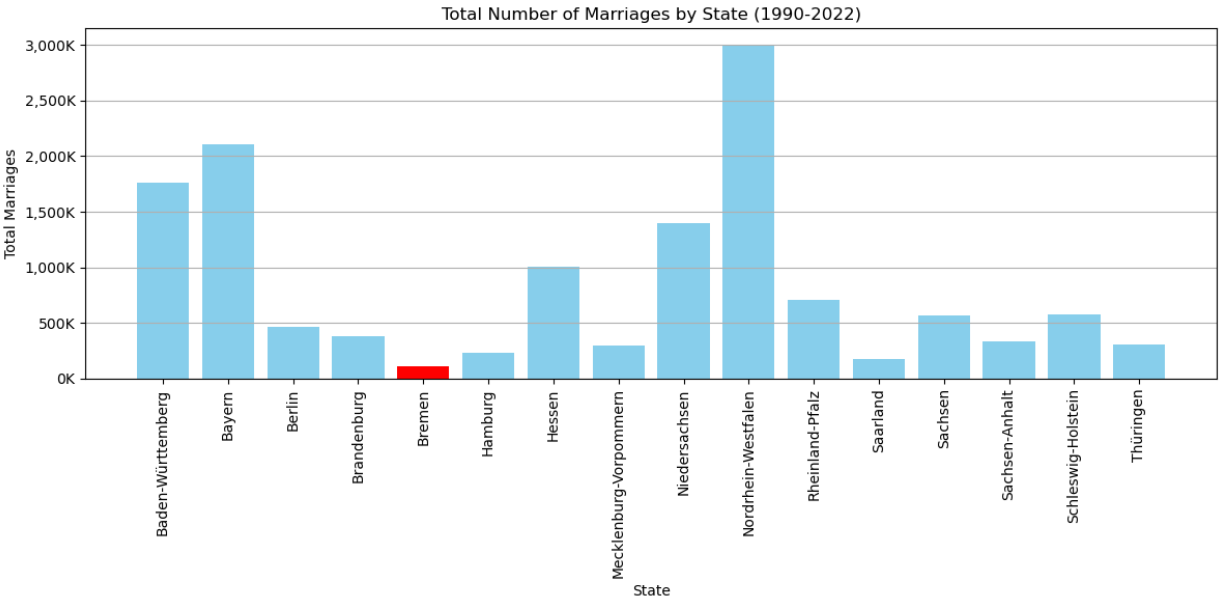
From the chart above we can observe that Nordrhein-Westfalen state holds highest number of marriages conducted. since it is the largest state in Germany and many people reside in this state. Below chart we can observe in details marriages conducted in this state

In [17]:
```
# Filter the row corresponding to Nordrhein-Westfalen
df_nrw = df_marriage_states.loc['Nordrhein-Westfalen']

# Plot the trend of marriages in Nordrhein-Westfalen
df_nrw.plot(marker='o', figsize=(10, 6))
plt.title('Trend of Marriages Conducted in Nordrhein-Westfalen (1990-2022
plt.xlabel('Year')
plt.ylabel('Number of Marriages')
plt.grid(True)
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



One thing to be noticed here in the 90's era people used to get marriages more rather than this decades.

In [18]:
```
import matplotlib.pyplot as plt
from matplotlib.ticker import FuncFormatter

# Calculate the total number of marriages for each state
df_marriage_states['Total Marriages'] = df_marriage_states.sum(axis=1)

# Function to format y-axis labels in thousands
def thousands_formatter(x, pos):
    return '{:,.0f}K'.format(x/1000)

# Plot the total number of marriages for each state
plt.figure(figsize=(12, 6))
plt.bar(df_marriage_states.index, df_marriage_states['Total Marriages'],
plt.title('Total Number of Marriages by State (1990-2022)')
plt.xlabel('State')
plt.ylabel('Total Marriages')
plt.xticks(rotation=90)
plt.grid(axis='y')

# Format y-axis labels in thousands
formatter = FuncFormatter(thousands_formatter)
plt.gca().yaxis.set_major_formatter(formatter)

