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# AN ASSESSMENT OF INJECTION SAFETY AND HEALTH CARE WASTE MANAGEMENT IN NIGERIA

AT SELECTED HEALTH FACILITIES IN ABUJA  
MUNICIPAL AREA COUNCIL, FEDERAL CAPITAL  
TERRITORY, AND MAKURDI LOCAL GOVERNMENT  
AREA, BENUE STATE

**AIDSTAR-One**  
AIDS SUPPORT AND TECHNICAL ASSISTANCE RESOURCES

**FEBRUARY 2014**

This publication was made possible through the support of the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) through the U.S. Agency for International Development under contract number GHH-I-00-07-00059-00, AIDS Support and Technical Assistance Resources (AIDSTAR-One) Project, Sector I, Task Order I.



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### **AIDS Support and Technical Assistance Resources Project**

AIDS Support and Technical Assistance Resources, Sector I, Task Order 1 (AIDSTAR-One) is funded by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) through the U.S. Agency for International Development (USAID) under contract no. GHH-I-00-07-00059-00, funded January 31, 2008. AIDSTAR-One is implemented by John Snow, Inc., in collaboration with BroadReach Healthcare, EnCompass LLC, International Center for Research on Women, MAP International, mothers2mothers, Social & Scientific Systems, Inc., University of Alabama at Birmingham, the White Ribbon Alliance for Safe Motherhood, and World Education. The project provides technical assistance services to the Office of HIV/AIDS and USG country teams in knowledge management, technical leadership, program sustainability, strategic planning, and program implementation support.

### **Recommended Citation**

Fatusi, Adesegun, Temitope Ojo, and Abimbola O. Sowande. 2014. *An Assessment of Injection Safety and Health Care Waste Management in Nigeria at Selected Health Facilities in Abuja Municipal Area Council, Federal Capital Territory, and Makurdi Local Government Area, Benue State*. Arlington, VA: USAID's AIDS Support and Technical Assistance Resources, AIDSTAR-One, Task Order 1.

### **Acknowledgments**

This AIDSTAR-One evaluation has benefited significantly from the participation and contributions of many individuals and organizations. Although it is impossible to mention each by name, we wish to specially acknowledge:

- Isa Iyortim, USAID, for his commitment to the study.
- AIDSTAR-One staff and consultants for their contributions to the various stages of the evaluation process, including their technical inputs into the study design and instruments, technical materials, and logistics support.
- The state government ministry, department, and agency officers and staff who participated in various ways.
- The health care waste management experts who oversaw and supervised data collection in the study locations: Dr. Victor Nwachukwu (Benue State) and Dr. M.M. Alhassan (Federal Capital Territory).
- Other experts who contributed to the development and review of the instruments (including Olusegun Afolabi, USAID, and Dr. Olufemi Aluko of the Department of Community Health, Obafemi Awolowo University, Ile-Ife, Nigeria) and the data management team.

### **AIDSTAR-One**

John Snow, Inc.  
1616 Fort Myer Drive, 16th Floor  
Arlington, VA 22209 USA  
Phone: 703-528-7474  
Fax: 703-528-7480  
Email: [info@aidstar-one.com](mailto:info@aidstar-one.com)  
Internet: [aidstar-one.com](http://aidstar-one.com)

# CONTENTS

- Acronyms..... ix**
- Executive Summary..... xi**
  - Methodology.....xi
  - Highlights of Findings.....xi
  - Discussion and Conclusion.....xvi
- Background..... 1**
- Goal and Objectives..... 3**
  - Goal..... 3
  - Specific Objectives..... 3
- Methodology..... 5**
  - Study Design and Selection of Health Facilities..... 5
  - Data Collection Methods and Activities..... 6
  - Study Management Structure..... 7
  - Data Analysis..... 7
- Results..... 9**
  - Findings from Health Facility Interviews and Observation..... 9
  - Findings from Structured Observations of Facilities’ Stores and Pharmacies.....53
  - Findings from In-Depth Stakeholder Interviews.....55
- Discussion and Conclusion..... 61**
- Appendix 1. Survey Instruments Used..... 63**
- Appendix 2. Waste Weighing Protocol..... 65**
- Appendix 3. Tool 1—Waste Weighing Sheet..... 67**
- Appendix 4. Tool 2—Officers in Charge of Facilities: interview..... 71**
- Appendix 5. Tool 3—Clinic Service Providers: Interview..... 93**
- Appendix 6. Tool 4—Waste Handlers and Environmental Health Workers: Interview ... 107**
- Appendix 7. Tool 5—Facility Checklist..... 121**
- Appendix 8. Tool 6—Structured Observation of Stores and Pharmacies..... 127**
- Appendix 9. Tool 7—Structured Observations of Injection Practices..... 131**
- Appendix 10. Tool 8—In-Depth Interview with Stakeholders..... 135**

## Figures

Figure 1. Health Workers Trained in Universal Precautions by Facility Type.....	11
Figure 2. Percentage of Clinic Service Providers and Environmental Health Workers Trained in Universal Precautions: Intervention versus Nonintervention Facilities in Benue State.....	11
Figure 3. Proportion of Observed Injections Where Patients Did Not Bring Their Own Syringes and Needles, by Service Provided, in Intervention Facilities in FCT and Benue State .....	27
Figure 4. Injections Where Patients Did Not Bring Their Own Syringes and Needles, by Services Provided, in Intervention Facilities in FCT and Benue State .....	29
Figure 5. Percentage Distribution of Health Care Waste in Seven Primary Health Care Facilities .....	46
Figure 6. Percentage Distribution of Health Care Wastes in Five Secondary Health Facilities.....	47
Figure 7. Percentage Distribution of Health Care Waste in Three Tertiary Health Facilities.....	48
Figure 8. Private-Sector Involvement in Health Care Waste Management in Intervention Facilities in FCT and Benue State, per Facilities' Officers in Charge .....	53

## Tables

Table 1. Study Facilities by Intervention Status, Category, and Location .....	5
Table 2. Data Collection Approaches and Foci.....	6
Table 3. Availability of Policy Documents and Operational Guidelines in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge.....	9
Table 4. Availability of Policy Documents and Operational Guidelines per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State .....	10
Table 5. Availability and Compliance with National Policies and Operational Guidelines at Intervention Facilities in FCT and Benue State per Clinic Service Providers.....	12
Table 6. Availability and Compliance with National Policies and Operational Guidelines per Clinic Service Providers: Intervention versus Nonintervention Facilities in Benue State.....	13
Table 7. Availability of and Compliance with National Policies and Operational Guidelines at Intervention Facilities in FCT and Benue State per Environmental Health Workers.....	13
Table 8. Availability and Compliance with National Policies and Operational Guidelines per Environmental Health Workers: Intervention versus Nonintervention Facilities in Benue State .....	14
Table 9. Availability of Budget Provision, Workplan, and Infection Control Committee at Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge.....	15
Table 10. Availability of Budget Provision, Workplan, and Infection Control Committee per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State.....	15
Table 11. Observations on the Facility Structure, General Cleanliness, and Water Supply in Intervention Facilities in FCT and Benue State.....	16
Table 12. Observations on the Facility Structure, General Cleanliness, and Water Supply in Intervention Facilities in FCT and Benue State.....	17
Table 13. Observations on the Toilet Facilities in Intervention Facilities in FCT and Benue State.....	18
Table 14. Self-Risk Perception of Clinic Service Providers and Environmental Health Workers in Intervention Facilities in FCT and Benue State.....	19
Table 15. Self-Risk Perception of Clinic Service Providers and Environmental Health Workers: Intervention versus Nonintervention Facilities in Benue State .....	19
Table 16. Immunization Experiences of Clinic Service Providers and Environmental Health Workers in Intervention Facilities in FCT and Benue and Their Opinion on the Availability of Post HIV-Exposure Prophylaxis .....	20

Table 17. Immunization Status of Clinic Service Providers and Environmental Workers and Availability of Post HIV-Exposure Prophylaxis: Intervention versus Nonintervention Facilities in Benue State.....	20
Table 18. Knowledge of Clinic Service Providers and Environmental Health Workers in Intervention Facilities in FCT and Benue State about Disease Transmission through Improper Health Care Waste Management and Needlestick Injuries .....	21
Table 19. Knowledge of Clinic Service Providers and Environmental Health Workers about Disease Transmission through Improper Health Care Waste Management and Needlestick Injuries: Intervention versus Nonintervention Facilities in Benue State .....	21
Table 20. Knowledge of Environmental Health Workers in Intervention Facilities in FCT and Benue State about the Need to Use of Personal Protective Equipment.....	22
Table 21. Knowledge of Environmental Health Workers about the Need to Use Personal Protective Equipment: Intervention versus Nonintervention Facilities in Benue State .....	22
Table 22. Personal Protective Equipment Availability at Intervention Facilities in FCT and Benue State per Facilities’ Officers in Charge.....	23
Table 23. Personal Protective Equipment Availability per Facilities’ Officers in Charge: Intervention versus Nonintervention Facilities in Benue State .....	23
Table 24. Observations on Use of Personal Protective Equipment in Intervention Facilities in FCT and Benue State .....	24
Table 25. Use of Personal Protective Equipment Observed: Intervention versus Nonintervention Facilities in Benue State.....	24
Table 26. Job Aids Availability Observed in FCT and Benue State Intervention Facilities.....	25
Table 27. Availability of Job Aids Observed: Intervention versus Nonintervention Facilities in Benue State .....	25
Table 28. Syringe Availability and Needle Reuse in Intervention Facilities in FCT and Benue State per Facilities’ Officers in Charge, Clinic Service Providers, and Environmental Health Workers.....	26
Table 29. Syringe Availability and Needle Reuse per Facilities’ Officers in Charge and Clinic Service Providers: Intervention versus Nonintervention Facilities in Benue State .....	27
Table 30. Syringe Types Seen in Use: Intervention versus Nonintervention Facilities in Benue State..	27
Table 31. Observations on Syringe and Needle Availability in Intervention Facilities in FCT and Benue State .....	28
Table 32. Observed Injection Preparation Facilities and Practices in Intervention Facilities in FCT and Benue State .....	29
Table 33. Observed Injection Preparation Facilities: Intervention versus Nonintervention Facilities in Benue State .....	30
Table 34. Observed Injection Preparation Practices in Intervention Facilities in FCT and Benue .....	31
Table 35. Observed Injection Preparation Practices: Intervention versus Nonintervention Facilities in Benue State .....	31
Table 36. Availability of Sharps Safety Boxes in Intervention Facilities in FCT and Benue State per Facilities’ Officers in Charge, Clinic Service Providers, and Environmental Health Workers .....	32
Table 37. Observations on Injection Areas in Intervention Facilities in FCT and Benue State.....	33
Table 38. Injection Area Characteristics Observed: Intervention versus Nonintervention Facilities in Benue State .....	33
Table 39. Sharps Safety Box Availability per Facilities’ Officers in Charge, Clinic Service Providers, and Environmental Health Workers: Intervention versus Nonintervention Facilities in Benue State .....	34

Table 40. Waste Segregation and Color Coding Knowledge of Clinic Service Providers in Intervention Facilities in FCT and Benue State.....	35
Table 41. Clinic Service Provider Knowledge of Waste Segregation and Color Coding: Intervention versus Nonintervention Facilities in Benue State .....	36
Table 42. Waste Segregation and Color Coding Knowledge of Environmental Health Workers in Intervention Facilities in FCT and Benue State.....	36
Table 43. Environmental Health Worker Knowledge of Waste Segregation and Color Coding: Intervention versus Nonintervention Facilities in Benue State .....	37
Table 44. Knowledge of Health Care Waste Treatment and Disposal Methods among Clinic Service Providers in Intervention Facilities in FCT and Benue State.....	38
Table 45. Clinic Service Provider Knowledge of Health Care Waste Treatment and Disposal Methods: Intervention versus Nonintervention Facilities in Benue State .....	38
Table 46. Knowledge of Health Care Waste Treatment and Disposal Methods among Environmental Health Workers in Intervention Facilities in FCT and Benue State.....	39
Table 47. Environmental Health Worker Knowledge of Health Care Waste Treatment and Disposal Methods: Intervention versus Nonintervention Facilities in Benue State.....	39
Table 48. Frequency of Waste Removal from Wards in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge and Environmental Health Workers .....	40
Table 49. Frequency of Waste Removal from Wards per Facilities' Officers in Charge and Environmental Health Workers: Intervention versus Nonintervention Facilities in Benue State .....	40
Table 50. Health Care Waste Management Equipment Availability at Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge .....	41
Table 51. Health Care Waste Management Equipment Availability per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State .....	41
Table 52. Waste Segregation Processes in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge .....	42
Table 53. Waste Segregation Processes per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State.....	43
Table 54. Observations of Health Care Waste Handling Materials in Intervention Facilities in FCT and Benue State .....	43
Table 55. Observations of Health Care Waste Handling Materials: Intervention versus Nonintervention Facilities in Benue State.....	44
Table 56. Types of Health Care Waste Generated in Intervention Facilities in FCT and Benue State per Environmental Health Workers .....	45
Table 57. Percentage Distribution of Waste from Primary Health Care Facilities by Waste Category	46
Table 58. Percentage Distribution of Waste from All Secondary and Tertiary Health Care Facilities by Waste Category.....	47
Table 59. Temporary Health Care Waste Storage and Transportation Practices in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge.....	49
Table 60. Temporary Health Care Waste Storage and Transportation Practices per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State .....	49
Table 61. Health Care Waste Treatment and Disposal Methods in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge .....	50

Table 62. Observations of Health Care Waste Treatment Facilities in Intervention Facilities in FCT and Benue State.....	51
Table 63. Observations of Health Care Waste Treatment Processes in Intervention Facilities in FCT and Benue State.....	51
Table 64. Observations of Health Care Waste Treatment Facilities: Intervention versus Nonintervention Facilities in Benue State.....	52
Table 65. Quality and Environmental Friendliness of Health Care Waste Treatment Methods and Disposal in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge and Environmental Health Workers.....	52
Table 66. Observations of Stock Card and Register Availability and Management in Stores and Pharmacies of Intervention Facilities in FCT and Benue State .....	54
Table 67. Observations of Stockouts and of Commodity and Medication Availability in Stores and Pharmacies of Intervention Facilities in FCT and Benue State .....	55



# ACRONYMS

ACT	artemisinin-based combination therapy (for malaria)
AIDS	acquired immunodeficiency syndrome
AMAC	Abuja Municipal Area Council
BENSESA	Benue State Environmental Agency
BO	bed occupancy
CHO	community health officer
CSP	clinic service provider
EHW	environmental health worker
FCT	Federal Capital Territory
HC	health care
HCW	health care waste
HCWM	health care waste management
HF	health facility
HIV	human immunodeficiency virus
IPC	infection prevention and control
IS	injection safety
JCHEW	junior community health extension worker
LAWMA	Lagos State Waste Management Authority
LGA	local government authority
LR	likelihood ratio
MMIS	Making Medical Injections Safer
MSS	Midwife's Service Scheme
NPHCDA	National Primary Healthcare Development Agency
OIC	officer in charge of health facility
OP	outpatient
PEP	post-exposure prophylaxis (for HIV)
PHC	primary health care
PMTCT	prevention of mother-to-child transmission (of HIV)
PPE	personal protective equipment

PPP	public–private partnership
RUP	reuse-prevention syringes
SHC	secondary health care facility
SHEW	senior community health extension worker
SOP	standard operating procedure
THC	tertiary health care facility
USAID	U.S. Agency for International Development
USG	United States Government
WDU	waste disposal unit
WHO	World Health Organization

# EXECUTIVE SUMMARY

In developing countries, health care waste management (HCWM) has not received the attention it deserves, and as a result, hazardous and medical wastes are handled and disposed of with general municipal waste—at great risk to the health of clinic service providers, environmental health workers, waste handlers, the public, and the environment. In Nigeria, with the advent of the Midwife’s Service Scheme and the Saving One Million Lives project, as well as U.S. Government initiatives to scale up HIV services to reduce number of children born with HIV (by encouraging women to access services for prevention of mother-to-child transmission of HIV), health care services are being decentralized to primary health care facilities (PHCs); it is expected that this increase in service provision will concomitantly increase quantities of waste—and create a greater-than-ever need to strengthen HCWM systems. An assessment to understand progress so far and the gaps that remain was conducted under the auspices of the AIDSTAR-One program of the U.S. Agency for International Development (USAID), which has supported national HCWM policy development in Nigeria for years. That assessment is the subject of this report.

Specifically, the study examined HCWM training compliance and commodity availability, plus health care waste treatment and disposal, and compared HCWM practices in hospitals supported by AIDSTAR-One to those not receiving interventions.

## METHODOLOGY

A comparative cross-sectional approach was used. Intervention areas where AIDSTAR-One had worked in the Federal Capital Territory (FCT) and Benue State were selected, plus a comparison group in Benue State (but not in FCT, which AIDSTAR-One had covered in entirety); health centers were selected at all levels—tertiary (THC), secondary (SHC), and primary (PHC).

Data was collected by trained research assistants who were supervised by HCWM experts. Questionnaires were administered to facilities’ officers-in-charge, clinic service providers (CSPs), and environmental health workers (EHWs); assessors observed facilities’ injection safety, waste management practices, and medical stores/pharmacy operations; on-site workers weighed facility wastes for a week; and key government and private-sector informants were interviewed in depth. Data were analyzed from intervention facilities alone to ascertain performance against desired standards; and intervention and nonintervention Benue State primary and secondary facility data compared, followed by chi-square analysis.

## HIGHLIGHTS OF FINDINGS

Findings illustrate compliance of most intervention facilities with HCWM standards. Nonetheless, achievements in knowledge of transmission of infection by injection and health worker tetanus and hepatitis B vaccination are balanced by areas that could be improved, such as in injection preparation and commodity availability. In several instances, observations revealed discrepancies between on-the-ground practices and officer-in-charge or health worker reports of those practices that may be due to social desirability bias. Some achievements prevail across all facility levels; others affect just one level, with other levels lagging.

## **POLICY AND OPERATIONAL FRAMEWORK**

- Intervention facilities' officers-in-charge (OICs) indicated that the *National Policy on Injection Safety and Healthcare Waste Management* was available in 75% of PHCs. But only two-thirds of facilities' OICs indicated compliance with national policies; observance was poor at PHC level (33.3%).
- Although intervention facilities' OICs indicated that the *National Policy on Injection Safety and Healthcare Waste Management* was available in all SHC and THC facilities, observers actually sighted it in few SHC and THC facilities.
- Only about a quarter of OICs described having internal guidelines and standard operating procedures; where they exist, they are not generally used—and that is true across all types of facilities.
- 61.2% of CSPs and 52.4% of EHWs across all levels have been trained in universal precautions.
- Although 93.8% of intervention facilities' OICs, across all levels, have an annual HCWM workplan, more than half (53.3%) did not have budgetary allocations for it.
- Most SHC (80%) and all THC facilities (100%) noted having a functioning committee focused on infection prevention and control; only 12.5% of PHCs reported having such a committee.

## **ENVIRONMENTAL CONDITIONS, WATER, AND SANITATION FACILITIES**

- All SHC and THC facilities had flushable staff and patient toilets with running water and handwashing facilities nearby.
- In only 14.3% of PHCs were there handwashing facilities near the toilet. Handwashing facilities had running water in only 43.8% of all facilities at all levels.
- Observers noted wet toilet floors in 56.2% of facilities and smelly conditions in 66.7% of PHC toilets; at PHCs, staff toilets in only 54.5% of facilities and patient toilets in only 28.6% had running water.
- Public sources supplied running water to only 20% of PHCs; one PHC facility had no water source.
- During assessment visits at all levels, most facility floors (93.8%) were observed to be clean on wards but littered elsewhere in 25% of cases, with used dressings (31.2%) or debris (43.8%) on the ground.

## **WORKER AND PATIENT SAFETY: KNOWLEDGE AND PRACTICE**

- In intervention facilities, visibly clean tables or trays that met expected standards were used to prepare injections for vaccination (in 58.8% of cases), therapeutic purposes (36.4%), family planning (34.5%), and dental services (22.7%).
- Knowledge of disease transmission via poor HCWM and needlestick was universal among both CSPs and EHWs.
- Knowledge of use of personal protective equipment varied among EHWs, with greatest knowledge about latex gloves (89.2%) and heavy-duty gloves (86.5%).

- During interviews, when OICs across levels were asked about their facility's PPE use, most claimed latex gloves (90.9%) and heavy-duty gloves (84.6%), plus nose masks (61.8%); only 30.0% noted availability of overalls. But observers across levels saw *all* waste handlers wearing overalls but only 38.1% using heavy-duty gloves and only 9.5% using face masks.

## **SAFETY BOXES AND SYRINGES AND NEEDLES**

- In interviews, intervention facilities' OICs at all levels indicated that their facilities have available sterilizable syringes (100%), standard disposable syringes (87.5%), and reuse-prevention syringes (RUPs; 81.3%). At few facilities (18.8%) did staff claim to use needlestick-prevention syringes or have them in stock. Wide availability of sterilizable syringes is of concern, particularly as unsafe use may occur during stockouts of standard disposable and RUP syringes, however, facilities may not feel able to dispose of these previously issued supplies.
- Although OICs reported that their facilities had not reused any syringes and needles during the previous year, one CSP (1.8%) described doing so.
- Some patients bring their own syringes and needles to health facilities for injections, fewer for vaccination (79.5%) than for family planning (45.5%) and therapeutic injections (40.9%).
- Before preparing vaccination injections, health workers seldom cleaned their hands; 18.6% of intervention facilities workers' used soap and running water and 6.8% an alcohol-based hand rub.
- Although sharps safety boxes are widely used, CSPs assert they are available in all injection rooms and on all wards in only 9.1% of facilities—contrary to claims by almost all OICs and EHWs. Observers found safety boxes in only 11.1% of PHC facilities; and in no SHC or THC facility were they present in *all* areas where injections were given.

## **WASTE GENERATION, SEGREGATION, TREATMENT, AND DISPOSAL: KNOWLEDGE AND PRACTICE**

- Among CSPs, a high proportion in FCT and Benue State know about segregating most types of waste (infectious waste, sharps, and general waste), but seldom about recyclables and chemical wastes.
- Knowledge about HCW treatment and disposal was variable among intervention facilities' EHWs and generally poor among intervention facilities' CSPs. Although 91% of CSPs knew about open burning and 77.6% about burial, only 26.9% were familiar with low-temperature incineration.
- Observers found color-coded HCW containers in all PHC and SHC facilities but in only 50% of THC facilities.
- Although all 12 PHC facilities observed were segregating sharps from general waste; only eight (75%) were segregating wastes more broadly into general, infectious, and anatomical and highly infectious groups.
- For HCW treatment, intervention facilities' OICs most frequently cited open burning in a hole or enclosure (62.5%) and low-temperature incineration/burning (31.2%). Only one OIC (6.2%) noted

using high- or medium-temperature incineration. Observers found open burning (93.8%) to be the most common on-site treatment method.

- For HCW disposal, intervention facilities' OICs most frequently claimed dumping in a protected/secure pit (31.2%), in an unprotected pit (25%), and in an unsupervised pit (18.8%) and burying (also 18.8%); unprotected pits were the most common dump site for PHCs (37.5%) and protected/secure pits for THCs (66.7%). Observers actually found unsupervised dumps to be the most common on-site disposal site across facility types (40%).
- Only a third of OICs (33.3%) rated their facility's HCW treatment capacity as adequate. Although most EHWs (62.2%) termed their facility's HCWM "safe," fewer than half (45.9%) thought it "environmentally friendly."
- Although most OICs at THC facilities (66.7%) described having agreements with private-sector operatives for HCWM, only 12.5% of PHC OICs and 20% of SHC OICs indicated any private-sector involvement.

### **Health Facilities' Waste Weight and Composition**

- On the whole, in PHC facilities, general waste constituted the highest proportion of waste (45.6%); other components included sharps (31.5%) and infectious (17.9%) and anatomical and highly infectious wastes (5.1%).
- In SHC facilities, general waste constituted the highest proportion (56.0%); other segregated components included anatomical and highly infectious wastes (18.3%), infectious wastes (15.6%), and sharps (10.1%).
- For THC facilities, general waste constituted the highest proportion of waste generated (46.2%); other components included anatomical and highly infectious wastes (21.7%), infectious wastes (17.1%), sharps (10.6%), and pharmaceutical wastes (4.3%).

### **STOCK CARD AND REGISTER MANAGEMENT**

- For commodity management, registers were found infrequently, with stock cards somewhat more common, but neither was regularly kept up to date: Sharps safety box registers were in only 12.5% of facilities and stock cards in 25%; only half those cards had been updated during the preceding month.
- Assessment visits revealed stockouts during the previous six months of bin liners (in 50% of facilities); heavy-duty gloves (27.3%); boots (27.3%); vacutainers (22.2%); sharps safety boxes (15.4%); disposable gloves (15.4%); needlestick-prevention syringes (66.7%); RUP syringes (44.4%); and standard disposable syringes (23.1%).

### **INTERVENTION FACILITIES VERSUS NONINTERVENTION FACILITIES**

Intervention group data did not always reveal compliance with safe HCWM and injection protocols at a level of statistical significance greater than for nonintervention facilities. No statistically significant difference was found between intervention and nonintervention facilities with respect to having a HCWM workplan and annual report; respondent claims for syringe availability, use, and reuse; knowledge of disease transmission via improper HCWM and needlestick; EHW universal precautions training; or observed reuse-prevention syringe and sharps safety box availability.

Conversely, intervention facilities revealed greater prevalence with statistical significance over nonintervention facilities in a broad range of areas, including:

- Providers washing their hands before preparing a vaccination ( $p=0.022$ ) or therapeutic injection ( $p=0.025$ ).
- Availability of job aids supporting injection safety ( $p=0.019$ ).
- Use of heavy-duty gloves and boots ( $p=0.050$ ) and EHW knowledge about heavy-duty gloves ( $p<0.001$ ) and boots ( $p=0.002$ ), aprons ( $p=0.007$ ), overalls ( $p=0.025$ ), and goggles ( $p=0.002$ ).
- Availability of the *National Policy on Infection Prevention and Healthcare Waste Management and Standards for Universal Precautions and Health Care Waste Management Practices* (but staff patterns of non-use of both were not significantly different).
- CSP training in universal precautions ( $p<0.001$ ).
- CSP knowledge about general waste ( $p=0.026$ ), anatomical and highly infectious wastes ( $p=0.003$ ), and color-coding of wastes ( $p<0.001$ ), EHW knowledge about segregating wastes ( $p<0.001$ ), pharmaceutical wastes ( $p=0.004$ ), and waste color-coding ( $p<0.001$ ).
- OICs' claims regarding waste segregation at the source ( $p=0.010$ ), waste weighing ( $p=0.010$ ), waste receptacle color-coding ( $p=0.002$ ); use of bin liners for segregating and storing waste ( $p=0.002$ ); and lack of waste storage container shortages ( $p=0.038$ ).
- For hazardous and nonhazardous waste, separate collection and storage ( $p=0.035$ ) and transportation ( $p=0.018$ ).
- Presence of color-coded bin liners ( $p=0.004$ ) and color-coded HCW containers ( $p<0.001$ ).
- Availability of facilities to transport HCW for off-site treatment ( $p=0.014$ ).

## **PUBLIC- AND PRIVATE-SECTOR STAKEHOLDER VIEWS**

Stakeholders from both the public and private sectors agree on the importance of effective health care waste management in Nigeria, as well as the magnitude of the task and the dire consequences of failure to meet the challenge.

### **Government Representative Key Observations**

- Although relevant agencies have been established, they are not adequately equipped, and supportive legislations and regulations are lacking. A HCWM unit is nonfunctional due to lack of resources.
- Private-sector involvement in HCWM is generally limited to transporting wastes.

### **Private-Sector Operatives Key Observations**

- The government is not doing enough to further effective HCWM in health facilities or in states as a whole.
- In both FCT and Benue State, the public–private partnership mechanism is evolving but challenges remain. The Benue State government has not followed up on plans for robust private-sector engagement.

- Regulations can ensure both facility use of private-sector HCWM experts and government monitoring.
- Public–private sector tensions exist: “Some officials see the private sector as competitors and undermine [our work].”
- Most private-sector organizations simply handle waste collection and disposal, with no HCW treatment. One organization equipped to do more “could be busier than we are” and is not breaking even.
- The private sector has the potential to do more for HCWM than at present, and with effective government support and partnership could contribute significantly to the growth of the national economy.

