Mapping and Size Estimation of Key Populations in Nigeria: Six States and the Federal Capital Territory

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Foreword

For the first time since the discovery of HIV, we potentially have all the tools needed to end the epidemic. Reliable tests to detect the virus, durable treatment to suppress the virus among those infected and to prevent onward transmission, and proven prevention tools have tipped the scales and brought us within arm's reach of eliminating HIV in Nigeria. Results from the recently completed Nigeria HIV/AIDS Indicator and Impact Survey (NAIIS) revealed an HIV prevalence of 1.4% among men and women of reproductive age (15-49 years), much lower than was previously thought, although the country is still home to 1.9 million people living with HIV. These findings indicate that significant strides have been made towards achieving epidemic control. We also now have the evidence to confidently say that Nigeria has transitioned from a generalized to a mixed epidemic, as suggested by the disproportionate contribution of key populations (KP)—i.e., female sex workers, men who have sex with men, and people who inject drugs in driving the epidemic. This knowledge brings about a renewed focus on KP in Nigeria and, with it, the diligent use of information on where the epidemic persists, and how to reach these highly stigmatized, often hidden populations. Accounting for human behavior, heterogeneous capture probabilities, and social visibility, the empirical key population size estimates presented in this report provide critical information for tailoring appropriately scaled response efforts and policy development. The results from this study demonstrate innovative methods to bridge data gaps and inform programs that will bring us one-step closer to an HIV-free generation in Nigeria.

The success of this study would not have been possible without the support of the US Centers for Disease Control and Prevention, the University of Maryland, Baltimore, State Agencies for the Control of AIDS, and KP community-based organizations in the 6+1 states: Akwa Ibom, Benue, Cross River, Lagos, Nasarawa, Rivers, and the Federal Capital Territory. The National Agency for the Control of AIDS is pleased to share these findings and encourages the utilization of these data to guide HIV programming for KP in the 6+1 states.

Dr. Sani Aliyu
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Executive Summary

Between August 2018 and January 2019, the study team conducted a formative assessment, hotspot mapping and validation exercise, and multiple-source capture recapture (MS-CRC) exercise as part of a key population size estimation (KPSE) activity in the PEPFAR priority states of Akwa Ibom, Benue, Cross Rivers, Lagos, Nasarawa, Rivers, and the FCT. The empirical methods for population size estimation chosen for multiple-source capture-recapture provide critical information for planning and implementing targeted HIV prevention, care and treatment programs, taking into account the mixed nature of Nigeria's epidemic in the priority states.

Across the three KP groups included in this activity, female sex workers (FSW), men who have sex with men (MSM), and people who inject drugs (PWID), a total of 1,297 KP hotspots were identified in Akwa Ibom State, 1,714 hotspots in Benue State, 2,666 KP hotspots in Cross Rivers State, 1,204 KP hotspots in FCT, 2,974 hotspots in Lagos State, 1,550 hotspots in Nasarawa State, and 2,494 hotspots in Rivers State.

With few exceptions, the majority of the enumerators were KP members. The close involvement of KP community-based organizations (CBO) allowed the study to reach previously unidentified and inaccessible hotspots. The information obtained from this study is intended to support efforts to respond to the HIV epidemic outlined in Nigeria's National Strategic Framework, particularly in moving towards location-population strategy and facilitating access to HIV prevention and treatment among members of key and vulnerable populations [1,2].

Abbreviations and Acronyms

AIDS	Acquired Immunodeficiency Syndrome
CBO	Community-based Organization
CDC	US Centers for Disease Control and Prevention
CI	Confidence interval or credibility interval
CRC	Capture-recapture
FCT	Federal Capital Territory
FGD	Focus Group Discussion
FMoH	Federal Ministry of Health
FSW	Female Sex Workers
GoN	Government of Nigeria
HAI	Heartland Alliance
HDI	Highest Density Interval
HIV	Human Immunodeficiency Virus
IQR	Interquartile Range
JTF	Joint Task Force
KII	Key Informant Interviews
KP	Key Population
KPMSE	Key Population Mapping and Size Estimation
LACA	Local Action Committee on AIDS
LGA	Local Government Areas
MS-CRC	Multiple-source Capture-recapture
MSM	Men who have Sex with Men
MSW	Male Sex Workers
NACA	National Agency for the Control of AIDS
NASCP	National HIV/AIDS and Sexually Transmitted Disease Control Program
NDLEA	National Drug Law Enforcement Agency
NHREC	Nigerian Health and Ethical Research Committee
NPopC	National Population Commission of *Nigeria*
NTT	National Technical Team
OSS	One-stop Shop
PACA	Police Action Committee on AIDS
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PSE	Population Size Estimation or Estimates
PWID	People Who Inject Drugs
SARS	Special Anti-Robbery Squad
SFH	Society for Family Health
SACA	State Agency for the Control of AIDS
STT	State Technical Team
UMB	University of Maryland, Baltimore
WHO	World Health Organization

Protocol Synopsis

Title	Mapping and Size Estimation of Key Populations in Nigeria
Purpose	To obtain population size estimates (PSE) for FSW, MSM, and PWID in Akwa Ibom, Benue, Cross River, Lagos, Nasarawa, and Rivers plus the Federal Capital Territory ("6+1") PEPFAR priority states of Nigeria using empirical methods.
Study Design	KP size estimates were obtained using MS-CRC.
Study population	• **FSW** were defined as any woman (female sex at birth) 15 years and above who received money or goods in exchange for sexual services, either regularly or occasionally, in the 12 months preceding this activity.
	• **MSM** were defined as any man (male sex at birth) 15 years and above who engaged in oral and/or anal (receptive or insertive) sex with another man at least once in the 12 months preceding this activity.
	• **PWID** were defined as any person 15 years and above who injected drugs (illicit, non-prescribed, and illegal) recreationally at least once in the last 12 months preceding this activity.
Study Duration	• **Formative Assessment**: July 2018 • **Hotspot Mapping and Validation**: August - November 2018 • **Multiple-source Capture-recapture** ○ *Venue-based capture*: October – December 2018 ○ *Facility-based capture*: December 2018 – January 2019
Study Sites	The study was conducted in the 6+1 PEPFAR priority states of Akwa Ibom, Benue, Cross River, Lagos, Nasarawa, Rivers, and the FCT.
Primary Objective	• To obtain state-level key population size estimates in the 6+1 PEPFAR priority states in Nigeria using MS-CRC.
Secondary Objectives	• To map and, where appropriate, characterize the type of KP hotspots in the 6+1 PEPFAR priority states. • To obtain sex and age-disaggregated PSE of PWID and age-disaggregated PSE of FSW and MSM in the 6+1 PEPFAR priority states.

1. Introduction

1.1. Background

Nigeria has an estimated 1.9 million people living with HIV (PLHIV)[3]. In 2017, UNAIDS models demonstrated high prevalence among Nigeria's KP: 14.4% among FSW, 23.0% among MSM, and 3.4% among PWID[3]. Nigeria is characterized as having a mixed HIV epidemic with a high HIV prevalence among KP, and low prevalence of 1.4% among other men and women of reproductive age[3]. The Government of the Federal Republic of Nigeria (GoN) National HIV and AIDS Strategic Framework 2017-2021 outlines the plan to "Fast-Track the national response towards ending AIDS in Nigeria by 2030" and includes focused interventions to increase testing and treatment for key populations[1,2]. To guide focused and appropriately scaled HIV epidemic response efforts for KP, program and policy development requires reliable, empirical population size estimates (PSE).

Various methodologies have been used to produce KP size estimates in Nigeria, and, generally, have been limited in scope and coverage[4,5,6]. Table 1 provides a brief summary of methods, study populations, and locations of previous PSE in Nigeria. With a broad range of non-empirical methodologies used and estimates obtained, the reliability of the results have been questioned.

Table 1: Summary of Previous Key Population Size Estimates Reported in Nigeria

No	Author and publication date (study date)	State (s)	KP group	Population size estimate	Confidence Interval (95% CI)	Methodology	Key Limitations
1	Adebajo et al. 2013 (2009)	Kano State		353	(332-373)	Capture-recapture	Excludes exclusive internet, social app users; those who refused to participate; coverage of enumerators resulting in underestimates
		Port Harcourt		723	(594-892)		
		Lagos State		620	(517-724)		
2	NACA 2013 (2012)	Abuja FCT	FSW	24,376	N/A	Hotspot mapping, venue profiling, and rural appraisals Modified hotspot mapping and venue profiling	A mapping and enumeration exercise and not a size estimation method. Enumerates only visible KP in physical hotspots and may underestimate those that do not operate from physical hotspots or those that operate more discretely/online. No confidence interval for estimates.
		Abuja FCT	MSM	1,892	N/A		
		Abuja FCT	PWID	205	N/A		
		Anambra	FSW	4,846	N/A		
		Anambra	MSM	260	N/A		
		Anambra	PWID	173	N/A		
		Benue	FSW	10,034	N/A		
		Benue	MSM	1,018	N/A		
		Benue	PWID	221	N/A		
		Cross River	FSW	9,858	N/A		
		Cross River	MSM	276	N/A		
		Cross River	PWID	54	N/A		
		Gombe	FSW	5,772	N/A		
		Gombe	MSM	681	N/A		
		Gombe	PWID	3,617	N/A		
		Lagos	FSW	46,691	N/A		
		Lagos	MSM	2,946	N/A		
		Lagos	PWID	1,186	N/A		
		Nasarawa	FSW	19,953	N/A		
		Nasarawa	MSM	440	N/A		
		Nasarawa	PWID	414	N/A		
		Ondo	FSW	9,677	N/A		
		Ondo	MSM	102	N/A		
		Ondo	PWID	0	N/A		
3	SFH 2015	Akwa Ibom	FSW	2,873	N/A	1. MS-CRC for MSM	Hotspot mapping and venue profiling is a mapping and
		Akwa Ibom	MSM	3,588	(3,321-3,855)		

No	Author and publication date (study date)	State (s)	KP group	Population size estimate	Confidence Interval (95% CI)	Methodology	Key Limitations
	(2015)	Akwa Ibom	PWID	739	N/A	2. Hotspot mapping and venue profiling for PWID and FSW[‡]	enumeration exercise and not a size estimation method. Two-source capture-recapture does not allow us to adjust for source-dependence. Enumerates only visible KP in physical hotspots and may underestimate those that do not operate from physical hotspots or those that operate more discretely/online. No confidence interval for estimates for FSW and PWID.
		Benue	FSW	4,540	N/A		
		Benue	MSM	1,485	(1,439-1,531)		
		Benue	PWID	1,812	N/A		
		Cross River	FSW	7,872	N/A		
		Cross River	MSM	3,509	N/A		
		Cross River	PWID	3,899	N/A		
		FCT	FSW	12,297	N/A		
		FCT	MSM	4,159	(4,106-4,212)		
		FCT	PWID	1,583	N/A		
		Kaduna	FSW	20,452	N/A		
		Kaduna	MSM	4,509	(4,398-4,620)		
		Kaduna	PWID	23,285	N/A		
		Lagos	FSW	40,863	N/A		
		Lagos	MSM	4,828	(4,677-4,979)		
		Lagos	PWID	5,342	N/A		
		Nasarawa	FSW	8,867	N/A		
		Nasarawa	MSM	2,737	(2,637-2,836)		
		Nasarawa	PWID	2,545	N/A		
		Rivers	FSW	5,711	N/A		
		Rivers	MSM	1,245	N/A		
		Rivers	PWID	4,055	N/A		

[‡](commonly known as the University of Manitoba approach)

The empirical methods for PSE used for this exercise provide critical information for planning and implementing targeted HIV prevention, care, and treatment programs. The information obtained from this study will support efforts to respond to the epidemic as outlined in Nigeria's National Strategic Framework especially in moving towards a location-population strategy [2,3].

1.2. Study Goals and Objectives

1.2.1. Primary Objective

- To obtain state-level key population size estimates in the 6+1 PEPFAR priority states in Nigeria using MS-CRC.

1.2.2. Secondary Objectives

- To map and, where appropriate, characterize the type of key population hotspots in the 6+1 PEPFAR priority states.
- To obtain sex- and age-disaggregated population size estimates of people who inject drugs and age-disaggregated population size estimates of female sex workers and men who have sex with men in the 6+1 PEPFAR priority states.

1.3. Study Population

FSW   Any woman (female sex at birth) 15 years and above who has received money or goods in exchange for sexual services, either regularly or occasionally, in the 12 months preceding this activity.

MSM   Any man (male sex at birth) 15 years and above who has engaged in oral and/or anal (receptive or insertive) sex with another man at least once in the 12 months preceding this activity.

PWID   Any person 15 years and above who has injected drugs (illicit, non-prescribed, and illegal) recreationally at least once in the 12 months preceding this activity

1.4. Study Locations

The population size estimation study was conducted in the 6+1 PEPFAR priority states of Akwa Ibom, Benue, Cross River, Lagos, Nasarawa, Rivers, and the FCT.

Figure 1: Map of Nigeria showing States included in Key Population Mapping and Size Estimation Exercise
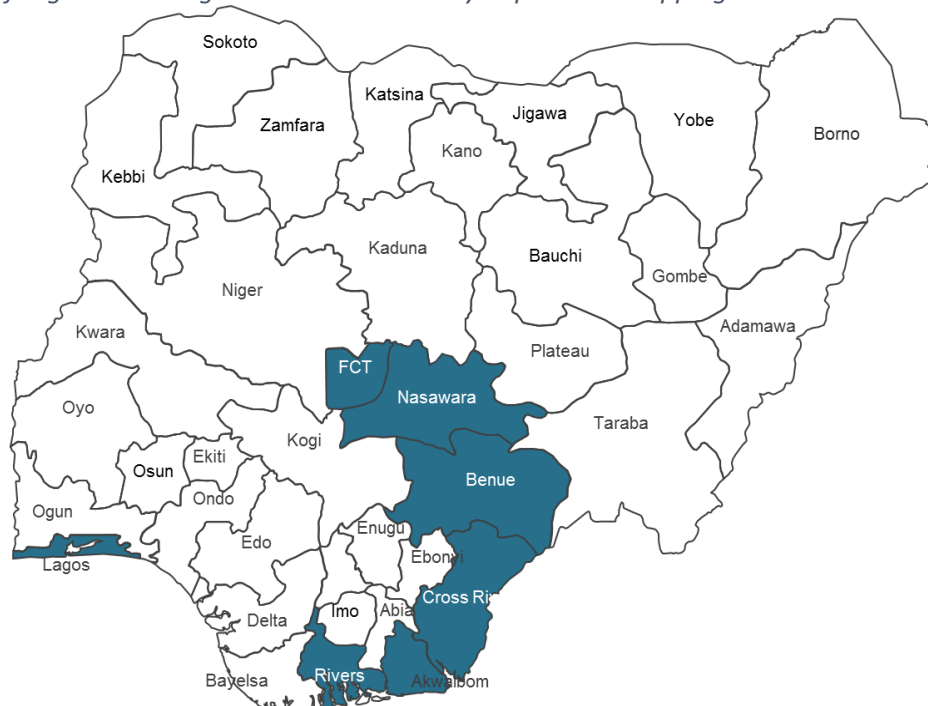
1.5. Study Activity and Timeline

The study comprises three primary data collection activities: formative assessment, hotspot mapping and validation, and MS-CRC. Formative assessment took place in July 2018, followed by hotspot mapping and validation in August 2018, and MS-CRC between October 2018 and January 2019.

	Oct - Dec 2017	Jan - Mar 2018	Apr - Jun 2018	July - Sep 2018	Oct - Dec 2018	Jan -Mar 2019
Protocol and SOP Development	▓	▓	▓			
Formative Assessment				▓		
Hotspot Mapping and Validation				▓		
Multiple- source Capture-recapture					▓	▓

2. Hotspot Mapping and Validation

2.1. Methods

During August 2018, 261 trained KP enumerators from 36 KP-led community-based organizations (CBO) in 6+1 PEPFAR priority states mapped, validated, and profiled all hotspots identified during formative assessment. For each hotspot, enumerators recorded geographic coordinates, peak day/time of KP activity, name, address, and estimated number of KP present. Reconciliation of information obtained from this field exercise was used to sieve out duplicate submissions and verify information submitted between August and November 2018, immediately before the first capture round of MS-CRC.

2.2. Results

Of the 13,899 KP hotspots mapped and validated during the exercise, FSW hotspots accounted for 69.0%, MSM hotspots accounted for 11.3%, and PWID hotspots accounted for 19.6%. Although more hotspots were found in urban areas and state capitals, hotspots were identified in rural areas and the majority of local government areas (LGA) visited. Enumerators found far fewer MSM hotspots compared to FSW and PWID hotspots. The largest number of hotpots were observed in Lagos, Cross River, and Rivers States.

Table 2: Number of Hotspots by Key Population in 6+1 PEPFAR Priority States

	FSW[‡]	MSM[∞]	PWID[*]	Total
Akwa Ibom	708	276	313	1,297
Benue	1,098	265	351	1,714
Cross River	1,782	268	616	2,666
Federal Capital Territory (FCT)	977	116	111	1,204
Lagos	2,603	131	240	2,974
Nasarawa	990	246	314	1,550
Rivers	1,435	275	784	2,494
Total (6+1 PEPFAR priority states)	9,593	1,577	2,729	13,899

[‡] FSW: Female Sex Workers
[∞] MSM: Men who have Sex with Men
[*] PWID: People Who Inject Drugs

Figure 2.1: Number of Hotspots per 100,000 persons by Key Population and LGA in Akwa Ibom State from Hotspot Mapping and Validation, 2018[‡]
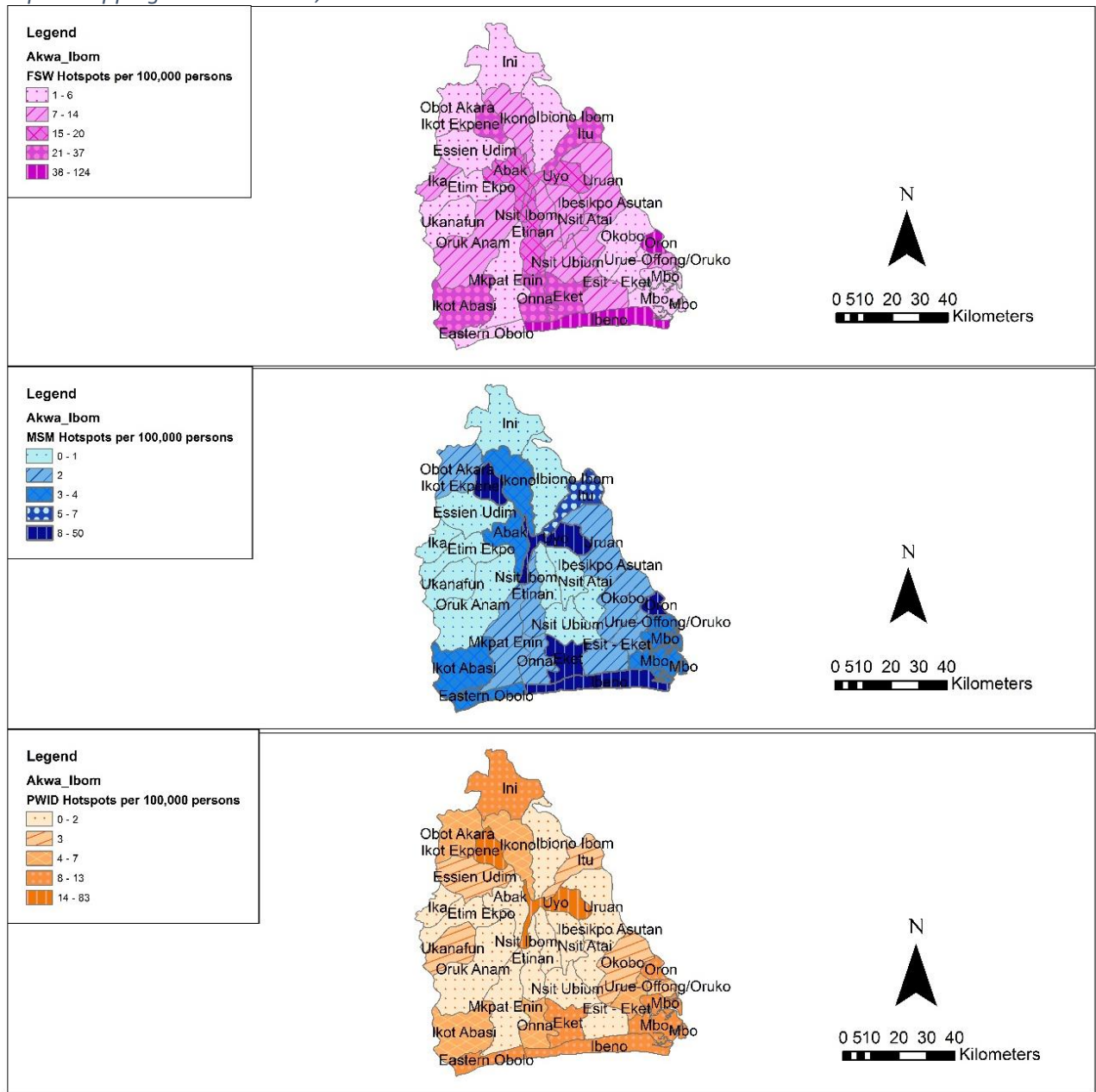
[‡] Number of key population (KP) hotspots presented in the map represent findings at the end of hotspot mapping and validation (HMV), immediately before multiple-source capture-recapture (MS-CRC) activities began. Hotspots are dynamic with frequent changes in activity status. Hotspot mapping, validation, and data reconciliation occurred between August 15th and October 21st 2018. LGA of KP hotspots were as indicated by enumerators. Maps represent number of KP hotspots per 100,000 population across LGA and not number of KPs found across hotspots. Population estimates by LGA were obtained from https://www.citypopulation.de/php/nigeria-admin.php, March 13 2019 as the website to Nigeria National Population Commission was down and not accessible at the time. Shapefile of Nigeria geographic boundaries were obtained from https://data.humdata.org/dataset/nga-administrative-boundaries Office for the Surveyor General of the Federation of Nigeria (OSGOF), Ehealth, United Nations Cartographic Section (UNCS) and were valid as of Feb 23, 2017.