# Highlight the state with the lowest trend
min_trend_state = df_marriage_states[df_marriage_states['Total Marriages'
plt.bar(min_trend_state.index, min_trend_state['Total Marriages'], color=

plt.tight_layout()
plt.show()
```



In the above bar chart shows the Bremen state the number of marriages are the **lowest**. it is also the smallest states in Germany this could be a probable reason and there might be less people residing there as it is small state.

In [19]:
```
# Calculate the total number of marriages for each state
df_marriage_states['Total Marriages'] = df_marriage_states.sum(axis=1)

# Find the state with the lowest total number of marriages
state_with_lowest_trend = df_marriage_states[df_marriage_states['Total Ma

print("State(s) with the lowest trend:")
print(state_with_lowest_trend)
```

```
State(s) with the lowest trend:
                1990  1991  1992  1993  1994  1995  1996  1997  1998  1999
\
German States
Bremen          4338  4264  4005  3969  3859  3561  3509  3553  3477  3438

                ...  2014  2015  2016  2017  2018  2019  2020  2021  2022
\
German States   ...
Bremen          ...  2800  2708  2677  2744  3360  3117  2765  2439  2642

                Total Marriages
German States
Bremen                   208484

[1 rows x 34 columns]
```

above output data shows the details of the marriage trends of the state.

Husband Wife Age in marriages

In [51]:
```
df_marriage_age= pd.read_csv('/Users/rising.volkan007/Downloads/Germany D
```

In [54]:
```
df_marriage_age.head(15)
```

Out[54]:

	Age of the husband	Age of the wife	Age of the wife.1	Age of the wife.2	Age of the wife.3	Age of the wife.4	Age of the wife.5	Age of the wife.6	Age of the wife.7	Age of the wife.8	Age of the wife.9
0	NaN	under 15 years	15 to under 20 years	20 to under 25 years	25 to under 30 years	30 to under 35 years	35 to under 40 years	40 to under 45 years	45 to under 50 years	50 to under 55 years	55 to under 60 years