## **DISCUSSION AND CONCLUSION**

Because of this assessment’s small sample size, statistically significant intervention–nonintervention differences were difficult to record. It is also impossible to understand the spillover effect of broad policy-level AIDSTAR-One work on nonintervention facilities. Despite limitations, this study provides a snapshot of a health care system that has attained international quality benchmarks for HCWM and injection safety in some areas, with other areas still requiring focused attention. Close analysis of the data from this study can be instrumental in completing the transformation for all areas of HCWM and injection safety. Insights from close data analysis will enable FCT and Benue State policymakers to prioritize coordinated and comprehensive HCWM and injection safety initiatives.

# BACKGROUND

Health care waste poses serious risks to the public health and the environment. As a result, its management is a critical issue that has taken a central place in the many countries' national policies. However, in developing countries, partly as a result of limited resources, health care waste management (HCWM) has not received sufficient attention; hazardous and medical waste are handled and disposed of with domestic wastes, at great risk to the health of waste handlers, the public, and the environment. Although health care waste (HCW) should be separated from municipal waste, in many parts of Africa it tends to be collected along with the rest of the waste stream. Most hazardous and toxic wastes are put into dump facilities, and few safeguards, if any, protect the environment, including water sources and those living nearby.

The U.S. Agency for International Development (USAID) has supported the development of national HCWM policies in Nigeria. This effort has led to the development of both sector-specific and state-specific strategies—that is, the National Primary Healthcare Development Agency (NPHCDA), and in Lagos State the Lagos State Waste Management Authority (LAWMA). In the Federal Capital Territory (FCT), the AIDSTAR-One project, funded through USAID by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), engaged with the Health and Human Services Secretariat and the Abuja Environmental Protection Board to develop a HCWM strategy and plan for the FCT. The FCT has six area councils; each has at least one facility for secondary health care (SHC) and several for primary health care (PHC), and each of two area councils has two facilities for tertiary health care (THC). AIDSTAR-One's GIS mapping of HCW treatment facilities revealed five high-temperature incinerators in the FCT, but all these are in public facilities that don't link to other public or private facilities. Although some quantitative data on FCT medical waste-generation exists, it is largely from public-sector facilities and because of poor sampling techniques, it is difficult to use as a basis for generalizations about the FCT.

The AIDSTAR-One project in Nigeria follows the Making Medical Injections Safer (MMIS) project in all the FCT area councils. Between 2005 and 2009 during the MMIS project, a large number of health workers in all FCT public tertiary and secondary health facilities as well as selected primary health facilities were trained in HCWM and injection safety (IS). At the same time, FCT policy makers and health facility managers were engaged to strengthen the system and ensure the sustainability of MMIS project gains. Health facilities were supported with a seed stock of IS commodities as well as with appropriate waste segregation commodities and personal protective equipment (PPE). Despite these interventions, recent data from follow-on assessments reveal less-than-perfect sustainability of the implemented systems.

When MMIS ended in 2009, AIDSTAR-One continued to build capacity and strengthen IS and HCWM within the health system, broadening its reach to Benue State and working there in six local government areas (LGAs) during the project's first two years and with an additional six LGAs during the project's final year. In these LGAs, AIDSTAR-One has built capacity among health workers and waste handlers on IS and HCWM, providing them with seed stock of IS and waste management commodities. The project has also engaged relevant stakeholders as a strategy to institutionalize sustainable HCWM practices within facilities and in the environment that nurtures these facilities.

Although a national HCWM policy exists in Nigeria, it has not yet been adopted and adapted to state-specific policies. The draft HCWM policy developed in the FCT in 2009 remained in draft form in 2013.

Despite the gaps, the NPHCDA—whose mandate is to provide accessible, affordable health care to the rural community—has partnered with AIDSTAR-One in the development of a HCWM strategic framework and a five-year implementation plan to strengthen systems within primary health care for HCWM. This partnership results from the increase in PHC-level services with the advent of the Midwife’s Service Scheme (MSS) and the Saving One Million Lives project of the Minister of State for Health, within the Ministry of Health, which also focuses on delivery of quality health care at PHC level.

Nigeria’s population of people living with HIV and AIDS, numbering 3.4 million, is the world’s third-largest, representing 10% of the global burden and comprising 32% of all HIV-positive infants globally. About 1,423,000 of Nigeria’s HIV-positive people require treatment, yet only about 543,000 are currently on treatment. The U.S. Government (USG) is scaling up treatment services in Nigeria to reduce number of children born with HIV infection in the country and to increase the number of women accessing services for prevention of mother-to-child transmission of HIV (PMTCT) and thus the number of people on treatment. This strategy requires decentralizing services to PHCs, where people can access care most readily. It is expected that women attending PHCs for PMTCT will also take advantage of other interventions and that this increase in PHC service provision will in turn lead to an increase in the quantity of waste generated—and a greater-than-ever need to strengthen HCWM systems.

For this reason, and because the FCT and Benue State rank within the top five states in Nigeria for HIV prevalence and a massive service scale-up from multiple sources is currently ongoing to reach people in need of treatment, developing and implementing a more coordinated, centralized HCWM system to manage the HCW that will be generated becomes imperative. All stakeholders must be identified and appropriate linkages forged. (Linkages are particularly pertinent, as data from supportive supervision at FCT and Benue State health facilities as well as policy makers, public health facilities’ management, and municipal environmental sanitation agencies have demonstrated a lack of collaboration and coordination in strengthening the HCWM system.)

In light of this need to strengthen the HCWM system at health-facility level, USG partners and other donors working in FCT and Benue State have provided support in the provision of waste segregation commodities as well as, in some cases, waste disposal units (WDUs). An assessment to understand the progress made so far and the gaps that remain was conducted to inform future activities. That assessment is the subject of this report. The insights will enable FCT and Benue State policymakers to prioritize coordinated and comprehensive HCWM. The study also has the potential to inform future USAID activities relating to HCWM.

# **GOAL AND OBJECTIVES**

## **GOAL**

The goal of the assessment was to examine the achievements attained by health facilities benefiting from AIDSTAR-One interventions to promote a sustainable health care waste management system in the Federal Capital Territory and Benue State.

## **SPECIFIC OBJECTIVES**

- To examine availability of sustainable HCWM commodities.
- To examine compliance with HCWM training.
- To examine the use of sustainable HCWM treatment and disposal methods.
- To compare HCWM practices in hospitals not supported by AIDSTAR-One to those that received interventions.



# METHODOLOGY

## STUDY DESIGN AND SELECTION OF HEALTH FACILITIES

The study was carried out in the Federal Capital Territory and Benue State. A comparative cross-sectional design was adopted.

In FCT, Abuja Municipal Area Council (AMAC) was selected for the intervention, including nine facilities: one tertiary, four secondary, and four primary. Because AIDSTAR-One covered *all* FCT health facilities, it was not possible to have a strict comparison group within FCT.

In Benue State, twelve facilities were chosen using a stratified sampling approach. The project had focused on only one LGA, Markurdi LGA (and its facilities comprised the intervention group), while Gwen North East LGA was selected as a comparison LGA. For intervention facilities, the sampling frame was the list of AIDSTAR-One facilities and for control facilities, the list of government health facilities. Facility level (primary, secondary, and tertiary) was used for stratification in both the intervention and control areas. Of the 12 selected in Benue State, two were tertiary, two secondary, and eight primary (Table 1). Of these, one SHC and four PHC facilities were in the nonintervention group.

**Table 1. Study Facilities by Intervention Status, Category, and Location**

TERTIARY	SECONDARY	PRIMARY
<b>INTERVENTION FACILITIES</b>		
Federal Capital Territory		
National Hospital, Abuja	Wuse General Hospital	PHC Lugbe
	Asokoro District Hospital	PHC Garki
	Maitama District Hospital	PHC Karu
	Nyanyan General Hospital	Family Health Clinic, Area 2
Markurdi LGA, Benue State		
Federal Medical Centre, Makurdi	General Hospital, North Bank	PHC Fiidi
Benue State University Teaching Hospital, Makurdi		PHC Asase
		PHC Wadata
		FSP Kwararafa
<b>NON-INTERVENTION FACILITIES</b>		
Gwen North East LGA, Benue State		
—	General Hospital, Aliade	PHC Ikoayongu
		PHC Tarku
		PHC Igbor
		PHC Aliade

# DATA COLLECTION METHODS AND ACTIVITIES

The study involved a number of data collection methods (Table 2):

- Questionnaires administered to officer-in-charge (OIC) of each health facility, clinical service providers (CSPs), and environmental health workers (EHWs).
- Walk-through surveys for facility and environmental assessments and observation of waste management practices.
- Structured observations of medical stores and pharmacies.
- Structured observations of injection practices.
- Daily weighing of waste.
- In-depth interviews with key government officials (in the Ministry of Health and waste management agencies) and private-sector stakeholders involved in waste management.

**Table 2. Data Collection Approaches and Foci**

INSTRUMENT/DATA COLLECTION	ISSUES COVERED	REMARKS
Questionnaire for the facility officer in charge	<ul style="list-style-type: none"> <li>• Availability of a budget line for the procurement of HCWM commodities</li> <li>• Availability of continuous education unit/activities</li> <li>• Bed availability in the health facility and the number occupied at the time of the survey</li> <li>• Support for safe, effective HCWM from the hospital's management board or the authority</li> <li>• Presence of public-private sector collaboration for off-site waste treatment and disposal</li> </ul>	<ul style="list-style-type: none"> <li>• The facility medical director, the chief nursing officer of the selected government health facility, or the head of pharmacy or head of department was interviewed as a key informant.</li> </ul>
Questionnaire for clinic service providers	<ul style="list-style-type: none"> <li>• Health workers' level of IS and HCWM knowledge</li> <li>• Awareness of HCWM policies and plans</li> <li>• Availability of policies or plans supporting HCWM in the health facility</li> <li>• Level of training and capacity building for health facility staff</li> <li>• Use of new entrant's package for injection safety and HCWM training</li> <li>• Availability of continuing education unit/activities</li> </ul>	<ul style="list-style-type: none"> <li>• The most senior and the most junior nurse or clinical service provider on duty at the time of the assessment visit were interviewed, together with three other nursing staff or CSPs selected randomly (or all staff members where the staff numbered three or fewer).</li> </ul>
Questionnaire for waste handling staff and environmental health personnel	<ul style="list-style-type: none"> <li>• Level of knowledge of HCWM</li> <li>• Awareness of HCWM policies and plans</li> <li>• Level of training and capacity building</li> <li>• Use of new entrant's package for injection safety and HCWM training</li> <li>• Availability of continuous education unit/activities</li> </ul>	<ul style="list-style-type: none"> <li>• Three waste handling staff members were interviewed, including the most senior, the most junior, and one other individual selected randomly (or all staff members where the staff numbered three or fewer).</li> </ul>
Structured work-based observation of health workers	<ul style="list-style-type: none"> <li>• Level of compliance to HCWM training</li> </ul>	<ul style="list-style-type: none"> <li>• Four injections (therapeutic or immunization) were observed by at least two health workers where possible. Where it was not possible to observe four injections, the assessment team observed the maximum number taking place at the time of the visit.</li> </ul>
Walk-through survey to observe waste management and determine the facility's number of beds and current bed occupancy	<ul style="list-style-type: none"> <li>• Level of compliance to HCWM training</li> <li>• HCWM treatment and disposal options available</li> <li>• Responsibility for off-site HCW treatment and disposal</li> </ul>	<ul style="list-style-type: none"> <li>• The waste management process was observed in the injection section, in two wards (chosen at random), and in facilities' immediate environment.</li> </ul>
Observation of stock room	<ul style="list-style-type: none"> <li>• Availability of commodities, their stock level, and proper placement</li> </ul>	<ul style="list-style-type: none"> <li>• Availability of color-coded HCWM supplies recommended by the WHO was observed.</li> </ul>

INSTRUMENT/DATA COLLECTION	ISSUES COVERED	REMARKS
Weighing of waste	<ul style="list-style-type: none"> <li>• Daily weighing of waste for seven consecutive days to provide, for each health facility, an average number of kilograms generated per day and per week of infectious waste, highly infectious waste, and municipal waste</li> </ul>	<ul style="list-style-type: none"> <li>• Waste was weighed at the end of every night duty (i.e., every morning).</li> <li>• One waste management officer was recruited to do the daily weighing. Waste weighing commenced following the staff interview and facility observations.</li> </ul>
In-depth interviews with other stakeholders	<ul style="list-style-type: none"> <li>• Level of their involvement in HCWM systems strengthening</li> <li>• Extent of public–private partnership and involvement</li> <li>• Support to health facilities in HCWM</li> </ul>	<ul style="list-style-type: none"> <li>• Public-sector stakeholders interviews included officials from the State Ministry of Health and a waste management agency (i.e., the focal officers in charge of IS or HCWM) and the LGA PHC coordinator.</li> <li>• Private-sector operatives involved in HCWM identified through health/waste management officials were also interviewed.</li> </ul>

Data collection was carried out by trained research assistants supervised by HCWM experts, one expert in each area of study.

To quantify the waste, an EHW based in the focal health facilities was recruited to weigh it for seven consecutive days as segregated by the health facilities. Waste content was examined for sharps, general waste, infectious wastes, anatomical and highly infectious wastes, radioactive wastes, and pharmaceutical wastes. The two HCWM experts leading each study area trained the EHWs to weigh the waste following a written protocol (Appendices 2 and 3). For all facilities, these officers were instructed to send waste weights to the study team immediately after weighing but to retain the waste itself until instructed to dispose of it by the study team. This protocol permitted the study team to conduct random checks on the weighing process and the validity and reliability of the data supplied.

## STUDY MANAGEMENT STRUCTURE

The study involved three consultants: one evaluation expert and two experts in HCWM. The evaluation consultant took the lead in designing the study protocol and instruments and for data analysis and the writing of the report; HCWM consultants were charged with training data collectors and supervising them in the field and had overall responsibility for the entire data collection process in their assigned study area. HCWM consultants were also charged with ensuring a standard two-way translation of study instruments where necessary—as for example, for interviews with low-literate EHWs and waste handlers.

## DATA ANALYSIS

Based on the study objectives, two approaches were adopted for the data analysis. The first involved analysis of data from the intervention facilities alone to ascertain their performance by comparison with desired standards. This analysis was also stratified by facility level.

The second approach involved comparing intervention and nonintervention facilities. For this purpose, only Benue State data were used. Because there was no THC facility in the nonintervention group, the comparison involved only the PHC and SHC facilities—one SHC facility and four PHC facilities for the intervention group and the same number for nonintervention groups. Chi-square analysis was used to compare performance for intervention and nonintervention facilities when the dependent and independent variables were categorical in nature. Where the assumption for Pearson chi-square procedure could not be met, likelihood ratio chi-square (LR) was carried out. In some

cases where the contingency cell had the figure zero, the Programme for Epidemiologist (PEPI)<sup>1</sup> software was used for chi-square analysis: PEPI adds 0.0000001 to zero cells to permit computation. Statistical significance was set at  $p < 0.05$ .

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<sup>1</sup> Abramson J.H, Gahlinger P.M. *Computer Programs for Epidemiologic Analysis (PEPI)*. Version 3.01. Llanidloes, Wales: Brixton Books, 1999.

# RESULTS

## FINDINGS FROM HEALTH FACILITY INTERVIEWS AND OBSERVATION

### AVAILABILITY OF POLICY, OPERATIONAL GUIDELINES, WORKPLANS, AND OPERATIONAL STRUCTURE

Information from the intervention facilities’ OICs indicated that the *National Policy on Injection Safety and Healthcare Waste Management* was available in 75% of PHCs and all SHC and THC facilities, although during assessment visits it was sighted in few SHC and THC facilities (Table 3). Overall, only about two-thirds of facilities’ OICs indicated that the policies were being followed and observance was particularly poor at PHC level (33.3%).

Also according to OICs, the *Standards for Universal Precautions and Health Care Waste Management Practices* was available in most facilities—62.5% of PHC, 80% of SHC facilities, and all (100%) THC facilities. Compared to nonintervention facilities, those in the intervention group showed statistically significant greater availability of *National Policy* and *National Standard and Norms*. However, use patterns were not significantly different (Table 4).

Only about a quarter of OICs indicated that their facilities have internal guidelines and standard operating procedures (SOPs); where they exist, they are not generally used—and that is true across all types of facilities.

**Table 3. Availability of Policy Documents and Operational Guidelines in Intervention Facilities in FCT and Benue State per Facilities’ Officers in Charge**

Policy Document and Operational Guidelines Availability and Utilization	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number	Yes		Number	Yes		Number	Yes		Number	Yes	
		n	(%)		n	(%)		n	(%)		n	(%)
National Policy on Injection Safety and Healthcare Waste Management available	8	6	75.0	5	5	100	3	3	100	16	14	87.5
National Policy on Injection Safety and Healthcare Waste Management sighted	6	5	83.3	5	1	20	3	1	33.3	14	7	50.0
Compliance with National Policy on Injection Safety and Healthcare Waste Management	6	2	33.3	5	5	100	3	2	66.7	14	9	64.3
Standards for Universal Precautions and Health Care Waste Management Practices available	8	5	62.5	5	4	80	3	3	100	16	12	75
Compliance with the National Policy and the Standards and Norms on Injection Safety and Health Care Waste Management	5	3	60	4	1	25	3	1	33.3	12	5	41.7
Internal guidelines and SOP on IS and HCWM available	8	1	12.5	4	2	50	3	1	33.3	15	4	26.7
Always follow internal guidelines and SOP on IS and HCWM	1	0	0.0	2	1	50	1	1	100	4	2	50.0
Challenges in implementing national guidelines on IS and HCWM	4	1	25	4	2	50	3	2	66.7	11	5	45.5
Internal guidelines available and sighted	1	1	100	2	1	50	1	1	100	4	3	75.0

**Table 4. Availability of Policy Documents and Operational Guidelines per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State**

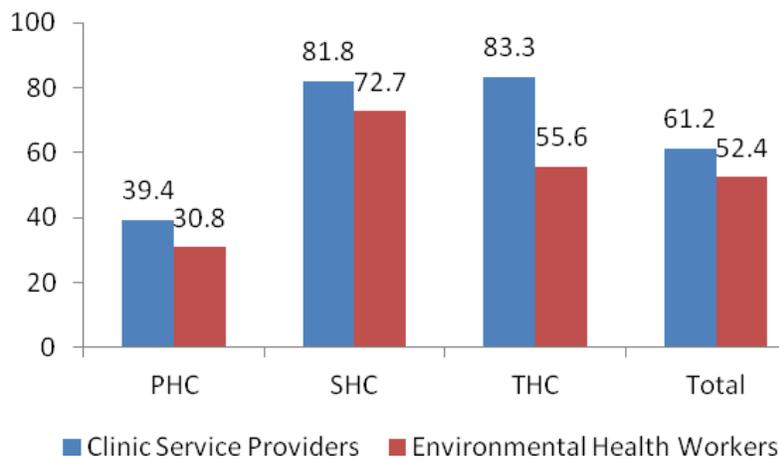
Policy Document and Operational Guidelines Availability and Utilization	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
National Policy on Injection Safety and Healthcare Waste Management available	5	5	100	5	1	20	0.010
Compliance with National Policy on Injection Safety and Healthcare Waste Management	5	3	60	1	0	0	0.273
Standards for Universal Precautions and Health Care Waste Management Practices available	5	4	80	5	0	0	0.010
Compliance with National Policy and Standards and Norms on Injection Safety and Health Care Waste Management	4	2	50	4	2	50	1.000
Internal guidelines and SOP on IS and HCWM available	5	1	20	5	0	0	0.292
Always follow internal guidelines and SOP on IS and HCWM	5	1	20	5	0	0	0.292

## Training of Health Workers on Injection Safety and Health Care Waste Management

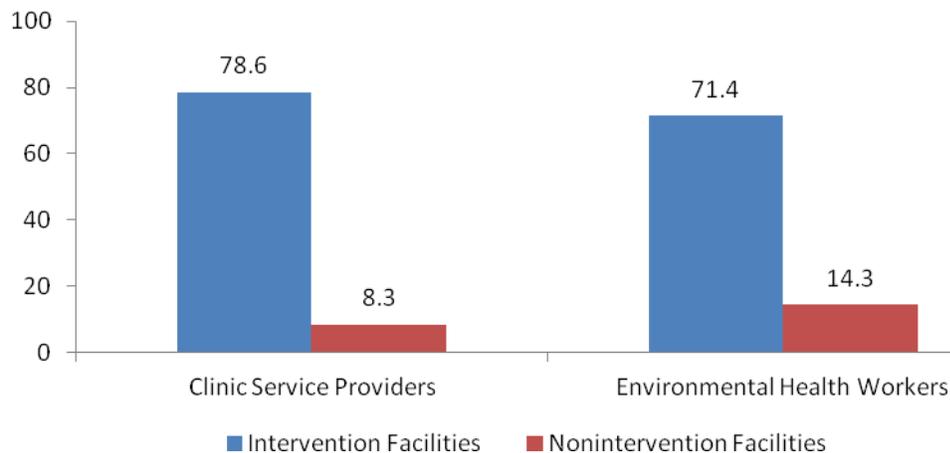
Responses from health workers in intervention facilities overall indicated that 61.2% of CSPs and 52.4% of EHWs had been trained in universal precautions. THC facilities had the highest proportion of both CSPs trained (83.3%) and SHCs the highest proportion of EHWs trained (72.7%; Figure 1).

A significantly higher proportion of CSPs in intervention facilities had been trained in universal precautions than those in nonintervention facilities (78.6% versus 8.3%,  $p < 0.001$ ; Figure 2). The proportion of EHWs trained in intervention facilities was also higher than the proportion at nonintervention facilities who had been trained, but the difference was not statistically significant (71.4% versus 14.3%,  $p = 0.25$ ).

**Figure 1. Health Workers Trained in Universal Precautions by Facility Type**



**Figure 2. Percentage of Clinic Service Providers and Environmental Health Workers Trained in Universal Precautions: Intervention versus Nonintervention Facilities in Benue State**



## WORKER KNOWLEDGE, AWARENESS, AND USE OF POLICY AND OPERATIONAL GUIDELINES

**Among Clinic Service Providers.** OICs reported awareness of the existence of the *National Policy on Injection Safety and Healthcare Waste Management* to be high among CSPs across the three levels of care in the intervention facilities in FCT and Benue State, with the lowest level of awareness recorded in THC facilities (83.3%). However, compliance with the policy was described as very poor across facility types (only 25.5%), with the poorest record among PHC facility workers (19.0%). Only about half of respondents across facility types (50.9%) indicated that copies of the *Standards for Universal Precautions and Health Care Waste Management Practices* were on hand in their facilities, and only a third (33.3%) affirmed the existence of internal guidelines, specific to their own facility (Table 5).

Interviews with CSPs pointed to significantly better performance among intervention facilities in Benue State than among noninterventional facilities in terms of awareness of the National Policy ( $p=0.003$ ), existence of the National Policy in plain view during the assessment visit ( $p=0.017$ ), and on-premises presence of the Standards for Universal Precautions and Health Care Waste Management Practices ( $p<0.001$ ; Table 6).

**Table 5. Availability and Compliance with National Policies and Operational Guidelines at Intervention Facilities in FCT and Benue State per Clinic Service Providers**

	PHC FACILITY			SHC FACILITY			THC FACILITY			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
Aware of National Policy on Injection Safety and Healthcare Waste Management	25	21	84.0	18	18	100	12	10	83.3	55	49	89.1
Copy of Policy on Injection Safety and Healthcare Waste Management available and sighted	21	8	31.8	18	2	11.1	10	2	20.0	49	12	24.5
Compliance with National Policy on Injection Safety and Healthcare Waste Management	21	4	19.0	17	6	35.3	9	2	22.2	47	12	25.5
Standards for Universal Precautions and Health Care Waste Management Practices available	25	11	44.0	18	10	55.6	12	7	58.3	55	28	50.9
Copy of Standards for Universal Precautions and Health Care Waste Management Practices sighted	11	4	36.4	10	2	20.0	7	1	14.3	28	7	25.0
Challenges in implementing national guidelines on IS and HCWM	10	4	40.0	10	6	60.0	10	8	80.0	30	19	60.0
Internal guidelines and SOP on IS and SOP on IS and HCWM available	25	7	28.0	18	5	27.8	6	6	54.5	54	18	33.3

**Table 6. Availability and Compliance with National Policies and Operational Guidelines per Clinic Service Providers: Intervention versus Nonintervention Facilities in Benue State**

Policy Document and Operational Guidelines Availability and Utilization	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
Aware of National Policy on Injection Safety and Healthcare Waste Management	14	14	100	12	6	50	0.003
Copy of Policy on Injection Safety and Healthcare Waste Management available and sighted	14	8	57.1	6	0	0	0.017
Compliance with National Policy on Injection Safety and Healthcare Waste Management	13	6	46.2	6	0	0	0.139
Copy of Standards for Universal Precautions and Health Care Waste Management Practices available	14	11	78.6	12	0	0	0.000
Internal guidelines and SOP on IS and SOP on IS and HCWM available	14	6	42.9	12	2	16.7	0.149

**Among Environmental Health Workers.** Only half of the EHW in intervention facilities in FCT and Benue State were aware of the *National Policy on Injection Safety and Healthcare Waste Management*; in the facilities of those who were, copies of the *National Policy* were observed during the assessment visit in only 50% of cases. Only a third of those aware of the National Policy indicated that it was available and in plain sight and that they followed it completely (Table 7). A significantly higher proportion of EHWs in intervention facilities in Benue State reported being aware of the National Policy on IS and HCWM ( $p=0.001$ ), compared to workers in nonintervention facilities (Table 8).

**Table 7. Availability of and Compliance with National Policies and Operational Guidelines at Intervention Facilities in FCT and Benue State per Environmental Health Workers**

	PHC FACILITY			SHC FACILITY			THC FACILITY			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
Aware of National Policy on Injection Safety and Healthcare Waste Management	8	4	50	9	6	66.7	19	8	42.1	36	18	50.0
Copy of Policy on Injection Safety and Healthcare Waste Management available and sighted	4	3	75.0	6	1	16.7	8	5	62.5	18	9	50.0
Compliance with National Policy on Injection Safety and Healthcare Waste Management	5	1	20.0	6	0	0	7	5	71.4	18	6	33.3
Copy of Standards for Universal Precautions and Health Care Waste Management Practices available	9	4	44.4	9	3	33.3	19	5	26.3	37	12	32.4
Copy of Standards for Universal Precautions and Health Care Waste Management Practices available	4	2	50.0	3	1	33.3	5	1	20.0	12	3	25.0
Challenges in implementing national guidelines on IS and HCWM	4	1	25.0	3	0	0	5	2	40.0	12	3	25.0
Internal guidelines and SOP on IS and SOP on IS and HCWM available	9	4	44.4	9	1	11.1	19	4	21.1	37	9	24.3

**Table 8. Availability and Compliance with National Policies and Operational Guidelines per Environmental Health Workers: Intervention versus Nonintervention Facilities in Benue State**

Policy Document and Operational Guidelines Availability and Utilization	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
Aware of National Policy on Injection Safety and Healthcare Waste Management	6	5	83.3	7	0	0	0.001 LR
Copy of Policy on Injection Safety and Healthcare Waste Management available and sighted	5	4	80	7	0	0	0.001 LR
Compliance with National Policy on Injection Safety and Healthcare Waste Management	6	6	100	7	0	0	0.001 LR
Copy of Standards for Universal Precautions and Health Care Waste Management Practices available	7	3	42.9	7	0	0	0.51 LR
Internal guidelines and SOP on IS and SOP on IS and HCWM available	7	4	57.1	7	0	0	0.12 LR

### **Annual Workplan and Report, Functional Infection Prevention and Control Committee**

Although 93.8% of intervention facilities' OICs across all facility levels, described having an annual HCWM workplan, more than half (53.3%) did not have budgetary allocations for HCWM and only 14.3% overall reported having an annual report (Table 9). There was no significant difference between intervention and nonintervention facilities (Table 10).

Most SHC (80%) and THC facilities (100%) noted that they had a functional committee focused on infection prevention and control (IPC); only 12.5% of PHCs reported the presence of such a committee. An IPC committee coordinator was stated to be in place and functional at 68.8% of intervention facilities. However, although the proportion of facilities that had a functional IPC committee was higher in the intervention group than among nonintervention facilities (40% versus 20%), the difference was not statistically significant (Table 10).

