**REPUBLIC OF GHANA**

# 2010
# POPULATION AND HOUSING CENSUS
## POST ENUMERATION SURVEY REPORT

2012

GHANA STATISTICAL SERVICE
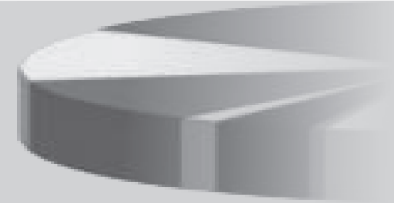DECEMBER 2012

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# PREFACE AND ACKNOWLEGEMENT

In a large-scale work of the magnitude of a census, it is inevitable that some discrepancies will arise from deficiencies and errors emanating from the coverage and responses. In order to estimate the accuracy of the data gathered, the Post Enumeration Survey (PES) has, since 1960, been instituted as part of census operations in Ghana. The 2010 Population and Housing Census (PHC) is the fifth census conducted in Ghana since independence, with the night of 26th September, 2010 serving as the reference point. Following the successful completion of the 2010 census enumeration, the Ghana Statistical Service (GSS) conducted a PES in April 2011 to provide information on the degree of Census coverage and the magnitude of content errors. The PES serves as an important tool for providing feedback on operational matters such as concepts and procedures in order to help improve future census operations. Indeed, the PES is informative and useful to data analysts and other users of the census data such as policy makers, training institutions, researchers and students, among others. It should, however, be mentioned that the PES results will not be used to correct the census figures.

In order to achieve the PES objective of providing quantitative information on the accuracy of the Census, all persons living in private households were targeted for the PES. The PES of the 2010 PHC randomly sampled 250 Enumeration Areas (EAs) in the country, using the demarcated EAs for the 2010 PHC as a frame. A one-stage stratified cluster sampling design was used in selecting the population for interview. This report contains the procedures used and the results of the PES conducted after the 2010 PHC.

We acknowledge the immense contributions of the Government of Ghana, European Union (EU), UK's Department for International Development (DFID), United Nations Population Fund (UNFPA), and others for making available the necessary financial and technical resources for undertaking the PES. Secondly, we would like to thank all partner institutions that collaborated with the GSS in carrying out this exercise. We wish to specially mention the contribution of Ms. Lynne Henderson of the World Bank. She read through the initial draft and made valuable suggestions which helped to improve this report. We are very grateful to Dr. Jeremiah P. Banda for reviewing the sample design and the final draft report irrespective of his very tight schedule. Our sincere gratitude also go to our Census Technical Advisor, Dr. Ismaila Sulaiman, for his invaluable contributions towards the entire processes of the PES.

Finally, we would like to extend our appreciation to the PES Secretariat and to all those who in one way or another participated in the planning and implementation of the PES, especially the data processing staff, field supervisors, enumerators, our Regional Statisticians and Officers as well as all the individual respondents.

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# LIST OF ABBREVIATIONS

CIDA          Canadian International Development Agency

CSPro         Census and Survey Processing

DEO           Data Entry Operator

DFID          United Kingdom Department for International Development

DP            Data Processing

EA            Enumeration Area

EU            European Union

EVR           Enumerator's Visitation Record

GSS           Ghana Statistical Service

PES           Post Enumeration Survey

PHC 1         Populations and Housing Census Form 1

PHC 2         Populations and Housing Census Form 2

PHC           Population and Housing Census

SPSS          Statistical Package for Social Sciences

UNFPA         United Nations Population Fund

UNSD          United Nations Statistics Division

# Executive Summary

The Ghana 2010 Census of Population and Housing (PHC) was conducted in September 2010. The Post Enumeration Survey (PES) was undertaken from $9^{th}$ to $29^{th}$ April 2011. The primary objective of the PES was to measure the quality of the census by providing an indication of the extent of coverage and content errors. In addition, the PES helped to explore areas that required improvements in future censuses, post enumeration surveys and inter-censal large scale household sample surveys.

A one-stage stratified sample design was implemented in Ghana. At the first stage, a sample of 250 enumeration areas (EAs) was selected from a collection of 37,481 EAs. All households and persons in the selected EAs were included in the sample. The PES questionnaire was shorter than the census questionnaire and contained only items suitable for measuring coverage and content errors. The PES questionnaire had similar questions to those in the census questionnaire to facilitate the estimation of coverage and consistency of responses between the two operations. The scope of the PES excluded inmates of institutions such as hotels, hospitals, and prisons. In addition, the floating population, including outdoor sleepers, was excluded.

After data collection, the results were matched by comparing information in each PES questionnaire to a corresponding census questionnaire. The data collection and matching methodology was according to procedure C of the UN recommendation manual. Under this procedure, data was collected on non-movers, out-movers and in-movers. Only non-movers and out-movers were matched. Cases which could not be matched because of doubtful responses and insufficient information had their enumeration status verified during reconciliation visits. These visits were used to determine the final matching status of households and persons.

The Dual System Estimation methodology was adopted in the evaluation of coverage errors based on household population and the estimation of the true population.

The results of the PES indicate that the net coverage rate at the national level was 1.8 percent. The variables selected for content error measurement include sex, age, relationship to head of household and marital status.

The main findings of the 2010 PES are as follows:
- About 97.0 percent of all household residents who were in the country on Census Night ($26^{th}$ September, 2010) were enumerated in the 2010 PHC. This represents an omission rate of 3.0 percent.
- The findings also show that 1.3 percent of the population was erroneously included in the census.
- While the 2010 PHC counted 24.0 million household population in Ghana, the PES results show that the census household population in Ghana was 24.4 million.
- The true population which is the population estimated from the PES multiplied by the population from the census after correcting for erroneous inclusions and divided by matched population between the census and the PES was 24.5 million.

- Regional differentials are observed in net coverage rate (net under-count rate). The Eastern Region had the lowest net coverage rate of 0.3 percent. While Ashanti, Northern and Upper West regions had the highest net coverage rates of 2.8 percent.
- Males (3.3%) were more likely than females (2.8%) to be omitted in the census. The net coverage rate for males was 2.0 percent and that for females was 1.6 percent. Also, the net coverage rates for those within the 20-29 and 30-39 age groups were relatively higher, 4.1 percent and 3.9 percent respectively, compared to the net coverage rates of the other age groups of 0.9 percent.

    There was a high rate of agreement between the 2010 PHC data and the PES data for sex (98.8%), marital status (94.6%), relationship to head of household (90.5%) and age (83.0%).

In conclusion, the relatively low net coverage rates is an indication that the quality of coverage during the 2010 Census was good. In addition, low content error of the PES results show that the census results can assuredly be used for planning and policy decision-making. Consequently, the PES findings should guide users to better interpret the 2010 PHC results.

# CHAPTER 1: INTRODUCTION

## 1.1 Background

In line with the United Nations recommendations, the Ghana Statistical Service (GSS) conducted a Population and Housing Census in September, 2010. A Post Enumeration Survey (PES) was also conducted in April, 2011 to assess the quality of the census. The PES sampled 250 out of a total of 37,642 Enumeration Areas (EAs) in the country with the aim of measuring the degree of error or accuracy of the census. The PES was guided by the principles of quality, including its independence from the main census.

Data collected through any field inquiry is invariably subject to certain amount of error due to administrative lapses, interviewer error or even the respondent error, just to mention a few possible reasons. A massive operation like the PHC is no exception. A large number of countries, including Ghana, carry out a PES after the completion of a census to systematically measure the degree of error or accuracy. The systematic attempt to estimate the accuracy of the count by sample surveys has become a part of the census operations in Ghana since 1960. In the 1984 and 2000 censuses, post enumeration surveys were undertaken to assess both coverage and content errors.

The PES seeks to quantify the likely omission or duplication in the census enumeration in terms of coverage of houses/dwellings, households or individuals. In conducting the survey, opportunity was taken to measure error in responses, or what is referred to as content error in the recorded household characteristics. In other words, the PES provided answers to questions like how accurate the structures/households/individuals have been enumerated in the census, and how precisely certain characteristics of the households/individuals were recorded in the census. The PES also served as an important tool for providing feedback on operational matters such as concepts and procedures, which would help in improving future census operations.

Empirical studies in some African countries show that under-coverage rather than over-coverage of households and persons was the main problem during censuses. In many cases, the census count is lower than the true population. The difference between the two is what is called "net coverage error". The net coverage rate can vary for different groups depending on factors such as geographic location, age and sex as can be seen in Table 4.2.

## 1.2 Objectives of the PES

The purpose of the PES was to facilitate the measurement of the magnitude, direction and sources of errors for the 2010 PHC. The specific objectives of the PES were:
(i)     To estimate the magnitude of coverage errors (both over-count and under-count);
(ii)    To assess the quality of reporting on selected characteristics which were collected during the census. These included sex, age, marital status and relationship to head of household;
(iii)   To serve as a basis for documenting lessons learnt for implementing future censuses.

## 1.3 Planning for the PES

The PES was an integral part of the 2010 PHC operation, whose implementation was initiated in August 2010 with the development of the PES Technical Document. The document outlined

specific issues including purpose and objectives of the PES; outputs, survey strategies/methodology and activities. A work plan, the budget, and draft questionnaire were also developed. The survey strategy/methodology included the development of a sample design, data collection strategy, procedures for matching PES, field reconciliation visit guidelines, data processing strategy, tabulation plan and estimation procedures for coverage and content errors. Plans and methodology documents included lessons learnt during the pilot test and the 2010 PHC. Specifically, the plan included the strategies and approaches related to:

i)  sample design;
ii)  data collection;
iii)  development of guidelines for matching and reconciliation visits;
iv)  instruments development, including the questionnaire;
v)  estimation procedures;
vi)  strategy for reporting results.


## 1.4  Phases of the PES

Distinct stages of operation were followed in the PES and these are:

- Listing and enumeration of persons in all households in the selected EAs;
- Matching of households and persons from the census questionnaire and the PES
- Field reconciliation visits to ascertain the final match status of cases identified as possible matches during the initial matching exercise and to verify erroneous inclusions and correct enumerations among persons found in the census but not in the PES;
- Data processing and analysis;
- Reporting of results

# CHAPTER 2: METHODOLOGY AND DATA COLLECTION

## 2.1    Introduction

This chapter discusses the PES philosophy and its methodology. Specifically, it gives detailed information on the PES concept, the sample design, the PES instruments used and the weighting procedure. The chapter also describes the strategies adopted in relation to staffing, recruitment, training, actual field enumeration and the challenges encountered during the PES field work and how these were addressed.