1	under 15 years	-	-	-	-	-	-	-	-	-	-
2	15 to under 20 years	-	254	192	37	9	5	2	2	-	-
3	20 to under 25 years	-	1754	11616	3627	664	191	59	36	17	8
4	25 to under 30 years	-	808	19666	54419	11133	1864	357	161	68	19
5	30 to under 35 years	-	168	5425	43396	44918	7742	1225	323	138	34
6	35 to under 40 years	-	46	1246	11206	26532	18314	3319	889	269	66
7	40 to under 45 years	-	15	368	2568	7457	11392	6995	2287	763	181
8	45 to under 50 years	-	10	174	964	2850	5736	6991	8005	3651	878
9	50 to under 55 years	-	4	84	438	1130	2249	3763	8550	9560	2950
10	55 to under 60 years	-	2	28	145	333	783	1378	3821	7073	5718
11	60 to under 65 years	-	-	14	54	119	235	435	1226	2887	3855
12	65 to under 70 years	-	-	5	22	31	91	136	400	939	1403
13	70 to under 75 years	-	-	2	6	13	32	47	138	292	454
14	75 years and over	-	-	2	3	7	17	44	96	178	312

This above dataframe represents the data from 2017 published data in Database of the Federal Statistical Office of Germany.

This dataframe provides a breakdown of marriages by the age groups of husbands and wives in Germany. Interestingly, the majority of marriages occur between individuals aged 25 to under 40 years, with the highest frequency observed in the **25 to under 30 years** age group for both husbands and wives. There's a noticeable decline in the number of marriages as the age of both spouses increases beyond 40 years. Additionally, the dataset reveals a relatively low number of marriages involving individuals under 20 years old.

Birth Statistics

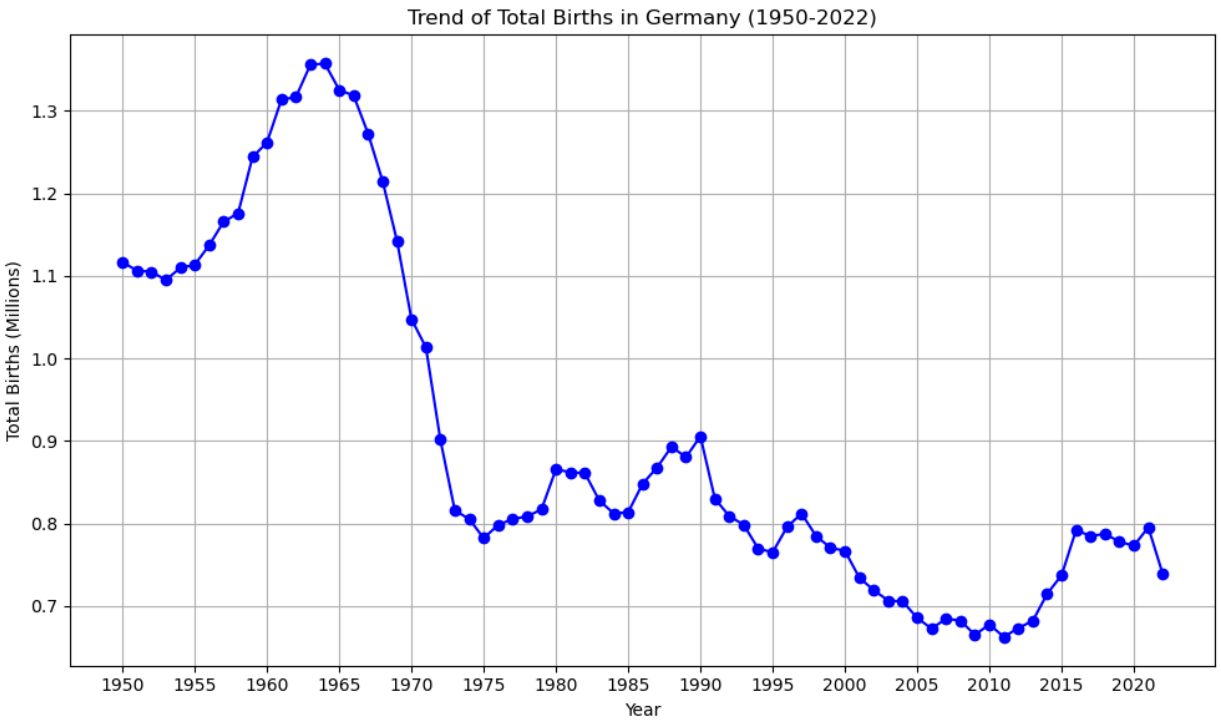
In [56]:
```
df_birth= pd.read_csv('/Users/rising.volkan007/Downloads/Germany Data/Bir
```

In [57]:
```
df_birth.head()
```

Out[57]:

	Year	Male	Female	Total
0	1950	578191	538510	1116701
1	1951	571699	534681	1106380
2	1952	571152	533932	1105084
3	1953	564929	530100	1095029
4	1954	572559	537184	1109743

In [62]:
```
import matplotlib.pyplot as plt

