

Start coding or [generate](#) with AI.

```
import numpy as np
import matplotlib.pyplot as plt

# Parameters for the population
population_mean = 50
population_std = 10
population_size = 100000

# Generate the population
population = np.random.normal(population_mean, population_std, population_size)

# Define sample sizes and number of samples
sample_sizes = [30, 50, 100]
num_samples = 1000

# Dictionary to store sample means
sample_means = {size: [] for size in sample_sizes}

# Generate sampling distributions
for size in sample_sizes:
    for _ in range(num_samples):
        sample = np.random.choice(population, size=size, replace=False)
        sample_means[size].append(np.mean(sample))

# Plotting the histograms
plt.figure(figsize=(12, 8))

for i, size in enumerate(sample_sizes, start=1):
    plt.subplot(len(sample_sizes), 1, i)
    plt.hist(sample_means[size], bins=30, alpha=0.7, label=f'Sample size {size}')
    plt.axvline(np.mean(population), color='red', linestyle='dashed', linewidth=1.5, label='Population mean')
    plt.title(f'Sampling Distribution (Sample Size = {size})')
    plt.xlabel('Sample Mean')
    plt.ylabel('Frequency')
    plt.legend()

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

