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Subcommittee on Energy, Nuclear
Proliferation and Government Processes,
Committee on Governmental Affairs,
U.S. Senate

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DECENNIAL CENSUS

Pretests Could Be Used More Effectively in Census Planning

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The Honorable Thad Cochran
Chairman, Subcommittee on Energy,
Nuclear Proliferation and
Government Processes
Committee on Governmental
Affairs
United States Senate

Dear Mr. Chairman:

Your October 10, 1985, letter requested that we assist the Subcommittee in its oversight of the Census Bureau's 1990 Decennial Census planning efforts by monitoring the Bureau's 1986 pretest in Los Angeles, California, and Meridian, Mississippi. Pretests are a critical element in helping the Bureau meet its goals for the 1990 census and the final opportunity to identify improvements and to test procedures before major 1990 decisions are made. The relationship of the 1986 pretest to the Bureau's planning process for the 1990 census is discussed in appendix I.

In summary, we found that the pretest was generally completed as planned and on schedule. However, we believe that the Bureau could do more to improve information available at the time 1990 decisions are made. Accordingly, as detailed in appendix III, we are making recommendations to improve the Bureau's planning activities and decisionmaking for the 1990 census and future decennials.

The 1986 pretest, the second of three full-scale 1990 test censuses, examined different enumeration and data processing options under census-like conditions. The Bureau selected East Mississippi and Central Los Angeles County for the pretest sites due to the mix of city and rural mail delivery, the ethnic mix of the population, the number of housing units, and the rate of unemployment.

The Bureau experimented with different office configurations in the two test sites. In Los Angeles, the Bureau separated the data collection and processing functions. Two collection offices, in the cities of Bell and Compton, obtained data from households which did not mail back the census form. Questionnaires returned by mail were processed at the Bureau's processing office in Laguna Niguel--about 60 miles from the collection offices. In Mississippi, a combined collection/ processing office performed all test activities.

This report is based on observations of the pretest operations in Mississippi and Los Angeles; discussions with Bureau officials in headquarters and in the field offices; and review of the 1986 pretest planning meeting notes, field observation memos, management cost and progress reports, and evaluation documents. We also reviewed the Bureau's plans and decisions for the 1990 census. Our report covered the 1986 pretest through August 1986 and does not reflect Bureau decisions after that date. Our work was conducted in accordance with generally accepted government audit standards.

We observed some new processes that merit consideration for 1990, and some problems that require further attention before that time. New follow-up procedures, such as centralized recruitment and daily management reports, helped assure sufficient staffing and timely completion of the follow-up operations. On the other hand, insufficient preparations resulted in the following problems:

-- Unclear contract specifications for printing vendors contributed to questionnaire delivery mix-ups.

-- A lack of coordination with the U.S. Postal Service resulted in the questionnaires not being presorted as planned in Los Angeles.

-- Limited testing of software programs for some activities, such as correction keying and management information reports, resulted in technical difficulties requiring revised keying procedures and managing by manual reports.

The Bureau overcame most of the operational problems by relying on technical assistance and support from headquarters and regional staff members. A similar level of experienced technical support, however, will not be available in 1990 to assist the large number of field offices. Thus, it is important to identify and resolve some of the seemingly minor problems experienced during the pretest which could present major problems on a nationwide scale in 1990. Our detailed observations of the 1986 pretest are discussed in appendix II.

While many important lessons were learned from the pretests, the tests are beneficial only to the extent that these lessons are considered in the 1990 decisionmaking process. For example, no evaluations of the 1986 office configurations or data capture technologies were available for the Bureau's two 1990 decisions on these matters announced in April 1986: (1) to establish 10 to 14 processing offices and (2) to use a modified

1980 Film Optical Sensing Device for Input to Computer (FOSDIC) technology. The Bureau ruled out combined collection/processing offices and decentralized data keying of all questionnaire data without evaluation results even though these procedures were tested for the first time in the 1986 pretest. The other potential 1990 data capture technology, Optical Mark Recognition (OMR), also excluded for 1990, was not fully evaluated in the 1985 pretest.

The Bureau budgeted $18.1 million for the 1986 pretest; however, it did not collect complete cost and productivity data from the 1986 pretest to assist in projecting 1990 costs. Some direct costs from the pretest were charged to 1990 projects or indirect cost accounts, which resulted in underreporting the 1986 pretest costs. Without reliable cost and workload data, the Bureau will not be able to compare the cost-effectiveness of alternatives for pending 1990 decisions, such as questionnaire delivery by census employees or U.S. Postal Service carriers. As a result, the Bureau may not fully realize its 1990 goal to contain costs to 1980 levels.

As discussed in appendix III, we believe that the Bureau could improve its timing and use of test results. We recommend that the Bureau place more emphasis for its remaining 1990 tests on (1) obtaining complete and accurate cost and productivity data and (2) integrating planning and test results to include test evaluations in the decisionmaking process. Also, the Bureau could improve future decennial planning by beginning tests earlier or conducting more special tests.

We provided the draft report to the Department of Commerce for review and included the Department's comments and our evaluation of those comments in appendix IV. Generally, the Department agreed that the report recommendations focused on important test objectives. It also indicated that it is taking steps to begin earlier planning and testing for the 2000 census. The Department acknowledged that it was not able to collect complete data or to analyze all test results; however, the Department said that necessary information from the 1986 pretest was available in time to make major 1990 decisions.

We believe that all necessary data was not available. As we discuss in appendix III, the Bureau did not have formal evaluations for two major objectives of the 1986 pretest to decide the 1990 office structure and processing technology. We believe that the Bureau could improve tests' contributions to 1990 and future decennial planning efforts by collecting sufficient data to evaluate test results and by using these results to assist decennial decisionmaking.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time we will send copies to the House Subcommittee on Census and Population; other appropriate congressional committees; the Secretary of Commerce; and the Director, Office of Management and Budget. Copies will be made available to other parties upon request.

If you have any questions about this report, please call Gene Dodaro on 275-8387.

Sincerely yours,

W. J. Anderson

William J. Anderson
Assistant Comptroller General

Contents

ABBREVIATIONS

ACF	Address Control File
CCAP	Census Community Awareness Program
FOSDIC	Film Optical Sensing Device For Input To Computers
GAO	General Accounting Office
OMR	Optical Mark Recognition

ROLE OF 1986 PRETEST IN 1990 PLANNING

Conducting a full-scale decennial census is a monumental, costly task, which poses a considerable challenge to the Census Bureau. For the 1980 census, the Bureau processed 88 million questionnaires containing 3 billion items of data about the Nation's 226.5 million persons and their housing. It required a temporary work force of over 280,000 persons, and cost about $1.1 billion. The Bureau expects the processing workload to increase to an estimated 106 million questionnaires in the 1990 decennial. GAO estimated in a prior report (GGD-82-13, Feb. 22, 1982) that the 1990 decennial could cost as much as $4 billion dollars.

Many important decisions for the 1990 census, such as the determination of the field office configurations and the automated data processing equipment, have been or will be made in 1986. The Bureau has established a planning process to guide its decisionmaking in which testing and evaluation are significant components. Even though the 1990 census will mark the 200th anniversary of census-taking in this country, each decennial requires continual updating to take advantage of technological advancements and to address changes in the work force, information needs, and cost requirements.

THE 1990 PLANNING CYCLE

While funding for the 1990 census formally began in 1984, the Bureau informally began planning the 21st decennial even before the 1980 census was completed. During planning, the Bureau analyzed problems experienced in past censuses, identified new techniques for study, established goals for 1990, and developed a schedule of decision dates. In the first planning phase, the following major 1980 census problems were identified:

-- Delays in data dissemination.

-- Slow, error-prone clerical operations.

-- Difficulties hiring and retaining a sufficient number of qualified employees.

-- Unforeseen occurrences such as a New York transit strike, the eruption of Mt. St. Helens, and fires in two district offices.

-- Numerous lawsuits filed challenging the accuracy of the census counts.

