

# National Size Estimation and Behavioral Survey among MSM in Cambodia

**Siyan Yi, MD, MHSc, PhD**  
**Director, Center for Population Health, KHANA**

**Phnom Penh Hotel**

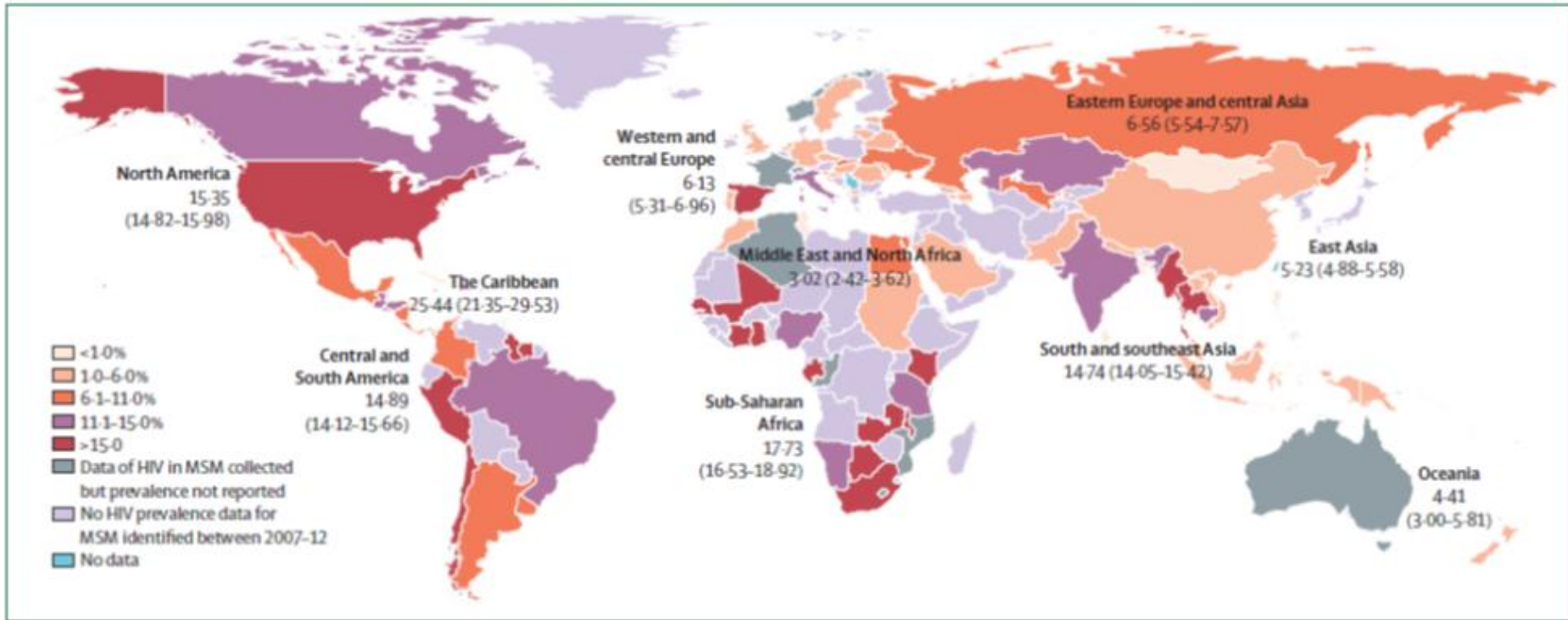
**August 04, 2015**



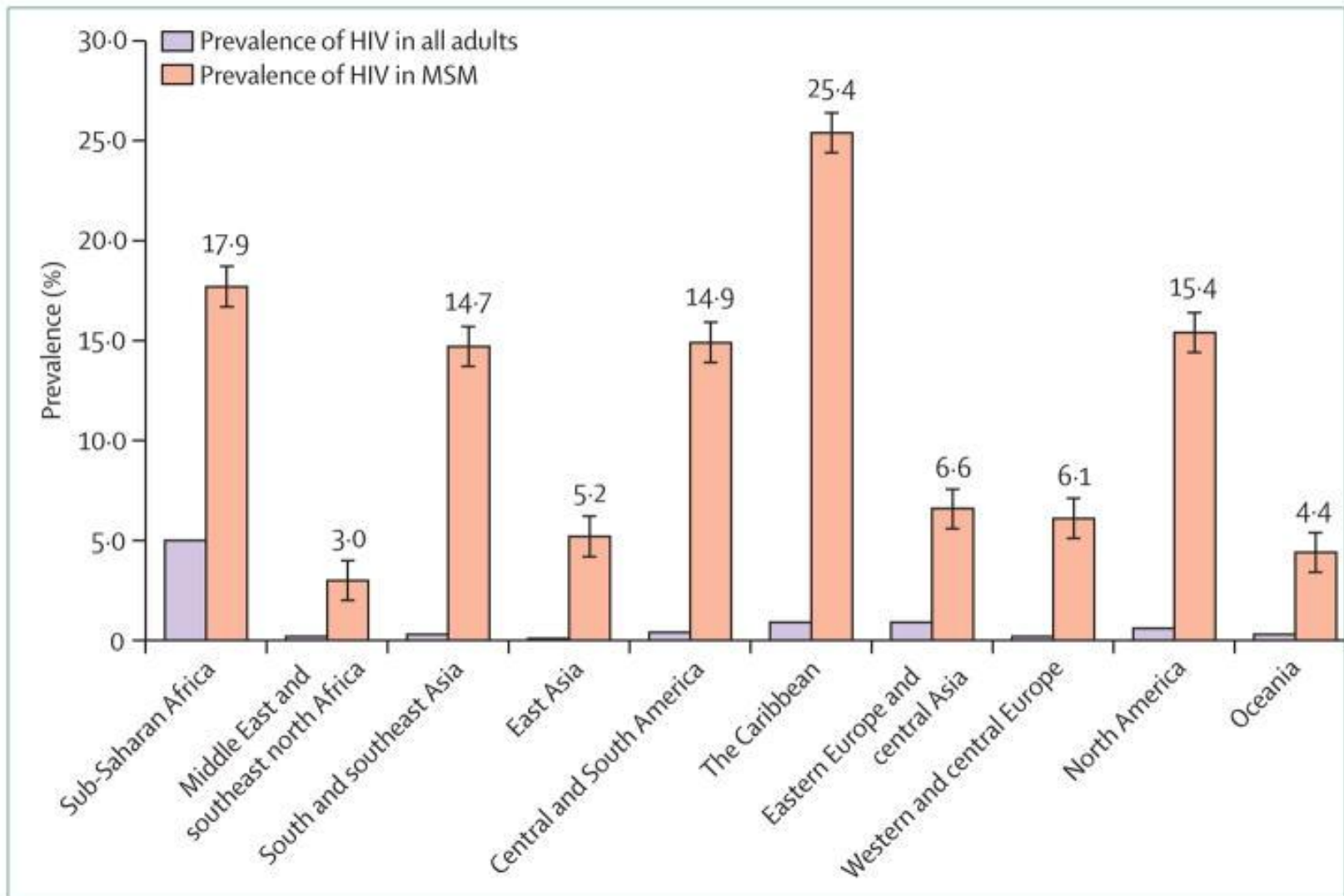
# Global HIV Situation among MSM

- **Challenges in HIV programs:** Greater risk for HIV/STI, less access to intervention programs, and less understood due to their more hidden and stigmatized nature ([Altman et al. Lancet 2012;380:439-45](#))
- **HIV prevalence:**
  - 3.0% in the Middle East and north Africa region to as high as 25.4% in the Caribbean ([Beyrer et al. Lancet 2012;380:367-77](#))
  - HIV and STI prevalence continues to rise ([Beyrer et al. AIDS 2013;27:2665-78](#))
- **Condom use and HIV testing:** Considerably low in low- and middle-income countries ([Oldenburg et al. PLOS One 2014;9:e103549](#))





Global HIV prevalence in MSM, from studies published 2007–2011 (Beyrer et al. Lancet 2012)



Global prevalence of HIV in MSM compared with regional adult prevalence (UNAIDS, 2010)

# HIV Situation among MSM in Cambodia

- **HIV/STI prevalence:** BROS Khmer Study (2010) - MSWM
