National HSS among ANC and MSM 2014

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HIV Strategic Information

- HIV strategic information is vital for the design and the implementation of HIV/AIDS programs

- In the past, NCHADS has been collecting those information by using different methods; passive and active data collection

- Active surveillance system consists of
    - HIV sentinel surveillance (HSS)
    - Behavioral surveillance survey (BSS)
    - STI surveillance survey (SSS)

- One of the main use of information collected through active surveillance is to estimate HIV prevalence among the Cambodian general population

What is HIV Sentinel Surveillance (HSS)?

- HSS is HIV sero-prevalence survey among some targeted population over time

- HSS data have been used for monitoring the spread of the epidemic as well as for estimating and projecting the HIV prevalence among the general population in Cambodia.

- This 11th round of HSS have been conducted by the NCHADS with technical and financial supports from developing partners

History of HSS in Cambodia

Years	HSS 1996	HSS 1997	HSS 1998	HSS 1999	HSS 2000	HSS 2002	HSS 2003	HSS 2006	HSS 2010	HSS 2014
Province #	18	22	19	20	21	20	22	22	22	22
DSWs	X	X	X	X	X	X	X	X	EWs	-
IDSWs	-	-	X	X	X	X	X	-	EWs	-
POLICE	X	X	X	X	X	X	X	-	-	-
ANC	X	X	-	X	X	X	X	X	X	X
MSM	-	-	-	-	-	-	-	-	-	X

*EWs: include both DSWs and IDSWs and considered as one groups

Objectives

- To estimate HIV prevalence in two sentinel groups: women attending ANC clinics and MSM

- To compare the HIV prevalence in the routine PMTCT program and the ANC sentinel surveillance

- To provide data needed for estimating HIV infection in the general population, trend analysis, monitoring, and program planning

- To conduct a population size estimation for men who have sex with men **(in a separate presentation)**

Methods

- Study design: Cross sectional study

- Sentinel groups:
  - Pregnant women attending antenatal clinics (ANC)
  - Men who have sex with men (MSM)

- Sentinel sites:
  - 22 cities/provinces (PC/RD) for ANC
  - 8 cities/provinces for MSM

- Sample size:
  - ANC: **880 per province/city** (440 from PC & 440 from RD)
  - MSM: **~ 200 per province/city, but ~400 in Phnom Penh**

ANC: 22 sentinel provinces

MSM: 8 provinces: PNP, BTB, BMC, SRP, KPC, KDL, SHV
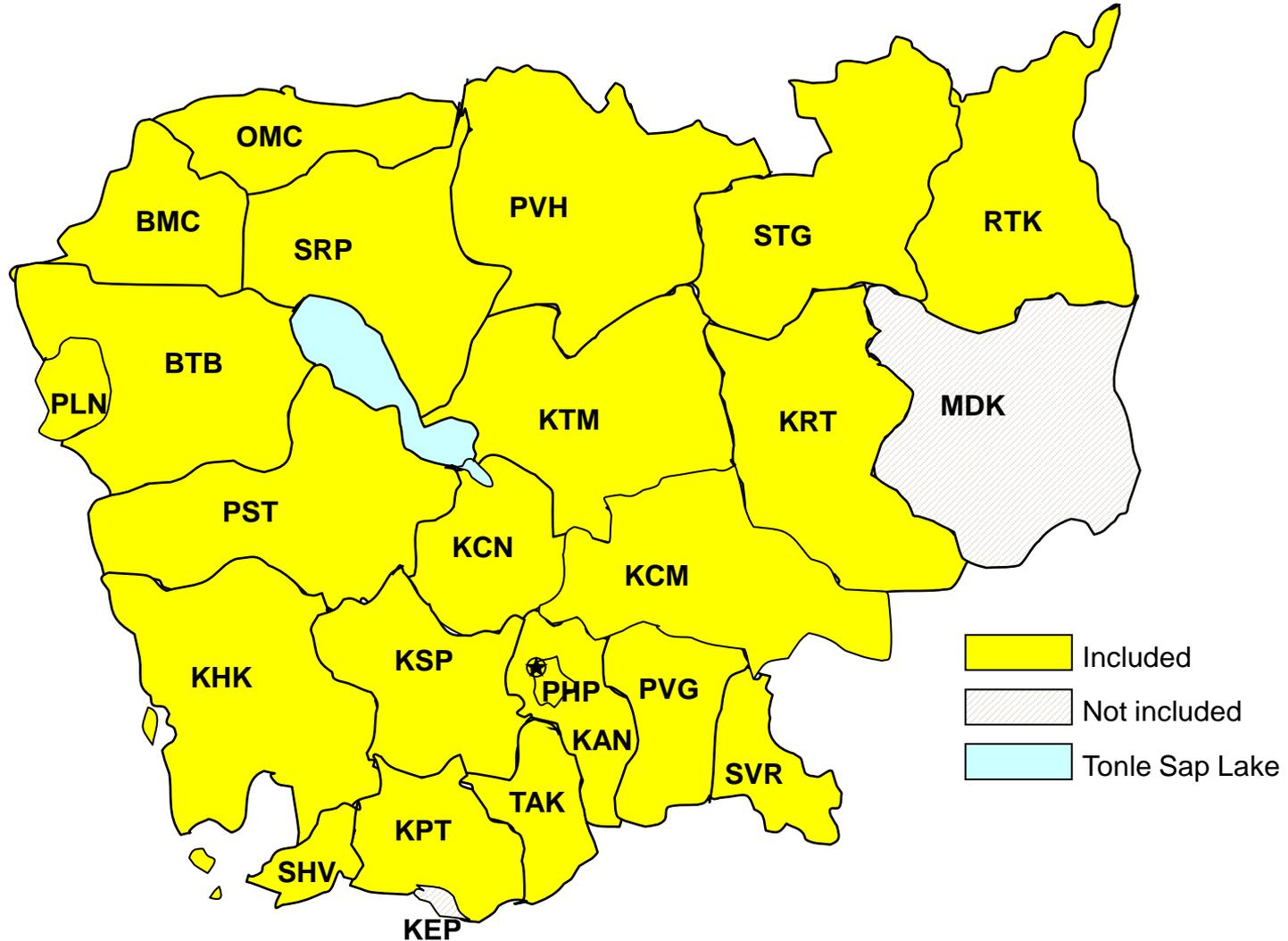
Data collector training