In the second planning phase, some of the potential 1990 improvements identified for further consideration included new automation techniques such as the automated production of census maps, an automated address control file, and computer-assisted telephone interviewing which allows respondents' answers to be directly entered into a computer during a telephone interview. Also, the Bureau considered procedural improvements such as converting questionnaire data to computer files earlier in the census process. In 1980, questionnaires were shipped from the district offices to one of three processing sites for automated data capture only after each district received and reviewed all of its questionnaires.

Based upon its internal review, the Bureau established the following major goals to guide its 1990 decisions:

-- Meet all legal deadlines for providing data for reapportionment and redistricting.

-- Conduct the 1990 census without increasing per housing unit cost in 1980 dollars.

-- Expedite the availability of data to users.

-- Maintain a high rate of overall coverage and improve the accuracy of small-area data while reducing the rate of undercount for different population groups and geographic areas.

-- Maintain the confidentiality of census data to ensure a high level of public trust and cooperation.

-- Strike an appropriate balance between the time it takes respondents to complete the questionnaire and the need for information by census data users.

As a final planning step, the Bureau set milestone dates for making critical decisions to achieve these goals and established a series of tests to provide data for decisionmaking.

The Bureau's series of tests to improve established census procedures and to test new operations for 1990 began in 1984 and will continue through 1988. The tests include (1) special purpose tests designed to focus on specific census functions, such as address list development and questionnaire content; (2) three full-scale test censuses characterized by the Bureau as "laboratories" for trying out, under census-like conditions, different enumeration and processing options; and (3) the 1988

dress rehearsal, a dry run of the 1990 census, designed to fine-tune the census procedures and techniques.

RELATIONSHIP OF THE 1986 PRETEST TO 1990 GOALS AND DECISIONS

The 1986 pretest in East Central Mississippi and Central Los Angeles, California, was the second "laboratory" test census in the 1990 planning cycle. It will be the largest test before the 1988 dress rehearsal, containing more objectives and more housing units, and will cost more than $15 million to implement. The Bureau developed objectives for the 1986 pretest census which relate to the overall major goals set for 1990.

The Bureau further developed the pretest objectives by identifying specific procedures and evaluations to be included in the Mississippi and California tests. The following examples illustrate the relationship between recognized problems, decennial goals, pretest objectives, new or refined techniques in the areas of automation and census procedures, and the scheduled 1990 decision dates.

Automation

-- Recognized problem: activities associated with collecting and processing census questionnaires have been time-consuming, paper- and people-intensive tasks.

-- 1990 goals: produce data products in a more timely manner than in past censuses, and provide population counts to meet legal deadlines.

-- 1986 pretest objective: examine new techniques for automating questionnaire processing.

-- New/refined techniques: (1) use an automated Address Control File, laser sorters, and hand-held wands to check-in returned questionnaires; (2) use "concurrent processing" to begin early data capture as soon as questionnaires are received.

-- 1990 decision date: September 1986 - make final decisions on processing office configurations and automated equipment.

Census procedures

-- Recognized problems: must improve census accuracy by (1) delivering questionnaires to the correct households in

rural areas; (2) resolving discrepancies in census counts with local officials to avoid legal disputes.

-- 1990 goals: maintain a high rate of overall coverage and improve the accuracy of small-area data.

-- 1986 pretest objectives: (1) improve rural address list development and questionnaire delivery; (2) improve local governments' participation in the Local Review Program; (3) examine the feasibility of adjusting census counts.

-- New/refined techniques: (1) compare the Postal Service's review and update of addresses and delivery of questionnaires in half of the rural areas to delivery by Bureau employees in the other half; (2) conduct both a precensus and postcensus local review with training workshops to explain the review process and preparation of review materials; (3) conduct a pre-enumeration survey and a post-enumeration survey to measure the accuracy of the population count and to determine whether to adjust census counts.

-- 1990 decision date: (1) September 1986 - determine delivery/enumeration methodologies; (2) December 1986 - determine specifications for local review; (3) January 1987 - determine criteria for adjusting population counts.

WHAT HAPPENED DURING THE 1986 PRETEST?

The Bureau's 1986 pretest was intended to provide some insights into the potential planning, implementation, and evaluation requirements necessary to conduct a census. Although the conditions of the pretest may not be representative of a national census, the pretest provides the opportunity to identify both potential problem areas which could have significant impact on a decennial census and successful techniques which should be incorporated in 1990 plans.

From our observations of the 1986 pretest in Meridian, Mississippi, and Los Angeles, California, as well as the preparations and evaluations at Bureau headquarters, we have identified some activities which are potential improvements for 1990 or which require further attention before 1990. The potential effect of some activities we observed could not be determined because of unavailable information or evaluations. While most of the pretest operations have been completed, some pretest evaluation results will not be available until 1987.

TIMELINESS PROBLEMS HINDER PLANNING EFFORTS

Planning a test census, which addresses numerous complex and often interrelated issues, entails a massive internal coordination effort. The Bureau's planning of the 1986 pretest began around November 1984 and involved many Bureau staff members. Planning meetings were generally held at least weekly with representatives from the various Bureau divisions. These groups met to discuss what needed to be done and how it should be done and to resolve any potential problems. Once decisions were made, detailed work began on developing the necessary procedural manuals, training programs, software programs, and report forms. Twenty-two people from 18 Bureau divisions were designated as 1986 Test Census Coordinators to ensure that preparations were completed on schedule.

The Bureau devoted considerable time and resources to planning the 1986 pretest which generally resulted in complete preparations. However, certain operations were affected by insufficient lead time, resulting in the following problems.

-- Delays in selecting contractors resulted in hurried preparation of contract specifications for the printing vendors. The contract did not contain specific requirements for sorting, packaging, and shipping the census questionnaires, which contributed to questionnaire delivery mix-ups.

-- Some software programs, such as the programs for correction keying and management reports, were not tested and debugged and did not perform as intended.

-- Some procedural manuals, originally scheduled for availability in November 1985, were not completed until just before implementation. Delayed delivery did not provide time for review and adequate training of field staff in operations such as edit review.

These problems did not pose insurmountable difficulties during the 1986 pretest because headquarters staff provided extensive assistance. The Bureau can avoid these problems for the 1990 census through more timely development of procedures, longer lead times for software development, and better coordination efforts with contractors and the U.S. Postal Service.

In addition, several major changes in the Bureau's 1986 pretest plans reduced the degree of innovation planned.

1. Plans to involve the Ad Council in market research for media promotion were dropped because the Bureau could not name the Ad Council as sole source for this service.

2. Plans to use Optical Mark Recognition (OMR) equipment as a potential 1990 data capture technology were also dropped due to inadequate planning to comply with procurement regulations.

3. Operations in the Los Angeles South Collection Office were cancelled about 2 weeks after census day because the mail response rate was lower than expected and the resulting cost of the nonresponse follow-up workload would have exceeded the allotted budget.

Although these changes did not detract from the completion of other pretest plans, the opportunity to learn more about OMR technology and advertising effects was lost. In addition, as we discuss on page 23, the opportunity to establish different procedures in the two Los Angeles collection offices for control group purposes was not included in the pretest plans.

MOST PRETEST OPERATIONS COMPLETED ON SCHEDULE, BUT SOME IMPROVEMENTS ARE NEEDED

The pretest in East Central Mississippi and Los Angeles consisted of a series of operations performed under census-like conditions to develop address lists of housing units, enumerate the population, capture and process census questionnaire data,

and evaluate census coverage. The Bureau experienced some management, coordination, and software problems but generally completed the operations in a timely manner. However, the Bureau had to rely on technical assistance and support from headquarters and regional staff to overcome implementation problems.

Due to this support, the timely completion of pretest operations may not reflect what the Bureau can expect in 1990. In a decennial census, these technical and support resources would not be available to support the large number of collection and processing offices. Thus, it is important for the Bureau to identify and solve some of the seemingly minor problems experienced during the pretest which could present major problems in a decennial. A discussion of the problems and successes experienced during the pretest is presented below.

Outreach and publicity

According to the Director of the Bureau, public cooperation and support is essential for conducting a successful census. At both the Los Angeles and the Mississippi test sites, the Bureau planned a Census Community Awareness Program to encourage timely and complete participation in the census. The program included general media coverage (television, radio, and newspapers) and special efforts designed to reach hard-to-enumerate areas and groups, such as apartment building residents, low-income households, and minorities. Although similar outreach activities were conducted in both sites, some differences occurred, such as the use of billboard advertisements in Mississippi and foreign language materials in Los Angeles.

