

B. Collections of Information Employing Statistical Methods

1. Describe the potential respondent universe and any sampling or other respondent selection methods to be used.

The respondent universe will be all operations in 24 States¹ with at least one beef cow. Examination of the National Agricultural Statistics Service's (NASS) 2012 Census of Agriculture summary information (the last publication of all State-level farm and inventory information) shows about 25 million beef cows on 575,273 operations in the 24 States.

The goal for NAHMS national studies is to include States that account for at least 70 percent of the animal and farm population in the United States. A total of 24 States were selected for inclusion in the study based on each State's contribution to the total number of U.S. beef farms and the total number of beef cows. These 24 States accounted for 86.8% of beef cows and 79.0% of beef operations in the United States (beef cows based on January 2016 inventory; beef operations based on 2012 Ag Census). States are also selected to provide good geographic coverage.

The goal of the study is to create population estimates to meet the following objectives:

1. Describe trends in beef cow–calf health and management practices, specifically
 - Cow health and longevity,
 - Calf health,
 - Reproductive efficiency,
 - Selection methods for herd improvement including tests of genetic merit, and
 - Biosecurity.
2. Describe management practices and producer beliefs related to
 - Animal welfare,
 - Emergency preparedness,
 - Environmental stewardship, and
 - Record keeping and animal identification practices.
3. Describe antimicrobial use practices (stewardship) and determine the prevalence and antimicrobial resistance patterns of potential food-safety pathogens.
 - Types and reasons for use of antimicrobial drugs by animal type
 - Stewardship
 - Use of alternatives for disease control.
 - Use of Beef Quality Assurance principles.
 - Veterinarian-client-patient relationship.
 - Information sources.
 - Enteric organism antimicrobial resistance assessments (e.g., *Salmonella*, *E. coli*, *Enterococcus*)

A sample of beef producers will be selected by NASS from producers with one or more beef cows in the 24 States from the January 1, 2017 Cattle Report. The sample will be selected from

¹ AL, AR, CA, CO, FL, GA, ID, IA, KS, KY, MN, MS, MO, MT, ME, ND, OH, OK, OR, SD, TN, TX, VA, WY

this sub-population instead of NASS' List Frame to minimize the number of producers selected that are out of business, have no beef cows, or are inaccessible. Results from NAHMS Beef 2007/2008 showed that a large proportion of producers selected from the List Frame did not meet eligibility requirements (out of business, no beef cows) or were inaccessible.

The study will have two phases. Phase I will be a NASS administered on-farm questionnaire and Phase II will be an on-farm questionnaire and biologic sampling administered by VS data collectors. All farms completing Phase I of the study will be eligible to participate in Phase II.

2. Describe the procedures for the collection of information including:

- **Statistical methodology for stratification and sample selection:**

Stratification – The sub-population of beef producers in the 24 States will be stratified by state and size category, where size categories are based on the number of beef cows: 1-49, 50-99, 100-199, and 200 or more. This will allow different sampling rates among strata; large producers will be sampled at a higher rate than small producers to capture more of the U.S. beef cow inventory.

Sampling methodology – NASS will stratify the sub-population as described, and select a total sample of about 4,000 operations. The number of operations selected within each stratum is based on a weighted proportion of the total population (of operations and inventory) that the stratum represents. In this way, strata with larger operations are sampled with higher selection probabilities so that more of the inventory is captured. Within each stratum, a random sample of operations is selected.

- **Estimation procedures:**

The sample design will be a stratified random sample, and appropriate estimation methods will be used to account for clustering of units within strata and unequal selection probabilities between strata. The sample will be weighted to account for the selection probability and for nonresponse.

The statistical estimation will be done using either SAS or SUDAAN. Both software packages use a Taylor series expansion to estimate variances.

- a. Degree of accuracy needed:**

With a total sample of 4,000 operations and an expected response rate of about 65% for Phase I of the Study, we can achieve coefficients of variation (CV) ranging from 2% for national estimates to 16% for regional or size category estimates (Appendix A). These CVs are within NAHMS' goal of CVs of 20% or less.

The estimates of precision shown in Appendix A do not account for increased variance due to design effects. However, minimal design effects are expected because any increase in variance due to clustering or unequal selection probabilities is offset by the expected decrease in variance due to stratification. Examination of design effects from

NAHMS Equine 2015, which had a similar study design, shows design effects ranging from 0.5 to 1.5.

For Phase II of the Study, we assumed that 30% of Phase I respondents would complete Phase II. Expected CVs range from 4% for national estimates to 29% for regional or size category estimates. We do not publish estimates if standard errors are too large.

b. Unusual problems requiring specialized sampling procedures and data collection cycles:

There are no unusual problems requiring specialized sampling procedures and data collection cycles.

3. Describe methods to maximize response rates and to deal with issues of non-responses:

Study Design:

- Many proven questions from previous NAHMS studies will be included in the questionnaire.
- The study minimizes collection of data to that which is absolutely necessary to meet the stated objectives.
- Numerous contacts and collaborative efforts have been made to identify the information needs of the industry and the best way to ask for that information via questionnaire.

Non-response:

The study is supported by industry representatives, who have contributed to the study development. Industry representatives will promote the study among beef producers.

Numerous efforts have been made to partner with the industry to make potential respondents aware of the value and use of the data from the study for setting policy, developing research objectives, educating future agriculturists and veterinarians, and assessing industry progress in addressing issues of importance to them.

Producers selected to be in the study will receive via U.S. mail pre-survey materials describing the study and explaining why it is important.