- 2-stage training
  - **Stage 1**: At PNP, Surveillance team, NCHADS trained PASP staff
  - **Stage 2**: At province, PASP staff trained ANC and MSM teams separately under NCHADS supervision

- Training contents
  - Eligibility criteria; sampling technique
  - Informed consent procedures;
  - Specimen collection, processing, and transport;
  - Record keeping and completion of forms (demographic information, and specimen information sheet)

Regional laboratory training

- Phlebotomy and use of vacutainer system

- Dried blood spot (DBS) card preparation

- Specimen handling, storage, and transport

- Record keeping and completion of specimen information sheet and specimen ID and test results

Data collection process

- Similar procedure for both ANC and MSM

  - Informed consent for each participant (both for blood and questionnaire)

  - Short questions on demographic information

  - Specimen collection:

    - **5-10 ml** of whole blood for HIV rapid test at provincial lab

    - DBS card for QC (Transport and stored at NCHADS lab under -80C)

- Thank you gift for participants with equivalent to US$2

Methods: Actual sample size by survey years

	2000	**2002**	**2003**	**2006**	**2010**	**2014**
Provinces	21	20	22	22	22	22
EWs	--	--	--	--	4,265	--
DFSW	2,180	2,110	2,411	2,266	--	--
IDFSW	1,799	1,232	1,633	--	--	--
Police	4,711	4,379	5,796	--	--	--
ANC	6,562	9,168	10,867	12,464	17,200	19,042
MSM	--	--	--	--	--	1,646
Total	15,252	16,889	20,707	14,730	21,465	20,688

Sampling: Pregnant women attending ANC

- Separate samples of 440 women were selected from PC and 440 RD

- In Phnom Penh, all 880 women were recruited

- Pregnant women were **selected consecutively** from designated ANC clinics or health centers until the required sample size was reached

- Duration of data collection was limited to **3 months**

Sampling for MSM

- Time location sampling (TLS) approach

- Before the survey, a mapping exercise to develop a sampling frame (venues and hotspots where and when MSM congregate)

- Then, venues and specific dates/times were randomly selected for data collection

Methods: HIV testing

Tests performed at the provincial level

- **Two rapid tests** were used (Determine HIV 1/2 & Stat-Pak)
- A serial two-test algorithm was used for ANC and MSM