The results of the tests were mixed. The Bureau experienced good public cooperation and support in Mississippi; however, the cooperation and support were not as apparent in Los Angeles. The mail response rates, one indication of public support, are shown in table II.1.

Table II.1:
Planned and Actual Mail Response Rates

Test sites	Mail response rates	
	Planned	Actual
	(percent)	
East Central Mississippi	55.0	66.6
Los Angeles: North Office	50.0	42.4
South Office	45.0	33.2

Information is not available to determine to what degree the lower than planned Los Angeles response rates were caused by problems in the Bureau's outreach efforts. Some outreach

material was not effective because of poor foreign language translations and untimely delivery to the Los Angeles test site. According to the Los Angeles publicity and outreach specialists, a low mail response rate is not necessarily an indicator of ineffective outreach efforts. They believed other factors beyond the Bureau's control contributed to the low rates, as follows:

-- Some households received incomplete mailing packets, missing either the census questionnaire, instructions, or return envelope.

-- Network stations in central Los Angeles were reluctant to broadcast census messages because the test area contained a small segment of their audience.

-- Billboard space was not donated for census use.

-- Minimal support was received from local public officials and from community groups.

-- A predominant religious group in the test area did not fully endorse the pretest because of past census problems regarding the discovery and deportation of illegal aliens.

The Director of the Bureau, and other Bureau officials, expect that public cooperation and support will be more favorable during the 1990 census because of better focused, nationwide publicity and outreach efforts.

Questionnaire delivery

The Bureau tested different questionnaire delivery techniques in the pretest sites. In Los Angeles, the Bureau contracted with the U.S. Postal Service to deliver census packets to housing units as it did during the 1980 census. In the Mississippi test site, the Bureau tested a new questionnaire delivery procedure called update list/leave during which enumerators delivered questionnaires and concurrently updated the rural address list. For evaluation purposes, the Bureau divided the Mississippi test area into two panels of about 40,000 housing units each. In one panel, census enumerators delivered census packets to housing units, and the U.S. Postal Service carriers delivered census packets to housing units in the other panel.

During implementation of the questionnaire delivery tests, the Bureau experienced problems resulting from the lack of coordination and communication between the Bureau, its questionnaire printing vendor, and the U.S. Postal Service. In Los Angeles, the Postal Service did not deliver all the census

packets on March 14, as scheduled. Some questionnaires were delivered early, which resulted in some census questionnaires being returned to the processing office a week before census day. In addition, some area residents complained to the Bureau that they did not receive census packets. Others complained that their census packets were incomplete, missing either the return envelopes or the questionnaires. Most of the residents who notified the Bureau that they did not receive questionnaires did get mail reminder cards which indicated that their addresses were on the Bureau's address file.

In Mississippi, the Bureau also experienced delivery problems and had about 4,770 undeliverable questionnaires. Both postal carriers and census enumerators had difficulties locating housing units due to incomplete or incorrect addresses. These problems indicate that better quality control procedures were needed in the Bureau's address list development operations, particularly in prelist where the Bureau initially developed the address list.

Also, in the Mississippi panel with postal carriers, some questionnaires and mail reminder cards were delivered by March 5, 1986, 8 days before the scheduled delivery date. According to one postal official, 15,000 questionnaires and some of the mail reminder cards were delivered early primarily due to improper packaging and labeling. Thus, the U.S. Postal Service could not correct the address list as planned. In addition, this situation created considerable confusion among some area residents who received reminder cards before receiving questionnaires.

In addition to the problems with the incorrect address listings, the enumerators delivering questionnaires in the Mississippi update list/leave panel also had problems using the census maps to locate housing units. In some cases, the census maps did not correctly show roads, road names, physical landmarks, and housing units. Also, some of the maps were torn, mutilated, smudged, or illegible. Some enumerators could not read maps and did not receive sufficient training in reading and correcting maps. Problems with the incorrect addresses and poor map quality also affected follow-up operations.

Nonresponse follow-up

The Bureau considers nonresponse follow-up to be one of the most difficult and challenging parts of census-taking. This operation involves obtaining questionnaires from households that failed to return them by mail. This operation was scheduled in both Los Angeles and Mississippi and was designed to test new management control procedures at both sites, including the use of

centralized recruitment and the use of incentive pay for enumerators and crew leaders.

Bureau officials credit new procedures and increased management control for the successful completion of the nonresponse follow-up operations. Despite some problems discussed below, nonresponse follow-up was implemented and completed 1 week earlier than scheduled in Mississippi. Since the nonresponse follow-up workload in Los Angeles was greater than expected due to the low mail response rate, the follow-up was completed 1 week later than scheduled.

Centralized recruiting

Both pretest locations, Los Angeles and Mississippi, used centralized selection of enumerators by office clerks; whereas in 1980 the supervisors, or crew leaders, selected their own crew members. Both offices were able to hire a sufficient number of temporary workers to conduct nonresponse follow-up. However, the Los Angeles North Collection Office had to hire 178 more enumerators than the 300 positions initially budgeted to compensate for the low mail response rate. Also, the office was not fully staffed during the first 2 weeks of the operation due to a daily attrition rate of about 15 enumerators. One factor contributing to the high attrition rate may have been the high number of part-time workers who rarely met production standards and who quit or were terminated.

Late mail return lists

The Bureau did not take advantage of computerized lists of questionnaires received late to reduce the nonresponse workload. The Los Angeles North Collection Office did not delete the 5,047 late mail return questionnaires from the assignment lists until the last week of the nonresponse operation. As a result, enumerators made personal visits to households that had already mailed back questionnaires. Supervisors said that they could have reduced these unnecessary visits if the lists had been available earlier. Similarly, in Mississippi, after the initial address registers were compiled, the Bureau did not use additional late mail return lists to reduce the nonresponse workload. According to a supervisor, the processing office could have generated daily late mail return lists to update the address registers, thus eliminating enumerator visits to 5,425 households that had returned questionnaires.

Incentive pay

In both locations, the Bureau tested an incentive pay system for enumerators and crew leaders who consistently met or exceeded

production quotas. In Mississippi, 127 of the 348 enumerators and 27 of the 32 crew leaders received production bonuses. In Los Angeles, 229 of the 616 enumerators and 51 of the 130 crew leaders received production bonuses. Several field operation supervisors in Los Angeles felt they were not adequately compensated for extra hours they worked without pay and suggested that the Bureau should have offered bonuses to them as well.

Data processing

One of the Census Bureau's major goals for the 1990 decennial is to increase the use of automation to help release data products in a more timely manner, improve accuracy, achieve greater cost-efficiencies, and give the Bureau more control over the entire census process. In the 1986 pretest, the Bureau tested different methods of processing questionnaire data in the processing offices in Laguna Niquel, California, and Meridian, Mississippi; however, support operations, such as edit review and telephone follow-up, were similar for both sites.

Check-in

The two processing offices tested different automated check-in procedures with mixed results. During check-in of mail returns, the barcode identification number on each questionnaire was "read" by either a hand-held wand or a laser sorter. For unreadable barcodes or addresses with handwritten corrections, clerks keyed in the addresses. These identification numbers and address corrections were then matched to the Address Control File (ACF) to update the master address list and generate field follow-up assignments. During check-in related operations, questionnaires were removed from envelopes and sorted into batches for further processing.

In Mississippi, the check-in operation generally progressed as planned. Clerks manually opened and sorted questionnaires into batches by short and long form. During check-in, keyers first read the address barcodes using hand-held wands and then keyed in the respondents' surnames. Due to the large number of address corrections and additions from the update list/leave operation, two keyers were added to the second check-in shift. According to a time and motion analyst, each check-in keyer processed more than 350 forms per hour as compared to 500 forms per day per clerk during the 1980 clerical check-in. One Bureau official suggested that by separating the wanding and surname keying operations for the 1990 census, the Bureau could increase the wanding production to 900 forms per hour. In commenting on a draft of this report, the agency suggested that separation of these two tasks could possibly reduce the joint production rate because the identification number would have to be captured

twice. We believe the efficiency of separating these procedures will not be known until it is tested.