**Table 9. Availability of Budget Provision, Workplan, and Infection Control Committee at Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge**

	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
No budgetary allocation for HCWM	8	5	62.5	5	1	20	2	2	100	15	8	53.3
Annual workplan on HCWM available	8	7	87.5	5	5	100	3	3	100	16	15	93.8
Annual HCWM activity report available	8	0	0	4	1	25	2	1	50	14	2	14.3
IPC committee exists and is functional	8	1	12.5	5	4	80	3	3	100	16	8	50
IPC committee coordinator operational	8	5	62.5	5	3	60	3	3	100	16	11	68.8

**Table 10. Availability of Budget Provision, Workplan, and Infection Control Committee per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State**

Policy Document and Operational Guidelines Availability and Utilization	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
No budgetary allocation for HCWM	5	3	60	5	4	80	0.208
Annual workplan available	1	1	100	1	1	100	1.000
Annual report available	5	5	100	5	5	100	1.000
IPC committee exists and is functional	5	2	40	5	1	20	0.490

## WORKER AND PATIENT HEALTH AND SAFETY

### Environmental Conditions, Water, and Sanitation Facilities

**Structural Facilities, General Cleanliness, and Water Supply.** Structured observation revealed that most intervention facilities in FCT and Benue State were fenced (92.9%); all SHC and THC facilities and 83.3% of PHC facilities were fenced. However, facilities suffered structural challenges: leaking roofs were observed in 41.7% of facilities overall, visible wall cracks in 25% (Table 12. Observations on the Facility Structure, General Cleanliness, and Water Supply in Intervention Facilities in FCT and Benue State ).

*General Cleanliness*—During assessment visits, the floors of most wards in facilities at all levels (93.8%) were observed to be clean, albeit littered in other parts of the facilities in 25% of cases. Used or soiled dressings were spotted on the floor in 31.2% of facilities overall, and litter and waste seen on the ground within the compound in 43.8% of facilities across levels. In no SHC facility was any rubbish found on any part of the floor or any litter or waste found on ground within the compound. Waste bins for general use were documented in all SHC and THC facilities but only

71.4% of PHC facilities. Overflowing bins were noted in 33.3% of THC facilities but none in any PHC or SHC facility (Table 12).

*Water Supply*—During structured observations, it was seen that the most common water supply source was from facility boreholes for PHC facilities (40%) and from a public water supply for SHC (66.7%) and THC (50%) facilities. Running tap water from the public water supply was available in only 20% of PHC facilities. A single facility (20%), at PHC level, had no water source (Table 11).

**Table 11. Observations on the Facility Structure, General Cleanliness, and Water Supply in Intervention Facilities in FCT and Benue State**

	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes	
		n	(%)									
<b>Facility Structure</b>												
Facility fenced	6	5	83.3	3	3	100	5	5	100	14	13	92.9
Visible cracks on the wall	7	4	57.1	3	0	0	6	0	0	16	4	25.0
Facility roof leakages	5	3	60.0	2	1	20.0	5	1	20.0	12	5	41.7
<b>General Cleanliness</b>												
Ward floors are clean	7	6	85.7	3	3	100	6	6	100	16	15	93.8
Floor littered with rubbish	7	3	42.9	3	0	0	6	1	16.7	16	4	25.0
Used /solid dressings on the floor	7	1	14.3	3	1	33.3	6	3	50.0	16	5	31.2
Cobwebs on the wall	7	4	57.1	3	1	33.3	6	2	33.3	16	7	43.8
Litter and waste on ground within compound	7	4	57.1	3	0	0	6	3	50.0	16	7	43.8
Waste bins for general use on premises	7	5	71.4	3	3	100	6	6	100	16	14	87.5
Overflowing waste bin	7	0	0	3	0	0	6	2	33.3	16	2	12.5
<b>Water Supply to Health Facility</b>												
Running tap water from public source	5	1	20.0	3	2	66.7	6	3	50.0	14	6	42.9
Running tap water from facility borehole	5	2	40.0	3	1	33.3	6	2	33.3	14	5	35.7
Water from protected dug well within health facility	5	1	20.0	3	0	0	6	0	0	14	1	7.1
Water obtained from protected dug well, outside the facility	5	0	0	3	0	0	6	1	16.7	14	1	7.1
None	5	1	20.0	3	0	0	6	0	0	14	1	7.1

**Toilet Facilities.** During assessment visits, the floor of the toilet was found to be wet in 56.2% of facilities across levels, and there was running water for the toilet in only 50% of facilities overall (Table 12).

*For Staff*—A water closet type of toilet (i.e., a flush toilet) was available in all SHC and THC facilities but in only 54.5% of PHC facilities. Separate toilets for male and female staff were available in only 26.7% of facilities overall. Staff toilets were found to be smelly in 28.6% of PHC facilities and 33.3% of secondary facilities but in none of the tertiary facilities. Only three-quarters of staff toilet facilities overall (75%) were found to be visibly clean (Table 12).

Handwashing facilities near the toilet were available in all SHC and THC facilities but in only 14.3% of PHC facilities. Across levels, handwashing facilities with running water were available in 43.8% of all facilities.

*For Patients*—A water closet was available in all SHC and THC facilities but only 28.6% of PHC facilities. A separate toilet for male and female patients was available in 53.3% of facilities overall. The patient toilet was found to be visibly clean in 66.7% of facilities overall and smelly in 66.7%. Handwashing facilities with running water near the toilet facilities were available in only about half (53.3%) of facilities overall. (Table 12)

**Table 12. Observations on the Facility Structure, General Cleanliness, and Water Supply in Intervention Facilities in FCT and Benue State**

	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes	
		n	(%)									
<b>Facility Structure</b>												
Facility fenced	6	5	83.3	3	3	100	5	5	100	14	13	92.9
Visible cracks on the wall	7	4	57.1	3	0	0	6	0	0	16	4	25.0
Facility roof leakages	5	3	60.0	2	1	20.0	5	1	20.0	12	5	41.7
<b>General Cleanliness</b>												
Ward floors are clean	7	6	85.7	3	3	100	6	6	100	16	15	93.8
Floor littered with rubbish	7	3	42.9	3	0	0	6	1	16.7	16	4	25.0
Used /solid dressings on the floor	7	1	14.3	3	1	33.3	6	3	50.0	16	5	31.2
Cobwebs on the wall	7	4	57.1	3	1	33.3	6	2	33.3	16	7	43.8
Litter and waste on ground within compound	7	4	57.1	3	0	0	6	3	50.0	16	7	43.8
Waste bins for general use on premises	7	5	71.4	3	3	100	6	6	100	16	14	87.5
Overflowing waste bin	7	0	0	3	0	0	6	2	33.3	16	2	12.5
<b>Water Supply to Health Facility</b>												
Running tap water from public source	5	1	20.0	3	2	66.7	6	3	50.0	14	6	42.9
Running tap water from facility borehole	5	2	40.0	3	1	33.3	6	2	33.3	14	5	35.7
Water from protected dug well within health facility	5	1	20.0	3	0	0	6	0	0	14	1	7.1
Water obtained from protected dug well, outside the facility	5	0	0	3	0	0	6	1	16.7	14	1	7.1
None	5	1	20.0	3	0	0	6	0	0	14	1	7.1

**Table 13. Observations on the Toilet Facilities in Intervention Facilities in FCT and Benue State**

	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>GENERAL TOILET CONDITIONS</b>												
Toilet floor wet	7	4	57.1	3	1	33.3	6	4	66.7	16	9	56.2
Running water for toilet	7	1	14.3	3	2	66.7		5	83.3	16	8	50.0
<b>TOILET FOR STAFF</b>												
<b>Type of Toilet Available for Staff</b>												
Water closet available	11	6	54.5	4	4	100	6	6	100	21	16	76.2
Pour flush toilet	11	1	9.1	4	0	0	6	0	0	21	1	4.8
VIP toilet	11	2	18.2	4	0	0	6	0	0	21	2	9.5
Pit toilet	11	2	18.2	4	0	0	6	0	0	21	2	9.5
<b>Toilets for Men and Women</b>												
Separate toilets for male and female staff	6	0	0	3	1	33.3	6	3	50.0	15	4	26.7
<b>Conditions of Staff Toilet</b>												
Toilet visibly clean	7	4	57.1	3	2	66.7	6	6	100	16	12	75.0
Toilet smelly	7	2	28.6	3	1	33.3	5	0	0	15	3	20.0
Houseflies in the toilet	7	1	14.3	3	1	33.3	6	0	0	16	2	12.5
Handwashing facility near toilet	7	1	14.3	3	3	100	6	6	100	16	10	62.5
Handwashing facility has water	7	1	14.3	3	2	66.7	6	4	66.7	16	7	43.8
<b>TOILET FOR CLIENTS</b>												
<b>Type of Toilet Available for Clients</b>												
Water closet available	7	2	28.6	3	3	100	6	6	100	16	11	68.8
Pour flush toilet	7	2	28.6	3	0	0	6	0	0	16	2	12.5
VIP toilet	7	2	28.6	3	0	0	6	0	0	16	2	12.5
No toilet	7	1	14.3	3	0	0	6	0	0	16	1	6.2
<b>Toilet for Men and Women</b>												
Separate toilets for men and women	6	1	16.7	3	3	100	6	4	66.7	15	8	53.3
<b>Conditions of Client Toilet</b>												
Toilet visibly clean	6	2	33.3	3	3	100	6	5	85.3	15	10	66.7
Toilet smelly	6	2	33.3	3	3	100	6	5	83.3	15	10	66.7
Houseflies in the toilet	6	2	33.2	3	0	0	6	0	0	15	2	13.3
Handwashing facility has water	6	0	0	3	3	100	6	5	83.3	15	8	53.3

## Health Workers' Self-Risk Perception and Biological Protection

**Risk Perception.** In interviews, 61.2% of CSPs and 48.6% of EHWs indicated that they were at no risk or low risk of sustaining needlestick injury (Table 14).

**Table 14. Self-Risk Perception of Clinic Service Providers and Environmental Health Workers in Intervention Facilities in FCT and Benue State**

Self-Perception of Risk of Needle Stick Injury	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Clinic Service Providers</b>												
No risk or low risk of needlestick perceived	33	18	54.5	22	14	63.6	12	9	75.0	67	41	61.2
Medium risk of needlestick perceived	33	2	6.1	22	0	0	12	0	0	67	2	3.0
High risk of needlestick perceived	33	13	39.4	22	8	36.4	12	3	25.0	67	24	35.8
<b>Environmental Health Workers</b>												
No risk or low risk of needlestick	9	3	33.3	9	3	33.3	19	12	63.2	37	18	48.6
Medium risk of needlestick perceived	9	1	11.1	9	1	11.1	19	3	15.8	37	5	13.5
High risk of needlestick perceived	9	5	55.6	9	5	55.6	19	4	21.1	37	14	37.8

**Table 15. Self-Risk Perception of Clinic Service Providers and Environmental Health Workers: Intervention versus Nonintervention Facilities in Benue State**

	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
<b>Clinic Service Providers</b>							
No risk or low risk of needlestick perceived	14	10	71.4	12	5	41.7	0.109 LR
Medium risk of needlestick perceived	14	0	0	12	2	16.7	0.109 LR
High risk of needlestick perceived	14	4	28.6	12	5	41.7	0.109 LR
<b>Environmental Health Workers</b>							
No risk or low risk of needlestick perceived	7	0	0	7	4	57.1	0.007 LR
Medium risk of needlestick perceived	7	0	0	7	1	14.3	0.007 LR
High risk of needlestick perceived	7	7	100	7	2	28.6	0.007 LR

**Vaccination.** More than four-fifths of CSPs across facility levels reported being vaccinated against tetanus (81.8%) and hepatitis (82.3%); the proportion vaccinated was highest among CSPs in PHCs (84.8%) and lowest among those in SHC facilities (77.3%). Among EHWs, 54.1% reported vaccination against tetanus and 51.4% against hepatitis. The proportion of respondents who affirmed availability of post HIV-exposure prophylaxis (PEP) in their facilities was 58.1% for CSPs and 60.0% for EHWs (Table 16).

Compared to nonintervention facilities' EHWs, a statistically higher proportion of Benue State intervention facilities' EHWs had been vaccinated against hepatitis ( $p=0.025$ ; Table 17).

**Table 16. Immunization Experiences of Clinic Service Providers and Environmental Health Workers in Intervention Facilities in FCT and Benue and Their Opinion on the Availability of Post HIV-Exposure Prophylaxis**

	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Clinic Service Provider Immunization</b>												
Tetanus	33	28	84.8	22	17	77.3	11	9	81.8	66	54	81.8
Hepatitis	32	25	78.1	19	16	84.2	11	10	90.9	62	51	82.3
Neither	17	1	5.9	9	0	0	5	1	20.0	31	2	6.5
PEP available	31	7	22.6	20	18	90.0	11	11	100	62	32	58.1
<b>Environmental Health-Worker Immunization</b>												
Tetanus	9	6	66.7	9	4	44.4	19	10	52.6	37	20	54.1
Hepatitis	9	6	66.7	9	4	44.4	19	9	47.4	37	19	51.4
Neither	9	2	22.2	9	1	11.1	19	3	15.8	37	6	16.2
PEP available	9	4	44.4	9	7	77.8	17	10	58.8	35	21	60.0

**Table 17. Immunization Status of Clinic Service Providers and Environmental Workers and Availability of Post HIV-Exposure Prophylaxis: Intervention versus Nonintervention Facilities in Benue State**

	INTERVENTION FACILITIES				NONINTERVENTION FACILITIES				p-value
	Number of Observations	Yes		Number of Observations	Yes				
		n	(%)		n	(%)			
<b>Clinic Service Provider Immunization</b>									
Tetanus	14	11	78.6	12	10	83.3	0.759		
Hepatitis B	3	10	76.9	12	10	83.3	0.689		
PEP available	13	8	61.5	10	3	30	0.133		
<b>Environmental Health-Worker Immunization</b>									
Tetanus	7	6	85.7	7	3	42.9	0.086 LR		
Hepatitis B	7	6	85.7	7	2	28.6	0.025 LR		
PEP available	7	4	57.1	7	2	28.6	0.331 LR		

### Health Worker Knowledge of Injection Safety

Knowledge that some diseases can be transmitted through improper HCWM and needlestick injuries was universal among both CSPs and EHWs at the PHC, SHC, and THC levels (Table 18). The same, however, was also true among the health workers in the nonintervention facilities in Benue State (Table 19).

**Table 18. Knowledge of Clinic Service Providers and Environmental Health Workers in Intervention Facilities in FCT and Benue State about Disease Transmission through Improper Health Care Waste Management and Needlestick Injuries**

	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Clinic Service Providers</b>												
Knowledge that diseases can be transmitted through improper HCWM	33	33	100	22	22	100	12	12	100	67	67	100
Knowledge that diseases can be transmitted through needlestick	33	33	100	22	22	100	12	12	100	67	67	100
<b>Environmental Health Workers</b>												
Knowledge that diseases can be transmitted through improper HCWM	9	9	100	9	9	100	19	19	100	37	37	100
Knowledge that diseases can be transmitted through needlestick	9	9	100	9	9	100	19	19	100	37	37	100

**Table 19. Knowledge of Clinic Service Providers and Environmental Health Workers about Disease Transmission through Improper Health Care Waste Management and Needlestick Injuries: Intervention versus Nonintervention Facilities in Benue State**

	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
<b>Clinic Service Providers</b>							
Knowledge that diseases can be transmitted through improper HCWM	14	14	100	12	12	100	—
Knowledge that diseases can be transmitted through needlestick	14	14	100	12	12	100	—
<b>Environmental Health Workers</b>							
Knowledge that diseases can be transmitted through improper HCWM	7	7	100	7	6	85.7	0.226 LR
Knowledge that diseases can be transmitted through needlestick	7	7	100	7	7	100	—

## Knowledge, Availability, and Use of Personal Protective Equipment

**Knowledge of Personal Protective Equipment.** Knowledge of PPE varied widely among EHWs by type of facility as well as PPE type. In general, knowledge of the need to use PPE was highest for latex gloves (89.2%) and heavy-duty gloves (86.5%) and lowest for overalls (48.6%) and protective goggles (43.2%). At least 70% of EHWs knew about each type of PPE except for protective goggles and overalls (Table 20). A significantly higher proportion of EHWs in intervention facilities in Benue State compared to those in nonintervention facilities had knowledge of the need to use heavy-duty gloves ( $p < 0.001$ ), heavy-duty boots ( $p = 0.002$ ), aprons ( $p = 0.007$ ), overalls ( $p = 0.025$ ), and goggles ( $p = 0.002$ ; Table 21).

**Table 20. Knowledge of Environmental Health Workers in Intervention Facilities in FCT and Benue State about the Need to Use of Personal Protective Equipment**

Personal Protective Equipment	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
Latex gloves	9	9	100	9	8	89.9	19	16	84.2	37	33	89.2
Heavy-duty gloves	9	5	55.6	9	9	100	19	18	94.7	37	32	86.5
Heavy-duty boots	9	4	44.4	9	8	88.9	19	14	73.7	37	26	70.3
Face masks	9	7	77.8	9	9	100	19	15	78.9	37	31	83.8
Aprons	9	5	56.6	9	9	100	19	13	68.4	37	27	73.0
Overalls	9	2	22.2	9	7	77.8	19	9	47.4	37	18	48.6
Protective goggles	9	3	33.3	9	6	66.7	19	7	36.8	37	16	43.2

**Table 21. Knowledge of Environmental Health Workers about the Need to Use Personal Protective Equipment: Intervention versus Nonintervention Facilities in Benue State**

Personal Protective Equipment	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
Latex gloves	7	7	100	7	6	85.7	0.226 LR
Heavy-duty gloves	7	7	100	7	0	0	<0.001 LR
Heavy-duty boots	7	7	100	7	2	28.6	0.002 LR
Face masks	7	5	71.4	7	3	42.9	0.276 LR
Aprons	7	7	100	7	3	42.9	0.007 LR
Overalls	7	5	71.4	7	1	14.3	0.025 LR
Protective goggles	7	5	71.4	7	0	0	0.002 LR

**Availability of Personal Protective Equipment.** During interviews, when OICs of FCT and Benue State intervention facilities across facility levels were asked what PPE was available in their facilities, most claimed to have latex gloves (90.9%), heavy-duty gloves (84.6%), nose masks (61.8%), and boots (53.8%). Only 30.0% said that overalls were available (Table 22). Although a higher proportion of OICs in intervention facilities indicated PPE availability compared to OICs in nonintervention facilities, statistically significant differences were recorded only for boots ( $p=0.038$ ) and aprons ( $p=0.002$ ; Table 23).

**Table 22. Personal Protective Equipment Availability at Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge**

Personal Protective Equipment	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
Latex gloves	5	4	80	5	5	100	1	1	100	11	10	90.9
Heavy-duty gloves	7	6	85.7	5	4	80	1	1	100	13	11	84.6
Boots	7	4	57.1	5	3	60	1	0	0	13	7	53.8
Nose masks	7	5	71.4	5	3	60	1	0	0	13	8	61.8
Aprons	8	5	62.5	5	3	60	1	0	0	14	8	57.1
Overalls	4	1	25	5	2	40	1	0	0	10	3	30.0

**Table 23. Personal Protective Equipment Availability per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State**

Personal Protective Equipment	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
Latex gloves	5	5	100	5	3	60	0.114
Heavy-duty gloves	5	5	100	5	3	60	0.114
Boots	5	5	100	5	2	40	0.038
Face masks	5	4	80	5	1	20	0.058
Aprons	5	5	100	5	0	0	0.002
Overalls	4	1	25	5	0	0	0.236
Latex gloves	5	5	100	5	3	60	0.114

**Use of Personal Protective Equipment.** Despite health staff conceptions about PPE availability and use, *all* waste handlers observed during assessment visits in facilities across levels wore overalls; 38.1% were using heavy-duty gloves, and only 9.5% were seen using face masks. Another 38.1% wore boots (Table 24). Although PPE usage percentage was greater in intervention facilities than in nonintervention facilities, only the difference in the percentage for the use of heavy-duty boots in intervention facilities was statistically significant, at the threshold for statistical significance at  $p=0.050$  (Table 25).

**Table 24. Observations on Use of Personal Protective Equipment in Intervention Facilities in FCT and Benue State**

Type of Personal Protective Equipment in Use	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
HCW handlers wear overalls	11	11	100	4	4	100	6	6	100	21	21	100
HCW handlers use face masks	11	1	9.1	4	1	25.0	6	0	0	21	2	9.5
HCW handlers wear heavy-duty gloves	11	4	36.4	4	2	50	6	2	33.3	21	8	38.1
HCW handlers wear aprons	11	3	27.3	4	2	50	6	2	33.3	21	7	33.3
HCW handlers wear boots	11	4	36.4	4	2	50	6	2	33.3	21	8	38.1
Other PPE used by HCW handlers	11	6	54.5	4	2	50	6	1	16.7	21	9	42.9
PEP sighted in pharmacy	11	2	18.2	4	4	100	6	5	83.3	21	11	52.4

**Table 25. Use of Personal Protective Equipment Observed: Intervention versus Nonintervention Facilities in Benue State**

Types of Personal Protective Equipment in Use	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	n	(%)	Number of Observations	n	(%)	
HCW handlers wear overalls	5	5	100	5	5	100	—
HCW handlers wear face masks	5	1	20	5	0	0	0.221 LR
HCW handlers wear heavy-duty gloves	5	4	80	5	1	20	0.050 LR
HCW handlers wear aprons	5	3	60	5	1	20	0.189 LR
HCW handlers wear boots	5	4	80	5	1	20	0.050 LR
Other PPE used by HCW handlers	5	3	60	5	3	60	1.000 LR
PEP sighted in pharmacy	5	2	40	5	2	40	1.000 LR

### Job Aids Availability and Use

Among facilities overall, job aids for HCWM were found in 90.5%. Job aids covering injection safety were spotted in 81.8% of PHC facilities, 50% of SHC facilities, and all THC facilities—81% of facilities overall (Table 26. Job Aids Availability Observed in FCT and Benue State Intervention Facilities). Between intervention and nonintervention facilities across all levels, significant differences were observed as to availability of job aids supporting injection safety (100% versus 40%,  $p=0.019$ ; Table 27).

**Table 26. Job Aids Availability Observed in FCT and Benue State Intervention Facilities**

Job Aids Prevalence and Use	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
HCWM-related job aids available and sighted in the facility	11	10	90.9	4	3	75	6	6	100	21	19	90.5
Injection safety-related job aids available and sighted in the facility	11	9	81.8	4	2	50	6	6	100	21	17	81.0

**Table 27. Availability of Job Aids Observed: Intervention versus Nonintervention Facilities in Benue State**

Job Aids Prevalence and Use	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	n	(%)	Number of Observations	n	(%)	
Job aids available for HCWM in facility and sighted	5	5	100	5	3	60	0.070 LR
Job aids available for injection safety and sighted	5	5	100	5	2	40	0.019 LR
Waste disposal site seen	5	5	100	5	5	100	—

### Availability, Use, and Reuse of Syringes and Needles

In interviews, OICs in the FCT and Benue State intervention facilities at all levels indicated that their facilities use sterilizable syringes (100%), standard disposable syringes (87.5%), and reuse-prevention syringes (RUPs; 81.3%) and have them in stock. Staff at few facilities (18.8%) claimed to be using needlestick-prevention syringes or having them in stock (Table 28).

CSPs interviewees generally concurred with OICs, although a higher proportion of CSPs (30.9%) claimed to use needlestick-prevention syringes. In contrast to all OICs, who reported no reuse of syringes and needles during the previous year, one CSP (1.8%) described reusing syringes and needles (Table 28).

No statistically significant difference was found between intervention and nonintervention facilities' respondents claims regarding syringe availability, use, and reuse (Table 29).

Facilities in the intervention group did not perform significantly differently with respect to syringe types in use than those in the nonintervention group (Table 30).

Structured observations revealed that a fair proportion of patients brought their own syringes and needles to health facilities for injections; the proportion of patients who did so was lowest for those who had come for vaccination. Four-fifths (79.5%) of patients did not bring syringes and needles for vaccination; 45.5% did not bring them for family planning; and 40.9% did not bring them for therapeutic injections (Figure 3).

However, the study team did note the presence of standard disposable needles, sterilizable syringes, and RUP syringes of various dimensions—0.5 ml, 10 ml, 18 g, and 25–27 g—to varying degrees across the three types of health facilities. RUP syringes were observed in all dimensions in fewer

than 50% of facilities, whereas in all health facilities, sterilizable syringes were found in four dimensions—0.5 ml, 10 ml, 18 g, and 25–27g (Table 31).

The syringes most commonly used in intervention facilities were RUP syringes for vaccination (86.4%) and standard disposable syringes for therapeutic injections (73.1%); for family planning services, 47.5% used standard disposable syringes and 42.1% used RUP syringes (Figure 4).

Between intervention and nonintervention facilities, the statistical significance was borderline for observed availability of RUP syringes (20% versus 80%,  $p=0.050$ , or a higher percentage in nonintervention facilities; Table 30).

Needlestick-prevention syringes were least frequently observed, used for only 10.4% of injections seen in family planning services, 3.9% of therapeutic injections, and 2.7% of vaccinations. All Benue State nonintervention facilities were seen using RUP syringes for vaccination, while 75% of intervention facilities used these syringes and 25% used standard disposable syringes. The difference was not statistically significant.