Specimen was tested with:			
Determine HIV 1/2	Stat-Pak		Interpret as HIV:
Nonreactive	N/A	→	Negative
Reactive	Nonreactive	→	Negative
Reactive	Reactive	→	Positive

HIV Quality control testing

- QC was performed at NCHADS central laboratory

- All positive samples were tested

- 10% of all non-reactive specimens were tested

- **Two enzyme Immunoassays** (EIA) were used for QC (Vironostika HIV Uniform and Murex HIV- 1.2 .O)

Vironostika HIV	Murex 1.2.o		Interpret as HIV:
Nonreactive	N/A	→	Negative
Reactive	Nonreactive	→	Negative
Reactive	Reactive	→	Positive

HIV testing algorithm
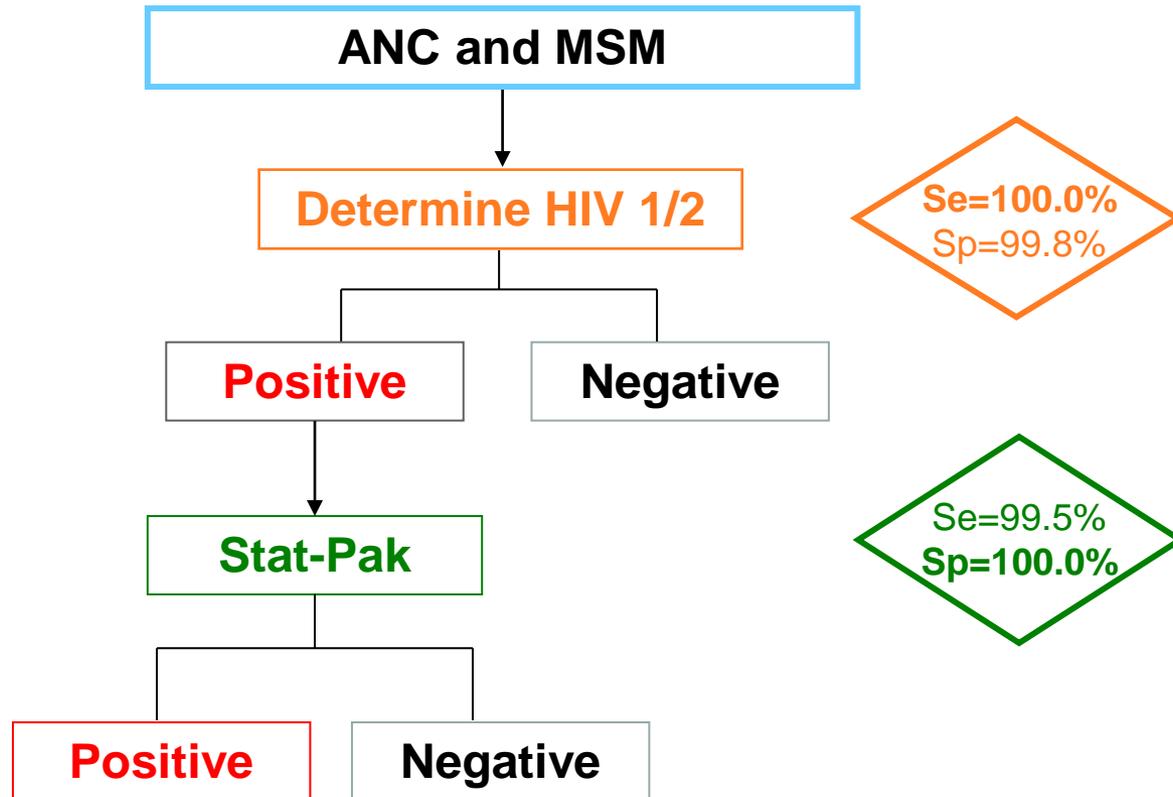
Sensitivity (Se) and specificity (Sp) data from phase 1 validation of 5 rapid HIV tests conducted in Cambodia in 2004. The combined algorithm was found to be 99.5% sensitive and 100% specific.