## 2.2    Concept of Post Enumeration Survey

Population and housing census is a huge exercise and as such it is inevitable that some errors will occur. Coverage error may result from inaccuracies in the enumeration of persons or housing units. Such errors include duplications, omissions, fabrications, erroneous inclusions and non-response. Content error, on the other hand, is an error arising from differences in responses for the same item during the census and the PES. For example, there is the possibility that the person interviewed in a particular household may not know all the exact details for everyone in the household and therefore reports differently on the same person during the census and the PES.

The PES of the 2010 PHC adopted the Dual System Estimation (DSE) methodology where respondents were asked, during the PES fieldwork, to identify all persons who were living in the sampled household on census night. The persons were then matched with the results from the census to compute the estimates of the number and the percent matched for non-movers and out-movers. The PES and census records were also compared in terms of the characteristics of households. The results of the matching/comparisons were used to measure the coverage and content errors. A PES was an independent survey that replicated the census enumeration.

The DSE methodology was used to arrive at the true population estimate. This implied using two independent sources to come up with the estimate of the true population: the sources being the PES and the Census field questionnaires. In general, it is assumed that the true population is more reliable than either the census enumeration or PES population estimate. In order to come up with the net coverage error, the difference between the true population and the corrected census population was taken. When the latter is divided by the true population and multiplied by 100 the result is the net coverage rate. As earlier stated, this is the single most important indicator of the quality of census coverage.

In order to operationalize the DSE, the following assumptions must hold:
(I)    The population should be closed;
(ii)   Operational independence between the census and the PES should be the norm;
(iii)  There must be no erroneous inclusions in the census. This is the reason why it is factored out from the PES census population when calculating the true population;
(iv)  There should be no incomplete matches.

## 2.3    Alternative procedures for evaluating coverage and content errors

There are three basic procedures (A, B and C) that can be used in PES to evaluate coverage and content errors in censuses. These procedures are used to determine the way in which movers *are treated. Procedure A consists of all household members as they existed at the time of the census*

*(non-movers and out-movers). Estimation* is made to determine the numbers and percent of matched non-movers and out-movers. Procedure B identifies all current residents in the sample households at the time of PES (non-movers and in-movers). Estimation is made to determine numbers and percent matched for non-movers and in-movers. On the other hand, Procedure C requires the enumeration of in-movers in addition to out-movers and non-movers.

*The PES adopted procedure C because the method combines procedures A and B,* taking the advantages of the features of each of procedures to reduce matching difficulties. In addition, the method improved the estimation of movers.

## 2.4     PES Sample Design

The PES operation was conducted in a sub-sample of the total number of EAs available (i.e. the 37,481 EAs demarcated for the 2010 census). A one-stage sample design was adopted where EAs were selected at the first stage and all households in the selected EAs were enumerated. This approach was necessary because, in order to estimate coverage error, the total population in the selected EAs had to be enumerated in the PES.

The sampling universe was the total population living in Ghana and this was measured as all households living in the EAs at the time of the census. Thus, all households living in the selected EAs were enumerated so as to check non-coverage (missing cases) of individuals in households or non-coverage of entire households. The scope of the PES, however, excluded inmates of institutions like hotels, hospitals, prisons and others, and the floating population, including outdoor sleepers.

### Sampling Frame

The existing number of EAs that were demarcated for the 2010 PHC constituted the sampling frame for the PES. In order to take advantage of possible gains in precision and reliability of the survey estimates, the PES frame was stratified into the 10 administrative regions of Ghana. A proportionate sample was independently selected from each stratum. This was to ensure proper representation of important sub-population groups without biasing the selection operation. Homogeneity in terms of political administration was the main variable for stratification.

### Sample Size Determination

In order to determine the sample size for the PES, the relative error methodology was used, where the relative error was defined as the sampling error of $p$ relative to $p,$ where $p$ is the proportion of coverage. There was no empirical value of $p$ as this was not estimated in both the 1984 and 2000 Population and Housing Census PES to serve as a guide regarding levels of coverage in any of these censuses. Thus, the regional estimates of the level of coverage during the 2010 Population and Housing Census were used to determine $p$ (See the formula in Appendix 2).

The sample design was validated by an international expert prior to the conduct of the PES. Comments from the international expert were incorporated in the design and its implementation. The selection of EAs in each regional stratum was based on the probability proportional to size (PPS). The measures of size were the population in each EA.

**Table 2.1: Sample size allocation to regions**

| Region | Total number of EAs | Number of selected EAs |
|---|---|---|
| **Ghana** | **37,488** | **250** |
| Western | 3,439 | 21 |
| Central | 3,165 | 19 |
| Greater Accra | 4,765 | 29 |
| Volta | 3,766 | 23 |
| Eastern | 4,776 | 29 |
| Ashanti | 7,330 | 45 |
| Brong Ahafo | 3,553 | 22 |
| Northern | 3,865 | 24 |
| Upper East | 1,717 | 19 |
| Upper West | 1,112 | 19 |

Provisional estimate of EAs at the time of Census Data Collection.

## *Stratification*

To improve the efficiency of the sample design, ten (10) regions, which were thought to be homogeneous within and heterogeneous among them, were treated as domains of selection and analysis. The assumption was that geography was correlated to coverage error. The combination of PPS sampling strategy and stratification by regions was expected to reduce sampling errors of some estimates. At the analysis stage, post strata were formed such as urban/rural, age-groups and sex.

## *Weighting*

As explained earlier, the PES was based on a probability sample of 250 EAs. However, five of the EAs were dropped from the reconciliation visits (see section 3.2.1 for further details). The PES sample design is not a self-weighting sample. This means that each household did not have the same chance of being selected into the sample. Hence, weights were computed to reflect the different probabilities of selection in order to obtain the true contribution of each selected EA in the estimates of the population parameters. The weight is simply the reciprocal of the selection probability of a sample unit. Refer to a brief presentation on weighting procedure in Appendix 2.

## *2.5 PES Instruments*

Three main instruments namely, the PES Questionnaire, Enumerator's and Supervisor's Manuals as well as material control forms were prepared for the PES. EA maps were also reproduced and given to guide enumerators in the tracing of the geographical boundaries for the selected EAs. The questionnaire was designed such that it captured the main elements for the measurement of coverage and content errors. Only a few variables from the main census questionnaire, which were not likely to change within a short period, were retained. The selected variables for the PES questionnaire included: name, relationship, sex, age and marital status.

## *2.6 Recruitment and Training*

The success of any field data collection exercise, to a large extent, depends on the caliber of staff recruited. Field officers recruited for the PES were those who took part in the 2010 PHC field enumeration exercise. To ensure that the right data collection officers were recruited, applicants completed forms endorsed by District Statistical Officers or Regional Statisticians who worked with them during the 2010 PHC enumeration period.

The training started on 27$^{th}$ March, 2011 and lasted for six days. Detailed training instruments were prepared and used during the training period at a centralized point. This was to ensure that all trainees received the same training instructions.

## 2.7    *Fieldwork and Quality Control*

After the training programme, fifty (50) teams were formed for the field work, with each team having a supervisor and three enumerators, making a total of 150 enumerators and 50 supervisors. Interviewers were selected based on their in-class participation, performance in the field practice sessions, fluency in the Ghanaian languages, and assessment tests. The most experienced trainees, and those who did extremely well, were selected to be supervisors. Fieldwork started from the 9$^{th}$ of April, 2011 and lasted for 21 days.

In order to facilitate the work of the enumerators, Enumeration Area (EA) map of the selected EA, together with the description form (PHC 2) were provided to each team before the start of the fieldwork, which involved re-listing of households and the filling of the PES questionnaire. Efforts were made to make the PES as operationally independent as possible from the census. To ensure independence of the census and PES activities, the following strategies were adopted:
a)    The list of the selected EAs and the households/persons in the EAs were not shown to any of the field officers.
b)    Independent listing of the structures was done. The PES enumerators were instructed to start listing from where the census enumerators ended their listing;
c)    The PES implementing team ensured that PES enumerators did not work in EAs where they previously worked during census enumeration.

Rigorous field procedures were factored into field supervision to ensure quality work. Established standards were followed in order to detect and prevent interviewer errors and any potential falsification of results. Apart from using trained supervisors who took part in the 2010 PHC, the decision to put field staff into teams was to ensure that team members checked on one another. Intensive monitoring of fieldwork was also carried out by the eight PES implementation team members, each of whom had six teams to monitor. The country was zoned into 10 where Census Coordinating Team members, Census Management Staff, the Census Technical Advisor and the Census Management Advisor were assigned a zone each to monitor. In addition, Regional Statisticians also monitored fieldwork in their area of jurisdiction.

During field monitoring, monitors were also tasked to conduct field verification by visiting three households within an EA for re-interview. This was to ensure that the field operations of the entire PES achieved quality work.

## 2.8  *Challenges related to field work*
a)    PES was undertaken six months after the census fieldwork which was later than the three months that international guidelines advocate.  Fortunately, estimates of net coverage rate were low and matching rates were high at national and regional levels. Reconciliation also was conducted over a year after the fieldwork. Some of the inconsistencies could be due to the length of time between the census, PES and reconciliation. For example, the composition of the household, where the person was enumerated during the census and relationship to head of household could be affected.

b)    One of the challenges encountered during the PES field work was that some respondents could not remember their exact ages. This compelled field officers to spend time to assist the respondents in estimating their ages and date of birth which in turn delayed the interview.

c)  The 2010 PHC was conducted from 26th September to 10ᵗʰ October, 2010 which was in the rainy season. As a result, some of the census structure numbers had been washed off and the numbers could not be traced for recording in the questionnaires during the PES field work. The need to record the census structure numbers was to facilitate matching of household information. In the absence of this, the structure address in the census Enumeration Visitation Record (EVR) Book and the address on the PHC 1 form were used, as substitutes, in facilitating matching.

# CHAPTER 3: MATCHING AND DATA PROCESSING

## 3.1 Office Matching

As earlier stated the matching exercise involved the comparison of household and person information from the census and PES questionnaires. Thus, the two-way case-by-case matching was carried out using the PES and census questionnaires. The data from the matching operation provided the necessary information for the estimation of matched numbers which were used in calculating the true population.

Matching took place from 29th December, 2011 to 24th January, 2012. The matching had been planned to start in September, 2011 on the basis of having scanned census forms to allow for electronic matching. Having waited till December 2011, it became apparent that the scanning was not progressing as quickly as hoped. It was then decided to adopt manual matching as an alternative method.

### 3.1.1 Objectives of the Matching Operation

The objective of the matching operation was to classify all PES enumerated persons and census enumerated persons within sample EAs in specific categories. This permitted the calculation of coverage error and the determination of cases for which the content error were calculated.