  - HIV prevalence: 2.2% (**HSS 2014: 2.3%**)
  - STI symptoms in the past 12 months: 51.5%
- **HIV risk behaviors (in the past 3 months):**
  - Mean number of sex partners: 4
  - Had sex with a girlfriend: 32.2%
  - Had sex with FSWs: 14.6%
  - Had sex with MSWs: 9.9%
  - Sold sex to women: 8.9%
  - Sold sex to men: 17.4%

*Siyon Yi et al., 2015 (JIAS, BMC Public Health, PLOS One)*



# Condom Use among MSM in Cambodia

## – Always used condoms in the past 3 months with:

- Girlfriends: 55.1%
- Boyfriends: 64.2%
- Female sex workers: 75.9%
- Male sex workers: 73.0%
- Female clients: 78.1%
- Male clients: 70.3%

## – Always used lubricant in the past 3 months:

- Anal sex with boyfriends (80.8%)
- Selling anal sex (64.1%)

Siyon Yi et al. *PLOS One* 2015 (In press)



# Factors Associated Inconsistent Condom Use among MSM in Cambodia

- Older age:  $\geq 25$
- Self-perception of higher HIV risk compared to the general population (**Higher: 36%, Same: 16.4%, Lower: 46.6%**)
- Illicit drug use
- Reported consistent lubricant use when having anal sex with men
- Self-reported quality of life as good or very good

Siyon Yi et al., *PLOS One* 2015 (in press)