# Divide total births by 1 million
total_births_millions = df_birth['Total'] / 1e6

# Plotting the trend of total births
plt.figure(figsize=(10, 6))
plt.plot(df_birth['Year'], total_births_millions, marker='o', color='b',
plt.title('Trend of Total Births in Germany (1950-2022)')
plt.xlabel('Year')
plt.ylabel('Total Births (Millions)')
plt.grid(True)
plt.xticks(range(1950, 2023, 5))  # Adjust x-axis ticks for better readab

plt.tight_layout()
plt.show()
```

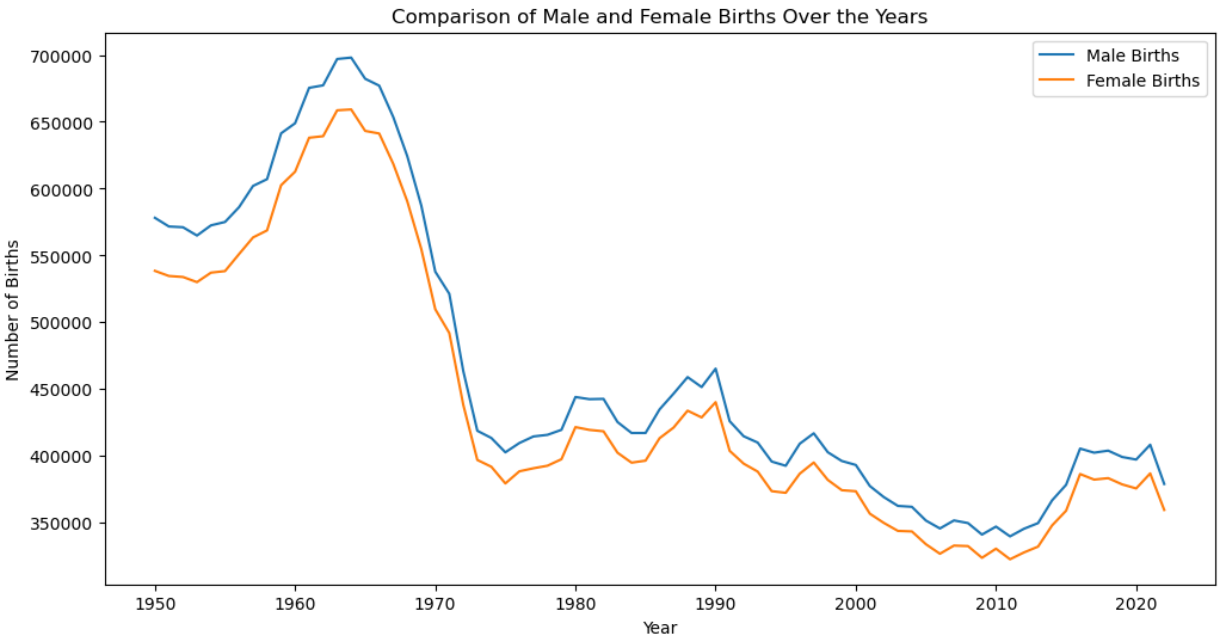


The chart shows the trend of total births in Germany from **1950 to 2022**. The y-axis shows the total number of births in millions, while the x-axis shows the years.

The chart shows that there was a baby boom in Germany after World War II, with the number of births peaking at around **1.3 million in the mid-1960s**. The birth rate then declined steadily over the next few decades, reaching a low of around **700,000 in the early 2000s**. Since then, the birth rate has recovered somewhat, but it is still well below the levels seen in the **1950s and 1960s**.

There are a number of factors that have contributed to the decline in Germany's birth rate, including economic uncertainty, the increasing cost of raising children, and the changing role of women in society.

In [63]:
```
# Plotting
plt.figure(figsize=(12, 6))
plt.plot(df_birth['Year'], df_birth['Male'], label='Male Births')
plt.plot(df_birth['Year'], df_birth['Female'], label='Female Births')

# Adding labels and title
plt.xlabel('Year')
plt.ylabel('Number of Births')
plt.title('Comparison of Male and Female Births Over the Years')
plt.legend()