### 3.1.2 Matching Tasks

The following were the general tasks in matching the results of the PES field work with the 2010 PHC data:
1. Determining the EA (or EAs) to be searched;
2. Searching for the census questionnaires for household(s) that matched with the corresponding PES household questionnaire for each selected EA;
3. Determining which of the listed persons in the PES were matched on the census questionnaire for the matched household;
4. For all matched household questionnaires, comparing selected characteristics of each member of the household with the corresponding census questionnaires;
5. For each unmatched household but enumerated in the PES, a search for these households was done in the surrounding EAs;
6. Establishment of the final match status of households and persons.

### 3.1.3 Supervision and Quality Control

There were two levels of supervision. The first level of supervision had to do with supervisors who had the oversight responsibility of editing and determining the final match status of questionnaires. The second level of supervision consisted of facilitators whose duties were to check and review work done by matchers and supervisors.

### 3.1.4 Office Matching Challenges

The following were some of the challenges faced by the matching team, among others:
• Difficulty in accessing census questionnaires for the corresponding PES questionnaires for matching as census data processing was on-going.
• Differences in names of household members in both PES and census questionnaires.

- Differences in spellings of names by the PES enumerators and the Census enumerators.
- Some of the Census structure numbers, required to help with the identification of structures, were not available in the PES Enumerators Visitation Record (EVR) book.
- Inconsistencies in the structure addresses of the PES and census in some questionnaires were observed.

A number of attempts were made to find solutions to some of the problems. The scanning of the census questionnaires was done on regional basis. At the time of the matching exercise, only five regions had been scanned. In trying to overcome the challenge, the PES team and Management agreed to give priority to scanned census questionnaires from the selected EAs. With regard to the problem of alternate names, households were also called on telephone to verify the names of members and their spellings. In addition, the EVR books were used to facilitate the identification of structure addresses.

## 3.2    Field Reconciliation

Field reconciliation visit is an integral part of the PES methodology aimed at resolving apparent discrepancies between census and PES enumeration. It was established that a number of households and individuals enumerated in the PES could not be matched with those enumerated in the census. Hence, field reconciliation visits were meant to resolve the differences noticed for possible matched and non-matched entries. The idea was to ascertain, to the extent possible, whether there were discrepancies between the census and PES data, and if so, to identify the reasons.

The revisits were, therefore, conducted in order to confirm or obtain additional information that could assist in matching unresolved cases. This applied to households or persons enumerated in the census that did not correspond with households or persons enumerated in the PES. For those enumerated in the census but not in the PES, the reconciliation visits facilitated the determination of erroneous inclusions and correctly enumerated persons in the census.

### 3.2.1    Criteria for Consideration of Clusters for Field Reconciliation

In total, 227 out of the 250 EAs (about 90%) had some cases which were sent to the field for reconciliation visits at the end of the manual matching exercise. In those EAs, a total of 13,500 households out of the 41,070 households enumerated in the 250 PES EAs were non-matched or possible matched households. The possible matched were those individuals/households that seemed matched but could not be matched because of insufficient information in the questionnaires. EAs with the following characteristics were excluded from the reconciliation visits:

- One (1) EA was a high movement zone of which residents were mostly students and temporary settlers who were likely not to be available for reconciliation;
- Three (3) EAs were high mop-up zones from which the census questionnaires extremely out-numbered that of the PES;
- One (1) EA's census satchel could not be traced at the time of the matching;
- Eighteen (18) EAs had relatively high matching rates (90% or more).

In all, a total of 23 EAs were excluded from the household reconciliation visits. Consequently, a total of 12,182 households were visited for the field reconciliation (Table 3.1).

**Table 3.1: Matching results summary**

| | Enumeration Areas | | | | | Households | | | |
| Region | Total EA Selected | Total EAs for High (90+) Matched | % of EAs with High (90+) match | Total dropped for other reasons | Total EAs For Recon-ciliation Visit | Total number of Hhs enum. in PES | Total Non-Matched/ Possible Match Hhs | % of Hhs Matched | Total number of Hhs requiring Reconciliation |
|---|---|---|---|---|---|---|---|---|---|
| **Ghana** | **250** | **18** | **6.5** | **5** | **227** | **41,070** | **13,500** | **67.1** | **12,182** |
| | | | | | | | | | |
| Western | 21 | 0 | 0.0 | 0 | 21 | 3,160 | 1,203 | 61.9 | 1,203 |
| Central | 19 | 1 | 5.3 | 1 | 17 | 3,642 | 1,369 | 62.4 | 1,142 |
| Greater Accra | 29 | 5 | 17.2 | 3 | 21 | 6,812 | 2,699 | 60.4 | 1,636 |
| Volta | 23 | 1 | 4.3 | 0 | 22 | 3,460 | 1,057 | 69.5 | 1,057 |
| Eastern | 29 | 0 | 0.0 | 0 | 29 | 4,837 | 1,222 | 74.7 | 1,222 |
| Ashanti | 45 | 4 | 8.9 | 0 | 41 | 7,945 | 2,033 | 74.4 | 2,005 |
| Brong Ahafo | 22 | 0 | 0.0 | 0 | 22 | 4,290 | 1,358 | 68.3 | 1,358 |
| Northern | 24 | 7 | 29.2 | 1 | 16 | 2,463 | 621 | 74.8 | 621 |
| Upper East | 19 | 0 | 0.0 | 0 | 19 | 2,551 | 1,151 | 54.9 | 1,151 |
| Upper West | 19 | 0 | 0.0 | 0 | 19 | 1,910 | 787 | 58.8 | 787 |

### 3.2.2 Objectives of the Reconciliation Operation

The reconciliation visits were to ensure that the final match status of the households/individuals was determined. The visit was to find out whether households/individuals were correctly or erroneously enumerated in the census. Specifically, the purpose of the reconciliation visit was to establish the status of:

- Households/individuals enumerated in the census but not in the PES;
- Households/individuals enumerated in the PES but not in the census;
- Households/Individuals that did not match but had some similarities for possible match;
- Individuals who could not be matched after applying the matching procedures;
- Inconsistencies of a number of structures covered in the census and PES.

### 3.2.3 Training and Fieldwork

A two-day training workshop was organized to equip participants for the field reconciliation visit to resolve the inconsistencies found among the possible matched and non-matched entries during the manual matching operation. The trainees were put into groups and tasked to:

- Locate and canvass the EAs that had been selected for the reconciliation.
- Search for the listed structures in the EAs to identify the households/individuals selected for reconciliation.
- Reconcile all inconsistent information provided on households and persons.
- Determine the very final status of each member of the household that had been matched.
- Provide any other information on the final status of the households/individuals, including detailed information to help the Secretariat understand properly what transpired on the ground.

### 3.2.4 Field Monitoring and Quality Control

To ensure quality work, monitoring teams were formed and were assigned to the field reconciliation teams. Monitoring guidelines were developed and distributed to the monitors. The field monitors sat in and observed interviews and spot checked some of the completed questionnaires to ensure that the field staff adhered to field procedures.

### 3.2.5 Outcome of Reconciliation Visit

All households identified for field reconciliation visits were covered. Field reports indicated that most of the households were able to recall those who were present in the households at the time of the census and at the time of the PES. All questionnaires sent for the field reconciliation visits were received for data capture.

### 3.3 Data Processing

The PES data capture was done manually in two stages using the Census and Survey Processing (CSPro) software. During the first stage, the PES field data was captured. At the second stage, data from the office matching and field reconciliation visits were captured. The decision to capture the PES data in two stages was arrived at because the census forms were still being processed at the end of the PES field work. To minimize errors, data entry verification was maintained at 100 percent throughout the data processing stages.

The first stage of the PES data capture was conducted between August and October, 2011 while the second stage data capture was done in February 2012. In both stages, officers were recruited to edit the completed PES field questionnaires to prepare them for data capture. The office editors checked for inconsistencies in the responses provided during the PES field data collection exercise. In addition, questionnaire administrators were recruited to help in controlling the movement and allocation of questionnaires.

The Data Entry Operators (DEOs) went through training where they were introduced to the CSPro software and the PES questionnaire as well as an application developed to capture the PES questionnaire. CSPro was also used to generate the initial tables. The initial tables were then exported from CSPro to Statistical Package for Social Sciences (SPSS) and Microsoft Excel in order to produce the final tables for the report. Verification of the captured data was conducted to check for errors and to resolve inconsistent information during the data capture.

# CHAPTER 4: COVERAGE ERROR EVALUATION

## 4.1 Population estimates

The sample population estimates are shown in Table 4.1. The estimated total census population is 24.0 million comprising of 11.8 million males and 12.2 million females. The PES national population estimate which is the sum of non-movers[1] and in-movers[2] is 24.4 million with 12.0 million males and 12.4 million females. The true population[3] is 24.5 million, with females constituting 50.9 percent. It should be noted that the estimation of the population is based on only household population and does not include non-household population.

**Table 4.1: Population Estimates by Age, Sex and Region**

| Characteristics | PES Population | Census Population | True Population |
|---|---|---|---|
| **Ghana** | **24,429,357** | **24,022,004** | **24,458,762** |
| | | | |
| **Age** | | | |
| 0 – 4 | 3,057,080 | 3,070,524 | 3,082,195 |
| 5 – 9 | 3,256,114 | 3,239,853 | 3,256,585 |
| 10 – 19 | 5,767,286 | 5,700,303 | 5,767,432 |
| 20 – 29 | 4,254,267 | 4,082,449 | 4,256,328 |
| 30 – 39 | 3,097,631 | 2,976,387 | 3,098,326 |
| 40+ | 4,996,979 | 4,952,488 | 4,997,896 |
| | | | |
| **Sex** | | | |
| Male | 11,985,634 | 11,761,479 | 12,002,776 |
| Female | 12,443,723 | 12,260,525 | 12,455,986 |
| | | | |
| **Region** | | | |
| Western | 2,156,850 | 2,129,435 | 2,158,629 |
| Central | 2,090,766 | 2,049,432 | 2,094,201 |
| Greater Accra | 4,383,742 | 4,383,457 | 4,402,666 |
| Volta | 1,976,630 | 1,935,341 | 1,981,145 |
| Eastern | 2,537,227 | 2,530,644 | 2,537,423 |
| Ashanti | 4,888,180 | 4,752,124 | 4,888,169 |
| Brong Ahafo | 2,255,235 | 2,204,717 | 2,255,357 |
| Northern | 2,431,516 | 2,364,798 | 2,431,964 |
| Upper East | 1,033,154 | 1,015,166 | 1,033,152 |
| Upper West | 676,057 | 656,890 | 676,056 |

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[1] A non-mover refers to a household member enumerated in the PES and was present on census night.
[2] An in-mover is one who moved into the household or house/compound after the Census enumeration date.
[3] True population is defined as the expected population of all persons in the country as at census night.