# HIV Testing among MSM in Cambodia

## – HIV testing history:

- Lifetime: 83.6%
- Past 6 months: 65.1%

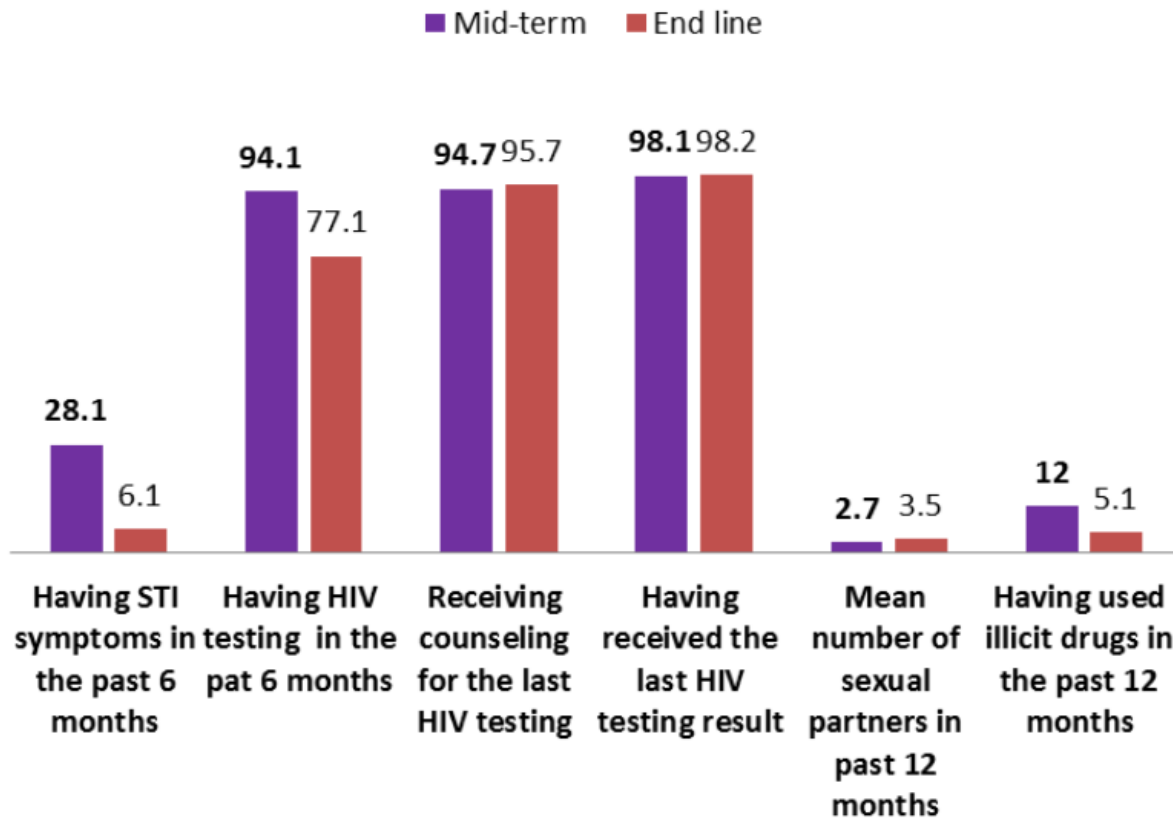
## – Factors associated with HIV testing:

- Receiving any form of HIV education
- Self-perception of higher HIV risk compared to general population
- Having been diagnosed with an STI
- Using a condom at last sex with a man or women
- Using a condom at last anal intercourse with a boyfriend

*Siyan Yi et al., BMC Public Health 2015; 15: 178*







**Figure:** Comparisons of STI, HIV testing and counseling, sexual behavior, and drug use among MSM under the SAHACOM Project at midterm and end line

**Source:** Siyan Yi et al. *Journal of International AIDS Society* 2015 (In press)

# History of MSM Size Estimation in Cambodia

- **MSM size estimation:**
  - In 2004, first MSM mapping - snowball sampling technique (by FHI 360)
    - 1,500 MSM in Phnom Penh
  - In 2008, two studies in 9 provinces:
    - Capture-Recapture methods (FHI 360)
    - Counting MSM population (KHANA)
    - Consensus number of MSM: approximately 21,000



# Why Another MSM Size Estimation?

- MSM size estimation data are outdated and did not cover some high burden ODs
- Updated data are important for micro-planning intervention and implementation
- This study included 21 ODs in 12 provinces from June to September 2014



# Objectives

## – Primary objective:

- To estimate the size of MSM population in Cambodia

## – Secondary objectives:

- To identify risky sexual behaviors among MSM
- To assess accessibility to HIV prevention, care, and support services among MSM
- To assess HIV and AIDS intervention coverage –
  - Exposure to outreach workers, the Mstyle website and facebook page among MSM



# Methods



# Study Population

- **MSM definition:** Males who have sex with males, regardless of whether they have sex with women or have a personal or social gay or bisexual identity (UNAIDS, 2011)
- **Eligibility criteria:**
  - Biological male
  - 15 years of age
  - Reporting having sex with at least one male partner in the past 12 months
  - Khmer speaking
  - Able and willing to provide oral informed consent



# Study Sites



12 provinces/21 ODs

## Types of venues:

- Night club/discotheque
- Sauna/spa
- Barber/beauty salon
- Streets
- Park/river bank
- Specific community:  
private houses,  
pagoda, etc.



# Behavioral Survey

- Randomly selected venues/hotspots : 133/641
- Recruited all MSM presenting at the selected venues/hotspots for interviews
- Sample size: 838 MSM
- Variables: Socio-demographic characteristics, sexual behaviors, condom use, HIV/STI testing, HIV education, accessibility to condom





# Mapping Prior to Data Collection

- Based on GIS mapping where it exists
- Working with local NGOs, PHD, MSM network to update list of venues/hotspots based on existing GIS data (as of July 2014)
- Interviewing 96 key informants (8 per province) to identify networks and new venues/hotspots