**Table 28. Syringe Availability and Needle Reuse in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge, Clinic Service Providers, and Environmental Health Workers**

Needles and Syringe Safety	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>OFFICERS IN CHARGE</b>												
<b>Types of Syringes Used in Facility</b>												
Standard disposable	8	6	75	5	5	100	3	3	100	16	14	87.5
Sterilizable	8	8	100	5	5	100	3	3	100	16	16	100
Reuse-prevention syringe (auto-disable)	8	8	100	5	3	60	3	2	66.7	16	13	81.3
Needlestick-prevention syringe (retractable)	8	0	0	5	2	40	3	1	33.3	16	3	18.8
<b>Types of Syringes in Current Stock</b>												
Standard disposable	8	6	75	5	5	100	3	3	100	16	14	87.5
Sterilizable	8	8	100	5	5	100	3	3	100	16	16	100
Reuse-prevention syringe (auto-disable)	8	8	100	5	4	80	3	2	66.7	16	14	87.5
Needlestick-prevention syringe (retractable)	8	0	0	5	2	40	3	1	33.3	16	3	18.8
<b>Reuse of Syringes and Needles</b>												
Needle and syringe not reused during the previous year	8	8	100	5	5	100	3	3	100	16	16	100
<b>CLINIC SERVICE PROVIDERS AND ENVIRONMENTAL HEALTH WORKERS</b>												
<b>Types of Syringes Used in Facility</b>												
Standard disposable	25	20	80	18	18	100	12	9	75.0	55	47	85.5
Sterilizable	25	25	100	18	18	100	12	12	100	55	55	100
Reuse-prevention syringe (auto-disable)	25	23	72.2	18	13	72.2	12	8	66.7	55	44	80.0
Needlestick-prevention syringe (retractable)	25	2	8.0	18	11	61.1	12	4	33.3	55	17	30.9
<b>Reuse of Syringes and Needles</b>												
Needle and syringe reused during the previous year	25	0	0	18	0	0	12	1	8.3	55	1	1.8

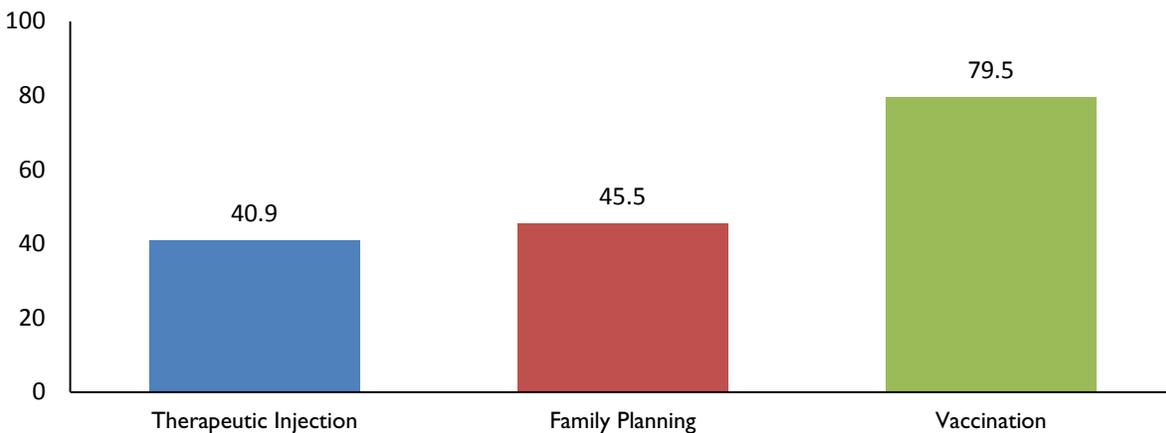
**Table 29. Syringe Availability and Needle Reuse per Facilities' Officers in Charge and Clinic Service Providers: Intervention versus Nonintervention Facilities in Benue State**

Needle and Syringe Safety	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
<b>OFFICERS IN CHARGE</b>							
<b>Reuse- and Needlestick-Prevention Syringes</b>							
Reuse-prevention syringe	5	4	80	5	4	80	1.00
Needlestick-prevention syringe	5	5	100	5	5	100	1.00
<b>Reuse of Syringes and Needles</b>							
Needle and syringe reused during the previous year	14	0	0	12	9	66.7	0.112 LR
<b>CLINIC SERVICE PROVIDERS</b>							
<b>Reuse- and Needlestick-Prevention Syringes</b>							
Reuse-prevention syringe	5	4	80	5	4	80	1.00
Needlestick-prevention syringe	5	5	100	5	5	100	1.00
<b>Reuse of Syringes and Needles</b>							
Needle and syringe reused during the previous year	14	0	0	12	2	66.7	0.112

**Table 30. Syringe Types Seen in Use: Intervention versus Nonintervention Facilities in Benue State**

Syringe Types	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations			Number of Observations			
		n	(%)		n	(%)	
Standard disposable	5	1	20	5	0	0	0.221 LR
Sterilizable	5	5	100	5	5	100	—
Reuse-prevention syringe (auto-disable)	5	1	20	5	4	80	0.050 LR

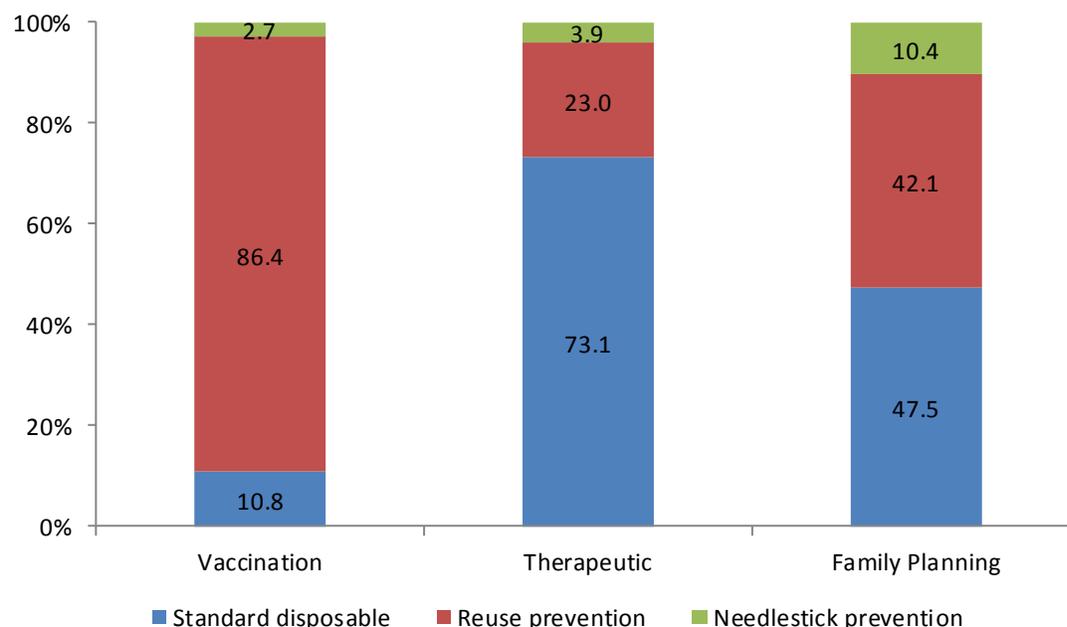
**Figure 3. Proportion of Observed Injections Where Patients Did Not Bring Their Own Syringes and Needles, by Service Provided, in Intervention Facilities in FCT and Benue State**



**Table 31. Observations on Syringe and Needle Availability in Intervention Facilities in FCT and Benue State**

	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>SYRINGES AND NEEDLES</b>												
<b>Standard Disposable Syringes</b>												
0.5ml, standard disposable	11	1	9.1	4	0	0	6	1	16.7	21	2	9.5
2ml, standard disposable	11	8	72.7	4	4	100	6	3	50	21	15	71.4
5ml, standard disposable	11	9	81.8	4	3	75.0	6	4	66.7	21	16	76.2
10ml, standard disposable	11	1	9.1	4	1	25.0	6	4	21	66.7	21	28.6
18g, standard disposable	11	1	9.1	4	1	25.0	6	2	33.3	21	4	19.0
21–23g, standard disposable	11	6	54	4	3	75.0	6	4	66.7	21	13	61.9
25–27g, standard disposable	11	1	9.1	4	0	0	6	0	0	21	1	4.8
<b>Sterilizable Syringes</b>												
0.5ml, sterilizable	11	11	100	4	4	100	6	6	100	21	21	100
2ml, sterilizable	11	1	9.1	4	0	0	6	0	0	21	1	4.8
5ml, sterilizable	11	1	9.1	4	0	0	6	0	0	21	1	4.8
10ml, sterilizable	11	11	100	4	4	100	6	6	100	21	21	100
18g, sterilizable	11	11	100	4	4	100	6	6	100	21	21	100
21–23g, sterilizable	11	1	9.1	4	0	0	6	0	0	21	1	4.8
25–27g, sterilizable	11	11	100	4	4	100	6	6	100	21	21	100
<b>Reuse-Prevention (Auto-disable) Syringes</b>												
0.5ml, auto-disable	11	6	54.5	4	1	25.0	6	2	33.3	21	9	42.9
2ml, auto-disable	11	4	36.4	4	1	25.0	6	1	16.7	21	6	28.6
5ml, auto-disable	11	4	36.4	4	2	50.0	6	2	33.3	21	8	38.1
10ml, auto-disable	11	0	0	4	1	25.0	6	1	16.7	21	2	9.5
18g, auto-disable	11	1	9.1	4	0	0	6	1	16.7	21	2	9.5
21–23g, auto-disable	11	2	18.2	4	2	50.0	6	2	33.3	21	6	28.6
25–25g, auto-disable	11	1	9.1	4	0	0	6	1	16.7	21	2	9.5

**Figure 4. Injections Where Patients Did Not Bring Their Own Syringes and Needles, by Services Provided, in Intervention Facilities in FCT and Benue State**



### Injection Preparation Facilities and Practices

**Preparation Facilities.** During assessment visits to intervention facilities in FCT and Benue State, vaccination injections were observed being prepared on dedicated, visibly clean tables or trays where contamination by blood, body fluids, or dirty swabs was unlikely in most THC facilities (77.8%), about half of SHC facilities (55.6%), and fewer than half of PHC facilities (47.1%). Overall, vaccination injections were prepared on visibly clean tables or trays that met the expected standard in 58.8% of facilities. For other injection types, preparation on tables or trays that met optimal standards was observed in 36.4% of therapeutic injections, 34.5% of family planning injections, and 22.7% of those for dental services (Table 32).

Soiled or dirty swabs were observed in injection areas in 31.2% of facilities (Table 37).

**Table 32. Observed Injection Preparation Facilities and Practices in Intervention Facilities in FCT and Benue State**

Purpose of Injection Prepared on Visibly Clean, Dedicated Table or Tray Where Contamination of the Equipment with Blood, Body Fluids, or Dirty Swabs Is Unlikely	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
Vaccination	17	8	47.1	18	12	55.6	9	7	77.8	44	28	58.8
Therapeutic	17	1	5.9	18	9	50	9	6	66.7	44	16	36.4
Family planning	17	4	23.5	18	8	44.4	9	3	33.3	44	15	34.5
Dental	1	0	0	18	4	22.2	9	6	66.7	44	10	22.7

**Table 33. Observed Injection Preparation Facilities: Intervention versus Nonintervention Facilities in Benue State**

Purpose of Injection Prepared on Visibly Clean, Dedicated Table or Tray Where Contamination of the Equipment with Blood, Body Fluids, or Dirty Swabs Is Unlikely	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	n	(%)	Number of Observations	N	(%)	
Vaccination	5	3	60	4	1	25	0.529 LR
Therapeutic	5	1	20	4	1	25	0.078 LR
Family planning	5	0	0	4	1	25	0.182 LR
Dental	—	—	—	—	—	—	—

**Injection Preparation Practices.** The percentage of health workers who cleaned their hands with soap and running water or alcohol-based hand rubs before preparing an injection was low. For vaccination, only 18.6% of observed health workers used soap and running water, while 6.8% used alcohol-based hand rubs. The proportions were 15.9% and 6.8% respectively for therapeutic injections; 25% and 2.3% for family planning injections; and 22.7% and 2.3% for injections administered in dental practice (Table 34).

The proportion of health care providers in intervention facilities who washed their hands appropriately before preparing an injection for vaccination ( $p=0.022$ ) or for therapeutic purposes ( $p=0.025$ ) was significantly higher than in nonintervention facilities (Table 35).

**Table 34. Observed Injection Preparation Practices in Intervention Facilities in FCT and Benue**

Injection Practices	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>WASHING OF HANDS BY PROVIDERS BEFORE PREPARING AN INJECTION</b>												
<b>Vaccination</b>												
Washed hands with soap and running water	17	3	17.6	18	4	22.2	9	1	11.1	44	8	18.2
Washed hands with alcohol-based hand rub	17	1	5.9	18	2	11.1	9	0	0	44	3	6.8
<b>Therapeutic Injection</b>												
Washed hands with soap and running water	17	1	5.9	18	4	22.2	9	2	22.2	44	7	15.9
Washed hands with alcohol-based hand rub	17	0	0	18	3	16.7	9	0	0	44	3	6.8
<b>Family Planning</b>												
Washed hands with soap and running water	17	2	11.8	18	5	27.8	9	4	44.4	44	11	25.0
Washed hands with alcohol-based hand rub	17	1	5.9	18	0	0	9	0	0	44	1	2.3
<b>Dental</b>												
Washed hands with soap and running water	17	0	0	18	4	22.2	9	6	66.7	44	10	22.7
Washed hands with alcohol-based hand rub	17	0	0	18	0	0.0	9	1	11.1	44	1	2.3

**Table 35. Observed Injection Preparation Practices: Intervention versus Nonintervention Facilities in Benue State**

Injection Practices	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	n	(%)	Number of Observations	n	(%)	
<b>Provider Washed Hands Appropriately Before Preparing Injection</b>							
Vaccination	5	3	60	4	0	0	0.022 LR
Therapeutic	5	1	20	4	0	0	0.025 LR
Family planning	5	5	100	4	4	75	0.182 LR
Dental	—	—	—	—	—	—	—

## Sharps Safety Boxes

**Use of Sharps Safety Boxes.** In interviews, almost all respondents across the three staff groups—OICs (100%), CSPs (90.9%), and EHWs (100%)—indicated that sharps safety boxes were used at their facilities. However, health workers’ responses were inconsistent as to sharps safety box availability at all points where injections are given and on wards. For example, only 9.1% of CSPs said that sharps safety boxes were available in all injection rooms and on all wards, in contrast to almost all OICs and EHWs (Table 36).

Supporting CSP claims, assessment visits found sharps safety boxes in only 11.1% of PHC facilities; in no SHC or THC facility were they present in all areas where injections were given. Overall, sharps were found to have been properly disposed in 71.4% of facilities (Table 37).

Between intervention and nonintervention facilities, significant differences were observed as to safe storage of full sharps safety boxes (100% in facilities versus 20%,  $p=0.004$ ; Table 38).

**Stockouts of Sharps Safety Boxes.** The proportion of health workers who indicated that their facilities had experienced a stockout of sharps safety boxes during the preceding six months was 12.5% for OICs, 20.9% for CSPs, and 14.3% for EHWs (Table 36). The difference between intervention and nonintervention groups in Benue State on sharps safety box availability was statistically insignificant (Table 39).

On the other hand, during structured observations, sharps safety boxes were found in stock in 92.9% of facilities (Table 37).

**Table 36. Availability of Sharps Safety Boxes in Intervention Facilities in FCT and Benue State per Facilities’ Officers in Charge, Clinic Service Providers, and Environmental Health Workers**

Sharps Safety Boxes	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Officers in Charge</b>												
Sharps safety boxes available in the facility	8	8	100	5	5	100	3	3	100	16	16	100
Sharps safety boxes in <u>all</u> injection rooms and wards	8	8	100	5	5	100	3	3	100	16	16	100
Stockout of sharps safety boxes during previous six months	8	0	0	5	2	40	3	0	0	16	2	12.5
<b>Clinic Service Providers</b>												
Sharps safety boxes available in the facility	32	29	90.6	22	20	90.9	11	1	91.7	66	60	90.9
Sharps safety boxes in <u>all</u> injection rooms and wards	32	3	9.4	22	2	9.1	12	1	8.3	66	6	9.1
Stockout of sharps safety boxes during previous six months	33	3	9.1	22	9	40.9	12	2	16.7	67	14	20.9
<b>Environmental Health Workers</b>												
Sharps safety boxes available in the facility	9	9	100	9	9	100	18	18	100	36	36	100
Sharps safety boxes in <u>all</u> injection rooms and wards	9	9	100	9	9	100	18	17	94.4	36	35	97.2
Stockout of sharps safety boxes during previous six months	9	0	0	9	2	25.0	18	3	16.7	35	5	14.3

**Table 37. Observations on Injection Areas in Intervention Facilities in FCT and Benue State**

Injection Area Characteristics	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
Solid/dirty swabs in injection area	7	1	14.3	3	1	33.3	6	3	50.0	16	5	31.2
Sharps safety boxes in stock and available	6	5	83.3	3	3	100	5	5	100	14	13	92.9
Sharps safety boxes present in all injection areas	9	1	11.1	4	0	0	6	0	0	19	1	5.3
Presence of overflowing/pierced open sharps safety boxes	11	2	18.2	4	0	0	6	3	50.0	21	5	23.8
Sharps properly disposed of	11	7	63.6	4	3	75.0	6	5	83.3	21	15	71.4
Used sharps seen around the health facility	11	0	0	4	1	25.0	6	0	0	21	1	4.8

**Table 38. Injection Area Characteristics Observed: Intervention versus Nonintervention Facilities in Benue State**

Injection Area Characteristics	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations			Number of Observations			
		n	(%)		n	(%)	
Soiled/dirty swab in injection area	5	0	0	5	1	20	0.221 LR
Sharps safety boxes in stock and available	4	3	75	5	4	80	0.858 LR
Sharps safety boxes present in all injection areas	4	0	0	4	1	25	0.216 LR
Presence of overflowing/pierced open sharp boxes	5	1	20	5	0	0	0.221 LR
Full sharp box(es) for disposal stored safely	5	5	100	5	1	20	0.004 LR
Used sharps seen around health facility	5	0	0	5	1	20	0.221 LR

**Table 39. Sharps Safety Box Availability per Facilities' Officers in Charge, Clinic Service Providers, and Environmental Health Workers: Intervention versus Nonintervention Facilities in Benue State**

Sharps Safety Boxes	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
<b>Officers in Charge</b>							
Sharps safety boxes available	5	5	100	4	3	75	0.236
Sharps safety boxes in all injection rooms and wards	5	5	100	4	3	75	—
Stockout of sharps safety boxes during previous six months	5	0	0	4	2	50	0.073
<b>Clinic Service Providers</b>							
Sharps safety boxes available	9	9	100	9	9	100	18
Sharps safety boxes in all injection rooms and wards	9	9	100	9	9	100	18
Stockout of sharps safety boxes during previous six months	9	0	0	9	2	25.0	18
<b>Environmental Health Workers</b>							
Sharps safety boxes available	7	7	100	7	6	85.7	0.226 LR
Sharps safety boxes in all injection rooms and wards	7	7	100	6	4	66.7	0.060 LR
Stockout of sharps safety boxes during previous six months	7	0	0	6	1	16.7	0.200 LR

## HEALTH CARE WASTE MANAGEMENT

### Knowledge of Waste Generation, Segregation, Treatment, and Disposal

**Knowledge of Waste Segregation and Color Coding.** Among CSPs, a high proportion in FCT and Benue State know about segregating types of waste: infectious waste (98.2%), sharps (98.2%), and general waste (96.5%). However, knowledge of waste segregation into recyclables and chemicals was poor (17.5% and 43.9% respectively; Table 40). Compared to CSPs in Benue State nonintervention facilities, those in Benue State intervention facilities had a significantly greater knowledge about general waste (100% versus 66.7%,  $p=0.026$ ) and anatomical and highly infectious wastes (85.7% versus 0,  $p=0.003$ ; Table 41).

The percentage of intervention facility CSPs who knew about color coding of waste ranged from 71.9% in PHCs to 91.7% in THC facilities, averaging 81.8% overall (Table 40)—and significantly higher among CSPs in intervention facilities than in nonintervention facilities ( $p<0.001$ ; Table 40). That said, knowing to use yellow bin liners for infectious waste was low in all facilities overall, even in intervention facilities (46.2%; Table 16), but particularly among CSPs in SHC facilities (52.6%). Nonetheless, the proportion of CSPs in Benue State who knew to use yellow liners for infectious waste was higher among those in intervention facilities than in nonintervention facilities.

Among EHWs, a high proportion in FCT and Benue State knew that waste should be segregated into general waste (100%), sharps (100%), pharmaceutical wastes (100%), infectious wastes (91.2%),

and anatomical and highly infectious wastes (64.7%). However, knowledge of waste segregation into recyclables (14.7%) and chemicals (35.3%) was poor. The percentage of intervention facilities' EHWs who knew about waste color-coding ranged from 85.7% in PHCs to 100% in SHC facilities, averaging 94.1% overall. The proportion of EHWs who associated the color yellow with the bin liners to use for infectious waste ranged from 58.8% in THC facilities to 77.8% in SHC facilities, averaging 65.7% overall (Table 42).

Compared to EHWs in nonintervention facilities, EHWs in Benue State intervention facilities had significantly greater knowledge about segregation of chemical wastes ( $p < 0.001$ ) and pharmaceutical wastes ( $p = 0.004$ ). The proportion of EHWs aware of waste color-coding was significantly higher among EHWs in intervention facilities (100%) than in nonintervention facilities (14.3%,  $p < 0.001$ ; Table 43).

**Table 40. Waste Segregation and Color Coding Knowledge of Clinic Service Providers in Intervention Facilities in FCT and Benue State**

Waste Segregation and Color Coding	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>HCW Segregation Categories</b>												
General waste	24	23	95.8	21	20	95.2	12	12	100	57	55	96.5
Recyclables	24	2	8.3	21	5	23.8	12	3	25.0	57	10	17.5
Infectious wastes	24	24	100	21	21	100	12	11	91.7	57	56	98.2
Sharps	24	24	100	21	21	100	12	11	91.7	57	58	98.2
Chemical wastes	24	7	29.2	21	11	52.4	12	7	58.3	57	25	43.9
Pharmaceutical wastes	24	9	37.5	21	15	71.4	12	9	75	57	33	57.9
Anatomical and highly infectious wastes	24	15	62.5	21	16	76.2	12	10	83.3	57	41	71.9
Others	24	24	100	21	21	100	12	12	100	57	57	100
<b>Knowledge of Color Coding</b>												
Aware of waste color coding	32	23	71.9	22	20	90.9	12	11	91.7	66	54	81.8
Knowledge that infectious wastes should be coded yellow	23	13	56.5	19	10	52.6	11	8	72.7	53	31	58.5

**Table 41. Clinic Service Provider Knowledge of Waste Segregation and Color Coding: Intervention versus Nonintervention Facilities in Benue State**

	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
<b>HCW Segregation Categories</b>							
General waste	14	14	100	3	2	66.7	0.026
Recyclables	14	6	42.9	3	1	33.3	0.761
Sharps	14	14	100	3	3	100	—
Chemical wastes	14	9	64.3	3	1	33.3	0.323
Pharmaceutical wastes	14	12	85.7	3	1	33.3	0.052
Anatomical and highly infectious wastes	14	12	85.7	3	0	0	0.003
Others	14	14	100	3	3	100	—
<b>Knowledge of Color Coding</b>							
Aware of waste color coding	14	14	100	11	2	18.2	p<0.001
Knowledge that infectious wastes should be coded yellow	13	6	46.2	2	0	0	0.215

**Table 42. Waste Segregation and Color Coding Knowledge of Environmental Health Workers in Intervention Facilities in FCT and Benue State**

Waste Segregation and Color Coding	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>HCW Segregation Categories</b>												
General waste	8	8	100	9	9	100	17	17	100	34	34	100
Recyclables	8	2	25.0	9	2	22.3	17	1	5.9	34	5	14.7
Infectious wastes	8	6	75.0	9	9	100	17	16	94.1	34	31	91.2
Sharps	8	8	100	9	9	100	17	17	100	34	34	100
Chemical wastes	8	3	37.5	9	3	33.3	17	6	35.3	34	12	35.3
Pharmaceutical wastes	8	3	37.5	9	4	44.4	17	11	64.7	34	18	100
Anatomical and highly infectious wastes	8	3	37.5	9	7	77.8	17	12	70.6	34	22	64.7
Others	8	0	0	9	1	11.1	17	0	0	34	1	2.9
<b>Knowledge of Color Coding</b>												
Aware of waste color coding	7	6	85.7	9	9	100	18	17	94.4	34	32	94.1
Knowledge that infectious wastes should be coded yellow	9	6	66.7	9	7	77.8	17	10	58.8	35	23	65.7

**Table 43. Environmental Health Worker Knowledge of Waste Segregation and Color Coding: Intervention versus Nonintervention Facilities in Benue State**

	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
<b>HCW Segregation Categories</b>							
General waste	6	6	100	4	3	75	0.157 LR
Recyclables	6	4	66.7	4	3	75	0.777 LR
Infectious wastes	6	6	100	4	3	75	0.157 LR
Sharps	6	6	100	4	3	75	0.157 LR
Chemical wastes	6	6	100	4	0	0	<0.001 LR
Pharmaceutical wastes	6	5	83.3	4	0	0	0.004 LR
Anatomical and highly infectious wastes	6	4	66.7	4	1	25	0.189 LR
Radioactive wastes	6	1	16.7	4	0	0	0.295 LR
<b>Knowledge of Color Coding</b>							
Aware of waste color-coding	7	7	100	7	1	14.3	<0.001 LR
Knowledge that infectious wastes should be coded yellow	7	6	85.7	2	1	50	0.312 LR

**Knowledge of HCW Treatment and Disposal.** Knowledge about HCW treatment and disposal was generally poor among CSPs in intervention facilities in FCT and Benue State. Although 91.0% of CSPs knew about open burning in a hole or enclosure, only 26.9% were familiar with the low-temperature incineration. The proportion of CSPs overall who identified burial as a means of waste disposal (77.6%) was higher than for any other method (Table 44).

The difference in knowledge of HCW treatment methods between CSPs in Benue State intervention facilities and those in nonintervention facilities was statistically significant. Specifically, CSPs in intervention facilities were more knowledgeable than those in nonintervention areas about low-temperature incineration (35.7% versus 0%,  $p=0.021$ ); high- or medium-temperature incineration (35.7% versus 0%,  $p=0.021$ ); and transportation of HCW for treatment off site (42.9% vs. 0%,  $p=0.010$ ). There was also significant difference in knowledge about dumping in a protected/secure pit as a method of waste disposal (64.3% versus 8.3%,  $p=0.003$ ; Table 45).

EHWs in intervention facilities also showed variable knowledge of HCW treatment and disposal. The most commonly known method of HCW treatment overall was open burning in a hole or enclosure (78.4%), while the best-known methods of disposal overall was burial (62.2%) and dumping in a protected/secure pit (59.5%). Knowledge about other methods of treatment and disposal was poor, with fewer than 50% of respondents knowing each of the other methods (Table 46).

However, between EHWs in intervention facilities and those in nonintervention facilities there was no significant difference in the level of knowledge about each of the HCW treatment and disposal methods except for knowledge regarding dumping in a protected/secure pit (64.3% versus 8.3%,  $p=0.003$ ; Table 47).

**Table 44. Knowledge of Health Care Waste Treatment and Disposal Methods among Clinic Service Providers in Intervention Facilities in FCT and Benue State**

HCW Treatment and Disposal Methods	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Treatment Method</b>												
Open burning in a hole or enclosure	33	29	87.9	22	21	95.5	12	11	91.7	67	61	91.0
High- or medium-temperature incineration	33	7	21.2	22	15	68.2	12	10	83.3	67	32	47.8
Low-temperature incineration/burning	33	6	18.2	22	8	36.4	12	4	33.3	67	18	26.9
Transportation for off-site treatment	33	7	21.2	22	12	54.5	12	4	33.3	67	23	34.3
Others	32	5	15.6	22	4	18.2	12	1	8.3	66	10	15.2
<b>Disposal Method</b>												
Burial	33	25	75.8	22	16	72.7	12	11	91.7	67	52	77.6
Dumping in a protected/secure pit	33	15	45.5	22	15	68.2	12	9	75.0	67	39	58.2
Dumping in an unprotected pit	33	22	66.7	22	12	54.5	12	4	33.3	67	38	56.7
Dumping in an unsupervised pit	33	9	27.3	22	9	40.0	12	5	41.7	67	23	34.3
Others	30	3	100	22	5	22.7	12	0	0	64	8	12.5

**Table 45. Clinic Service Provider Knowledge of Health Care Waste Treatment and Disposal Methods: Intervention versus Nonintervention Facilities in Benue State**

HCW Treatment and Disposal Methods	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		N	(%)		n	(%)	
<b>Treatment Method</b>							
Open burning in a hole or enclosure	14	12	85.7	12	12	100	0.173
High- or medium-temperature incineration	14	5	35.7	12	0	0	0.021
Low-temperature incineration/burning	14	5	35.7	12	0	0	0.021
Transportation for off-site treatment	14	6	42.9	12	0	0	0.010
Others	14	5	35.7	11	0	0	0.027
<b>Disposal Method</b>							
Burial	14	10	71.4	12	8	66.7	0.793
Dumping in a protected/secure pit	14	9	64.3	12	1	8.3	0.003
Dumping in an unprotected pit	14	12	85.7	12	9	75.0	0.490
Dumping in an unsupervised pit	14	6	42.9	12	2	16.7	0.149
Others	14	14	100	9	9	100	—

**Table 46. Knowledge of Health Care Waste Treatment and Disposal Methods among Environmental Health Workers in Intervention Facilities in FCT and Benue State**

HCW Treatment and Disposal Methods	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Treatment Method</b>												
Open burning in a hole or enclosure	9	6	66.7	9	9	100	19	14	73.7	37	29	78.4
High- or medium-temperature incineration	9	7	77.8	9	6	66.7	19	5	26.3	37	15	40.5
Low-temperature incineration/burning	9	2	22.2	9	4	44.4	19	4	21.1	37	10	40.5
Transportation for off-site treatment	9	2	22.2	9	4	44.4	19	2	10.5	37	8	21.6
Others	9	1	11.1	9	4	44.4	19	11	57.9	37	16	43.2
<b>Disposal Method</b>												
Burial	9	4	44.4	9	8	88.9	19	11	57.9	37	23	62.2
Dumping in a protected/secure pit	9	4	44.4	9	7	77.8	19	11	57.9	37	22	59.5
Dumping in an unprotected pit	9	4	44.4	9	3	33.3	19	7	36.8	37	14	37.8
Dumping in an unsupervised pit	9	4	44.4	9	3	33.3	19	7	36.8	37	14	37.8
Others	9	1	11.1	9	2	22.2	19	4	21.1	37	7	18.9

**Table 47. Environmental Health Worker Knowledge of Health Care Waste Treatment and Disposal Methods: Intervention versus Nonintervention Facilities in Benue State**

HCW Treatment and Disposal Methods	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
<b>Treatment Method</b>							
Open burning in a hole or enclosure	7	5	71.4	7	2	28.6	0.103 LR
High- or medium-temperature incineration	7	6	85.7	7	6	85.7	1.000 LR
Low-temperature incineration/burning	7	2	28.6	7	0	0	0.078 LR
Transportation for off-site treatment	7	3	42.9	7	0	0	0.078 LR
Others	7	0	0	7	2	28.6	0.078 LR
<b>Disposal Method</b>							
Burial	14	10	71.4	12	8	66.7	0.793
Dumping in a protected/secure pit	14	9	64.3	12	1	8.3	0.003
Dumping in an unprotected pit	14	12	85.7	12	9	75.0	0.490
Dumping in an unsupervised pit	14	6	42.9	12	2	16.7	0.149
Others	14	14	100	9	9	100	—

### Waste Collection within Health Facilities

In interviews, most OICs (87.5%) and EHWs (62.5%) in PHC facilities indicated that waste was removed from wards daily; most OICs (80%) and EHWs (66.7%) in SHC facilities said that waste was removed from wards on each shift (i.e., more than once a day). However, although most OICs

in THC facilities (66.7%) noted waste removal frequency as daily, half of EHWs (52.6%) indicated that it was done every shift (Table 48).

