###### GPS Data Collection

The *Global Positioning System* (GPS) is a satellite-based navigation system. A GPS unit determines its position using satellites that orbit the earth. Each satellite’s position, as well as the current time, is transmitted via radio signals. The GPS unit receives these signals and uses them to calculate its position in terms of latitude, longitude, and altitude.

**GPS and MICS**

The collection of GPS data is optional. However, as GPS units are relatively inexpensive and generally available in countries, UNICEF recommends the use of units during fieldwork to record information on the exact geographic location of the sample cluster, but only if this information is not already available elsewhere.

The most critical instruction is that GPS data collection must not interfere with the overall objective of conducting quality fieldwork. From experience, unless properly managed and implemented, GPS data collection can in fact negatively affect the quality of the main fieldwork.

Therefore it is strongly recommended that any GPS data collection activity entail special training of a GPS Coordinator. Depending on the level of GPS data collection and existing capacity, this extra training ranges from simple oversight to extensive technical assistance. There are vast opportunities to collect more than just basic GPS cluster waypoints, but a very careful assessment must be made if more advanced data collection is sought. Please contact the Regional MICS Coordinator if such considerations are being made.

Please note that it is important to clarify ownership of collected GPS data in the Memorandum of Understanding. UNICEF recommends that GPS data is not shared in the publicly available SPSS data sets, but that interested parties submit a formal request for access and use to the National Statistical Office.

**Benefits of GPS data collection**

The benefits of GPS waypoint[[1]](#footnote-1) collection are substantial – unless geo-coded cluster locations are already available from Census cartography. This will make it possible after the survey to link MICS data with other data sets containing similar geographic information. Typical examples are to use databases that include geographic location information on health facilities, schools, road network, climate, altitude, or many other geographically located attributes. With the use of GPS, it becomes possible to carry out further analyses of MICS data sets by expanding them with information available from other databases.

GPS units may also be used while updating the sample frame, meaning that listing teams may have used GPS units to record information on the geographic location of the clusters in the sample. In such cases, using GPS during the main fieldwork may facilitate locating the clusters, since information on longitude and latitude will be available to Supervisors during fieldwork. In most countries that have conducted a Census recently, GIS (Geographic Information System) data is often available at cluster level and can be verified during listing and employed during fieldwork. Collaboration with a GIS specialist at the implementing agency can be very fruitful.

This document only describes GPS use in main fieldwork, but most material is easily adopted for use in listing activities.

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| **Why use GPS to collect cluster locations?**   * Permits linking of additional data to MICS data through geographic links   + E.g. Census data, facility data, other geo-located data * Permits geographic grouping of data beyond political boundaries   + E.g. Climactic zones, agricultural zones, etc. * Permits mapping of sample clusters   + E.g. with DevInfo or other mapping software for presentation purposes * Allows monitoring of fieldwork to ensure that teams have visited all clusters |

**Operational considerations**

GPS data collection can almost always be done without hiring additional personnel. The set-up of roles and responsibilities may vary according to the survey and what data is already available. However, there should be a person on each field team who is responsible for collection of the GPS points (the GPS Operator) and an overall GPS Coordinator at the implementing agency headquarters.

Since the collection of GPS waypoints occurs while data collection teams are already in the field, roles will be doubled up. Typically, the Measurer, the male interviewer, or the Driver on each field team will collect GPS data and the GPS Coordinator will likely be one of the Field Managers. UNICEF does not recommend that interviewers collect GPS data, but rather that other team members are all trained and one on each team is responsible overall. This includes Editors and Supervisors as they are responsible for data quality in general. However, the Measurer is typically not immediately engaged in work on arrival in a cluster, but is waiting for interviewers to identify children for measurement. Typically, this allows for more than adequate time to perform GPS data collection while waiting. The Driver is another good option, as he/she also has significant time during the day to perform GPS data collection. Be advised, though, that in some surveys, there may not be a driver in each team or drivers may drive considerable distances on poor roads and must be allowed adequate rest as safety is otherwise compromised.

The responsibilities of the GPS Operators are as follows:

1. Capture and record the GPS waypoint at the centre of the survey site.
2. Complete the GPS data collection form, including the GPS waypoint name/number, latitude, longitude, altitude, and GPS-unit number. As with the Cluster Control Sheet, only once the cluster is completed, the form should be included in the bundle of questionnaires and transported to Headquarters.
3. Communicate with the GPS Coordinator about any problems encountered in the field and follow his or her instructions.
4. Ensure that unit and accessories are handled properly during fieldwork. This includes maintaining battery level and transfer of data when GPS Coordinator visits team.