# Show plot
plt.show()
```



The chart is titled "Comparison of Male and Female Births Over the Years". It shows the number of male and female births over a period that is not specified on the chart. The y-axis shows the number of births, and the x-axis shows the years. From the information provided in the chart, it is impossible to say exactly how many births are represented or the exact time period covered.

Here are some observations about the chart:

- The number of births appears to fluctuate somewhat over time.
- There seems to be a generally higher number of male births than female births.
- The gap between the number of male and female births appears to be widening over time.

It is important to note that this chart does not show sex ratios at birth, which is the number of male births for every 100 female births. According to Our World in Data: https://ourworldindata.org/gender-ratio, naturally occurring sex ratios at birth are around 105 males per 100 females.

Death Statistics

In [64]:
```
df_death= pd.read_csv('/Users/rising.volkan007/Downloads/Germany Data/Dea
```

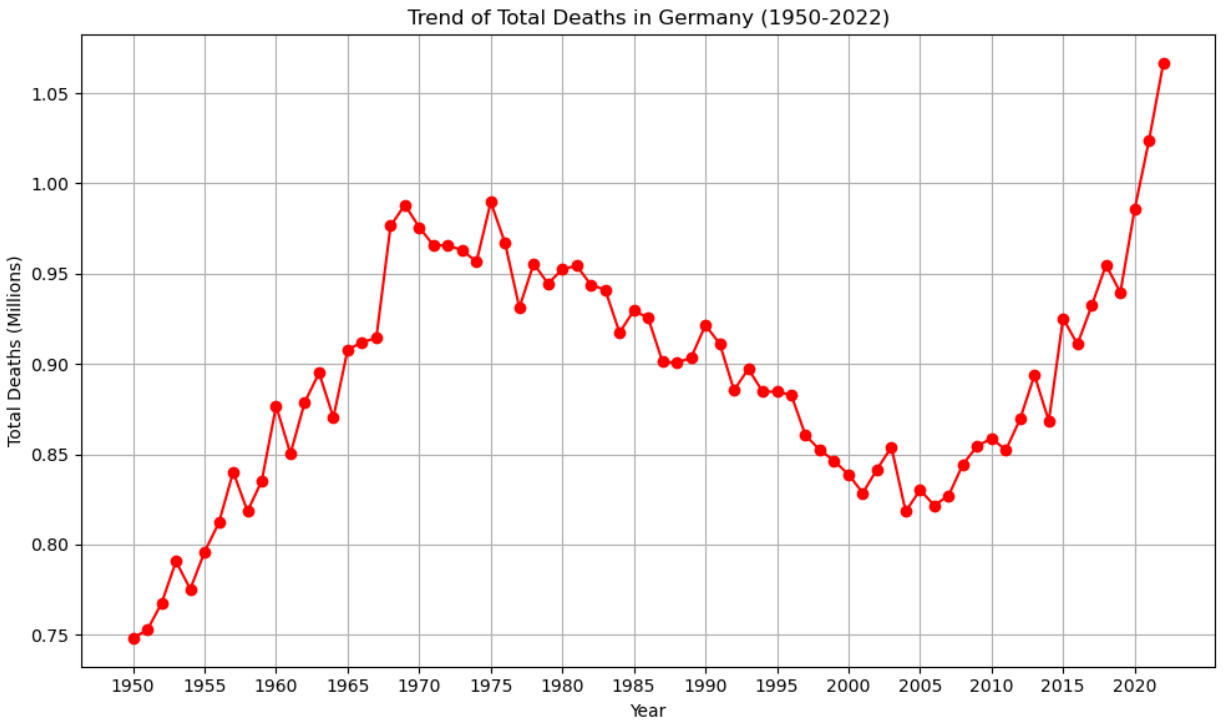
In [65]:
```
df_death.head()
```

Out[65]:

	Year	Male	Female	Total
0	1950	375323	373006	748329
1	1951	380155	372542	752697
2	1952	387003	380636	767639
3	1953	400373	390281	790654
4	1954	392610	382681	775291

In [69]:

```
# Divide total deaths by 1 million
total_deaths_millions = df_death['Total'] / 1e6

# Plotting the trend of total deaths
plt.figure(figsize=(10, 6))
plt.plot(df_death['Year'], total_deaths_millions, marker='o', color='r',
plt.title('Trend of Total Deaths in Germany (1950-2022)')
plt.xlabel('Year')
plt.ylabel('Total Deaths (Millions)')
plt.grid(True)
plt.xticks(range(1950, 2023, 5))  # Adjust x-axis ticks for better readab

