**GATS in Nigeria:**

**A Key to Innovation/Success in Adult Tobacco Surveillance in Africa**

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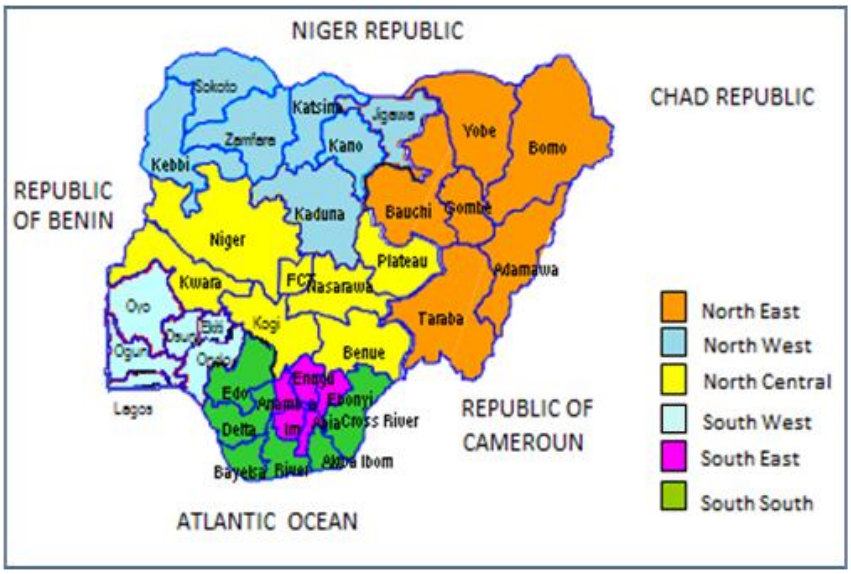
## 1. Introduction

Nigeria is made up of 36 states and a Federal Capital Territory, grouped into six geo-political zones. A census conducted in 2006 put Nigeria's population at 140 million with an annual growth rate of 2.9 percent. Nigeria's population as at mid 2012 was about 150 million.

The National Bureau of Statistics (NBS), Nigeria's National Statistical Organization conducts household-based national surveys on regular basis to measure various socioeconomic indicators at the state and national levels or according to the needs of different sponsors and data users. The most regular is the General Household Survey (GHS) which is conducted annually. The sampling frame for the GHS and other surveys is based on the National Integrated Survey of Households (NISH[1]).

**Figure 1: Map of Nigeria showing Six Geo-Political Zones and States**




### 1.1. The National Integrated Survey of Households (NISH)

The individual states of Nigeria are the geographic domains of analysis for most of the surveys conducted under the NISH. A systematic sample of 200 EAs had been selected with equal probability within the state. The NISH sample EAs in each state were then divided into 20 replicates of 10 EAs each. The master sample size varies from 1,000 to 1,400 depending on the number of states in the region.

## 2. Global Adult Tobacco Survey (GATS), Nigeria

The Global Adult Tobacco Survey (GATS) is the global standard for systematically monitoring adult tobacco use (smoking and smokeless) and tracking key tobacco

1 Nigeria's version of International Household Survey Capability Programme (IHSCP)

control indicators. In Nigeria, it was the first stand-alone survey on tobacco use with a very large scope and nationwide coverage. GATS Nigeria, 2012 was conducted by NBS, in collaboration with the Federal Ministry of Health (FMoH) and technical assistance of the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), the Johns Hopkins Bloomberg School of Public Health, and RTI International.

The survey was conducted in all 36 states plus Federal Capital Territory (FCT) of Nigeria[2]. The states make up the strata in the survey. Each state consists of a number of EAs, and the sampling was done with probability proportional to size (PPS).

## 3. GATS Methodology

### 3.1. Survey Strategy

GATS Nigeria used a standardized questionnaire, sample design, data collection and management procedures. The target population was non-institutionalized adults (men and women), 15 years of age or older, residing in any of the states in Nigeria, covering 100% of the adult population. The sampling strategy was designed to generate precise cross-sectional estimates at the national level, and to compare estimates among the six geo-political zones of Nigeria. A multistage stratified cluster sampling was adopted. Electronic handheld devices were used for data collection.