The responsibilities of the GPS Coordinator are explained in detail in the subsequent sections:

**Obtaining materials**

It is the role of the GPS Coordinator to manage all aspects of implementation of GPS data collection, including obtaining the necessary material:

1. Hardware:
   * One GPS receiver per field team, plus two (2) extra GPS units. See below for recommended unit.
   * Eight (8) AA batteries per GPS unit.
   * Two (2) standard USB to Micro-USB cables for downloading data from receivers.
   * Optional: One vehicle dashboard mount per vehicle used in survey.
   * Optional: One vehicle unit charger per vehicle used in survey.
   * Optional: Four (4) rechargeable (NimH) AA batteries and one charger per field team, plus eight (8) extra batteries and two (2) chargers.
2. Software:
   * One (1) copy of a GPS software to visualize and troubleshoot GPS waypoints. This could be GPS Trackmaker (free), Garmin MapSource (free with unit purchase), or any other appropriate software already in use by implementing agency.
3. Data:

* Map of sampled area, incl. cluster boundaries if possible.
* Possibly waypoints indicating sampled clusters.

1. Training/other field materials
   * Customise and copy (parts of) the GPS Operator’s Manual for each training participant.
   * Customise and provide copies of the GPS Data Collection Form – enough so that all survey sites can be recorded and for training exercises.

**Preparing the GPS units**

This should be done before training and field work:

* 1. Ensure each unit has appropriate settings (Set-up differs between models. UNICEF recommends the Garmin eTrex 30). It is highly recommended that the unit Firmware is updated as well.
  2. Tag each GPS unit with a number. This number should be recorded by the GPS data collectors on the GPS data collection form.

**Training**

The GPS Operators must be trained in the basics of the GPS units, point collection protocols, and simple troubleshooting techniques. The training of GPS Operators should take a half to a full day. It is extremely important to give time during the training to practice GPS waypoint collection where there is a clear view of the sky. This training must be conducted by the GPS Coordinator.

A useful training method is the so-called ‘Mapping Party’ described here: http://wiki.openstreetmap.org/wiki/Mapping\_Weekend\_Howto

If the ‘Mapping Party’ is used, there is opportunity to use various tools to visualise the results of the training, which usually proves an effective way of engaging trainees and partly also evaluate the individual results.

The GPS Coordinator may need additional training beyond what is provided to the GPS Operators. The GPS Coordinator needs to know how to transfer points from the GPS units to a computer, operate a GPS unit, and how to modify the GPS unit settings (e.g. coordinate system, datum, measurement units). Training of the GPS Coordinator should occur early on so he/she can take a lead role in the training of field staff, data collection, and data processing.

**Data collection / processing**

As in regular field monitoring, the GPS Coordinator must verify that Form and Unit data match.

Specifically the tasks during fieldwork include:

1. Data should be copied from GPS units as often as possible. This is most conveniently done during regular field monitoring. The GPS units can be connected to a laptop with the USB cable supplied with the unit and the data can be directly copied/synchronised.
2. Type the hand-recorded GPS coordinates from the GPS data collection form into an Excel spreadsheet.
3. Use the chosen GPS mapping software to verify the accuracy of GPS readings
4. Inform the survey management of any inconsistencies
5. Arrange for the recollection of any missing/inaccurate GPS waypoints

Once all locations are verified, the data must be added to the CSPro data. This should be done after the secondary editing is complete (when the database is final). This is the responsibility of the Data Processing Expert, who has received training and documentation on how to perform this task.

Please remember that the GPS data should be removed from the SPSS data files for anonymisation when the data is prepared for sharing on Government and the UNICEF websites.

**Available material**

The following material is available:

* GPS Operator’s Manual: Instructions using unit and filling form, as well as some information on the role and responsibility of the GPS Operator. This manual should be customised and be part of the material copied to all GPS Operators and Field Supervisors
* GPS Data Collection Form: The form should be customised and enough copies distributed to Field Supervisors and GPS Operators (1 per cluster plus extra copies).
* GPS Coordinator’s Manual: This document provides details on the responsibilities of the GPS Coordinator: Materials (including customisation needs), preparing units, conducting training and monitoring, addressing data quality, and steps in data processing. Manuals to software are also included here.

1. A set of coordinates that identify a point in physical space, in this case to identify the location of a surveyed site using [longitude](http://en.wikipedia.org/wiki/Longitude), [latitude](http://en.wikipedia.org/wiki/Latitude), and altitude and the time surveyed. [↑](#footnote-ref-1)