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# -----  
# Simulation in R - Sampling Distribution  
# -----  
  
# Install required packages (only first time)  
if(!require(gapminder)) install.packages("gapminder")  
if(!require(dplyr)) install.packages("dplyr")  
  
# Load libraries  
library(gapminder)  
library(dplyr)  
  
# Load the dataset (works even if package version fails)  
if(!exists("gapminder")){  
  gapminder <- read.csv("https://raw.githubusercontent.com/resbaz/r-novice-gapminder-files/master/data/gapminder-FiveYearData.csv")  
}  
  
# Check data  
head(gapminder)  
  
# Extract life expectancy data  
life_data <- gapminder$lifeExp  
  
# Generate 1000 sample means (sample size = 30)  
sample_means <- replicate(1000, mean(sample(life_data, size = 30, replace = TRUE)))  
  
# Visualize the sampling distribution  
hist(sample_means,  
      main = "Sampling Distribution of Sample Mean",  
      xlab = "Mean Life Expectancy",  
      col = "skyblue",  
      border = "white")  
  
# Optional: test different sample sizes  
sizes <- c(10, 30, 100)  
par(mfrow=c(1,3))  
for (s in sizes) {  
  sm <- replicate(1000, mean(sample(life_data, size=s, replace=TRUE)))  
  hist(sm,  
       main=paste("n =", s),  
       col="lightgreen",  
       border="white",  
       xlab="Mean Life Expectancy")  
}
```

```
Loading required package: gapminder

Warning message in library(package, lib.loc = lib.loc, character.only = TRUE, logical.return = TRUE, :
"there is no package called 'gapminder'"
Installing package into '/usr/local/lib/R/site-library'
(as 'lib' is unspecified)

Loading required package: dplyr

Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

  filter, lag

The following objects are masked from 'package:base':

  intersect, setdiff, setequal, union
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A tibble: 6 × 6

country	continent	year	lifeExp	pop	gdpPercap
<fct>	<fct>	<int>	<dbl>	<int>	<dbl>
Afghanistan	Asia	1952	28.801	8425333	779.4453
Afghanistan	Asia	1957	30.332	9240934	820.8530
Afghanistan	Asia	1962	31.997	10267083	853.1007
Afghanistan	Asia	1967	34.020	11537966	836.1971
Afghanistan	Asia	1972	36.088	13079460	739.9811
Afghanistan	Asia	1977	38.438	14880372	786.1134