## *4.2 Coverage rates*

This section deals with the results of the Post Enumeration Survey (PES) with respect to coverage. The census omission rate, coverage rate, erroneous inclusions rate, true population, net coverage error, net coverage rate and gross coverage error rate are estimated by using the matched population, census population, and PES population.

Table 4.2 shows that at the national level, the net coverage rate was 1.8 percent. The rate for females of 1.6 percent was lower than that of males at 2.0 percent. Among the regions, Eastern had the lowest net error rate of 0.3 percent followed by Greater Accra with a net error rate of 0.4 percent. The regions with the highest net coverage rate of 2.8 percent were Ashanti, Northern and Upper West. From the results, the single most important indicator of quality of the census coverage, the net coverage rate, had a range of 0.3 percent to 2.8 percent. Based on these relatively low net coverage rates, we conclude that the 2010 Ghana census was of good coverage quality.

**Table 4.2: Coverage Error Rates by Sex and Region**

| Characteristics | Coverage Rate | Omission Rate | Erroneous inclusion Rate | Gross Coverage Error Rate | Net Coverage Rate |
|---|---|---|---|---|---|
| **Ghana** | 97.0 | 3.0 | 1.3 | 4.4 | 1.8 |
| **Age** | | | | | |
| 0 – 4 | 99.6 | 0.4 | 0.0 | 0.4 | 0.4 |
| 5 – 9 | 99.5 | 0.5 | 0.0 | 0.5 | 0.5 |
| 10 – 19 | 98.3 | 1.7 | 0.5 | 2.2 | 1.2 |
| 20 – 29 | 94.1 | 5.9 | 1.9 | 8.1 | 4.1 |
| 30 – 39 | 94.1 | 5.9 | 2.1 | 8.3 | 3.9 |
| 40+ | 96.3 | 3.7 | 2.8 | 6.6 | 0.9 |
| **Sex** | | | | | |
| Male | 96.7 | 3.3 | 1.3 | 4.7 | 2.0 |
| Female | 97.2 | 2.8 | 1.3 | 4.1 | 1.6 |
| **Region** | | | | | |
| Western | 96.1 | 3.9 | 2.6 | 6.5 | 1.4 |
| Central | 96.5 | 3.5 | 1.4 | 5.0 | 2.1 |
| Greater Accra | 97.1 | 2.9 | 2.4 | 5.3 | 0.4 |
| Volta | 95.7 | 4.3 | 2.1 | 6.5 | 2.3 |
| Eastern | 97.4 | 2.6 | 2.3 | 4.9 | 0.3 |
| Ashanti | 96.9 | 3.1 | 0.3 | 3.5 | 2.8 |
| Brong Ahafo | 97.7 | 2.3 | 0.1 | 2.5 | 2.2 |
| Northern | 97.2 | 2.8 | 0.0 | 2.9 | 2.8 |
| Upper East | 98.2 | 1.8 | 0.1 | 2.0 | 1.7 |
| Upper West | 97.1 | 2.9 | 0.1 | 3.1 | 2.8 |

With reference to coverage rates, a coverage rate of 97.0 percent was recorded at the national level. The coverage rate for females (97.2%) was higher than that of males (96.7%). Among the regions, Upper East region had the highest coverage rate of 98.2 percent, followed by Brong Ahafo (97.7%) and Eastern (97.4%). The region with the lowest coverage rate was Volta (95.7%). The age group 0-4 years recorded the highest coverage rate of 99.6 percent while the age groups 20-29 and 30-39 had the lowest coverage rate of 94.1 percent. A little over one (1) percent of the population was erroneously included in the census.

Erroneous inclusions included persons who were enumerated in the census when they should not have been or were enumerated in the wrong place. Table 4.2 shows that whereas persons in Western (2.6%) were more likely to be erroneously enumerated; those in Northern (0.0%) were least likely to be wrongly enumerated. The highest gross coverage error rate[4] of 6.5 percent was recorded in Western and Volta followed by Central region with a gross error rate of 5.0 percent.

**Table 4.3:    Coverage Errors by Age, Sex and Regions**

| Characteristics | Erroneous Inclusion | Gross Coverage Error | Net Coverage Error |
|---|---|---|---|
| **Ghana** | **308,622** | **1,054,002** | **436,758** |
| **Age** | | | |
| 0 – 4 | 0 | 11,671 | 11,671 |
| 5 – 9 | 0 | 16,731 | 16,731 |
| 10 – 19 | 29,200 | 125,529 | 67,129 |
| 20 – 29 | 77,421 | 328,721 | 173,879 |
| 30 – 39 | 62,007 | 245,953 | 121,939 |
| 40+ | 139,994 | 325,395 | 45,407 |
| **Sex** | | | |
| Male | 153,200 | 547,698 | 241,298 |
| Female | 155,422 | 506,304 | 195,460 |
| **Region** | | | |
| Western | 54,644 | 138,486 | 29,198 |
| Central | 28,515 | 101,803 | 44,773 |
| Greater Accra | 107,024 | 233,267 | 19,219 |
| Volta | 39,758 | 125,324 | 45,808 |
| Eastern | 58,576 | 123,936 | 6,784 |
| Ashanti | 15,631 | 167,318 | 136,056 |
| Brong Ahafo | 1,915 | 54,475 | 50,645 |
| Northern | 914 | 69,000 | 67,172 |
| Upper East | 1,102 | 20,192 | 17,988 |
| Upper West | 543 | 20,253 | 19,167 |

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[4] Gross coverage error rate is the total error made in the census in terms of omissions and erroneous inclusions.

# CHAPTER 5: CONTENT ERROR EVALUATION

As mentioned earlier, one of the objectives of the Post Enumeration Survey (PES) was to assess the quality of reported information during the census and the PES for selected variables. Content error was estimated for sex, age, relationship and marital status. Evaluation of census content error involved the estimation of variation and bias components of total error which may be due to mistakes in data processing, interviewer bias, respondent bias, unclear questionnaire and misreporting.

## 5.1    Rate of Agreement

Table 5.1 provides information on the rate of agreement[5] in the census and PES.  A low rate of agreement indicates a high degree of variability and vice-versa.

It is observed from Table 5.1 that at the national level, sex recorded the highest rate of agreement (98.8%), followed by marital status (94.6%). The rate of agreement (83.0%) for age was the lowest. The high variations in age could be due to respondents giving different ages during the census and PES enumeration.

**Table 5.1: Rate of Agreement by Region and Selected Characteristics**

| Region | Sex | Relationship | Age | Marital Status |
|---|---|---|---|---|
| **Ghana** | **98.8** | **90.5** | **83.0** | **94.6** |
| **Region** | | | | |
| Western | 98.5 | 86.4 | 88.8 | 93.4 |
| Central | 98.8 | 93.5 | 85.5 | 95.9 |
| Greater Accra | 99.3 | 94.3 | 83.6 | 94.5 |
| Volta | 99.1 | 90.1 | 85.8 | 93.3 |
| Eastern | 99.0 | 89.3 | 85.7 | 91.6 |
| Ashanti | 99.1 | 90.0 | 86.0 | 93.1 |
| Brong Ahafo | 99.0 | 91.7 | 83.4 | 94.5 |
| Northern | 98.2 | 92.5 | 70.0 | 97.3 |
| Upper East | 98.7 | 91.0 | 78.1 | 96.7 |
| Upper West | 98.0 | 88.6 | 75.4 | 96.5 |

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[5] Rate of agreement indicates the level at which information given in the census matches that given in the PES.

At the regional level, the lowest rate of agreement for age (70.0%) was observed for the Northern region, followed by Upper West (75.4%) and Upper East (78.1%). Sex showed the lowest variation in rate of agreement ranging from 98.0 percent in the Upper West region to 99.3 percent in Greater Accra. In the Eastern region, there was a variation of 3.0 percentage points for marital status compared to 2.7 percentage points in the Northern region. Upper West (88.6%) recorded the lowest rate of agreement for relationship to the head of household while Greater Accra (94.3%) recorded the highest.

## *5.2    Net Difference Rate (NDR) and Index of Inconsistency*

The net difference rate (NDR) is the difference between the number of cases in the census and the number of cases in the PES that fall under each response category relative to the total number of reported persons in both the census and PES in all response categories (Table 5.2).

In general, marital status was accurately reported. Males were under reported while their female counterparts were over reported. There was over reporting in the relationship to the head of household, with grandchild (0.70) recording the highest, followed by brother/sister (0.50). On the other hand, the head of household (-0.50), child (-0.34), spouse (-0.29) and other relative (-0.25) were under reported.

Table 5.2 further indicates that age groups 0-4 and 30-39 years were over reported by net difference rates of 1.75 and 0.04 respectively. On the other hand, age groups 5-9, 10-19, 20-29 and 40+ were under reported.

Index of Inconsistency is the relative number of cases for which the response varied between the census and the PES. It is the ratio of the simple response variance to the total variance of the characteristic, including its variability in the population. It is calculated for each response category. Table 5.2 shows that both males and females recorded a low index of inconsistency level. A high inconsistency occurred for foster child (54.9%), while moderate rates were recorded for step child (44.0%) and son/daughter-in-law (38.3%).

Age group 5-9 recorded the highest index of inconsistency of 51.1 percent and the lowest was observed in age group 40 years and older (11.7). The table also shows that there were low levels of inconsistencies in the never married, married and widowed categories.