The frequency of waste removal from wards was not statistically significant or different between intervention and nonintervention facilities (Table 49).

**Table 48. Frequency of Waste Removal from Wards in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge and Environmental Health Workers**

Frequency of Removal of Waste from Wards	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Officers in Charge</b>												
Daily	8	7	87.5	5	1	20	3	2	66.7	16	10	62.5
Every shift	8	0	0	5	4	80	3	1	33.3	16	5	31.2
Twice weekly	8	1	12.5	5	0	0	3	0	0	16	0	0
<b>Environmental Health Workers</b>												
Daily	8	5	62.5	9	3	33.3	19	9	47.4	36	17	47.2
Every shift	8	2	25.0	9	6	66.7	19	10	52.6	36	18	50.0
Twice weekly	8	1	12.5	9	0	0	19	0	0	36	1	2.8

**Table 49. Frequency of Waste Removal from Wards per Facilities' Officers in Charge and Environmental Health Workers: Intervention versus Nonintervention Facilities in Benue State**

Frequency of Removal of Waste from Wards	INTERVENTION FACILITIES				NONINTERVENTION FACILITIES				p-value
	Number of Observations	Yes		Number of Observations	Yes				
		n	(%)		n	(%)			
<b>Officers in Charge</b>									
Daily	5	5	100	5	4	80	0.292		
Every shift	5	0	0	5	1	20	0.292		
<b>Environmental Health Workers</b>									
Daily	6	6	100	7	7	100	—		

### **Health Care Waste Segregation and Handling: Materials and Processes**

In interviews, most OICs said their facilities had dust bins (93.8%), brooms (93.8%), bin liners (87.5%), and rakes (75%). However, fewer than half indicated having dino bins (large waste collection bins, often on wheels) (25%); high-temperature incinerators (31.2%); or wheelbarrows or other equipment for internal transportation of wastes (37.5%; Table 50).

However, the difference between intervention and nonintervention was significant only with respect to bin liners, with intervention facilities having higher reporting ( $p=0.010$ ; Table 51).

**Table 50. Health Care Waste Management Equipment Availability at Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge**

HCWM Equipment	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
Bin liners	8	8	100	5	4	80	3	2	66.7	16	14	87.5
Dust bins	8	8	100	5	4	80	3	3	100	16	15	93.8
Dino bins	8	0	0	5	2	40	3	2	66.7	16	4	25
Rakes	8	5	62.5	5	4	80	3	3	100	16	12	75
Brooms	8	8	100	5	4	80	3	3	100	16	6	93.8
Wheelbarrows (or other equipment for internal transportation of wastes)	8	0	0	5	3	60	3	3	100	16	6	37.5
High-temperature incinerators	8	0	0	5	3	60	3	2	66.7	16	5	31.2

**Table 51. Health Care Waste Management Equipment Availability per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State**

HCWM Equipment	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
Bin liners	5	4	80	5	0	0	0.010
Dust bins	5	4	80	5	5	100	0.292
Dino bins	5	5	100	5	5	100	1.000
Rakes	5	2	40	5	3	60	0.527
Brooms	5	4	80	5	5	100	0.292
Wheelbarrows (or other equipment for internal transportation of wastes)	5	0	0	5	1	20	0.292
High-temperature incinerators	5	5	100	5	5	100	1.000

**Initial Health Care Waste Processing.** A high proportion of FCT and Benue State intervention facilities' OICs who were interviewed indicated that waste segregation was being undertaken at the source (93.8%). Only 37.5% of FCT and Benue State intervention facilities' OICs who were interviewed said that their facilities' wastes are routinely weighed (Table 52).

**Materials for Segregating Waste.** All intervention facility OICs interviewed said that specific containers are used for waste segregation and 87.5% indicated that waste receptacles and containers are color-coded. More than three-quarters (78.5%) of the OICs knew that yellow liners should be used for infectious waste (Table 52).

Some 37.5% noted having experienced a waste storage container shortage during the preceding six months, and 56.2% said they had had a shortage of bin liners (Table 52).

A statistically higher proportion of OICs in intervention facilities in Benue State, compared to nonintervention facilities, indicated waste segregation at source ( $p=0.010$ ); weighing of generated wastes ( $p=0.010$ ); color coding of waste receptacles ( $p=0.002$ ); and bin liners used for segregating and storing waste ( $p=0.002$ ).

A higher proportion of OICs in nonintervention facilities than in intervention facilities described not having experienced waste storage container shortages ( $p=0.038$ ; Table 53).

During assessment visits to intervention facilities in FCT and Benue State, the assessment team viewed waste disposal sites in all facilities. Waste storage containers were covered in 50% of facilities overall, and waste storage areas were well designated in 37.5% of facilities overall. (Table 54).

Standard lidded waste storage bins (such as in the form of wheeler bin) were found in half of THC facilities (50%) and two-thirds of SHC facilities (66.7%) but in none of the PHCs, for an average of 38.5% overall. On the other hand, HCW containers were found to be color-coded in all PHC and SHC facilities but only in 50% of THC facilities, or about 81.2% of facilities overall (Table 54).

Compared to nonintervention facilities, observers in intervention facilities sighted more color-coded bins (80% versus none,  $p=0.004$ ) and more color coding of HCW containers (100% versus none,  $p<0.001$ ; Table 55).

**Table 52. Waste Segregation Processes in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge**

Waste Segregation Processes	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
Waste segregation at the source	8	8	100	5	4	80	3	3	100	16	15	93.8
Specific container used for waste segregation	8	8	100	5	5	100	3	3	100	16	16	100
Generated waste is weighed	8	4	50	5	0	0	3	2	66.7	16	6	37.5
Color coding of waste receptacles/containers done	8	7	87.5	5	5	100	3	2	66.7	16	14	87.5
Yellow bin liners used for infectious wastes	7	4	57.1	5	5	100	2	2	100	14	11	78.6
Bin liners used for segregating and storing waste	8	8	100	5	5	100	3	3	100	16	16	100
Shortage of bin liners experienced during the preceding six months	8	3	37.5	5	3	60	3	3	100	16	9	56.2
Shortage of waste storage containers experienced during the preceding six months	8	2	25	5	1	20	3	3	100	16	6	37.5

**Table 53. Waste Segregation Processes per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State**

Waste Segregation Processes	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number Of Observations	Yes		
		n	(%)		n	(%)	
Waste segregation at the source	5	5	100	5	1	20	0.010
Specific container used for waste segregation	5	5	100	5	5	100	1.000
Generated waste is weighed	5	4	80	5	0	0	0.010
Color coding of waste receptacles/containers	5	5	100	5	0	0	0.002
Bin liners used for segregating and storing waste	5	5	100	5	0	0	0.002
Shortage of bin liners experienced during the preceding six months	5	1	20	5	1	20	1.000
Shortage of waste storage containers experienced during the preceding six months	5	0	0	5	3	60	0.038

**Table 54. Observations of Health Care Waste Handling Materials in Intervention Facilities in FCT and Benue State**

	PHC FACILITIES		SHC FACILITIES			THC FACILITIES			TOTAL			
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Waste Storage Bins and Bin Liners</b>												
Waste storage bins	4	0	0	3	2	66.7	6	3	50.0	13	5	38.5
Color-coded bin liners sighted	7	5	71.4	3	3	100	6	3	50.0	16	11	68.8
Color coding of HCW containers	7	7	100	3	3	100	6	3	50.0	16	13	81.2
<b>Condition of Storage Bins</b>												
Waste storage container covered	7	3	42.9	3	2	66.7	6	3	50.0	16	8	50.0
Waste storage container leaky	7	1	14.3	3	0	0	6	1	16.7	16	1	12.5
Storage area well designated	7	1	14.3	3	3	100	6	2	33.3	16	6	37.5
<b>Waste Storage Area</b>												
Storage area well designated	7	1	14.3	3	3	100	6	2	33.3	16	6	37.5
Access of storage only to authorized personnel	6	1	16.7	3	2	66.7	6	2	33.3	15	5	33.3
Waste disposal site seen	7	7	100	3	3	100	6	6	100	16	16	100

**Table 55. Observations of Health Care Waste Handling Materials: Intervention versus Nonintervention Facilities in Benue State**

	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	n	(%)	Number of Observations	n	(%)	
<b>Waste Storage Bins and Bin Liners</b>							
Waste storage bins available	2	1	50	4	1	25	0.208 LR
Color-coded bin liners sighted	5	4	80	5	0	0	0.004 LR
Color coding of HCW containers	5	5	100	5	0	0	<0.001 LR
<b>Condition of Storage Container</b>							
Waste storage container is not leaky	5	5	100	5	5	100	—
Waste storage container not overfilled	5	5	100	5	5	100	—
Waste storage container covered	5	3	60	5	1	20	0.189 LR
<b>Waste Storage Area</b>							
Storage area well designated	5	2	40	5	1	20	0.487 LR
Access of storage only to authorized personnel	5	1	20	5	0	0	0.116 LR
Waste disposal site seen	5	5	100	5	5	100	—

### Health Facilities' Waste Weight and Composition

Waste weighing revealed how much waste facilities generate per day and the proportion of waste in each category. Over the seven days, measurements ranged from 5.4 to 136.1 kilograms in the observed PHCs, 147.1 to 1808.8 in the SHCs, and 1694.3 to 4090.9 in the THCs. Mean waste per patient—the total waste generated divided by the total patient load for the period, including inpatients and outpatients—ranged from 0.065 to 1.6 kilograms at PHCs, 0.120 to .670 at SHC facilities, and 0.370 to 3.199 at THC facilities.

In interviews, a high percentage of EHWs in intervention facilities in FCT and Benue States asserted that their facilities generated sharps (100%), general waste (97.3%), and infectious wastes (94.6%). On the other hand, fewer than half of these officers indicated that their facilities generate recyclables (35.1%) or radioactive wastes (48.6%; Table 56).

The on-the-ground realities of facilities' individual approaches to waste segregation proved highly variable. During assessment visits, all 12 PHC facilities reviewed were seen to be segregating sharps from general waste; eight (75%) were segregating wastes into general, infectious, and anatomical and highly infectious groups (Table 56). None of the PHC facilities were segregating pharmaceutical and radioactive wastes. In nine of the 12 PHC facilities, general waste constituted the highest proportion of waste. Sharps constituted the highest proportion in two facilities (PHC Wadata, Benue State, and Family Health Clinic, Abuja), and the proportion of sharps and general waste was the same in the remaining facility (PHC Karu, FCT; Table 57).

Overall, based on analysis of the eight PHC facilities where waste was being segregated into at least four groups—sharps, general, infectious, and anatomical / highly infectious wastes—general waste constituted the highest proportion of waste (45.6%), followed by sharps (31.5%), while infectious wastes (17.9%) and anatomical and highly infectious wastes (5.1%) constituted the lowest proportions (Figure 5).

The three THC facilities visited were seen to be segregating wastes into four categories (sharps, general waste, infectious wastes, and anatomical / highly infectious wastes); none segregated radioactive wastes. The picture for SHC facilities was similar to that for THC facilities with these exceptions: General Hospital, Aliede, Benue State (the only noninterventional SHC facility), which was segregating only sharps and general waste; and two Benue State intervention facilities—Benue State Teaching Hospital, Makurdi (a THC facility) and General Hospital, North Bank (a SHC facility)—which were segregating pharmaceutical wastes in addition to the four categories used by THC facilities noted above (and shown in Table 58).

Pharmaceutical wastes constituted 9.4% of wastes in Benue State Teaching Hospital and 1.5% in General Hospital, North Bank. For each of the THC and SHC facilities, general waste constituted the highest proportion of waste; the category that ranked second highest varied from one facility to the next (Table 58).

Also, in an analysis of weighed wastes from SHC facilities—excluding General Hospital Aliede, the only non-intervention secondary HC facility and which segregates waste into only two categories (sharps and general)—general waste constituted the highest proportion of waste (56.0%), followed by anatomical and highly infectious wastes (18.3%), while infectious wastes constituted 15.6% and sharps the lowest proportion (10.1%; Figure 6). For THC facilities, the overall pattern closely followed that of the secondary facilities: general waste constituted the highest proportion (46.2%), followed by anatomical and highly infectious wastes (21.7%). Infectious wastes constituted 17.1%; sharps 10.6%; and pharmaceutical wastes 4.3% (Figure 7).

**Table 56. Types of Health Care Waste Generated in Intervention Facilities in FCT and Benue State per Environmental Health Workers**

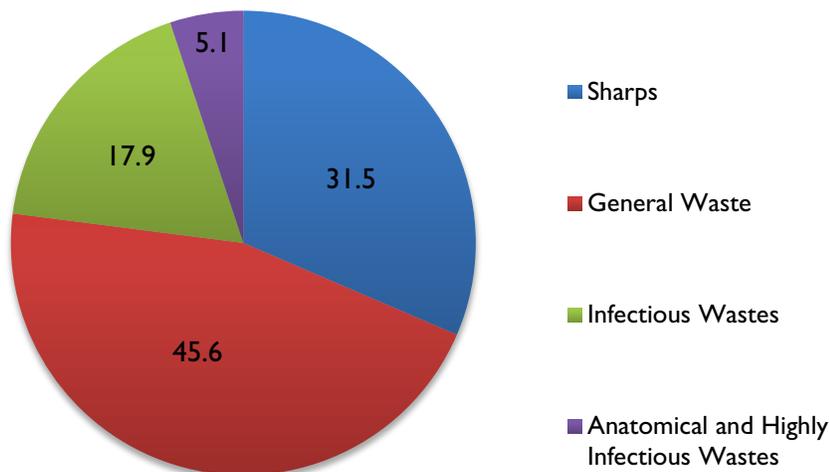
Types of Waste Generated in the Health Facilities	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
General waste	9	8	88.9	9	9	100	19	19	100	37	36	97.3
Recyclables	9	5	55.6	9	3	33.3	19	5	26.3	37	13	35.1
Radioactive wastes	9	4	44.4	9	4	44.4	19	10	52.6	37	18	48.6
Infectious wastes	9	8	88.9	9	8	88.9	19	19	100	37	35	94.6
Sharps	9	9	100	9	9	100	19	19	100	37	37	100
Chemical wastes	9	5	55.6	9	6	66.7	19	10	52.6	37	37	56.8
Pharmaceutical wastes	9	5	55.6	9	6	66.7	19	11	57.9	37	37	59.5
Anatomical and highly infectious wastes	9	6	66.7	9	9	100	19	16	84.2	37	37	83.8
Other waste	9	0	0	9	1	11.1	19	1	5.3	37	37	5.4

**Table 57. Percentage Distribution of Waste from Primary Health Care Facilities by Waste Category**

Types of Waste	PHC Lugbe*	PHC GARKI*	PHC Karu*	Family Health Clinic, Area 2, Abuja*	PHC Asase*	PHC Wadata*	PHC Kwararafa*	PHC Fiidi*	PHC Ikpayongu*	NPHCC Igbor	CHC Aliade	CHC Taraku
Sharps (sharp boxes)	23.7	51.6	38.0	32.1	13.7	46.3	4.0	33.5	13.5	6.6	16.0	6.3
General waste (black bag)	53.7	29.7	38.0	45.4	58.0	37.0	87.3	41.5	86.5	93.4	84.0	93.7
Infectious wastes (yellow bag)	22.6	14.8	17.4	22.5	5.3	5.6	10.8	9.8				
Anatomical and highly infectious wastes (red bag)	0.0	3.9	6.6	0.0	22.9	11.1	11.9	15.2	—	—	—	—
Radioactive wastes (yellow bag with “radioactive” icon)	—	—	—	—	—	—	—	—	—	—	—	—
Pharmaceutical wastes (brown bag)	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

\* Intervention facilities

**Figure 5. Percentage Distribution of Health Care Waste in Seven Primary Health Care Facilities**

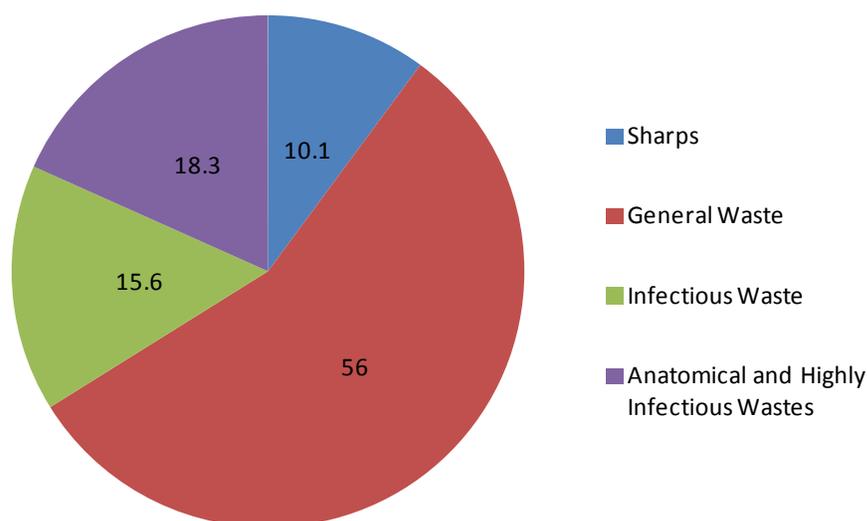


**Table 58. Percentage Distribution of Waste from All Secondary and Tertiary Health Care Facilities by Waste Category**

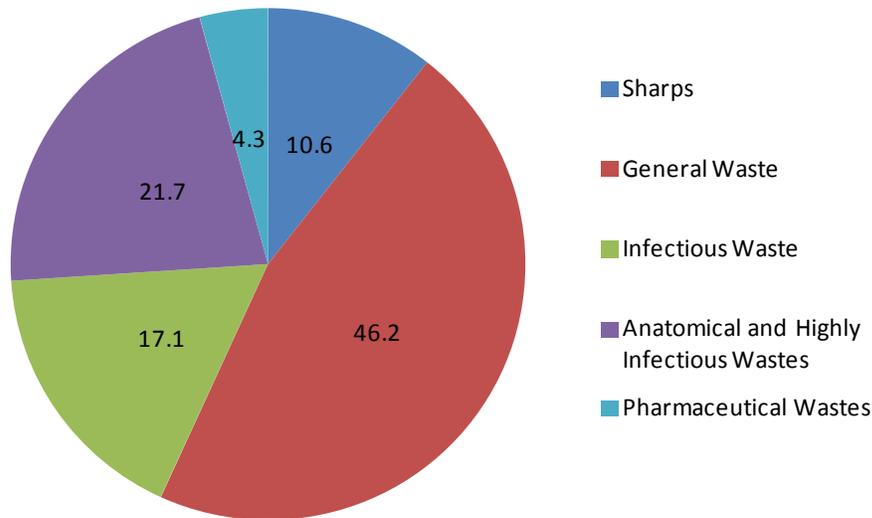
Types of Waste	THC FACILITIES			SHC FACILITIES					
	National Hospital, Abuja*	FMC Makurdi*	Benue State Teaching Hospital, Makurdi*	Wuse General Hospital*	Asokoro District Hospital*	Maitama District Hospital*	Nyanyan General Hospital*	General Hospital, North Bank*	General Hospital, Aliede
Sharps (sharp boxes)	5.3	18.5	11.3	12.0	7.6	8.6	10.5	25.7	12.3
General waste (black bag)	67.2	46.7	30.4	39.6	70.1	61.5	58.9	43.9	87.7
Infectious wastes (yellow bag)	15.9	16.0	18.5	22.9	10.2	11.5	16.7	20.2	—
Anatomical and highly infectious wastes (red bag)	11.6	18.8	30.4	25.4	12.2	18.5	13.9	8.7	—
Radioactive wastes (yellow bag with “radioactive” icon)	—	—	—	—	—	—	—	—	—
Pharmaceutical wastes (brown bag)	—	—	9.4	—	—	—	—	1.5	—
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

\* Intervention facilities

**Figure 6. Percentage Distribution of Health Care Wastes in Five Secondary Health Facilities**



**Figure 7. Percentage Distribution of Health Care Waste in Three Tertiary Health Facilities**



### **Health Care Waste Temporary Storage and Transportation**

In interviews, more than four-fifths of OICs indicated that their facilities have a designated area for temporary waste storage; 53.8% indicated that only authorized persons had access to these facilities. Of all the OICs, 63.6% indicated that municipal facilities are used for transportation of HCW, while only 6.3% described recycling HCW in their facilities (Table 59).

Compared to Benue State nonintervention facilities, intervention facilities report significantly higher separate collection and storage of hazardous and nonhazardous waste ( $p=0.035$ ) and separate transportation of hazardous and nonhazardous wastes ( $p=0.018$ ; Table 60).

**Table 59. Temporary Health Care Waste Storage and Transportation Practices in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge**

HCW Temporary Storage and Transportation Practices	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
Designated area for temporary HCW storage exists	8	6	75	5	4	80	3	3	100	16	13	81.2
Only authorized personnel have access to designated temporary HCW storage area	6	3	50	4	3	75	3	1	33.3	13	7	53.8
Hazardous and nonhazardous wastes are collected and stored separately	6	3	50	5	0	0	3	1	33.3	14	4	28.6
Hazardous and nonhazardous wastes are transported separately	7	3	42.9	5	0	0	3	2	66.7	15	5	33.3
A closed device is used to transport HCW off site	7	1	14.3	5	3	60	3	3	100	15	7	46.7
HCW is recycled	8	1	12.5	5	0	0	3	0	0	16	1	6.2
HCW transport	3	2	66.7	5	2	40	3	3	100	11	7	63.6

**Table 60. Temporary Health Care Waste Storage and Transportation Practices per Facilities' Officers in Charge: Intervention versus Nonintervention Facilities in Benue State**

HCW Temporary Storage and Transportation Practices	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	Yes		Number of Observations	Yes		
		n	(%)		n	(%)	
Designated area for temporary HCW storage exists	5	5	80	5	2	40	0.197
Only authorized personnel have access to designated temporary HCW storage area	4	3	75	2	1	50	
Hazardous and nonhazardous wastes are collected and stored separately	3	2	66.7	5	0	0	0.035
Hazardous and nonhazardous wastes are transported separately	4	3	75	5	0	0	0.018
A closed device is used to transport HCW off site	3	1	33.3	2	0	0	0.361
HCW is recycled	5	1	20	5	0	0	0.292

### Treatment and Disposal Methods

In interviews, about a quarter of intervention facilities' OICs (26.7%) reported that their facilities transport HCW off site for treatment (Table 61).

For HCW treatment, open burning in a hole or enclosure was cited most frequently (62.5%), followed by low-temperature incineration/burning (31.2%). Only one OIC of the 16 interviewed (6.2%), the OIC of a tertiary facility, reported using high- or medium-temperature incineration (Table 61).

For HCW disposal, dumping in a protected/secure pit was most commonly cited among OICs overall (31.2%), followed by dumping in an unprotected pit (25%), while 18.8% of facilities dump HCW in an unsupervised pit and another 18.8% bury HCW. The pattern differed by facility type: Dumping in an unprotected pit was the most common HCW disposal method at PHC level (37.5%), dumping in a protected/secure pit at tertiary level (66.7%); and no method emerged as most common in secondary facilities (Table 61).

In assessment visits, the most common on-site disposal practice seen in PHC facilities was dumping in unprotected pit (42.9%), while dumping in unsupervised area was the most commonly observed practice in THC facilities (80%). Among SHC facilities, a third (33.3%) were seen to dump HCW in unprotected pit and an equal number in an unsupervised area. Overall, observers saw an unsupervised dump to be the most common on-site disposal location across facility types (40%) and open burning on the ground (93.8%) the most common on-site treatment method (Table 62).

Open waste drainage was found in a third of tertiary facilities (33.3%) but only 12.5% of facilities overall. Central waste collection was found to exist in all SHC and THC facilities but in only 42.9% of PHCs. The treatment facility was observed to be well maintained in all THC facilities but in only 28.6% of PHCs and 33.3% of SHC facilities—46.2% overall. The treatment site was found to be within 30 meters of underground water source at 33.3% of SHC and 40% of THC facilities (Table 63).

Availability of facilities to transport HCW for off-site treatment was significantly higher in intervention facilities than in nonintervention facilities (40% versus 25%,  $p=0.014$ ; Table 64).

On the whole, only a third of OICs (33.3%) rated their facilities' current HCW treatment capacity as adequate. Among EHWs, more than three-fifths (62.2%) believed that HCW was safely managed in their facilities; less than half (45.9%) believed their facilities' HCW to be managed in environmentally friendly way (Table 65).