### 3.2. Sampling Design

According to GATS protocols, the survey has to be designed to produce estimates at the national level, by urbanicity, by gender and by the cross of gender and urbanicity, and it should have a 95% confidence interval with a margin of error of 3 percentage points or less for tobacco use rates of 40%. Sample sizes should be sufficiently large to accommodate the statistical power requirements for tests to detect differences between survey rounds with independently chosen samples. A design effect of 2.0 was assumed for estimates computed at the national level, by urban/rural classification, by gender and by the cross of gender and urban/rural. According to the protocols, the minimum sample sizes needed to accommodate these precision requirements are 2,000 respondents in each of the four groups.

This resulted in a minimum sample of 8,000 respondents for Nigeria. The sample size was then adjusted to account for the potential sample size loss due to ineligibility and non-response, using the following information, which was based on the previous surveys, assuming equal rates for each of the six geo-political zones:

Total number of persons within households to be screened is given by:

$$M_{s^{Person}} = \frac{R_{s^{Person}}}{E_{s^{Person}} \cdot P_{s^{Person}}}$$

And the total number of households to be selected is given by:

$$H_s = \frac{M_{s^{Person}}}{E_{s^{HH}} \cdot T_s \cdot P_{s^{HH}}}$$

Where

| | | | | |
|---|---|---|---|---|
| $R_{s^{Person}}$ | = | Total Number of Respondents in Stratum | = | 8000 |
| $E_{s^{HH}}$ | = | Household Eligibility Rate | = | 90% |

2 Throughout this document these will be referred to as 37 states

| | | | | |
|---|---|---|---|---|
| $P_{sHH}$ | = | Household Response Rate | = | 97% |
| $T_s$ | = | Percentage of Households with at least one survey-eligible individual | = | 95% |
| $E_{sPerson}$ | = | Individual Eligibility Rate | = | 98% |
| $P_{sPerson}$ | = | Individual Response Rate | = | 90% |

Computations based on above parameters yielded a national sample of 9,070 respondents from 10,937 households.

### 3.3. Design Challenges

The challenges confronting the design were to:-

a) reduce variance of estimates through lager sample sizes but fewer respondents per PSU, or improved sample stratification,
b) control the multiplicative effect of variable sample weights, through reduced sample disproportionality (e.g., to produce equal sample sizes for the six geo political region and urban-rural subgroups that differ in size).

The sampling frame for GATS was based on the NISH (2007/08 – 2012/13) master sample, which was based on the complete list of EAs defined for the 2006 Nigeria Census of Population. A quick count of the households in master sample EAs conducted about four years prior to the GATS indicated that the EAs had an average of 37 households for the urban areas and 33 households for the rural, and about 25% of the EAs had less than 20 households. It was hence obvious that selecting a high number of households per EA would result in having a sizeable number of the PSUs with fewer households than proposed. So it was easy abiding by the GATS protocol that advised for a maximum of 20 households per PSU. Hence, an average sample of 10 households per EA was proposed from a sample of 1,100 EAs.

### 3.4. Dis-proportionality of the design

The distribution of the master sample EAs shows that only about 26% are urban while about 74% are rural. The distribution of the EAs by geo-political region indicates that the size varies from 1,000 to 1,400. Level of urbanicity is also not uniform across the geo political region. In order to control the multiplicative effect of variable sample weights, sample disproportionality was considered only for urban-rural subgroup. Equal sample of 5,500 households was proposed for both urban and rural subgroups.

**Table 1: Distribution of Sample by Region**

| Geo-Political Zone | Number of Strata | % of Total Population | Total EAs | Master Sample EAs | | | GATS Sample EAs |
|---|---|---|---|---|---|---|---|
| | | | | **Total** | **Urban** | **Rural** | |
| North Central | 7 | 14.5 | 107,141 | 1400 | 359 | 1041 | 160 |
| North East | 6 | 13.6 | 91,783 | 1200 | 149 | 1051 | 148 |
| North West | 7 | 25.5 | 158,924 | 1400 | 222 | 1178 | 282 |
| South East | 5 | 11.7 | 80,949 | 1000 | 212 | 788 | 129 |
| South-South | 6 | 15.0 | 98,284 | 1200 | 248 | 952 | 165 |
| South West | 6 | 19.8 | 125,448 | 1200 | 730 | 470 | 216 |
| **Total** | **37** | **100.0** | **662,529** | **7,400** | **1,920** | **5,480** | **1,100** |

### 3.5. Sample Selection

The selection of the 1,100 EAs with PPS from the NISH Master Sample would produce about 300 urban and 800 rural EAs. In order to come up with approximately equal sample of households for urban and rural areas, a sample of 18 households was drawn from urban while 7 households was drawn from rural EAs, all with equal

probability within EAs. A fresh household listing had been conducted in each selected EA to provide an up-to-date frame of households as the secondary sampling units (SSUs). Resultantly, the allocation of sample produced a total national sample of 11,107 households (5,748 urban and 5,359 rural areas). Selection of individuals within selected households was done electronically by the handheld device.