plt.tight_layout()
plt.show()
```



The chart shows the trend of total deaths in Germany from 1950 to 2022. The y-axis shows the total number of deaths in millions, while the x-axis shows the years.

There are two main things to note about the trend:

- Overall, the number of deaths in Germany has increased over time. There are a few exceptions, such as a decrease between 1975 and 2004.
- The rate of increase has slowed in recent years.

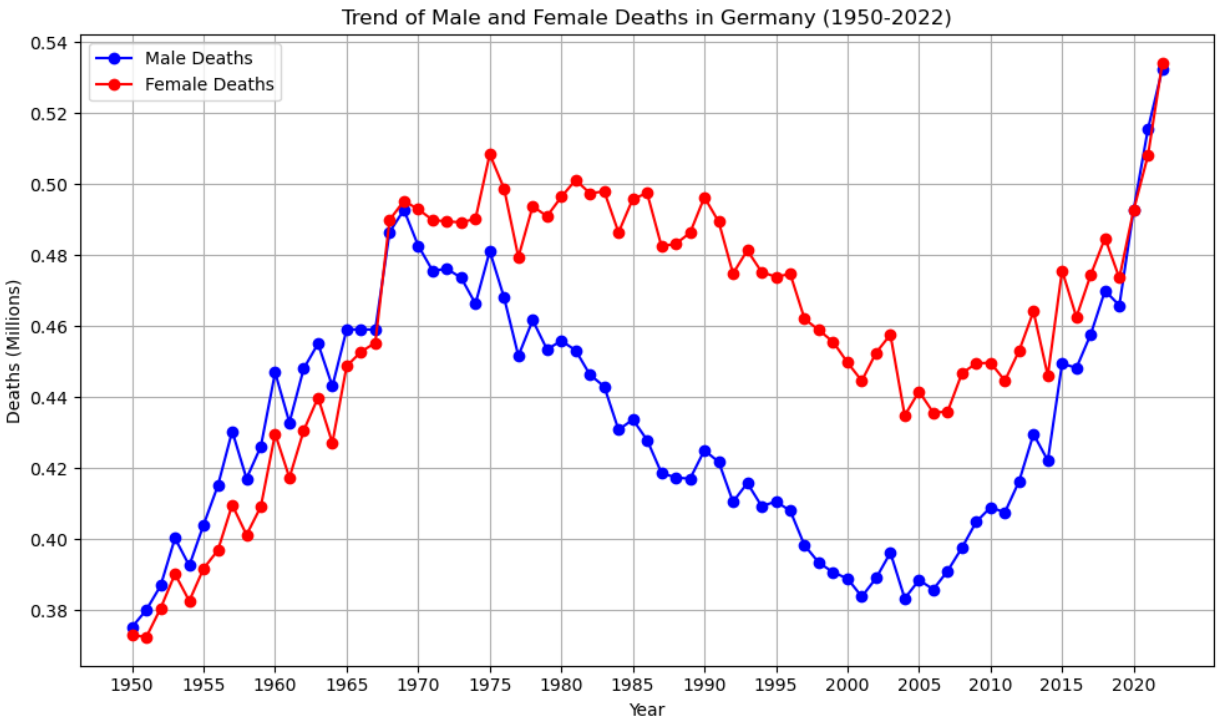
There are a number of reasons why the number of deaths in Germany has increased over time. One reason is that the population of Germany is aging. As people get older, they are more likely to die. Another reason is that medical advances have led to people living longer with chronic conditions, which can eventually lead to death. And also people died more in the Covid-19 time period from 2019-2022.

The fact that the rate of increase has slowed in recent years may be due to a number of factors, including improvements in public health and medical care.

Here are some additional resources that you may find helpful:

Population, mortality and place of death in Germany (1950-2050) - implications for end-of-life care in the future: https://pubmed.ncbi.nlm.nih.gov/23041107/

In [70]:
```
# Plotting the trend of male and female deaths
plt.figure(figsize=(10, 6))
plt.plot(df_death['Year'], df_death['Male'] / 1e6, marker='o', color='b',
plt.plot(df_death['Year'], df_death['Female'] / 1e6, marker='o', color='r
plt.title('Trend of Male and Female Deaths in Germany (1950-2022)')
plt.xlabel('Year')
plt.ylabel('Deaths (Millions)')
plt.grid(True)
plt.xticks(range(1950, 2023, 5))  # Adjust x-axis ticks for better readab
plt.legend()