**Table 61. Health Care Waste Treatment and Disposal Methods in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge**

HCW Treatment and Disposal Methods	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Treatment Method</b>												
Open burning in a hole or enclosure	8	7	87.5	5	2	40	3	1	33.3	16	10	62.5
High- or medium-temperature incineration	8	0	0	5	0	0	3	1	33.3	16	1	6.2
Low-temperature incineration/burning	8	2	25	5	2	40	3	1	33.3	16	5	31.2
<b>Disposal Method</b>												
Burial	8	2	25	5	1	20	3	0	0	16	3	18.8
Dumping in a protected/secure pit	8	2	25	5	1	20	3	2	66.7	16	5	31.2
Dumping in an unprotected pit	8	3	37.5	5	1	20	3	0	0	16	4	25
Dumping in an unsupervised pit	8	1	12.5	5	1	20	3	1	33.3	16	3	18.8
Others	8	2	25	5	4	80	3	0	0	16	6	37.5
<b>Off-Site Treatment</b>												
HCW is transported off site for treatment	7	1	14.3	5	2	40	3	1	33.3	15	4	26.7

**Table 62. Observations of Health Care Waste Treatment Facilities in Intervention Facilities in FCT and Benue State**

	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Type of On-Site Waste Treatment Facility</b>												
Open burning on the ground	7	6	85.7	3	3	100	6	6	100	16	15	93.8
Open burning in secured pit or enclosure	7	1	14.3	3	0	0	6	0	0	16	1	6.2
Open burning in porous and insecure pit	—	—	—	—	—	—	—	—	—	—	—	—
High- or medium-temperature incineration	—	—	—	—	—	—	—	—	—	—	—	—
Low-temperature incineration	—	—	—	—	—	—	—	—	—	—	—	—
<b>Type of On-Site Disposal Facility Seen</b>												
Burial	7	1	14.3	3	0	0	5	0	0	15	1	6.7
Dumping in a protected pit	7	1	14.3	3	0	0	5	1	20.0	15	2	13.3
Dumping in unprotected pit	7	3	42.9	3	1	33.3	5	0	0	15	4	26.7
Dumping in an unsupervised area	7	1	14.3	3	1	33.3	5	4	80.0	15	6	40.0
Others	7	1	14.3	3	1	33.3	5	0	0	15	2	13.3

**Table 63. Observations of Health Care Waste Treatment Processes in Intervention Facilities in FCT and Benue State**

	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Waste Treatment Process</b>												
Open waste drainage within hospital	7	0	0	3	0	0	6	2	33.3	16	2	12.5
Central waste collection exists	7	3	42.9	3	3	100	5	5	100	15	11	73.3
Central waste collection point is well maintained	4	0	0	3	3	100	6	1	16.7	13	4	30.8
<b>Waste Treatment Site Characteristics</b>												
Treatment site within 30 meters of an underground water source	7	0	0	3	1	33.3	5	2	40.0	15	3	20.0
Treatment facility well maintained	7	2	28.6	3	1	33.3	3	3	100	13	6	46.2
Transport available for off-site treatment	7	2	28.6	3	3	100	6	6	100	16	11	68.8

**Table 64. Observations of Health Care Waste Treatment Facilities: Intervention versus Nonintervention Facilities in Benue State**

	INTERVENTION FACILITIES			NONINTERVENTION FACILITIES			p-value
	Number of Observations	n	(%)	Number of Observations	n	(%)	
<b>Type of On-Site Waste Treatment Facility</b>							
Open burning on the ground	5	1	20	5	2	40	0.327 LR
Open burning in secured pit or enclosure	5	1	20	5	2	40	0.327 LR
Open burning in porous and insecure pit	5	2	40	5	0	0	0.327 LR
High- or medium-temperature incineration	5	0	0	5	0	0	—
Low-temperature incineration	5	1	20	5	1	20	0.327 LR
<b>Type of On-Site Disposal Facility</b>							
Burial	5	1	20	5	2	40	0.343 LR
Dumping in a protected pit	5	1	20	5	0	0	0.343 LR
Dumping in a unprotected pit	5	2	40	5	2	40	0.343 LR
Dumping in an unsupervised area	5	1	20	5	0	0	0.343 LR
Others	5	0	0	5	1	20	0.343 LR
<b>Waste Treatment Site Characteristics</b>							
Waste treatment site within 30 meters of underground water source	5	1	20	5	2	40	0.487 LR
Waste treatment facility appear well maintained	5	2	40	5	1	20	0.487 LR
Transport available for off-site treatment	5	2	40	4	1	25	0.014 LR

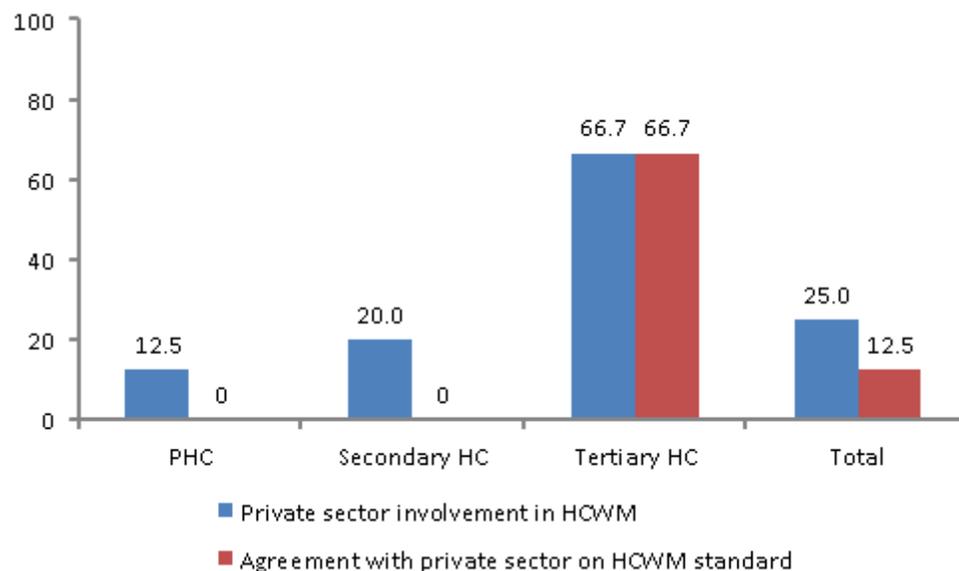
**Table 65. Quality and Environmental Friendliness of Health Care Waste Treatment Methods and Disposal in Intervention Facilities in FCT and Benue State per Facilities' Officers in Charge and Environmental Health Workers**

HCW Treatment and Disposal Methods	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Officers in Charge</b>												
Current capacity of the treatment method in facility is adequate	8	2	25	4	2	50	3	1	33.3	15	5	33.3
<b>Environmental Health Workers</b>												
HCW is safely managed in the health facility	9	3	33.3	9	6	66.7	19	14	73.7	37	23	62.2
HCW is managed in an environmentally friendly way in the facility	9	2	22.2	9	5	55.6	19	10	52.6	37	17	45.9

## INVOLVEMENT OF PRIVATE-SECTOR PROVIDERS

In interviews, although most OICs at THC facilities (66.7%) described having agreements with private-sector operatives for HCWM, only 12.5% of PHC OICs and 20% of SHC OICs indicated any private-sector involvement. Although no PHC or SHC OIC noted having any agreement with private-sector operatives for HCWM, 66.7% of THC OICs said they had an agreement with a private-sector partner to manage wastes in line with best practices (Figure 8).

**Figure 8. Private-Sector Involvement in Health Care Waste Management in Intervention Facilities in FCT and Benue State, per Facilities' Officers in Charge**



## FINDINGS FROM STRUCTURED OBSERVATIONS OF FACILITIES' STORES AND PHARMACIES

### STOCK CARD AND REGISTER MANAGEMENT

Availability and use of stock cards and registers for commodity management varied widely by types of materials and facilities. Overall, registers for vacutainers were found in only 12.5% of facilities and stock cards in 25%. Where stock cards existed, they had been updated during the previous 30 days in 50% of cases. Registers documenting sharps safety boxes were found in only 12.5% of facilities and stock cards in 25%; of those stock cards, 50% had been updated during the preceding the previous 30 days. Registers for needlestick-prevention syringes were found in only 6.25% of facilities and stock cards in 31.25% of facilities, but of those stock cards, 80% had been updated during the previous 30 days. Registers of reuse-prevention syringes were found in in 6.25% of facilities and stock cards in 31.25%; 66.7% of those stock cards had been updated during the previous 30 days. Registers of standard disposable syringes were observed in 18.75% of facilities and stock cards found in 43.75% and updated during the previous 30 days in 57.1% of cases (Table 66).

**Table 66. Observations of Stock Card and Register Availability and Management in Stores and Pharmacies of Intervention Facilities in FCT and Benue State**

Stock Card and Register Management	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Vacutainers</b>												
Stock card exists	8	1	12.5	5	2	40	3	1	33.3	16	4	25
Register exists	8	1	12.5	5	1	20	3	—	—	16	2	12.5
Stock card updated during previous 30 days	1	1	100	2	1	50	1	—	—	4	2	50
<b>Sharps Safety Boxes</b>												
Stock card exists	8	1	12.5	5	2	40	3	1	33.3	16	4	25
Register exists	8	1	12.5	5	1	20	3	—	—	16	2	12.5
Stock card updated previous 30 days	1	1	100	2	2	100	1	—	—	4	3	75
<b>Needlestick-Prevention Syringes</b>												
Stock card exists	8	—	—	5	3	60	3	2	66.7	16	5	31.25
Register exists	8	—	—	5	—	—	3	1	33.3	16	1	6.25
Stock card updated previous 30 days	0	—	—	3	2	66.7	2	2	100	5	4	80
<b>Reuse-Prevention Syringes</b>												
Stock card exists	8	1	12.5	5	4	80	3	0	0	16	5	31.25
Register exists	8	1	12.5	5	—	—	3	1	33.3	16	2	12.5
Stock card updated previous 30 days	1	1	100	4	2	50	1	1	100	6	4	66.7
<b>Standard Disposable Syringes</b>												
Stock card exists	8	2	40	5	3	60	3	2	66.7	16	7	43.75
Register exists	8	1	12.5	5	1	20	3	1	100	16	3	18.75
Stock card updated previous 30 days	2	1	50	3	2	66.7	2	1	50	7	4	57.1

## ADEQUATE SUPPLIES AND STOCKOUTS

During assessment visits, it was found that stockouts of bin liners had been experienced during the previous six months (in 50% of facilities); heavy-duty gloves (in 27.3%); boots (also in 27.3%); vacutainers (in 22.2%); sharps safety boxes and disposable gloves (in 15.4%), needlesstick-prevention syringes (in 66.7%); RUP syringes (in 44.4%); and standard disposable syringes (in 23.1%; Table 67).

Stock sufficient for two weeks' needs was found of standard disposable syringes in almost three-quarters of facilities (73.3%), of reuse-prevention syringes (62.5%), and needlesstick-prevention syringes (50%; Table 67).

**Table 67. Observations of Stockouts and of Commodity and Medication Availability in Stores and Pharmacies of Intervention Facilities in FCT and Benue State**

	PHC FACILITIES			SHC FACILITIES			THC FACILITIES			TOTAL		
	Number of Observations	Yes		Number of Observations	Yes		Number of Observations	Yes		Number of Observations		
		n	(%)		n	(%)		n	(%)		n	(%)
<b>Stockout of Health Care Waste Management Materials during the Preceding Six Months</b>												
Bin liners	7	2	28.6	3	2	66.7	2	2	100	12	6	50.0
Heavy-duty gloves	7	1	14.3	2	0	0	2	2	100	11	3	27.3
Boots	7	1	14.3	2	0	0	2	2	100	11	3	27.3
Vacutainers	4	1	25.0	3	0	0	2	1	50.0	9	2	22.2
Sharps safety boxes	8	0	0	4	1	25.0	1	1	100	13	2	15.4
Disposable gloves	7	2	28.6	4	0	0	2	0	0	13	2	15.4
<b>Stockout of Syringes during the Preceding Six Months</b>												
Needlestick-prevention syringes	—	—	—	2	2	100	1	0	0.0	3	2	66.7
Reuse-prevention syringes	6	2	33.3	3	2	66.7	—	—	—	9	4	44.4
Standard disposable syringes	7	2	28.6	4	1	25.0	2	0	0	13	3	23.1
<b>Adequate Number of 5ml Syringes in Store for Two Weeks' Use</b>												
Standard disposable syringes	8	5	62.5	4	3	75	3	3	100	15	11	73.3
Reuse-prevention syringes	3	3	100	3	1	33.3	2	1	50.0	8	5	62.5
Needlestick-prevention syringes	1	1	100	3	1	33.3	2	1	50.0	6	3	50.0
<b>Availability of Selected Common Medications</b>												
ACT (for malaria treatment)	8	7	87.5	5	5	100	3	2	66.7	16	14	87.5
Paracetamol	8	7	87.5	5	5	100	3	3	100	16	15	93.8
Ampicillin/ampiclox/septrin	8	7	87.5	5	5	100	3	3	100	16	15	93.8

## FINDINGS FROM IN-DEPTH STAKEHOLDER INTERVIEWS

### INTERVIEWS WITH REPRESENTATIVES FROM THE PUBLIC SECTOR

#### The Importance of Health Care Waste Management

The government officials interviewed indicated that health care waste management is critical to Nigerians' health and requires significant attention.

*“Health care waste management is critical, because you are not talking about normal household waste. The consequence of not controlling health care waste is disastrous... when you don't handle it well, it is going to increase the number of patients from the hospital that produced the waste. Of course, we know that the issue of handling needles or syringes is vital because of the pathogens that could come from them. We consider it a very important challenge—to the public, to people who generate the waste, and to those who handle the waste.”*

—Benue State Environmental Agency Officer

*“Health care waste management is quite a big challenge, because the government is not giving it due attention. That makes health care waste very difficult to control.”*

—Benue State Injection Safety Focal Officer

### **Government’s Effort to Address HCWM Issues**

Although the government of Nigeria has established relevant agencies for addressing waste management issues as a whole, the government is challenged in managing HCW effectively because relevant agencies are not adequately equipped and because supportive legislation and regulations are lacking. In general, interviewed government officials indicated that with the exception of awareness and educational programs that have been undertaken largely with the support of USAID via AIDSTAR-One, little is being done about HCWM.

*“We have the health care waste unit, but it is nonfunctional because we don’t have the resources . . . So technically we are doing nothing about health care waste. Maybe we do segregation at a point, at various units in some health care facilities, but take for instance Federal Medical Centre. It is a private service provider and it manages its own waste but it doesn’t separate it, and even when it does, we have the challenge of a dump site, and we might have dishonest drivers so after they go and collect the waste, they look for somewhere to put it, maybe a backyard, and dump it. As a result we have health care waste dumped indiscriminately all over the state. So it is a serious challenge . . . We need a functional incinerator that has reasonable capacity, and of course we need specialized vehicles that can transport the health care waste from the points of generation to the point of disposal. Of course, we will also need personal protective devices and equipment . . . and safety boxes. We need all those things.”*

—Benue State Environmental Agency Officer

### **Current and Potential Private-Sector Involvement**

Interviews with stakeholders described private-sector involvement in HCWM in Benue and FCT as varied but generally limited. The private sector was mostly involved in transporting wastes, although in Abuja, a private organization with an incinerator was involved in waste treatment, with government health facilities among its clients. In another case, a state-level government health program depended on a private for-profit organization’s facilities for waste treatment.

*“We have big problem in the area of waste treatment because, for now, we have only one incinerator in the state that I will say is about to become very functional—that is in Benue State University Teaching Hospital. Recently, during a measles immunization campaign, the WHO stated that the waste generated during the campaign should not be burned and buried. So we tried to collect all the safety boxes and take them to Benue State Cement Factory in Gboko and Dangote Cement Factory for incineration.”*

—Benue State Environmental Agency Officer

*“From what I know, the state Ministry of Health has never been directly involved the private sector in collecting waste. It is only at the Federal Medical Centre where a private agency was collecting waste: I know that one very well. Benue State Environmental Agency (BENSESA) collects the waste of the General Hospital, North Bank, which I knew very well. Apart from that, no other body is involved in HCWM. We don’t have collaboration like that in the state from the Ministry of Health.”*

—Benue State Injection Safety Focal Officer

In general, government officials welcomed private-sector involvement in HCWM as a beneficial development.

*“If collaboration between the state government, the environmental agency (BENSESA) and the private sector is there, I believe that it will work well, because a tree cannot make forest. Right now, we don’t have the equipment required for HCWM on the ground, and if a private-sector organization is here and they want to do it, we can go ahead. And if the private sector comes in, they will not just manage the public facilities alone, they will manage both the private and public facilities. . . So when you bring in private-sector organizations, they will also look at health care waste management holistically and not haphazardly, and then everybody will be carried along.”*

—Benue State Injection Safety Focal Officer

## **INTERVIEWS WITH PRIVATE-SECTOR OPERATIVES**

### **Government’s Effort to Address Health Care Waste Management Issues**

Private-sector operatives were of the opinion that the government is not doing enough regarding HCWM in the health facilities or in the state as a whole.

*“Absolutely no, there is no question they (i.e. the government) are not doing enough. They are not supervising the hospitals enough; whether government or private there are standards that are supposed to be met... How many hospitals in the country budget for sharp boxes? How many hospitals in the country have the color-coded bin liners in place for disposal of different category of wastes? How many hospitals understand the basics of HCWM? How many hospitals in the country have health care waste officers?”*

—Private-Sector Operative, FCT

*“For health care waste management I don’t think much has been done. If much is being done, government would be interested in how or where the waste is being dumped. It is not that the government is not interested in it but whatever the government says is lip-service. I imagine that maybe, from time to time, seminars will be going on, calling health care workers together to teach them about waste management issues . . . The same vehicles that are being use for municipal waste management are also being used for health care waste. Most of the vehicles are not even covered, so you can imagine that some health care waste will fly from the vehicle, In fact, those of us that are in private sector sometimes have to obey government because of regulations. But the government people do not obey regulations—they just do things the way they want to do it. In fact I think government has not done much in terms of health care waste management.”*

—Private-Sector Operative, Benue State

### **The Potential for Public–Private Partnerships**

In both FCT and Benue State, the mechanism for public–private partnerships (PPP) is evolving, and there are various challenges in the partnership relationships. In Benue State, for example, it was found that the government had not systematically followed up its initial plan for robust engagement of private-sector organizations in waste management.

*“[Public–private partnership] is still in its infancy, although efforts have been made. But there is light at the end of the tunnel. At least the government understands the issue—that they need to partner with the private sector because government alone cannot provide all the infrastructure, all the technology that is required, the human capacity, everything. So there is an effort being made. We hope in the next couple of months that it will bear some useful fruits.”*

—Private-Sector Operative, FCT

Although most stakeholders generally described a positive relationship between public and private sectors, other opinions highlight tension between the two.

*“Unfortunately, some government officials see the private sector as competitors and do things to undermine the performance of those of us in the private sector. We have seen situations where, for no reason, officials have told their customers to stop patronizing us. We have cases where government officials have told our customers that they in the government are the one to be patronized, even though we are the ones who have license to cover those areas. We have cases where people come to us and say, ‘Look, this zone has not been given to any particular person, so come and service us, because we have this challenge.’ And one day, after we’ve started servicing those people, some government official comes and tells us to pull out of that zone.”*

—Private-Sector Operative, Benue State

### **Current Private-Sector Involvement in Health Care Waste Management**

Most private-sector organizations are involved in simply collecting waste from health facilities and disposing of it at government-specified dump sites, with no specific treatment for HCW and no separation of HCW from general waste either during transportation or disposal.

However, one private-sector organization with its own incinerator, Hospitalia Consultaire, is involved in waste treatment. Although the officials interviewed during the assessment reported low patronage by government institutions, Hospitalia Consultaire does have the patronage of an international organization. In the words of a Hospitalia Consultaire official:

*“We have equipment, a 150-kilogram power incinerator that is just lying there, and we are incinerating wastes for one of the international-supported intervention schemes for malaria drugs, drug sachets, and the rest. But we don’t have enough business—we could be much busier than we are. And we are not breaking even in terms of investment and the manpower we have.”*

### **How to Make Private Involvement in Health Care Waste Management More Effective**

Assessment interviews with stakeholders highlighted the need for regulations and legislations to ensure that health facilities use private-sector HCWM experts as necessary while emphasizing the importance of government monitoring of private-sector operatives’ performance and government regulatory and oversight functions.

*“It is cheaper for private clinics and hospitals not to use health care waste management experts or disposal facilities. So the government must step in and put in place the infrastructure that allows for hospitals’ waste collection and a fee structure involving weekly or monthly payments or whatever . . . there must be an organized system for collection of waste from these hospitals at fixed fees. It is the government that has the enforcement capacities to do that. Private companies that invest huge amounts in health care waste management have to be sure that they can recoup their investment, and its government that has the capacity to put the legislative infrastructure in place for this to be achievable.”*

—Private-Sector Operative, FCT

*“If the government is not involved in overseeing private-sector organizations, there will be exploitation—that is what we have seen with the tax collection system, where some state and local governments are using private tax collectors. This system has been abused in lots of instances. If you leave the private sector without checks and balances, things will be open to abuse. They might overcharge, there might be incompetent people who do not have the right equipment claiming that they can do*

*the job. So any private organization must register with the government and show its expertise so that the government can monitor the work—the disposal methodology, for example, and the transportation methodology for health care waste management. One day, if you leave things in the hands of private people without oversight, you will see them carrying culture swabs and dumping them in a public refuse bin so that if it rains, cholera bacteria could wash into bodies of water and then there will be an epidemic. Private-sector operators can't operate unchecked—they must be monitored and there must be room for the game to be played on even grounds if we are to succeed.”*

—Private-Sector Operative, FCT

Overall, stakeholder interviews showed that private-sector operatives believe that the private sector could be more involved in HCWM, and that with effective government support and partnership could contribute significantly to the growth of the national economy.

*“You need specialized vehicles and equipment for health care waste management. Transportation of the wastes from health care facilities to disposal sites is a big area and will create a huge amount of employment. Proper disposal is another huge area. In fact, it is an area where companies can employ more than 1,500 to 2,000 people—just for health care waste management. It’s an area that, once developed, can contribute to the economy. . . Thus, the private sector has a huge role to play—in health care waste transportation, disposal, treatment, training capacity building, consultancy.”*

—Private-Sector Operative, FCT



# DISCUSSION AND CONCLUSION

This assessment has examined the injection and health care waste management practices in intervention facilities across the three levels of health care facilities—primary, secondary, and tertiary—in FCT and Benue State, where AIDSTAR-One has been working to raise standards for HCWM commodities, injection practices, and waste segregation, collection, transportation, and treatment. The study also explored the degree to which government and the private sector have supported facilities in HCWM. In addition, the study compared the performance of intervention and nonintervention facilities. Finally, the study also quantified waste percentages per facility, per patient, and by component, generating preliminary information that is essential to anticipate and ensure sufficient supplies of waste handling materials and to help decide how to most efficiently and effectively improve treatment and disposal method safety and environmental friendliness.

Assessment findings demonstrated that most intervention facilities have complied with recommended HCWM standards. Among health workers there was universal knowledge of transmission of infection by injection. Few health workers in intervention facilities reported reuse of syringes and needles during the preceding year. The high proportion of intervention-facility health workers who had been vaccinated against tetanus and hepatitis B (more than 80%) is another major finding. However, improvement is still needed in virtually all areas of HCWM—from waste collection to waste segregation, treatment, transportation, and disposal. Areas of deficiency include injection preparation and commodity management. A substantial proportion of facilities still experience both critical shortages as well as stockouts of HCWM commodities.

Intervention facilities' performance was statistically significantly higher or improved over that of nonintervention facilities in such areas as:

- Availability of copies of the *National Policy* and the *National Standards for Universal Precautions and Health Care Waste Management Practices* on health-facility premises, and health workers' awareness of these policies and standards
- Health worker knowledge of the importance of PPE, such as heavy-duty gloves, heavy-duty boots, aprons, overalls, and protective goggles
- Health worker knowledge of color coding of wastes
- Availability and use of bin liners in health facilities
- The process of collecting, storing, and transporting hazardous and nonhazardous wastes
- Waste segregation at the source, weighing of generated wastes, and color coding of waste receptacles
- Appropriate hand washing by CSPs before they prepare injections for vaccination or for therapeutic purposes

In interpreting the findings of the comparison, two issues are important to bear in mind. First, the number of study respondents was generally small. Consequently, it was difficult to record statistically significant differences between intervention and nonintervention facilities. Second, although the study design was geared toward minimizing the effects of intervention activities on activities and behaviors in nonintervention facilities, the possibility that study results were skewed in this way cannot be ruled out. This is because in facilities and locations where AIDSTAR-One is not working directly, the broad policy-level interventions at national and state levels can have a spillover effect on

nonintervention facilities. Also, both transfers of government staff from one facility to the other and monitoring activities across LGA and facilities by the same state-level officials could also produce spillover effects. Such “contaminations” would tend to reduce the differences between intervention and nonintervention facilities.

In quantifying wastes, the study found differences in patterns among facilities at the same level and among facilities at different levels. On the whole, in PHC facilities, general waste constituted the highest proportion of waste (45.6%); other components included sharps (31.5%), infectious (17.9%), and anatomical and highly infectious wastes (5.1%). In SHC facilities, general waste also constituted the highest proportion (56.0%); other segregated components included anatomical and highly infectious wastes (18.3%), infectious waste (15.6%), and sharps (10.1%). For THC facilities, general waste again constituted the highest proportion of waste generated (46.2%); other components included anatomical and highly infectious wastes (21.7%), infectious wastes (17.1%), sharps (10.6%), and pharmaceutical waste (4.3%). Interpretation of waste quantification data has to be done in the context of other activities that may be taking place in the health facility at the time of the study—activities such as the National Immunization Days program significantly increase the number of sharps generated, for example.

In-depth interviews of government and private stakeholders revealed that state governments are not doing enough in the area of HCWM. Both government and private-sector operatives are open to and interested in implementing public–private partnerships for HCWM, but the needed framework and enabling legislation have not yet been put in place. On the whole, the concept of public–private partnership is in its formative stage in Nigeria’s HCWM, and the engagement of private-sector HCWM operatives is currently limited, leaving significant opportunity to improve private-sector involvement.

# APPENDIX I

## SURVEY INSTRUMENTS USED

<b>TOOL NUMBER</b>	<b>TYPE OF TOOL</b>	<b>APPENDIX NUMBER</b>
Tool 1	Waste Weighing Sheet	Appendix 3
Tool 2	Officers in Charge of Facilities: Interview	Appendix 4
Tool 3	Clinic Service Providers: Interview	Appendix 5
Tool 4	Waste Handlers and Environmental Health Workers: Interview	Appendix 6
Tool 5	Facility Checklist	Appendix 7
Tool 6	Structured Observation of Stores and Pharmacies and Inventory of Supplies in Central Pharmacy Stores and Main Store Room	Appendix 8
Tool 7	Structured Observations of Injection Practices	Appendix 9
Tool 8	In-Depth Interview with Government and Other Stakeholders	Appendix 10



## APPENDIX 2

# WASTE WEIGHING PROTOCOL

## WASTE SEGREGATION

Waste must be segregated into the following color-coded waste bin liners:

Black	General waste (noninfectious)
Yellow	Infectious wastes
Red	Highly infectious wastes (anatomical and pathological waste, blood-soaked gauze)
Brown	Pharmaceutical wastes <i>and</i>
Sharps safety box	Sharps (needles and syringes, etc.)

## WASTE COLLECTION

- The waste shall be collected from the selected wards/units/departments by the designated waste handler.
- Waste in bin liners must be tied by the waste handler to avoid spillages.
- Waste shall be stored at an agreed secured central location within the facility prior to weighing.

## WASTE WEIGHING

- Weighing will be in kilograms, up to one decimal place only (e.g., 2.3 kg).
- The various bags shall be separated according to their color codes; sharps safety boxes will be kept aside from the liners.
- The bags shall be gathered to a central point in the facility for weighing every morning by 8:00 am.
- They shall be counted and record taken.
- The weighing scale shall be calibrated (make the pointer to be set at “0”) before the weighing process starts.
- The calibration shall be checked and recalibrated after the tenth bag has been weighed.
- Each waste bag weighed shall be recorded immediately and put aside from those not yet weighed.
- Like colors shall be weighed and recorded together.
- The total weight of each color stream shall be summed together and record taken.

- The data collected shall be immediately sent by text message to the team supervisor.
- Data sent should comprise:
  - Total number of bags (bin liners) by color
  - Total weight by colors
  - Total number of sharps safety boxes and their weight.
- Waste shall be kept until visibly sighted by the supervisor before they are discarded
- The supervisor shall forward the data to the central pool not later than one hour by text message and also fill in the Data Sheet 5.

## **WEIGHING PROCESS**

- Couple the weighing scale by attaching the flat plate on the top of the scale with screws provided.
- Place the weighing scale on a flat hard surface.
- Calibrate the weighing scale by turning the knob at the top under the plate and set the pointer to zero.
- Note that the red color reads kilograms and the black reads pounds.
- Measurements should be given in kilograms.

# APPENDIX 3

# TOOL I—WASTE WEIGHING SHEET

## MANAGEMENT

---

NAME OF FACILITY

---

STATE

---

LGA

---

TYPE OF FACILITY

---

Primary [ ]    Secondary [ ]    Tertiary [ ]

---

NAME OF OBSERVER

---

DESIGNATION OF OBSERVER

---

SECTION/UNIT OF THE FACILITY COVERED

---

# PRIMARY HEALTH CARE FACILITIES

		DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	TOTAL
COMPOSITION OF WASTE		Number of outpatients per day							
		OP =	OP =	OP =	OP =	OP =	OP =	OP =	
		Number of beds occupied on the day [bed occupancy] (BO)							
		BO =	BO =	BO =	BO =	BO =	BO =	BO =	
		Weight of waste (in kilograms)							
A	Sharps (sharp boxes)								
B	General waste and recyclables (black bag)								
C	Infectious wastes (yellow bag)								
D	Anatomical and highly infectious waste (red bag)								
E	Others (black bag)								
F	TOTAL								
	DATE								
	TIME								

# SECONDARY AND TERTIARY FACILITIES

		DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	TOTAL
COMPOSITION OF WASTE		Number of outpatients per day							
		OP =	OP =	OP =	OP =	OP =	OP =	OP =	
		Number of beds occupied on the day [bed occupancy] (BO)							
		BO =	BO =	BO =	BO =	BO =	BO =	BO =	
		Weight of waste (in kilograms)							
A	Sharps (sharp boxes)								
B	General waste and recyclables (black bag)								
C	Recyclables (black bag)								
D	Radioactive wastes (yellow bag with “radioactive” icon)								
E	Infectious wastes (yellow bag)								
F	Anatomical and highly infectious wastes (red bag)								
G	Pharmaceutical wastes and chemical wastes (brown bag)								
H	Others (black bag)								
I	TOTAL								
	DATE								
	TIME								



## APPENDIX 4

# TOOL 2—OFFICERS IN CHARGE OF FACILITIES: INTERVIEW

## INTRODUCTION

Thank you for taking the time to meet with me today. My name is \_\_\_\_\_ and I would like to talk to you about your experiences with respect to injection safety and health care waste management. Specifically, as part of a baseline assessment commissioned by AIDSTAR-One which will provide information on how to improve on injection safety and health care waste management in the country. The interview should take a few minutes.