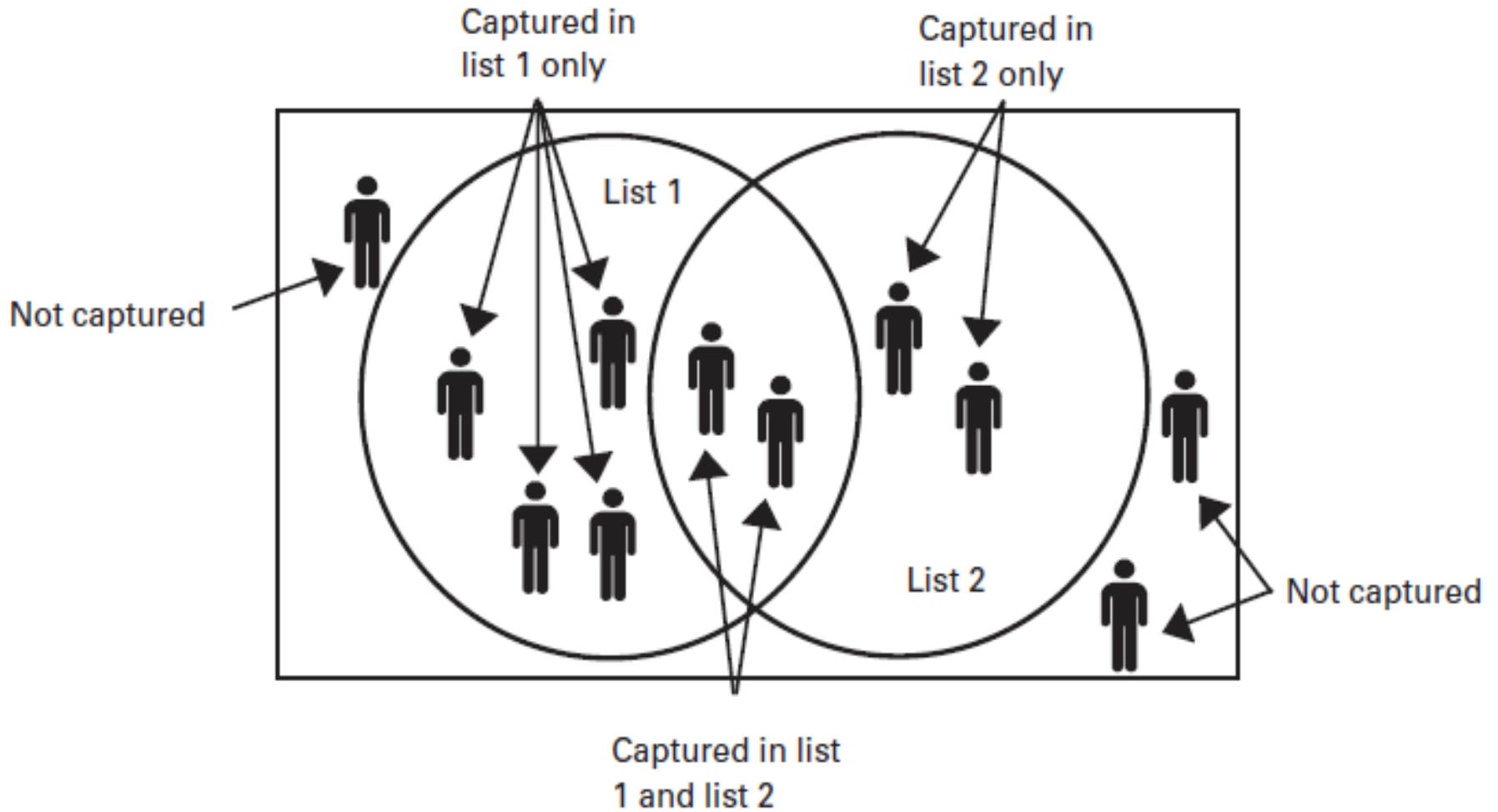


# Mapping Results

Provinces	Number of venues/hotspots			Total
	From GIS	Phase 1 : adding new sites from programs	Phase2 : adding new sites from KII	
Banteay Meanchey	82	70	0	152
Battambang	83	2	0	85
Kampong Cham	27	0	0	27
Kampong Chhnang	28	2	0	30
Kampong Speu	2	16	3	21
Kandal	19	0	0	19
Koh Kong	27	14	2	43
Phnom Penh	108	0	13	121
Prey Veng	69	4	0	73
Siem Reap	43	0	0	43
Preah Sihanouk	17	0	0	17
Svay Rieng	0	0	10	10
<b>Total</b>	<b>505</b>	<b>108</b>	<b>28</b>	<b>641</b>



# Capture-Recapture Method



# Capture and Recapture

- **Round 1:** Visiting all sites and tagging all MSM from Monday – Sunday
- **Round 2:** After 18 days, returning to the same sites and re-tagging all MSM from Monday – Sunday
- One-page paper-based questionnaire
- Visiting each venue/hotspot (in both round) at least **two times**



# Assumptions

## Inclusion: All MSM – sexually active & inactive, reachable & hidden, and urban & rural

- Using capture – recapture method: Visible and reachable MSM
- Being MSM is biological factor – MSM can be everywhere among male population
- MSM are more likely to relocate to the cities where they can meet their peers and sexual partners – the ratio of MSM among male population in urban is believed to be higher than in rural
- In our case, ratio MSM to male is 18 to 1000 (1.8%) in urban, and 5 to 1,000 (0.5%) in rural



# Data Analyses: Size Estimation

- **For capture-recapture data:** Lincoln-Peterson formula for MSM size estimation

$$: N = \frac{C1 * C2}{R}$$

$$95\% \text{ CI} = N \pm 1.96 \sqrt{\text{Var}(N)} \text{ where } \text{Var}(N) = \frac{C1C2 * (C1 - R) * (C2 - R)}{R^3}$$

