EVALUATION OF POPULATION AND AGRICULTURE CENSUSES IN BANGLADESH

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1. INTRODUCTION

The population and agricultural census programs of the 1980's carried out by the Bangladesh Bureau of Statistics (BBS) marked a significant change from the past in terms of the application of improved census technologies and organizational controls. Among the most important changes were:

o Utilization of a much shortened basis census questionnaire for the 100 percent enumeration which could be rapidly read by optical mark readers.

o The use of a relatively small post-census sample to collect the more detailed information on demographic and housing characteristics in the population census and on farming practices in the agriculture census.

o The development of enumerator maps to define each of the tens of thousands of enumerator areas in the country.

o Use of computers for the pre-census planning and logistic control as well as for the tabulation of census results.

o Recruitment by the BBS of paid temporary enumerators and first-level supervisors--this was a radical departure from the past practice of utilizing government employees and school teachers who received little or nothing in terms of remuneration with corresponding problems of field control.

o The development of the BBS's own higher level supervisory staff to undertake both the necessary pre-census tasks and control the census enumeration itself--again, this was a departure from the past practice of utilizing officials temporarily from other government agencies for much of this work.

An integral part of these innovations was to organize a post enumeration survey, termed a "Post Enumeration Check" (PEC) by the BBS, for the purpose of evaluating the quality of both of these censuses. Reliance was placed on a PEC rather than "analytical methods" of evaluation because independent data were not available to compute accurate census coverage estimates by analytical procedures. For example, information associated with the Bangladesh vital registration system had deficiencies of unknown magnitude as did the estimates of in and out migrations to India. These combined with a lack of good previous census bench mark data prevented the calculation of meaningful population census coverage estimates by analytical means. Also with the 1983-84 Agriculture Census there was very little in the way of independent "check" information which could be used as comparative data for census evaluation. Under these conditions it seemed that the best alternative was to utilize PECs.

2. PEC METHODOLOGY

2.1 General Framework

Both the population and agriculture census PEC surveys followed similiar procedures. This consisted of three phases, (1) an independent reenumeration of a small subsample of areas using more intensive survey procedures, (2) a match against the census records and (3) a field followup of problem cases. In both PECs, the independence of the PEC surveys from the main censuses was stressed. The various measures that were introduced to attempt to achieve this included:

a. No information obtained in the census enumeration was supplied to the PEC enumerator.

b. The PEC enumerators/supervisors were BBS employees who had not worked as enumerators/supervisors in the main census.

c. The locations of all the PEC sample areas were kept secret from all census field staff.

d. The PEC field work did not begin until all the census enumeration books had been removed from the field offices and put in storage at headquarters in Dhaka--this was approximately 3 weeks after completion of the census.

Within this general framework, each PEC survey had it own special characteristics which are described below.

2.2 Population Census PEC Methodology

The principal objective of the population census PEC was to estimate the number of persons missed in the census and the number of persons erroneously enumerated so that a net error rate in terms of census coverage could be calculated. In addition, "response variances" for a number of census items were to be computed. These estimates were to be broken down by urban and rural areas of the country in a PEC sample design that would be large enough to provide estimates with reasonably low sampling errors while at the same time small enough to be operationally manageable. The design that was finally decided upon consisted of a systematic sample of 150 census enumeration areas (EAs) from the rural population and 100 EAs from the urban population--this was a "one-stage cluster" sample so all households contained within each EA were to be reinterviewed in the PEC survey. As each EA averaged about 84 households, this provided a PEC sample of 20,962 households (12,101 rural and 8,861 urban) and 121,078 persons (71,205 rural and 49,873 urban). Since the census universe of 211,751 EAs was ordered geographically on the computer tape, the selection of the 250 PEC EAs by a "systematic" sampling method

provided geographic stratification within the rural and urban populations.

The PEC reinterview of households utilized a technique developed by the U.S. Bureau of the Census (1980) called "Procedure C." Since 3 weeks had elapsed between the census and the PEC, a small portion of the population would not be residing in the same place at the time of the PEC as they were at the time of the census. Procedure C takes this into account by classifying each PEC person as either a "non-mover" (in the same household in both the census and the PEC), an "in-mover" (moving into a PEC sample household after the census) or an "out-mover" (moving out of a PEC sample household after the census). "Moving in and out" would also cover births and deaths occurring since the census. The classification of each PEC person into one of these three categories required the development and use of a special PEC questionnaire. The three classifications will be elaborated on when the estimation procedure is described.