All responses will be kept confidential. This means that your interview responses will only be shared with research team members and we will ensure that any information we include in our report does not identify you as the respondent. Remember, you don't have to talk about anything you don't want to and you may end the interview at any time.

Are there any questions about what I have just explained? Are you willing to participate in this interview?

Informed Consent Statement (*Accept to Participate*)

\_\_\_\_\_

NAME OF FACILITY	
STATE	
LGA	
TYPE OF FACILITY	
Primary [ ]    Secondary [ ]    Tertiary [ ]	
NAME OF INTERVIEWEE AND DESIGNATION	PHONE NUMBER OF INTERVIEWEE
DESIGNATION OF INTERVIEWEE	
INTERVIEWER NAME	DATE OF INTERVIEW

## SECTION A: HEALTH CARE FACILITY CHARACTERISTICS

How many beds do you have in total?

What is the average bed occupancy? (\* number of bed spaces averagely occupied by admitted patients daily divided by number of available beds)

<20% per day [ ] 20%–50% per day [ ] 51%–100% per day [ ]

How many of the beds in your facility are occupied presently?

How many outpatients come each day on average?

Do you have the National Policy on injection safety and health care waste management (HCWM)?

Yes [ ] No [ ]

If yes, is a copy of the document sighted?

Yes [ ] No [ ]

*(If No, skip to Q8)*

Yes [ ] No [ ]

Do you use the National Policy on injection safety and HCWM?

Yes, completely [ ] Yes, partially [ ] Not at all [ ]

Do you have the *National Standards and Norms* on injection safety and HCWM?

Yes [ ] No [ ]

*(If No, skip to Q13)*

If yes, is a copy of the document sighted?

Yes [ ] No [ ]

Do you use the *National Standards and Norms* on injection safety and HCWM?

Yes, completely [ ] Yes partially [ ] Not at all [ ].

Do you face any challenges implementing the national guidelines on injection safety and HCWM?

Yes [ ] No [ ]

*If Yes, what are these problems?*

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Do you have internal guidelines and standard operating procedures (SOPs) on injection safety and HCWM?

Yes [ ] No [ ]

Is it available and sighted?

Yes [ ] No [ ]

Not available [ ] (If not available, skip to Q16)

Available and sighted [ ]

Available and not sighted [ ]

If available, do you use internal guidelines and SOPs?

Yes, always [ ]

Yes, sometimes [ ]

Never [ ]

Is budget allocated for HCWM?

Not allocated [ ] (If not allocated, skip to Q18)

Ongoing plans for allocation [ ]

(Skip to Q18)

Allocated but not used [ ]

Allocated and used [ ]

I do not know [ ]

If budget is allocated, complete the table below for your health facility.

YEAR	PROPOSED BUDGET FOR HCWM (IN NAIRA)	FUNDS RELEASED FOR HCWM, INCLUDING TRAINING (IN NAIRA)	REMARKS
2011			
2012			
2013			

Do you have an annual workplan for HCWM?

Yes [ ] No [ ]

*(If No, skip to Q20)*

If yes, is it available and can you produce a copy of the document?

Available and produced a copy [  ]

Could not produce a copy [  ]

Do you have an annual report regarding HCWM activities?

Yes [  ] No [  ]

(If No, skip to Q22)

If Yes, is it available and can you produce a copy of the document?

Available and produced a copy [  ]

Could not produce a copy [  ]

Is there a functional infection prevention and control committee (IPC) in the HCF?

Yes [  ] No [  ]

(If No, skip to Q28)

If Yes, please list three members and their official designation

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How frequently does the IPC committee of this HCF meet?

Once a month [  ]

Once in a quarter [  ]

Once in six months [  ]

Once a year [  ]

Other (Please specify)

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When was the last meeting of the infection prevention committee held (day/month/year)?

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Did you record minutes at the meeting of the IPC committee?

Yes [ ] No [ ]

Can you produce the minutes of the last meeting?

Sighted [ ] Not sighted [ ]

Is there a designated and fully operational person (coordinator) responsible for HCWM?

Not identified [ ]

Identified but not operational [ ]

Operational [ ]

Has the designated staff ever been trained on injection safety and HCWM?

Yes [ ] No [ ]

*(If No, skip to Section B)*

If yes, what kind of training has the staff had?

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How often does the staff participate in training?

Every year [ ]

Every two years [ ]

Every three years [ ]

Other (Please specify)

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## SECTION B: HEALTH CARE WASTE MANAGEMENT

What category of waste is generated in this HCF? (*Tick all that apply*)

- General waste (food waste, used clothes, etc.)
- Recyclables (empty bottles, metal objects, waste papers)
- Radioactive wastes (unused liquids from radiotherapy or laboratory; contaminated glassware, packages or absorbent paper; urine and excreta from patients treated or tested with unsealed radionuclides; sealed sources)
- Infectious wastes (laboratory samples, cultures and stocks; tissues; dressings, swabs or other items soaked with blood; blood bags and sharps)
- Sharps (needles and syringes)
- Chemical wastes (liquid and solid); acids, reactive chemicals)
- Pharmaceutical wastes (expired drugs)
- Anatomical wastes (human parts, umbilical cords, placenta)

Other types of waste

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Is waste segregated at source?

Yes  No

*(If No, skip to Q35)*

*If Yes, into what categories are they segregated? (Tick all that apply)*

- |                                  |                          |   |                          |
|----------------------------------|--------------------------|---|--------------------------|
| General                          | <input type="checkbox"/> | Chemicals ( <i>liquid and solid</i> )   | <input type="checkbox"/> |
| Recyclables                      | <input type="checkbox"/> | Pharmaceutical wastes                   | <input type="checkbox"/> |
| Radioactive                      | <input type="checkbox"/> | Anatomical and highly infectious wastes | <input type="checkbox"/> |
| Infectious                       | <input type="checkbox"/> | Sharps                                  | <input type="checkbox"/> |
| Others ( <i>Please specify</i> ) |                          |   |                          |

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Into what type of containers do you segregate waste? *(Tick all that apply)*

No specific container

Plastic

Metallic

Cardboard box

Bin liners

Others (Please specify)

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If you use containers, which of the following best describe the containers:

Leak proof

Puncture proof

Leak and puncture proof

Neither leakproof nor puncture proof

Others (Please specify)

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Is waste generated weighed in this facility?

Yes  No

Do you color code waste receptacles/containers?

Yes  No

If yes, what color do you use for infectious waste?

---

Do you use bin liners for the waste storage receptacles?

Yes  No

*(If No, skip to Q43)*

If Yes, have you experienced shortage of bin liners in the past 6 months?

Yes [ ] No [ ]

If Yes, what were (was) the reasons for shortage? (Tick all that apply)

Budget [ ]

Logistic [ ]

Others (Please specify)

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Do you have the following types of equipment for HCWM?

Bin liners: Yes [ ] No [ ]

Dust bin Yes [ ] No [ ]

Dino bins Yes [ ] No [ ]

Rakes Yes [ ] No [ ]

Brooms Yes [ ] No [ ]

Transport van/ wheelbarrow Yes [ ] No [ ]

High-temperature incinerator Yes [ ] No [ ]

Have you experienced shortage of waste storage containers during the past six months?

Yes [ ] No [ ]

(If No, skip to Q46)

If yes, what was the reason for shortage? (Comments on Q42 also apply).

Budget [ ]

Logistic [ ]

Other (Please specify)

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Do you have the following personal protective equipment available and in use?

S/N	PERSONAL PROTECTIVE EQUIPMENT	AVAILABLE		IN USE	
		YES	NO	YES	NO
A	Latex gloves				
B	Heavy-duty gloves				
C	Boots				
D	Nose mask				
E	Apron				
F	Overalls				

\*Is there a designated area for temporary storage facility of HCW?

Yes [ ] No [ ]

If yes, name/describe the temporary facility

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Is the area only accessible to authorized personnel?

Yes [ ] No [ ]

Is hazardous and nonhazardous wastes collected and stored separately?

Yes [ ] No [ ]

Is hazardous and nonhazardous wastes transported separately?

Yes [ ] No [ ]

What means do you use to transport HCW off site?

Open device [ ]

Closed device [ ]

Other (Please specify)

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Who transports HCW?

- HCF  [ ]  
 Municipal service  [ ]  
 Private company  (*Name?*)

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Is health care waste recycled?

- Yes  [ ] No  [ ]

How are the following types of waste handled by your health facility?

	TREATMENT OPTIONS			REMARKS
	NO TREATMENT	TREATED ON SITE	TREATED OFF SITE	
General waste				
Sharps				
Infectious wastes				
Anatomical and highly infectious wastes				
Pharmaceutical wastes				
Chemical wastes, liquid and solid				

What kind of treatment method do you practice for HCW? (*Tick all that apply*)

- Open burning in a hole or in an enclosure  [ ]  
 High- or medium-temperature incineration (two chamber, rotary kiln, industrial, Demont forte, or waste disposal unit)  [ ]  
 Low-temperature incineration/burning (single-chamber, “Drum,” brick)  [ ]  
 Transportation for off-site treatment (*Specify type of transportation*)

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Other (Please specify)

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What kind of disposal method do you practice for HCW? *Tick all that apply*)

Burial [ ]

Dumping in a protected/secure pit (including a needle pit) [ ]

Dumping in an unprotected pit [ ]

Dumping in an unsupervised area [ ]

Other (Please specify)

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Is the current capacity of the treatment method adequate?

Yes [ ] No [ ]

*(Please give reason(s) for answer)*

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Are there any operational problems with the treatment system?

Yes [ ] No [ ]

If yes, what is/are the problem(s)? *(Tick all that apply)*

Money [ ]

Maintenance [ ]

Spare parts [ ]

Others (Please specify)

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What do you do if the treatment method does not function?

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How would you rate the quality of the treatment technology?

Very poor [ ]

Poor [ ]

Fair [ ]

Good [ ]

Excellent [ ]

*(Please give reason(s) for answer)*

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---

How would you rate the maintenance of the treatment technology?

Very poor [ ]

Poor [ ]

Fair [ ]

Good [ ]

Excellent [ ]

*(Please give reason(s) for answer)*

---

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## SECTION C: INJECTION SAFETY

What type of syringe do you use in this facility? *(Tick all that apply)*

- Standard disposable [ ]
- Sterilizable [ ]
- Reuse-prevention needle (auto-disable) [ ]
- Needlestick-prevention syringe (retractable) [ ]

What type do you currently have in stock? *(Tick all that apply)*

- Standard disposable [ ]
- Sterilizable [ ]
- Reuse prevention needle (auto-disable) [ ]
- Needlestick-prevention syringes (retractable) [ ]

Have you reused a needle and syringe on the same or another patient in the course of your work during the past year?

Yes [ ] No [ ]

*If Yes*, what was responsible for the reuse of needle and syringe?

- Patient could not afford to buy [ ]
- Disposable syringes were out of stock [ ]
- Providers choice (I prefer to use that) [ ]
- Other *(Please specify)*

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Do you have sharps safety boxes in your health facility?

Yes [ ] No [ ]

*(If No, skip to Q74)*

*If Yes*, are the sharps safety boxes available in the wards and/or rooms where injections are given?

- Yes, in all injection rooms and wards [ ]
- Yes, in some injection rooms and wards [ ]

Have you experienced stock out of sharps safety boxes in this health facility during the preceding six months?

Yes [ ] No [ ]

In the absence of sharps safety boxes, how did you dispose of sharps?

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On the average, how many injections do you administer in this facility per day? \_\_\_\_\_

Have you ever experienced needle stick injury?

Yes [ ] No [ ]

*(If No, skip to Q79)*

If yes, when did you experience needle stick injury last? \_\_\_\_\_

The last time you experienced needle stick injury, what did you do?

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How many cases of needlestick injuries have been reported in this facility in the past 12 months? \_\_\_\_

What measures do you usually take/will you take when such accident occurs?

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What measures are available to health care workers who experienced needlestick injury?

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Have you had any training on universal precaution and injection safety?

Yes [ ] No [ ]

*(If No, skip to Q85)*

If Yes, when was the last training in this facility held?

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How many people have been trained in this facility during the last three years?

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## SECTION D: RISK PERCEPTION AND MANAGEMENT

Do you think that diseases can be transmitted through improper HCWM?

Yes [ ] No [ ]

Do you think that diseases can be transmitted through needlestick injuries?

Yes [ ] No [ ]

Please mention three diseases that can be transmitted through such routes?

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What is/are your information source(s) on the transmission of the diseases? (*Tick all that apply*)

In-service training [ ]

Pre-service training [ ]

Radio/TV [ ]

Supervisor [ ]

Books/brochures [ ]

Newspapers [ ]

Billboards [ ]

Which of the above source of information do you consider most important to you?

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Which of the following have you been vaccinated against?

Tetanus Yes [ ] No [ ]

Hepatitis Yes [ ] No [ ]

Neither Yes [ ] No [ ]

Do you have HIV post-exposure prophylaxis in your health facility?

Yes [ ] No [ ]

How will you describe your risk of contracting infection from accidental needle injury?

- Nonexistent            [   ]
- Low risk                [   ]
- Medium-level risk    [   ]
- High risk                [   ]

*(Please give reason(s) for answer)*

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Describe the HCWM schedule operational in this health care facility, from waste generation to final disposal.

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How often are waste bins removed from the ward?

- Daily                    [   ]
- Every shift            [   ]
- Once in two days    [   ]
- Twice weekly           [   ]
- Weekly                   [   ]

Other *(Please specify)*

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How often are wastes transported for final disposal?

Daily [ ]

Once in two days [ ]

Twice weekly [ ]

Weekly [ ]

No formal schedule [ ]

As and when it becomes necessary [ ]

Other (*Please specify*)

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## SECTION E: CHALLENGES AND WAYS FORWARD

What kind of shortcomings (weak points) in HCWM in this health care facility can you point out?

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Do you think HCW is safely managed in this facility?

Yes [ ] No [ ]

*(Please give reason(s) for your answer)*

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*If No, what can be done to improve safety of HCWM?*

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Do you think HCW is managed in an environmentally friendly way?

Yes [ ] No [ ]

*Other (Please specify)*

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*If No, what can be done to make it more environmentally friendly?*

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## SECTION F: PARTNERSHIPS

In what way does the waste management authority/agency support your health care facility in the management of your health care waste?

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Is the private sector involved in HCWM of your facility?

Yes [ ] No [ ]

Do you have an agreement with the private operators to manage waste according to international best practices?

Yes [ ] No [ ]

How do the private-sector operatives organize and manage waste within the agreement signed?

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## SECTION G: HUMAN RESOURCES AND CAPACITY DEVELOPMENT—DATA ON HUMAN RESOURCES AND CAPACITY DEVELOPMENT

No.	Item	Medical Doctor	Midwife	General Nurse	Community Health Officer	CHEW	Health Attendant/Orderly	Environmental Health Officer	Environmental Health assistant/Technicians	Laboratory Technician	Other
1	How many funded positions does this facility have for this type of staff member? <i>(Write number)</i>										
2	How many are currently employed by this facility? <i>(Write number)</i>										
3	How many left this facility in the last 12 months? <i>(Write number)</i>										
4	Of those that left, how many were transferred to another facility? <i>(Write number)</i>										
5	How many were posted to this facility in the last 12 months? <i>(Write number)</i>										
6	How many currently in your employment have been trained on injection safety and HCWM issues in this facility? <i>(Write number)</i>										
7	How many were trained or attended refreshers training during the preceding six months in this facility? <i>(Write number)</i>										
8	Do you have a new-entrant training package in this facility?	Yes				No					
9	If yes, how many have been trained using the new entrants package at the facility? <i>(Write number)</i>										

*Thank you!*



## APPENDIX 5

# TOOL 3—CLINIC SERVICE PROVIDERS: INTERVIEW

## INTRODUCTION

Thank you for taking the time to meet with me today. My name is \_\_\_\_\_ and I would like to talk to you about your experiences with respect to injection safety and health care waste management. Specifically, as part of a baseline assessment commissioned by AIDSTAR-One which will provide information on how to improve on injection safety and health care waste management in the country. The interview should take a few minutes.

All responses will be kept confidential. This means that your interview responses will only be shared with research team members and we will ensure that any information we include in our report does not identify you as the respondent. Remember, you don't have to talk about anything you don't want to and you may end the interview at any time.

Are there any questions about what I have just explained? Are you willing to participate in this interview?

Informed Consent Statement (*Accept to Participate*)

\_\_\_\_\_

NAME OF FACILITY	
STATE	
LGA	
TYPE OF FACILITY	
Primary [ ]    Secondary [ ]    Tertiary [ ]	
NAME OF INTERVIEWEE AND DESIGNATION	PHONE NUMBER OF INTERVIEWEE
DESIGNATION OF INTERVIEWEE	
INTERVIEWER NAME	DATE OF INTERVIEW

## SECTION A: HEALTH CARE FACILITY CHARACTERISTICS

Are you aware of the National Policy on injection safety and health care waste management (HCWM)?

Yes [ ] No [ ]

*(If No, skip to Q4)*

If Yes, is a copy of the document available and sighted?

Yes [ ] No [ ]

Do you use the National Policy on injection safety and HCWM?

Yes completely [ ] Yes partially [ ] Not at all [ ]

Do you have the National Standards and Norms on injection safety and HCWM?

Yes [ ] No [ ]

*(If No, skip to Q9)*

If Yes, is a copy of the document sighted?

Yes [ ] No [ ]

Do you use the National Standards and Norms on injection safety and HCWM?

Yes completely [ ] Yes partially [ ] Not at all [ ]

Do you face any challenges implementing the National guidelines on injection safety and HCWM?

Yes [ ] No [ ]

If Yes, what are the problems?

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Do you have internal guidelines and standard operating procedures (SOPs) on injection safety and HCWM?

Yes [ ] No [ ]

Is it available and sighted?

Not available [ ] *(If No, skip to Q12)*

Available and sighted [ ]

Available and not sighted [ ]

If available, do you use internal guidelines and SOP?

Yes, always [ ]

Yes, sometimes [ ]

Never [ ]

Is there a functional infection prevention/control committee (IPC) in the HCF?

Yes [ ] No [ ]

*(If No, skip to Q18)*

*If Yes, please list three members and their official designation*

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How frequently does the IPC committee of this health care facility (HCF) meet?

Once a month [ ]

Once in a quarter [ ]

Once in six months [ ]

Once a year [ ]

Others *(Please specify)*

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When last did the IPC committee meet?

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Did you record minutes at the meeting of the IPC committee?

Yes [ ] No [ ]

Can you produce the minutes of the last meeting?

Sighted [ ] Not sighted [ ]

Is there a designated and fully operational person (coordinator) responsible for HCWM

Not identified [ ]

Identified but not operational [ ]

Operational [ ]

Has the designated staff ever been trained on injection safety and HCWM?

Yes [ ] No [ ]

*If Yes, what kind of training has the staff had?*

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How often does the staff participate in refresher training on HCWM?

Every year [ ]

Every two years [ ]

Every three years [ ]

Others (*Please specify*)

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## SECTION B: HEALTH CARE WASTE MANAGEMENT

What category of waste is generated in this HCF? (tick all that apply)

- General waste (food waste, used clothes, etc.)
  - Recyclables (empty bottles, metal objects, waste papers)
  - Radioactive wastes (unused liquids from radiotherapy or laboratory; contaminated glassware, packages or absorbent paper; urine and excreta from patients treated or tested with unsealed radionuclides; sealed sources)
  - Infectious wastes (laboratory samples, cultures and stocks; tissues; dressings, swabs or other items soaked with blood; blood bags and sharps)
  - Sharps (needles and syringes)
  - Chemical wastes (liquid and solid); acids, reactive chemicals
  - Pharmaceutical wastes (expired drugs)
  - Anatomical wastes (human parts, umbilical cords, placenta)
- Other (*Please specify*)

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Are you aware of the concept of waste segregation at source?

Yes  No

Do you practice waste segregation at source in this facility?

Yes  No

If yes, into what categories can HCW be segregated? (*Tick all that apply*)

- |             |                          |   |                          |
|-------------|--------------------------|---|--------------------------|
| General     | <input type="checkbox"/> | Sharps                                  | <input type="checkbox"/> |
| Recyclables | <input type="checkbox"/> | Chemicals (liquid and solid)            | <input type="checkbox"/> |
| Radioactive | <input type="checkbox"/> | Pharmaceutical wastes                   | <input type="checkbox"/> |
| Infectious  | <input type="checkbox"/> | Anatomical and highly infectious wastes | <input type="checkbox"/> |
- Others (Please specify)

---

Into what type of containers should waste be segregated? *(Tick all that apply)*

No specific container [ ]

Plastic [ ]

Metallic [ ]

Cardboard box [ ]

Bin liners [ ]

Others *(Please specify)*

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Are you aware of waste color coding?

Yes [ ] No [ ]

*If Yes, what should be the color of infectious waste container?*

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Can you mention the personal protective equipment that can be used by HCW?

Latex gloves Yes [ ] No [ ]

Heavy-duty gloves Yes [ ] No [ ]

Boots Yes [ ] No [ ]

Nose masks Yes [ ] No [ ]

Aprons Yes [ ] No [ ]

Overalls Yes [ ] No [ ]

Where should HCW be stored?

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Mention the waste treatment methods you are aware of? *(Tick all that apply)*

Open burning in a hole or in an enclosure [ ]

High- or medium-temperature incineration (dual chamber, rotary kiln, industrial, Demont forte or waste disposal unit) [ ]

Low-temperature incineration /burning (single-chamber, “drum,” brick) [ ]

Transportation for off-site treatment [ ]

*(Respondent should specify type of transportation if off-site treatment mentioned)*

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Other *(Please specify)*

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---

What kind of waste disposal methods you are aware of *(Tick all that apply)*

Burial [ ]

Dumping in a protected/secure pit (including a needle pit) [ ]

Dumping in an unprotected pit [ ]

Dumping in an unsupervised area [ ]

Others *(Please specify)*

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## SECTION C: INJECTION SAFETY

What type of syringe do you use in this facility? (*Tick all that apply*)

Standard disposable [ ]

Sterilizable [ ]

Reuse prevention needle (auto-disable) [ ]

Needlestick-prevention syringe (retractable) [ ]

Have you reused a needle and syringe on the same or another patient in the course of your work in last year?

Yes [ ] No [ ]

*If Yes*, what was responsible for the reuse of needle and syringe?

Patient could not afford to buy [ ]

Disposable syringes were out of stock [ ]

Providers choice (*I prefer to use that*) [ ]

Others (*Please specify*)

---

---

---

Do you have sharps safety boxes in your health facility?

Yes [ ] No [ ]

*(If No, skip to Q40)*

*If Yes*, are the sharps safety boxes available in the wards and/or rooms where injections are given?

Yes, in all injection rooms and wards [ ]

Yes, in some injection rooms and wards [ ]

Have you experienced a stock out of sharps safety boxes in this health facility during the preceding six months?

Yes [ ] No [ ]

If Yes, at that time of out of stock or stock out of sharps safety boxes, how did you dispose of sharps?

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Have you ever experienced needle stick injury?

Yes [ ] No [ ]

*(If No, skip to Question 43)*

If Yes, when did you experience needle stick injury last? The last time you experienced needle stick injury, what did you do?

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What measures are available to health care workers who experienced needle stick injury? What measures should be taken when such accident occurs?

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Have you had any training on universal precaution and injection safety?

Yes [ ] No [ ]

*(If No, skip to Q46)*

If yes, when was the last training in this facility held?

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## SECTION D: RISK PERCEPTION AND MANAGEMENT

Do you think that diseases can be transmitted through improper HCWM?

Yes [ ] No [ ]

Do you think that diseases can be transmitted through needlestick injuries?

Yes [ ] No [ ]

Please give three examples of diseases that can be transmitted through such routes?

---

---

---

What is/are your information source(s) on the transmission of the diseases? (*Tick all that apply*)

In-service training [ ]

Pre-service training [ ]

Radio/TV [ ]

Supervisor [ ]

Books/Brochure [ ]

Newspaper [ ]

Billboards [ ]

Which of the above source of information do you consider most important to you?

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Which of the following have you been vaccinated against?

Tetanus Yes [ ] No [ ]

Hepatitis Yes [ ] No [ ]

Neither Yes [ ] No [ ]

Do you have post HIV-exposure prophylaxis in your health facility?

Yes [ ] No [ ]

How will you describe your risk of contracting infection from accidental needle injury?

Nonexistent [ ]

Low risk [ ]

Medium-level risk [ ]

High risk [ ]

*Please give reason(s) for your answer*

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---

What is the sequence of HCWM?

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---

How often are wastes removed from the ward?

Daily [ ]

Every shift [ ]

Once in two days [ ]

Twice weekly [ ]

Weekly [ ]

Others [ ] (Please specify)

---

---

---

How often are wastes transported for final disposal?

Daily [ ]

Once in two days [ ]

Twice weekly [ ]

Weekly [ ]

No formal schedule [ ]

As and when it becomes necessary [ ]

Others [ ] (Please specify)

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## SECTION E: CHALLENGES AND WAYS FORWARD

What kind of shortcomings (weak points) regarding HCWM in this HCF can you point out?

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Do you think HCW is safely managed in this facility?

Yes [ ] No [ ]

*Please give reason(s) for your answer*

---

---

---

*If No, what can be done to improve safe management of HCW?*

---

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Do you think HCW is managed in an environmentally friendly way?

Yes [ ] No [ ]

*Please give reason(s) for your answer*

---

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---

*If No*, what can be done to make it more environmentally friendly?

---

---

---

*Thank You!*

## APPENDIX 6

# TOOL 4—WASTE HANDLERS AND ENVIRONMENTAL HEALTH WORKERS: INTERVIEW

## INTRODUCTION

Thank you for taking the time to meet with me today. My name is \_\_\_\_\_ and I would like to talk to you about your experiences with respect to injection safety and health care waste management. Specifically, as part of a baseline assessment commissioned by AIDSTAR-One which will provide information on how to improve on injection safety and health care waste management in the country. The interview should take a few minutes.

All responses will be kept confidential. This means that your interview responses will only be shared with research team members and we will ensure that any information we include in our report does not identify you as the respondent. Remember, you don't have to talk about anything you don't want to and you may end the interview at any time.

Are there any questions about what I have just explained? Are you willing to participate in this interview?

Informed Consent Statement (*Accept to Participate*)

\_\_\_\_\_

NAME OF FACILITY	
STATE	
LGA	
TYPE OF FACILITY	
Primary [ ]    Secondary [ ]    Tertiary [ ]	
NAME OF INTERVIEWEE AND DESIGNATION	PHONE NUMBER OF INTERVIEWEE
DESIGNATION OF INTERVIEWEE	
INTERVIEWER NAME	DATE OF INTERVIEW

## SECTION A: HEALTH FACILITY CHARACTERISTICS

Are you aware of the National Policy on injection safety and health care waste management (HCWM)?

Yes [ ] No [ ]

*(If No, skip to Q4)*

If Yes, is a copy of the document available and sighted?

Yes [ ] No [ ]

Do you use the National Policy on injection safety and HCWM?

Yes completely [ ] Yes partially [ ] Not at all [ ]

Do you have the National Standards and Norms on injection safety and HCWM?

Yes [ ] No [ ]

*(If No, skip to Q9)*

If Yes, is a copy of the document sighted?

Yes [ ] No [ ]

Do you use the National Standards and Norms on injection safety and HCWM?

Yes completely [ ] Yes partially [ ] Not at all [ ]

Do you face any challenges implementing the National guidelines on injection safety and HCWM?

Yes [ ] No [ ]

If Yes, what are the problems?

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---

---

Do you have internal guidelines and standard operating procedures (SOPs) on injection safety and HCWM?

Yes [ ] No [ ]

Is it available and sighted?

Not available [ ] *(If No, skip to Q12)*

Available and sighted [ ]

Available and not sighted [ ]

If available, do you use internal guidelines and SOP?

Yes, always [ ]

Yes, sometimes [ ]

Never [ ]

Is there a functional infection prevention/control committee (IPC) in the HCF?

Yes [ ] No [ ]

*(If No, skip to Q18)*

*If Yes, please list three members and their official designation*

---

---

---

Has the designated staff ever been trained on injection safety and HCWM?