At the processing office in Laguna Niguel, California, however, backlogs developed in both the check-in and batching operations. During check-in, a laser sorter machine read the address barcodes and sorted the questionnaires by short and long form. Due to a lack of coordination with the U.S. Postal Service, questionnaires were not presorted by North or South collection office. As a result, the processing office initially used a 24-pocket sorter instead of the 6-pocket sorter, which required additional time and clerks to operate. According to time and motion data, pretest clerks using the 6-pocket sorter processed about 900 forms per hour, while permanent Bureau employees averaged about 4,200 forms per hour using the sorter in the 1985 pretest.

The next operation, batching, was also delayed due to insufficient staffing and difficulties with the procedures. During batching, the clerks removed the questionnaires from envelopes and counted them into batches for the various types of data capture processing. Since the batching operation was backlogged by the end of the first week, the processing office temporarily assigned 21 edit review clerks to reduce the backlog. As a result of the backlog, the start of the automated data capture processing was delayed by 4 days.

Data capture

The Bureau tested different data capture procedures in each processing office. In Laguna Niguel, long forms from the North Collection Office were keyed, while all short forms and long forms from the South Collection Office were filmed using a modified version of the Bureau's 1980 FOSDIC technology. The FOSDIC technology involves three distinct processes: first, the questionnaires are microfilmed; then the film is developed; and lastly, the film is read by a scanning device. In Mississippi, all questionnaire data was entered into a key-to-disk minicomputer system. While some adjustments were required, the data capture operations at both sites generally proceeded in a timely manner.

In Laguna Niguel, the filming operation took longer than planned due to several factors including poor paper quality, the long form questionnaire's uneven cut, and the insecurely stapled long form booklets. To overcome these problems, the office added four clerks to manually repair the booklets whose cover pages were ripped by the camera unit. The paper quality differed among the questionnaires, thus technicians had difficulties adjusting the camera unit to accommodate the difference. In addition,

because of the unevenly cut edges, the camera unit sometimes attempted to turn more than one page of the booklet at a time, which required camera operators to manually film some questionnaires, thus slowing the filming process. However, with the reduced workload, the operation was completed without backlogs.

In Mississippi, Bureau officials considered the data capture keying operation very successful. After a 6 day training session, the keyers consistently met or exceeded production rates. For quality control purposes, the Bureau tested a software program designed to chart each keyer's performance based on error rates and error fields. Using these daily reports, supervisors were able to monitor each keyer's performance, identify problem areas, and prevent recurrences.

Edit review

The edit review consisted of both an automated edit to identify questionnaires which had incomplete or incorrect data and a clerical review to attempt to repair those questionnaires failing the automated edit. At both sites, the automated edit software generated a listing by identification number of failed questionnaires which clerks then used to locate the questionnaires. According to Bureau officials, the automated edit was faster and more consistent than the 100 percent clerical review used in the 1980 census.

The clerical edit review operation is an example of how implementation of similar procedures in two different locations can have dissimilar results. In Mississippi, the edit review operation experienced difficulties, creating backlogs and delaying subsequent operations. The quality control clerk rejected the first 10 batches processed, and due to continued poor quality, the office stopped the operation after 2 days. The edit review clerks received an additional 8 hours of training, and headquarters personnel reviewed all edit repairs before transmitting batches. Even with additional training, problems persisted, and the backlog eventually exceeded 150 batches.

As a result of the severe backlog, the office had to release all but four data keyers for a lack of work and delayed the telephone follow-up operations for 2 weeks. The Bureau planned to train seven telephone follow-up clerks to help reduce the backlog, but determined it would be more efficient to send five people from headquarters who were experienced in the edit review process to resolve the problem. It took the staff approximately 50 hours to reedit the batches and transmit the backlog.

In Laguna Niguel, the processing office had to delay the clerical edit review for 2 weeks, in part because procedural manuals were not available by the scheduled starting date and also because the edit review clerks were temporarily assigned to the batching operation. Even with these delays, the clerical edit review in Laguna Niguel was completed without the problems experienced in Mississippi. However, the Bureau did not adequately plan the telephone follow-up work schedule to cover evening and weekend hours for the questionnaires that failed edit review. As a result, the staff worked approximately 355 overtime hours on evenings and weekends to complete the operation on time. According to an office supervisor, the overtime could have been avoided if a part-time shift had been planned initially.

Software problems

The Bureau did not allow sufficient lead time to adequately test software programs before usage. As a result, many software programs initially did not work, and some operations had to be modified. To resolve these problems, headquarters staff provided technical assistance and support to the pretest sites. However, these resources would not be available to support a large number of offices, and problems such as those encountered in 1986 could adversely affect processing operations in 1990 due to the large workloads and the time constraints.

In Laguna Niguel, several software programs were completed 1 to 7 days before the operations were scheduled to start. Because the software was not tested, programmers from Bureau headquarters were on-site at the processing office to correct errors while the programs were being used. For example, the computer system did not initially print results from the surname keying operation, but headquarters programmers were able to resolve the problem.

Similarly, software problems in Mississippi resulted in downtime almost daily, during which keyers could not update the Address Control File (ACF). In several instances, the system "lost" all the address corrections and changes, and the check-in clerks had to reenter the data. Headquarters programmers were in Mississippi during most of the check-in operation to resolve these problems. While these difficulties created no significant backlogs, the Bureau did have to authorize overtime to complete check-in operations so that nonresponse follow-up would begin as scheduled. Further, to assure the accuracy of checked-in questionnaires, a clerk was assigned to manually compare identification numbers with computer-generated reports.

Due to software problems, the Bureau had to modify some procedures. In Mississippi, the correction keying software required 15 minutes to an hour to search and locate

questionnaires in the data base, thus creating a backlog and idle keyers. Programmers from headquarters were not able to solve the problem even though they identified the source. As a result, keyers had to rekey all questionnaire data rather than keying only corrections. Additionally, due to installation difficulties in Mississippi, the edit review software required modifications, and the revised clerical procedures were not available until 2 days before implementation.

Automated management reports

The Bureau used multiple management information systems to monitor the daily progress of various collection and processing operations. As a result of insufficient software testing discussed above, automated management reports were not always available as planned during the test, and managers had to rely on manual reports. Also, automated management reports were not always timely or accurate. In some instances, different information systems reported inconsistent data about the same operation. Thus, managers in headquarters and in the field offices did not have consistent data on the pretest activities. Some examples of reporting problems are discussed below.

-- Automated reports from the collection control file were not available in Mississippi for the nonresponse and failed edit follow-ups. As a result, collection office staff had to rely on manual reports and telephone the results to headquarters.

-- Lost computer data resulted in inaccurate and untimely progress reports in the Los Angeles North Office. An assistant manager blamed the computer software for data losses and estimated that 5 percent of the data had to be rekeyed. At one point, the collection control file reporting cycle had a 5-day lag, which limited the reports' utility to field supervisors. One supervisor stated that the reports, while promoting conversation between himself and his crew leaders, were not accurate enough to use for management decisions.

-- Due to software problems, the ACF in Mississippi could not transmit data for several weeks, and processing office staff had to manually compile reports and telephone the results to headquarters.

-- Management information reports on the status of the data capture workload in Laguna were not consistent with raw data from the ACF. For example, 4 weeks after Census Day the ACF reported 40,295 forms were data captured,

while the management information system reported 26,109 forms were data captured.

Bureau officials recognized the data problems created from multiple reporting systems and stated that they plan to integrate reporting on one data base for 1990.

Coverage Evaluation

The Bureau planned to conduct three separate sample census surveys during the pretest to test techniques to assess and improve the accuracy of census coverage and, ultimately, to adjust census counts. Two surveys, one pre-enumeration (before census day) and one post-enumeration, were scheduled for the Los Angeles test site; and one post-enumeration survey was scheduled for the Mississippi test site. The surveys consisted of two main operations: (1) listing the addresses of a sample of housing units and (2) interviewing the listed households. A third operation, matching the survey data and census data to determine accuracy, is scheduled for completion in early 1987.