Table 3.1: Number of KP Hotspots per 100,000 persons by LGA in Akwa Ibom State

Local Government Area (LGA)	FSW[‡]		MSM[∞]		PWID[*]		2016 Census Projections[°]
	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	
Abak	31	16	8	4	4	2	195,400
Eastern Obolo	5	6	3	4	7	8	84,300
Eket	63	26	35	14	26	11	242,900
Esit - Eket	7	8	2	2	0	0	89,000
Essien Udim	13	5	3	1	8	3	271,500
Etim Ekpo	8	5	0	0	3	2	148,800
Etinan	35	15	5	2	5	2	237,300
Ibeno	44	42	10	10	13	12	105,100
Ibesikpo Asutan	18	9	1	1	4	2	192,700
Ibiono Ibom	9	3	3	1	4	2	265,000
Ika	12	12	0	0	0	0	102,200
Ikono	20	11	8	4	11	6	185,000
Ikot Abasi	41	22	6	3	8	4	186,300
Ikot Ekpene	43	22	26	13	45	23	198,700
Ini	9	6	1	1	13	9	139,200
Itu	43	24	10	6	6	3	179,600
Mbo	8	6	5	3	15	10	143,500
Mkpat Enin	2	1	4	2	6	2	249,100
Nsit Atai	7	7	0	0	1	1	103,100
Nsit Ibom	15	10	0	0	2	1	151,900
Nsit Ubium	19	11	0	0	0	0	178,500
Obot Akara	5	2	5	2	10	5	206,900
Okobo	1	1	3	2	4	3	144,400
Onna	36	21	3	2	7	4	173,100
Oron	81	66	34	28	16	13	122,500
Oruk Anam	33	14	3	1	5	2	241,400
Udung Uko	5	7	2	3	2	3	74,500
Ukanafun	3	2	0	0	5	3	176,300
Uruan	20	12	3	2	4	2	164,600
Urue-Offong/Oruko	5	5	2	2	6	6	99,400
Uyo	67	16	91	21	73	17	429,900
Total	708	13	276	5	313	6	5,482,200

[‡] FSW: Female Sex Workers
[∞] MSM: Men who have Sex with Men
[*] PWID: People Who Inject Drugs
[°] Population estimates by LGA were obtained on March 13 2019 from https://www.citypopulation.de/php/nigeria-admin.php as the official website to Nigeria National Population Council (NPopC) was down and inaccessible at the time.

Figure 2.2: Number of Hotspots per 100,000 persons by Key Population and LGA in Benue State from Hotspot Mapping and Validation, 2018[‡]
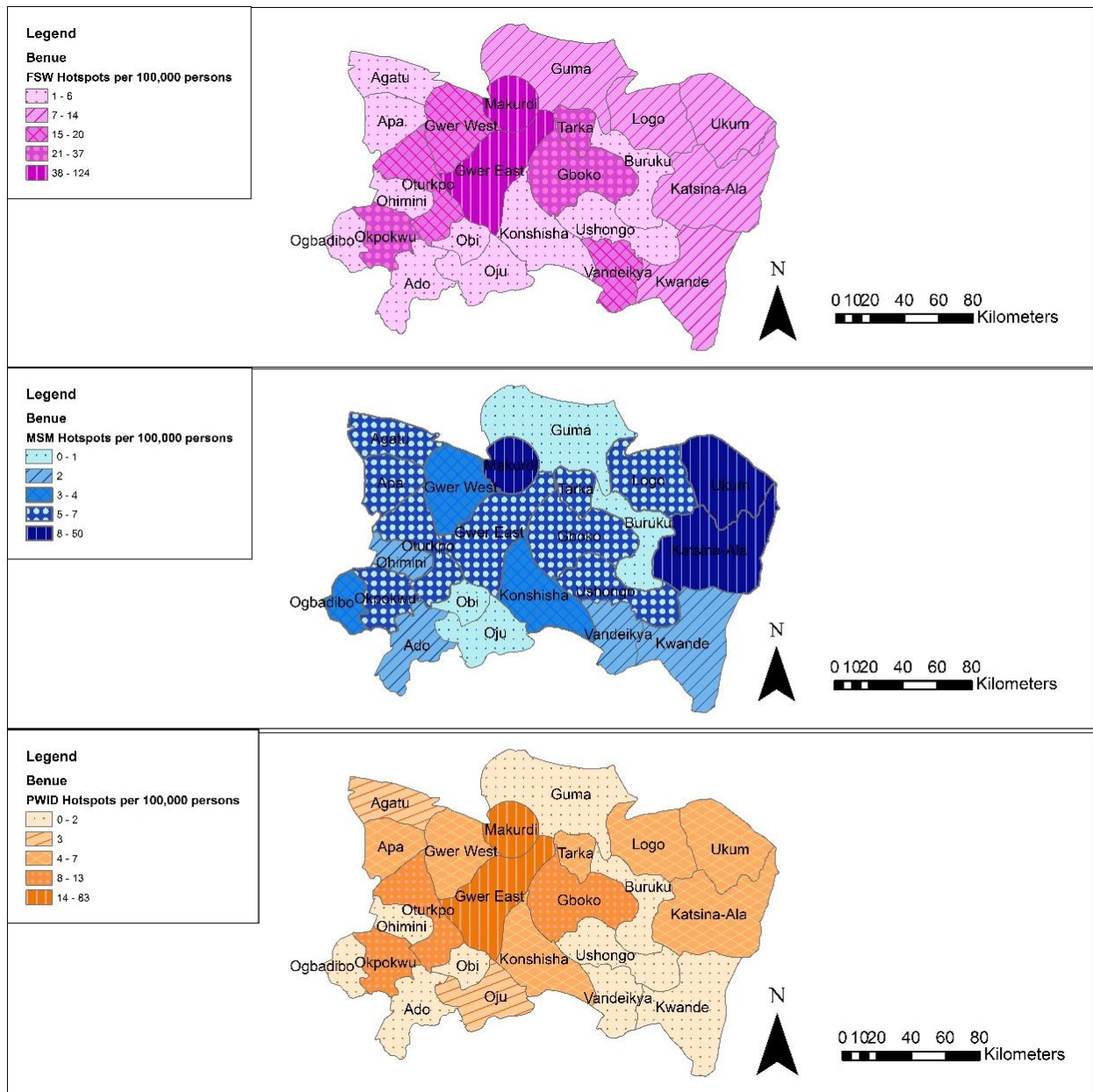
‡ Number of key population (KP) hotspots presented in the map represent findings at the end of hotspot mapping and validation (HMV), immediately before multiple-source capture-recapture (MS-CRC) activities began. Hotspots are dynamic with frequent changes in activity status. Hotspot mapping, validation, and data reconciliation occurred between August 15th and November 4th 2018. LGA of KP hotspots were as indicated by enumerators. Maps represent number of KP hotspots per 100,000 population across LGA and not number of KPs found across hotspots. Population estimates by LGA were obtained from https://www.citypopulation.de/php/nigeria-admin.php, March 13 2019 as the website to Nigeria National Population Commission was down and not accessible at the time. Shapefile of Nigeria geographic boundaries were obtained from https://data.humdata.org/dataset/nga-administrative-boundaries Office for the Surveyor General of the Federation of Nigeria (OSGOF), Ehealth, United Nations Cartographic Section (UNCS) and were valid as of Feb 23, 2017.

Table 3.2: Number of KP Hotspots per 100,000 persons by LGA in Benue State

Local Government Area (LGA)	FSW[‡]		MSM[∞]		PWID[*]		2016 Census Projections[°]
	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	
Ado	3	1	4	2	3	1	248,900
Agatu	1	1	9	6	4	3	156,000
Apa	4	3	9	7	7	5	130,600
Buruku	16	6	3	1	6	2	278,400
Gboko	172	35	24	5	47	10	487,700
Guma	32	12	0	0	5	2	262,100
Gwer East	117	51	17	7	53	23	227,700
Gwer West	29	18	7	4	9	5	165,100
Katsina-Ala	41	13	23	8	11	4	304,400
Konshisha	11	4	9	3	12	4	305,700
Kwande	40	12	8	2	8	2	335,600
Logo	15	7	13	6	14	6	228,900
Makurdi	342	84	47	12	65	16	405,500
Obi	1	1	0	0	1	1	133,200
Ogbadibo	7	4	5	3	2	1	176,800
Ohimini	2	2	2	2	2	2	95,400
Oju	6	3	2	1	7	3	227,400
Okpokwu	61	26	11	5	31	13	237,000
Oturkpo	60	17	18	5	31	9	359,600
Tarka	40	37	8	7	8	7	107,000
Ukum	38	13	26	9	14	5	292,900
Ushongo	3	1	13	5	4	2	259,100
Vandeikya	57	18	7	2	7	2	316,600
Total	1098	19	265	5	351	6	5,741,800

[‡] FSW: Female Sex Workers
[∞] MSM: Men who have Sex with Men
[*] PWID: People Who Inject Drugs
[°]Population estimates by LGA were obtained on March 13 2019 from https://www.citypopulation.de/php/nigeria-admin.php as the official website to Nigeria National Population Council (NPopC) was down and inaccessible at the time.

Figure 2.3: Number of Hotspots per 100,000 persons by Key Population and LGA in Cross River State from Hotspot Mapping and Validation, 2018[‡]
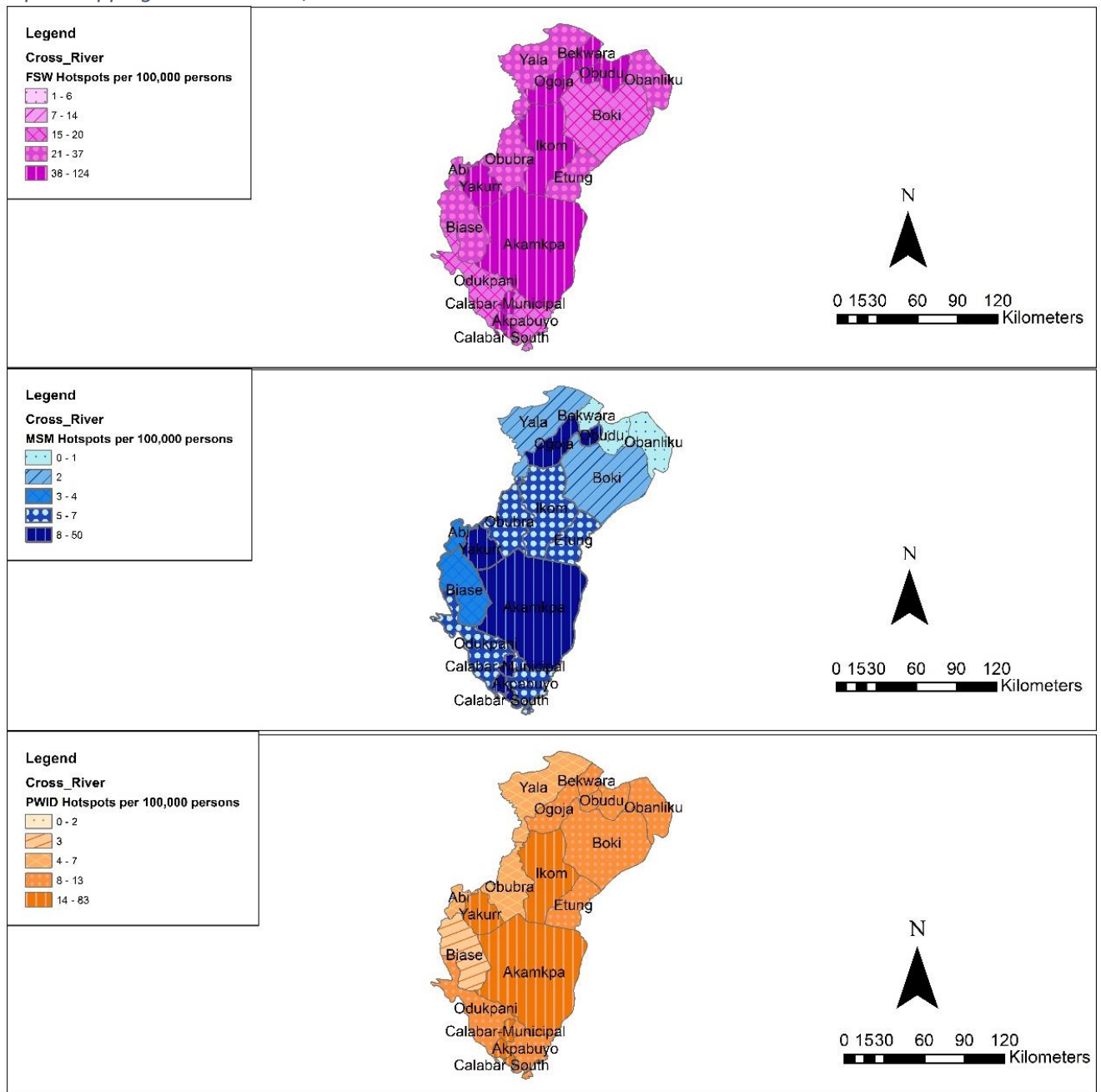
[‡] Number of key population (KP) hotspots presented in the map represent findings at the end of hotspot mapping and validation (HMV), immediately before multiple-source capture-recapture (MS-CRC) activities began. Hotspots are dynamic with frequent changes in activity status. Hotspot mapping, validation, and data reconciliation occurred between August 12th and November 25th 2018. LGA of KP hotspots were as indicated by enumerators. Maps represent number of KP hotspots per 100,000 population across LGA and not number of KPs found across hotspots. Population estimates by LGA were obtained from https://www.citypopulation.de/php/nigeria-admin.php, March 13 2019 as the website to Nigeria National Population Commission was down and not accessible at the time. Shapefile of Nigeria geographic boundaries were obtained from https://data.humdata.org/dataset/nga-administrative-boundaries Office for the Surveyor General of the Federation of Nigeria (OSGOF), Ehealth, United Nations Cartographic Section (UNCS) and were valid as of Feb 23, 2017.

Table 3.3: Number of KP Hotspots per 100,000 persons by LGA in Cross River State

| Local Government Area (LGA) | FSW[‡] | | MSM[∞] | | PWID[*] | | 2016 Census Projections° |
	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	
Abi	43	22	7	4	7	4	192,900
Akamkpa	84	42	31	15	29	14	200,100
Akpabuyo	53	15	20	5	43	12	363,900
Bakassi	48	113	21	50	35	83	42,300
Bekwara	63	45	2	1	15	11	141,000
Biase	68	30	6	3	7	3	224,700
Boki	45	18	5	2	27	11	249,400
Calabar-Municipal	304	124	61	25	92	37	245,500
Calabar South	160	63	22	9	119	47	255,900
Etung	25	23	5	5	14	13	107,000
Ikom	217	99	10	5	54	25	218,800
Obanliku	48	33	0	0	17	12	146,500
Obubra	78	34	11	5	15	7	230,600
Obudu	110	51	1	0	19	9	215,800
Odukpani	49	19	19	7	24	9	257,800
Ogoja	163	71	18	8	30	13	229,300
Yakurr	142	54	23	9	53	20	262,300
Yala	82	29	6	2	16	6	282,700
Total	1782	46	268	7	616	16	3,866,300

[‡] FSW: Female Sex Workers
[∞] MSM: Men who have Sex with Men
[*] PWID: People Who Inject Drugs

°Population estimates by LGA were obtained on March 13 2019 from https://www.citypopulation.de/php/nigeria-admin.php as the official website to Nigeria National Population Council (NPopC) was down and inaccessible at the time.

Figure 2.4: Number of KP hotspots per 100,000 persons by key population and LGA in FCT from Hotspot Mapping and Validation, 2018[‡]
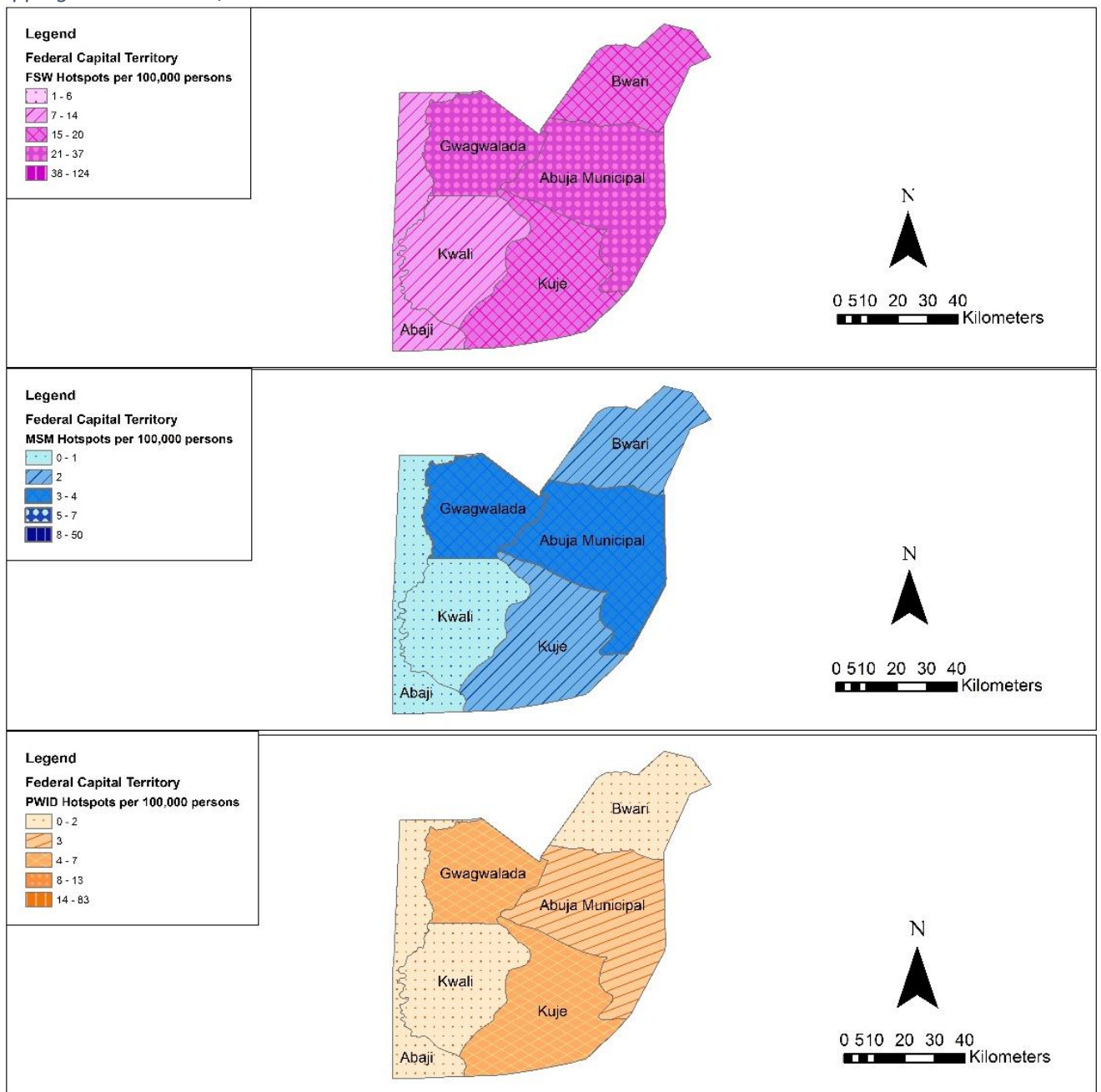
[‡] Number of key population (KP) hotspots presented in the map represent findings at the end of hotspot mapping and validation (HMV), immediately before multiple-source capture-recapture (MS-CRC) activities began. Hotspots are dynamic with frequent changes in activity status. Hotspot mapping, validation, and data reconciliation occurred between August 7th and October 9th 2018. LGA of KP hotspots were as indicated by enumerators. Maps represent number of KP hotspots per 100,000 population across LGA and not number of KPs found across hotspots. Population estimates by LGA were obtained from https://www.citypopulation.de/php/nigeria-admin.php, March 13 2019 as the website to Nigeria National Population Commission was down and not accessible at the time. Shapefile of Nigeria geographic boundaries were obtained from https://data.humdata.org/dataset/nga-administrative-boundaries Office for the Surveyor General of the Federation of Nigeria (OSGOF), Ehealth, United Nations Cartographic Section (UNCS) and were valid as of Feb 23, 2017.

Table 3.4: Number of KP Hotspots per 100,000 persons by LGA in FCT

Local Government Area (LGA)	FSW[‡]		MSM[∞]		PWID[*]		2016 Census Projections[°]
	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	
Abaji	12	8	1	1	1	1	148,600
Abuja Municipal	667	34	79	4	68	3	1,967,500
Bwari	107	18	14	2	12	2	581,100
Gwagwalada	121	30	16	4	17	4	402,000
Kuje	40	16	5	2	9	4	246,400
Kwali	30	14	1	0	4	2	218,400
Total	977	27	116	3	111	3	3,564,100

[‡] FSW: Female Sex Workers
[∞] MSM: Men who have Sex with Men
[*] PWID: People Who Inject Drugs
[°] Population estimates by LGA were obtained on March 13 2019 from https://www.citypopulation.de/php/nigeria-admin.php as the official website to Nigeria National Population Council (NPopC) was down and inaccessible at the time.

Figure 2.5: Number of KP Hotspots per 100,000 persons by key population and LGA in Lagos State from Hotspot Mapping and Validation, 2018[‡]

Table 3.5: Number of KP Hotspots per 100,000 persons by LGA in Lagos State

| Local Government Area (LGA)	FSW[‡]		MSM[∞]		PWID[*]		2016 Census Projections[°]
	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	
Agege	124	19	7	1	39	6	635,900
Ajeromi-Ifelodun	149	16	5	1	5	1	946,500
Alimosho	557	31	7	0	18	1	1,817,200
Amuwo-Odofin	114	25	10	2	10	2	453,000
Apapa	149	49	0	0	11	4	307,100
Badagry	105	32	4	1	6	2	327,400
Epe	13	5	3	1	0	0	250,300
Eti-Osa	203	52	10	3	10	3	390,800
Ibeju/Lekki	28	17	0	0	0	0	162,200
Ifako-Ijaye	167	28	5	1	3	1	589,000
Ikeja	202	46	21	5	34	8	437,400
Ikorodu	116	16	2	0	4	1	727,000
Kosofe	88	9	3	0	17	2	940,300
Lagos Island	42	14	6	2	11	4	292,900
Lagos Mainland	88	20	12	3	5	1	449,900
Mushin	54	6	9	1	30	3	870,100
Ojo	115	14	0	0	4	0	838,900
Oshodi-Isolo	126	15	14	2	17	2	866,300
Shomolu	37	7	5	1	3	1	555,800
Surulere	126	18	8	1	13	2	692,500
Total	2603	21	131	1	240	2	12,550,600

[‡] FSW: Female Sex Workers
[∞] MSM: Men who have Sex with Men
[*] PWID: People Who Inject Drugs
[°]Population estimates by LGA were obtained on March 13 2019 from https://www.citypopulation.de/php/nigeria-admin.php as the official website to Nigeria National Population Council (NPopC) was down and inaccessible at the time.