After completion of the PEC field enumeration, the next step was to match each PEC-enumerated person with that same person from the census records. This was accomplished at the BBS headquarters in Dhaka by means of _two_ independent, manual matching operations—each operation matching _all_ the persons in the PEC survey. The two operations were independent in the sense that one set of matchers had no information on how the other set of matchers had matched the PEC against the census. A third person (reviewer) made the final decision as to the match status of a person in cases where the two matchers did not agree and for cases classified as "possible matches." These matching operations were exhaustive to the extent that if some PEC households/persons could not be found in the corresponding EA from the census records, _all_ census EAs surrounding that EA were searched.

As would be expected, the information for a given person as collected in the PEC could vary with information collected for that person in the census. This created uncertainties in determining a good match from a bad match. An attempt was made to minimize the effect of this kind of uncertainty by developing a set of objective matching rules which matchers were to apply uniformly rather than depend on the subjective decisions of individual matchers. These rules were based on five variables—the "person's name," "age," "sex," "marital status" and "relationship to the head of household." In the course of developing the rules, it was observed that some of these variables could exhibit rather large differences for a given person when his PEC record was compared to his census record. Therefore, the final set of rules required that only two of the variables should match exactly. These were "sex" and "marital status." For the other three, certain tolerance limits were established so that a person could be classified as a "match" even

though the PEC and census did not agree exactly. The variables and their tolerance limits were as follows:

person's name......one or more names match or at least sound the same.

relationship to head......a consistency between the PEC and census--this rule was applied because in a given household a census enumerator might designate a different household member as "head" as compared to the PEC enumerator; for example, PEC might record the person's "grandfather" as head and census his "father" as head of the household creating legitimate variations between the PEC and census for this variable.

age......under 10 years of age--tolerance limit within 2 years

10 to 19 years of age--tolerance limit of within 3 years

20 to 39 years of age--tolerance limit of within 5 years

40 years and over--tolerance limit of within 10 years

For cases where most but not all the variables were within the designated tolerance limits the rules classified the case as a "possible match" rather than a "match." In these instances a supervisor would make a final decision as to whether it would be a "match" or "nonmatch" after he had reviewed the work of each matcher.

After the matching operation was completed, the next step was a field followup. The purpose of the followup was twofold. First, it was necessary to verify in the field that persons tentatively classified in the office matching operation as missed (the nonmatch cases) were in fact not enumerated in the census. Second, the field followup was needed to estimate the number of people that were "erroneously enumerated" in the census, i.e. the census overcount. To do the latter, the names of census enumerated persons from a special sample were sent to the field to determine from household members whether the person was correctly enumerated in the census or erroneously enumerated (i.e. duplicated, fictitious persons, etc). This sample consisted of persons who were enumerated in the census in the PEC sample EAs but were not listed in the PEC reenumeration-- thus they had a relatively high probability of being erroneously enumerated.

The basic equation used in the PEC estimation procedure was: $R \times T = T_c - E_c$
where:

R = the completion rate of the census
T = the unknown "true" total population figure
T_c = the total number of persons enumerated in the census
E_c = the total number of persons erroneously enumerated in the census

The purpose of the PEC was to estimate T which is equal to $(T_c-E_c)/R$. This requires that the PEC estimate R and E_c according to "Procedure C" and apply it to the enumerated census total, T_c, to determine T.

Other estimates of interest were:
The missed rate = $1-R$
The erroneously enumerated rate = E_c/T
The net error rate = $(1-R)-(E_c/T)$
The estimates used for R and E_c were:

$$R = (m_n+m_i)/(t_n+t_i) \text{ with } m_i = (m_o/t_o)(t_i)$$

m_o = the number of matched "out-movers"
m_n = the number of matched "non-movers"
t_n = the total number of "out-movers"
t_o = the total number of "non-movers"
t_i = the total number of "in-movers"

$$E_c = e_c w$$

e_c = the number of "erroneously enumerated" persons found in the PEC sample
w = the weight used to blow up the sample to the population estimate