We found that the Bureau experienced planning and management problems implementing the Los Angeles pre-enumeration survey. The listing and interviewing operations were completed 2 weeks later than scheduled because of recruitment difficulties and high enumerator turnover. Misunderstanding between the Bureau's Los Angeles Regional Office and the Los Angeles Collection Offices over recruitment responsibilities contributed to the recruitment problem. To overcome staffing problems, the Bureau assigned 13 regional interviewers to complete the survey. Also, the Bureau fell 3 weeks behind schedule in implementing quality control procedures for the interviewing phase.

Both of the post-enumeration survey operations in Los Angeles and Mississippi were completed ahead of schedule without staffing or quality control problems. However, some households complained about repeated census-related interviews. The results of these surveys and the pre-enumeration survey will not be available until early 1987.

WHAT DID THE BUREAU LEARN FROM THE 1986 PRETEST?

The Bureau obtains data about the 1986 pretest through several methods, including informal observations, formal evaluations, and cost and progress reports. The Bureau could use such data to determine the feasibility and cost-effectiveness of various test operations in planning the 1990 census. However, the Bureau does not fully use evaluations to analyze pretest results. For some operations, such as incentive pay and

outreach, the Bureau did not specify control groups or other criteria against which to assess effectiveness.

Due to problems with the management information reporting during the pretest as discussed on page 20, the Bureau does not have complete information on the pretest activities and results. Also, data was not always collected to identify why pretest operations were not completed as planned or to compare differing results at the pretest sites. Furthermore, incomplete and inaccurate cost data resulted in underreporting of 1986 pretest costs. Without accurate cost data, the Bureau may not be able to assess the cost-effectiveness of pretest operations or to project costs for the 1990 census.

Informal Observations Insightful, But Data Cannot Be Generalized

Although the 1986 pretest is still underway, informal observation reports are available for most pretest operations. These reports document headquarters staffs' observations of field work performed by temporary employees during pretest site inspections. Based on these observations, headquarters staff may recommend changes to refine training material and procedural manuals. Although observers document where procedures are not implemented as planned or other problems encountered during an operation, informal reports do not contain data to determine the magnitude of these problems. Such reports, which may be based on observations of one or two enumerators or a few hours at a processing or collection office, include limited data which may not be representative of an entire operation.

Since these informal reports are available months before the formal evaluation of an operation, Bureau officials may tentatively conclude whether or not an operation is feasible for the 1990 census based on personal observations. For some operations, such as the collection control file or the combined processing/collection office configuration, the Bureau has not planned any formal evaluations. In these cases, Bureau officials must base any decisions for the 1990 census on informal observations and debriefings of pretest field staff.

Formal Evaluations Not Planned To Fully Analyze Pretest Results

The Bureau planned to conduct more than 60 formal evaluations of the feasibility and cost-effectiveness of pretest operations. However, poor evaluation design for some evaluations and incomplete data collection may limit the Bureau's use of 1986 pretest results. Most evaluation results will not be available until late 1986 or early in 1987, which may be too late for some

1990 decisions, such as the selection of 1990 office configurations and automation equipment.

The Bureau did not always specify control groups or criteria against which to compare the effectiveness of alternative procedures. For pending evaluations of mail reminder cards and motivational inserts, the research designs included control groups for comparison with the panels receiving the items. The Bureau did not take advantage of the two collection offices in Los Angeles to test new procedures such as an incentive pay system for nonresponse follow-up crew leaders and enumerators. Without comparable data from a control group, the Bureau may not be able to assess the impact of the bonus system on productivity or staff turnover. Similarly, the Bureau did not specify quantifiable criteria or conduct market research to compare the cost-effectiveness of various outreach activities.

The Bureau conducted about 30 time and motion studies of various collection and processing office operations to determine production rates for use in budgeting and staffing for the 1990 census. However, this productivity data may not be representative of actual census conditions since the pretest processing workloads were small. Also, time and motion analysts collected data at the start of an operation when temporary staff were still learning the procedures, therefore the resulting data may not be representative of production by more experienced clerks during the more lengthy 1990 operations. One Bureau official suggested measuring the production at the start and end of an operation to identify the "learning curve" during which inexperienced clerks do not perform at full production.

The Bureau does not always collect data to identify why operations are not completed as planned or to compare differing results in the test sites. As part of the urban Census Community Awareness Program (CCAP) evaluation, a survey of households in the Los Angeles test sites identified reasons for the low mail response rates in the urban area. However, the Bureau did not evaluate the rural outreach program or survey rural households to determine why the mail response rates were higher than expected in Mississippi.

Also, the Bureau does not have data to explain why 27 percent of those households contacted during the Los Angeles CCAP survey claimed they did not receive questionnaire packets. Furthermore, the Bureau does not know how many questionnaires were not delivered correctly by the Postal Service or census enumerators in the Mississippi site. Without complete data, the Bureau may not be able to compare the effectiveness of the two techniques for delivery in a rural area.

1986 Pretest Costs Are Underreported

The Bureau reports spending about $15 million dollars of the $18.1 million dollars budgeted for the 1986 pretest as of August 31, 1986. However, this figure does not include all 1986 pretest costs. As a result of charging some direct costs for 1986 pretest work to 1990 projects and to interfund projects (indirect cost accounts), the Bureau underreported the 1986 pretest costs. Because interfund costs are redistributed to all Bureau projects, charges to interfund projects for pretest work cause pretest projects to be undercharged and other projects to be overcharged. Following are examples of costs incorrectly charged.

-- Salaries and expenses for three regional office outreach staff were charged to an interfund project, even though one outreach specialist worked full-time on the 1986 pretest and two regional office outreach coordinators worked part-time on the pretest.

-- Salaries and expenses, other than travel, for time and motion studies of 1986 pretest operations were charged to an interfund project.

-- Costs for purchases, leasing, and maintenance of automated equipment acquired for the 1986 pretest were charged to 1990 projects rather than to the pretest.

The Bureau's cost reporting systems and evaluations do not always provide data necessary to evaluate the cost-effectiveness of pretest operations. Without reliable cost and workload data, the Bureau may not be able to compare the cost-effectiveness of alternative operations or to project costs for the 1990 census. The following are examples of incomplete or inaccurate cost data.

-- Collection office staff mischarged operation codes. As a result, the costs of some operations will be overreported while other operations' costs will be underreported.

-- Headquarters' divisions generally do not use operation codes, so pretest planning costs cannot be accurately related to various operations.

-- The formal evaluation of the rural prelist reported that the operation cost $88,472. However, this figure included only the field costs for enumerator salaries and expenses, but excluded salaries and expenses for crew leaders, clerks, and headquarters staff. Charges to the entire prelist project totaled $352,983.

USE OF TEST RESULTS FOR CENSUS PLANNING COULD BE IMPROVED

Tests are an important information source to assist the Bureau's decisionmakers in planning how to meet their 1990 census goals. The 1986 pretest in Meridian, Mississippi, and Los Angeles, California, gave the Bureau the opportunity to test new or refined techniques for improving census data collection and data processing procedures. Tests also provide the opportunity to acquire information to evaluate the cost-effectiveness and feasibility of various proposed census alternatives. While the 1986 pretest did include a number of potential alternatives for improving census procedures, the limited availability of complete and accurate pretest data and cost benefit assessments has reduced the benefits of the pretest to the Bureau's planning efforts for the 1990 census. In addition, the limited integration between pretest evaluations and 1990 decisions may jeopardize the Bureau's ability to meet some of its 1990 goals.

1990 CENSUS GOALS REQUIRE EFFORTS TO CONTAIN COSTS AND IMPROVE EFFICIENCY

The Bureau has planned to achieve two of its 1990 goals--to contain costs to a 1980 level and to expedite the availability of data to users--through two major objectives:

-- automating many of the census tasks performed clerically during the 1980 census and

-- beginning automated processing earlier than in 1980.

We have advocated that the Bureau's planning efforts consider these objectives in our prior report, The Census Bureau Needs to Plan Now For A More Automated 1990 Decennial Census (GAO/GGD-83-10, Jan. 11, 1983). The Bureau announced its intention to begin automated data processing earlier than in 1980. However, based upon decisions made by the Bureau in April 1986, we are concerned that the Bureau may not meet its 1990 cost containment goal and that census procedures may not be as cost efficient as possible if the Bureau does not maximize automation improvements.

