

## **Standard Operating Procedure**

### **Installing Indoor Air Pollution Instruments in a Home**

**Version 5.1 (October 2005)**

**Indoor Air Pollution Team  
and  
Center for Entrepreneurship in International Health and Development  
(CEIHD)**

**School of Public Health, University of California-Berkeley**

#### **A. Introduction**

Installing indoor air pollution (IAP) instruments in a standardized manner is rather challenging. A variety of factors (including irregularly shaped rooms, different building materials, varying stove types and locations, concerns about household safety, and so forth) make it difficult to standardize the placement of IAP instruments. However, it is **critical** to use standard installation guidelines throughout an IAP sampling project. Following standard procedures allows for the comparison of measurements within and between households and for the presentation of results in a scientifically credible manner. Particularly important is standardizing the height of the IAP samplers, because air pollutants are extremely vertically stratified inside a household (concentrations increase greatly with increasing height in a room).

Sections B & C provide specific IAP instrument installation guidelines for indoor microenvironments like kitchens and bedrooms. We strongly recommend installing the instruments on a wall of the room of interest. It is relatively easy to hang instruments on the wall and much easier to standardize instrument location as compared to other locations, such as hanging the instruments from the center of the room. Placing instruments on the wall is also usually a very safe choice that minimizes the chance that household members will change their typical behaviors or bump the instruments (resulting in personal injury or damage to the equipment) in the often dimly-lit households; such is not the case when instruments are hung in the center of the room. One could consider reducing the possibility of injury by hanging the instruments near the ceiling of the room, but this area is not representative of the breathing zones of the household members, nor is it very safe or convenient for those who have to install the equipment.

One disadvantage of installing instruments on the wall is that IAP concentrations are somewhat lower near the walls than they are in the middle of the room. Based on our IAP monitoring in Guatemala, we find that the differences in IAP concentrations between the walls and the center of the room are not too great.

The guidelines presented here refer to indoor environments only. Of course, outdoor and person monitoring are also very important. Monitoring guidelines on these important microenvironments are forthcoming.

## B. General Placement Guidelines

- 1.0 Place the IAP instruments approximately **100 cm from the edge of the combustion zone** of the main cooking stove. This distance should be measured as the shortest, horizontal line possible (i.e. parallel to the floor, from the closest edge of the combustion zone to the wall underneath where the monitor is to be placed.). See Figure 1 in the Appendix.
  - 1.1 Record the actual distance on the Sampling Data Form.
  - 1.2 Placing the instruments *too close* to the fire could be damaging, because they generally cannot tolerate extreme temperatures.
  - 1.3 This distance away from the stove approximates the edge of the active cooking area.
  
- 2.0 Place the IAP instruments at a height of **145 cm above the floor**. See Figure 1 in the Appendix.
  - 2.1 Record the actual distance on the Sampling Data Form.
  - 2.2 This height relates to the approximate breathing height of a standing woman.
  - 2.3 The floor is defined as the predominant lowest point of the kitchen (e.g. *do not* measure from the top of a stove surface).
  - 2.4 A standard height for monitor placement is necessary due to the vertical stratification of indoor air pollutants.
  
- 3.0 Place the IAP instruments **at least 150 cm away (horizontally) from openable doors and windows**, where possible.
  - 3.1 If this is not possible, the distance from the openings should be recorded on the Sampling Data Form (otherwise no notation is required).

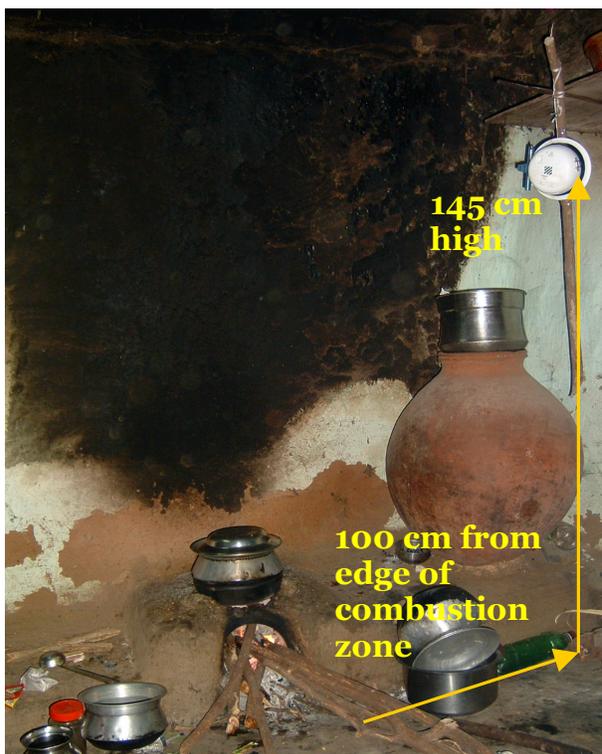
- 4.0 In each indoor microenvironment, co-locate all of the IAP instruments (e.g. place them next to each other), leaving a few centimeters of space between them to ensure that their inlets are not blocked. See Figure 2 in the Appendix.
- 5.0 All instruments must be placed in a relatively safe location to minimize the risk of interrupting household activities or being disturbed or damaged.
- 6.0 Make a detailed sketch of the kitchen showing the positions of the IAP instruments, the stove/fire, and the main door(s) and windows. This is particularly important if the IAP sampling is to be repeated at a later date in the same location (for example, as part of a “before and after” study). The sketch should contain sufficient detail to be able to detect a change in position of the cooking location (stove) within the kitchen during the intervening period.
  - 6.1 In a “before and after” study, if the stove position in the room has not moved, the instruments should be placed in the same location as before, (i.e. a new choice of location should not be made even if the old position seems incorrect).
  - 6.2 In a “before and after” study, if the stove position has changed within the room or other major changes have occurred (entirely new kitchen, for example), the original criteria should be applied to choose a new position for the instruments and appropriate notation be made on the Sampling Data Form.

**\* Note - it may be difficult to simultaneously satisfy guidelines 1, 2, and 3. If this is the case, simply choose the best possible location.**

## C. Specific Instrument Guidelines

1. CO Dosimeter Tubes
  - 1.1 CO diffusion tubes should be placed so that the open end of the tube faces the combustion source.
  - 1.2 Measurements should be made to the open end of the CO tube.
2. HOBO CO Logger
  - 2.1 Measure distances to the center/middle of the logger.
3. UCB Particle Monitor
  - 3.1 Measure distances to the center/middle of the monitor.
  - 3.2 Consider using a piece of tape to cover up the blinking light to minimize disturbance to household members. Make sure that the tape can be removed so that the field staff can easily check the monitor to make sure it is working properly.
  - 3.3 If a support plate has been placed on the wall, place the monitor in the support plate.

## Appendix 1. Pictures of Field Installation of IAP Instruments



**Figure 1.** IAP instrument placement in homes in Accra, Ghana (top) and Tamil Nadu, India (bottom). Notice that the horizontal measurement (100 cm; guideline 1) is made from the closest edge of the combustion zone and that the height is measured from the floor, not the top of the stove (145 cm; guideline 2).



**Figure 2.** IAP instrument placement in a home in Addis Ababa, Ethiopia. Notice that the instruments are co-located (placed next to each other) with a few centimeters of space between them to ensure that their inlets are not blocked (guideline 4).