plt.tight_layout()
plt.show()
```



Based on the details the chart depicting trends in male and female deaths in Germany between 1950 and 2022, here's a revised analysis of the observations:

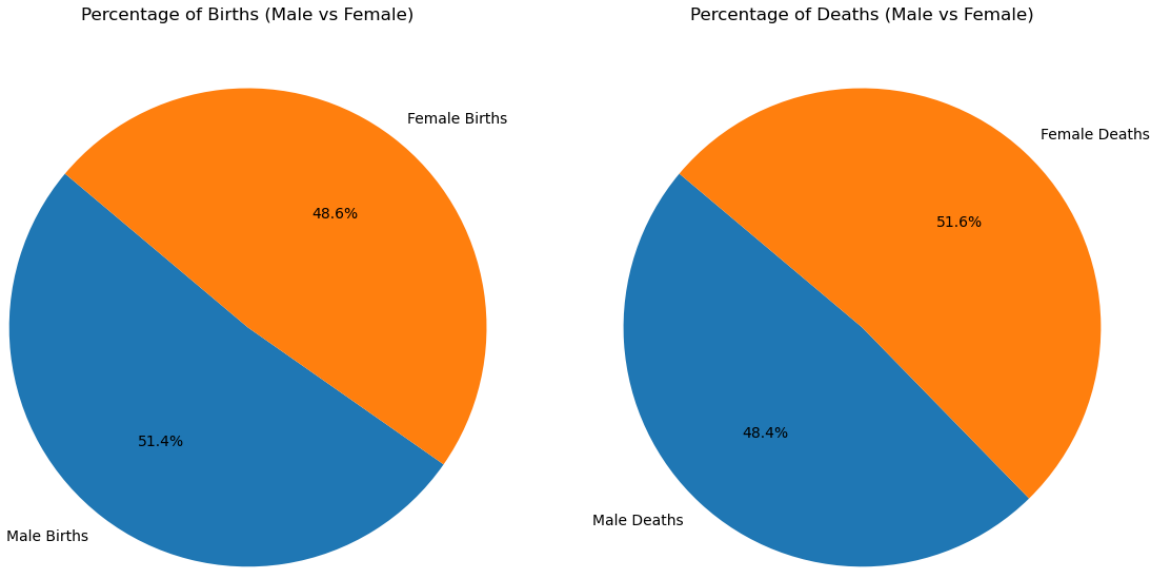
- Generally, male death rates appear consistently higher than female death rates throughout the timeframe, with a possible exception in the mid-1970s where female deaths might have been higher.
- There appears to be a downward trend in death rates for both genders, barring the potential anomaly in the 1970s.
- The disparity between male and female death rates may be shrinking, with female death rates potentially approaching or surpassing male death rates in recent years.

Important Considerations:

- To validate these observations and acquire a more comprehensive understanding of mortality trends in Germany, consulting reliable sources like official German health statistics or reputable publications is essential.

In [71]:

```
import matplotlib.pyplot as plt

# Calculate total births and deaths for males and females
total_births_male = df_birth['Male'].sum()
total_births_female = df_birth['Female'].sum()
total_deaths_male = df_death['Male'].sum()
total_deaths_female = df_death['Female'].sum()

# Data for pie chart of births
births_labels = ['Male Births', 'Female Births']
births_sizes = [total_births_male, total_births_female]

# Data for pie chart of deaths
deaths_labels = ['Male Deaths', 'Female Deaths']
deaths_sizes = [total_deaths_male, total_deaths_female]

# Plotting pie chart for births
plt.figure(figsize=(12, 6))
plt.subplot(1, 2, 1)
plt.pie(births_sizes, labels=births_labels, autopct='%1.1f%%', startangle
plt.title('Percentage of Births (Male vs Female)')

# Plotting pie chart for deaths
plt.subplot(1, 2, 2)
plt.pie(deaths_sizes, labels=deaths_labels, autopct='%1.1f%%', startangle
plt.title('Percentage of Deaths (Male vs Female)')