**Table 5.2: Net Difference Rate and Index of Inconsistency by Selected Characteristics**

| Characteristics | Number of Cases in PES | Number of Cases in Census | Net Difference Rate (NDR) | Index of Inconsistency |
|---|---|---|---|---|
| **Sex** | | | | |
| Male | 92,798 | 92,765 | -0.017 | 2.32 |
| Female | 97,557 | 97,590 | 0.017 | 2.32 |
| **Relationship** | | | | |
| Head | 45,491 | 44,545 | -0.497 | 9.5 |
| Spouse | 25,213 | 24,669 | -0.286 | 10.3 |
| Child | 85,152 | 84,504 | -0.340 | 10.2 |
| Parent | 2,601 | 2,630 | 0.015 | 24.2 |
| Son/Daughter in Law | 844 | 1,020 | 0.092 | 38.3 |
| Grandchild | 12,739 | 14,069 | 0.699 | 18.1 |
| Brother/ Sister | 5,009 | 5,963 | 0.501 | 24.9 |
| Step Child | 812 | 932 | 0.063 | 44.0 |
| Foster Child | 177 | 279 | 0.054 | 54.9 |
| Other Relative | 9,565 | 9,086 | -0.252 | 24.4 |
| Non Relative | 2,749 | 2,655 | -0.049 | 19.6 |
| **Age** | | | | |
| 0 – 4 | 12,552 | 14,400 | 1.750 | 16.0 |
| 5 – 9 | 14,477 | 14,050 | -0.404 | 51.1 |
| 10 – 19 | 25,088 | 24,237 | -0.806 | 18.7 |
| 20 – 29 | 15,540 | 15,524 | -0.015 | 25.0 |
| 30 – 39 | 13,599 | 13,639 | 0.038 | 29.8 |
| 40+ | 24,336 | 23,742 | -0.563 | 11.7 |
| **Marital Status** | | | | |
| Never married | 116,857 | 116,214 | -0.003 | 4.0 |
| Consensual Union | 7,589 | 7,235 | -0.002 | 33.0 |
| Married | 54,026 | 54,519 | 0.003 | 9.3 |
| Separated | 1,298 | 1,684 | 0.002 | 44.3 |
| Divorced | 3,649 | 4,013 | 0.002 | 27.2 |
| Widowed | 6,936 | 6,690 | -0.001 | 11.9 |

Source: UNSD 2010, PES Operational Guidelines Technical Report, pp 66.

**Note:**
- Net Difference Rate of less than 0.01 is Low; 0.01-0.05 is Moderate; and Greater than 0.05 is High.
- Index of inconsistency less than 20 is Low; 20-50 is Moderate; and greater than 50 is High.

**Table 5.3: Standards for the interpretation of the different content error measures**

| Measure | Low | Moderate | High |
|---|---|---|---|
| Index of inconsistency | <20 | 20 - 50 | >50 |
| Aggregate index of inconsistency | <20 | 20 - 50 | >50 |
| Absolute value of NDR relative to mean or proportion (NDR/P) | <0.01 | 0.01 – 0.05 | >0.05 |

Source: UNSD 2010, PES Operational Guidelines Technical Report, pp 66.

# Chapter 6: Post enumeration survey results and their reliability measures

Given that the Post Enumeration Survey (PES) estimates were obtained through probability sampling procedure, they were subject to sampling errors, which indicate their reliability. It is against this background that the standard errors and confidence intervals were calculated for selected estimates. The PES was a household sample survey, subject to the errors indicated above and non-sampling errors. The Ghana PES was based on a representative and an acceptable sample size. This made it possible to carry out the statistical analysis which facilitated the derivation of measurable reliability of standard errors, 95 percent confidence intervals and the design effects associated with the selected estimates.

## 6.1 Standard errors and confidence intervals

It was necessary to include appropriate measures of precision of some estimates generated from the PES results. The estimates which are considered in this section include PES population estimates, net coverage rates and coverage rates. The reliability measures will facilitate the proper use and interpretation of the results. In addition, they will also serve as a basis for evaluating future PES sample designs and procedures.

Standard errors measure the variability of the sample estimates. In this regard, one of the key measures of precision in the PES is the sampling variance which is an indicator of the variability introduced by selecting a sample instead of enumerating the whole population. Thus, the sampling variance is the measure of variability of the sampling distribution of an estimator. The standard error/sampling error is the square root of the variance.

As earlier indicated in Chapter 2, the Ghana PES resorted to a single-stage stratified cluster sample design:

The PES population estimate was obtained as follows:

$$Y_{hi} = \sum_{i=1}^{a_h} \sum^{m_{hi}} W_{hi} y_{hij}$$

The standard error of the estimate is given by:

$$se(y) = \left[ \sum_{h=1}^{H} \frac{a_h}{a_h - 1} \sum_{i=1}^{n_h} \left( y_{hi} - \frac{y_h}{a_h} \right) \right]^{1/2}$$

Where $H$ = Number of strata

$a_h$ = Number of sample EAs selected in the $h^{th}$ stratum

$y_{hij}$ = Value of $Y$ variable for the $j^{th}$ household or person in the sample EA in the $h^{th}$ stratum

$m_{hi}$ = Number of households with completed PES interviews in the $i^{th}$ sample EA in the $h^{th}$ stratum

$W_{hi}$ = Weight for households in the $i^{th}$ sample EA in the $h^{th}$ stratum.

The formula for estimating sampling errors for ratios, rates, and percentage is given below:

(i) $\qquad R = \dfrac{\hat{Y}}{\hat{X}}$ or $\dfrac{y}{x}$ , $\quad \hat{Y}$ and $\hat{X}$ ( $y$ and $x$) are weighted total estimates

(ii) $\qquad se(R) = \left[ \dfrac{1}{x^2} v(y) + R^2 v(x) - 2R \operatorname{cov}(x,y) \right]^{1/2}$

Where $v(y)$ and $v(x)$ are variances of PES estimates of total

## 6.2 Confidence intervals

Confidence intervals were calculated for selected estimates as was the case for sampling errors. The confidence intervals were computed on the basis of the specification of limits or boundary values of the interval and the associated probability that the population parameter is contained in the interval values. The interval values are referred to as "*confidence intervals*" **and the *boundary values* which** define them are called the *confidence limits.* For each confidence interval, there is an associated probability indicating how certain we can be that the population parameter falls within the interval. The probability associated with each of the calculated confidence intervals was expressed as a percentage statement rather than a decimal probability. For example, the probability of a parameter being included in a particular interval was chosen to be $p = 0.95$ . In this report, we use the 95 percent confidence interval.

The confidence intervals were calculated for selected estimates as follows:
Lower limit = value of estimate – 1.96 x standard error of the estimate
Upper limit = value of estimate + 1.96 x standard error of the estimate

## 6.3 Design effect

The design effect (deff) is defined as the ratio of the sampling variance of an estimator under a given design relative to the variance based on a simple random sample of the same size. The design effects in Tables 6.1, 6.2 and 6.3 are all below 2 ranging from 1.0 to 1.11. While we are not discussing them in detail, we conclude that the variances resulting from the complex design involving clustering and stratification would not vary much from those based on simple random sampling design of the same size because the design effects are not very large. This, however, does not preclude increasing the sample sizes in some smaller regional domains, such as the Upper West region, in future Post Enumeration Surveys.

## 6.4 Results

We present below Tables 6.1 to 6.3 representing PES population estimates, net coverage rates and coverage rates, with the estimated sampling errors, 95 percent confidence intervals and design effects. Through these measures we attempt to assess the reliability of the estimates.

Table 6.1 above shows that the estimated PES population at the national level was 24,429,357 with a standard error of 8,629. The lower and upper limits were relatively close at 24,412,099 and 24,446,615 respectively. The PES estimated population by region ranged from 676,057 (Upper West) to 4,888,180 (Ashanti). In general, the lower and upper limits of the confidence intervals were not very wide apart. It can, therefore be, safely stated that the estimates are reliable.

**Table 6.1: Estimates of the PES population by region**

| Region | Population | Standard error | Design effect | 95% Confidence Interval limits | |
|---|---|---|---|---|---|
| | | | | **Lower** | **Upper** |
| **Ghana** | **24,429,357** | **8,629** | **1.09** | **24,412,444** | **24,446,270** |
| Western | 2,156,850 | 971 | 1.01 | 2,154,947 | 2,158,753 |
| Central | 2,090,766 | 674 | 1.01 | 2,089,445 | 2,092,087 |
| Greater Accra | 4,383,742 | 3,789 | 1.02 | 4,376,316 | 4,391,168 |
| Volta | 1,976,630 | 460 | 1.01 | 1,975,728 | 1,977,532 |
| Eastern | 2,537,227 | 519 | 1.01 | 2,236,210 | 2,253,244 |
| Ashanti | 4,888,180 | 1,143 | 1.01 | 4,888,940 | 4,890,420 |
| Brong Ahafo | 2,255,235 | 370 | 1.00 | 2,254,510 | 2,255,960 |
| Northern | 2,431,516 | 550 | 1.01 | 2,430,438 | 2,432,594 |
| Upper East | 1,033,154 | 114 | 1.00 | 1,032,931 | 1,033,377 |
| Upper West | 676,057 | 39 | 1.00 | 675,981 | 676,133 |

The net coverage rate, as earlier stated, is the most important indicator of the quality of census coverage. The rate at the national level was relatively low at 1.8 percent, implying that the quality of coverage in the census was good with a standard error of 0.001 and associated 95 percent confidence limits ranging from 1.6 percent to 2.0 percent. The 95 percent confidence limits for net coverage rates imply that there is a high probability (chance) that the true net coverage rate is between 1.6 percent and 2.0 percent. The estimates at regional and any other post-strata levels can be similarly interpreted.

Among the regions, the highest net coverage rate was observed in Ashanti, Northern and Upper West regions estimated at 2.8 percent and the lowest was that of the Eastern region (0.3%). In general, as can be seen from Table 6.2, the widths of the intervals are relatively small. The confidence interval is widest for the Western region.

**Table 6.2: Net coverage rates by region**

| Region | Net Coverage Rate (%) | Standard Error | Design Effect | 95% Confidence Interval limits | |
|---|---|---|---|---|---|
| | | | | **Lower** | **Upper** |
| **Ghana** | **1.8** | **0.0010** | **1.08** | **1.6** | **2.0** |
| Western | 1.4 | 0.0055 | 1.11 | 0.3 | 2.4 |
| Central | 2.1 | 0.0028 | 1.05 | 1.6 | 2.7 |
| Greater Accra | 0.4 | 0.0014 | 1.04 | 0.2 | 0.7 |
| Volta | 2.3 | 0.0018 | 1.04 | 2.0 | 2.7 |
| Eastern | 0.3 | 0.0018 | 1.05 | 0.0 | 0.6 |
| Ashanti | 2.8 | 0.0006 | 1.03 | 2.7 | 2.9 |
| Brong Ahafo | 2.2 | 0.0013 | 1.02 | 2.1 | 2.4 |
| Northern | 2.8 | 0.0012 | 1.05 | 2.5 | 3.0 |
| Upper East | 1.7 | 0.0009 | 1.02 | 1.6 | 1.9 |
| Upper West | 2.8 | 0.0029 | 1.05 | 2.3 | 3.4 |

The coverage rate at the national level was 97 percent, implying that the omission rate was about 3.0 percent. The confidence limits of the coverage rate were 96.8 percent and 97.1 percent. With respect to regions the coverage rates where highest in the Upper East region at 98.2 percent. Volta had the lowest (95.7%). However, for both regions the confidence limits converged to 95.7 percent and 97.2 percent, respectively.