*(C1 = capture round 1, C2= capture round 2, R= retagged)*

## MSM in this study:

- Visible-reachable MSM
- Having sex with at least one man in the past 12 months
- Presented at the hotspots/venues



# Data Analyses: Size Estimation (2)

- **Second step:** Calculation of all MSM population in the studied areas including hidden and sexually inactive MSM using the following assumptions:
  - **35% hidden MSM among total MSM**
    - Rate obtained during the mapping through interviewing with 96 Key Informants
  - **11% sexually inactive MSM among total MSM**
    - Rate obtained from screening questionnaire before enrolment



# Data Analyses: Size Estimation (3)

- **Third step: Estimation of the whole MSM population in Cambodia through:**
  - Calculating the proportion of MSM compared to male population in the studied areas
    - *Male population aged 15-49 in studied administrative districts were used as based population*
  - Extrapolating to estimate MSM size population in the remaining areas not included in the study
  - Summing the estimated number of MSM in all provinces/ODs to obtain the global MSM population in Cambodia





# Ethical Considerations

- **Ethical approval:**
  - National Ethics Committee for Health Research (NECHR)
  - FHI 360 Ethical Committee-Protection of Human Subjects Committee (PHSC)
- **Oral informed consent:** All participants
- **Confidentiality & privacy protection:**
  - No personal identifier collected
  - Interviews at private places



# Results



# Age Groups

Number by age group	<i>n</i> =5,557 (%)
Mean ± (years, SD)	<b>24.8 (6.6)</b>
15-17	222 (4.0)
18-24	<b>2,998 (54.0)</b>
25-29	1,370 (24.6)
30-34	573 (10.3)
35-39	181 (3.2)
40-44	88 (1.6)
45-49	128 (2.3)



# Education & Migration

Education (years)	
Mean number of years in school (in years $\pm$ SD)	9.6 (3.6)
Never attended school	84 (1.5)
Grade 1-6	899 (16.2)
Grade 7-9	<b>1,700 (30.6)</b>
Grade 10-12	<b>1,952 (35.2)</b>
Grade 12 or higher	915 (16.5)
Planned to stay in the current city in the next 30 days	<b>2730 (90.4)</b>
Stayed in the current city in the past 30 days	<b>3929 (93.8)</b>



# Occupation & Marital Status

## Occupations

Unemployed	513 (9.2)
Students	<b>933 (16.8)</b>
Office workers	781 (14.0)
Entertainment workers	586 (10.5)
Self-employed	<b>1,042 (18.8)</b>
Salon & hairdressers	779 (14.0)
Labor workers	835 (15.0)
Sex workers	40 (0.7)

## Marital status

Never married	<b>5,163 (92.7)</b>
Married	281 (5.0)
Divorced, separated, or widowed	105 (1.9)



## Sexual behaviors (*n*= 838)

*n* (%)

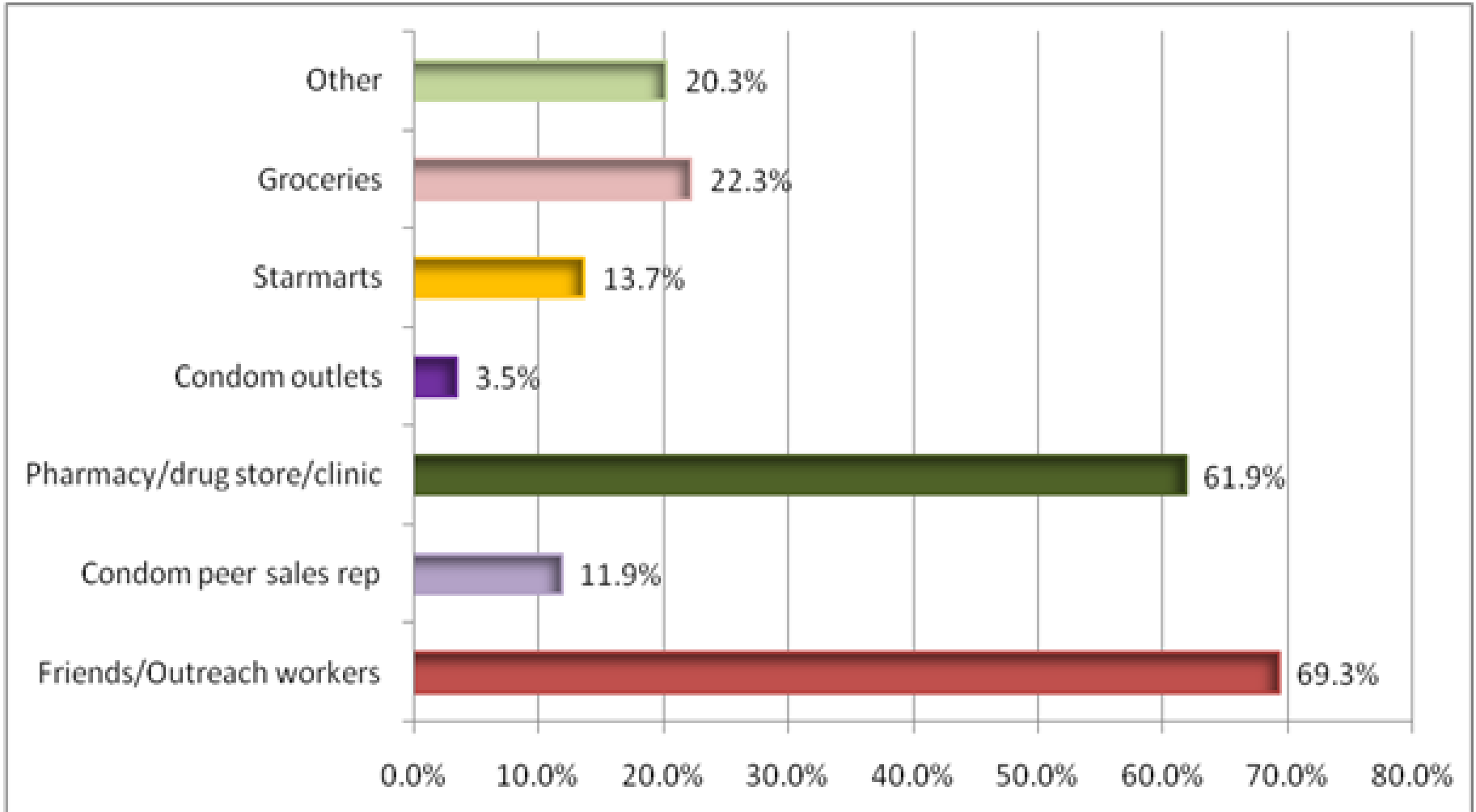
Had anal sex in last 12 months	742 (88.6)
Had anal sex last month	536 (64.0)
Role at last anal sex	
Never had sex	75 (8.9)
Insertive	346 (41.0)
Receptive	343 (41.0)
Both	74 (8.8)
Number of sexual partner in the past month	
Mean ( $\pm$ SD)	<b>1.7 <math>\pm</math> 4.8</b>
0	139 (16.6)
1	197 (23.5)
2-3	<b>254 (30.4)</b>
> 3	<b>247 (29.5)</b>
Types of sexual partners in the past 6 months	
Biological male only	<b>538 (70.5)</b>
Biological female only	17 (2.3)