plt.tight_layout()
plt.show()
```



The chart you sent is titled "Percentage of Births (Male vs Female)" and "Percentage of Deaths (Male vs Female)". It compares the percentage of male and female births and deaths.

Here are some observations about the chart:

Births:

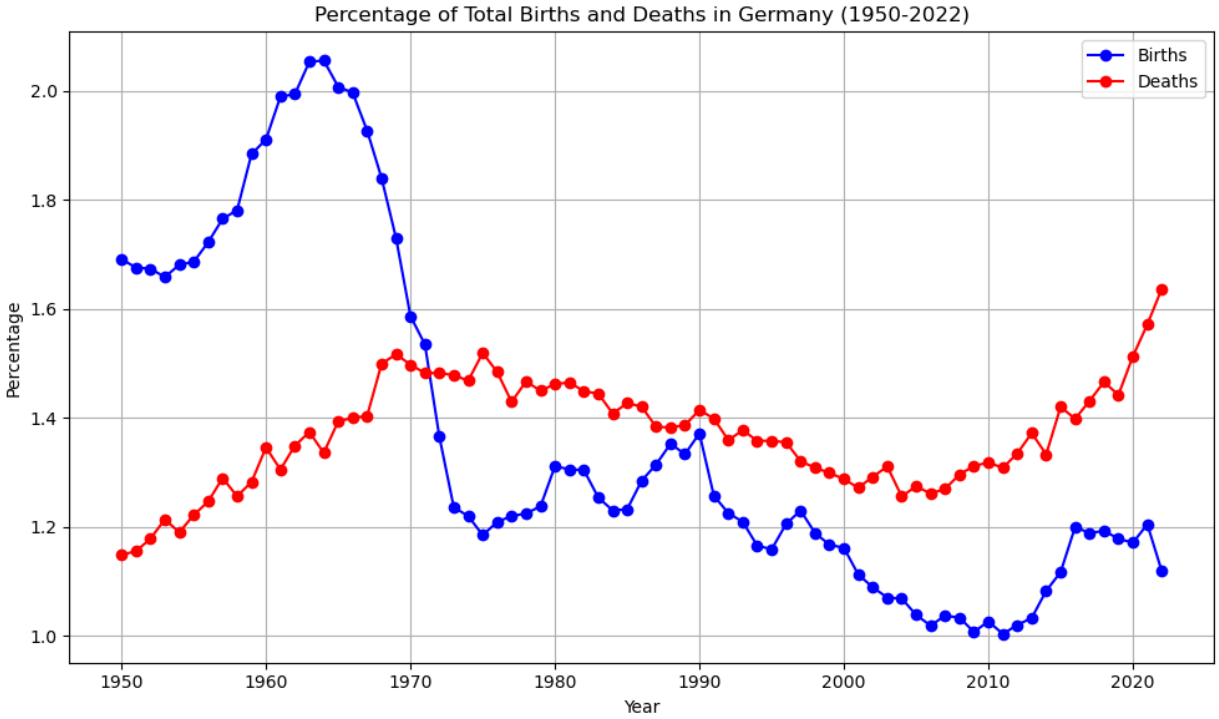
- The pie chart shows that the percentage of male and female births is nearly equal.
- There are slightly more male births (51.4%) than female births (48.6%).

Deaths:

- The pie chart shows that there are more female deaths (51.6%) than male deaths (48.4%).

further information in details:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8822249/

In [72]:
```
import matplotlib.pyplot as plt

# Calculate total births and deaths for each year
total_births = df_birth['Total'].sum()
total_deaths = df_death['Total'].sum()

# Calculate percentages for births and deaths
birth_percentages = (df_birth['Total'] / total_births) * 100
death_percentages = (df_death['Total'] / total_deaths) * 100

# Plotting the trend of birth and death percentages
plt.figure(figsize=(10, 6))
plt.plot(df_birth['Year'], birth_percentages, marker='o', color='b', line
plt.plot(df_death['Year'], death_percentages, marker='o', color='r', line
plt.title('Percentage of Total Births and Deaths in Germany (1950-2022)')
plt.xlabel('Year')
plt.ylabel('Percentage')
plt.grid(True)
plt.legend()

plt.tight_layout()
plt.show()
```



The chart titled "Percentage of Total Births and Deaths in Germany (1950-2022)" shows the percentage of total births and deaths in Germany from 1950 to 2022. The y-axis shows the percentage, and the x-axis shows the years.

Here are some observations about the chart:

- The percentage of births and deaths fluctuates over time, but there seems to be a general trend of decline in both.
- Births start at around 1.8% in 1950 and then steadily decline to around 1% by 2022. Deaths start at around 1.2% and increase to over 1.6% by 2022.
- Overall, the death rate is higher than the birth rate throughout the entire period.

This suggests that Germany's population is aging.

Here are some additional resources that you may find helpful:

Demographics of Germany - Wikipedia:
https://en.wikipedia.org/wiki/Demographics_of_Germany

Live births and deaths (time series) - German Federal Statistical Office:
https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Geburten/Tabellen/lebendgeborene-gestorbene.html