Additional Methodology

Sample Size Estimation Method: Given the population distribution, Adams County has the largest share, while the other three counties collectively account for approximately 30% of the district's population. This distribution was carefully considered to ensure proportional representation in the survey.

The sample size was estimated using the Cochran Formula, widely used for determining sample size in large populations:

$$n = \frac{Z^2 \times p \times (1 - p)}{e^2}$$ Where:

- n = Required sample size

- Z = Z-score corresponding to the desired confidence level (1.96 for 95% confidence)

- p = Estimated proportion of the population (0.5, to ensure maximum variability)

- e = Margin of error (typically set at 5%, or 0.05)

Given these parameters:

$$n = \frac{(1.96)^2 \times 0.5 \times (1 - 0.5)}{(0.05)^2} = 384.16$$

Thus, a minimum sample size of 385 respondents was required for the district as a whole to ensure statistical representativeness at a 95% confidence level with a 5% margin of error.

Adjusting for Finite Population
Since the total population of SHD is finite (44,733), the sample size was adjusted using the finite population correction (FPC):

$$n_{\text{adjusted}} = \frac{n}{1 + \frac{n-1}{N}}$$ Where:

- n = 385 (initial sample size)

- N = 44,733 (total population of SHD)

$$n_{\text{adjusted}} = \frac{385}{1 + \frac{385-1}{44,733}} \approx 382$$

The adjusted sample size for SHD remained approximately 382 respondents for the entire district.

County-Level Representation
To ensure proportional representation across the four counties, the sample size was distributed based on each county's share of the total population:

County	Population	% of Total Population	Proportional Sample Size
Adams County	31,143	69.6%	266
Clay County	6,088	13.6%	52

County	Population	% of Total Population	Proportional Sample Size
Nuckolls County	4,092	9.2%	35
Webster County	3,410	7.6%	29
Total	44,733	100%	382

Oversampling for Robustness

To account for potential nonresponse and ensure data robustness, SHDHD aimed to exceed the minimum required sample size. The target was set at approximately 500-600 responses, which allowed for:

- Better representation of subgroups (e.g., by age, gender, race/ethnicity).

- Mitigation of bias caused by nonresponse.

- Enhanced statistical power for analyzing smaller counties or population groups.

The final sample size for the Community Health Survey was designed to be representative of the 44,733 residents across the four counties of SHD. Using statistical methods and proportional allocation, the survey aimed to collect sufficient data to inform health priorities while maintaining validity and reliability.

Sample Representativeness for the Community Health Survey

The gender-weighted analysis of the **South Heartland District (SHD) Community Health Survey** indicates an effort to align the sample characteristics with SHD Census data, especially concerning gender representation. Below is the assessment of how representative the survey sample is across key demographic characteristics:

1. **Gender**:

   o **Male**: 23.1% (Unweighted) → 49.2% (Weighted) vs. **49.8%** (SHD Census)

   o **Female**: 74.6% (Unweighted) → 48.5% (Weighted) vs. **50.2%** (SHD Census)

   o Adjusting the weights successfully corrected the overrepresentation of females, balancing the gender proportions to closely match census data.

2. **Other Categories**:

   o **Non-binary/Third Gender, Prefer Not to Say, and Self-Described**: These groups had minimal representation in the survey sample (0.5%–1.4%). Weighting could not meaningfully change their proportions due to low counts.

3. **Overall Distribution**:

   o The weighted totals demonstrate the gender balance aligns closely with the SHD Census data, ensuring representativeness for male and female populations.