## 4. Sample Achieved

Out of the 11,107 sampled households, 9,911 completed the household screening, yielding a household response rate of 89.1%. The individual-level response rate of 98.6% yielded an overall response rate of 87.9%; (urban = 83.1%; rural = 93.1%).

## 5. Data Collection Procedure and Management

General Survey System (GSS) software, developed by RTI International, was used. The system was tested using Hewlett-Packard iPAQ 210. Nigeria used the data management model B – semi internet based model[3].

A four-man team, comprising officers from NBS, FMOH and WHO country office coordinated the data collection and management. They also served as the research officers (ROs) in along with 3 other persons.

### 5.1. Training

Training was conducted for various cadres of personnel for the survey; refresher training for the research officers (ROs), training of the IT personnel and training of enumerators for area mapping and household listing, and training of field personnel for data collection. The training for EA mapping and household listing was conducted a month before the training for data collection. This allowed for preparation and finalization of the sampling frame that was used for preparation of the case file.

Training of field personnel for data collection was done in two phases; the southern region and the northern region. The training at each phase was done centrally. Adapted GATS manuals were made use of during the trainings.

### 5.2. Fieldwork

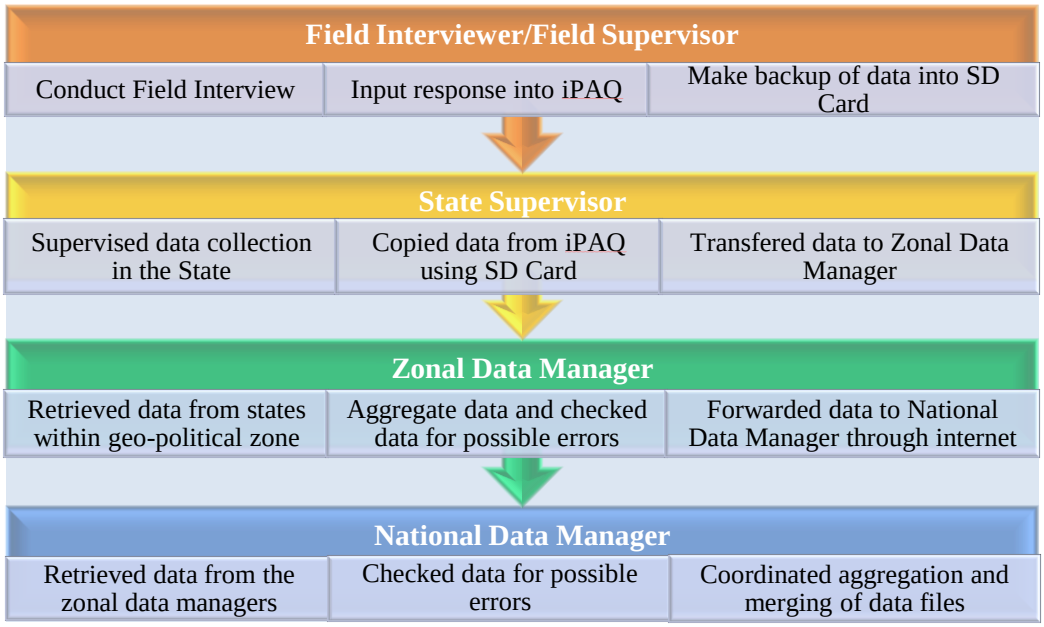
The fieldwork was conducted in two phases as was necessitated by insufficiency of handheld devices. Whereas, 128 handheld devices were required to conduct the survey at a stretch, only 80 handheld devices were available. In the first phase, 18 states in the south were covered while 19 states in the north were covered in the second. Data collection for each phase lasted 21 days. The case files were uploaded to the handheld devices independently for the southern and northern regions.

The field staff comprised of the 64 Field Interviewers (FIs), 64 Field Supervisors (FSs), 37 State Supervisors (SSs), and 7 Zonal Data Managers (ZDM). For quality assurance, 12 zonal field coordinators and the 7 research officers participated in the data collection exercise.