Proposed 1990 Decisions Do Not Realize Maximum Automation Benefits

The relationship between the Census Bureau's pretest results and 1990 decisions is not clear, because some 1990 decisions have been made without evaluations from the pretests. The 1990 tests conducted by the Bureau to date have demonstrated that improved automation techniques such as an automated address control file,

automated check-in, automated editing, and earlier data processing can be successfully implemented. However, the Bureau's most recent decisions suggest that the Bureau may not fully utilize these automation techniques in the 1990 census.

The proposed 1990 office configurations and data capture technologies were tested during the 1986 pretest, except for the OMR data capture technology which was tested in the 1985 pretest. The OMR was planned for further testing in the 1986 pretest but was later eliminated. A combined collection/processing office was tested for the first time in Meridian. Also, decentralized data keying was tested for the first time in Meridian, and a modified version of the 1980 FOSDIC without a preliminary clerical edit was tested for the first time in Los Angeles.

In April 1986, the Census Bureau changed its decision reached in October 1985 by limiting the extent of proposed decentralization for 1990 and eliminating consideration of combined collection/processing offices for 1990. Instead the Bureau decided to establish 10 to 14 processing centers to support an undetermined number of district offices. Also, the Bureau decided to use FOSDIC as the primary 1990 data capture technology, rather than the alternative OMR technology or data keying, which will be used on a limited basis to capture names and write-in data.

While census officials have explained that the April decisions were based primarily upon cost and staffing considerations, no evaluations of the 1986 office configurations or data capture technologies were available at the time of the April decision. In addition, complete cost and productivity data were not available from the 1986 pretest for use in the April decisionmaking. The Bureau's evaluation of the 1986 data capture methodologies was not completed by the September decision date for selecting the entire 1990 data capture methodology. Currently, the 1986 data capture evaluation is scheduled for completion in December 1986.

We have previously encouraged the Bureau to begin planning and testing census alternatives earlier to maximize the benefits of exploring new technology and to be in a position to make informed decisions in a timely manner. We have also expressed our concern that the pretests have not fully explored the benefits of new OMR data capture technology (GAO/GGD-86-76BR, May 5, 1986) or a shorter short questionnaire form (GAO/GGD-86-74BR, May 5, 1986). However, we are supportive of the Bureau's testing of several new automation techniques in the 1986 pretest, such as automated check-in and editing.

While the Bureau has not made its final decisions on how these automated techniques will be incorporated into the 1990 census, the Bureau's current plans could result in a processing operation for most of the Nation similar to that used in 1980. Based on the final decisions, questionnaires from approximately 40 to 85 percent of the Nation will be returned to district offices, where they will be checked-in and clerically edited before being sent to the processing offices for data capture. This decision may limit the benefits gained from the Bureau's tests of new automated techniques. In addition to the potential loss of greater efficiency and accuracy, continued reliance on manual procedures will necessitate a continued need for large numbers of temporary clerical staff.

Pretest Results Do Not Show How 1990 Cost Containment Goal Can Be Met

Ultimately, it appears questionable that the Bureau will be able to meet its 1990 goal of containing the per housing unit costs to 1980 levels while planning to increase the number of offices, the workload, the staffing requirements, and the amount of automated equipment over the levels used in 1980. Based upon 1986 pretest results, Bureau officials could not identify any cost savings for 1990. Again, it is not clear how the pretests are assisting the Bureau in meeting its 1990 goals. The 1986 pretest did include some techniques intended to result in greater cost efficiencies, such as automated check-in and mail reminder cards. However, reliable and complete information is not always available to assess the cost-efficiency of alternative processes, such as surname keying to resolve address mix-ups in multiunit buildings or telephone interviewing for nonresponse follow-up.

CONCLUSION

We believe the Bureau's timing and utilization of test results could be improved to maximize the tests' contributions to the Bureau's 1990 and future decennial planning efforts. The Bureau could derive greater benefits from its tests if more emphasis were devoted towards obtaining complete and accurate cost and productivity data and on comparing alternative procedures. Also, the Bureau needs to improve the timing of test results by ensuring that test evaluations are completed before decennial decisions are made.

We recognize the complexity and the long lead time needed to plan, test, and prepare for a decennial census. The Bureau began testing 1 year earlier for the 1990 decennial; however, time constraints may have caused the Bureau to forego the benefits of fully testing, evaluating, and maximizing potential automation

improvements. While it may be too late in the 1990 cycle to implement all necessary improvements for 1990 tests, the Bureau should consider, for example, how to improve cost data and evaluations for 1990.

In its planning for future decennials, the Bureau should determine the necessary scope of tests, which may indicate the need for fewer full-test censuses and more of the smaller special tests, and also begin its testing sooner. In addition, it may be beneficial to allow more time between tests to ensure that test results are available to provide input to future test plans.

RECOMMENDATIONS

The Secretary of Commerce should require the Director, Bureau of the Census, to improve planning and decisionmaking for the 1990 census and future decennials by (1) obtaining cost and productivity data from the Bureau's tests to accurately and completely measure test results, (2) integrating planning and test results to ensure the completion of test evaluations before scheduled decision dates, and (3) beginning earlier planning and testing for future decennials to maximize the benefits of exploring new technology.

AGENCY COMMENTS AND OUR EVALUATION

We received official comments from the Department of Commerce and met with Census Bureau officials to further discuss these comments. The Department commented that this report helped to identify areas for improving the 1990 decennial and agreed with our recommendation to begin earlier planning and testing for the 2000 decennial census.

The Department also provided observations concerning our recommendations to obtain complete cost and productivity data from the pretests and to better integrate planning and test results. While the Department agreed with the principle of these recommendations, it indicated that necessary data was collected from the 1986 pretest and was available to assist in 1990 decisionmaking.

We do not agree that the Bureau collected sufficient data to assess the cost-effectiveness of some alternative census procedures included as test objectives such as telephone interviewing for nonresponse follow-up or update list/leave questionnaire delivery. Since the goal of pretests is to evaluate the feasibility of alternative procedures, we believe that the Bureau should ensure that data are collected to permit cost-effective comparisons among alternative census procedures.

We also do not agree that the Bureau obtained the most critical information in time to make major 1990 decisions. In our discussions with Bureau officials, they said that the April 1986 decisions on the 1990 processing technology and office configurations were based primarily upon a series of action plans which analyzed the risk assessment of various proposals, institutional knowledge, and informal assessments from the 1986 pretest. In addition, the complexity of the testing timetable and the time frame of the decisions precluded the availability of formal evaluations and complete test data for consideration in the April decision. We believe that reevaluation of the testing timetable and better integration with scheduled decennial decision dates could improve the Bureau's use of test data.

The Department also provided comments to clarify some technical details, and we changed the text where appropriate. We have included the Department's comments and our discussion of those comments in appendix IV.

APPENDIX IV

COMMENTS FROM THE DEPARTMENT OF COMMERCE

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Administration
Washington, D.C. 20230

OCT 31 1986

Mr. J. Dexter Peach
Assistant Comptroller General
Resources, Community, and
Economic Development Division
United States General
Accounting Office
Washington, D.C. 20548

Dear Mr. Peach:

This is in reply to GAO's letter of September 12, 1986 requesting comments on the draft report entitled "Decennial Census: Pretests Could Be Used More Effectively in Census Planning."

We have reviewed the enclosed comments of the Under Secretary for Economic Affairs and believe they are responsive to the matters discussed in the report.

Sincerely,

Kay Bailow

Kay Bailow
Assistant Secretary
for Administration

Enclosure

APPENDIX IV

UNITED STATES DEPARTMENT OF COMMERCE
The Under Secretary for Economic Affairs
Washington, D.C. 20230

Mr. J. Dexter Peach
Assistant Comptroller General
Resources, Community, and Economic
Development Division
General Accounting Office
Washington, D.C. 20548

Dear Mr. Peach:

Thank you for your letter to Secretary Baldrige inviting the Department of Commerce to comment on the General Accounting Office (GAO) draft report "DECENNIAL CENSUS: Pretests Could Be Used More Effectively in Census Planning." The report will help identify areas for improvement of the 1990 decennial census of population and housing.