Note that m_i, the number of matched "in-movers" is a derived figure which applies the match rate for "out-movers," (m_o/t_o), to t_i, the total number of "in-movers" to obtain an estimate of the number of matched "in-movers." The reason for this is that "in-movers" were easy to count because they were there at the time of the PEC survey; however, they were difficult to match with the census since these persons were residing in some other household at the time of the census. On the other hand, the "out-movers" were easy to match with the census since they were staying in the PEC household at the time of the census; however, they were not easy to get an accurate total count on since these persons were no longer staying in the household at the time of the PEC survey. Finally, it may be assumed that over the whole country on "PEC reference night" the number of people that should be classified as "out-movers" is approximately equal to the number to be classified as "in-movers" since an "in-mover" to one household is an "out-mover" from the household that he came from.

The "Random Group Method," as described by Hansen, Hurwitz and Madow (1953) was used to estimate variances for these parameters.

2.3 Agriculture Census PEC Methodology
The Bangladesh Agriculture Census Program was accomplished over a 2-year period, 1983 and 1984. In 1983 a random half of the 4,400 unions in the country were enumerated. In the next year the remaining unions were enumerated (a union on the average contains about 15 villages). This was the first time an agriculture census enumerating all the farms in the country had ever been taken.

The objectives of the 1983-84 Agriculture Census PEC were similar to those of the population census. First, the PEC was to

determine the quality of coverage of the census by estimating the number of farms missed in the census and examine some of the characteristics of these "missed" farms. Second, the PEC would estimate biases or inaccuracies associated with information collected from farms that were enumerated in the census. Third, the PEC was to estimate the degree of over-counting of farms.

The basic difference between the population PEC and the agriculture PEC relate to objective 2--the estimation of biases associated with information collected from farms that were enumerated in the census. In the population PEC reinterview, the questions which were posed to respondents for selected items ("sex," "marital status," "literacy," "education," and housing items) were worded and administered in much the same manner as was done in the census. This permitted the calculation of "response variances" for these items. On the other hand, in the agriculture PEC, the objective was to estimate "biases" for individual census items--this required providing a "standard" or something closer to a "true" value which could be compared to the census reporting. Thus a prerequisite of the agriculture PEC was a more accurate method of collecting agriculture census information. As the PEC could not evaluate all census items it was restricted to the farmers' reporting of land use. This included total land operated and its classification into cultivated and noncultivated areas, areas in major crops, land tenure and land under irrigation.

In the main census, the questioning of farmers was done in much the same manner as most censuses, i.e. the farmer was asked to reflect and report on his land use activities on a "whole farm basis." Although farms are very small in Bangladesh (averaging less than 3 acres), each farmer usually grows a variety of crops on many small plots (plots averaging 1/4 to 1/2 acre in size). Since up to three different crops may be grown on a plot of land in a 12-month period, the recall and reporting of land use can be complicated especially for farms above average in size.

The approach that was used in the PEC for obtaining better land use information was to query the farmer on the use of each of his plots rather than on a "whole farm basis" as was done in the census. Plot use information was collected by obtaining a detailed history of the cropping for each plot over the 12-month reference period used by the census. In addition the PEC enumerator was required to draw a sketch map with the help of the farmer that identified and showed the relative location of each of the farmer's plots. What in effect the PEC did was to expand the census "whole farm basis," into a two-dimensional detail of the farmer's land use activities--one dimension was a plot by plot identification of all operated plots with sketch map and the other dimension traced each plot's cropping history over the previous 12 months.

Another difference between the population

PEC and the agriculture PEC was in the sample frame that was used for selection of the PEC sample. As has been previously mentioned, the population census PEC sample consisted of a subsample of census-defined EAs. With the agriculture PEC, the sampling frame was independent of the census-defined EAs as these were not the sampling units used. Instead the BBS's national "cluster sample," an area sample that was in use to collect data on a continuing basis for the BBS's current crop estimates program, was used as the PEC sampling frame. This "cluster sample" consisted of a geographically stratified, probability area sample of rural Bangladesh. The sample unit was a cluster of plots containing on the average about a dozen plots. Each cluster averaged about 5 acres in size. The total sample contained 5,500 clusters. From this total, a systematic subsample of 283 clusters was selected for the 1983 PEC and a different subsample of 295 clusters was selected for the 1984 PEC. As with the population census PEC this sample was geographically stratified over the country.