Quality control testing algorithm
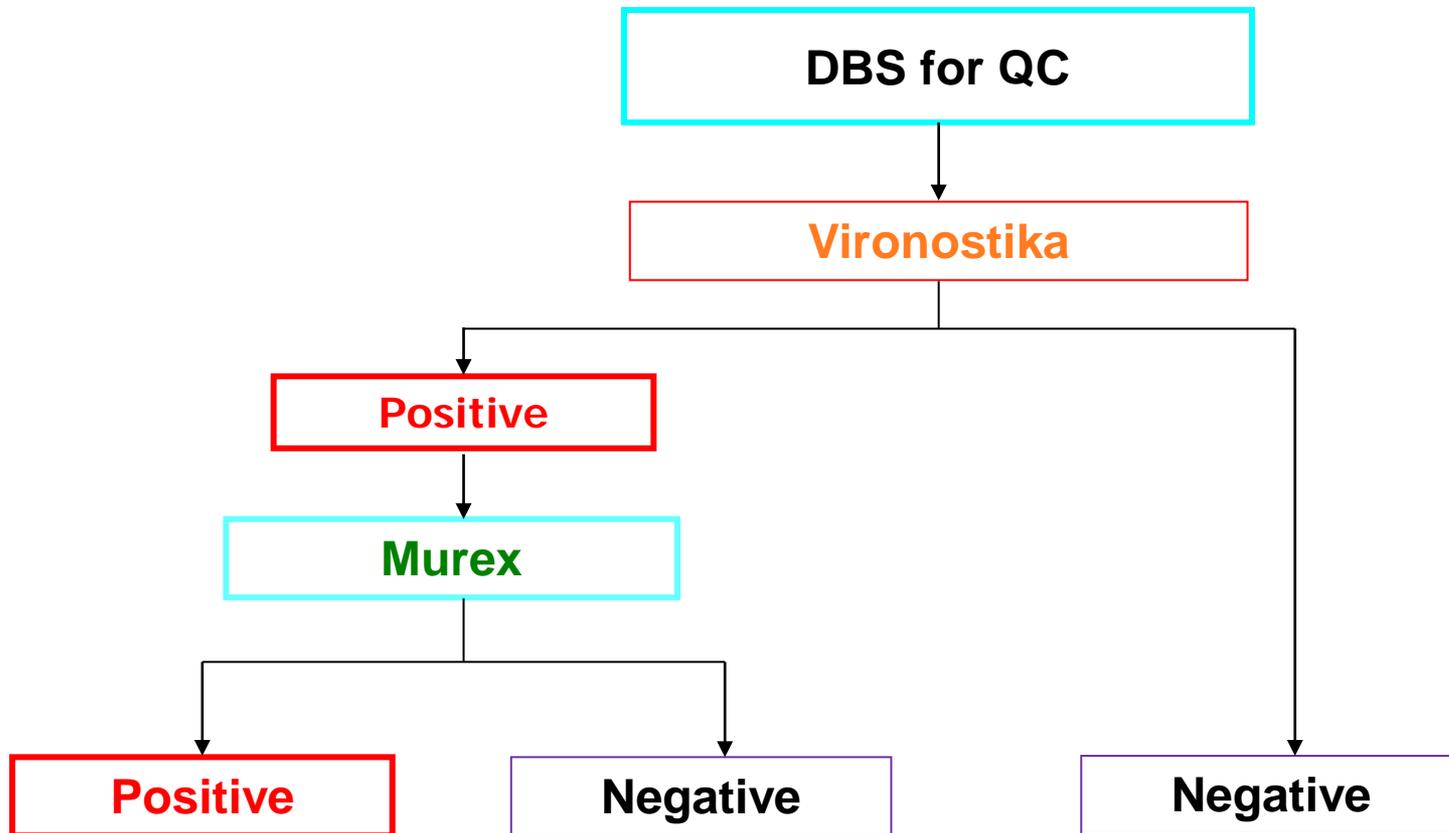
* DBS: Dried blood spot (DBS) card; QC: Quality Control

Data analysis

- Data were analyzed with STATA 13

- HIV prevalence was adjusted for QC

- **For ANC**

  - HIV data were weighted for female population aged 15-49 years old in 2014 by province and stratification by PC and RD