The Census Bureau agrees with the GAO's assessment that the 1986 pretests were completed as planned and in a timely manner. Although a number of problems occurred in the 1986 test censuses, identification of these problems is the main reason the Census Bureau conducts such tests. The Census Bureau can formally test new procedures and systems during the census cycle, as well as evaluate such procedures and systems through less formal assessments by experienced census planners and managers, even when formal evaluations are not possible. The magnitude of change from one decennial census to the next makes it difficult to operate in any other manner.

Your report discusses problems with mailing packages and postal delivery. A number of these problems resulted from poor implementation by the subcontractor hired by the printing firm to package and ship materials to the U.S. Postal Service (USPS); other problems resulted from coordination difficulties within the USPS.

Finally with respect to the three specific recommendations on page 53 of your report, we would like to make the following observations.

Now on p. 28.

APPENDIX IV

2

Obtain cost and productivity data from the Bureau's tests that accurately and completely measure test results

See pages 28-29.

This is always one of the most important objectives of any test. Information on cost and productivity provided through normal reporting channels as well as the Census Management Information System is used to track progress of the testing activities and as a basis for refining the budget structure for subsequent tests.

We gathered useful information about all aspects of the test censuses. We conducted time and motion productivity studies for 1986 collection and processing activities covering the vast majority of major operations and costs. We also collected data for a wide variety of formal and informal evaluations of test objectives.

As you know, not all aspects of the Bureau's testing program can be characterized using only cost and productivity measures. That is, some factors (tests of pay methods and outreach efforts, for example) do not lend themselves readily to formal experiments with controlled treatments. As we noted earlier, many of these factors must be evaluated through more informal assessments by experienced census planners and managers. For these, we accumulate information and experience over time and from various sources to develop the approaches we believe most likely to succeed under decennial conditions.

Integrate planning and test results by ensuring the completion of test evaluations prior to scheduled decision dates

See pages 28-29.

All agree this should be a guiding principle for the entire test census cycle leading up to 1990. This is a formidable objective given the need for multiple census tests in a variety of locations between 1984 and 1987, coupled with the length of time needed for preparation, implementation, and evaluation of each test census. While we have not always been able to complete all evaluations before designing subsequent tests, we put a great deal of effort into designing our evaluations and test censuses in order to produce information needed for our major decisions. In fact, observations and analyses of a number of logistical, equipment and control problems in the 1986 tests have already had a major effect on the Census Bureau's decisions. In general, then, we have obtained the most critical information (from both formal and informal evaluations) in time to make our basic decisions, and subsequent information will be used to refine various aspects of workflows, staffing, and equipment requirements.

APPENDIX IV

3

Begin earlier planning and testing for future decennials to maximize the benefits of exploring new technology

See pages 28-29.

If anything has prevented the fullest possible testing for 1990, it is the fact that automation in general, and tests of new technology in particular, do indeed require long lead times. We agree that planning and testing for the 2000 decennial census must begin sooner than that for 1990. For this reason, we are taking steps to establish a staff to begin early planning for the 2000 census testing cycle, particularly with respect to new technology.

We are enclosing other comments and a copy of the draft report with some suggested changes to correct technical inconsistencies. We appreciate the efforts of the GAO. If you have any questions or need additional information, please contact Mr. Michael S. McKay, Chief, Organization and Management Systems Division, Bureau of the Census, on 763-7452.

Sincerely,

Robert Ortner
Under Secretary
for Economic Affairs

Enclosures

APPENDIX IV

Enclosure

Comments of the Department of Commerce on the General Accounting Office (GAO) Draft Report Entitled "DECENNIAL CENSUS: Pretests Could Be Used More Effectively in Census Planning."

The following comments respond to statements made in the draft report. The statements are shown in quotes.

Now on p. 2.

Page 3, Paragraph 2: "--Unclear contract specifications for the printing vendors resulted in questionnaire delivery mixups."

See comment 1.

The problems in the printing, assembly, and distribution of the 1986 mailing pieces were not primarily because of deficient specifications, but from complex testing objectives that required over 30 separate packages.

Paragraph 5: "The Bureau overcame most of the operational problems by relying on technical assistance and support from headquarters and regional staff members. A similar level of experienced technical support, however, will not be available in 1990 due to the large number of planned offices."

See comment 2.

We used Headquarters (HQ) operational support for both the 1986 test sites because of timing issues and the lack of resources to implement two separate prototype census processing designs simultaneously. The level of direct HQ support used in 1986, neither intended nor possible for 1990, did not substantially reduce the Census Bureau's ability to learn and meet its objectives.

Now on p. 3.

Page 4, Paragraph 3: "...the Bureau did not collect complete cost and productivity data from the 1986 test...."

See comment 3.

The Census Bureau conducted time and motion productivity studies for 1986 collection and processing activities. While these studies did not represent the "complete" set of operations, major operations covering a large percentage of total costs were covered. Cost data for all 1986 field operations are available through the Census Bureau's automated payroll system.

Now on p. 6.

Page 11, Paragraph 1: "...The Bureau expects the processing workload to increase to an estimated 106 million questionnaires in the 1990 decennial, at a cost estimated to be as high as $4 billion."

See comment 4.

The $4 billion is a GAO figure. The Census Bureau does not estimate the total cost of the 1990 census program to be that high.

Now on p. 11.

Page 20, Paragraph 5: "2. Use of Optical Mark Recognition (OMR) equipment as a potential 1990 data capture technology was also dropped due to required competitive contracting and inadequate planning by the Bureau to develop needed modifications."

APPENDIX IV

See comment 5.

The problems experienced with the W201 OMR unit tested before and during the 1985 pretest were documented in a report by the Census Bureau. Among other points made, the vendor acknowledged the limitations in the existing production scanners. To address the needs of the decennial census, a new OMR scanner would have to be designed and funded by the Census Bureau. The proposals submitted by the vendor showed that a new OMR system was a major research and development effort and not a modification of an existing machine as the Bureau was led to believe. Comparisons between a proposed nonexisting OMR scanner (with numerous technical issues) and an existing proven scanner made the decision clear. A new OMR system would have to be designed and engineered to provide capabilities that already existed in the FOSDIC.

Now on p. 12.

Page 23, Paragraph 2: "...public...cooperation and support was not as apparent in Los Angeles."

Now on pp. 12-13

Paragraph 3: "Information is not available to determine to what degree the low Los Angeles response rates were caused by problems in the Bureau's outreach efforts. Some outreach material was not effective...."

See comment 6.

While there were some identified problems with Los Angeles outreach materials (some errors in Asian translations of census materials), the Census Bureau is convinced the public cooperation problems are related to the external factors mentioned on page 24 of the draft GAO report. Outreach experiences in Los Angeles have provided extremely valuable qualitative information for developing and implementing an effective outreach program in difficult urban areas with significant ethnic/ language diversity.

Now on p. 14.

Page 26, Paragraph 2: "...better quality control procedures were needed in the Bureau's address list development operations,...."

See comment 7.

Additional quality control procedures were used in the prelist operation for the 1987 Census of North Central North Dakota and are planned for the Dress Rehearsal Prelist in Missouri and Washington. In addition, supplemental pay incentives for future prelist operations have been proposed to help improve quality and productivity during this operation.

Now on p. 15

Pages 28 and 29 -- Late mail return lists

See comment 7.

During the 1985 tests, the Census Bureau experienced significant control problems during follow-up by generating multiple lists of late mail returns during these activities. Because of this, it was decided to use only one list during the 1986 tests to see if the improved control was worth the cost and effort of making some unnecessary follow-up visits to late mail-return households. The Census Bureau now plans to generate late mail-return lists several times during nonresponse follow-up. This is being done as a result of the Census Bureau's experiences in 1985 and 1986 and because of improved methods and systems for the collection control file used in the district offices to assign and track work in progress.

Now on p. 16.

Page 29, Paragraph 2: "Several field operation supervisors in Los Angeles felt they were not adequately compensated...and suggested that the Bureau should have offered bonuses to them as well."

See comment 7.