Figure 2.6: Number of KP Hotspots per 100,000 persons by key population and LGA in Nasarawa State from Hotspot Mapping and Validation, 2018[‡]
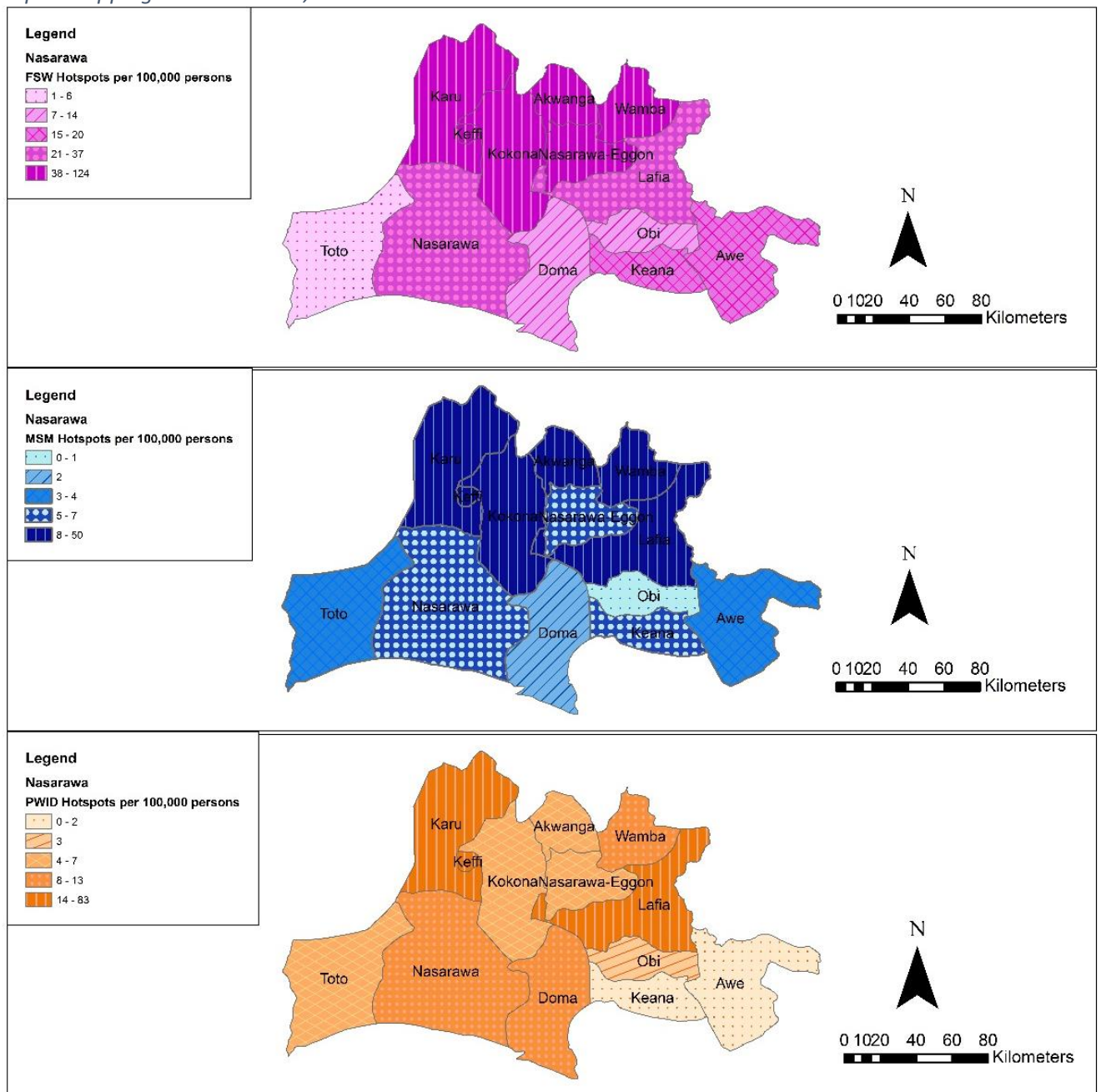
‡ Number of key population (KP) hotspots presented in the map represent findings at the end of hotspot mapping and validation (HMV), immediately before multiple- source capture-recapture (MS-CRC) activities began. Hotspots are dynamic with frequent changes in activity status. Hotspot mapping, validation, and data reconciliation occurred between August 6th and October 27th 2018. LGA of KP hotspots were as indicated by enumerators. Maps represent number of KP hotspots per 100,000 population across LGA and not number of KPs found across hotspots. Population estimates by LGA were obtained from https://www.citypopulation.de/php/nigeria-admin.php, March 13 2019 as the website to Nigeria National Population Commission was down and not accessible at the time. Shapefile of Nigeria geographic boundaries were obtained from https://data.humdata.org/dataset/nga-administrative-boundaries Office for the Surveyor General of the Federation of Nigeria (OSGOF), Ehealth, United Nations Cartographic Section (UNCS) and were valid as of Feb 23, 2017.

Table 3.6: Number of KP Hotspots per 100,000 persons by LGA in Nasarawa State

| Local Government Area (LGA)	FSW[‡]		MSM[∞]		PWID[*]		2016 Census Projections[°]
	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	
Akwanga	119	79	31	21	6	4	151,100
Awe	25	16	4	3	2	1	152,600
Doma	25	13	4	2	22	12	187,600
Karu	251	86	54	18	99	34	291,900
Keana	22	20	6	5	1	1	110,400
Keffi	69	55	39	31	52	42	124,900
Kokona	61	42	13	9	9	6	146,500
Lafia	157	35	49	11	72	16	445,300
Nasarawa	81	32	16	6	20	8	252,700
Nasarawa-Eggon	77	38	13	6	8	4	200,300
Obi	29	14	2	1	6	3	201,100
Toto	10	6	6	4	7	4	160,700
Wamba	64	65	9	9	10	10	98,100
Total	990	39	246	10	314	12	2,523,400

[‡] FSW: Female Sex Workers
[∞] MSM: Men who have Sex with Men
[*] PWID: People Who Inject Drugs

[°]Population estimates by LGA were obtained on March 13 2019 from https://www.citypopulation.de/php/nigeria-admin.php as the official website to Nigeria National Population Council (NPopC) was down and inaccessible at the time.

Figure 2.7: Number of KP Hotspots per 100,000 persons by key population and LGA in Rivers State from Hotspot Mapping and Validation, 2018[‡]
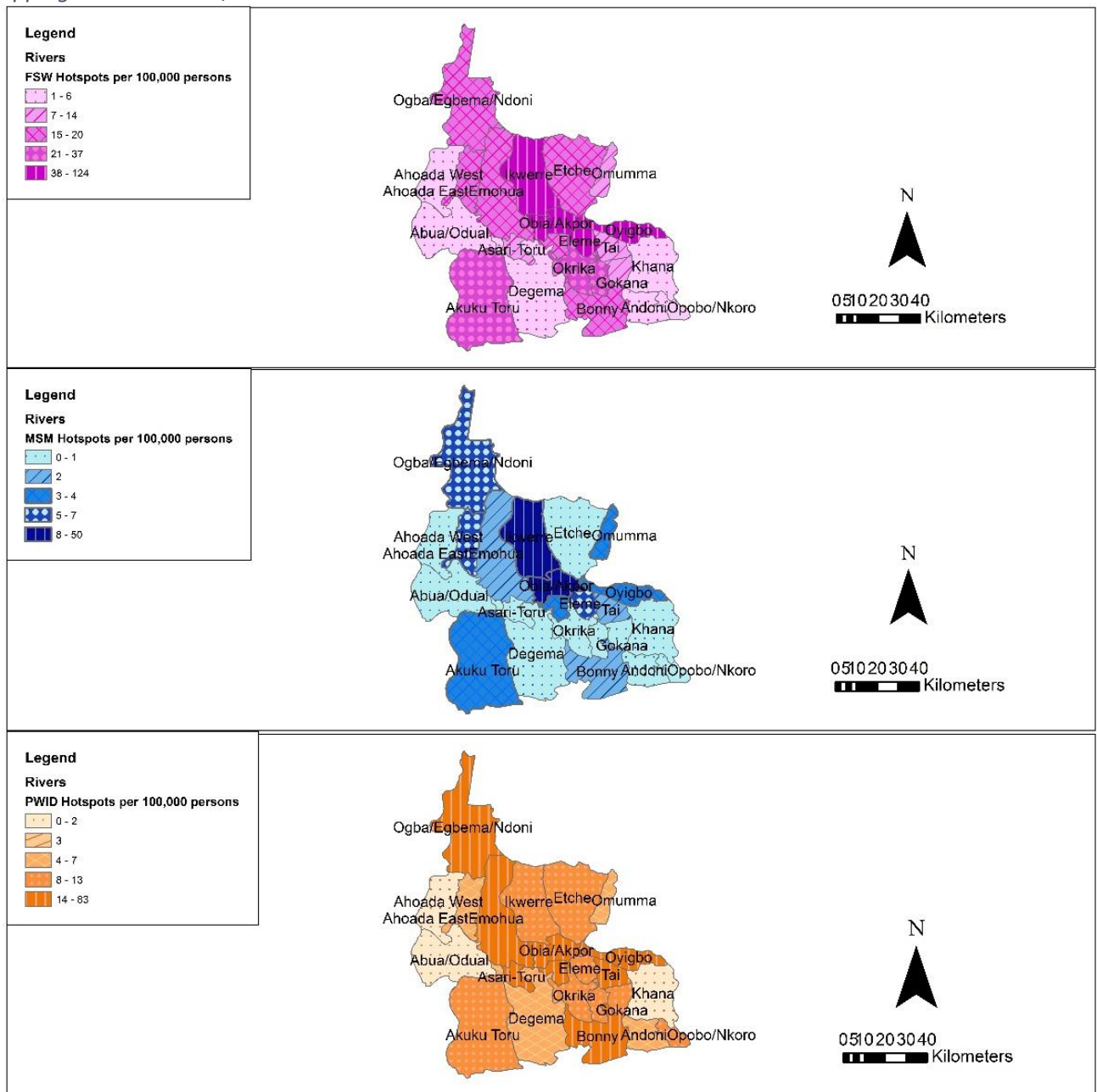
‡ Number of key population (KP) hotspots presented in the map represent findings at the end of hotspot mapping and validation (HMV), immediately before multiple-source capture-recapture (MS-CRC) activities began. Hotspots are dynamic with frequent changes in activity status. Hotspot mapping, validation, and data reconciliation occurred between August 5th and November 20th 2018. LGA of KP hotspots were as indicated by enumerators. Maps represent number of KP hotspots per 100,000 population across LGA and not number of KPs found across hotspots. Population estimates by LGA were obtained from https://www.citypopulation.de/php/nigeria-admin.php, March 13 2019 as the website to Nigeria National Population Commission was down and not accessible at the time. Shapefile of Nigeria geographic boundaries were obtained from https://data.humdata.org/dataset/nga-administrative-boundaries Office for the Surveyor General of the Federation of Nigeria (OSGOF), Ehealth, United Nations Cartographic Section (UNCS) and were valid as of Feb 23, 2017.

Table 3.7: Number of KP Hotspots per 100,000 persons by LGA in Rivers State

| Local Government Area (LGA)	FSW[‡]		MSM[∞]		PWID[*]		2016 Census Projections°
	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	Number of Hotspots	Hotspots per 100,000 persons	
Abua/Odual	14	4	3	1	7	2	396,800
Ahoada East	44	19	11	5	17	7	233,700
Ahoada West	18	5	4	1	7	2	350,200
Akuku Toru	58	26	8	4	24	11	226,300
Andoni	15	5	2	1	17	6	306,200
Asari-Toru	33	11	0	0	58	19	308,800
Bonny	61	20	5	2	52	17	302,000
Degema	20	6	0	0	23	7	350,500
Eleme	117	44	20	7	36	13	267,200
Emohua	41	15	6	2	42	15	282,500
Etche	57	16	0	0	40	11	351,200
Gokana	33	10	2	1	31	9	328,500
Ikwerre	101	38	20	8	35	13	265,400
Khana	16	4	5	1	2	0	411,500
Obia/Akpor	377	58	115	18	96	15	649,600
Ogba/Egbema/Ndoni	58	15	18	5	62	16	398,000
Ogu/Bolo	24	23	0	0	8	8	105,800
Okrika	96	31	4	1	26	8	312,300
Omumma	14	10	6	4	7	5	141,000
Opobo/Nkoro	9	4	2	1	19	9	214,700
Oyigbo	76	43	7	4	34	19	176,100
Port-Harcourt	140	19	34	4	108	14	756,600
Tai	13	8	3	2	33	20	169,000
Total	1435	20	275	4	784	11	7,303,900

[‡] FSW: Female Sex Workers
[∞] MSM: Men who have Sex with Men
[*] PWID: People Who Inject Drugs

°Population estimates by LGA were obtained on March 13 2019 from https://www.citypopulation.de/php/nigeria-admin.php as the official website to Nigeria National Population Council (NPopC) was down and inaccessible at the time.

For this study, the following definitions were used: 'Street/public place' was defined as any outdoor area accessible to the public. These included streets, under bridges, organized motor parks, unnamed drinking places, mechanic villages, and bus stops. 'Hostel/campus' was defined as an area near student living apartment/hostels of a secondary, polytechnic, or university level academic institution meant for student relaxation, academic and/or social meetings. KP hotspots not captured in the categories as described in the protocol were classified as 'Other'. These included car wash, shops, bakeries, and health facilities providing services to KP, e.g., U.S. Government (USG) supported One-stop Shops (OSS). Figures 3.1 to 3.3 and tables 5.1 to 5.3 show the proportion of each type of hotspot found for each KP group.

Figure 3.1: Type of FSW Hotspots by State
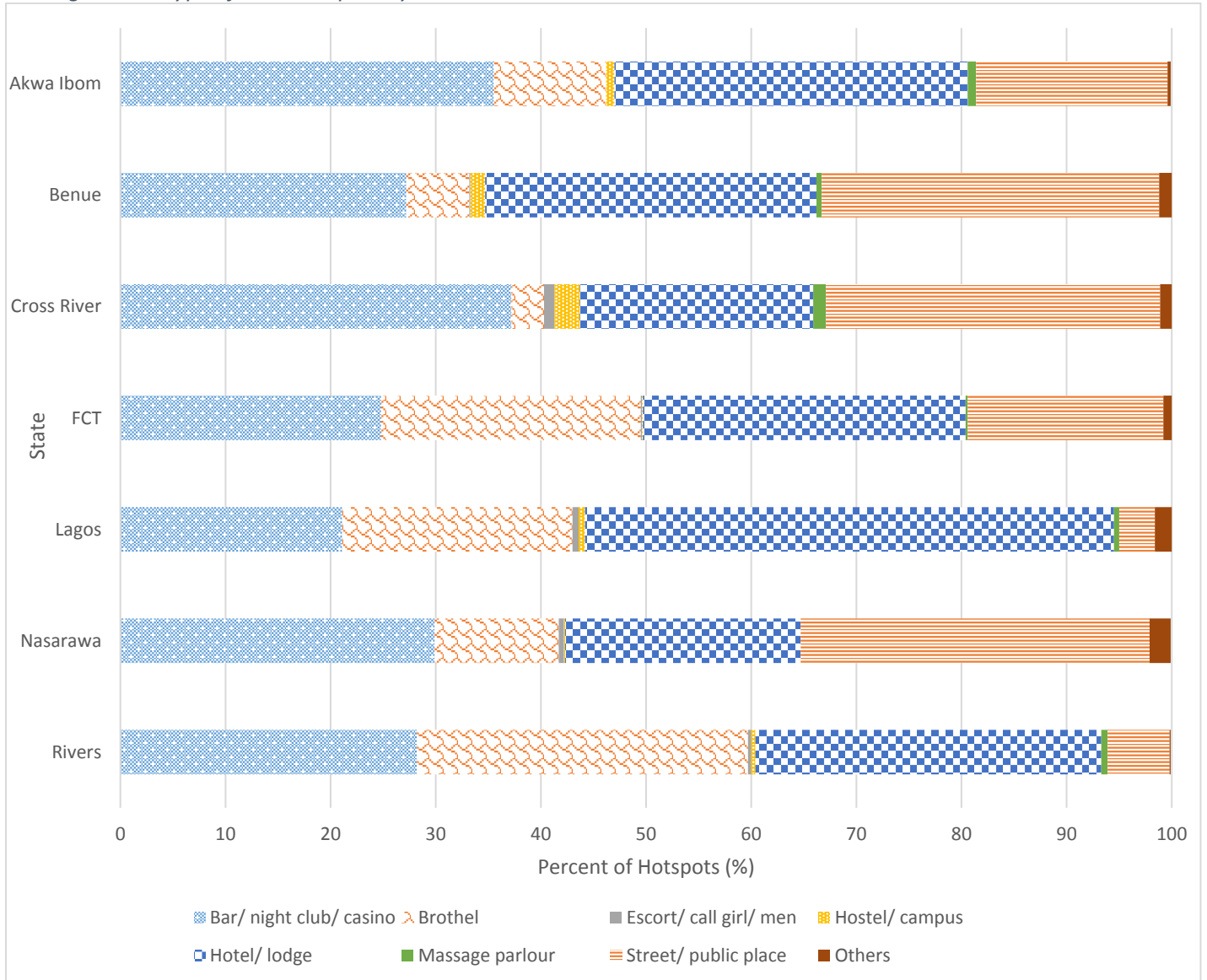
Examples of other hotspot types include restaurants and gardens.

Table 4.1: Type of FSW Hotspots by State

	Akwa Ibom		Benue		Cross River		FCT		Lagos		Nasarawa		Rivers	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Bar/ night club/ casino	251	35.5	299	27.2	657	37.2	242	24.8	545	21.1	296	29.9	403	28.2
Brothel	76	10.7	66	6.0	54	3.1	241	24.7	565	21.9	117	11.8	450	31.5
Escort/ call girls/ men	0	0.0	1	0.1	17	1.0	1	0.1	16	0.6	5	0.5	4	0.3
Hostel/ campus	6	0.8	15	1.4	43	2.4	1	0.1	16	0.6	1	0.1	6	0.4
Hotel/ lodge	238	33.6	346	31.5	392	22.2	300	30.7	1,298	50.3	222	22.4	470	32.9
Massage parlour	6	0.8	6	0.5	22	1.2	2	0.2	12	0.5	0	0.0	9	0.6
Street/ public place	129	18.2	352	32.1	562	31.8	182	18.6	87	3.4	328	33.2	85	5.9
Other	2	0.3	13	1.2	19	1.1	8	0.8	41	1.6	20	2.0	2	0.1
Total	708	100.0	1,098	100.0	1,766	100.0	977	100.0	2,581	100.0	989	100.0	1,429	100.0
Missing	0		0		16		0		22		1		6	

Due to rounding, percentages may not sum to 100%

Figure 3.2: Type of MSM Hotspots by State
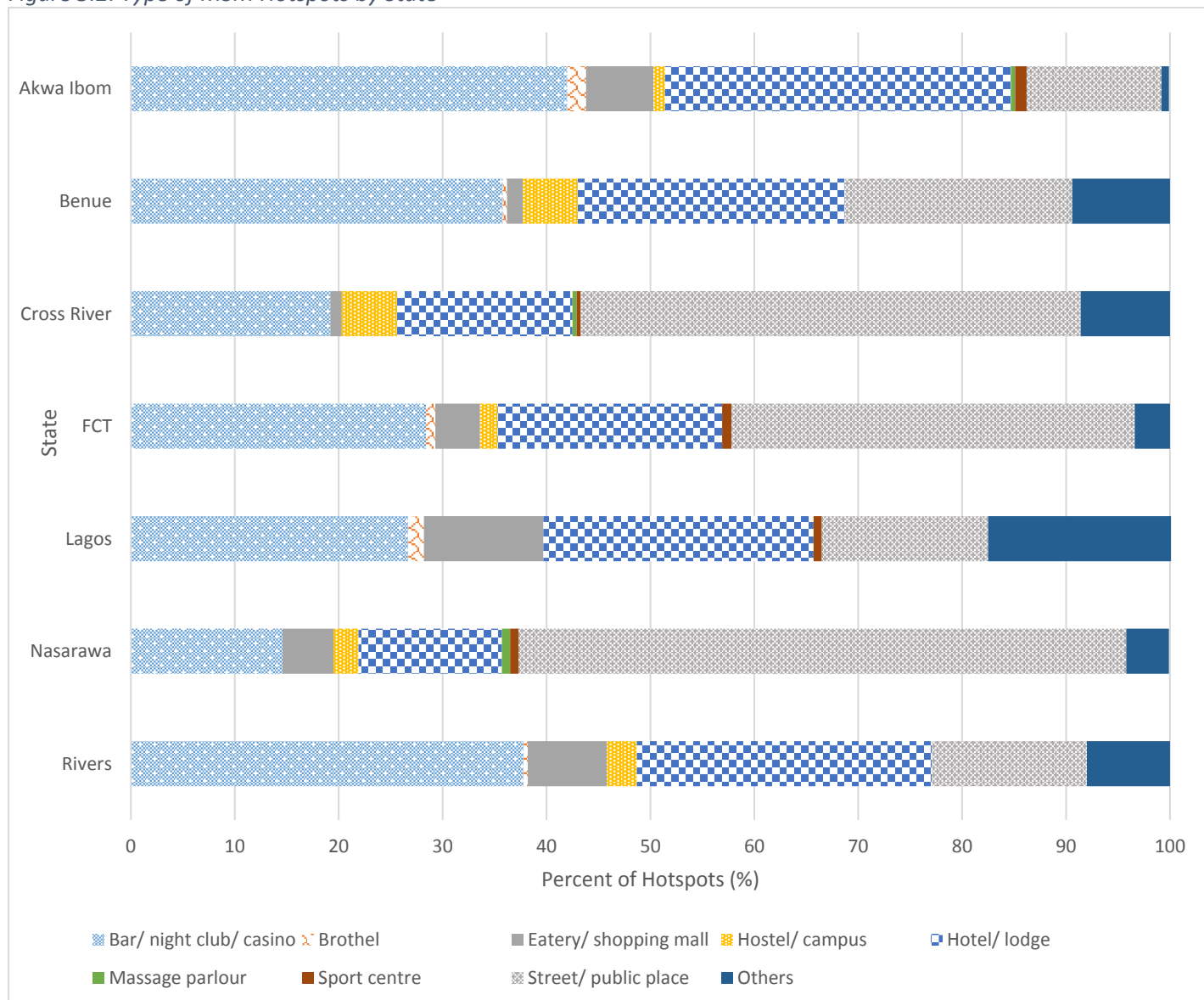
Examples of other hotspot types include health facilities and primary schools.

