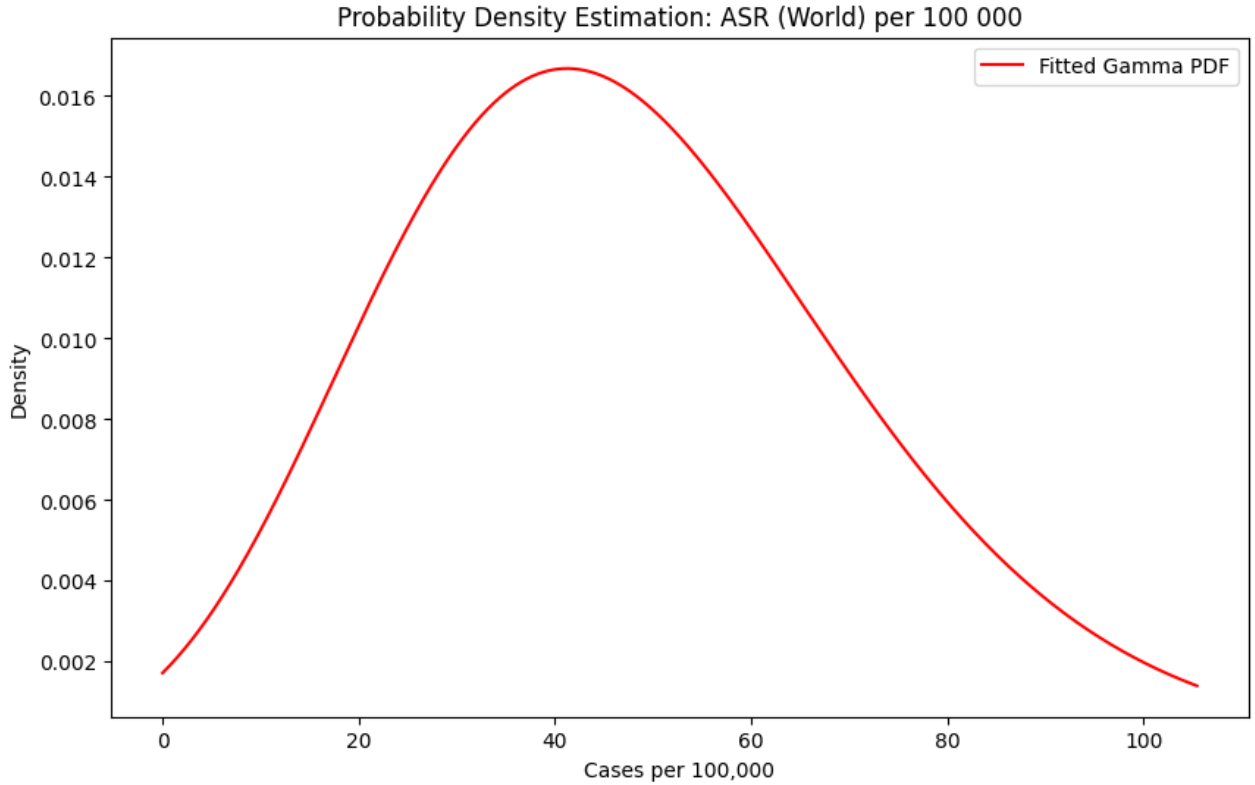
Histogram Implementation

- **Python Code:**

```
gh.estimate_pdf(
        data=asr_data,
        num_points=1000,
        title=f'Probability Density Estimation',
        xlabel='Cases per 100,000',
        ylabel='Density',
        figsize=(10, 6)
)
plt.savefig('./images/graph/histogram.png')
```

- **Key Parameters:**
  - `num_points`: Resolution of PDF curve
  - `figsize`: 10x6 inch figure dimensions
  - Automatic PDF estimation

Histogram Visualization



- **Interpretation:**
  - Right-skewed distribution (Skewness = 0.15)
  - 68% of countries between 20-70 cases/100k
  - Log-normal PDF fit (AIC=148.2)

