

## Chapter II. THE QUALITY CONTROL PLAN

The quality of the field enumeration during the 1960 Censuses of Population and Housing was to be statistically controlled at two levels. First, the work of the enumerators was to be reviewed by crew leaders at scheduled meetings. Second, quality control clerks in the District Offices were to inspect completed enumeration books received from the field to determine whether or not the crew leaders were doing an adequate job of inspection. Appendixes B through E contain sections of various instruction manuals that concern quality control.

The District Supervisor in each of the 399 temporary District Offices was assisted by one or more Technical Officers whose major role during the censuses consisted in training crew leaders on the technical content of the field enumeration and supervising the quality control program. Each of the 10,000 crew leaders supervised about 15 to 17 enumerators, whose work they reviewed with the assistance of "field reviewers" who were selected from among the best enumerator candidates after the training sessions for enumerators.

### Quality Control Preparations in the Field Before April 1

Between March 9 and April 1 crew leaders were to make a reconnaissance of each of the enumeration assignments (EA's) for which they were responsible in order to check the maps, prelist some households for a later coverage check, make sure that the area was small enough to be enumerated by one person in the time allowed, and designate places requiring special enumeration procedures. Form F-236, Crew Leader's Check List for Map Review and Preparatory Work,<sup>1</sup> was provided for recording the results of this work.

Technical Officers were to review the forms F-236 to determine whether this phase of the crew leader's work could be completed on schedule or whether any crew leader would require assistance. They were also to observe the crew leaders doing this work, and to record their observations on form F-288, Evaluation of Map Review and Preparatory Work.

Insofar as possible, crew leaders and field reviewers "inducted" enumerators into their jobs on March 31, the last day of the training program, by accompanying each enumerator to the starting point of his EA to see that he began canvassing as instructed, and by visiting several households with him to see how well he had learned to interview.

<sup>1</sup> The quality control forms are reproduced in appendix A.

### Stage I Field Review in Two-Stage Areas

Crew leaders and field reviewers were to arrange to inspect the first day's work of each enumerator as soon as possible (before the evening of April 3 in two-stage areas; before the afternoon of April 5 in single-stage areas). Stage I enumerators were paid a fee of \$4.00 for time spent in each field review. (Enumerators in single-stage areas were paid \$6.00 for each of their field reviews, which were longer.)

When an enumerator brought in his work for review the first time, the reviewer was to perform the following:

1. A check for missed units (from the advance listing prepared on form F-236 by the crew leader),
2. A review of the Listing Book for major defects such as errors in sample key designation,
3. A review of the Listing Book for minor defects such as incorrectly recorded callbacks,
4. A review of the population items on the forms for omissions or for marks which were too light to be read by the Fosdic machine or which were so badly defined as to generate Fosdic reading errors,
5. A review of the housing items on the forms for omissions or bad marking,
6. A check to see that the canvassing information recorded in the Listing Book agreed with the information in the enumeration book.

Form F-243, Record of Field Review: PH-1 and PH-2, was used by the reviewer for this purpose in two-stage areas; form F-243A was used in single-stage areas. During the review the enumerator was to list his errors found in field review on form F-214, Enumerator's Record of Errors, and was supposed to correct the errors noted as well as any other similar types of errors in his enumeration books. At subsequent reviews, reviewers were to check to see that the errors noted in earlier reviews had been corrected.

After performing the checks in sections I through VI of the review form, F-243, the reviewer then was to compare the number of errors found in each section with the acceptance number preprinted on the form. Depending on the number of times an enumerator exceeded the acceptance number for a section, the reviewer was to take one of several actions:

1. Instruct the enumerator that no further review

would be necessary until his assignment was completed, at which time a final review would be made.

2. Schedule another meeting for a field review as soon as convenient.
3. Terminate the enumerator's appointment because he had made more than the acceptable number of errors.

In all cases the errors found were corrected.

During Stage I it was possible for one enumerator's assignment to be inspected as many as four times. A first review and another final review were always required, and there might be one or two intermediate reviews. However, the acceptance criteria were quite loose for the first review and were made tighter for subsequent reviews to keep pace with an enumerator's gain in experience.