- **For MSM**

  - Un-weighted analysis

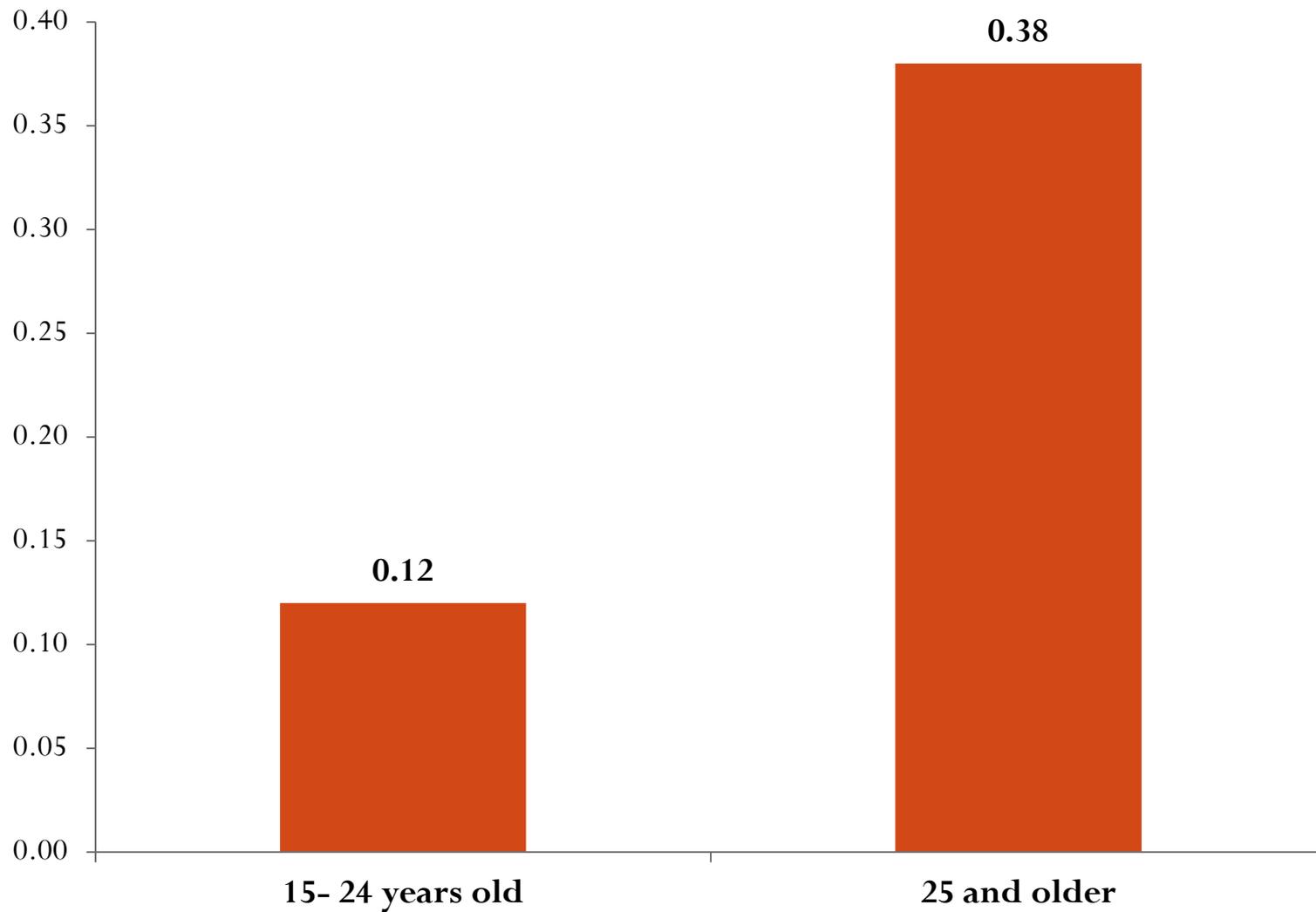# Findings

ANC women's characteristics and PMTCT

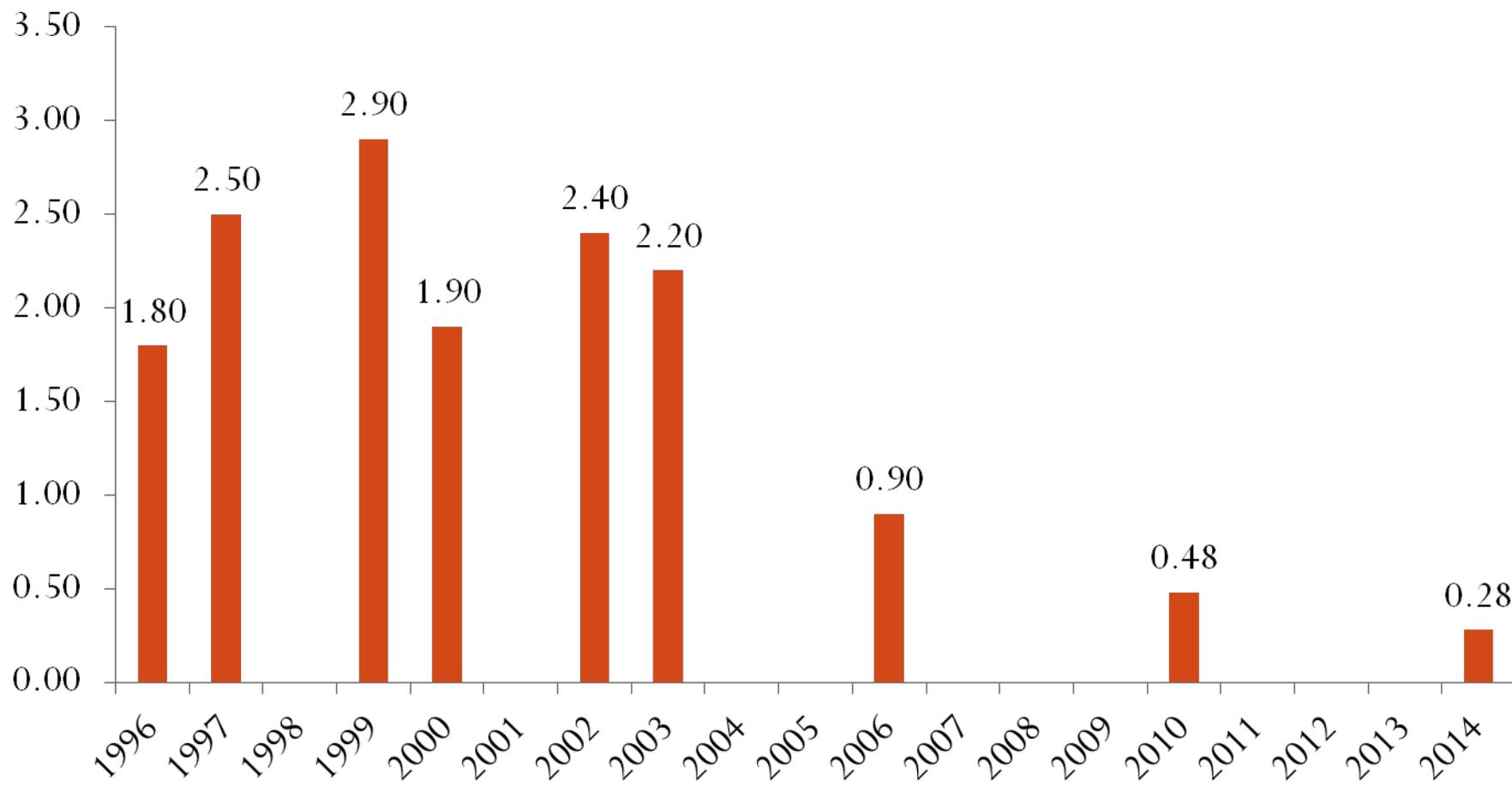| Characteristics	%	n
Mean age in year (median)	26.3 (26)	
Education		
No education	5.1	971
Mean year of educaton (median)	7.1 (7)	
Mean age of first sex (median)	21.7 (21)	
PMTCT		
Be aware of HIV status before pregnancy, N = 18847	59.7	11248
HIV (+) among women known their HIV status before pregnancy, N = 11248	**0.15**	17
ANC women with ART among HIV (+), N = 17	82.4	14
PMTCT HIV test offered at first ANC visit, N = 17	94.1	16
PMTCT HIV test result among those women, N = 15	93.3	14