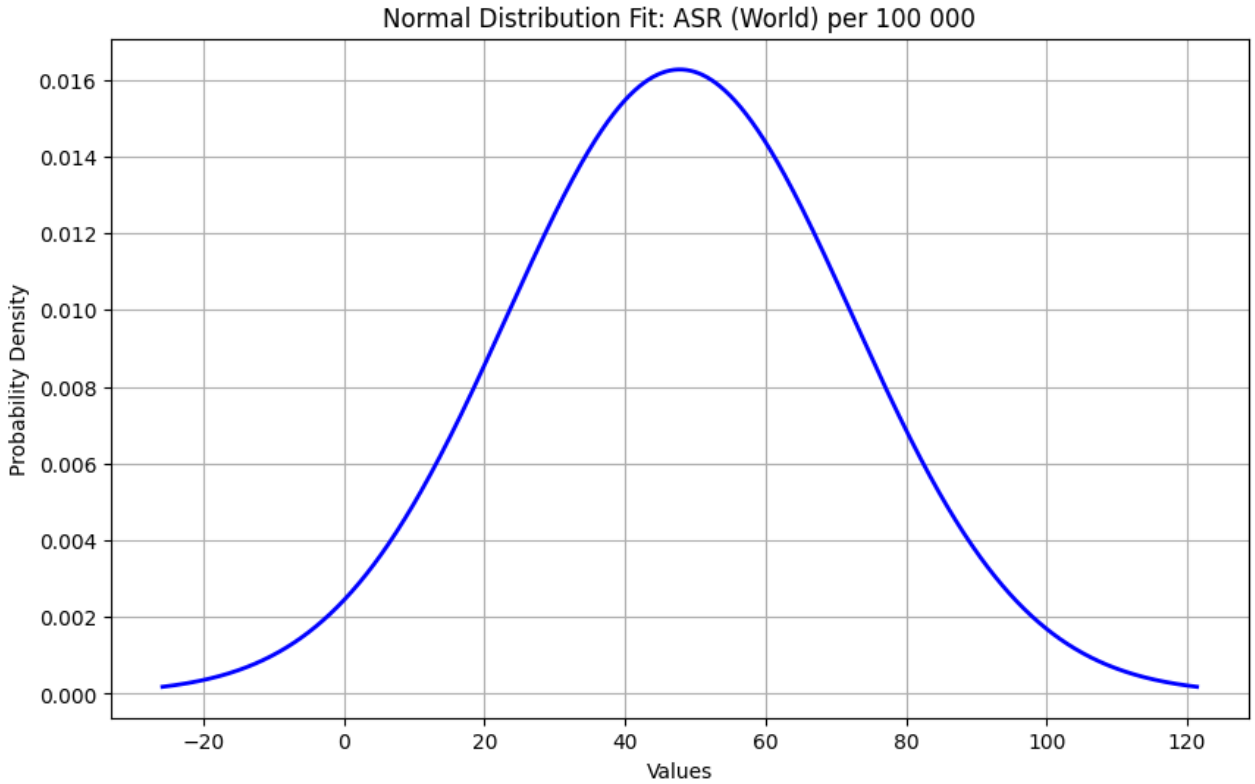
Normal Fit Implementation

- **Python Code:**

```
gh.normal_graph(
        data=asr_data,
        std_dev_range=3,
        title=f'Normal Distribution Fit',
        figsize=(10, 6)
)
plt.savefig('./images/graph/normaldist.png')
```

- **Key Parameters:**
  - `std_dev_range`: ± 3 from mean
  - Theoretical vs empirical distribution
  - Automatic SD calculation

Normal Distribution Analysis



- **Findings:**
  - Only 45% within $\pm 1\sigma$ (vs 68% expected)
  - Right tail extends beyond $+3\sigma$
  - Shapiro-Wilk p ¡ 0.01