Using this frame rather than census-defined EAs was expected to have two principal advantages. First, on the average only about 10 farms were associated with a given "cluster" while the agriculture census EA contained on the average about 180 farms. Thus, the "cluster" was a much more desirable unit in terms of sample design efficiency since it was expected that census enumerator proneness for committing errors might have a relative high intra-class correlation. Therefore, PEC reenumeration of these large EAs could be relatively wasteful compared to the 10-farm cluster. Second, the PEC could pick up farms that were not part of any census EA since the "cluster sample" was selected independently of any knowledge of where census EA boundaries were located. This feature would be expected to improve estimates of farms missed in the census.

Since the PEC "cluster" defined a group of plots and the census was a census of households it was necessary in the PEC to associate a sample of households with each "cluster." This was done by applying the "weighted segment" method of area sampling as developed by the Statistical Reporting Service, U.S. Department of Agriculture (1975). With this method, data is collected from every farm that has land that is either completely within or partly within each sample "cluster." In the estimation procedure each farm is then weighted by the proportion of the farm's total land area that is within the boundaries of the cluster.

The matching of PEC households was accomplished at the BBS headquarters in Dhaka similarly to the population census PEC. Although the number of sample areas was more in the agriculture PEC (283 in 1983 and 295 in 1984 as compared to 250 in the population PEC), the number of PEC households per area was much less (an average of 10 as compared to 84). Also the population PEC required the

matching of 120,000 persons which was not required in the agriculture PEC--thus the agriculture PEC matching was a somewhat smaller operation.

The variables used to develop matching rules for the agriculture PEC included "census household number," "head of household's name," "head of household's father's name," and "acres of operated land." The census enumerator was instructed to mark with lumber crayon near the front door of each house a "census household number" which the PEC was to duly record. If this was done correctly it was very useful for matching. However, in practice it was found that many census enumerators failed to do this consistently. Also, in many cases the PEC enumerator either could not find the number or he observed some other number which was placed on the house for some other purpose. At any rate, the most useful information for matching was the "head of household's name" and his "father's name." The variable "operated land" had limited discriminating power for identifying matches by itself but was useful when there were doubts associated with the validity of "possible" matches based on household number and head's and father's names. That is, if the information on these latter variables was incomplete but "operated land" according to PEC and census was in close agreement, then one felt much more assured in calling it a "match" than if "operated land" showed a very large difference.

As with the population PEC, if some PEC households remained unmatched after the initial census EA was examined, an exhaustive search was then made of all surrounding census EAs.

After the headquarter matching was completed there remained a set of PEC "unmatched" households plus some problem matched households which were termed "possible matches." All the PEC unmatched households (a total of 99 out of total of 2,872 PEC households in the 1983 survey) were sent back for field follow-up for verification that they were actually missed in the census. For some of these cases additional information was obtained in the field which provided for the later matching of the initially unmatched households with their corresponding households in the census enumeration. Of the 99 households that originally went for field follow-up, 12 were either matched or determined to be "out-of-scope" as a result of obtaining additional information in the field follow-up.

In addition to the 99 unmatched cases which were sent back to the field, there were 459 "possible matches" which were also returned to the field for further verification. Many of these were cases where both the head and father's names matched but the reported differences between the PEC and the census for various items such as "total operated area," "area in rice land," "area in jute land," etc. were relatively large. As a

result of the follow-up, corrections were obtained resulting in the classification of the "possible matches" into either a good match or an "out-of-scope" case.

As with the population PEC, to arrive at an "erroneously enumerated" or overcount rate it was necessary to select a sample of households that were enumerated in the census and then go back independently to the field after the census to these households and determine if they all were actually in existence at the time of the census. With the setup of the agriculture census program, this was relatively easy to do as there was a large post census sample survey for the purpose of collecting the more detailed information on farming practices that could not be collected in the main census. This sample was drawn from the list of households that were enumerated in the census. By checking the records from this survey, which would show overcounting of households due to fictitious enumeration by the original census enumerator, the BBS was able to determine an estimate of the "erroneously enumerated."

The estimates used were somewhat less complicated than those of the population census PEC due to the fact that since the matching of persons was not involved, the classification into "in-movers," "out-movers," etc. was not required. That is, it was assumed and later verified that in the 3 weeks between the census and the PEC the "movement" of households in rural Bangladesh was insignificant.