Table 4.2: Type of MSM Hotspots by State

	Akwa Ibom		Benue		Cross River		FCT		Lagos		Nasarawa		Rivers	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Bar/ night club/ casino	116	42.0	95	35.8	51	19.2	33	28.4	35	26.7	36	14.6	104	37.8
Brothel	5	1.8	1	0.4	0	0.0	1	0.9	2	1.5	0	0.0	1	0.4
Eatery/ shopping mall	18	6.5	4	1.5	3	1.1	5	4.3	15	11.5	12	4.9	21	7.6
Hostel/ campus	3	1.1	14	5.3	14	5.3	2	1.7	0	0.0	6	2.4	8	2.9
Hotel/ lodge	92	33.3	68	25.7	45	16.9	25	21.6	34	26.0	34	13.8	78	28.4
Massage parlour	1	0.4	0	0.0	1	0.4	0	0.0	0	0.0	2	0.8	0	0.0
Sport centre	3	1.1	0	0.0	1	0.4	1	0.9	1	0.8	2	0.8	0	0.0
Street/ public place	36	13.0	58	21.9	128	48.1	45	38.8	21	16.0	144	58.5	41	14.9
Other	2	0.7	25	9.4	23	8.6	4	3.4	23	17.6	10	4.1	22	8.0
Missing	0		0		2		0		0		0		0	

Due to rounding, percentages may not sum to 100%

Figure 3.3: Type of PWID Hotspots by State
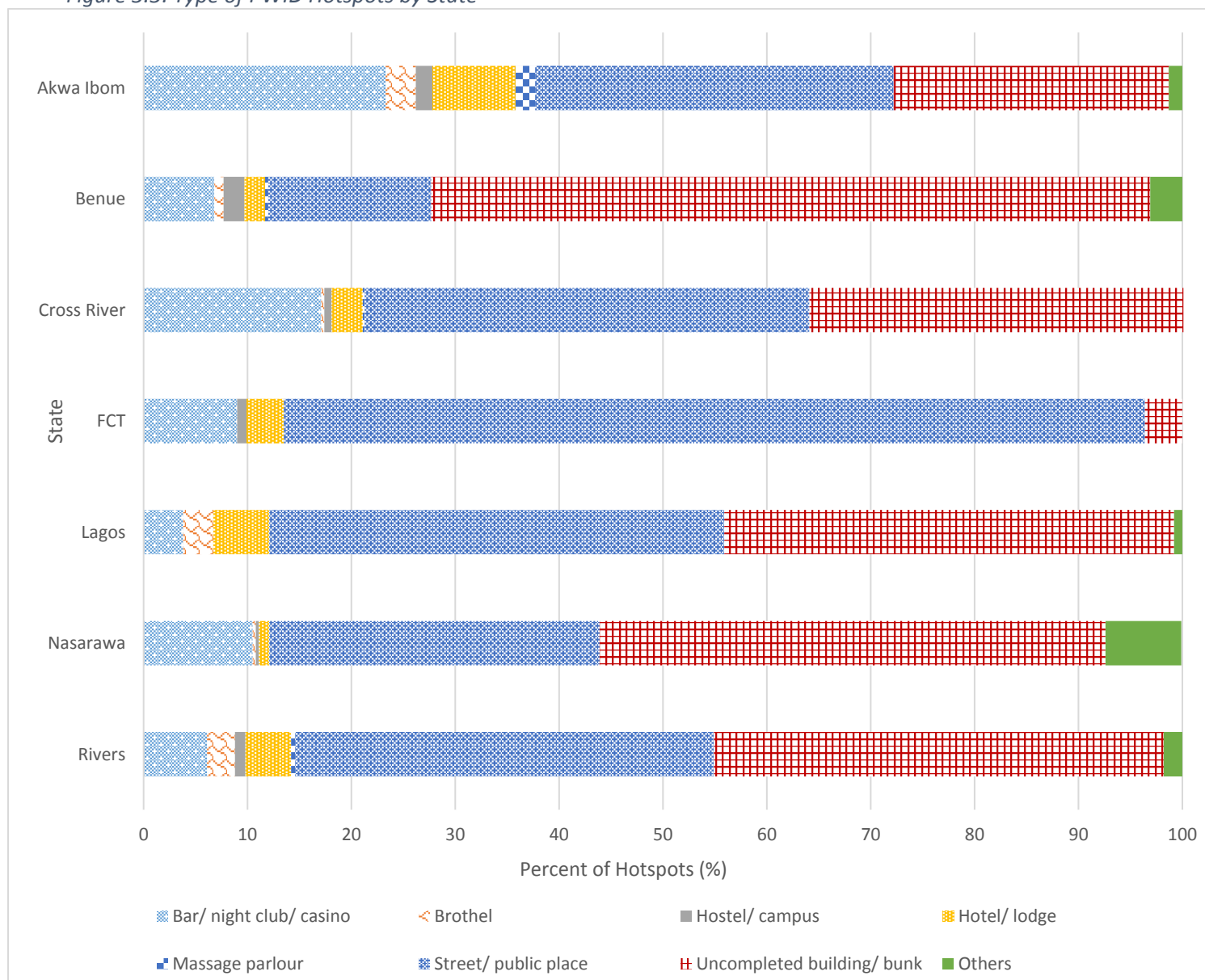
Examples of other hotspot types include under mango trees, cemeteries, and primary schools.

Table 4.3: Type of PWID Hotspots by State

	Akwa Ibom		Benue		Cross River		FCT		Lagos		Nasarawa		Rivers	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Bar/ night club/ casino	73	23.3	24	6.8	104	17.1	10	9.0	9	3.8	33	10.5	48	6.1
Brothel	9	2.9	3	0.9	2	0.3	0	0.0	7	2.9	1	0.3	21	2.7
Hostel/ campus	5	1.6	7	2.0	4	0.7	1	0.9	0	0.0	1	0.3	8	1.0
Hotel/ lodge	25	8.0	7	2.0	18	3.0	4	3.6	13	5.4	3	1.0	34	4.4
Massage parlour	6	1.9	1	0.3	1	0.2	0	0.0	0	0.0	0	0.0	3	0.4
Street/ public place	108	34.5	55	15.7	260	42.8	92	82.9	105	43.8	100	31.8	315	40.3
Uncompleted building/ bunk	83	26.5	243	69.2	219	36.0	4	3.6	104	43.3	153	48.7	338	43.3
Other	4	1.3	11	3.1	0	0.0	0	0.0	2	0.8	23	7.3	14	1.8
Total	313	100.0	351	100.0	608	100.0	111	100.0	240	100.0	314	100.0	781	100.0
Missing	0		0		8		0		0		0		3	

Due to rounding, percentages may not sum to 100%

Tables 5.1 to 5.7 show the most commonly reported peak KP activity period by each KP group and type of hotspot in the 6+1 states. Morning was defined as any time before 12 noon, afternoon between 12pm to 5pm, evening between 5pm to 9pm, and night as any time after 9pm. Fields are listed as N/A if the hotspot type did not apply to the corresponding state and/or KP group; e.g., sport centres were not identified as hotspots for FSW or PWID.

Table 5.1: Most Commonly Reported Peak KP Activity Period in Akwa Ibom State

	FSW	MSM	PWID
Bar/ night club/casino	Friday Evening	Friday Evening	Friday Evening
Brothel	Friday Evening	Wednesday Night	Tuesday Evening
Eatery/ shopping mall	N/A	Friday Afternoon	N/A
Escort/ call girl/ men	N/A	N/A	N/A
Hostel/ campus	Friday Evening	Tuesday Afternoon	Wednesday Morning
Hotel/ lodge	Friday Evening	Friday Evening	Friday Evening
Massage parlour	Friday Evening	Sunday Evening	Wednesday Evening
Sport centre	N/A	Friday Afternoon	N/A
Street/ public place	Friday Evening	Friday Evening	Friday Evening
Uncompleted building/ bunk	N/A	N/A	Friday Evening
Other*	Friday Night	Friday Evening	Tuesday Evening

*Other hotspot types include gardens, health facilities, and primary schools.

Table 5.2: Most Commonly Reported Peak KP Activity Period in Benue State

	FSW	MSM	PWID
Bar/ night club/ casino	Friday Evening	Friday Evening	Friday Night
Brothel	Friday Evening	Saturday Evening	Sunday Morning
Eatery/ shopping mall	N/A	Wednesday Night	N/A
Escort/ call girl/ men	Friday Evening	N/A	N/A
Hostel/ campus	Saturday Night	Friday Evening	Monday Evening
Hotel/ lodge	Friday Evening	Friday Evening	Wednesday Night
Massage parlour	Friday Evening	N/A	Friday Evening
Sport centre	N/A	N/A	N/A
Street/ public place	Friday Evening	Wednesday Evening	Wednesday Evening
Uncompleted building/ bunk	N/A	N/A	Friday Evening
Other*	Wednesday Afternoon	Friday Evening	Friday Night

*Other hotspot types include gardens, health facilities, and primary schools.

Table 5.3: Most Commonly Reported Peak KP Activity Period in Cross River State

	FSW	MSM	PWID
Bar/ night club/ casino	Friday Evening	Sunday Evening	Wednesday Evening
Brothel	Friday Evening	N/A	Monday Morning
Eatery/ shopping mall	N/A	Thursday Evening	N/A
Escort/ call girl/ men	Tuesday Evening	N/A	N/A
Hostel/ campus	Friday Evening	Monday Morning	Wednesday Evening
Hotel/ lodge	Friday Evening	Sunday Evening	Tuesday Evening
Massage parlour	Wednesday Night	Friday Evening	Monday Evening
Sport centre	N/A	Friday Morning	N/A
Street/ public place	Friday Evening	Monday Evening	Monday Evening
Uncompleted building/ bunk	N/A	N/A	Wednesday Evening
Other*	Friday Evening	Monday Morning	N/A

*Other hotspot types include gardens, health facilities, and primary schools.

Table 5.4: Most Commonly Reported Peak KP Activity Period in FCT

	FSW	MSM	PWID
Bar/ night club/ casino	Friday Evening	Friday Evening	Wednesday Night
Brothel	Friday Evening	Wednesday Night	N/A
Eatery/ shopping mall	N/A	Friday Evening	N/A
Escort/ call girl/ men	Friday Night	N/A	N/A
Hostel/ campus	Friday Afternoon	Wednesday Morning	Wednesday Evening
Hotel/ lodge	Friday Evening	Friday Night	Thursday Night
Massage parlour	Friday Evening	N/A	N/A
Sport centre	N/A	Friday Evening	N/A
Street/ public place	Friday Night	Friday Evening	Friday Evening
Uncompleted building/ bunk	N/A	N/A	Friday Evening
Other*	Friday Evening	Friday Evening	N/A

*Other hotspot types include gardens, health facilities, and primary schools.

Table 5.5: Most Commonly Reported Peak KP Activity Period in Lagos State

	FSW	MSM	PWID
Bar/ night club/ casino	Friday Evening	Friday Night	Friday Evening
Brothel	Friday Night	Friday Night	Saturday Morning
Eatery/ shopping mall	N/A	Friday Evening	N/A
Escort/ call girl/ men	Friday Evening	N/A	N/A
Hostel/ campus	Thursday Evening	N/A	N/A
Hotel/ lodge	Friday Night	Friday Night	Friday Night
Massage parlour	Friday Night	N/A	N/A
Sport centre	N/A	Monday Evening	N/A
Street/ public place	Friday Night	Friday Night	Friday Night
Uncompleted building/ bunk	Monday Morning	N/A	Friday Afternoon
Other*	Friday Night	Saturday Afternoon	Thursday Evening

*Other hotspot types include gardens, health facilities, and primary schools.

Table 5.6: Most Commonly Reported Peak KP Activity Period in Nasarawa State

	FSW	MSM	PWID
Bar/ night club/ casino	Friday Evening	Friday Evening	Friday Evening
Brothel	Friday Evening	N/A	Monday Night
Eatery/ shopping mall	N/A	Friday Evening	N/A
Escort/ call girl/ men	Friday Night	N/A	N/A
Hostel/ campus	Thursday Night	Friday Evening	Monday Afternoon
Hotel/ lodge	Friday Evening	Saturday Night	Thursday Night
Massage parlour	N/A	Wednesday Evening	N/A
Sport centre	N/A	Saturday Evening	N/A
Street/ public place	Friday Evening	Friday Evening	Friday Night
Uncompleted building/ bunk	N/A	N/A	Monday Evening
Other*	Friday Evening	Saturday Evening	Friday Evening

*Other hotspot types include gardens, health facilities, and primary schools.

Table 5.7: Most Commonly Reported Peak KP Activity Period in Rivers State

	FSW	MSM	PWID
Bar/ night club/ casino	Friday Evening	Friday Evening	Monday Afternoon
Brothel	Friday Evening	Wednesday Evening	Monday Evening
Eatery/ shopping mall	N/A	Monday Morning	N/A
Escort/ call girls/ men	Friday Evening	N/A	N/A
Hostel/ campus	Friday Evening	Tuesday Evening	Friday Evening
Hotel/ lodge	Friday Evening	Friday Evening	Monday Evening
Massage parlour	Friday Evening	N/A	Wednesday Morning
Sport centre	N/A	N/A	N/A
Street/ public place	Friday Night	Friday Evening	Monday Evening
Uncompleted building/ bunk	N/A	N/A	Monday Evening
Other*	Friday Evening	Wednesday Evening	Tuesday Evening

*Other hotspot types include gardens, health facilities, and primary schools.

2.3. Challenges and Limitations

Hotspots are dynamic. Some previously enumerated hotspots had either closed or moved prior to the mapping and validation exercise. In total, 528 hotspots were closed, moved, or absent of KP-defining activity between hotspot mapping and the third capture round of MS-CRC. Formative assessment activities included updating lists of hotspots and there were challenges including duplicate or inaccurate information (names, nicknames, and addresses) and inaccessibility due to security challenges and inclement weather conditions. These challenges affected a negligible number of hotspots and are unlikely to have impacted the results of this study.

3. Multiple-source capture-recapture (MS-CRC)

Multiple-source capture-recapture methodology was used to estimate the population size of FSW, MSM and PWID. This method determines population sizes based on identifying individuals who appear in one, two, three or more "captures" within a specified timeframe. Individuals were offered inexpensive, but memorable unique objects. If the respondent accepted the object, he/she was considered "tagged" and, in each round, the aggregate number of those who are newly tagged or are "recaptures" from previous round(s) were ascertained. This method allows estimation of the number who have not been captured, and then consolidates estimates of the "unobserved" with counts of the "observed" to estimate total population size. Adding one or more sources to traditional (two sources) capture-recapture studies strengthens the design and produces more robust estimates. Furthermore, the assumption of source independence is also relaxed with the additional sources as Bayesian latent-class models account for heterogeneity of capture probabilities[7].

Assumptions for all capture-recapture[8]

- All identified individuals meet the target population definition
- Each "capture" and "recapture" are correctly identified
- Homogeneity of capture probabilities; each population member has an equal chance of being captured
- Data sources, or captures, are independent and not correlated
- The study population remains constant over the study period; no migration in or out of the population

3.1. Methods

Between October and December 2018, we sampled FSW, MSM, and PWID during three independent captures in active hotspots identified during the mapping and validation activity. During encounters in KP hotspots, distributors offered inexpensive and memorable objects to FSW, MSM, and PWID that were unique to each round of capture and KP. Eligible respondents who consented were considered enrolled in this population size estimation activity. In subsequent rounds, 1-2 weeks apart, participants were asked to describe objects they had received during previous rounds, and affirmative responses were tallied upon correct identification of the object. Distributors recorded information on tablets with REDCap software and uploaded to a secure central server after each encounter. Data were aggregated by state, KP, age group, and sex (where applicable) for analysis. PSE were derived using Bayesian nonparametric latent class models for three-source CRC (3S-CRC)

Table 6: Summary of Unique Objects Distributed During Each Round of Capture

Round of Capture	Distribute	Inquire about having previously received:
Capture 1 (C^1)	Tag 1	
Capture 2 (C^2)	Tag 2	Tag 1
Capture 3 (C^3)	Tag 3	Tag 1 and/or tag 2
Capture 4 (C^4) (facility-based capture)	Tag 4 (catchphrase)	Tag 1, tag 2, and/or tag 3

Key population members between 15 and 17 years of age who identified as sex workers, victims of violence, or victims of human trafficking received referrals to local organizations that provide relevant support services.

Referral forms documented the date of the referral, name of local organization, type of services provided by the organization, and a unique, alphanumeric referral code. Organizations were contacted by CBO partners at weeks 1, 4, and 7 after the referral, using the referral code to determine if the KP member had accessed support services at the facility.

3.2. Study Population

Eligible participants were at least 15 years of age, displayed understanding of study objectives, consented to participate, had not already been captured in the current round of MS-CRC, accepted the unique object/ tag distributed by enumerators, and self-reported engaging in KP-defining behaviour within the previous 12 months (section 1.3).

To satisfy the assumption of homogeneous capture probability across data sources, analyses were restricted to individuals who were captured/ recaptured at hotspots that were visited in all three rounds of venue-based MS-CRC. In other words, if a hotspot was not visited in the second round of MS-CRC, any individuals captured/ recaptured at that hotspot in rounds 1 or 3 were excluded.

3.3. Data Analysis

Participant-level data from REDCap was exported into SAS and exclusion criteria were applied. Participants were subset by state, KP group, age, and sex (where applicable), and aggregated datasets detailing counts of each capture/ recapture combination were produced for each subset. Bayesian nonparametric latent-class models were used to produce PSE from aggregate data sets. A maximum of 10 latent components were specified for each model. Sampling parameters for each PSE included 100,000 samples from the posterior distribution using Markov Chain Monte Carlo computation, thinning was set to 100 (higher if effective sample size was too small), and burn in was at least 10,000 to promote unbiased estimates. All analyses were performed using the Latent-class model for capture-recapture (LCMCR) package in R version 3.4.4. PSE median population size with 95% credible sets for three-source and four-source CRC were output for each KP by state. The posterior distribution for latent-class models were very skewed, producing very wide credible intervals with a long tail. To facilitate interpretation of results and application of estimates for programs, we calculated 80% highest density intervals and presented those in this report.

3.4. Results

In total, 310,140 encounters from capture rounds one, two, and three of MS-CRC were included in analyses (all states and KP groups).

Table 7: Number of Encounters by State and KP Group

State	KP Group			
	FSW[‡]	MSM[∞]	PWID[*]	Total
Akwa Ibom	32,635	11,760	14,659	59,054
Benue	35,284	9,726	14,059	59,069
Cross River	13,344	3,670	10,142	27,156
FCT	25,800	3,427	3,076	32,303
Lagos	36,147	2,444	7,363	45,954
Nasarawa	25,609	4,600	9,790	39,999
Rivers	30,447	7,733	8,425	46,605
Total	**199,266**	**43,360**	**67,514**	**310,140**

[‡] FSW: Female Sex Workers
[∞] MSM: Men who have Sex with Men
[*] PWID: People Who Inject Drugs
These figures represent enrolment per round of data collection, not size estimates.

Key population members were enrolled into the study if they were eligible, consented to participation, and accepted the unique object. There were 88,805 individuals excluded due to ineligibility or non-consent, including 74,349 captures/ recaptures from hotspots that were not visited in all three rounds of MS-CRC. This

is described in greater detail in the challenges and limitations section. Round four, facility-based encounters, defined as a phone call from a KP-friendly facility staff to KP clients who had presented at the clinic within the previous six months, were also excluded from PSE. Despite overlap in catchment areas, data suggested minimal interaction between the facility-based and hotspot-based members of each of the KP from the first three rounds. Section 4.5 provides additional detail and justification.

Tables 8.1 to 14.7 detail demographic characteristics of enrollees, summaries of enrolment, and age-stratified PSE for each state. Demographic results were stratified by state and KP group, and only the first capture of each participant was included in analysis to avoid double-counting individuals who were captured in multiple rounds. Newly captured participants refer to individuals who did not recall accepting an item from an enumerator. Median and interquartile range (IQR) of age, and frequencies by age group, highest education level, and primary occupation were evaluated for newly captured participants. Note that highest education level does not necessitate completion/ degree attainment. Demographic tables for MSM and PWID also describe self-reported engagement in sex work, and sex at birth was included for PWID.

Age-stratified PSE are provided for all KP groups, with PWID PSE additionally stratified by sex at birth. Enrolled participants were at least 15 years of age, self-reported sex in exchange for money or gifts within the previous 12 months (FSW), anal or oral sex with another man within the past 12 months (MSM), and/or injection drug use within the previous 12 months (PWID), displayed understanding the study objective, consented to participate, had not already been captured in the current round of MS-CRC, and accepted the unique object/tag distributed by enumerators. Born-male FSW and born-female MSM were excluded from PSE as there were not enough encounters to generate separate, reliable PSE. All numbers reflect newly captured and recaptured participants.

Median PSE rounded to the nearest hundred with 80% highest density intervals are presented for each KP by state. Results are presented in context of the 2015 National Population Commission (NPopC) of Nigeria general population census projections to aid interpretation. In the right-most column of each table, the proportion of KPSE relative to the general population was calculated (median PSE divided by the corresponding NPopC general population census projection). All models were run using data from rounds one, two, and three of venue-based MS-CRC. Data collected during round four (i.e., facility-based MS-CRC) was excluded from analysis.

Helpful Tips for Interpreting Population Size Estimates

- These are model-based estimates and not census counts or enumerations of KP members.
- The study was conducted in six unique and independent states and FCT. Results are not meant to be combined to represent a regional or national PSE.
- Population size estimates are presented with highest density intervals to support flexible program planning and adjustment.