Another measure to minimize nonresponse is to subsample from operations that had beef cows in January 2017 (from the NASS Cattle Report). We expect this to substantially reduce the number of ineligible or inaccessible operations. For the NAHMS Beef 2007-08 Study, the response rate was 54%. However, 25% of the original sample was either out of business, inaccessible, or had no beef cows on July 1, 2007 and were therefore ineligible. If we omit the ineligible/inaccessible operations from the original 2007 sample, our response rate was effectively 72%.

For the Beef 2017 Study, we will also broaden eligibility to operations that had beef cows at any time during 2017, instead of just on a particular day.

Contacting Respondents:

About 2 weeks prior to the start of field enumeration, producers selected to be in the study will receive via U.S. mail pre-survey materials describing NAHMS Beef 2017 and explaining the importance of the Study. The producers will then be contacted by telephone to schedule appointments for an in-person visit to administer to questionnaire.

Data Collection Steps:

Data will be collected through two personal interviews with a structured questionnaire.

4. Data Analysis Steps:

Data from the Phase I questionnaires will be validated and entered into a SAS dataset by NASS staff. Additional data validation will be done by NAHMS staff. Data from Phase II hardcopy questionnaire will be entered into a SAS dataset by NAHMS staff. The data will then be cleaned and validated. Descriptive statistics (proportions, ratios, and means) will be estimated using standard SAS or SUDAAN procedures.

Describe any tests of procedures or methods to be undertaken.

The study might use questions revised from previous NAHMS studies. The questionnaire has been reviewed by a variety of experts, including academic researchers, industry representatives, extension agents, veterinarians, health specialists, and epidemiologists. The proposed questionnaire has been tested during the pretest phase involving fewer than 10 respondents. Results of these pretests were used to refine the information collection in order to reduce respondent burden and improve the usefulness of the information collected

Regional and size category estimates will be accompanied by standard errors, so that differences can be evaluated. .

5. Provide the name and telephone number of individuals consulted on statistical aspects of the design and the name of the agency unit, contractor(s), grantee(s), or other person(s) who will actually collect and /or analyze the information for the agency.

The statistical aspects of the design were coordinated by Ms. Christine Koprak, Statistician, USDA: APHIS, Veterinary Services, CEAH, Fort Collins, CO, (970) 494-7125.

Analysis of the data will be accomplished by NAHMS veterinarians, epidemiologists, and statisticians under the direction of:

- Dr. Katherine Marshall, National Animal Health Monitoring System, USDA: APHIS, VS, CEAH, 2150 Centre Avenue, Building B MS2E7, Fort Collins, CO 80526-8117 (970) 494-7256.

Appendix A: Precision of Estimates

Estimates of percent of operations and percent of animals will be reported at the national level, by size category, and by region.

Estimates of precision for Phase I of the study and for proportions of 0.5 and 0.1 are shown in Table 1. As an example, for the size category ‘200 or more’ and an expected proportion of 0.5, the coefficient of variation (CV) is 3%. All of the CVs shown in Table 1 meet the goal of 20% or less.

Table 1. Expected precision of Phase I estimates, by reporting class and by proportion, at 95% confidence.

Reporting class	Total Population (N) ¹	Sample size (Phase I)	Number of respondents to Phase I at 65% response rate	Expected proportion	Half-width of confidence interval	Coefficient of variation (%)
Size category						
1-49	456,950	1,282	833	.5	±0.03	3
				.1	±0.02	10
50-99	62,339	545	354	.5	±0.05	5
				.1	±0.03	16
100-199	32,567	538	350	.5	±0.05	5
				.1	±0.03	16
200 or more	23,417	1,632	1,061	.5	±0.03	3
				.1	±0.02	9
Total	575,273	3,997	2,598	.5	±0.02	2
				.1	±0.01	6
Region						
West	57,763	737	479	.5	±0.04	5
				.1	±0.03	14
Central	144,261	1,355	881	.5	±0.03	3
				.1	±0.02	10
South Central	178,030	813	528	.5	±0.04	4
				.1	±0.03	13
East	195,219	1,092	710	.5	±0.04	4
				.1	±0.02	11

¹Number of operations with 1 or more beef cows in the 24 States, NASS 2012 Census of Agriculture

Table 2 shows estimates of precision for Phase II of the study. It was assumed that 30% of Phase I respondents would complete Phase II. Although some of regional or size category estimates may have CVs of greater than 20%, we expect the majority of estimates to have precision within the desired range. We do not publish estimates if the standard errors are too large.

Table 2. Expected precision of Phase II estimates, by reporting class and by proportion, at 95% confidence.

Reporting class	Sample size (Number of respondents to Phase I)	Number of respondents to Phase II at 30% response rate*	Expected proportion	Half-width of confidence interval	Coefficient of variation (%)
Size category					
1-49	833	250	.5	±0.06	6
			.1	±0.04	19
50-99	354	106	.5	±0.09	10
			.1	±0.06	29
100-199	350	105	.5	±0.09	10
			.1	±0.06	29
200 or more	1,061	318	.5	±0.05	6
			.1	±0.03	17
Total	2,598	779	.5	±0.03	4
			.1	±0.02	11
Region					
West	479	144	.5	±0.08	8
			.1	±0.05	25
Central	881	264	.5	±0.06	6
			.1	±0.04	18
South Central	528	158	.5	±0.08	8
			.1	±0.05	24
East	710	213	.5	±0.07	7
			.1	±0.04	21

* For NAHMS Beef 2007/2008, 26% of Phase I respondents completed Phase II