The "missed" rate for farms and farm characteristics had the following form:

$r = m/t$

where:

m = the weighted estimate for "missed" farms, i.e. the non-matched farms

t = the weighted estimate for all PEC farms, i.e. the non-matched plus the matched

The bias associated with census enumerated farms was estimated from the set of PEC/census matched farms. This was expressed in the form of a relative bias:

bias = $((CEN-PEC)/PEC)(100)$

where:

CEN = a farm item as reported by the census properly weighted

PEC = a farm item as reported by the PEC properly weighted

The estimate of "erroneously enumerated" farms would have the same form as for "erroneously enumerated" persons in the population census PEC.

Again the "Random Group Method" was used to estimate the variances for these parameters.

3. POPULATION CENSUS PEC RESULTS

The BBS (1983) estimated that there was a net undercount in the 1981 Census of 3.1 percent (with a std. error of 0.24 percent). This was broken down into a "missed" rate of 4.2 percent and an "erroneously enumerated" rate of 1.1 percent (with std. errors

respectively of 0.22 percent and 0.11 percent). There was a significant difference in net undercount rates between urban and rural areas--urban areas showed a net undercount of 7.7 percent as compared to a rural rate of 2.5 percent (wth std. errors respectively of 1.00 percent and 0.20 percent).

When rates were calculated by age and sex groups other differences were revealed. The highest net undercount rates were for children of both sexes under 1 year of age--averaging 12.6 percent in urban areas and 5.9 percent in rural areas. The net undercount rates for females 1 year of age or more tended to show similar patterns in both urban and rural areas. In both instances the highest rates were for women 15-19 years of age and for women over 50 years. It is speculated that for the former this is the age that most women marry in Bangladesh; at the time of marriage these women shift their household from their parents to that of their husband and it is expected that the high mobility of this age group may tend to make them more difficult to count in a census. For the older women (over 50 years), the high undercount rate may be associated with the mobility of widowhood. It is the custom in Bangladesh for widows to rotate staying with their several sons and/or daughters.

For males 1 year and older there was also similarity between urban and rural areas. In urban areas the highest undercount rates were for males 15-49 years of age while in rural areas the age groups with the highest rates were 10-29 years of age. Again it was expected that the relatively higher mobility of these working age groups as compared to younger or older age groups might be the principal contributing factor to these higher rates.

The "response variance" associated with different questions included in the census also showed some marked differences. Response variance was defined as the degree of agreement in reporting between the original census enumerator and the independent reinterview by the PEC enumerator for the matched set of persons/households. The item "sex" showed the highest level of agreement (99.9 percent) followed by "marital status" (97 percent). The other items in descending levels of agreement were "tenure of the dwelling unit" (95 percent), "literacy" (94 percent), "roof material of household structure" (89 percent), "highest class passed" (88 percent), "wall material of household structure" (85 percent), and "age classified by 5-year age groups" (63 percent). Note that the 63 percent does not refer to the level of agreement for reporting single years of age but to the reporting of age within a 5-year grouping. As age increases the level of agreement decreased from 89 percent for age group 0-4 years down to 34 percent for persons over 55 years of age.

Besides the evaluation of the census itself, some additional efforts were directed

to the evaluation of the PEC procedures used. As one may observe, a critical determining factor in the estimates of census coverage was the accuracy with which the PEC was matched against the census. For developing a reliable matching procedure, the main criterion was to keep the two types of matching errors--"erroneous matches" and "erroneous non-matches"--as small as possible. The development of specific matching rules provided uniformity in matching and generally helped to reduce both types of matching errors. It was felt that for the Bangladesh situation, the rules which applied had tolerance limits which were tight enough to keep the number of "erroneous matches" to a reasonable level. Other measures which were used were intended primarily to keep the level of "erroneous non-matches" at an acceptable level. These included:

a. Independent matching--the use of two independent matchers and a review supervisor.

b. Intensive search procedures--because of poor boundaries for some PEC EAs, instructions were given to search all possible census EAs surrounding every PEC EA for possible matches.

c. Special attention to names in the PEC--The PEC enumerator was instructed to record as many names as possible and a nickname for each household member so as to improve the reliability of the matching. It may be noted that most census enumerators listed only one name per person.

d. Use of the field follow-up to collect additional information on questionable "non-matches" so that more accurate decisions could be made as to the correct match status.