3.4.1. Akwa Ibom

Table 8.1: Demographic Characteristics of Newly Captured FSW from Rounds 1-3 of Venue-based Capture-recapture in Akwa Ibom State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	26 (24-31)
Age group (years)	15-19	310 (1)
	20-24	6,877 (30)
	25-34	12,870 (56)
	35+	3,049 (13)
Highest education level	Never attended school	528 (2)
	Quranic only	6 (0)
	Primary	1,407 (6)
	Junior Secondary School	4,188 (18)
	Senior Secondary School	11,253 (49)
	Higher than Senior Secondary School	5,313 (23)
	Don't know	122 (1)
	Refused	290 (1)
Primary occupation	Not working	643 (3)
	Pupil/ student	327 (1)
	Professional career	578 (3)
	Self-employed student	1,091 (5)
	Petty trading	1,433 (6)
	Entertainment/ service/ bar/ restaurant/ hotel	1,784 (8)
	Sex work	16,907 (73)
	Other[‡]	29 (0)
	Don't know	24 (0)
	Refused	289 (1)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and hair dressing

Table 8.2: Demographic Characteristics of Newly Captured MSM from Rounds 1-3 of Venue-based Capture-recapture in Akwa Ibom State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	26 (23-29)
Age group (years)	15-19	361 (4)
	20-24	3,009 (32)
	25-34	5,313 (57)
	35+	601 (6)
Highest education level	Never attended school	71 (1)
	Quranic only	7 (0)
	Primary	50 (1)
	Junior Secondary School	672 (7)
	Senior Secondary School	4,349 (47)
	Higher than Senior Secondary School	4,065 (44)
	Don't know	9 (0)
	Refused	62 (1)
Primary occupation	Not working	1,026 (11)
	Pupil/ student	561 (6)
	Professional career	1,430 (15)
	Self-employed student	1,976 (21)
	Petty trading	1,182 (13)
	Entertainment/ service/ bar/ restaurant/ hotel	2,049 (22)
	Sex work	822 (9)
	Other[‡]	60 (1)
	Don't know	13 (0)
	Refused	166 (2)
Engages in sex work*	No	2,107 (23)
	Yes	7,130 (77)
	Don't know	7 (0)
	Refused	41 (0)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?"
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 8.3: Demographic Characteristics of Newly Captured PWID from Rounds 1-3 of Venue-based Capture-recapture in Akwa Ibom State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	30 (25-34)
Age group (years)	15-19	105 (1)
	20-24	2,116 (20)
	25-34	5,932 (55)
	35+	2,558 (24)
Sex	Male	9,324 (87)
	Female	1,384 (13)
	Don't know	1 (0)
	Refused	3 (0)
Highest education level	Never attended school	376 (4)
	Quranic only	30 (0)
	Primary	363 (3)
	Junior Secondary School	1,397 (13)
	Senior Secondary School	4,539 (42)
	Higher than Senior Secondary School	3,738 (35)
	Don't know	67 (1)
	Refused	202 (2)
Primary occupation	Not working	1,069 (10)
	Pupil/ student	584 (5)
	Professional career	1,647 (15)
	Self-employed student	2,247 (21)
	Petty trading	2,974 (28)
	Entertainment/ service/ bar/ restaurant/ hotel	1,286 (12)
	Sex work	483 (5)
	Other[‡]	90 (1)
	Don't know	53 (0)
	Refused	279 (3)
Engages in sex work*	No	633 (46)
	Yes	733 (53)
	Don't know	3 (0)
	Refused	15 (1)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?", female sex at birth only
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 8.4: Enrolment of FSW by Hotspot Type and Round of Venue-based Capture-recapture, Akwa Ibom State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	4,096	4,660	3,016
Brothel	1,325	1,398	846
Escorts/ call girls/ men	0	0	0
Hostel/ campus	60	80	45
Hotel/ lodge	3,843	4,150	2,718
Massage parlour	63	82	73
Street/ public place	1,989	2,321	1,704
*Other	35	40	20

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 8.5: Enrolment of MSM by Hotspot Type and Round of Venue-based Capture-recapture, Akwa Ibom State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	2,088	2,126	1,081
Brothel	59	72	54
Eatery/ shopping mall	308	176	111
Hostel/ campus	39	45	25
Hotel/ lodge	1,412	1,321	763
Massage parlour	44	44	8
Sport centre	29	21	36
Street/ public place	788	664	254
*Other	44	83	37

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 8.6: Enrolment of PWID by Hotspot Type and Round of Venue-based Capture-recapture, Akwa Ibom State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	1,081	1,276	1,236
Brothel	148	153	136
Hostel/ campus	151	68	57
Hotel/ lodge	353	254	282
Massage parlour	76	29	79
Uncompleted building/ bunk	1,777	1,220	1,275
Street/ public place	1,562	1,880	1,447
*Other	25	36	31

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 8.7: KP Size Estimates: Akwa Ibom State

KP	Age Group	Median	Highest Density Interval*		Gen Pop 2018 Census Projections 15+ yrs[+]	Median PSE / Gen Pop[+] (%)
			Lower	Upper		
FSW	All	64,300	44,100	84,900	1,557,841	4.1
	15-24 years	18,200	11,400	23,000	465,126	3.9
	25+ years	45,200	32,600	61,400	1,092,715	4.1
MSM	All	34,600	12,000	72,400	1,594,978	2.1
	15-24 years	38,900	8,200	55,800	499,067	7.8
	25+ years	17,000	8,900	31,200	1,095,911	1.6
PWID	All F	4,000	2,700	5,200	1,257,841	0.3
	15-24 years	1,900	800	2,700	165,126	1.2
	25+ years	2,300	1,500	3,100	1,092,715	0.2
PWID	All M	19,900	12,500	26,100	1,594,978	1.2
	15-24 years	3,400	2,500	4,000	499,067	0.7
	25+ years	15,000	10,000	20,200	1,095,911	1.4

*80% highest density interval (HDI)

[+]NPopC census projection for 2018 population shown are age and sex-specific for each PSE

FSW

Of FSW encountered in Akwa Ibom, 56% were between 25-34 years old and 72% reported an education level of senior secondary school or higher. Formative assessment results, supported by State Technical Team experience, indicated a large number of FSW in Akwa Ibom who primarily engage their clients using online platforms. The subset of FSW who operate exclusively online would not be represented in estimates from hotspot-based MS-CRC. Security incidents reported in some FSW hotspots during MS-CRC might have resulted in fewer captures, impacting capture probabilities and resulting PSE.

MSM

Among MSM encountered during MS-CRC activities, 89% were between 20 and 34 years old, 91% reported senior secondary or higher as their highest level of education, and 77% reported engaging in sex work. Potential influences on capture probabilities and PSE included MSM hotspots that were difficult to access, such as private residences and invitation-only events, as well as frequent security incidents.

PWID

The majority of PWID were 25 years or older (79%), male (87%), and reported senior secondary or higher as their highest level of education (77%). Fifty-three percent (53%) of female PWID reported engaging in sex work. Potential limitations included security incidents reported at hotspots and limited coverage of female PWID.

3.4.2. Benue

Table 9.1: Demographic Characteristics of Newly Captured FSW from Rounds 1-3 of Venue-based Capture-recapture in Benue State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	27 (24-31)
Age group (years)	15-19	355 (2)
	20-24	5,396 (26)
	25-34	12,691 (60)
	35+	2,636 (13)
Highest education level	Never attended school	1791 (8)
	Quranic only	30 (0)
	Primary	3,390 (16)
	Junior Secondary School	4,980 (24)
	Senior Secondary School	7,369 (35)
	Higher than Senior Secondary School	3,167 (15)
	Don't know	27 (0)
	Refused	333 (2)
Primary occupation	Not working	532 (3)
	Pupil/ student	356 (2)
	Professional career	315 (1)
	Self-employed student	1289 (6)
	Petty trading	2,183 (10)
	Entertainment/ service/ bar/ restaurant/ hotel	1702 (8)
	Sex work	14,519 (69)
	Other‡	127 (1)
	Don't know	11 (0)
	Refused	50 (0)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

‡Other primary occupations include farming and hair dressing

Table 9.2: Demographic Characteristics of Newly captured MSM from Rounds 1-3 of Venue-based Capture-recapture in Benue State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	27 (24-30)
Age group (years)	15-19	140 (2)
	20-24	1,540 (26)
	25-34	3,765 (64)
	35+	466 (8)
Highest education level	Never attended school	9 (0)
	Quranic only	5 (0)
	Primary	24 (0)
	Junior Secondary School	379 (6)
	Senior Secondary School	3,254 (55)
	Higher than Senior Secondary School	2,239 (38)
	Don't know	2 (0)
	Refused	1 (0)
Primary occupation	Not working	470 (8)
	Pupil/ student	560 (9)
	Professional career	814 (14)
	Self-employed student	1,362 (23)
	Petty trading	1,035 (18)
	Entertainment/ service/ bar/ restaurant/ hotel	831 (14)
	Sex work	810 (14)
	Other[‡]	21 (0)
	Don't know	0 (0)
	Refused	8 (0)
Engages in sex work*	No	818 (14)
	Yes	5,091 (86)
	Don't know	2 (0)
	Refused	2 (0)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?"
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 9.3: Demographic Characteristics of Newly Captured PWID from Rounds 1-3 of Venue-based Capture-recapture in Benue State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	28 (24-32)
Age group (years)	15-19	190 (2)
	20-24	2,357 (24)
	25-34	5,823 (60)
	35+	1,369 (14)
Sex	Male	8,709 (89)
	Female	1,026 (11)
	Don't know	2 (0)
	Refused	3 (0)
Highest education level	Never attended school	316 (3)
	Quranic only	45 (0)
	Primary	316 (3)
	Junior Secondary School	1,127 (12)
	Senior Secondary School	5,668 (58)
	Higher than Senior Secondary School	2,236 (23)
	Don't know	4 (0)
	Refused	28 (0)
Primary occupation	Not working	1,765 (18)
	Pupil/ student	927 (10)
	Professional career	1,158 (12)
	Self-employed student	1,950 (20)
	Petty trading	2,316 (24)
	Entertainment/ service/ bar/ restaurant/ hotel	715 (7)
	Sex work	111 (1)
	Other[‡]	617 (6)
	Don't know	31 (0)
	Refused	150 (2)
Engages in sex work*	No	850 (83)
	Yes	167 (16)
	Don't know	4 (0)
	Refused	5 (0)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?", female sex at birth only
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 9.4: Enrolment of FSW by Hotspot Type and Round of Venue-based Capture-recapture, Benue State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	3,863	2,383	3,143
Brothel	1,047	604	946
Escorts/ call girls/ men	4	15	24
Hostel/ campus	218	225	149
Hotel/ lodge	4,450	2,506	3,883
Massage parlour	69	38	64
Street/ public place	4,305	2,896	3,898
*Other	159	99	237

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 9.5: Enrolment of MSM by Hotspot Type and Round of Venue-based Capture-recapture, Benue State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	1,630	1,157	1,197
Brothel	1	1	0
Eatery/ shopping mall	74	40	32
Hostel/ campus	201	154	278
Hotel/ lodge	890	638	705
Massage parlour	0	0	0
Sport centre	0	0	0
Street/ public place	814	522	620
*Other	315	235	207

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 9.6: Enrolment of PWID by Hotspot Type and Round of Venue-based Capture-recapture, Benue State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	339	226	344
Brothel	35	20	34
Hostel/ campus	81	49	62
Hotel/ lodge	61	40	66
Massage parlour	34	12	9
Uncompleted building/ bunk	4,558	2,504	3,319
Street/ public place	849	498	711
*Other	55	34	108

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 9.7: KP Size Estimates: Benue State

KP	Age Group	Median	Highest Density interval*		Gen Pop 2018 Census Projections 15+ yrs[+]	Median PSE / Gen Pop[+] (%)
			Lower	Upper		
FSW	All	46,700	27,500	113,900	1,653,910	2.8
	15-24 years	11,000	9,500	13,400	624,617	1.8
	25+ years	28,900	23,500	35,500	1,029,293	2.8
MSM	All	10,800	8,000	13,100	1,683,863	0.6
	15-24 years	2,900	2,100	3,600	650,662	0.5
	25+ years	7,500	5,700	9,000	1,033,201	0.7
PWID	All F	30,900	2,500	55,400	1,653,910	1.9
	15-24 years	5,000	1700	8,700	624,617	0.8
	25+ years	11,700	1,500	20,800	1,029,293	1.1
PWID	All M	21,400	18,000	27,400	1,683,863	1.3
	15-24 years	6,600	5,100	8,600	650,662	1.0
	25+ years	14,800	12,600	18,400	1,033,201	1.4

*80% highest density interval (HDI)

[+]NPopC census projection for 2018 population shown are age and sex-specific for each PSE

FSW

In Benue State, 86% of FSW participants were between 20 to 34 years of age, and 50% reported senior secondary school or higher as their highest level of education. During formative assessment, Benue was the only state to report low online-based KP activities due to poor internet connectivity. The resulting increase in social visibility of FSW in hotspots increased robustness of the PSE.

MSM

The majority of MSM participants were between 20 to 34 years of age (90%), reported senior secondary school or higher as their highest level of education (93%), and engaged in sex work (86%). Low participation in online-based MSM activity improved social visibility in hotspots and increased robustness of PSE.

PWID

Most participating PWID were between 25 to 34 years of age (60%) and male (89%) with senior secondary school or higher education (81%). Limitations included poor social visibility of female PWID. To improve model precision, male and female PWID captures were combined for the final PSE.

Table 10.1: Demographic Characteristics of Newly Captured FSW from Rounds 1-3 of Venue-based Capture-recapture in Cross River State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	26 (23-30)
Age group (years)	15-19	286 (3)
	20-24	3,361 (35)
	25-34	5,180 (54)
	35+	725 (8)
Highest education level	Never attended school	503 (5)
	Quranic only	41 (0)
	Primary	589 (6)
	Junior Secondary School	1,542 (16)
	Senior Secondary School	4,269 (45)
	Higher than Senior Secondary School	2,483 (26)
	Don't know	25 (0)
	Refused	101 (1)
Primary occupation	Not working	639 (7)
	Pupil/ student	184 (2)
	Professional career	380 (4)
	Self-employed student	559 (6)
	Petty trading	1,101 (12)
	Entertainment/ service/ bar/ restaurant/ hotel	625 (7)
	Sex work	5,876 (62)
	Other‡	38 (0)
	Don't know	7 (0)
	Refused	122 (1)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

‡Other primary occupations include farming and hair dressing

Table 10.2: Demographic Characteristics of Newly captured MSM from Rounds 1-3 of Venue-based Capture-recapture in Cross River State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	25 (22-28)
Age group (years)	15-19	145 (6)
	20-24	923 (38)
	25-34	1,203 (49)
	35+	186 (8)
Highest education level	Never attended school	51 (2)
	Quranic only	9 (0)
	Primary	73 (3)
	Junior Secondary School	202 (8)
	Senior Secondary School	1,336 (54)
	Higher than Senior Secondary School	775 (32)
	Don't know	1 (0)
	Refused	9 (0)
Primary occupation	Not working	303 (12)
	Pupil/ student	144 (6)
	Professional career	292 (12)
	Self-employed student	701 (29)
	Petty trading	326 (13)
	Entertainment/ service/ bar/ restaurant/ hotel	336 (14)
	Sex work	310 (13)
	Other[‡]	22 (1)
	Don't know	1 (0)
	Refused	19 (1)
Engages in sex work*	No	150 (6)
	Yes	2,301 (94)
	Don't know	2 (0)
	Refused	4 (0)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?"
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 10.3: Demographic Characteristics of Newly Captured PWID from Rounds 1-3 of Venue-based Capture-recapture in Cross River State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	28 (25-32)
Age group (years)	15-19	76 (1)
	20-24	1,832 (24)
	25-34	4,712 (61)
	35+	1,090 (14)
Sex	Male	7,011 (91)
	Female	695 (9)
	Don't know	2 (0)
	Refused	4 (0)
Highest education level	Never attended school	404 (5)
	Quranic only	23 (0)
	Primary	450 (6)
	Junior Secondary School	1,174 (15)
	Senior Secondary School	3,767 (49)
	Higher than Senior Secondary School	1,828 (24)
	Don't know	16 (0)
	Refused	49 (1)
Primary occupation	Not working	959 (12)
	Pupil/ student	131 (2)
	Professional career	580 (8)
	Self-employed student	1,372 (18)
	Petty trading	1,934 (25)
	Entertainment/ service/ bar/ restaurant/ hotel	1,840 (24)
	Sex work	45 (1)
	Other‡	607 (8)
	Don't know	15 (0)
	Refused	224 (3)
Engages in sex work*	No	609 (88)
	Yes	86 (12)
	Don't know	0 (0)
	Refused	0 (0)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?", female sex at birth only
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

‡Other primary occupations include farming and driving

Table 10.4: Enrolment of FSW by Hotspot Type and Round of Venue-based Capture-recapture, Cross River State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	2,725	1,280	1,138
Brothel	70	44	44
Escorts/ call girls/ men	36	21	30
Hostel/ campus	250	118	95
Hotel/ lodge	1,426	652	613
Massage parlour	84	62	86
Street/ public place	2,331	1,085	1,025
*Other	30	18	20

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 10.5: Enrolment of MSM by Hotspot Type and Round of Venue-based Capture-recapture, Cross River State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	283	252	208
Brothel	0	0	0
Eatery/ shopping mall	0	0	0
Hostel/ campus	90	97	65
Hotel/ lodge	273	253	195
Massage parlour	0	3	0
Sport centre	12	5	5
Street/ public place	650	500	375
*Other	160	127	109

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 10.6: Enrolment of PWID by Hotspot Type and Round of Venue-based Capture-recapture, Cross River State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	882	312	340
Brothel	9	5	3
Hostel/ campus	0	0	0
Hotel/ lodge	147	69	51
Massage parlour	19	11	8
Uncompleted building/ bunk	1,545	1,190	1,213
Street/ public place	2,016	1,088	1,200
*Other	0	0	0

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 10.7: KP Size Estimates: Cross River State

KP	Age Group	Median	Highest Density interval*		Gen Pop 2018 Census Projections 15+ yrs[+]	Median PSE / Gen Pop[+] (%)
			Lower	Upper		
FSW	All	15,300	11,900	20,000	1,070,063	1.4
	15-24 years	5,500	4,100	6,900	331,424	1.6
	25+ years	9,600	7,600	12,200	738,639	1.3
MSM	All	3,200	2,700	3,600	1,046,104	0.3
	15-24 years	1,400	1,200	1,600	347,758	0.4
	25+ years	1,700	1,500	1,900	698,346	0.2
PWID	All F	2,300	1,800	2,900	1,070,063	0.2
	15-24 years	<1000	600	1,200	331,424	0.3
	25+ years	1,300	900	1,700	738,639	0.2
PWID	All M	13,900	9,300	21,500	1,046,104	1.3
	15-24 years	5,100	4,100	6,400	347,758	1.5
	25+ years	8,800	6,100	11,700	698,346	1.3

*80% highest density interval (HDI)

[+]NPopC census projection for 2018 population shown are age and sex-specific for each PSE

3.4.3.1.   Discussion

FSW

In Cross River State, the majority of FSW encountered were between 20-34 years of age (89%), and reported an education level of senior secondary school or higher (71%). Multiple-source capture-recapture was conducted throughout the festive period in December. Carnival celebrations during this time resulted in a huge influx of FSW, which likely affected capture probabilities. There were some challenges among the FSW with acceptance of the unique objects that might have influenced capture probabilities and resulting PSE.

MSM

Of the MSM encountered during MS-CRC activities, the majority were between 20-34 years of age (87%), reported an education level of senior secondary school or higher (86%), and reported engaging in sex work (94%). The influx of MSM during the festive period might have influenced capture probabilities and resulting PSE.

PWID

The majority of PWID enrolled in the study were male (91%), between the ages of 25 to 34 (61%), and reported an education level of senior secondary school or higher (73%). Acceptance of unique objects in PWID hotspots was a challenge observed during field monitoring visits and might have impacted capture probabilities and resulting PSE.

Table 11.1: Demographic Characteristics of Newly Captured FSW from Rounds 1-3 of Venue-based Capture-recapture in FCT, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	27 (24-31)
Age group (years)	15-19	415 (3)
	20-24	4,393 (27)
	25-34	9,332 (58)
	35+	2,043 (13)
Highest education level	Never attended school	1,170 (7)
	Quranic only	233 (1)
	Primary	2,547 (16)
	Junior Secondary School	3,380 (21)
	Senior Secondary School	6,688 (41)
	Higher than Senior Secondary School	2,001 (12)
	Don't know	35 (0)
	Refused	135 (1)
Primary occupation	Not working	100 (1)
	Pupil/ student	50 (0)
	Professional career	67 (0)
	Self-employed student	344 (2)
	Petty trading	633 (4)
	Entertainment/ service/ bar/ restaurant/ hotel	619 (4)
	Sex work	14,260 (88)
	Other[‡]	24 (0)
	Don't know	4 (0)
	Refused	87 (1)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and hair dressing

Table 11.2: Demographic Characteristics of Newly Captured MSM from Rounds 1-3 of Venue-based Capture-recapture in FCT, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	27 (24-31)
Age group (years)	15-19	177 (6)
	20-24	674 (23)
	25-34	1,690 (58)
	35+	370 (13)
Highest education level	Never attended school	81 (3)
	Quranic only	144 (5)
	Primary	186 (6)
	Junior Secondary School	269 (9)
	Senior Secondary School	995 (34)
	Higher than Senior Secondary School	1,232 (42)
	Don't know	0 (0)
	Refused	4 (0)
Primary occupation	Not working	198 (7)
	Pupil/ student	174 (6)
	Professional career	382 (13)
	Self-employed student	467 (16)
	Petty trading	470 (16)
	Entertainment/ service/ bar/ restaurant/ hotel	615 (21)
	Sex work	536 (18)
	Other[‡]	60 (2)
	Don't know	2 (0)
	Refused	7 (0)
Engages in sex work*	No	1,299 (45)
	Yes	1,452 (50)
	Don't know	50 (2)
	Refused	110 (4)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?"
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 11.3: Demographic Characteristics of Newly Captured PWID from Rounds 1-3 of Venue-based Capture-recapture in FCT, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	27 (25-31)
Age group (years)	15-19	40 (2)
	20-24	469 (23)
	25-34	1,357 (65)
	35+	206 (10)
Sex	Male	1716 (83)
	Female	353 (17)
	Don't know	0 (0)
	Refused	3 (0)
Highest education level	Never attended school	113 (5)
	Quranic only	165 (8)
	Primary	245 (12)
	Junior Secondary School	263 (13)
	Senior Secondary School	704 (34)
	Higher than Senior Secondary School	418 (20)
	Don't know	12 (1)
	Refused	152 (7)
Primary occupation	Not working	329 (16)
	Pupil/ student	177 (9)
	Professional career	125 (6)
	Self-employed student	143 (7)
	Petty trading	572 (28)
	Entertainment/ service/ bar/ restaurant/ hotel	286 (14)
	Sex work	97 (5)
	Other[‡]	78 (4)
	Don't know	33 (2)
	Refused	232 (11)
Engages in sex work*	No	182 (52)
	Yes	166 (47)
	Don't know	1 (0)
	Refused	4 (1)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?", female sex at birth only
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 11.4: Enrolment of FSW by Hotspot Type and Round of Venue-based Capture-recapture, FCT, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	1,862	2,522	1,789
Brothel	1,992	2,514	2,164
Escorts/ call girls/ men	0	0	0
Hostel/ campus	19	15	1
Hotel/ lodge	2,281	2,720	2,258
Massage parlour	13	33	11
Street/ public place	1,826	2,040	1,496
*Other	53	59	26

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 11.5: Enrolment of MSM by Hotspot Type and Round of Venue-based Capture-recapture, FCT, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	370	370	257
Brothel	8	9	8
Eatery/ shopping mall	64	39	9
Hostel/ campus	46	39	20
Hotel/ lodge	222	241	158
Massage parlour	0	0	0
Sport centre	12	24	4
Street/ public place	475	666	308
*Other	20	33	24

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 11.6: Enrolment of PWID by Hotspot Type and Round of Venue-based Capture-recapture, FCT, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	46	67	30
Brothel	0	10	0
Hostel/ campus	6	20	11
Hotel/ lodge	61	32	21
Massage parlour	0	0	0
Uncompleted building/ bunk	40	24	24
Street/ public place	839	872	970
*Other	0	0	0

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 11.7: KP Size Estimates: Federal Capital Territory

KP	Age Group	Median	Highest Density interval*		Gen Pop 2018 Census Projections 15+ yrs[+]	Median PSE / Gen Pop[+] (%)
			Lower	Upper		
FSW	All	45,700	23,100	56,700	439,067	10.4
	15-24 years	15,800	12,200	21,800	186,017	8.5
	25+ years	31,100	14,700	38,600	253,050	12.3
MSM	All	8,200	6,500	10,700	483,100	1.7
	15-24 years	3,500	1,400	14,500	155,809	2.3
	25+ years	6,200	2,200	18,500	327,291	1.9
PWID	All F	<1000	<1000	<1000	439,067	0.1
	15-24 years	<1000	<1000	<1000	186,017	0.1
	25+ years	<1000	<1000	<1000	253,050	0.1
PWID	All M	2,700	2,200	3,200	483,100	0.6
	15-24 years	<1000	500	1,000	155,809	0.5
	25+ years	1,900	1,500	2,200	327,291	0.6

*80% highest density interval (HDI)

[+]NPopC census projection for 2018 shown are age and sex-specific for each PSE

FSW

In FCT, 85% of FSW participants were between 20 to 34 years of age, and approximately half (53%) reported senior secondary school or higher as their highest level of education. Population size estimates for this group were consistent with previous studies.