## Places to meet sex partners in the past 12 months

Clubs or discotheques	<b>308 (40.4)</b>
Saunas, spas, or massage parlors	131 (17.2)
Barbers or beauty salons	27 (3.5)
Streets, parks or river sides	<b>435 (57.0)</b>
Private houses	<b>300 (39.3)</b>
Specific communities	101 (13.2)
M-Style or MSM clubs	19 (2.5)
<b>Always used condoms when having anal sex in last 6 months</b>	<b>530 (69.4)</b>



# Preferred Place to Get Condoms & Lube





# HIV & STI Testing

HIV and STI Testing (n=838)	<i>n</i> (%)
Had HIV test in the past 6 months	<b>558 (66.6)</b>
Had STI screening in the past 6 months	413 (49.3)
Had STI symptoms in the past 12 months	65 (7.8)



# Access to HIV Education

Access to HIV education(n=838)	<i>n</i> (%)
Received information on HIV in the past 6 months	<b>600 (71.6)</b>
Visited M-Style website in the past 6 months	116 (13.9)
Used M-Style Facebook in the past 6 months	93 (11.1)



# Findings: Size Estimation



# Estimation of C-RC MSM Population (15-49) in Studied Areas

Variables	Capture Recapture		R	Total	95% CI	
	(C1)	(C2)			Lower	Upper
<b>Number by province</b>	<i>n</i>	<i>n</i>		<i>n</i> (%)		
BanteayMeanchay	307	514	238	663	634	692
Battambang	440	573	250	<b>1,008</b>	947	1,070
Kampong Cham	113	123	69	201	182	221
Kampong Chhnang (Urban)	59	115	32	212	170	254
<b>Kampong Chhnang (Rural)</b>	50	96	26	185	143	227
Kampong Speu	87	146	40	318	256	379
Kandal	115	183	74	284	255	314
Koh Kong	39	59	31	74	66	82
Phnom Penh	1,291	1,624	569	<b>3,685</b>	3,502	3,867
<b>Prey Veng (Rural)</b>	41	173	32	222	189	254
Siem Reap	366	430	212	<b>742</b>	696	789
Preah Sihanouk	65	118	52	148	134	161
Svay Rieng	53	44	32	73	65	81
<b>Total</b>	<b>3026</b>	<b>4198</b>	<b>1657</b>	<b>7,815</b>	<b>7,238</b>	<b>8,391</b>



## Estimation of All MSM Population (15-49) in Studied Areas Including Sexually Inactive and Hidden MSM

Provinces and administrative districts	Had sex in past 12 months (C-RC) (54%)	Sexually inactive (11%)	Hidden MSM (35%)	Total MSM (100%)
<b>Phnom Penh</b>	<b>3,685</b>	<b>751</b>	<b>2388</b>	<b>6823</b>
<b>Battambang</b>	<b>1,008</b>	<b>205</b>	<b>654</b>	<b>1868</b>
<b>Siem Reap</b>	<b>742</b>	<b>151</b>	<b>481</b>	<b>1375</b>
<b>Banteay Meanchey</b>	<b>663</b>	<b>135</b>	<b>430</b>	<b>1228</b>
<b>Kampong Chhnang (Urban)</b>	<b>212</b>	<b>43</b>	<b>137</b>	<b>393</b>
<b>Kampong Chhnang (Rural)</b>	<b>185</b>	<b>38</b>	<b>120</b>	<b>343</b>
<b>Kampong Speu</b>	<b>318</b>	<b>65</b>	<b>206</b>	<b>588</b>
<b>Kandal</b>	<b>284</b>	<b>58</b>	<b>184</b>	<b>527</b>
<b>Prey Veng (Rural)</b>	<b>222</b>	<b>45</b>	<b>144</b>	<b>410</b>
<b>Kampong Cham</b>	<b>201</b>	<b>41</b>	<b>131</b>	<b>373</b>
<b>Preah Sihanouk</b>	<b>148</b>	<b>30</b>	<b>96</b>	<b>273</b>
<b>Koh Kong</b>	<b>74</b>	<b>15</b>	<b>48</b>	<b>137</b>
<b>Svay Rieng</b>	<b>73</b>	<b>15</b>	<b>47</b>	<b>135</b>
<b>Total</b>	<b>7,815</b>	<b>1,509</b>	<b>4,802</b>	<b>13,719</b>