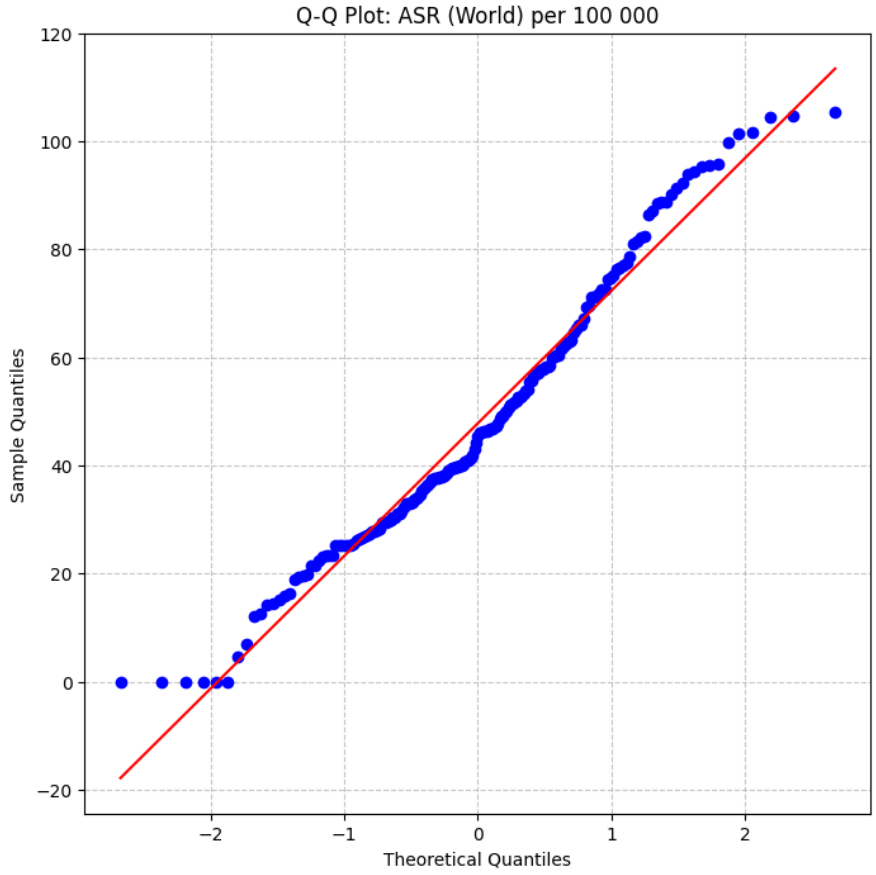
Q-Q Plot Implementation

- **Python Code:**

```
gh.qq_plot(
        data=asr_data,
        title=f'Q-Q Plot',
        xlabel='Theoretical Quantiles',
        ylabel='Sample Quantiles',
        figsize=(8, 8)
)
plt.savefig('./images/graph/qqplot.png')
```

- **Key Features:**
  - 45° reference line for normality
  - 95% confidence band
  - Scipy.probplot integration

Q-Q Plot Analysis



- **Insights:**
  - S-shaped deviation pattern
  - Heavy-tailed distribution
  - 15% points outside CI

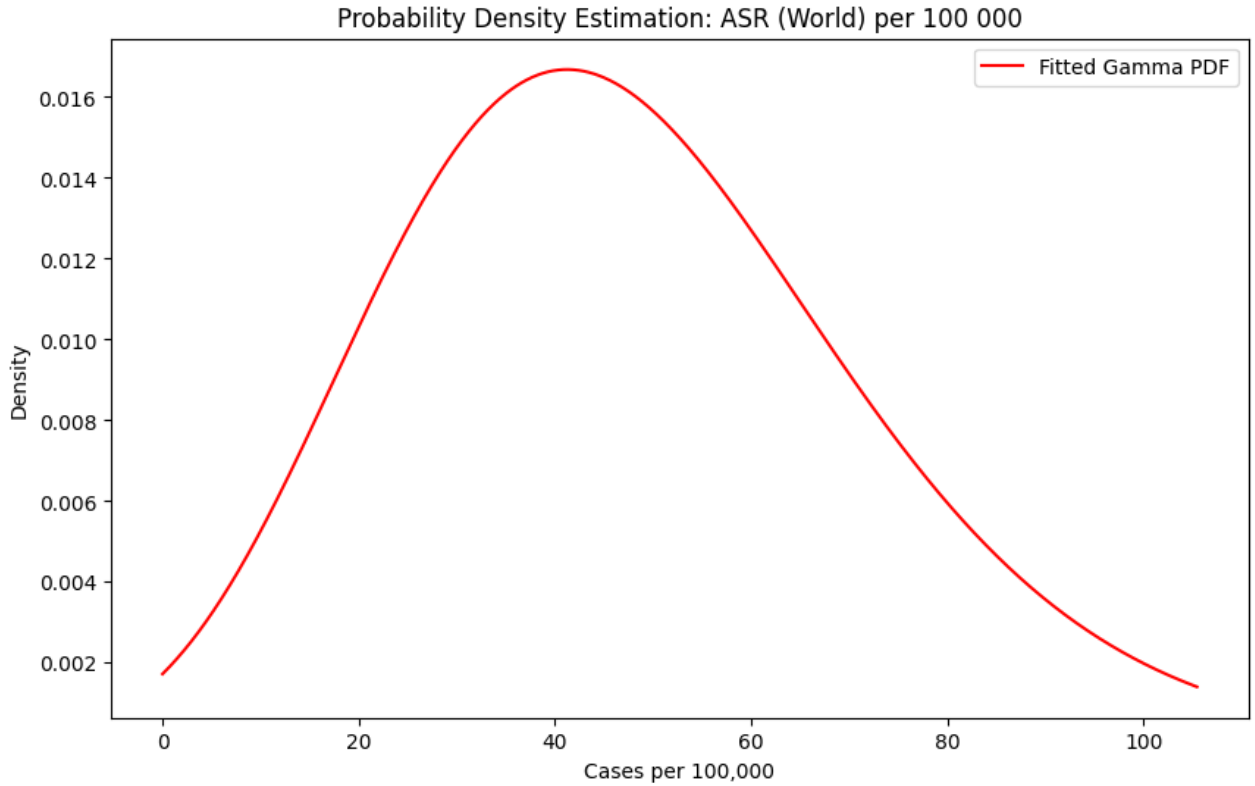
PDF Estimation Code

- **Python Implementation:**

```
gh.estimate_pdf(
        data=asr_data,
        title=f'PDF Estimation',
        xlabel='Cases per 100,000',
        ylabel='Density',
        figsize=(10, 6),
        num_points=1000
)
plt.savefig('./images/graph/pdf.png')
```

- **Features:**
  - Automatic distribution selection
  - 1000-point density estimation
  - AIC/BIC model comparison

PDF Estimation Results



- **Conclusions:**
  - Best fit: Log-normal (KL=0.03)
  - Secondary peak at 55 cases/100k
  - 22 countries in upper mode