MSM

The majority of MSM encountered in FCT were 25 years or older (71%) and reported senior secondary school or higher as their highest level of education (76%). Half (47%) reported engaging in sex work. Younger, non-emancipated MSM, and those of higher social status were unlikely to be found at hotspots. The poor social visibility of these sub-groups might have impacted capture probabilities and resulting PSE.

PWID

Of PWID encountered in FCT, 65% were between the ages of 25 to 34, 83% were male, and 54% reported senior secondary or higher as their highest level of education. Forty-seven percent (47%) of female PWID reported engaging in sex work. Sparse participation among female PWID influenced capture probabilities and resulting PSE.

Table 12.1: Demographic Characteristics of Newly Captured FSW from Rounds 1-3 of Venue-based Capture-recapture in Lagos State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	28 (25-32)
Age group (years)	15-19	274 (1)
	20-24	6,632 (23)
	25-34	17,877 (62)
	35+	4,093 (14)
Highest education level	Never attended school	674 (2)
	Quranic only	130 (0)
	Primary	3,403 (12)
	Junior Secondary School	7,102 (25)
	Senior Secondary School	13,574 (47)
	Higher than Senior Secondary School	3,495 (12)
	Don't know	187 (1)
	Refused	314 (1)
Primary occupation	Not working	251 (1)
	Pupil/ student	61 (0)
	Professional career	167 (1)
	Self-employed student	185 (1)
	Petty trading	667 (2)
	Entertainment/ service/ bar/ restaurant/ hotel	653 (2)
	Sex work	26,609 (92)
	Other[‡]	14 (0)
	Don't know	89 (0)
	Refused	164 (1)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and hair dressing

Table 12.2: Demographic Characteristics of Newly Captured MSM from Rounds 1-3 of Venue-based Capture-recapture in Lagos State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	26 (23-29)
Age group (years)	15-19	104 (4)
	20-24	705 (30)
	25-34	1,335 (56)
	35+	219 (9)
Highest education level	Never attended school	9 (0)
	Quranic only	2 (0)
	Primary	31 (1)
	Junior Secondary School	112 (5)
	Senior Secondary School	1,392 (59)
	Higher than Senior Secondary School	805 (34)
	Don't know	2 (0)
	Refused	10 (0)
Primary occupation	Not working	299 (13)
	Pupil/ student	212 (9)
	Professional career	594 (25)
	Self-employed student	460 (20)
	Petty trading	201 (9)
	Entertainment/ service/ bar/ restaurant/ hotel	397 (17)
	Sex work	167 (7)
	Other[‡]	18 (1)
	Don't know	0 (0)
	Refused	10 (0)
Engages in sex work*	No	847 (36)
	Yes	1,502 (64)
	Don't know	1 (0)
	Refused	14 (1)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?"
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 12.3: Demographic Characteristics of Newly Captured PWID from Rounds 1-3 of Venue-based Capture-recapture in Lagos State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	31 (27-36)
Age group (years)	15-19	87 (1)
	20-24	710 (12)
	25-34	3,240 (55)
	35+	1,851 (31)
Sex	Male	5,045 (86)
	Female	835 (14)
	Don't know	3 (0)
	Refused	6 (0)
Highest education level	Never attended school	216 (4)
	Quranic only	113 (2)
	Primary	710 (12)
	Junior Secondary School	1,364 (23)
	Senior Secondary School	2,662 (45)
	Higher than Senior Secondary School	725 (12)
	Don't know	19 (0)
	Refused	79 (1)
Primary occupation	Not working	889 (15)
	Pupil/ student	17 (0)
	Professional career	580 (10)
	Self-employed student	312 (5)
	Petty trading	2,897 (49)
	Entertainment/ service/ bar/ restaurant/ hotel	597 (10)
	Sex work	348 (6)
	Other[‡]	37 (1)
	Don't know	75 (1)
	Refused	131 (2)
Engages in sex work*	No	419 (50)
	Yes	376 (45)
	Don't know	28 (3)
	Refused	12 (1)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?", female sex at birth only
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 12.4: Enrolment of FSW by Hotspot Type and Round of Venue-based Capture-recapture, Lagos State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	1,703	1,553	3,790
Brothel	3,530	3,035	4,378
Escorts/ call girls/ men	127	36	65
Hostel/ campus	34	28	82
Hotel/ lodge	4,572	4,060	8,112
Massage parlour	18	5	15
Street/ public place	194	132	455
*Other	14	16	13

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 12.5: Enrolment of MSM by Hotspot Type and Round of Venue-based Capture-recapture, Lagos State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	182	145	313
Brothel	0	2	5
Eatery/ shopping mall	40	23	208
Hostel/ campus	0	0	0
Hotel/ lodge	180	168	598
Massage parlour	0	0	0
Sport centre	7	6	4
Street/ public place	55	62	150
*Other	93	90	105

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 12.6: Enrolment of PWID by Hotspot Type and Round of Venue-based Capture-recapture, Lagos State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	22	12	29
Brothel	67	78	111
Hostel/ campus	0	0	0
Hotel/ lodge	70	46	146
Massage parlour	0	0	0
Uncompleted building/ bunk	1,234	845	1,764
Street/ public place	985	667	1,265
*Other	0	0	0

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 12.7: KP Size Estimates: Lagos State

KP	Age Group	Median	Highest Density interval*		Gen Pop 2018 Census Projections 15+ yrs[+]	Median PSE / Gen Pop[+] (%)
			Lower	Upper		
FSW	All	48,200	30,900	76,100	3,858,772	1.2
	15-24 years	12,100	7,600	19,600	955,681	1.3
	25+ years	32,700	23,400	46,800	2,903,091	1.1
MSM	All	81,400	4,800	127,400	4,746,577	1.7
	15-24 years	<1000	500	1,000	938,061	0.1
	25+ years	3,800	2,900	4,800	3,808,516	0.1
PWID	All F	4,400	1,000	8,300	3,858,772	0.1
	15-24 years	<1000	<1000	<1000	955,681	0.0
	25+ years	4,700	1,100	7,100	2,903,091	0.2
PWID	All M	16,300	5,900	43,300	4,746,577	0.3
	15-24 years	5,600	800	9,100	938,061	0.6
	25+ years	7,800	4,600	22,400	3,808,516	0.2

*80% highest density interval (HDI)

[+]NPopC census projection for 2018 population shown are age and sex-specific for each PSE

FSW

Of the participating FSW in Lagos State, 62% were between 25 and 34 years, and 47% reported senior secondary school as their highest level of education. An influx of FSW during the holidays in December resulted in a sharp increase in enrolment during the final capture round. There were challenges with unique object acceptance among FSW that might have impacted capture probabilities and resulting PSE.

MSM

Of participating MSM, 56% percent were between the ages of 25 and 34, 93% reported senior secondary school or higher as their highest level of education, and 64% reported engaging in sex work. The relatively few hotspots identified suggest that many MSM in Lagos may not spend time in hotspots, but rather engage in social activities exclusively online or in venues not specific to MSM; thus, PSE might not be representative of all MSM.

PWID

Of PWID, 86% were 25 years or older, 86% were male, and 57% reported senior secondary school or higher as their highest level of education. Forty-five percent (45%) of female PWID reported engaging in sex work**.**

Table 13.1: Demographic Characteristics of Newly Captured FSW from Rounds 1-3 of Venue-based Capture-recapture in Nasarawa State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	27 (24-30)
Age group (years)	15-19	312 (2)
	20-24	4,734 (26)
	25-34	11,252 (61)
	35+	2,181 (12)
Highest education level	Never attended school	1423 (8)
	Quranic only	334 (2)
	Primary	2,573 (14)
	Junior Secondary School	4,278 (23)
	Senior Secondary School	6,620 (36)
	Higher than Senior Secondary School	3,236 (18)
	Don't know	9 (0)
	Refused	10 (0)
Primary occupation	Not working	325 (2)
	Pupil/ student	222 (1)
	Professional career	186 (1)
	Self-employed student	1,086 (6)
	Petty trading	1,472 (8)
	Entertainment/ service/ bar/ restaurant/ hotel	1,568 (8)
	Sex work	13,555 (73)
	Other[‡]	58 (0)
	Don't know	4 (0)
	Refused	7 (0)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and hair dressing

Table 13.2: Demographic Characteristics of Newly Captured MSM from Rounds 1-3 of Venue-based Capture-recapture in Nasarawa State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	25 (22-27)
Age group (years)	15-19	228 (7)
	20-24	1,296 (39)
	25-34	1,638 (50)
	35+	123 (4)
Highest education level	Never attended school	196 (6)
	Quranic only	131 (4)
	Primary	138 (4)
	Junior Secondary School	282 (9)
	Senior Secondary School	1,527 (46)
	Higher than Senior Secondary School	1,008 (31)
	Don't know	3 (0)
	Refused	1 (0)
Primary occupation	Not working	381 (12)
	Pupil/ student	432 (13)
	Professional career	315 (10)
	Self-employed student	823 (25)
	Petty trading	653 (20)
	Entertainment/ service/ bar/ restaurant/ hotel	229 (7)
	Sex work	446 (14)
	Other[‡]	2 (0)
	Don't know	1 (0)
	Refused	4 (0)
Engages in sex work*	No	66 (2)
	Yes	3,220 (98)
	Don't know	0 (0)
	Refused	0 (0)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?"
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 13.3: Demographic Characteristics of Newly Captured PWID from Rounds 1-3 of Venue-based Capture-recapture in Nasarawa State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	27 (25-29)
Age group (years)	15-19	82 (2)
	20-24	1,166 (23)
	25-34	3,547 (70)
	35+	240 (5)
Sex	Male	4,525 (90)
	Female	508 (10)
	Don't know	1 (8)
	Refused	2 (6)
Highest education level	Never attended school	604 (12)
	Quranic only	247 (5)
	Primary	361 (7)
	Junior Secondary School	812 (16)
	Senior Secondary School	1,790 (36)
	Higher than Senior Secondary School	1,123 (22)
	Don't know	4 (0)
	Refused	95 (2)
Primary occupation	Not working	978 (19)
	Pupil/ student	492 (10)
	Professional career	310 (6)
	Self-employed student	667 (13)
	Petty trading	1,664 (33)
	Entertainment/ service/ bar/ restaurant/ hotel	481 (10)
	Sex work	113 (2)
	Other[‡]	256 (5)
	Don't know	0 (0)
	Refused	75 (1)
Engages in sex work*	No	128 (25)
	Yes	378 (74)
	Don't know	0 (0)
	Refused	2 (0)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?", female sex at birth only
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and driving

Table 13.4: Enrolment of FSW by Hotspot Type and Round of Venue-based Capture-recapture, Nasarawa State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	4,068	2,250	1,145
Brothel	1,905	1,028	755
Escorts/ call girls/ men	48	48	20
Hostel/ campus	61	20	3
Hotel/ lodge	3,126	1,392	816
Massage parlour	0	0	0
Street/ public place	4,490	2,610	1,373
*Other	206	126	100

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 13.5: Enrolment of MSM by Hotspot Type and Round of Venue-based Capture-recapture, Nasarawa State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	361	213	186
Brothel	3	0	0
Eatery/ shopping mall	91	65	52
Hostel/ campus	57	32	22
Hotel/ lodge	330	202	129
Massage parlour	23	21	5
Sport centre	26	12	9
Street/ public place	1,201	749	592
*Other	91	40	40

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 13.6: Enrolment of PWID by Hotspot Type and Round of Venue-based Capture-recapture, Nasarawa State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	484	310	267
Brothel	22	14	9
Hostel/ campus	15	10	9
Hotel/ lodge	42	22	28
Massage parlour	0	0	0
Uncompleted building/ bunk	1,744	1,194	1,278
Street/ public place	1,332	882	1,010
*Other	533	209	185

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 13.7: KP Size Estimates: Nasarawa State

KP	Age Group	Median	Highest Density interval*		Gen Pop 2018 Census Projections 15+ yrs[+]	Median PSE / Gen Pop[+] (%)
			Lower	Upper		
FSW	All	55,600	26,000	73,700	569,223	1.2
	15-24 years	22,600	7,100	29,400	235,045	1.3
	25+ years	42,800	19,100	52,000	334,178	1.1
MSM	All	5,000	3,700	6,400	477,029	1.7
	15-24 years	6,500	2,500	8,800	229,829	0.1
	25+ years	2,200	1,900	2,400	247,200	0.1
PWID	All F	<1000	<1000	<1000	569,223	0.1
	15-24 years	<1000	<1000	<1000	235,045	0.0
	25+ years	<1000	<1000	<1000	334,178	0.2
PWID	All M	6,700	5,300	7,600	477,029	0.3
	15-24 years	1,500	1,200	1,700	229,829	0.6
	25+ years	5,000	4,000	5,700	247,200	0.2

*80% highest density interval (HDI)

[+]NPopC census projection for 2018 population shown are age and sex-specific for each PSE

FSW

Of the participating FSW, 87% were between the ages of 20 and 34, and 54% reported senior secondary school or higher as their highest level of education. The PSE do not account for FSW who are exclusively home-based and not found in hotspots, but the proportion of home-based FSW among all FSW is unknown. For that reason, the impact of excluding this sub-population on the PSE is unknown.

MSM

The majority of MSM were between the ages of 20 and 34 (89%), with senior secondary school or higher as their highest level of education (77%), and reported engaging in sex work (98%). Challenges with unique object acceptance among MSM and high interstate mobility during MS-CRC might have impacted capture probabilities and resulting PSE. Security threats from cult clashes were reported in several LGAs that might have influenced hotspot activity, resulting in an unknown impact on the PSE.

PWID

The majority of PWID encountered during MS-CRC were male (90%), between the ages of 25 and 34 (70%), and reported senior secondary school or lower as their highest level of education (78%). Seventy-four percent (74%) of female PWID reported engaging in sex work. Population size estimates might have been impacted by security threats in some hotspots and poor social visibility of PWID with higher social standing.

3.4.7. Rivers

Table 14.1: Demographic Characteristics of Newly Captured FSW from Rounds 1-3 of Venue-based Capture-recapture in Rivers State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	26 (23-31)
Age group (years)	15-19	539 (4)
	20-24	4,408 (33)
	25-34	6,706 (50)
	35+	1,725 (13)
Highest education level	Never attended school	467 (3)
	Quranic only	76 (1)
	Primary	2,394 (18)
	Junior Secondary School	3,617 (27)
	Senior Secondary School	5,077 (38)
	Higher than Senior Secondary School	1,683 (13)
	Don't know	18 (0)
	Refused	52 (0)
Primary occupation	Not working	18 (0)
	Pupil/ student	30 (0)
	Professional career	56 (0)
	Self-employed student	82 (1)
	Petty trading	200 (1)
	Entertainment/ service/ bar/ restaurant/ hotel	117 (1)
	Sex work	12,769 (95)
	Other[‡]	23 (0)
	Don't know	8 (0)
	Refused	74 (1)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

[‡]Other primary occupations include farming and hair dressing

Table 14.2: Demographic Characteristics of Newly Captured MSM from Rounds 1-3 of Venue-based Capture-recapture in Rivers State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	27 (24-30)
Age group (years)	15-19	229 (4)
	20-24	1,487 (25)
	25-34	3,744 (63)
	35+	514 (9)
Highest education level	Never attended school	175 (3)
	Quranic only	15 (0)
	Primary	70 (1)
	Junior Secondary School	517 (9)
	Senior Secondary School	1,856 (31)
	Higher than Senior Secondary School	3,169 (53)
	Don't know	14 (0)
	Refused	160 (3)
Primary occupation	Not working	1,086 (18)
	Pupil/ student	354 (6)
	Professional career	889 (15)
	Self-employed student	1,309 (22)
	Petty trading	941 (16)
	Entertainment/ service/ bar/ restaurant/ hotel	838 (14)
	Sex work	349 (6)
	Other‡	40 (1)
	Don't know	17 (0)
	Refused	144 (2)
Engages in sex work*	No	2,382 (40)
	Yes	3,412 (57)
	Don't know	20 (0)
	Refused	164 (3)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?"
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

‡Other primary occupations include farming and driving

Table 14.3: Demographic Characteristics of Newly Captured PWID from Rounds 1-3 of Venue-based Capture-recapture in Rivers State, 2018

Characteristic	Category	Median (IQR) / n (%)
Age (years)	Median (IQR)	32 (27-36)
Age group (years)	15-19	37 (1)
	20-24	369 (7)
	25-34	2,992 (59)
	35+	1,716 (34)
Sex	Male	4,803 (94)
	Female	303 (6)
	Don't know	4 (0)
	Refused	10 (0)
Highest education level	Never attended school	133 (3)
	Quranic only	17 (0)
	Primary	273 (5)
	Junior Secondary School	449 (9)
	Senior Secondary School	2,575 (50)
	Higher than Senior Secondary School	1,540 (30)
	Don't know	9 (0)
	Refused	125 (2)
Primary occupation	Not working	290 (6)
	Pupil/ student	89 (2)
	Professional career	540 (11)
	Self-employed student	1,022 (20)
	Petty trading	921 (18)
	Entertainment/ service/ bar/ restaurant/ hotel	1,216 (24)
	Sex work	90 (2)
	Other‡	33 (1)
	Don't know	165 (3)
	Refused	745 (15)
Engages in sex work*	No	67 (22)
	Yes	192 (63)
	Don't know	26 (9)
	Refused	18 (6)

Recaptures excluded to avoid double-counting

Results from round 4 of capture-recapture not reflected

*Determined by yes/no response to "Do you engage in sex work?", female sex at birth only
Percentages may not sum to 100% due to rounding, and the sample sizes for a given classification may be less than the total sample size due to missing responses

‡Other primary occupations include farming and driving

Table 14.4: Enrolment of FSW by Hotspot Type and Round of Venue-based Capture-recapture, Rivers State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	3,183	3,115	1,942
Brothel	4,316	3,158	2,623
Escorts/ call girls/ men	0	0	0
Hostel/ campus	100	20	7
Hotel/ lodge	3,464	2,804	2,148
Massage parlour	81	60	44
Street/ public place	782	661	607
*Other	0	0	0

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 14.5: Enrolment of MSM by Hotspot Type and Round of Venue-based Capture-recapture, Rivers State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	1,200	1,296	776
Brothel	14	31	19
Eatery/ shopping mall	200	237	85
Hostel/ campus	57	34	48
Hotel/ lodge	511	742	485
Massage parlour	0	0	0
Sport centre	0	0	0
Street/ public place	584	505	286
*Other	226	250	117

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 14.6: Enrolment of PWID by Hotspot Type and Round of Venue-based Capture-recapture, Rivers State, 2018

Hotspot type	Round 1	Round 2	Round 3
Bar/ night club/ casino	189	101	92
Brothel	210	97	105
Hostel/ campus	27	16	21
Hotel/ lodge	175	98	149
Massage parlour	0	0	0
Uncompleted building/ bunk	1,311	779	876
Street/ public place	1,544	873	991
*Other	19	7	15

Numbers include newly captured and recaptured individuals from rounds 1-3 (venue-based only).

Enrolled participants were eligible, consented, and accepted the unique object/ tag.

*Other hotspot types include shops, car washes, bakeries, and health facilities.