Yes [ ] No [ ]

## SECTION B: HEALTH CARE WASTE MANAGEMENT

What category of waste is generated in this HCF? (*Tick all that apply*)

- General waste (food waste, used clothes, etc.)
- Recyclables (empty bottles, metal objects, waste papers)
- Radioactive wastes (unused liquids from radiotherapy or laboratory; contaminated glassware, packages or absorbent paper; urine and excreta from patients treated or tested with unsealed radionuclides; sealed sources)
- Infectious wastes (laboratory samples, cultures and stocks; tissues; dressings, swabs or other items soaked with blood; blood bags and sharps)
- Sharps (needles and syringes)
- Chemical wastes (liquid and solid); acids, reactive chemicals
- Pharmaceutical wastes (expired drugs)
- Anatomical wastes (human parts, umbilical cords, placenta)

Others (Please specify)

---

---

---

Are you aware of the concept of waste segregation at source?

Yes  No

Do you practice waste segregation at source in this facility?

Yes  No

If yes, into what categories can HCW be segregated? *(Tick all that apply)*

- General  [ ]
- Recyclables  [ ]
- Radioactive  [ ]
- Infectious  [ ]
- Sharps  [ ]
- Chemicals (liquid and solid)  [ ]
- Pharmaceutical wastes  [ ]
- Anatomical and highly infectious wastes  [ ]
- Others *(Please specify)*

---

---

---

Into what type of containers should waste be segregated? *(Tick all that apply)*

- No specific container  [ ]
- Plastic  [ ]
- Metallic  [ ]
- Cardboard box  [ ]
- Bin liners  [ ]
- Others *(Please specify)*

---

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Are you aware of waste color coding?

Yes  [ ] No  [ ]

*If Yes*, what should be the color of infectious waste container?

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Can you mention the personal protective equipment that can be used by HCW?

Latex gloves Yes [ ] No [ ]

Heavy-duty gloves Yes [ ] No [ ]

Boots Yes [ ] No [ ]

Nose masks Yes [ ] No [ ]

Aprons Yes [ ] No [ ]

Overalls Yes [ ] No [ ]

Protective goggles Yes [ ] No [ ]

Where should HCW be stored?

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Mention the waste treatment methods you are aware of? *(Tick all that apply)*

Open burning in a hole or in an enclosure [ ]

Open burning in an unprotected and porous pit [ ]

High- or medium-temperature incineration (dual chamber, rotary kiln, industrial, Demont forte or waste disposal unit) [ ]

Low-temperature incineration /burning (single-chamber, "drum," brick) [ ]

Transportation for off-site treatment [ ]

*(Respondent should specify type of transportation if off-site treatment mentioned)*

---

What kind of waste disposal methods you are aware of (*Tick all that apply*)

Burial

Dumping in a protected/secure pit (including a needle pit)

Dumping in an unprotected pit

Dumping in an unsupervised area

Other (*Please specify*)

---

---

---

## SECTION C: INJECTION SAETY

What type of syringe do you use in this facility? (*Tick all that apply*)

Standard disposable [ ]

Sterilizable [ ]

Reuse prevention needle (auto-disable) [ ]

Needlestick-prevention syringe (retractable) [ ]

Have you reused a needle and syringe on the same or another patient in the course of your work in last year?

Yes [ ] No [ ]

*If Yes, what was responsible for the reuse of needle and syringe?*

Patient could not afford to buy [ ]

Disposable syringes were out of stock [ ]

Providers choice (*I prefer to use that*) [ ]

Other (Please specify)

---

---

---

Do you have sharps safety boxes in your health facility?

Yes [ ] No [ ]

*(If No, skip to Q40)*

*If Yes, are the sharps safety boxes available in the wards and/or rooms where injections are given?*

Yes, in all injection rooms and wards [ ]

Yes, in some injection rooms and wards [ ]

Have you experienced a stockout of sharps safety boxes in this health facility during the preceding six months?

Yes [ ] No [ ]

If Yes, at that time of out of stock or stock out of sharps safety boxes, how did you dispose of sharps?

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---

---

Have you ever experienced needle stick injury?

Yes [ ] No [ ]

*(If No, skip to Question 43)*

If Yes, when did you experience needle stick injury last? The last time you experienced needle stick injury, what did you do?

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---

What measures are available to health care workers who experienced needle stick injury? What measures should be taken when such accident occurs?

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---

---

Have you had any training on universal precaution and injection safety?

Yes [ ] No [ ]

*(If No, skip to Q38)*

If yes, when was the last training in this facility held?

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## SECTION D: RISK PERCEPTION AND MANAGEMENT

Do you think that diseases can be transmitted through improper HCWM?

Yes [ ] No [ ]

Do you think that diseases can be transmitted through needlestick injuries?

Yes [ ] No [ ]

Please give three examples of diseases that can be transmitted through such routes?

---

---

---

What is/are your information source(s) on the transmission of the diseases? *(Tick all that apply)*

- |                      |     |
|----------------------|-----|
| In-service training  | [ ] |
| Pre-service training | [ ] |
| Radio/TV             | [ ] |
| Supervisor           | [ ] |
| Books/Brochure       | [ ] |
| Newspaper            | [ ] |
| Billboards           | [ ] |

Which of the above source of information do you consider most important to you?

---

---

---

Which of the following have you been vaccinated against?

- |           |         |        |
|-----------|---------|--------|
| Tetanus   | Yes [ ] | No [ ] |
| Hepatitis | Yes [ ] | No [ ] |
| Neither   | Yes [ ] | No [ ] |

Do you have post HIV-exposure prophylaxis in your health facility?

Yes [ ] No [ ]

How will you describe your risk of contracting infection from accidental needle injury?

Nonexistent [ ]

Low risk [ ]

Medium-level risk [ ]

High risk [ ]

*Please give reason(s) for your answer*

---

---

---

What is the sequence of HCWM?

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---

How often are wastes removed from the ward?

Daily [ ]

Every shift [ ]

Once in two days [ ]

Twice weekly [ ]

Weekly [ ]

Others *(Please specify)*

---

---

---

How often are wastes transported for final disposal?

Daily [ ]

Once in two days [ ]

Twice weekly [ ]

Weekly [ ]

No formal schedule [ ]

As and when it becomes necessary [ ]

Other (Please specify)

---

---

---

## SECTION E: CHALLENGES AND WAYS FORWARD

What kind of shortcomings (weak points) regarding HCWM in this HCF can you point out?

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---

---

Do you think HCW is safely managed in this facility?

Yes [ ] No [ ]

*Please give reason(s) for your answer*

---

---

---

*If No*, what can be done to improve safe management of HCW?

---

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---

Do you think HCW is managed in an environmentally friendly way?

Yes [ ] No [ ]

*Please give reason(s) for your answer*

---

---

---

*If No*, what can be done to make it more environmentally friendly?

---

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*Thank You!*

# APPENDIX 7

## TOOL 5—FACILITY CHECKLIST

NAME OF FACILITY	
STATE	
LGA	
TYPE OF FACILITY	
Primary [ ]    Secondary [ ]    Tertiary [ ]	
NAME OF INTERVIEWEE AND DESIGNATION	PHONE NUMBER OF INTERVIEWEE
DESIGNATION OF INTERVIEWEE	
INTERVIEWER NAME	DATE OF INTERVIEW

### SECTION A: ENVIRONMENTAL SANITATION

NO	CHARACTERISTICS	Observations		REMARKS
1	Facility fenced	Yes	No	
2	Condition of health-facility (HF) floor and walls			
2A	Floor littered with rubbish	Yes	No	
2B	Visible cracks on the wall	Yes	No	
2C	Cobwebs on the walls	Yes	No	
2D	Used/soiled dressings on the floor (any part of the hospital)	Yes	No	
3	Health-facility roof leakages	Yes	No	Not assessed
4	Condition of HF toilets			
4A	Toilet floor wet	Yes	No	
4B	Toilet smelly	Yes	No	
4C	Toilet water running/available	Yes	No	
5	Working toilets/latrine available for clients			
5A	Type of functional toilets available for clients	Water closet Pour flush toilet 2) Ventilated improved pit latrine 3) Pit latrine 4) Other ( <i>Please specify</i> ) 5) No toilet for clients		

NO	CHARACTERISTICS	Observations		REMARKS
		(If no toilet, skip to Q6)		
5B	Are toilets for male and female clients separate?	Yes	No	
5C	Are the toilets visibly clean?	Yes	No	
5D	Is the latrine smelly?	Yes	No	
5E	Are there houseflies within the toilet?	Yes	No	
5F	Is there any handwashing facility within or near the toilets for the clients?	Yes	No	
5G	Do the handwashing facilities have water and soap?	Yes	No	
6	Working toilets/latrines available for staff			
6A	Type of working toilets available for staff	1) Water closet 2) Ventilated improved pit latrine 3) Pit latrine 4) Other (Please specify) 5) No toilet for staff (If none, skip to Q7)		
6B	Are toilets for male and female staff separate?	Yes	No	
6C	Are the toilets visibly clean?	Yes	No	
6D	Is the latrine smelly?	Yes	No	
6E	Are there houseflies within the toilet?	Yes	No	
6F	Is there a handwashing facility within or in close proximity to the toilets for the staff?	Yes	No	
6G	Do the handwashing facilities have soap?	Yes	No	
7	Source of water supply to the health facility	Running tap water within the HF from public source Running tap water within the HF from a facility borehole Water obtained from protected dug well within HF compound Water obtained from protected dug well outside HF compound Water obtained from unprotected dug well within HF compound Water obtained from unprotected dug well outside HF compound Water fetched directly from public-source running tap outside HF Water supplied to HF by hospital/private water tanker Water purchased from vendors/hawkers Water obtained from an open body of water (e.g., river, lake, stream) Other (Please specify)		

NO	CHARACTERISTICS	Observations			REMARKS
		None			
8	Open waste drainage exist within the hospital premises	Yes	No	Not assessed	
9	Central waste collection point exists	Yes	No	(If No, skip to Q11)	
10	Does the central waste collection point look well maintained?	Yes	No	Specify reason for your answer	
11	Obnoxious odor within HF	Yes	No	Specify source(s), please	
12	General cleanliness of HF premises				
12A	Are there litter and waste on the ground within the compound?	Yes	No		
12B	Are there overgrown bushes?	Yes	No		
12C	Are waste bins available for general use within the premises?	Yes	No		
12D	Is there any overflowing waste bin?	Yes	No	If yes, how many	
13	Health Facility Wards				
13A	Are the floors of the wards clean (free of dirt)?	Yes	No		
13B	What substance is the floor made of?				

## SECTION B: HEALTH CARE WASTE MANAGEMENT

NO	CHARACTERISTICS	Observations			REMARKS
1	Availability of waste storage bins	Available and lidded	Available without lid	Not available	
2	Evidence of waste segregation at source (color coded bin liners sighted-)	Yes	No		
3	Color coding of HCW containers	Yes	No		
4	Condition of waste storage containers				
4A	Is waste storage container leaky?	Leaky	Not leaky	Not assessed	
4B	Is waste storage container overfilled?	Yes	No		
4C	Is waste storage container covered?	Yes	No		
5	Is storage area well designated?	Yes	No	Not assessed	
6	Access of storage only to authorized personnel	Yes	No		
7	Waste treatment/disposal site	Seen	Not seen	Comment on the state:	
7A	Type of on-site waste treatment facility seen	A. Open burning on the ground B. Open burning in a secured pit or in an enclosure C. Open burning in a porous and insecure pit D. High- or medium-temperature incineration E. Low-temperature incineration/burning (single-chamber, "Drum," brick)			Comments
7B	Type of on-site disposal facility seen	A. Burial B. Dumping in a protected/secure pit (including a needle pit) C. Dumping in an unprotected pit D. Dumping in unsupervised area E. Other ( <i>Please specify</i> )			Comments
8	Is the waste treatment/disposal site within 30 meters (100 yards) of underground water source	Yes	No		
9	Does the waste treatment facility appear well maintained	Yes	No		

NO	CHARACTERISTICS	Observations			REMARKS
		Yes	No	Not applicable (if waste is fully treated on site)	
10	Transportation available for waste to off-site treatment site	Yes	No	Not applicable (if waste is fully treated on site)	Comment on the type of transportation facility

## SECTION C: INJECTION SAFETY

NO	CHARACTERISTICS	OBSERVATIONS			REMARKS
		Yes	No	Not applicable	
1	Soiled/dirty swab in the injection area	Yes	No		
2	Availability of sharps safety boxes in stock (outside those in current use)	Yes	No		State number in stock
4	Presence of sharps safety boxes in all injection areas	Yes, in all areas	Yes, in some areas		Not at all
5	Presence of overflowing /pierced or open sharp boxes	Yes	No		
6	Number of full sharp box(es) waiting for disposal stored safely				
7	Number of full sharp box(es) waiting for disposal stored in an unsupervised fashion				
8	Are used sharps properly disposed of?	Yes	No		
9	Used sharps seen around the health care facility	Yes	No		
10	Availability of syringes	<i>Tick whichever size of syringe is available by type</i>			
		Standard Disposable	Sterilizable	Auto-disable	
10A	0.5ml				
10B	2ml				
10C	5ml				
10D	10ml				
10E	Others (Please specify)				
11	Availability of needles				
11A	25–27g				
11B	21–23g				
11C	18g				
11D	Others (Please specify)				

## SECTION D: RISK PREVENTION AND MANAGEMENT

NO	CHARACTERISTICS	OBSERVATIONS		REMARKS
1	Do the HCW handlers wear overalls?	Yes	No	
2	Do the HCW handlers use face masks?	Yes	No	
3	Do the HCW handlers wear heavy-duty gloves?	Yes	No	
4	Do the HCW handlers wear aprons?	Yes	No	
5	Do the HCW handlers wear boots?	Yes	No	
6	Any other PPE used by the HCW handlers?	Yes	No	<i>(Please specify)</i>
7	Availability of post HIV-exposure prophylaxis (PEP) drugs seen in pharmacy	Yes	No	

## SECTION E: JOB AIDS

N O	CHARACTERISTICS	OBSERVATIONS		REMARKS
1	Job aids available for HCWM in facility and sighted	Yes	No	
2	Job aids available for injection safety in the facility and sighted	Yes	No	

## APPENDIX 8

# TOOL 6—STRUCTURED OBSERVATION OF STORES AND PHARMACIES

## AND INVENTORY OF SUPPLIES IN CENTRAL PHARMACY STORES AND MAIN STORE ROOM

NAME OF FACILITY	
STATE	
LGA	
TYPE OF FACILITY	
Primary [ ]    Secondary [ ]    Tertiary [ ]	
NAME OF INTERVIEWEE AND DESIGNATION	PHONE NUMBER OF INTERVIEWEE
DESIGNATION OF INTERVIEWEE	
INTERVIEWER NAME	DATE OF INTERVIEW

### OVERVIEW

What types of injection equipment do you use in this facility (with reference to the last 3 months)?

(Circle ALL the appropriate types)

Needlestick-prevention syringes (Retractable)

Reuse-prevention syringes [RUP] (Auto-disable)

Standard disposable

# STOCK CARDS AND STOCKOUT EXPERIENCES

	SUPPLIES	STOCK CARD EXISTS	REGISTER EXISTS	NO STOCK CARD OR REGISTER	IF STOCK CARD EXISTS, HOW MANY DAYS AGO WAS IT UPDATED?		DID YOU EXPERIENCE STOCKOUT OF THIS SUPPLY IN THE PAST SIX MONTHS		
					≤ 30 DAYS	> 30 DAYS	YES	NO	
A	Needlestick-prevention syringes (Retractable)								
B	Reuse-prevention syringes (Auto-disable)								
C	Standard disposable								
D	Vacutainers								
E	Sharps safety boxes								
F	Disposable gloves								
G	Bin liners								
H	Heavy-duty gloves								
I	Boots								
3	What quantity (units) of the <b>standard disposable</b> syringes do you have available on the stock card or register?								
	10 ml								
	5ml								
	2 ml								
	1 ml								
	0.5ml								
	Total disposable syringes								
	What is the average consumption of <b>5ml</b> standard disposable syringes in your health facility per week?								
	Is the number of <b>5ml</b> standard disposable syringes available enough for 2 weeks?							Yes	No
4	What quantity (units) of reuse-prevention syringes do you have available on the stock card or register?								
	10 ml								
	5ml								
	2/3 ml								
	1 ml								
	0.5ml								
	Total auto-disposable syringes								
	What is the average consumption of 5ml RUP syringes in your health facility per week?								
	Is the number of 5ml RUP syringes available enough for two weeks?							Yes	No
5	What quantity (units) of needlestick-prevention syringes (retractable) syringes do you have available on the stock card or register?								
	10 ml								
	5 ml								
	2/3 ml								
	1 ml								
	0.5 ml								
	Total retractable syringes								

	SUPPLIES	STOCK CARD EXISTS	REGISTER EXISTS	NO STOCK CARD OR REGISTER	IF STOCK CARD EXISTS, HOW MANY DAYS AGO WAS IT UPDATED?		DID YOU EXPERIENCE STOCKOUT OF THIS SUPPLY IN THE PAST SIX MONTHS	
					≤ 30 DAYS	> 30 DAYS	YES	NO
	What is average consumption of 5ml needlestick-prevention syringes in your health facility per week?							
	Is the number of 5ml needlestick-prevention syringes available enough for two weeks						Yes	No
7	What number of sharps safety boxes do you have in store?							
8	Are the oral formulations of the following drugs available?							
	ACT (for malaria treatment)						Yes	No
	Paracetamol						Yes	No
	Ampicillin/ampiclox/septrin						Yes	No



## APPENDIX 9

# TOOL 7—STRUCTURED OBSERVATIONS OF INJECTION PRACTICES

### CODE S-3

NAME OF FACILITY		
FACILITY ADDRESS		
STATE		
LGA		
TYPE OF FACILITY Primary <input type="checkbox"/> Secondary <input type="checkbox"/> Tertiary <input type="checkbox"/>		
NAME OF HEAD OF INSTITUTION		
TELEPHONE NUMBER		
SEX OF SERVICE PROVIDER Male <input type="checkbox"/> Female <input type="checkbox"/>	AGE OF SERVICE PROVIDER AT LAST BIRTHDAY	YEARS IN PROFESSIONAL PRACTICE
DESIGNATION OF SERVICE PROVIDER		
NAMES OF ASSESSORS		ASSESSMENT DATE

## INSTRUCTIONS

Up to four injections are to be observed and reported on using this tool. One injection of each of the following types that are performed during the facility evaluation should be included if possible: one vaccination, one therapeutic injection, one family planning injection, and/or one dental injection.

The fieldworker should ask where each type of injection might be performed and check with staff at each of these locations to see when injections are likely to occur on that day. If the facility has more than one location where a particular type of injection is performed, ask to be informed when and where the first injection of each type might be observed. If more than one location or department might perform the same type of injection at the same time, select outpatient over inpatient departments. Remember to verify what type of injection is about to be performed before entering data.

## INJECTIONS OBSERVED

CATEGORY OF HEALTH WORKERS	“A” VACCINATION	“B” THERAPEUTIC	“C” FAMILY PLANNING	“D” DENTAL
Doctors				
Nurses				
Community Health Officers				
Senior Community Health Extension Workers (SHEW)				
Junior Community Health Extension Workers (JCHEW)				
Auxiliary Nurse				
Others (Please specify)				

## INJECTION PRACTICES: OBSERVATIONS

Please circle “Yes,” “No,” or “NA” (Not applicable / not observed) in the designated column. Use a single column below to record all of your observations for a given injection. The goal is to observe ONE injection of each type that is provided in each service unit that is included in the survey.

		“A” VACCINATION	“B” THERAPEUTIC	“C” FAMILY PLANNING	“D” DENTAL
Q201	Was the injection prepared on a visibly <b>clean, dedicated table or tray</b> where contamination of the equipment with blood, body fluids or dirty swabs is unlikely?	YES NO	YES NO	YES NO	YES NO
Q202	Did the provider wash her/his hands before preparing an injection with <b>soap and running water</b> ?	YES NO N/A	YES NO N/A	YES NO N/A	YES NO N/A
Q203	Did the provider cleanse her/his hands before preparing an injection by using <b>alcohol-based hand rub</b> ?	YES NO N/A	YES NO N/A	YES NO N/A	YES NO N/A
Q204	Did any <b>patients bring their own syringe</b> and needle for the observed injection?	YES NO N/A	YES NO N/A	YES NO N/A	YES NO N/A

		<b>“A” VACCINATION</b>	<b>“B” THERAPEUTIC</b>	<b>“C” FAMILY PLANNING</b>	<b>“D” DENTAL</b>
Q205	<p>What <b>type of syringe</b> was used for the injection you observed?</p> <p>1. Standard disposable 2. Reuse-prevention syringes [RUP] (Auto-disable) 3. Needlestick-prevention syringes (Retractable) 4. Other safety syringe 5. Sterilizable 6. Disposable—type unknown</p> <p>(If 5. Sterilizable, then go to Q205A , others go to Q206)</p>	1. 2. 3. 4. 5. 6.	1. 2. 3. 4. 5. 6.	1. 2. 3. 4. 5. 6.	1. 2. 3. 4. 5. 6.
Q205A	Are needles sterilizable?				YES NO
Q206	For this injection, was a syringe and needle taken from a sterile unopened packet or fitted with caps?	YES NO N/A	YES NO N/A	YES NO N/A	YES NO N/A
Q207	For each injection given with a <b>sterilizable syringe</b> and needle, were they <b>taken from a sterilizer (or sterile packs) using sterile technique?</b>				YES NO N/A
Q208	For reconstitution, was a syringe and needle each taken from a sterile unopened packet or fitted with caps? Instructions: Code as NA ( <i>not applicable</i> ) if there was no reconstitution step.	YES NO N/A	YES NO N/A	YES NO N/A	YES NO N/A
Q209	Is reconstitution of a powdered vaccine or medicine performed using <b>diluent by manufacturer?</b> Instructions: Code Yes if the diluent is water for therapeutic injections and as NA ( <i>not applicable</i> ) if use of the diluent is not observed.	YES NO DON'T KNOW N/A	YES NO N/A	YES NO	YES NO N/A
Q210	If a multidose vial was used, did the <b>provider clean the rubber cap</b> with antiseptic? Instructions: Code as NA ( <i>not applicable</i> ) if no multidose vials were used for the injection you observed.	YES NO N/A	YES NO N/A	YES NO N/A	YES NO N/A
Q210A	If a multidose vial was used, did the <b>provider clean the rubber cap</b> with dirty swab? Instructions: Code as NA ( <i>not applicable</i> ) if no multidose vials were used for the injection you observed.	YES NO N/A	YES NO N/A	YES NO N/A	YES NO N/A
Q211	If a multidose vial was used, was the <b>needle removed from the rubber cap of each multidose vial</b> after withdrawing each dose for administration? Instructions: Code as NA ( <i>not applicable</i> ) if no multidose vials were used for the injection you observed.	YES NO N/A	YES NO N/A	YES NO N/A	YES NO N/A
Q212	If <b>glass ampoules</b> are used is a <b>clean barrier</b> (e.g. small gauze pad or cotton) used to protect fingers when breaking the top from the glass ampoule? Instructions: <i>If no glass ampoules were used, code as “NA” (not applicable). If an unsafe procedure was used such as forceps, knife or scissors, code as “no.”</i>	YES NO N/A	YES NO N/A	YES NO N/A	YES NO N/A

		<b>“A” VACCINATION</b>	<b>“B” THERAPEUTIC</b>	<b>“C” FAMILY PLANNING</b>	<b>“D” DENTAL</b>
Q213	<p>If using temperature sensitive vaccines or medications, is the vial kept between 2°C - 8°C during the period of use?</p> <p>[A vial that is in contact with a combination of ice and water will be between 2°C - 8°C.] [Instructions: If no heat sensitive vaccines and medication were used, code as “N/A” (not applicable).]</p>	<p>YES</p> <p>NO</p> <p>N/A</p>	<p>YES</p> <p>NO</p> <p>N/A</p>	<p>YES</p> <p>NO</p> <p>N/A</p>	<p>YES</p> <p>NO</p> <p>N/A</p>
Q214	<p>Did the provider use a <b>new pair of gloves</b>?</p> <p>1. New gloves used 2. Gloves not changed 3. No gloves used 4. Not observed</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p>
Q215	<p>What was the <b>patient’s skin cleaned</b> with before the injection was given?</p> <p>1. Water or a clean, wet swab 2. An antiseptic 3. Dry cotton 4. A dirty swab 5. The skin was not cleaned and it’s clean 6. The skin was not cleaned and it’s dirty 7. Not observed</p> <p>[Select the most appropriate response.] Instructions: If the provider used any unclean material to swab the skin including any swab soaking in a liquid, circle “4. A dirty swab”.</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p> <p>5.</p> <p>6.</p> <p>7.</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p> <p>5.</p> <p>6.</p> <p>7.</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p> <p>5.</p> <p>6.</p> <p>7.</p>	
Q216	<p>Did the provider <b>recap</b> the used needle and syringe?</p> <p>1. Yes, with one hand 2. Yes, with two hands 3. Not recapped 4. Not observed</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p>	<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p>
Q217	<p>Was a <b>needle-remover</b> or needle-destroyer used?</p>	<p>YES</p> <p>NO</p>	<p>YES</p> <p>NO</p>	<p>YES</p> <p>NO</p>	<p>YES</p> <p>NO</p>
Q218	<p>If disposable or safety syringe was used, after the injection did the provider <b>immediately dispose</b> of the needles and syringes used for the injection (and reconstitution if applicable) in an appropriate sharps container?</p>	<p>YES</p> <p>NO</p> <p>N/A</p>	<p>YES</p> <p>NO</p> <p>N/A</p>	<p>YES</p> <p>NO</p> <p>N/A</p>	<p>YES</p> <p>NO</p> <p>N/A</p>
Q219	<p>If <b>sterilizable equipment</b> was used, immediately after the injection was the equipment <b>disassembled and immersed</b> in a container of water?</p>	<p>YES</p> <p>NO</p> <p>N/A</p>	<p>YES</p> <p>NO</p> <p>N/A</p>	<p>YES</p> <p>NO</p> <p>N/A</p>	<p>YES</p> <p>NO</p> <p>N/A</p>

## APPENDIX 10

# TOOL 8—IN-DEPTH INTERVIEW WITH STAKEHOLDERS

## INSTRUCTIONS

Please start by asking the individual to mention his/her name, and his official position: please record the same on tape and in writing.

## QUESTIONS TO ASK

How important do you consider the issue of health care waste management (HCWM)?

*Probe:* Why did you say so? Probe about diseases that can result from poor HCWM practices.

How big is the challenge of health care waste management in your area of jurisdiction (state or LGA)?

To what extent do you think that the government in this state/LGA is giving attention to HCWM?

*Probe:* What specifically has the government done or is doing with regards to the following, among others:

Legislation and regulations

Establishment/availability of relevant agencies

Oversight of health facilities with regards to HCWM

Availability of equipment and infrastructure

Provision of resources and funding of agencies

Provision of direct support/services to health facilities

Involvement of private sector in HCWM

What is the focus of your organization with regards to health care waste generation and management?

In what ways is your organization supporting health facilities in HCWM?

What are the sources and level of your funding?

*Probe for:*

Government funding (adequacy and regularity of release; proportion of overall fund)

Private-for-profit sector funding and support; organizations that have supported you in the last three years and the type of support given

Civil society organizations' funding and support (mention the organizations that have supported you in the last three years and the type of support given)

International development organizations' funding and support (mention the organizations that have supported you in the last three years and the type of support given)

Individuals; type of support you have received in last three years

What is the extent of public–private partnership and involvement in HCWM in your state/LGA?

*Probe for:*

The effectiveness of private-sector involvement in HCWM—how do they organize, manage and dispose health care waste

The degree to which the private sectors are well equipped for HCWM—e.g. what equipment, facilities, and infrastructure do they have

What protocols do private-sector operatives use in HCWM?

What are the advantages of private-sector involvement in HCWM in the state?

What are the disadvantages of private-sector involvement in HCWM in the state?

What constraints/challenges exist for effective private-sector involvement in HCWM in the state/LGA?

How can private-sector involvement in HCWM be improved?

How can HCWM in the state/LGA be strengthened further?

Is there anything more you would like to add?

*Thank you for your time.*

For more information, please visit [aidstar-one.com](http://aidstar-one.com).

**AIDSTAR-One**

John Snow, Inc.

1616 Fort Myer Drive, 16th Floor

Arlington, VA 22209 USA

Phone: 703-528-7474

Fax: 703-528-7480

Email: [info@aidstar-one.com](mailto:info@aidstar-one.com)

Internet: [aidstar-one.com](http://aidstar-one.com)