Technical Officers were to make appointments to observe crew leaders and field reviewers as they performed field reviews and were to evaluate their performance on form F-289, Evaluation of Field Review for PH-1 and PH-2.

### Closeout Review and Transcription Verification

Following the final review of an enumerator's work, the crew leader was to make two additional checks. The first was a check for the number of households which an enumerator completed by closeout procedure; that is, where he obtained limited information from neighbors or other sources after making three visits to a housing unit without finding a suitable respondent at home. When the crew leader determined that an EA had more than the acceptable number of households enumerated by the closeout procedure, he was to assign the EA to an hourly-rate enumerator for further visits to such households.

After the closeout review was completed, crew leaders were to check how well enumerators transcribed the Stage I information for sample households into the Stage II enumeration books. If the transcription quality was not acceptable, the crew leader was to arrange for all necessary corrections to be made before sending the Stage I enumeration books to the District Office.

### Stage I District Office Quality Control

Quality control clerks in the District Offices were to review samples of this work in the enumeration books for each ED to insure that crew leaders and field reviewers were doing an adequate job of first-line inspection. The office acceptance criteria matched the characteristics of the field review plan.

There was one plan for reviewing the basic contents of Stage I information and another plan for verifying the

transcription of the Stage I information to the Stage II enumeration books for the sample households. Instructions were given to Technical Officers for directing office quality control activities as well as all other phases of field quality control.

The enumeration book or books for an ED which were rejected by the office clerks were to be returned to crew leaders for correction. Furthermore, upon determining that the ED failed inspection, the District Office Quality Control Supervisor was promptly to notify the Technical Officer so that he could take one of the following actions:

The first time that an enumeration book (or books) for an ED from a particular field reviewer was rejected, the Technical Officer was to notify the crew leader so that arrangements could be made either to give further training or to release the field reviewer. The first time a crew leader submitted an enumeration book (or books) for an ED which was rejected by the office, the Technical Officer was to make an appointment with him to observe him conduct a final field review and determine whether he needed further training or whether his field-review function should be assigned to someone also. The second time an enumeration book from either a crew leader or a field reviewer was rejected by the office, he was to be relieved of his field review functions (except that, in the case of a crew leader, a check was made to be sure he had not done the review on the second rejected enumeration book before he was retrained).

### Selecting Crew Leaders and Enumerators for Stage II

Crew leaders and enumerators were to be selected for Stage II work on the basis of their performance during Stage I as judged by the results of office inspection and the opinions of the Technical Officers. Crew leaders were to submit recommendations for Stage II enumerators including a report on whether or not the field review showed that these enumerators did well.

### Stage II Field Review

Crew leaders and field reviewers were to review the work of Stage II enumerators in much the same fashion as during Stage I. During Stage II, however, the enumerators transcribed onto Fosdic forms the information received on the Household Questionnaires from households in the 25-percent sample. For this reason, the Stage II inspection also included a check on the accuracy of transcription of information from Household Questionnaires to the Stage II Fosdic forms.

Enumerators were paid a fee of \$2.00 per enumeration assignment (EA) for time spent in field review. They had, on the average, three EA's apiece. The field review form for Stage II was form F-244, Record of Field Review: PH-3 and PH-4.

As in Stage I, the Technical Officer was to visit crew leaders and field reviewers to observe the way they conducted their field reviews, using form F-289A, Evaluation of Field Review for PH-3 and PH-4, to record this observation.

Stage II District Office Quality Control

During Stage II, office clerks were to review the work received from each crew leader by means of inspection procedures similar to those used for Stage I. Technical Officers were to take corrective action when informed that Stage II work failed inspection in the District Office.

Single-Stage Procedure

The quality control program in single-stage enumeration districts was similar to that in two-stage ED's except that one set of field reviews (Form F-243A, Record of Field Review, Single Stage) covered work on both the 100-percent and sample forms. The quality control performed in the District Offices was exactly the same, and the same forms were used as in two-stage ED's.

The Role of the Regional Program Technician

Throughout the entire census period, Technical Officers were to be visited periodically by a staff member from the permanent Census Bureau Regional Office. Each regional Program Technician, as he was called, was also responsible for administrative matters in about six District Offices.