**Table 6.3: Coverage rates by region**

| Region | Coverage Rate (%) | Standard Error | Design Effect | 95 % Confidence | Interval limits |
|---|---|---|---|---|---|
| | | | | Lower | Upper |
| **Ghana** | **97.0** | **0.0010** | **1.02** | **96.8** | **97.1** |
| | | | | | |
| Western | 96.1 | 0.0010 | 1.02 | 95.9 | 96.3 |
| Central | 96.5 | 0.0006 | 1.01 | 96.4 | 96.6 |
| Greater Accra | 97.1 | 0.0027 | 1.08 | 96.6 | 97.7 |
| Volta | 95.7 | 0.0002 | 1.01 | 95.7 | 95.7 |
| Eastern | 97.4 | 0.0002 | 1.00 | 97.4 | 97.5 |
| Ashanti | 96.9 | 0.0001 | 1.01 | 96.9 | 96.9 |
| Brong Ahafo | 97.7 | 0.0001 | 1.01 | 97.6 | 97.7 |
| Northern | 97.2 | 0.0002 | 1.01 | 97.2 | 97.2 |
| Upper East | 98.2 | 0.0002 | 1.00 | 98.1 | 98.2 |
| Upper West | 97.1 | 0.0002 | 1.00 | 97.0 | 97.1 |

By examining the results presented in Table 6.1, 6.2, and 6.3, it is observed that the PES population estimates, net coverage rates and coverage rates were reliable, as indicated by the sampling errors and confidence intervals.

# CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

## 7.1 Conclusions

In reviewing the planning, implementation and results of the PES, we conclude that in general, the PES was a successful exercise whose results can objectively be used to evaluate the 2010 Population and Housing Census coverage and content errors (of the selected variables). Notwithstanding its success in implementation, the PES experience has given an insight into the potential sources of error in future censuses and surveys. The insights would go a long way in improving the planning and conduct of future population censuses and large-scale household surveys in the country.

The major component of the error in the census is the incomplete count of household members. The estimated omission rate is 3.0 percent while the erroneous inclusion rate is, however, only 1.3 percent at the national level. The quality of enumeration, as revealed by the level of response variance, varies with the characteristics enumerated in the census. While the rates of agreements are relatively high, for most variables such as sex and marital status, the data suggest that the quality of age reporting in the census has to improve.

Considering the degree of net coverage rate (1.8%) and standard errors of selected characteristics estimated from the PES results, it can be concluded that the 2010 Population and Housing Census was successfully implemented and yielded plausible results in terms of both coverage and quality of responses, notwithstanding the challenges earlier discussed in the report.

## 7.2 Recommendations

- The PES should be conducted within three months of census fieldwork, as recommended by the United Nations. Delays in its conduct could violate the Dual System Estimation methodology assumption pertaining to the requirement for a closed population.
- The simple one-stage sample design should be maintained, but consideration should be given to increasing the sample size to around one percent.
- Because of the high matching rate, there is no need for adjusting the census based on the PES adjusting factors. .
- Structure numbers should be written on quality stickers and pasted in secure places of the structures during the census listing exercise.
- The phone numbers of households collected during the census was helpful during the post enumeration period and should be maintained.
- The census EVR used for the census household listing should be structured to allow for the listing of households within each structure as was done for the PES EVR.
- The final match status of each member of the PES household should be determined to facilitate the accurate calculations of matching rates and other relevant estimates.
- Sampling errors, for selected key estimates, should always be calculated and included in the PES technical report.
- The GSS should consider both manual and computer matching to fast track the matching exercise.
- Different approaches, to publicity, should be adopted depending on prevailing circumstances in different parts of the country. For effective publicity in future PES, the campaign should be targeted to the enumeration areas selected for the survey, for example, via the use of local FM radio stations and Information Service vans.
- The GSS should come out with PES practical manual, for Ghana, that could be used for future post enumeration surveys.

# Glossary

**Population census:** A Population Census is the official enumeration of all persons in a country at a specific time. The Census implies the collection, compilation, evaluation, analysis, publication and dissemination of demographic, social and economic statistics relating to the population.

**Housing census:** A Housing Census is the official enumeration of all living quarters (occupied and vacant) in a country at a specified time. This enumeration also implies the collection, compilation, evaluation, analysis, publication and dissemination of statistical data pertaining to these living quarters and the occupants.

**Household:** A household consists of a person or a group of persons who live together in the same house or compound, share the same house-keeping arrangements and are catered for as one unit.

**Head of household:** The household usually recognizes one person as the head. The head of household is generally the person, male or female, who has economic and social responsibility for the household.

**Census Night:** It was the reference time to which census and PES enumeration were related. In the case of the 2010 PHC, Census Night was the midnight of 26th September, 2010.

**House/Compound:** It is a structurally separate and independent place of abode.

**Enumeration Area (EA):** It is simply a geographical area (land, water) into which the country is divided for the purpose of the 2010 census enumeration. An enumeration area has features (boundaries, names, etc.) that are unique to a particular part of the country.

**Listing:** It is the process of identifying and recording all housing units and all other structures in an EA.

**Non-mover:** A non-mover refers to a household member enumerated in the PES and was present on Census Night.

**In-mover:** An in-mover is one who moved into the household or house/compound after the Census enumeration date.

**Out-mover:** Residents who left the household or died during the interim period between the census and the PES.

**Out-of-scope:** A person is considered as out-of-scope if he/she was born after Census Night or if there is insufficient information for matching.

**Match:** A person is classified as a match if the name and other characteristics are the same on both the PES and Census questionnaires. In other words, if there is no doubt that the person in the PES questionnaire is the same person as in the Census questionnaire.

**Possible match:** This is the situation where the name recorded on the Census questionnaire is not exactly the same as that on the PES questionnaire or there is a significant difference in age or some other attributes.

**Non-match:** A person is considered as a "Non-Match" if he/she was not enumerated in the Census when he/she should have been. This means that he/she was not found in any Census questionnaire but there is a record from the PES enumeration.

**Matched population**: Matched non-movers and matched out-movers

**Erroneous enumeration:** It is the enumeration of persons that should not have been included in the census.

**Erroneous enumeration duplication**: Duplications occur when persons or households were enumerated more than once either intentionally or unintentionally.

**Erroneous inclusions:** This includes persons that are enumerated in the census when they should not have been or were enumerated in the wrong place (e.g., including a person who died before the census date and births that occurred after the census date in a census).

**Coverage rate:** Coverage rate refers the ratio of matched population to the PES population. The matched population was the sum of matched non-movers and estimated matched in-movers; likewise, the PES population was the sum of non-movers and in movers.

*Coverage error:* Refers to either an under-count or over-count of units owing to omissions of persons/ housing units or duplication/erroneous inclusion, respectively.

*Content error:* Refers to the response differences of the same characteristic, as reported during the census and the PES.

**Omissions:** This results from missing housing units, households, or persons during census enumeration. Missing a whole housing unit implies that all households and persons living in that housing unit will also be missed during the census enumeration.

**Duplications:** Duplications occur when persons, households or housing units are enumerated more than once. They also occur owing to enumerators' overlapping of assignments or errors committed during pre-census listing and EA delineation.

**Gross coverage error:** Gross coverage error represents the sum of three components of coverage error namely, duplication, erroneous inclusions and omissions.

**Net coverage error**: It is the difference between what should have been counted (true population) and what was counted (census population).

**Census population enumeration:** It is the total matched *non-movers, matched out-movers, population erroneously included in the census and population correctly enumerated in the census but missed in the PES census population.*

**PES population:** It is the total number of non-movers and in-movers.

**True population:** It is the population estimated from the PES multiplied by the census population after correcting it for erroneous inclusions and divided by matched population between the census and the PES.

# APPENDICES

***Appendix 1: Definition of Indicators***

The following concepts and symbols were adopted for the calculation and presentation of coverage and content indicators. All the rates were computed from the weighted sample data and are presented in a form of percentages.

1. Matched population = Matched non_movers + Matched out_movers

2. Census population =
     Matched non_movers
       + Matched out_movers
       + Erroneous inclusion     + Correctly enumerated in the census but missed in the PES

3. PES population = Non_movers + In_movers

4. True Population = $\dfrac{\text{PES population x (Census population } - \text{ Erroneous inclusions)}}{\text{Matched Population}}$

5. Census omissions = True Population − (Census Population + Erroneous inclusions)

6. Coverage rate = $\dfrac{\text{Matched population}}{\text{PES population}}$

7. Erroneous inclusion rate = $\dfrac{\text{Erroneous inclusions}}{\text{Census population}}$

8. Net coverage error = True population − Census population

9. Net coverage error rate = $\dfrac{\text{Net coverage error}}{\text{True population}}$

10. Gross coverage error $=$ Omissions $+$ Erroneous inclusions

11. Gross coverage error rate per unit $= \dfrac{\text{Gross coverage error}}{\text{Census Population}}$

12. $\text{RA} = \dfrac{1}{n} \sum_{i=1}^{c} Y_{ii} \times 100$

Where:

RA = Rate of agreement

$Y_{ii}$ = number of cases where category i was given as response in both Census and PES.

n = total number of PES cases for which there was a report in both Census and PES.

c = number of categories for a given characteristic.

The rate of agreement indicates the level at which the information given in the Census matches that given during the PES. A low rate of agreement indicates a high degree of variability and vice-versa. The rate of agreement is therefore a good measure of the gross error for an item.

13. $\text{NDR} = \dfrac{y.i - yi.}{(n)} \times 100;$        For $i = 1, 2, 3, \dots n$

Where:

$y.i$ = unweighted census number of cases in the $i\,th$ category

$yi.$ = the unweighted PES number of cases in the $i\,th$ category

$n$ = unweighted total number of reported persons in both census and PES

$s$ = the total number of response categories for characteristic y

The Net Difference Rate (NDR) is the difference between the number of cases in the census and the number of cases in the PES that fall under each response category relative to the total number of reported persons in both the Census and PES in all response categories.

NDR approximates the level of under reporting or over reporting for each response in the Census and the PES relative to the total number of matched persons in all response categories. It can be interpreted as a measure of the bias only when the PES is considered to have been more accurate closer to the true value than the original response.

14. Index of inconsistency (I) $= \dfrac{y.i - yi. - 2yii}{\frac{1}{n}\{y.i(n - yi.) + yi.(n - y.i)\}} \times 100$   For $i = 1, 2, 3, \dots n$

The Index of Inconsistency (I) is the ratio of the Simple Response Variance (SRV) to the total variance for a given item. It is computed for each response category $i$.

