Statistical Thinking Writing Task

In this assignment, you will design and conduct your own small-scale statistical study, applying descriptive statistics to analyze quantitative data. This process will help you understand how statistics are used to draw meaningful conclusions from raw data and recognize the inherent limitations in statistical studies.

The Assignment

Part 1: Study Design and Data Collection

1. Formulate a clear research question that can be answered using quantitative data. You may create your own question or select from one of these options:
    - How many pairs of shoes do people own?
    - How many hours of sleep did people get last night?
    - How much did people spend on lunch yesterday?
    - What is people's height in inches?
    - What is people's shoe size?
2. Collect data from at least 30 respondents. Consider how you will:
    - Identify and reach your sample population
    - Ensure consistency in how questions are asked
    - Record responses accurately
    - Address potential sampling biases
3. Organize your raw data in a spreadsheet, showing:
    - Individual responses
    - Data collection method
    - Any relevant categories or groupings
    - Date of collection

Part 2: Statistical Analysis

4. Calculate the following descriptive statistics for your data:
    - Measures of central tendency: mean, median, and mode
    - Measures of dispersion: range, standard deviation, and variance
    - Distribution characteristics: skewness and kurtosis
5. Create the following visualizations:
    - Histogram with 5-6 class intervals (include label, title, and appropriate scale)
    - Frequency distribution table showing class intervals, frequencies, relative frequencies, and cumulative frequencies

- Box plot based on your five-number summary (minimum, Q1, median, Q3, maximum)

Part 3: Interpretation and Reflection

6. Analyze your findings:
    - Describe the shape of your distribution (symmetric, right-skewed, left-skewed, bimodal, etc.)
    - Compare the mean, median, and mode in context of your distribution shape
    - Identify any outliers and discuss their potential impact on your statistics
    - Explain what your box plot reveals about the center and spread of your data
7. Evaluate your study:
    - Identify at least three limitations of your study (sampling method, sample size, question wording, etc.)
    - Explain how these limitations might affect the validity or generalizability of your results
    - Discuss how your data collection methods might have introduced bias
8. Propose future research:
    - Suggest two specific follow-up studies that could build on your findings
    - Explain how these studies would address the limitations you identified
    - Describe what additional statistical methods might be appropriate for deeper analysis

Your submission should include:

- A complete report with all components above, clearly labeled
- Your original data set (as an appendix or separate file)
- All statistical calculations with work shown
- Properly formatted visualizations
- Thoughtful interpretation connecting your findings to your research question

This assignment is worth 20 points. Your work will be assessed on the accuracy of statistical calculations, quality of visualizations, depth of analysis, and critical reflection on limitations and potential improvements.

Rubric:

Criteria	Proficient	Developing	Not Evident	Points
Study Design & Data Collection	Clearly articulates research question and data collection approach. Gathers data from at least 30 respondents. Presents raw data in an organized, complete manner with attention to potential biases.	Research question somewhat unclear or data collection method incompletely explained. Sample includes most of required respondents. Data organization shows minor issues.	Poorly defined research question or inadequate explanation of data collection. Significantly fewer than required respondents. Data disorganized or incomplete.	___/4
Statistical Calculations & Visualizations	Accurately calculates all required descriptive statistics. Creates clear, properly labeled histogram, frequency table, and box plot that effectively represent the data. Shows all work and properly interprets results.	Most calculations correct with minor errors. Visualizations present but may have formatting issues or minor inaccuracies. Work shown with some gaps in process or interpretation.	Multiple significant errors in calculations. Visualizations missing key elements, poorly constructed, or inaccurate. Limited work shown or major misinterpretations.	___/8
Distribution Analysis	Provides thorough, accurate analysis of distribution shape and characteristics. Correctly interprets relationship between mean, median, and mode. Thoughtfully analyzes outliers and their impact. Demonstrates strong understanding of what box plot reveals.	Basic analysis of distribution with some insights but limited depth. Some understanding of mean-median-mode relationships. Identifies outliers but analysis of their impact is superficial.	Minimal or incorrect analysis of distribution shape. Limited understanding of relationships between statistics. Fails to identify outliers or explain their significance.	___/4

Limitations & Future Research	Identifies significant, relevant limitations with insightful analysis of their impact on validity. Proposes thoughtful, specific follow-up studies that directly address limitations. Demonstrates excellent critical thinking about research methodology.	Identifies some limitations but analysis of impact may lack depth. Proposes general follow-up studies with some connection to limitations. Shows basic critical thinking about methodology.	Few or irrelevant limitations identified. Proposed follow-up studies vague or disconnected from limitations. Limited evidence of critical thinking about methodology.	___/4
Total				___/20