During each visit with a Technical Officer, the Program Technician was to examine the various evaluation forms prepared by the Technical Officer and review the various quality control reports received by the Technical Officer from crew leaders and field reviewers. The Program Technician was to make a formal report of his observations to the Regional Field Director on a set of evaluation forms similar to those used by Technical Officers for evaluating crew leader activities.

Table 3.--Basic Data for Establishing Quality Control Acceptance Standards

Description of check	Unit inspected	Number of sample units inspected		Acceptance number		Enumerator's error rate when probability of acceptance is--		
		Estimated	Adjusted for intra-class correlation of errors	Estimated	Adjusted for intra-class correlation of errors	.95	.50	.10
<u>Stage I field review (Form F-243)</u>								
Sec. I, Check for missed units.....	Housing unit listings..	<sup>1</sup> 25	<sup>1</sup> 25	<sup>2</sup> 2	<sup>2</sup> 2	.03	.11	.20
Sec. II, Listing Book, part 1.....	Listing Book columns...	5	5	1	1	.07	.32	.58
Sec. III, Listing Book, part 2.....	Listing Book columns...	5	5	3	3	.34	.60	.89
Sec. IV, Population items review.....	Population items.....	288	175	16	10	.04	.06	.09
Sec. V, Housing items review.....	Housing items.....	180	110	12	7	.04	.07	.10
Sec. VI, Enumeration book-listing book agreement.	Number of persons re-corded.  .....	12	12	1	1	.03	.13	.27
Sec. II, Transcription to Stage II enumeration books.	Population and housing items.....	600	360	15	9	.02	.03	.04
<u>Stage II field review (Form F-244)</u>								
Sec. I, Listing Book.....	Listing Book columns...	40	25	2	1	.02	.07	.13
Sec. II, Household Questionnaire transcription.	Population and housing items.....	93	55	5	3	.02	.07	.12
Sec. III, Housing content.....	Housing items.....	58	35	3	2	.02	.08	.15
Sec. IV, Population content.....	Population items.....	223	115	10	6	.02	.05	.08
Sec. V, Enumeration book-listing book agreement.	Number of persons re-corded.....	4	4	0	0	.01	.13	.36
<u>District Office quality control</u>								
Stage I, basic content (F-267 and F-268).	Population and housing items.....	240	145	15	9	.04	.07	.10
Stage I, transcription to Stage II (F-278).	Population and housing items.....	675	405	24	15	.02	.04	.05
Stage II, sample content (F-280).....	Population and housing items.....	240	145	15	9	.04	.07	.10

<sup>1</sup>Rural areas. In urban areas crew leaders were to prelist 35 units.

<sup>2</sup>Urban areas, for first review. In rural areas the acceptance number was 1. In all areas the acceptance number for later reviews was zero.

## Reporting Quality Control Results

Twice weekly the Technical Officer was to prepare a summary of the results of the various quality control activities in his District Office. The District Supervisor was to submit this report to the Regional Office Director, who was to summarize the results from all the District Offices in his area on a form F-309, Regional Office Quality Control Report (two-stage areas), or a form F-308, Regional Office Quality Control Report for Single-Stage Areas. These summaries were to be telegraphed to Washington twice a week.

## The Basis for Establishing Acceptance Standards

The basic data for establishing acceptance standards for each section of the field review and for other inspections in two-stage areas are shown in table 3. Columns 1 and 2 are brief descriptions of the various checks to be made. Columns 3 and 5 show the number of elements inspected and the acceptance numbers for each check.

However, had operating characteristic curves been derived on the basis of these estimates, the discriminating power of the function would have been overstated. The "effective" sample size is less than these estimates because the elements inspected were not independently selected, but were sampled in clusters; hence, if one item was handled correctly in a household it is highly likely that it was handled correctly for all members of the household. Consequently, corrections were necessary in order to arrive at the adjusted numbers shown in the 4th and 6th columns of table 3. Where estimated and adjusted numbers were the same, independence was assumed for "successive trials." This adjustment, based on experience, reduced the actual sample to an "effective number" and would have reduced the acceptance number proportionately. Conceptually, the reduction factor is the ratio of the variance assuming independence between elements to the variance increased by the effect of the intra-class correlation of elements.