15. Aggregate index of inconsistency (IAG) $= \dfrac{[n - \sum_i^c y_{ii}]}{n - {}^1\!/_n \sum_i^c y_{.i} y_{i.}} \times 100$

The Aggregate Index of Inconsistency (IAG) is a summary measure of the index of inconsistency (that is, for all the response categories of the characteristic as a whole).

*Appendix 2: Weighting Procedure*
The objective of weighting the PES data is to improve the representativeness of the PES sample in terms of the size, distribution and characteristics of the study population. Weighting is necessary in order to reduce bias; there is also the possibility of a reduction in variance for some estimates. Weights were assigned to the data record for each sample unit for analysis. The weights compensated for unequal selection probabilities.

**Design weight**
A design weight can be defined as the ***average number of units in the PES population that each sample EA represents.***

* The design weight $w_d$ for a unit in the sample is the reciprocal/inverse of its selection probability ($p$)
* The Ghana PES was a one stage-cluster stratified sample design. Thus, the Probability of a sample unit selection was $\dfrac{1}{p} = w_d$

Once the probabilities of selection of sampled EAs were determined, the sampling weights were constructed. The development of weights started with the construction of design weight for each sampled unit.

Here is an example:

i) A sample of households with probability $\frac{1}{100}$ presents 100 households in from which the sample was drawn
ii) In this case, sample weights act as inflation factors designed to represent the number of units in the survey population that are represented by the sample unit to which the weight was assigned.
iii) In general, the sum of sample weights provides an unbiased estimate of the total number of units in the target population.

*Sample Size Determination*
In arriving at the estimate, the following factors were evaluated for each district in the regions:
1. Number of EAs assigned to district
2. Number of EAs covered in the district as at December 2010
3. Number of residential structures listed in each EA
4. Number of residential structures enumerated in the EA

The average level of coverage based on all the regional estimates was 94.4 percent and this was used in determining the sample size. The following expression was used in calculating the sample size based on the definition of the relative error of $p$.

*$n = \{(1-p)/p\} \, x \, \{deft/RE\,(p)\}^2$*

*where:*
deft = design effect. This is assumed to be 1.5 as defined in the Ghana Demographic and Health Surveys

RE $(p)$ = the relative error of $p$

$p$ = Estimated proportion of coverage nationally which is 94.4

$n$ = Sample size

The table below shows the calculation of the sample size 'n' at 97.5%, 95% and 92.5% confidence levels.

| Relative error of 2.5% | | | | |
|---|---|---|---|---|
| **Rate per 100** $p$ | **Rate as a proportion** $P$ | **Sample Size** $n$ | **95% Confidence Interval** | |
| | | | **Lower Bound** $p\,(1-2RE)$ | **Upper Bound** $p\,(1+2\,RE)$ |
| 97.4 | 0.9740 | 96 | 0.9253 | 1.0227 |
| 96.4 | 0.9640 | 134 | 0.9158 | 1.0122 |
| 95.4 | 0.9540 | 174 | 0.9063 | 1.0017 |
| 94.4 | 0.9440 | 214 | 0.8968 | 0.9912 |
| 93.4 | 0.9340 | 254 | 0.8873 | 0.9807 |
| 92.4 | 0.9240 | 296 | 0.8778 | 0.9702 |

| Relative error of 5% | | | | |
|---|---|---|---|---|
| **Rate per 100** $p$ | **Rate as a Proportion** $p$ | **Sample Size** $n$ | **95% Confidence Interval** | |
| | | | **Lower Bound** $p\,(1-2RE)$ | **Upper Bound** $p\,(1+2RE)$ |
| 97.4 | 0.9740 | 24 | 0.8766 | 1.0714 |
| 96.4 | 0.9640 | 34 | 0.8676 | 1.0604 |
| 95.4 | 0.9540 | 43 | 0.8586 | 1.0494 |
| 94.4 | 0.9440 | 53 | 0.8496 | 1.0384 |
| 93.4 | 0.9340 | 64 | 0.8406 | 1.0274 |
| 92.4 | 0.9240 | 74 | 0.8316 | 1.0164 |

| Relative error of 10% | | | | |
|---|---|---|---|---|
| **Rate per 100** $p$ | **Rate as a Proportion** $P$ | **Sample Size** $n$ | **95% Confidence Interval** | |
| | | | **Lower Bound** $p\,(1-2RE)$ | **Upper Bound** $p\,(1+2RE)$ |
| 97.4 | 0.9740 | 6 | 0.7792 | 1.1688 |
| 96.4 | 0.9640 | 8 | 0.7712 | 1.1568 |
| 95.4 | 0.9540 | 11 | 0.7632 | 1.1448 |
| 94.4 | 0.9440 | 13 | 0.7552 | 1.1328 |
| 93.4 | 0.9340 | 16 | 0.7472 | 1.1208 |
| 92.4 | 0.9240 | 19 | 0.7392 | 1.1088 |

From the tables, each domain (region) of study required a minimum of 19 EAs in order to measure the proportion of coverage accurately at 2.5% significance level. Thus, for the 10 domains, the minimum number of EAs required was 214. However, the choice of sample size involved balancing the demand for precise analysis with the capability of implementing organizations and to ensure that each region had adequate number of EAs for representation of all residential types in the country. To account for non-response, an additional 36 EAs was added, giving a total sample size of 250 EAs.

The sampling fraction for each region was computed using the formula $f = n/N$; where n=sample size of EAs selected from each region and N is the total number of EAs in the region. EAs were denoted by $N_1, N_2, N_3, \ldots, N_i$; such that $N_1 + N_2 + N_3 + \ldots + N_i = N$.

Allocation of EAs to the regions was made proportional to the number of EAs in each region. This required knowledge about the total number of EAs for each region as well as the estimated coverage per region. Based on this information, the proportion for each region was obtained with reference to the estimated sample size of 250 EAs. The systematic sampling method with probability proportional to size was used within each region in selecting the allocated number of EAs in each region where size was the number of households in each EA.

The estimation of the erroneous inclusions provides a correction factor required in the estimation of the true population.

Institutional populations (those in Universities, schools, colleges, hospitals, army barracks, hotels, etc.) and households residing in refugee camps) were excluded from the PES sample.

Within the selected EAs, map reading and canvassing of each selected EA was carried out and a complete listing of all structures was done, after which all households in each sampled EA were enumerated.

*Appendix 3: Summary Results of PES*

| Region | Census Population | Dual System estimate | PES Population | Net coverage rate |
|---|---|---|---|---|
| **Ghana** | **24,022,005** | **24,458,761** | **24,429,357** | **1.8** |
| Western | 2,129,435 | 2,158,629 | 2,156,850 | 1.4 |
| Central | 2,049,432 | 2,094,201 | 2,090,766 | 2.1 |
| Greater Accra | 4,383,457 | 4,402,666 | 4,383,742 | 0.4 |
| Volta | 1,935,341 | 1,981,145 | 1,976,630 | 2.3 |
| Eastern | 2,530,644 | 2,537,423 | 2,537,227 | 0.3 |
| Ashanti | 4,752,124 | 4,888,169 | 4,888,180 | 2.8 |
| Brong Ahafo | 2,204,717 | 2,255,357 | 2,255,235 | 2.2 |
| Northern | 2,364,798 | 2,431,964 | 2,431,516 | 2.8 |
| Upper East | 1,015,166 | 1,033,152 | 1,033,154 | 1.7 |
| Upper West | 656,890 | 676,056 | 676,057 | 2.8 |

## *Appendix 4: PES Questionnaire*

**2010 POPULATION AND HOUSING CENSUS**

**POST ENUMERATION SURVEY (PES) QUESTIONNAIRE**

### SECTION 1: AREA IDENTIFICATION

1. Region Name: _____

2. District Name: _____

3. District Type: _____ 4. Sub-District: _____

5. Locality Name: _____

6a. Detailed Address of House / Compound

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

6b. NHIS / ECG / VRA / Other Number

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|

6c. Household Contact Phone Number 1:       6c. Household Contact Phone Number 2:

7. Enumeration Area Code

| Region | District | District Type | Sub-District | E. A. Number | | 8. E.A. Type | 9. Locality Code |
|---|---|---|---|---|---|---|---|

10. Structure number within house / compound

11. Household mumber within house / compound

12. Type of residence
   Occupied housing unit _____ 1
   Vacant housing unit ═══════════════════ 2 (go to q.15)

13. Name of household head

14. Record Visits:

|  | Day | Month | USUAL MEMBERS PRESENT M    F | VISITORS M    F |
|---|---|---|---|---|
| a. Date of First Visit | | | | |
| a. Date of Last Visit | | | | |

(Derive from P03 and P05)

c. Total Number of Visits

|  | HRS | MINS |
|---|---|---|
| Time Started | | : |

|  | HRS | MINS |
|---|---|---|
| Time Completed | | : |

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## SECTION 2: OCCUPANCY AND QUESTIONNAIRE STATUS

**15.** (ENUMERATOR ANSWER)
IS THE HOUSE / COMPOUND OCCUPIED?

1. Yes -- GO TO Q.17
2. No -- CONTINUE

(ASK NEIGHBOUR)

**16a.** Was someone living here during the Census?

1. Yes, moved -- CONTINUE
2. No -- END INTERVIEW

**16b.** How long has this household / compound been vacant (in months)? - END INTERVIEW

**17.** Was this household enumerated during the Census either in this structure or elsewhere?

1. Yes, in this structure (GO TO P01)
2. Yes, elsewhere -- (indicate locality name / region / phone number) (GO TO P01)

Locality Name: . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Region: . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Phone number: . . . . . . . . . . . . . . . . . . . . . . . . . . . .

3. No (CONTINUE)

**17b.** Why was thousehold not enumerated during the Census?

1. Travelled
2. Structure listed but no one came to interview
3. Was absent when the interviewer came
4. Enumerator did not call back
5. No one came to this household

GO TO P01

**18.** INTERVIEW STATUS
1. Interview Completed
2. Non-Contact

**19.** LINE NUMBER OF RESPONDENT

**20.** SUPPLEMENTARY COMPLETED?

1. Yes
2. No -- GO TO SECTION 3

**21.** IF YES, THIS FORM IS THE

1. 1st (First)
2. 2nd (Second)
3. 3rd (Third)
4. 4th (Fourth)

I UNDERSTAND THAT I SHALL FORFEIT ALL OR PART OF MY ALLOWANCES SHOULD MY WORK BE FOUND TO BE UNSATISFACTORY OR ANY INFORMATION FALSIFIED.