HIV prevalence* among ANC in 2010 & 2014
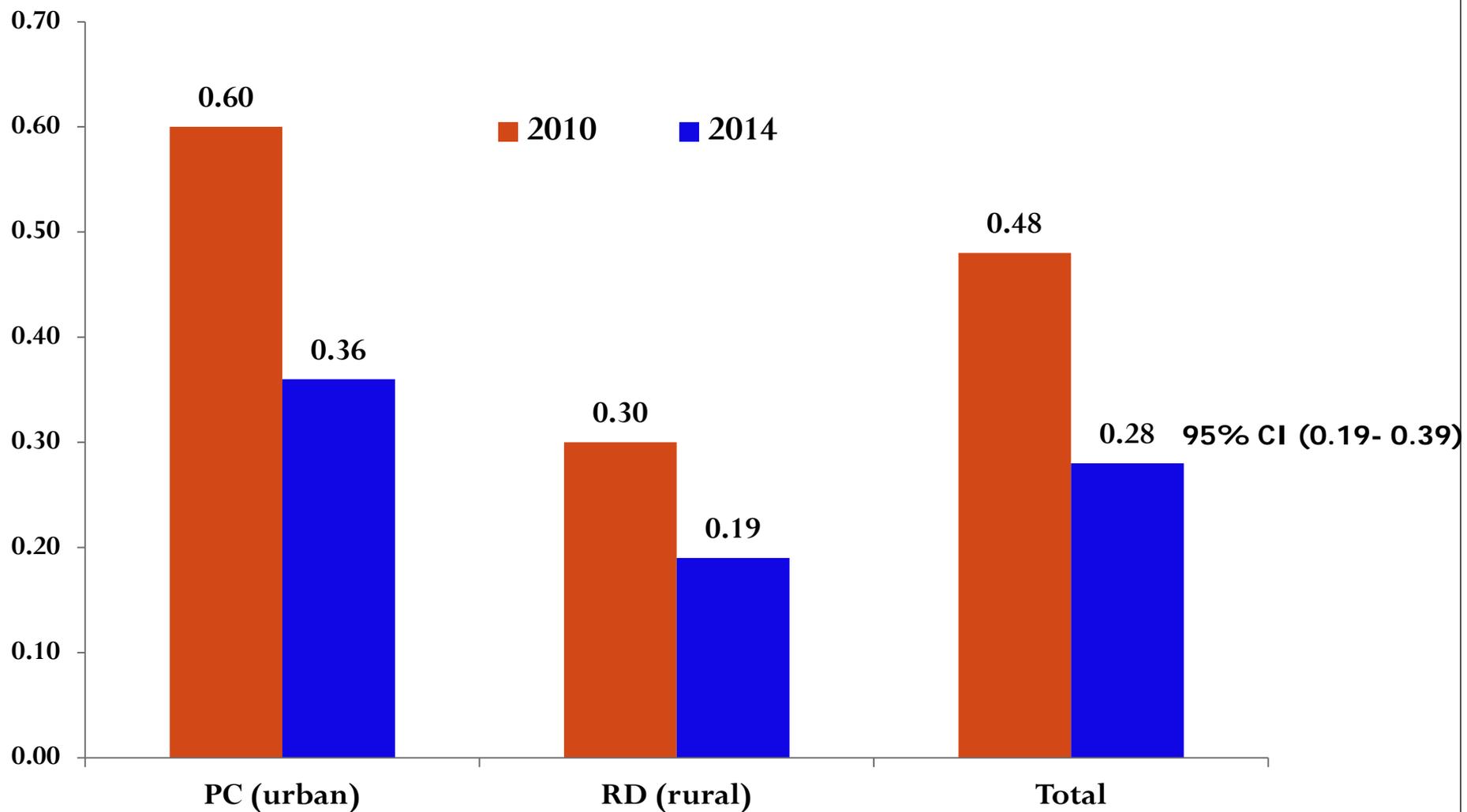
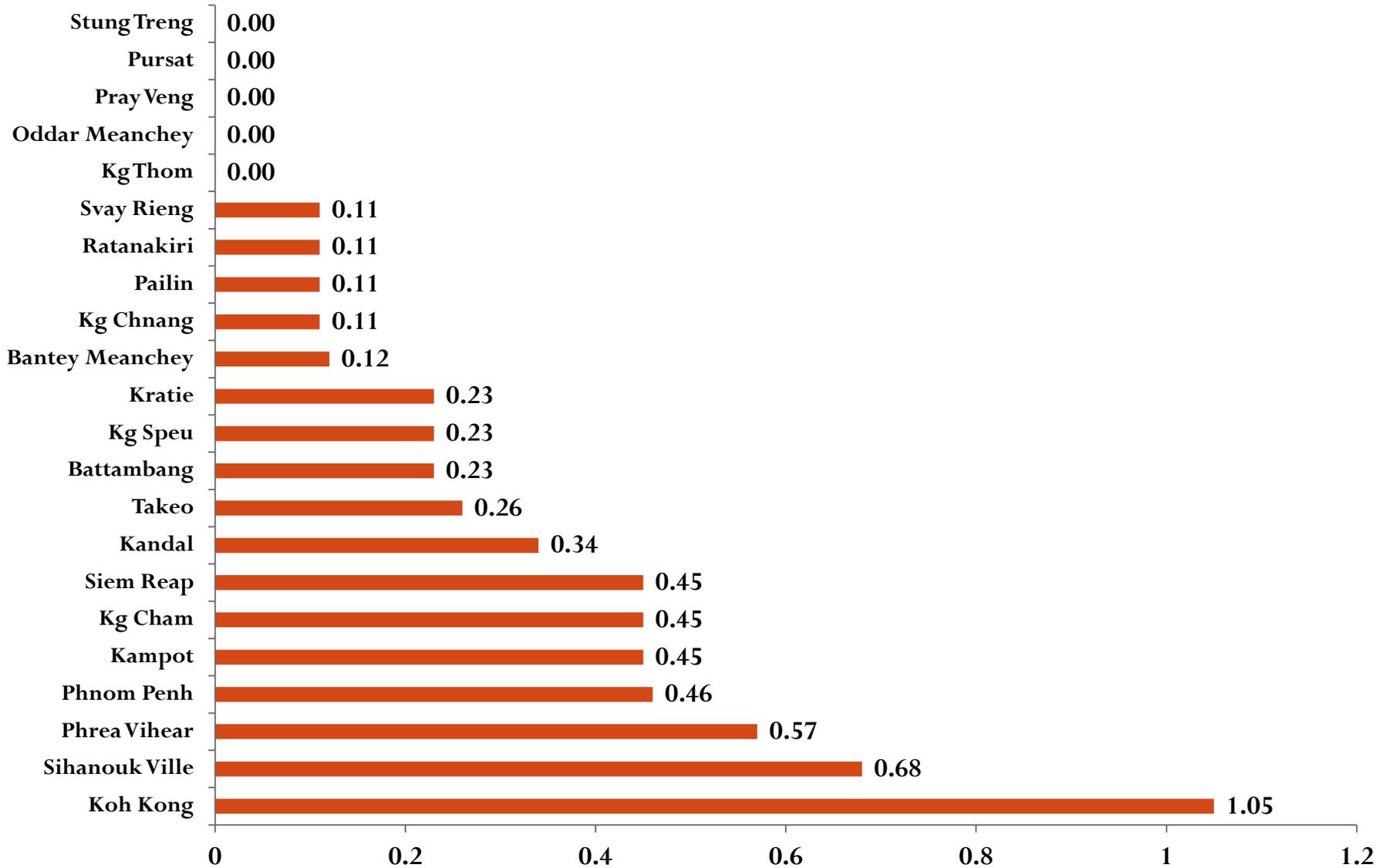* HIV prevalence was weighted for female population in each province