Table 14.7: KP Size Estimates: Rivers State

KP	Age Group	Median	Highest Density interval*		Gen Pop 2018 Census Projections 15+ yrs[+]	Median PSE / Gen Pop[+] (%)
			Lower	Upper		
FSW	All	14,500	14,100	15,200	2,128,841	0.7
	15-24 years	5,400	5,200	5,600	606,665	0.9
	25+ years	9,300	8,900	10,100	1,522,176	0.6
MSM	All	41,400	8,400	61,800	2,354,728	1.8
	15-24 years	8,000	2,000	11,300	649,779	1.2
	25+ years	43,200	28,300	63,700	1,704,949	2.5
PWID	All F	<1000	300	1,000	2,128,841	0.0
	15-24 years	<1000	<1000	<1000	606,665	0.0
	25+ years	<1000	<1000	<1000	1,522,176	0.0
PWID	All M	30,100	7,900	42,100	2,354,728	1.3
	15-24 years	1,400	<1000	2,100	649,779	0.2
	25+ years	37,400	25,700	54,400	1,704,949	2.2

*80% highest density interval (HDI)
[+]NPopC census projection for 2018 population shown are age and sex-specific for each PSE

3.4.7.1.   Discussion

FSW

The majority of FSW encountered in Rivers State were between 25 and 34 years of age (50%) and reported senior secondary school or higher as their highest level of education (51%). Data collection in Rivers State occurred throughout December, during which many FSW traveled to neighboring states for festivals; this might have impacted capture probabilities in Rivers State hotspots and influenced PSE.

MSM

Among MSM encountered during CRC activities, 81% were 25 years old or older, 84% reported senior secondary or higher as their highest level of education, and 57% reported engaging in sex work. Enumerators reported challenges accessing a number of hotspots, which might have had an impact on capture probabilities and resulting PSE.

PWID

The majority of PWID encountered during CRC were 25 years old or older (93%) and 80% reported their educational level as senior secondary school or higher. Sixty-three percent (63%) of female PWID reported engaging in sex work. Difficulty accessing hotspots might have impacted capture probabilities and resulting PSE.

3.5. Facility-based Capture

Data sources for the fourth, facility-based round of MS-CRC included 24 one-stop shop (OSS) client registries and the TRUST/RV368 cohort of MSM in Abuja. Between December 2018 and February 2019, 82 trained facility staff from 24 OSS and the TRUST clinic, identified a total of 7,156 eligible clients from facility registries to be contacted in the fourth round of MS-CRC. Clients were eligible if KP-defining behaviour was documented and they had presented at the clinic within the previous six months. Facility staff were trained in study procedures, interview etiquette, and data collection in REDCap, and began contacting participants following completion of venue-based MS-CRC. The facility-based questionnaire (Appendix section 6.4) was administered over the phone by clinic staff and was similar to those used in previous rounds.

There were 7,156 clients from the OSS client registries who responded, consented, and were eligible for inclusion in the fourth capture round. Only 20% (FSW 13%; MSM 32%; PWID 11%) recalled ever being approached by an enumerator or receiving a unique object, suggesting minimal overlap between OSS clients and KP encountered at hotspots. It was later found that limiting eligibility to clients who had presented at the clinic within the previous six months unintentionally biased the sampling frame towards a HIV-positive clientele. In most states, the KP who consented were obtained from the HIV treatment registry, excluding those on the HIV testing and counselling registry. When combined, the negligible overlap between hotspot and facility-based capture rounds resulted in hyper-inflated PSE, some increasing tenfold. For that reason, model results are not presented here. Further analyses will be performed to understand the relationship between KP in hotspots and those with HIV-related regular clinic attendance.

3.6. Challenges and Limitations

Of the 13,998 documented hotspots mapped in preparation for MS-CRC, 8,885 were visited during all three capture rounds. Maintaining a detailed, comprehensive hotspot inventory was a challenge due to the dynamic nature of KP hotspots. Names, exact locations, and KP presence fluctuated between capture rounds, and security incidents rendered some hotspots entirely inaccessible. Time constraints, coupled with challenging terrain and unfavourable weather conditions also limited hotspot coverage. Capture-recapture encounters from 4,973 hotspots were excluded from analysis as they were not visited in each of the three venue-based rounds due to challenges described above. To understand the effect this may have on PSE, demographics of encounters excluded were compared to included encounters. No notable differences were found between excluded encounters and encounters used in PSE models.

In Lagos, Rivers, and Cross River States, venue-based MS-CRC extended through the holiday period in December 2018. Travel to and from neighbouring states for holiday festivities was evident in the final rounds of data collection, particularly in Lagos and Rivers States. In Lagos, there was an increase in the number of KP present at most hotspots, largely due to holiday-related parties or other events, and the majority of these participants were new captures. Conversely, data from round three in Rivers State suggested that many KP had left the area by mid-December, particularly FSW. This was affirmed by enumerators, who reported that many FSW had travelled to neighbouring Cross River for the carnival.

Limited resources prevented implementation of an online-based round of MS-CRC. Formative assessment findings suggested that, with the exception of Benue state, online social platforms are widely used by KP in the 6+1 states. Virtual hotspots provide an opportunity to reach those with poor social visibility at hotspots; an online capture round might have improved the representativeness of the PSE.

Due to the structure of the REDCap questionnaire, it was not possible to calculate a response rate. The survey instrument begins with eligibility, followed by a description of the study objective, after which the respondent is asked whether or not he/ she would like to participate. Because consent is not prompted unless the individual self-identifies as a KP member and displays understanding of the study objective, the non-consenting population could not be documented. Initiating the questionnaire with whether or not the

individual was willing to be approached may have elicited a better view of the response rate, although it would have relied heavily on an enumerator's judgment in terms of accurately identifying KP members.

4. Conclusions

The PSE presented in this report were larger than previously documented in Nigeria. Empirical methods and analysis using Bayesian models that account for heterogeneity in capture probabilities may reflect more accurate size estimates compared to methods applied in previous studies. These population data are critical to inform HIV prevention and treatment programs and the large PSE suggest a need for programmatic scale-up to reach these populations at highest risk for HIV. Due to the fluctuating nature of KP— KP may start/stop engaging in behaviour and/or migrate to different geographic locations—PSE can change and efforts should be made to update them every two to three years.

The PSE as described in this report represent only one component of a larger key population size estimation strategy to inform policy and programming in Nigeria. PSE from the Network Scale-up Method (NSUM) as part of the Nigeria HIV/AIDS Indicator and Impact Survey (NAIIS) adjusted for transmission error by the Game of Contacts will be available soon. Results from these studies will be triangulated, and, where appropriate, extrapolated to areas of Nigeria without PSE, and summarized in a separate report.

5. Recommendations for future PSE

- Planning
    - Allow sufficient time for a comprehensive formative assessment to gather all necessary information from community members about mapping/validation of KP hotspots and the capture-recapture data sources, unique objects, online social platforms, etc.
    - Key population members should be part of the unique object selection process during formative assessment.
    - Schedule data collection activities outside of festive periods, election season, and other major events. Migration in and out of states and increased/decreased activity in hotspots may influence capture probabilities and affect PSE.
- Implementation
    - Dispatch well-trained community mobilizers to work with gatekeepers and community influencers to improve participation and avoid security incidents and any adverse responses from KP and unique objects.
    - Incorporate intensive field monitoring and central data repository monitoring for timely identification and resolution of potential data quality issues.
    - Collaborate with CBOs to coordinate prevention education and intervention efforts in tandem with MS-CRC activities, e.g., condom distribution.
    - Include a capture round using an online social platform. This will broaden the populations reached, particularly those with poor social visibility in physical hotspots.
- Analysis
    - Opt for latent-class models that account for heterogeneity of capture probabilities instead of log-linear models.
    - Consider highest density intervals for improved interpretation and application to inform program and policy.
- Dissemination
    - Schedule national and state representatives to meet, review, and provide context for model results.

6. References

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7. Appendices
7.1. Formative Assessment
7.1.1. Appendix A: Formative Assessment Methods

In July 2018, a series of advocacy visits took place in 6+1 PEPFAR-funded states to enlist KP stakeholders and community gatekeepers for participation in a formative assessment. Primary goals of the formative assessment were to update a KP hotspot inventory obtained from various stakeholders including Heartland Alliance International (HAI), Society for Family Health (SFH), and NACA, and to prepare for MS-CRC. During visits, key informant interviews (KII) and focus group discussions (FGD) were conducted with KP members and staff of the State Agency for the Control of AIDS (SACA), KP CBOs, and referral facilities. KII and FGD guides can be found in Appendix D and E. Participants were asked about social networks, virtual social platforms, service access, security issues, unique object preferences for MS-CRC, and approaches for selection of enumerators for mapping and MS-CRC. Altogether, in the 6 + 1 States, the formative assessment consisted of 189 FGDs involving 2,079 KP participants and 112 KIIs.

Key objectives*:*

- To update list of venue-based KP hotspots in the 6+1 states
- To explore other facility and online-based platforms frequented by KP members
- To elicit appropriate method to identify, approach, and confirm KP membership
- To identify appropriate unique objects (i.e. gifts) to be utilized in MS-CRC
- To identify appropriate procedures for community entry
- To identify security measures during data collection
- To ensure the overall feasibility and acceptability of study plans

Key findings from the formative assessment

- Additional hotspots from the initial list compiled from NACA, SFH, and HAI were identified and used to update the inventory, with KIIs and FGDs confirming location and KP activity.
- Common online platforms in use among KP included WhatsApp (all KP), Instagram (all KP), Facebook Messenger (FSW and MSM), Badoo (FSW and MSM), Manjam (FSW and MSM), and Grindr (MSM). In general, respondents reported that only MSM and FSW use social media to communicate with other KP members and/or solicit clients or sexual partners; PWID do not use social media for KP-defining activities, only social use.
- Informing key KP and local gatekeepers such as village heads, area boys, local civil task forces, and other law enforcement bodies is crucial to ensure security of enumerators and KP, and to facilitate community entry.
- Overall, most acceptable unique objects (i.e. gifts) by KP members were:
  - FSW–Face towel, small mirrors, keychain pens
  - MSM–Wristbands, key tags
  - PWID–Face towel, key tags, sunglasses

Question 1: Where and when do KP members congregate?

Focus group discussion and KII participants worked in groups to validate known hotspots from the initial inventory compiled by HAI, NACA, and SFH during prior PSE and outreach exercises. Hotspots not already listed were appended to the inventory.

In Rivers KII, SACA officers commented on high inter-State mobility among FSW**.**

<div align="center">

"Now they are in Rivers, tomorrow it is Abuja" (Rivers)

</div>

In Lagos, teams reported that KP members were sometimes reluctant to disclose the location of newfound hotspots.

Question 2: Aside from physical venues, which other platforms do KP members meet?

Most local experts and FGD reported that although MSM and FSW use social media to solicit clients, sexual partners, and/or interact with other KP members, it is not a common mode of communication among PWID. A headcount of PWID in Rivers revealed that only three of the twelve PWID present had access to a personal phone. During FGD, several PWID remarked that KP members were not clustered in any virtual space.

Comment from FSW on social media platforms:

<div align="center">

"*As I dey here wey una dey talk sef, I dey busy dey sell my market oo (source for Clients). E-Messenger dey wey some of us dey use sell our market*" (Akwa Ibom)

</div>

Perceived social media use among specific KP groups varied by state, as participants from Rivers State claimed that MSM and PWID tended to use online group features more than FSW. While FSW used these platforms to solicit clients, MSM and PWID used group features to interact and connect with each other. Facebook and WhatsApp were reported to be the most popular social media platforms across KP groups. In Benue, social media was reported to not be a common mode of communicating with clients and/or or other KP due to the poor availability of network and electricity associated with poor living conditions and infrastructure. Some FSW reported using Facebook, IMO, WhatsApp, and Instagram to reach new clients; however, they still relied heavily on physical hotspots. Pimps were reported to operate via one-on-one verbal communication, telephone calls, and text messages.

Question 3: How can enumerators identify, confirm and approach a KP member?

There was consensus among KP that the successful identification and engagement of KP in hotspots must be accomplished by KP gatekeepers and/or KP community escorts. In short, the three KP communities agreed that to reach any KP, KP members must be fully involved throughout the study. Participants also suggested the use of incentives in the form of gifts and/or money to improve participation in the study.

Community gatekeepers by KP group

- **FSW**: Community influencers, CBOs, chairladies, bar/brothel managers/owners, Aproko Boys (Lagos and FCT)
- **MSM**: Community influencers, well-connected MSM
- **PWID**: Bunk owners, community influencers /"the senior men", well-connected KP members familiar with coded language (e.g., "on board" signifying an active PWID, "coco, csp, limp" as slang for codeine)

Question 4: What do we need for community entry?

Key population gatekeepers and KP members have unique access to hotspots and KP communities through their credibility and contacts. Utilization of KP social and personal networks will facilitate entry into community, ensuring safe and discrete process.

Other key elements of community entry included: advocacy, education, and mobilization. It was emphasized that all stakeholders must be aware of specific study procedures and timelines. In addition to study stakeholders, participants suggested liaising with local chiefs, village heads, youth leaders, and similar figureheads prior to the start of any fieldwork.

Key gatekeepers and other notes for community entry by KP community

FSW: chairladies, managers, stone boys (special boyfriends), maga hajiyas

One FSW noted:

> "**If una wan see see us, make una see our Madams and Managers and this CBO who our managers and even us sabi**" (Rivers)

MSM: MSM key influencers

Although physical venues exclusively for MSM are uncommon, strong MSM communities can be found in social media and online platforms. In Lagos, Eventbrite was cited as a means of RSVP-ing to MSM-exclusive parties.

PWID: Bunk owners

Common observations from PWID members included the "tradition" of pouring drinks on the floor by guests, a strict "code of conduct" for behaviours that is internal to bunks/ PWID communities, and the importance of greeting the chief security officer of the barrack prior to entry.

"Abeg una go find way inform all the drug lords or bunk owners on time make them no feel say we dey sell out our locations to the police. Because anything way happen (Police arrest) within that period wey the program dey go on, them go say na una bring them come." (Rivers)

Question 5: What challenges have you faced when working with KP members and how have you been managing them?

FSW

- Gender-based violence was a strong theme. FSW suffer attacks in the hands of the vigilante groups and uniformed service men especially the Special Anti-Robbery Squad (SARS) and Joint Task Force (JTF).
- Key population members can be rude. Enumerators were advised to exercise patience when dealt with bad behaviour.
- The study team should maintain a mix of female and male enumerators as some FSW prefer to talk to men while others to women.
- Encounters should be kept as brief as possible. It is important to respect FSW business hours. FSW may expect monetary incentives for their time.

MSM:

- The study team should recruit "classy/ high-profile" enumerators and provide condoms and lubricants to maximize participation.
- Study investigators should consider language barriers as some MSM do not understand English.
- Many MSM are in denial about their sexual orientation which may pose a challenge to fieldworkers. Due to the harsh environment, specifically, the 2015 Same-Sex Prohibition Act, many are conscious and sensitive about their safety.
- Enumerators should avoid asking personal questions. The latter applies to all KP but especially MSM. Enumerators should also respect individuals' privacy.

PWID

- People who inject drugs are quick to raise alarm and regard outsiders within their territory as a threat. This can be managed through prompt and proper community entry, and engagement of gatekeepers and KP members.
- People who inject drugs should not be kept for too long at the study site or hotspot to avoid them being restless and/or hyperactive.

Question 6: What additional security measures are needed to ensure safety of enumerators and study participants in this locality?

Engagement of law enforcement, key local stakeholders and KP members

Focus group discussion and KII participants emphasized the importance of engaging law enforcement, key local stakeholders, and KP members in ensuring safety of all involved in the study. Law enforcement includes the Local Action Committee on AIDS (LACA), National Drug Law Enforcement Agency (NDLEA), state-specific law enforcement (SARS, Civil Defence, task force) and local vigilante. Government ownership, coordination, and commitment is crucial. Advocacy to the police commissioner, in addition to Police Action Committee on AIDS (PACA), is needed. The police should be notified of activity days and key officers contacted in case of incidents. In all states, measures must be taken by the government to cover for security, and suspend strike force operations during the study period.

Appropriate dressing

Focus group discussion and KII participants advised against official uniforms and flashy clothing that will attract unnecessary attention. Casual clothing should be worn to gain acceptance and to better assimilate to the surroundings. In addition, enumerators were advised against flaunting of expensive items such as phones and tablets. Boots, raincoats, and umbrellas should be provided to ensure the security of enumerators, especially if fieldwork is to be conducted during the rainy season.

Leaving on time in areas of high security risks

Several high security risk areas were brought up during FGD and KII discussions. These include Abaji, Gwagwalada, and Kwali localities in FCT, and Ikom LGA in Cross River State. Investigators and enumerators were advised to abide by curfews and ensure that the police are promptly notified when working in these areas.

Discrete security measures

Uniformed police officers and official law enforcement vehicles might alarm KP and should be avoided. The study team should plan for discrete security measures.

Effective Time management

Enumerators should be as brief as possible when speaking with KP members, and should avoid staying in any particular hotspot too long so as not to incite suspicion.

Making appropriate arrangement for challenging terrain and unfavourable weather conditions

In Cross River, informants reported that unfavourable weather, difficult terrain, and bad roads will pose challenges to enumerators. Study investigators should make appropriate arrangements to account for the challenging working conditions.

Question 7: What would be an appropriate 'tag'/ unique object for the study?

The top choice for an appropriate tag differed by focus group; many items listed as choices were found to be appropriate as tags for KP participants.

Overall, these items were the most popular among the KP community members:

- **FSW**: Face towel/ handkerchief; small handheld mirror; keychain pens
- **MSM**: Wristband (watch design); wristband (regular, Tyvek); silicone key tags
- **PWID**: Face towel/ handkerchief; key chains; key tags; keychain pens; sunglasses

<u>Recommendations from the Formative Assessment</u>

The following recommendations were put forward in support of a successful enumeration exercise:

1. Adequate human resources and time should be allocated for fieldwork given the large number of hotspots to be covered.
2. If the study investigators intend to utilize online platforms, some means of verification should be incorporated into the exercise. For instance, the study investigators may randomly select individuals to be contacted for physical confirmation as a KP member and to avoid instances in where the same individual is presenting as two or more individuals on social media.
3. Security issues should be given due consideration. A means should be established to maintain continuous communication with field workers.
4. Advocacy to local security organizations especially the JTF, SARS and anti-cultism group should be done to ensure that enumerators are not harassed by area/cult boys. This must be done at the local police stations and not at the national-level.
5. Key populations must be represented in the study team. Key population members will respond more positively to a familiar face. This will help avoid trickery, beating, harassment, and extortions.
6. The MSM community suggested that legal assistance be provided to any enumerators or participants under risk of arrest or detainment during the course of the activity.

7.1.3. Appendix C: Formative Assessment Challenges and Limitations

1. Interviews of KP informants often took place in hotspots, where the environment could be volatile.
2. One FGD session was disrupted by aggressive individuals who were not part of the exercise.
3. Attendance of interviews and FGD sessions was hampered by extortion, violence, and other security concerns in the area.

For SACA and KP CBO:

1) Data collector/ enumerator recruitment and selection criteria
   a) What will be the best approach to recruit qualified and experienced enumerators for this exercise?
   b) What selection criteria should be used in screening study enumerators for the MSM, PWID and FSW communities?
   c) Do you have persons you would recommend? If so, please provide the list:
2) Where and when do KPs congregate?
   a) List the LGA and specific intervention sites where you have worked or currently providing services for KP (FSW, MSM and PWID).
   b) For each KP community, list hotspots in the area (with geocode information if available) and peak day/hours.
   c) List other facilities in the state which provides services to KP members.
   d) What are your challenges working with KP members and how have you been managing them?
3) How can a KP member be identified, approached and confirmed at a hotspot?
   a) What dialogue, body language, and other social cues can be used to indicate intent to engage in KP behaviour of interest (transactional sex, needle sharing, or insertive/receptive anal sex among men) should enumerators look out for?
   b) What would be an appropriate unique object for MS-CRC?
   c) In what areas can your organization support this activity?
4) What additional security measures should the study team plan for to ensure safety of enumerators and study participants?
   a) KP CBOs to recommend informants and escort officers to facilitate entry of KP enumerators.
   b) SACA to recommend emergency response number and relevant security agency to work with in the state.
   c) Hotel owners and bunk owners to provide list of security tips.

For in-depth interview with bunk owners, chair ladies, party planners, MSM-friendly centres, hotel owners, etc…

1) Which is the majority KP group who visit this type of venue in the state?
2) List the KP groups who can be seen in this type of facility at peak periods.
3) Do KP found in this type of facility belong to any online platform? Name the possible platforms.
4) When is the most appropriate time to meet with KP members in a venue like this?
5) What are the major security issues in working with KP members in a venue like this?
6) Which law enforcement groups must the study team engage with for maximum security?
7) On average, how many of this type of venue exist in the state? List minimum and maximum.
8) In your opinion, what makes this venue appealing to these KP?
9) What verbal, body language, and other social cues to indicate intent to engage in KP behaviour of interest (transactional sex, needle sharing, or insertive/receptive anal sex among men) should enumerators look out for?
10) What would be an appropriate unique object to use for MS-CRC? (show picture samples)

1) List all service delivery facilities in the state for each of the KP groups.
   a. When did the facility begin servicing KP communities?
   b. Which KP groups visit the facility?
   c. List the services offered by the facility.
   d. List the personal information collected from clients at these facilities.
2) Do FSW, MSM, PWID members have any active online-based networks? If so, please describe them.
   a. List all online platforms popular among the MSM, FSW and PWID communities.
      i) Of all listed, which platform has the largest number of FSW, MSM and PWID members?
   b. What is the average number of members in each of the networks?
   c. Do the platforms maintain a database of members' information such as state/LGA of residence, date of birth, name and/ or surname?
   d. What is the predominant function of this online network/ platform?
   e. Who manages this online network/ platform?
3) Where and when do KPs congregate?
   a. List the LGAs and specific intervention sites where you have worked or currently provide services for KP members.
   b. For each KP community: list hotspots in the area (with geocode information if available) and peak day/hours.
   c. List any other facilities in the state which provide services to KP members.
   d. What are your challenges when working with KP members and how have you been managing them?
4) How can a KP member be identified, approached and confirmed at a hotspot?
   a. What dialogue, body language, and other social cues can be used to indicate intent to engage in KP behaviour of interest (transactional sex, needle sharing, or insertive/receptive anal sex among men) should enumerators look out for?
   b. What would be an appropriate unique object for MS-CRC?
5) What additional security measures should the study team plan for to ensure safety of enumerators and study participants?