_____
Enumerator's Signature

DATE
DAY   MTH

_____
Supervisor's Signature

DATE
DAY   MTH

## SECTION 3: OPERATIONS CONTROL

| OPERATIONS | | | DATE | | OPERATIONS | | | DATE | |
|---|---|---|---|---|---|---|---|---|---|
| Operation | Name | Code | Day | Month | Operation | Name | Code | Day | Month |
| 22. Enumerator | . . . . . . . . . . | | | | 26. Reviewer | . . . . . . . . . . | | | |
| 23. Field Sup. | . . . . . . . . . . | | | | 27. Rec. Enum. | . . . . . . . . . . | | | |
| 24. SFS (RS) | . . . . . . . . . . | | | | 28. Off. Editor | . . . . . . . . . . | | | |
| 25. Matcher | . . . . . . . . . . | | | | 29. Data Entry | . . . . . . . . . . | | | |

## SECTION 4: FOR OFFICE USE ONLY

**30. HOUSEHOLD MATCH STATUS**

1. Match : 1 to 1
2. Match : 1 to 2 or more
3. Match : 2 or more to 1
4. Non-Match
5. Not Applicable

**31. RECONCILIATION VISIT REQUIRED?**
1. Yes
2. No

**32. REASON FOR RECONCILIATION VISIT**
1. Possible Match
2. Persons Enumerated in Census but not PES
3. Persons Enumerated in PES but not in Census
4. H/hold Enumerated in Census but not in PES
5. H/hold Enumerated in PES but not in Census

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## SECTION 5A: CURRENT PARTICULARS OF HOUSEHOLD MEMBERS *(WRITE IN THE PLAIN SPACES ONLY)*

| SERIAL NUMBER OF HOUSEHOLD MEMBER | NAME OF HOUSEHOLD MEMBER | RESIDENT STATUS | RELATIONSHIP TO HEAD OF HOUSEHOLD | SEX | AGE |
|---|---|---|---|---|---|
| | LIST NAMES OF USUAL MEMBERS OF THE HOUSEHOLD (including those absent) AND CURRENT VISITORS | 1 = Usual Member Present<br>2 = Usual Member Absent<br>3 = Visitor | What is (NAME'S) relationship to the head of household?<br><br>1 = Head<br>2 = Spouse (wife/husband)<br>3 = Child (son/daughter)<br>4 = Parent/Parent-in-law<br>5 = Son/daughter-in-law<br>6 = Grandchild<br>7 = Brother/sister<br>8 = Step child<br>9 = Foster child<br>10 = Other relative<br>11 = Non-relative | 1=Male<br>2=Female | What is (NAME'S) age? |
| P01 | P02 | P03 | P04 | P05 | P06 |
| 1 Popular Name / Other Name □□ | ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐☐ ☐☐ |
| 2 Popular Name / Other Name □□ | ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐☐ ☐☐ |
| 3 Popular Name / Other Name □□ | ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐☐ ☐☐ |
| 4 Popular Name / Other Name □□ | ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐☐ ☐☐ |
| 5 Popular Name / Other Name □□ | ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐☐ ☐☐ |
| 6 Popular Name / Other Name □□ | ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐☐ ☐☐ |
| 7 Popular Name / Other Name □□ | ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐☐ ☐☐ |
| 8 Popular Name / Other Name □□ | ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐☐ ☐☐ |
| 9 Popular Name / Other Name □□ | ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐☐ ☐☐ |
| 0 Popular Name / Other Name □□ | ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐☐ ☐☐ |

## SECTION 5B: PARTICULARS OF HOUSEHOLD MEMBERS AS AT CENSUS NIGHT (26TH SEPTEMBER, 2010)

| MARITAL STATUS FOR PERSONS AGED 12 YEARS AND OLDER) | DRAW RESPONDENTS ATTENTION TO CENSUS NIGHT AND BE SURE HE / SHE REMEMBERS THAT DAY CLEARLY | | | FOR OFFICE ONLY | |
|---|---|---|---|---|---|
| 1 = Never Married<br>2 = Informal / Consensual Union / Living together<br>3 = Married<br>4 = Separated<br>5 = Divorced<br>6 = Widowed | Was (NAME) a member of this household as at Census, 26th September, 2010?<br><br>1 = Yes<br>2 = No | Was (NAME) enumerated in 2010 Census?<br><br>1 = Yes<br>2 = Yes, elsewhere<br>3 = No<br>(IF 2 or 3, GO TO SECTION 6) | What was (NAME) status?<br><br>1 = Usual member present<br>2 = Usual member absent<br>3 = Visitor<br><br>GO TO SECTION 6 | MOVING STATUS<br><br>1 = Non-mover<br>2 = In-mover<br>3 = Out-of-scope | MATCH STATUS<br><br>1 = Match<br>2 = Possible Match<br>3 = Non-match<br>4 = In-mover<br>5 = Out-of-scope |
| P07 | P08a | P08b | P08c | P09 | P10 |

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## SECTION 6: OUTMOVERS *(WRITE IN THE PLAIN SPACES ONLY)*

**M01a**

Are there any prsons who were usual members and visitors of the household at census night who are no longer members of this household, including persons who were usual members of the household that have died since census night?

1. Yes -- LIST THE NAME(S) OF PERSONS WHO HAVE MOVED SINCE CENSUS NIGHT
2. No -- END INTERVIEW

☐

| SERIAL NUMBER | NAME(S) | RELATIONSHIP | SEX | AGE | MARITAL STATUS | FOR OFFICE USE ONLY |
|---|---|---|---|---|---|---|
| | LIST NAMES OF USUAL MEMBERS VISITORS OF THE HOUSEHOLD ON CENSUS NIGHT WHO ARE NO LONGER USUAL MEMBERS OR VISITORS OFTHIS HOUSEHOLD, ALSO LIST THE NAME OF ANY USUAL MEMBER OF THIS HOUSEHOLD THAT HAS DIED SINCE CENSUS NIG | What is (NAME'S) relationship to the head of household? 1 = Head 2 = Spouse (wife/husband) 3 = Child (son/daughter) 4 = Parent/Parent-in-law 5 = Son/daughter-in-law 6 = Grandchild 7 = Brother/sister 8 = Step child 9 = Foster child 10 = Other relative 11 = Non-relative | 1 = Male 2 = Female | What is (NAME's) age? ENTER AGE IN COMPLETE YEARS. IF NAME IS UNDER ONE YEAR ENTER "00" IN THE COLUMN. | What is (NAME's) marital status? 1 = Never married 2 = Informal / Consensual union / Living together 3 = Married 4 = Separated 5 = Divorced 6 = Widowed | Match Status 1 = Match 2 = Possible Match 3 = Non-match |
| M01b | M02 | M03 | M04 | M05 | M06 | M07 |
| 1 | | | | | | Initial / Final |
| 2 | | | | | | Initial / Final |
| 3 | | | | | | Initial / Final |
| 4 | | | | | | Initial / Final |
| 5 | | | | | | Initial / Final |
| 6 | | | | | | Initial / Final |
| 7 | | | | | | Initial / Final |
| 8 | | | | | | Initial / Final |
| 9 | | | | | | Initial / Final |
| 0 | | | | | | Initial / Final |

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# PERSONS ENUMERATED IN CENSUS BUT NOT IN PES

## (FOR RECONCILIATION VISIT ONLY)

*FORM R*

| SECTION 7:  PARTICULARS OF HOUSEHOLD MEMBERS *(WRITE IN THE PLAIN SPACES ONLY)* | | | | | |
|---|---|---|---|---|---|
| | NUMBER | NAME OF HOUSEHOLD MEMBER | RELATIONSHIP TO HEAD OF HOUSEHOLD | SEX | AGE |
| SERIAL NUMBER | WRITE THE PERSONS SERIAL NUMBER LISTED ON THE CENSUS FORM | LIST NAMES OF USUAL MEMBERS OF THIS HOUSEHOLD ENUMERATED IN THE CENSUS BUT NOT IN THE POST-ENUMERATED SURVEY. | What is (NAME'S) relationship to the head of household?<br><br>1 = Head<br>2 = Spouse (wife/husband)<br>3 = Child (son/daughter)<br>4 = Parent/Parent-in-law<br>5 = Son/daughter-in-law<br>6 = Grandchild<br>7 = Brother/sister<br>8 = Step child<br>9 = Foster child<br>10 = Other relative<br>11 = Non-relative | 1 = Male<br>2 = Female | What is (NAME's) age?<br><br>ENTER AGE IN COMPLETE YEARS.  IF NAME IS UNDER ONE YEAR ENTER "00" IN THE COLUMN. |
| R01 | R02 | R03 | R04 | R05 | R06 |
| 1 | ☐☐ | | ☐ | ☐ | ☐☐ |
| 2 | ☐☐ | | ☐ | ☐ | ☐☐ |
| 3 | ☐☐ | | ☐ | ☐ | ☐☐ |
| 4 | ☐☐ | | ☐ | ☐ | ☐☐ |
| 5 | ☐☐ | | ☐ | ☐ | ☐☐ |
| 6 | ☐☐ | | ☐ | ☐ | ☐☐ |
| 7 | ☐☐ | | ☐ | ☐ | ☐☐ |
| 8 | ☐☐ | | ☐ | ☐ | ☐☐ |
| 9 | ☐☐ | | ☐ | ☐ | ☐☐ |
| 0 | ☐☐ | | ☐ | ☐ | ☐☐ |

**Comments**

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| SECTION 7:  PARTICULARS OF HOUSEHOLD MEMBERS *(WRITE IN THE PLAIN SPACES ONLY)* | | | | |
|---|---|---|---|---|
| MARITAL STATUS | RESIDENCE STATUS (PAST) | RESIDENCE STATUS (PRESENT) | FOR OFFICE USE ONLY | |
| What us (NAME's) marital status?<br><br>1 = Never married<br>2 = Informal / Consensual Union / Living together<br>3 = Married<br>4 = Separated<br>5 = Divorced<br>6 = Widowed | Was (NAME) a usual resident / visitor of this household at census time?<br><br>1 = Yes, usual resident present<br>2 = Yes, usual resident absent<br>3 = Yes, visitor<br>4 = No, (GO TO NEXT PERSON) | Is (NAME) still a usual member or visitor of this household?<br><br>1 = Yes<br>2 = No | MOVING STATUS<br><br>1 = Non-mover<br>2 = In-mover<br>3 = Out-mover<br>4 = Out-of-scope | CENSUS ENUMERATION STATUS<br><br>1 = Correct enumeration<br>2 = Erroneous enumeration fabrication<br>3 = Erroneous enumeration duplication<br>4 = Out-of-scope |
| R07 | R08 | R09 | R10 | R11 |
| ☐ | ☐ | ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ | ☐ | ☐ |

**Comments**

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