# Proportion of MSM among Male Population (15-49) in Studied Areas

Provinces and administrative districts	Male pop. age 15-49	Total MSM age 15-49	Percent, 95% CI
<b>Urban</b>			
Phnom Penh	329,073	6823	2.1
Battambang	101,083	1868	1.8
Siem Reap	75,947	1375	1.8
Banteay Meanchey	51301	1228	2.4
Kampong Chhnang	11166	393	3.5
Kampong Speu	57,084	588	1.0
Kandal	69,469	527	0.8
Kampong Cham	42,654	373	0.9
Preah Sihanouk	22,226	273	1.2
Koh Kong	7,906	137	1.7
Svay Rieng	13,304	135	1.0
<b>Total</b>	<b>781,214</b>	<b>13,719</b>	<b>1.8</b>
<b>Rural</b>			
Prey Veng	104,537	410	0.4
Kampong Chhnang	55864	343	0.6
<b>Total</b>	<b>160,401</b>	<b>753</b>	<b>0.5</b>



# Estimation of the Whole MSM Population in Cambodia

Pro and Admin districts	Urban			Rural			Total		
	M-pop. age 15-49	%	Est. MSM age 15-49	M-pop. age 15-49	%	Est. MSM age 15-49	M-pop. age 15-49	%	Est. MSM age 15-49
Phnom Penh	329,073	2.1	6823	N/A	N/A	N/A	329,073	2.1	6,823
Battambang	80,784	2.3	1868	192,696	0.5	963	273,480	1.0	2,831
Banteay Meanchey	75,947	1.8	1375	150,086	0.5	750	226,033	0.9	2,125
Siem Reap	51301	2.4	1228	185,992	0.5	930	237,293	0.9	2,158
Kampong Chhnang	11,166	3.5	393	123,013	0.5	615	134,179	0.8	1,010
Kampong Speu	57,084	1	588	156,563	0.5	783	213,647	0.6	1,371
Kandal	69,469	0.8	527	300,133	0.5	1,501	369,602	0.5	2,028
Prey Veng	7,199	1.8	130	217,091	0.5	1,085	224,290	0.5	1,215
Kampong Cham	42,654	0.9	373	471,508	0.5	2,358	514,162	0.5	2,731
Preah Sihanouk	22,226	1.2	273	34,332	0.5	172	56,558	0.8	445
Svay Rieng	13,304	1	135	152,362	0.5	762	165,666	0.5	897
Koh Kong	7,906	1.7	137	28,285	0.5	141	36,191	0.8	278
Otdar Meanchey	35308	1.8	636	22,950	0.5	115	58,258	1.3	750
Pursat	17302	1.8	311	99,045	0.5	495	116,347	0.7	807
Kampong Thom	15323	1.8	276	172,227	0.5	861	187,550	0.6	1,137
Takeo	13125	1.8	236	253,926	0.5	1,270	267,051	0.6	1,506
Mondul Kiri	2758	1.8	50	12,653	0.5	63	15,411	0.7	113
Kampot	10148	1.8	183	165,484	0.5	827	175,632	0.6	1,010
Pailin	8939	1.8	161	9,357	0.5	47	18,296	1.1	208
Kracheh	8698	1.8	157	78,030	0.5	390	86,728	0.6	547
Stung Treng	8157	1.8	147	20,870	0.5	104	29,027	0.9	251
Ratanak Kiri	6503	1.8	117	31,373	0.5	157	37,876	0.7	274
Preah Vihear	4879	1.8	88	40,245	0.5	201	45,124	0.6	289
Kep	2852	1.8	51	7,248	0.5	36	10,100	0.9	88
<b>Total</b>	<b>902,105</b>	<b>—</b>	<b>16,263</b>	<b>2,925,470</b>	<b>—</b>	<b>14,627</b>	<b>3,827,575</b>	<b>0.8</b>	<b>30,891</b>



# Discussion





# Assumptions for C-RC Data Accuracy

## Assumptions for C-RC data accuracy:

1. Two rounds of sampling should be independent (no token influence and equal probability of selection between the two rounds)
2. A recapture should be easily identified and reliable (effective token and optimum time interval)
3. Sample size of each round should be large enough
4. Population should be closed (<10% migration outside the study areas)
  - 90.2% planned to stay in the current city in next 30 days
  - 93.6% stayed in the current city in the past 30 days