7.2. Hotspot Mapping and Validation Questionnaire

7.2.1.   Appendix F: Hotspot Mapping and Validation Questionnaire: FSW

State: _____(Code); LGA: _____ Zones: _____ Spot Name: _____ Spot type: _____	Date: _____ ENU Code: _____ Spot active: _____YES _____NO _____ Duplicate If duplicate, which hotspot _____ Spot Geocode: Longitude _____ Latitude _____ Do you have proposes revisions to the address provided? 1. Yes, proposed new address:_____ 0.No

Spot profile

1	Code the venue based on option which best described it	1. Brothel, 2. Street/public place, 3. Bar/night club/casino, 4. Hotel/lodge, 5. Massage parlour, 6. Hostel/campus, 7. Escort/call girls/men, 8. Others
1b	If others, please specify:	
2	Which day of the week do FSW visit this spot more than normal? (choose no more than **3** day/time combinations)	1. Monday 2. Tuesday 3. Wednesday 4. Thursday 5. Friday 6. Saturday 7. Sunday
3	For the days indicated above, what is/are the peak time?	1. Morning (before 12 noon) 2. Afternoon 3. Evening (5-9pm) 4. Night (9pm-late night)
4	Do other key populations visit these hotspots? (multiple options allowed	1. MSM 2. PWID 3. FSW
5	Do sex take place in this spot	1. Yes 2. No
6	Do FSW negotiate sex with male partner in this spot?	1. Yes 2. No
7	Do you know any other place like this where FSW seek male customer for sex?	1. Yes 2. No
	If yes, name them	Estimate of FSW in the spot
1	_____	Max FSW_____ Min FSW_____
2	_____	Max FSW_____ Min FSW_____
3	_____	Max FSW_____ Min FSW_____

7.2.2.   Appendix G: Hotspot Mapping and Validation Questionnaire: MSM

State: _____(Code);	Date: _____

LGA: _____ Zones: _____ Spot Name: _____ Spot type: _____	ENU Code: _____ Spot active: _____YES _____NO_____ Duplicate If duplicate, which hotspot _____ Spot Geocode: Longitude _____ Latitude _____ Do you have proposes revisions to the address provided? 1. Yes, proposed new address:_____ 0.No

Spot profile

1	Code the venue based on option which best described it	1. Brothel, 2. Street/public place, 3. Bar/night club/casino, 4. Hotel/lodge, 5. Massage parlour, eateries/shopping mall 6. Hostel/campus, 7. Sport Centres, 8. Others
1b	If others, please specify:	
2	Which day of the week do MSM visit this spot more than normal? (choose no more than **3** day/time combinations)	1. Monday 2. Tuesday 3. Wednesday 4. Thursday 5. Friday 6. Saturday 7. Sunday
3	For the days indicated above, what is/are the peak time/s?	1. Morning (before 12 noon) 2. Afternoon (12-5pm) 3. Evening (5-9pm) 4. Night (9pm-late night)
4	Do other key populations visit these hotspots? (multiple options allowed)	1. MSM 2. PWID 3. FSW
5	Does anal sex between two adult men take place in this spot?	1. Yes 2. No
6	Do male sex workers negotiate sex with male partner(s) in this spot?	1. Yes 2. No
7	Do you know any other place like this where MSM gather to socialize?	1. Yes 2. No
	If yes, name them	**Estimate of MSM in the spot**
1	_____	Max MSM_____ Min MSM____
2	_____	Max MSM_____ Min MSM____
3	_____	Max MSM_____ Min MSM____

State: _____(Code);	Date: _____
LGA: _____	ENU Code: _____
Zones: _____	Spot active: _____YES _____NO_____ Duplicate
Spot Name: _____	If duplicate, which hotspot _____
Spot type: _____	Spot Geocode: Longitude _____ Latitude _____
	Do you have proposes revisions to the address provided?
	1. Yes, proposed new address:_____ 0.No

Spot profile

1	Code the venue based on option which best described it	1. Brothel 2. Street/public place, 3. Bar/night club/casino, 4. Hotel/lodge, 5. Massage parlour, 6. Hostel/campus, 7. Uncompleted building/Bunk 8. Others
1b	If others, please specify:	
`2	Which day of the week do PWID visit this spot more than normal? (choose no more than **3** day/time combinations)	1. Monday 2. Tuesday 3. Wednesday 4. Thursday 5. Friday 6. Saturday 7. Sunday
3	For the days indicated above, what is/are the peak time?	1. Morning (before 12 noon) 2. Afternoon (12-5pm 3. Evening (5-9pm) 4. Night (9pm-late night)
4	Do other key populations visit these hotspots? (multiple options allowed)	1. MSM 2. PWID 3. FSW
5	Do drug injections take place in this spot?	1. Yes 2. No
6	Do female drug users negotiate sex with male partners for drug in this spot?	1. Yes 2. No
7	Do you know any other place like this where PWID gather to inject drugs?	1. Yes 2. No
	If yes, name them	Estimate of PWID in the spot
1	_____	Max PWID_____ Min PWID_____
2	_____	Max PWID_____ Min PWID_____
3	_____	Max PWID_____ Min PWID_____

7.3. Appendix I: Venue-based Capture-recapture Questionnaire

Summary

Enumerator Code: ,………………………..

Stage	Give (Tag)	Tag Code	Ask (Previous tag)
C1	Give C1 tag		None
C2	Give C2 tag		Ask about C1 tag
C3	Give C3 tag		Ask about C1 and C2 tag

To be filled per hotspot per enumerator team

Capture 1: Enumerator: _____ Date: _____ Time In: _____ Time Out: _____		
Questions for enumerators	**Possible responses**	**Notes**
What division, zone, and locality are you located in?	Context specific responses	
What is the name of the Hotspot?		
What type of hotspot is this	1. Brothel 2. Street/public place 3. Bar/night club/casino, 4. Hotel/lodge, 5. Massage parlour, 6. Hostel/campus, 7. Escort/call girls/men, 8. Drug bunk 9. Others	
Which KP sub group?	1. FSW 2. PWID 3. MSM	
GPS reading of hotspot	Longitude: _____ Latitude:_____	
1st, 2nd, or 3rd round of capture?	1. 1st round 2. 2nd round 3. 3rd round	
Number of eligible KPs found in hotspot		
Is this a count or actual estimate?	1. Actual Count 2. Estimate	

Is this hotspot a duplicate?	1. Yes 2. No	
If yes, of which hotspot ID?		If yes to 'Is this hotspot a duplicate'
Correct address		If incorrect address as currently in list
Correct spot name		If incorrect spotname as currently in list
To be filled per KP encountered		
Date and time of encounter		
Has the target population member been approached during this round of capture?	1. Yes 2. No 3. Don't know 4. Refused to answer	Yes >> End Form No >> Proceed to Next Questions
Did the target population member accept this round of tag?	1. Yes 2. No 3. Don't know 4. Refused to answer	Yes>> Proceed to Next question No>> Document any reasons (if given)
Does the individual engage in sex work (sex for gifts/ money)	1. Yes 2. No 3. Don't know 4. Refused to answer	If yes and below 18 years of age, provide with referral services
What is the individual's LGA and state of residence?		
Do they travel to current LGA for work?	1. Yes 2. No 3. Don't know 4. Refused to answer	
Which other LGAs/ state do they travel to for work?	--------------------------	If no other, write (N**/A**) **If respondent refuses type "refused"**
What is the person's sex at birth?	1. Female 2. Male 3. Refused	
What does the person consider their sexual orientation to be?	1. Gay or homosexual (have sex with members of the same sex only) 2. Bisexual 3. (have sex with both men and women) 4. Heterosexual or Straight (Have sex with member of the opposite sex only) 5. Other, specify: _____ 6. Refusal 7. Don't know	

What does the person consider their gender to be?	1. Man 2. Woman 3. Other, specify: _____ 4. Both male and female 5. Refusal 6. Don't know.	
How old is the individual?		
What is the individual's highest level of education?	1. Never attended school 2. Quranic Only 3. Primary 4. Junior Secondary/ JSS 5. Senior Secondary/ SSS 6. Higher than SSS 7. Refusal	
What is the occupation from which the individual earn most of their income? (choose one)	1. Not Working (support from someone else) 2. Pupil/Student (support from someone else) 3. Professional career 4. Self-employed business 5. Petty trading 6. Entertainment/Service/Bar/Restaurant/Hotel 7. Sex work 8. Other_____ 9. Refusal	
Are they an injecting drug user?	1. Yes 2. No 3. Don't know 4. Refused to answer	Only if individual is an MSM
To be filled per hotspot per enumerator team		

Capture 2: Enumerator: _____ Date: _____ Time In: _____ Time Out: _____

Questions for enumerator	Possible responses	Notes
What division, zone, and locality are you located in?	Context specific responses	This will be included if you ask your enumerators to go to specific areas only.
What is the name of this hotspot		
What type of hotspot is this	1. Brothel 2. Street/public place 3. Bar/night club/casino, 4. Hotel/lodge, 5. Massage parlour, 6. Hostel/campus, 7. Escort/call girls/men, 8. Drug bunk	

	9. Others	
Which KP sub group?	1. FSW 2. PWID 3. MSM	
GPS reading of Hotspot		
1st, 2nd, or 3rd round of capture?	1. 1st round 2. 2nd round 3. 3rd round	
Number of eligible KPs found in hotspot		
Is this a count or actual estimate?	1. Actual Count 2. Estimate	
Is this hotspot a duplicate?	a. Yes b. No	
If yes, of which hotspot ID?		If yes to 'Is this hotspot a duplicate'
Correct address		If incorrect address as currently in list
Correct spot name		If incorrect spotname as currently in list
To be filled per KP encountered		
Date and time of encounter		
Has the target population member been approached during this round of capture?	1. Yes 2. No	Yes >> End Form No >> Proceed to Next Questions
Does the individual engage in sex work **(sex for gifts/ money)**	1. Yes 2. No 3. Don't know 4. Refused to answer	If yes and below 18 years of age, provide with referral services
Did the target population member receive tag one?	1. Yes 2. No 3. Don't know 4. Refused to answer	
Do they have tag one?	1. Yes 2. No 3. Don't know 4. Refused to answer	

If unable to present tag received, can they identify from page of item pictures?	1. Yes 2. No 3. Don't know 4. Refused to answer	
Where and when did the participant report receiving item one?		
Did the target population member accept this round of tag?	1. Yes 2. No 3. Don't know 4. Refused to answer	Yes>> Proceed to Next question No>> Document any reasons (if given)
What is the individual's LGA and state of residence?		
Do they travel to current LGA for work?	1. Yes 2. No 3. Don't know 4. Refused to answer	
Which other state/LGAs do they travel to for work?	--------------------	If no other, write (N**/A**) If respondent refuses type "refused"
What is the person's sex at birth?	1. Female 2. Male 3. Refused	
What does the person consider their sexual orientation to be?	1. Gay or homosexual (have sex with members of the same sex only) 2. Bisexual 3. (have sex with both men and women) 4. Heterosexual or Straight (Have sex with member of the opposite sex only) 5. Other, specify: _____ 6. Refusal 7. Don't know	
What does the person consider their gender to be?	1. Man 2. Woman 3. Other, specify: _____ 4. Both male and female 5. Refusal 6. Don't know.	
How old is the individual?		
What is the individual's highest level of education?	1. Never attended school 2. Quranic Only 3. Primary	

	4. Junior Secondary/ JSS 5. Senior Secondary/ SSS 6. Higher than SSS 7. Refusal	
What is the occupation from which the individual earn most of their income? **(choose one)**	1. Not Working (support from someone else) 2. Pupil/Student (support from someone else) 3. Professional career 4. Self-employed business 5. Petty trading 6. Entertainment/Service/Bar/Restaurant/Hotel 7. Sex work 8. Other_____ 9. Refusal	
Are they an injecting drug user?	1. Yes 2. No 3. Don't know 4. Refused to answer	Only if individual is an MSM

To be filled per hotspot per enumerator team

Capture 3: Enumerator: _____ Date: _____ Time In: _____ Time Out: _____		
Questions for Enumerator	**Possible responses**	**Notes**
What division, zone, and locality are you located in?	Context specific responses	This will be included if you ask your enumerators to go to specific areas only.
What is the name of the Hotspot?	1. Brothel, 2. Street/public place, 3. Bar/night club/casino, 4. Hotel/lodge, 5. Massage parlour, 6. Hostel/campus, 7. Escort/call girls/men, 8. Drug bunk 9. others	
GPS reading of Hotspot	Longitude: _____ Latitude:_____	
1st, 2nd, or 3rd round of capture?	1.1st round 2.2nd round 3.3rd round	
Number of eligible KPs found in hotspot		
Is this a count or actual estimate?	1. Actual Count	

	2. Estimate	
Is this hotspot a duplicate?	1. Yes 2. No	
If yes, of which hotspot ID?		If yes to 'Is this hotspot a duplicate'
Correct address		If incorrect address as currently in list
Correct spot name		If incorrect spotname as currently in list
To be filled per KP encountered		
Date and time of encounter		
Has the target population member been approached during this round of capture?	1. Yes 2. No	Yes >> End Form No >> Proceed to Next Questions
Does the individual engage in sex work **(sex for gifts/ money)**	1. Yes 2. No 3. Don't know 4. Refused to answer	If yes and below 18 years of age, provide with referral services
Did the target population member receive unique tag one?	1. Yes 2. No 3. Don't know 4. Refused to answer	
Do they have unique tag one?	1. Yes 2. No 3. Don't know 4. Refused to answer	
If they do not have it can they identify from page of item pictures?	1. Yes 2. No	
Where and when did they receive unique tag one?		
Did the (target population member) receive unique tag two?	1. Yes 2. No 3. Don't know 4. Refused to answer	
Do they have the unique tag two?	1. Yes 2. No 3. Don't know 4. Refused to answer	

If they do not have it can they identify from page of item pictures?	1. Yes 2. No	
Where and when did they receive unique tag two?		
Did the target population member accept this round of tag?	1. Yes 2. No 3. Don't know 4. Refused to answer	Yes>> Proceed to Next question No>> Document any reasons (if given)
Does the individual engage in sex work (sex for gifts/ money)	1. Yes 2. No 3. Don't know 4. Refused to answer	If yes and below 18 years of age, provide with referral services
What is the individual's LGA and state of residence?		
Do they travel to current LGA for work?	1. Yes 2. No 3. Don't know 4. Refused to answer	
Which other LGAs/ state do they travel to for work?	-------------------------	If no other, write (N**/A**) **If respondent refuses type "refused"**
What is the person's sex at birth?	1. Female 2. Male 3. Refused	
What does the person consider their sexual orientation to be?	1. Gay or homosexual (have sex with members of the same sex only) 2. Bisexual 3. (have sex with both men and women) 4. Heterosexual or Straight (Have sex with member of the opposite sex only) 5. Other, specify: _____ 6. Refusal 7. Don't know	
What does the person consider their gender to be?	1. Man 2. Woman 3. Other, specify: _____ 4. Both male and female 5. Refusal 6. Don't know.	

How old is the individual?		
What is the individual's highest level of education?	1. Never attended school 2. Quranic Only 3. Primary 4. Junior Secondary/ JSS 5. Senior Secondary/ SSS 6. Higher than SSS 7. Refusal	
What is the occupation from which the individual earn most of their income? **(choose one**	1. Not Working (support from someone else) 2. Pupil/Student (support from someone else) 3. Professional career 4. Self-employed business 5. Petty trading 6. Entertainment/Service/Bar/Restaurant/Hotel 7. Sex work 8. Other_____	
Are they an injecting drug user?	1. Yes 2. No 3. Don't know 4. Refused to answer	Only if individual is an MSM

7.4. Appendix J: Facility-based Capture-recapture Questionnaire

A. Per identified source

No.	Name of Source	Options	Branching Logic
1	Type of Source	1. Clinic Register 2. KP focused research study 3. Online network group 4. KP outreach programs 5. Drug treatment centre	
2	Name of Source		
3	For which of the activity states do these registers contain information on? (multiple answers allowed)	1. Akwa Ibom 2. Benue 3. Cross River 4. FCT 5. Lagos 6. Nasarawa 7. Rivers	
4	Other Notes:		
5	Which key population does this register capture? (multiple answers allowed)	1. MSM 2. FSW 3. PWID	
6	How many KPs were identified in this register?	1. MSM : _____ 2. FSW : _____ 3. PWID : _____	Only KP selected in question 5 of this form will be asked.
7	How many KPs were successfully contacted and enumerated (either through phone/physical or online)	1. MSM : _____ 2. FSW : _____ 3. PWID : _____	Only KP selected in question 5 of this form will be asked.
8	How many KPs refused participation to study?	1. MSM : _____ 2. FSW : _____ 3. PWID : _____	Only KP selected in question 5 of this form will be asked.

B. Per identified KP person from source

No.	Name of Source	Options	Branching Logic
1	Which key population does the contact belong to?	1. MSM 2. FSW 3. PWID	
2	Does the individual engage in sex work (sex for gifts/ money)	1. Yes 2. No 3. Don't know 4. Refused to answer	If yes and below 18 years of age, provide with referral services
3	Did the contact reported being approached and given a tag?	1. Yes 2. No 3. Don't know 4. Refused to answer	if YES continue to Q5 of this form if NO move to Q6 of this form
4	How many times did the contact reported being approached and accepting a tag?	1. Once 2. Twice 3. Thrice	Number of options will be as many round of captures done before for the KP group.
5	When did the contact say they received the tag?	[approximate date]	Question will be repeated according to how many

No.	Name of Source	Options	Branching Logic
			rounds specified in question 4 of this form
6	Which location did the contact received the tag? (name of Hotspot or LGA)		Question will be repeated according to how many rounds specified in question 4 of this form
7	What colour of tag item did the contact receive?	1. Pink 2. Blue 3. Red 4. White 5. Green 6. Yellow	If Q1 is "1" Phone contact Question will be repeated according to how many rounds specified in question 4 of this form
8	Provide tag code and/or other description given by the contact.	[Notes]	If Q1 is "1" Phone contact Question will be repeated according to how many rounds specified in question 4.
90	Of the pictures shown below, which is the tag the contact received?	1. [pic 1] 2. [pic 2] 3. [pic3] 4. [pic4] 5. [pic5] 6. [pic6] 7. [pic7] 8. [pic8] 9. [pic9] 10. [pic10]	If Q1 is "2" in-person contact "3" texting, or 4 "e-mail" Question will be repeated according to how many rounds specified in question 4.
10	What is the contact 's LGA and state of residence?		
11	Does the contact travel to current LGA for work?	1. Yes 2. No 3. Don't know 4. Refused to answer	
12	Which other state/LGA do the contact travel to for work?		List the state/LGAs OR else type N/A
13	How old is the contact?		
14	What is the individual's highest level of education?	1. Never attended school 2. Quranic Only 3. Primary 4. Junior Secondary/ JSS 5. Senior Secondary/ SSS 6. Higher than SSS 7. Refusal	
15	What is the occupation from which the individual earn most of their income? (choose one)	1. Not Working (support from someone else) 2. Pupil/Student (support from someone else) 3. Professional career 4. Self-employed business 5. Petty trading	

No.	Name of Source	Options	Branching Logic
		6. Entertainment/Service/Bar/Restaurant/Hotel 7. Sex work 8. Other_____	
16	What is the contact's sex at birth?	1. Female 2. Male 3. Refused	
17	What does the contact consider their sexual orientation to be?	1. Gay or homosexual (have sex with members of the same sex only) 2. Bisexual 3. (have sex with both men and women) 4. Heterosexual or Straight (Have sex with member of the opposite sex only) 5. Other, specify: _____ 6. Refusal 7. Don't know	
18	What does the contact consider their gender to be:	1. Man 2. Woman 3. Other, specify: _____ 4. Both male and female 5. Refusal 6. Don't know.	

7.5. Appendix K: Community-based Organization Partners in the 6+1 States

Address, phone information suppressed. Information available upon request with approval from NACA.

No.	State	Name	Email address	
1	Akwa Ibom	Initiative for Health and Rights	initiative4health2016@gmail.com	
2	Akwa Ibom	Life Hope Network	hopenetnigeria@yahoo.com	
3	Akwa Ibom	Pride of Womanhood Empowerment Initiative	powinitiative@yahoo.com ; info@powinitiative.org.ng	;
4	Akwa Ibom	Attitude Reorientation Health Initiative	alexanderjerome21gmail.com arhinigeria@gmail.com	
5	Akwa Ibom	Young People Come for ReliefInitiative	ud4mi@yahoo.co.uk	
6	Akwa Ibom	Drug Free and Preventive Healthcare Organization	cfnvinitiative@gmail.com	
7	FCT	Passion and Concern for Women's Welfare and Empowerment Initiative		
8	FCT	Society for Women Development		
9	FCT	Center for Right to Health HIV and Cancer Prevention		
10	FCT	Youth Rise Nigeria		
11	FCT	Life Advancement Project Initiative		
12	FCT	International Center for Total Health and Rights Advocacy Empowerment		
13	FCT	Community Health Initiative for Youth in Nigeria		
14	FCT	International Center for Advocacy on Right to Health		
15	Benue	Total Health Empowerment and Development Initiative	thedinig@gmail.com	
16	Benue	Concerned Youths for Development Initiative	cydinig@gmail.com	
17	Benue	Hope Sisters Against HIV, Stigma and Discrimination Initiative	hope_sisters@yahoo.com	
18	Nasarawa	Life Building Awareness Initiative	livingindignitynas@gmail.com	
19	Nasarawa	Women Learning Initiative and Health Empowerment	Womenforchangeanddevelopment@gmail.com	
20	Nasarawa	Initiative for Youth Development Change in Nigeria	changeplus14@gmail.com	

No.	State	Name	Email address
21	Cross Rivers	Initiative for Young Women's Health and Development	whrinitiative@gmail.com
22	Cross Rivers	Health Action Support Initiatives	hasical2015@yahoo.com
23	Cross Rivers	Initiative for Improved Male Health	contactus@maleattitudenetwork.com
24	Lagos	Access To Health And Rights Development Initiative	info@ahrdinitiative.org
25	Lagos	Improved Sexual Health and Rights Advocacy Initiative	ishraing@gmail.com
26	Lagos	Maintaining Healthy Behavior Initiative (MHBI)	informationmbing@gmail.com
27	Lagos	Mind Renewal Women's Initiative	mindrenewalwomeninitive@yahoo.com
28	Lagos	Mobile Foundation for Health Security and Rehabilitation	Mhsr.ng@gmail.com
29	Lagos	Good Women Association	goodwomenassociation575@gmail.com
30	Lagos	Equal Health and Rights Access Advocacy Initiative	ehraai@gmail.com
31	Lagos	Royal Women's Health and Rights initiative	royalwomeninitiative@gmail.com
32	Rivers	Initiative for Advancement of Humanity	iahinfodesk@yahoo.com
33	Rivers	Engaging Men for Positive Change Initiative	engagingmenforpositivechangeinitiative@gmail.com
34	Rivers	Greater Women Initiative for Health and Right	greaterwomeninitiative@gmail.com