FSs and FIs worked in pairs to canvass the EAs in a roving manner. The number of teams in each state was determined by number of sample EAs and workload which was not to exceed 3 households per day per interviewer.

Apart from transferring data from the FI/FS to the zonal data managers, the SS were responsible for the overall operation of the field activities in their various states.

3 model B: Semi internet based model refers to transmission of completed cases via internet to the head office




The zonal data manager are the IT staff and were responsible for providing technical support during fieldwork and for troubleshooting issues with the handheld devices. The ZDM performed the field-level data aggregation and conduct consistency checks on a regular basis to identify data collection errors and problems with skip patterns. They were also responsible for transferring data to the national data centre.

Data quality control was implemented by the zonal field coordinators and research officers who carried out spot-check on a sample the field workers across the states.

## 6. Statistical Analysis

Complex survey analysis was used to obtain prevalence and population estimates with 95% confidence intervals. Prior to the analysis, sample weights were calculated for each respondent in order to improve the representativeness of the sample in terms of the size, distribution, and characteristics of the study population. The calculation involved three steps:

a. The determination of a base weight, which was calculated from the probability of selection at each step in the sample design;
b. An adjustment for non-response/ineligibility for household and individual samples; and
c. A post-stratification calibration to national population counts of people aged 15 years or above by residence, gender, and age groups.

The analysis was carried out using SPSS version 19, SAS version 9.2, and SUDAAN version 10.1 software. Standard errors were calculated using Taylor series linearization. Statistical tests were performed by comparing the 95% confidence intervals of two estimates to determine whether they were statistically different.

## 7. Innovation and Success

The Global Adult Tobacco Survey was the first survey in Nigeria that explored the use of electronic handheld devices in full to collect and collate household data. The system had not been achieved by NBS before the GATS.

The survey has therefore helped to build the capacity of the field interviewers on the use of electronic devices for data collection; preparation of case file helped to verify and validate the sampling frame; collecting data electronically facilitated the complex

skip patterns as well as the use of some built-in validity checks. It also provided regular feedback on the performance of the field staff, allowing early detection of inadequate behaviours. The use of the handheld device removed the burden of carriage of bulky paper questionnaires. The processing and analysis of data were done timely as data cleaning and validation took very little time.

## 8. Challenges

The following challenges were confronted during that conduct of GATS Nigeria 2012:

- More days than anticipated 7 days were spent for mapping and household listing.
- Written consents could not be obtained from a number of the respondents who were not literate. For such cases consents were obtained orally.
- Security challenges in some parts of the country reduced the household response rates; 89% response rate was achieved against anticipated 97%.
- Though, less than 2% of the handhelds had technical problems, inability of interviewers to personally tackle the technical problems of the handhelds hindered timeliness in completing data collection activities in some areas. Activities had to stop temporarily while waiting for the repair of the defective handheld devices.
- In the 2nd phase, data collection fell into the fasting period; some respondents took temporary cessation during the period as total cessation for tobacco use.
- Data collection was done at the peak of raining season.

## 9. Recommendations

The following are suggested for conduct of GATS in Africa:

- Adequate number of handhelds would cause the data collection exercise to be done at a stretch, thereby reducing the length of data collection period.
- Training of interviewers for data collection should include trouble shooting problems with defective handheld equipment so that interviewers could personally tackle the associated problems.
- Data collection exercise should be planned not to coincide with fasting period, and interviewers should be more kitted to access EAs in the difficult terrains like flooded areas.

## 10. Conclusion

Even though, GATS Nigeria 2012 was the first in its series, success was recorded despite various challenges; the objectives of the survey were met. Innovation in terms of use of modern technology for data collection was introduced and mastered. Owing to the success achieved in the GATS, NBS is considering the use of electronic devices in all its household-based data collection systems. The method is currently being test-run with the hope of replacing paper questionnaires with electronic devices within the next year. This is to achieve reduction in non-sampling errors usually associated with household surveys, particularly those introduced by the field interviewers.

## References:


1. National Bureau of Statistics; National Integrated Survey of Households (NISH), 2007/08 - 2012/13 Editions.

2. Global Adult Tobacco Survey (GATS); Sample Design Manual

3. David J. Megill; Final Sample Design and Estimation Procedures for 2010 Nigeria General Household Panel Survey, July 2010.