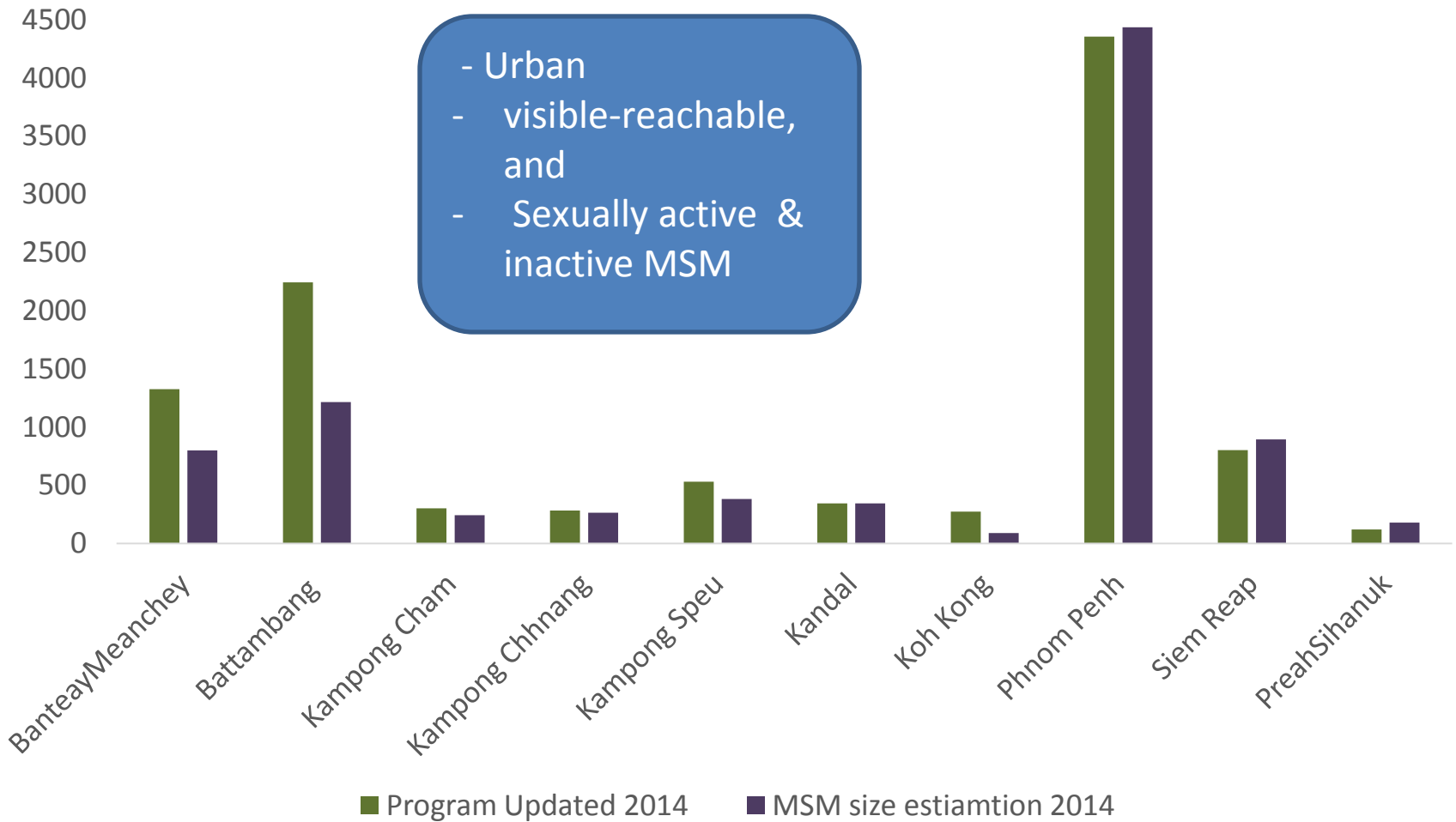
# Assumptions for C-RC Data Accuracy

## 5. Every target population (MSM) has equal chance to be recruited

- Non-disclosed MSM
- Few venues were not accessible and/or had some security issues (Svay Rieng),
- Recruitment was sometimes difficult because of the weather (raining)
- The number of non-disclosed MSM was compensated by adding 35% hidden MSM, and some MSM could be captured elsewhere



# Comparisons with Program Data



# Limitations

- Not completely closed population
- Difficult to justify for equal chance to participate due to intrinsic nature of human variation
- Estimation reflects only number of MSM who usually congregate at venues or hotspots listed during mapping
- Behavioral questionnaire: Self-report measures - inherent biases potential for both under and over reporting
- Unknown reliability and validity of the study tools
- Possible recall biases



# Conclusions



# Size Estimation

- **Number of MSM in Cambodia**

- TOTAL: 30,891

■ Urban	16,263 (52.6%)
Rural	14,627 (47.4%)
■ Sexually active	27,493 (89.0%)
Sexually inactive	3,398 (11.0)
■ Visible-reachable	20,079 (65.0%)
Hidden	10,812 (35.0%)



# HIV Risk Behaviors among MSM

- **MSM remain at increased risk for HIV:**
  - 60% had two or more sexual partners in the past month
  - 30% did not use condoms consistently when having anal sex in the past 6 months
  - Most common places for finding sexual partners:
    - Streets, parks, or river sides (57%)
    - Clubs or discotheques (40%)
    - Private houses (39%)
- **Recent HIV and STI testing remain considerably low at 67% and 49%, respectively**



# Acknowledgments

- NCHADS
- NIPH
- PHDs, ODs
- USAID
- US-CDC
- WHO
- UNAIDS
- Flagship (KHANA, FHI 360, PSI/PSK)
- Implementing partners and their staff members
- Study participants, local authorities
- Research team members





# Thank you!

## Q & A

