Direct digital entry of national iodine survey data in Senegal

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IDD is a public health problem in Senegal, with four regions considered endemic for goiter. About 60% of households do not use adequately iodized salt and over 75% of children are iodine deficient (1). A national program to promote Universal Salt Iodization (USI) started in 1995 and seeks to reach the goal of 90% of households consuming iodized salt. To evaluate the progress achieved to date, the Government of Senegal commissioned a national survey in 2009, in collaboration with University Cheikh Anta Diop and the Micronutrient Initiative (MI). The survey was designed to assess the current national prevalence of iodine deficiency in school-age children and women of reproductive age, levels of iodized salt utilization and associated household characteristics.

Building capacity for USI program monitoring and evaluation includes using appropriate technology for improved data management. Personal digital assistants (PDAs) are hand-held computers that facilitate high quality data collection and timely analysis for large complex surveys. Experience with using PDAs for direct data capture is increasing in the global health field (2-4). A recent review of the evidence concluded: “Evaluations of personal digital assistants and mobile devices convincingly demonstrate that such devices can be very effective in improving data collection time and quality” (5).

In addition to ensuring high data quality, direct data capture eliminates the step of data entry of paper-based questionnaires and data are available for analysis within a very short time following completion of the survey. Concerns
with this method include the lack of a hard copy for data verification or double entry, the perceived complexity of programming the questionnaire and the cost of the equipment and technical support for using it. This paper describes recent experience in Senegal using PDAs to collect data for a national USI program evaluation.

Survey design

Although previous studies of IDD have been conducted in goiter endemic regions of Senegal, this survey was designed to assess the situation in a nationally representative sample taken from all regions of the country. The survey questionnaire was developed by Institut de Population, Développement et Santé de la Reproduction of University Cheikh Anta Diop (IPDSIR) and MI as a paper-format questionnaire in French and was then adapted for direct data capture on PDAs. The questionnaire consisted of several modules that were administered to each household (Figure 1). In addition to these questions, enumerators also examined all school-age children and women of reproductive age present in the household for goiter and used a rapid test kit to test household cooking salt for iodine content. In sub-sampled households, samples of salt and urine were collected for laboratory analysis. Technical support on the use of PDAs for data collection, management and analysis was provided by HealthBridge (Ottawa, Canada), along with the equipment (Figure 2) for carrying out the survey. Panel 1 provides an overview of the specific data quality control features that were programmed in the PDA-based questionnaires.

Survey Training

District health team members were appointed by the Ministry of Health to be enumerators within their respective districts, with five senior team members chosen as supervisors. Survey training was done in two stages. An initial three-day training session was held for the survey coordination team and supervisors. The training covered all key aspects of the survey, including operation of the PDA, interviewing techniques, clinical assessment of goiter, collection of salt and urine samples, practice sessions and field testing. Team supervisors received specific training in PDA maintenance, battery charging, troubleshooting and data backup. A second round of training was conducted for enumerators, with one day spent on introducing the teams to the PDAs and providing training in their operation, while also reviewing the questionnaire. A second day was spent on training in clinical assessment of goiter, collection of salt and urine samples, practice sessions and field testing.

Panel 1: Summary of PDA-specific data quality control aspects

- If the respondent refused to participate, the survey ended
- Response-dependent skips:
  - If child < 13 years, skip “Occupation” question
  - If no salt in household, skip type of salt questions
- Checks
  - If no response entered, prompt enumerator to enter response (not allowed to go to next question before answering current question)
  - If select both “don’t know” and “consume iodized salt” as ways to prevent iodine deficiency, prompt enumerator to clarify response
- Prompts
  - If child or woman of eligible age group, prompt enumerator to perform goiter assessment and enter results of assessment
  - Random selection of child & woman to provide urine sample
Survey Implementation
From October 15 to November 5, 2009, five teams used 25 PDAs to collect data from 3768 households across 13 regions. On the final day of the survey, data were downloaded from PDAs via USB cable to a Microsoft Access database on a laptop computer. Refusals and incomplete interviews were identified. Preliminary results were available within one week of the survey end. Laboratory results (urine and salt iodine concentration) were available within two months post-survey and merged with household and member databases (98% urine and 96% salt results successfully matched). A total of 15 households refused to participate in the survey but there was no indication that this was related to PDA use. Enumerators reported some anecdotal concerns expressed by caregivers about the PDAs, such as respondents wondering if the PDA was equipped with a camera (they were not). The average interview length was 19 minutes (median 16) and this varied based on the household size (number of members). PDA units were equipped to take GPS readings and this was successfully done for 82% of households surveyed. This information was useful in providing a visual overview of the distribution of households across the country (Figure 3A), in specific clusters (Figure 3B) and for each enumerator’s daily data collection record (Figure 3C).

Lessons Learned
The following lessons learned were identified by participating stakeholders:
1. Health staff quickly learned to use PDAs for survey data collection.
2. Inability to look back at previously-entered data was challenging for enumerators but interview technique training helped and the PDA was programmed to provide confirmation at strategic points.
3. PDA programming contributed to high quality data – there were no inconsistencies between responses (e.g., no “pregnant men”); no missing data; appropriate target group selection; non-biased random selection of woman/child for urine samples.
4. Preliminary results were ready and presented to survey team within one week after completion of the survey because of time-saving on data entry and cleaning.
5. Conceptual differences in survey questionnaire design need to be understood.
7. Small errors in programming affected data collected by all enumerators – this reinforced the importance of a well-tested questionnaire with no last-minute changes.
8. While costs for printing questionnaires and manual data entry were saved, significant costs were incurred for PDAs technical support by an international consultant.

Conclusion
PDAs are an excellent tool for enhancing capacity to collect complex household survey data and make it available for analysis in a timely manner. Quality training and adequate pre-testing of questionnaires are still essential. Increased use of mobile or hand-held computers in USI program monitoring and evaluation is recommended, along with efforts to build local technical capacity.