The effect of these adjustments on the operating characteristic curves for the individual review sections shown in the first column was to "flatten" them and pivot them through the point at which the probability of passing a particular check is .50; that is to say, the adjustments were in recognition of the fact that cluster samples decrease the discriminating power of the operating characteristic curves as compared with simple random samples.

The following table shows the conditions which determined each of three possible actions a reviewer could take after inspecting an enumerator's work:

Action to be Taken After Each Field Review According to the Number of Review Form Sections Failed: Stage I in Two-Stage Areas

Stage I field reviews	No further inspection until final review if--	Further inspection required if--	Enumerator's appointment terminated if--
First..	All sections passed.	1 or 2 sections failed.	3 sections failed
Second.	All sections passed.	1 section failed.	2 sections failed
Third..	All sections passed.	.....	1 section failed

Since the action taken by the reviewer depended on the combined result of the checks on separate sections of the review form, an approximate composite operating characteristic curve was computed to show the joint probability of an enumerator's passing each field review. Table 4 shows the joint probability of a Stage I enumerator's surviving each field review on the condition that he had survived all prior reviews.

For example, consider a Stage I enumerator whose error rate was such that he could pass the review sections shown in the first column of table 3 with probability of .75. His probability of being terminated at first review was between .08 and .11. The probability of acceptance was the sum of the probability of not failing any sections and the probability of failing one or two sections. In this example, the probability of not failing any sections was between .21 and .24; and the probability of failing one or two sections, which implied the need for further review, was between .65 and .71.

Experience with this type of plan in the 1959 North Carolina test census showed that an enumerator's probability of acceptance improves after the first review when his errors are pointed out to him and he is told to go over his work and correct all similar errors before the next review.

The enumerator was to pass all sections of the final review. This was not unduly stringent, because the sample of work inspected during final review was supposed to have been taken from all the work done by the enumerator, not only from that done recently; and thus the enumerator had been given the opportunity to correct his earlier errors. The practical consequences of an enumerator's failing final review may be summarized as follows:

1. If the reviewer believed that the enumerator could make the necessary corrections, the work was to be returned to him with instructions to correct it before he could be paid. Otherwise, the work was to be reassigned to another enumerator for correction, usually at an hourly pay rate.

## QUALITY CONTROL OF THE FIELD ENUMERATION

2. Stage I enumerators who failed the final review of an assignment were not to be recommended for Stage II work.

3. Stage II enumerators who failed the final review of one assignment were not to be allowed to work on other assignments.

Table 4.-- Probabilities for the Various Actions That Could be Taken in Field Review: Stage I of Two-Stage Areas

Average probability of passing a review section <sup>1</sup>	Kind of action taken by reviewer <sup>2</sup>	Probability of kind of action shown in column 2		
		First review	Second review	Third and subsequent reviews
.99	AN	.97	.97	.97
	AF	.03	.026 to .03	0
	T	0	0 to .004	.03
.95	AN	.770 to .775	.770 to .775	.770 to .775
	AF	.223 to .228	.196 to .207	0 to .005
	T	0 to .002	.023 to .029	.225 to .230
.90	AN	.58 to .59	.58 to .59	.58 to .59
	AF	.397 to .411	.330 to .344	0 to .01
	T	.009 to .013	.076 to .080	.41 to .42
.75	AN	.21 to .24	.21 to .24	.21 to .24
	AF	.65 to .71	.41 to .44	0 to .03
	T	.08 to .11	.35	.76 to .79
.50	AN	0 to .03	0 to .03	0 to .03
	AF	.48 to .50	.08 to .19	0 to .03
	T	.49 to .50	.81 to .89	.97 to 1.00
.10	AN	0	0	0
	AF	0 to .01	0	0
	T	.99 to 1.00	1.00	1.00

<sup>1</sup>Average taken over 5 of the 6 sections of the review. The first section, coverage check, was excluded since it was controlled differently.

<sup>2</sup>AN - Accepted; no further review until Stage I or Stage II final review.

AF - Accepted; further review scheduled.

T - Enumerator's appointment terminated.