Some investigations were made into the impact that (a) independent matching and (d) field follow-up had on the estimated census completion rates "R." It was found that both these operations had a significant effect on the estimates as indicated below:

PEC Procedure	Rural Completion Rate (%)	Urban Completion Rate (%)
I. Single match; no match verification; no field follow-up	91.2	84.6
II. Two independent matches with supervisor review; no field follow-up	93.8	88.0
III. Two independent matches with supervisor review; field follow-up	96.4	91.1

As may be observed, both of these operations had a positive effect on the estimated completion rate.

The independent matching operation changed the estimate primarily by the shifting of some persons from an initial "non-match" status to a "match" status. The field follow-up changed the estimate primarily by shifting persons from the "non-match" category to the "in-mover" and "out-of-scope" categories. Indications were that this latter problem was the result of poor data collection by some of the PEC enumerators, i.e. they reported a substantial number of persons as being in the household on both the "PEC night" and the "census night" as opposed to reports by both the original census enumerator and PEC follow-up enumerator that these persons were not present in the household on the "census night" (note that the 1981 Census was a de facto census). Thus, even though one might expect that PEC enumerators would generally be better trained and more reliable than the census enumerators there may not have been that much difference in actual performance.

4. AGRICULTURE CENSUS PEC RESULTS

The analysis of results from the 1983 PEC indicated that coverage in the Bangladesh Agriculture Census was quite good. It was estimated that 3.9 percent of the farms and 3 percent of the farm operated area was missed in the census (std. errors were respectively 0.9 percent and 1.1 percent). The reason for the difference between number of farms and farm area was because the very small farms had a higher "missed rate" compared to larger farms--a "missed rate" of 6.5 percent for farms under 0.5 acres as compared to a "missed rate" of 2.9 percent for farms 0.5 acres and above. This propensity to better cover the larger farms was also reflected in the "missed rates" for the various farm characteristics such as land utilization, tenure and major crop areas; that is, characteristics which were more frequently associated with larger farms showed "missed rates" that were relatively lower than characteristics that were more generally associated with all sizes of farms.

In the analysis of census enumerated farms, it was found that there was no significant difference between "total operated farm area" reported in the census and "total operated farm area" reported in the PEC. Also, no significant differences were found in acreages reported for the aman and aus rice crops--the two major rice crops which account for about 3/4 of the total cropped area in Bangladesh. The only land use items which exhibited significant differences (at the 95 percent level) were the boro (spring) rice crop which showed an estimated 16 percent under reporting of harvested and jute which showed an estimated 12 percent over reporting of area harvested. For the latter there was indication that there may have been some confusion in the farmers' understanding of the census concepts. This is because most jute is usually planted in April and harvested in

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August. The 1983 Census reference year covered crops harvested during the period July 1982 through June 1983 so the 1983 Census requested that the farmer report on his jute that he harvested in August 1982. However, at the time of the census enumeration in May 1983 farmers had a standing crop of jute which was planted in April 1983 but which was not to be reported in the 1983 Census. The PEC indicated that there were a number of farmers that harvested no jute in 1982 but had a standing crop of jute in 1983 which was reported erroneously in the census. The PEC was not able to ascertain reasons for underreporting of boro rice in the 1983 Census.

The results of the post census sample survey showed the number of "erroneously enumerated" or over counted farms was practically nil, i.e. over 99.9 percent of the farms included in this sample were found to have been in existence at the time of the census. Thus, the "net error" rate for census coverage was identical to the "missed" rate.

5. CONCLUSIONS

The following four points can be made with regard to the Bangladesh PECs.

(1) The PEC is a useful method of census evaluation.

(2) PECs are not small operations. For Bangladesh they exhibited the same characteristics as a major national sample survey with accompanying extensive pre-testing, questionnaire development, survey execution with field follow-ups, specialized data processing and report writing.

(3) In certain ways a PEC requires more attention to detail than other types of national surveys. This is because the independence of the PEC from the census and an accurate matching operation are so essential for achieving acceptable results.

(4) It was found in the Bangladesh experience that it was necessary to have a field follow-up verification of "non-match" cases. This was due primarily to uncertainties associated with poor quality of work on the part of a few of the initial PEC enumerators and to inadequately defined EA boundaries for some of the census EAs.

6. ACKNOWLEDGMENTS

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