The Dallas and Los Angeles Regional Offices recognize the important contribution field operations supervisors made in the successful completion of 1986 operations and have recommended several of the staff for a one-time Census Bureau performance award. The proposed incentive pay plans for the 1987 test censuses include a field operations supervisors component.

Now on pp. 16-17.

Page 31, Paragraph 1: "One Bureau official suggested that by separating the wanding and surname keying operations for the 1990 census, the Bureau could increase the wanding production to 900 forms per hour."

See comment 8.

While the suggested separation of ID wanding and surname keying would increase the production rate for wanding, surnames still must be captured in a comparable amount of time. The separation of these two tasks would require the capture of ID twice; thus, possibly causing a lesser joint production rate than when performing both tasks simultaneously.

Now on p. 17.

Page 32, Paragraph 2: -"In Mississippi, all questionnaire forms were keyed into a microcomputer system."

See comment 9.

Data conversion for the Mississippi test site was not via microcomputers but a key-to-disk minicomputer system.

Now on p. 20.

Page 38, Paragraph 2: "--Lost computer data resulted in inaccurate and untimely progress reports in the Los Angeles-North Office.... At one point the collection control file reporting cycle had a five day lag,...."

See comment 10.

Batch control procedures in the collection office required some late changes, but the Census Bureau is aware of only one set of batches experiencing this problem. While there were periods when the Collection Control File reporting lagtime was as much as 5 days, this was only during the first week of nonresponse follow-up. Subsequent time lags were not more than 2 days, providing a more timely and accurate source of management information than ever before available in census field offices.

Now on pp. 22-23.
See comment 11.

On pages 41-43, it is important to recognize that it is difficult, if not impossible, to design formal experiments in areas such as pay methods and outreach. Proper panels with appropriate controlled treatments and effects cannot be designated, particularly in conjunction with numerous other parallel tests. For example, control groups for pay rates, incentive pay plans, and so forth are a proven way to harm staff morale and generate bad publicity. Instead, the Census Bureau needs to collect data from other useful and valid types of evaluations (observation reports, debriefings, focus groups, trends over time, and so forth), and to draw inferences about what is and is not effective.

APPENDIX IV

4

See comment 12.

In addition, two offices did provide an opportunity to test the operational and logistical problems associated with one processing office serving multiple district offices.

Now on p. 24.

Page 45, Paragraph 2: "--Salaries and expenses for three regional office outreach staff were charged to an interfund project,...."

Paragraph 3: "--Salaries and expenses, other than travel, for time and motion studies of 1986 pretest operations were charged to an interfund project."

See comment 13.

Salaries of continuing regional office outreach staff are charged to Project 0549 (interfund), but when the staff worked on the 1986 test censuses, special operation codes were used for cost monitoring and accountability. When outreach specialists work exclusively on the 1986 test censuses, they charge Project 5220, using the same set of operation codes already mentioned.

The staff that performed the time and motion studies are properly funded through the interfund, as their services are available to all parts of the Census Bureau. Studies conducted for the decennial constituted only a portion of the staffs' workload, and the salary costs involved were not significant.

GAO COMMENTS

The following are GAO's comments on the Department of Commerce's letter dated October 31, 1986.

1. Observation reports prepared by Bureau staff suggested that assembly and distribution specifications need clarification to prevent similar mix-ups during 1990, thereby indicating that the specifications were a contributing factor in delivery mix-ups. We did not say that unclear specifications were the primary cause of the delivery mix-ups, and we have revised the language on pages 2 and 10 to reflect the possibility that factors other than unclear specifications may have contributed to the delivery mix-ups.

2. We did not say that the use of headquarters support substantially reduced the Bureau's ability to learn or meet its objectives. Rather our point was that problems which were resolved quickly by experienced headquarters and regional personnel could cause delays during the actual census when experienced personnel will not be available at all census locations.

3. We agree payroll data is available for all field operations; however, field costs do not represent the total cost of the test. For example, software development and headquarters assistance to pretest sites are not field costs. Costs for these efforts are important to consider in planning the 1990 census.

4. Changed to clarify, on page 6, that the $4 billion estimate was made by GAO.

5. GAO evaluated the Bureau's planning and testing of Optical Mark Recognition technology in a prior report (GAO/GGD-86-76BR, May 5, 1986). In this report, GAO found that the Bureau's delays and slow progress in planning may have jeopardized its ability to achieve the maximum benefits from computer technology.

6. Although the Department is convinced the public cooperation problems were related to external factors, it acknowledged in the agency comments that some problems were identified with the Bureau's outreach material. In addition, quantitative data is not available to assess the magnitude of external and internal factors on the mail response rate in Los Angeles. Therefore, we continue to believe that the problems with outreach material discussed on page 13 also contributed to the low mail response rates in Los Angeles.

7. The Bureau provided information on future actions to address problems noted during pretest implementation.

8. See discussion on pages 16-17.

9. Changed to "data was entered into a key-to-disk minicomputer system," on page 17.

10. Although the collection control file provided more timely information than has previously been available, the Bureau's efforts to improve follow-up control through daily reporting necessitated accurate and timely management reports. In our meeting with Bureau officials, they agreed that their objective was to produce accurate daily reports and explained that they plan to reduce the reporting lagtime in future tests by rescheduling the clerical worktime and increasing office support.

11. We recognize the difficulties of establishing multiple controlled experiments within a test involving numerous and complex test objectives. However, since one purpose of a test is to assess the cost-effectiveness of alternative census procedures, it is important that the criteria and data needed to assess these alternatives are specified in the test plans. For example, the Bureau did not collect data or specify criteria to measure the effectiveness of specific outreach activities, such as the school and the religious organizations projects. In addition, although the incentive pay plan was a major test objective, the Bureau did not assess the cost-effectiveness of this alternative versus other pay methods.

    As suggested in our report, the Bureau may want to reevaluate the test cycle to include fewer objectives in a test census to allow more complete evaluations. Also, the Bureau should specify criteria or data which will be used to assess test objectives.

12. We believe the Bureau did not fully test the logistical problems of one processing office supporting multiple collection offices, because one collection office was closed before the follow-up operations, leaving only one collection office open during the remainder of the test.

13. In accordance with proper cost accounting practices, costs should be charged where direct benefits are identifiable. Since the benefits of the regional outreach staff could be identified to the 1986 pretest, we believe that the

associated costs should be directly charged to the pretest rather than the interfund. Similarly, the time and motion studies conducted during the 1986 pretest were for the benefit of the 1990 decennial. Therefore, we believe the costs incurred for these studies should be directly charged to the 1990 census.

GLOSSARY

Address control file	-	A computerized listing of addresses for housing units and special places.
Automated check-in	-	A system employing a scanning device, such as a laser sorter or hand-held wand, to record returned questionnaire identification codes.
Barcode label	-	A label consisting of a series of vertical bars containing an identification code that can be read with the use of a scanning device.
Data capture	-	The processes of converting questionnaire data to computer files.
Edit review	-	A procedure to identify and repair, where possible, questionnaires with incomplete or inconsistent data.
Film optical sensing device for input to computer	-	(FOSDIC) A computerized system for converting microfilm of specially-designed questionnaires to computer files.
Key-to-disk system	-	A data capture technology in which questionnaire data are keyed directly onto a computer disk.
Local review	-	An operation in which preliminary housing unit counts are provided to local officials to identify possible missed housing units.
Map spots	-	A mark on a map and an associated address used to identify the location of housing units or special places.
Nonresponse follow-up	-	The process of obtaining information for housing units for which a census questionnaire has not been received in a mail census.
Post-enumeration survey	-	An independent sample survey conducted after census day to estimate the accuracy and completeness of census counts through address and name matching.

Pre-enumeration survey	-	An independent sample survey conducted prior to census day to estimate the accuracy and completeness of the census counts through address and name matching.
Prelist	-	A procedure whereby a lister systematically canvasses an assigned area and lists the mailing address, location description, and geographic information of all housing units.
Quality control	-	A systematic check on completed work to ensure quality.
Reminder card	-	A notice sent to households to encourage respondents to complete and mail back their census questionnaires.
Update list/leave	-	A procedure where census employees deliver the census questionnaires and correct, where necessary, an existing list of addresses.
Wanding	-	A procedure to check in returned questionnaires using a hand-held scanning device.

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