HIV Prevalence among ANC by age groups

HIV prevalence* among ANC by survey year

HIV prevalence was adjusted for QC and weighted (2006, 2010 ad 2014) by provincial population

HIV prevalence among ANC by provinces, 2014

Province	Value
Stung Treng	0.00
Pursat	0.00
Pray Veng	0.00
Oddar Meanchey	0.00
Kg Thom	0.00
Svay Rieng	0.11
Ratanakiri	0.11
Pailin	0.11
Kg Chnang	0.11
Bantey Meanchey	0.12
Kratie	0.23
Kg Speu	0.23
Battambang	0.23
Takeo	0.26
Kandal	0.34
Siem Reap	0.45
Kg Cham	0.45
Kampot	0.45
Phnom Penh	0.46
Phrea Vihear	0.57
Sihanouk Ville	0.68
Koh Kong	1.05

MSM characteristics

Characteristics	%	n
Mean age in year (median)	24.8 (23)	
15- 24 years old	57.2	942
25 and older	42.8	704
Reported married, N = 1646	18.6	306
Spouse of the married MSM, N = 306		
Men	13.4	41
Women	**83.3**	255
Transgender	3.3	10
Mean year of educaton (median)	8.6 (9)	
Mean age of first sex (median)	18.2 (18)	
Reported self identity		
Men	53.8	886
Women	24.6	404
Transgender	21.6	356

MSM occupation

Occupation	Percent
Labor & farmer	29.7
Students	15.8
Beauty salon	11.8
Waiter	11.4
Petty cash seller	8.6
Others	7.1
Jobless	6.9
Private company	3.6
NGOs	3.3
Sell sex	1.8

Percent

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**Others: moto-taxi driver, officer and others*
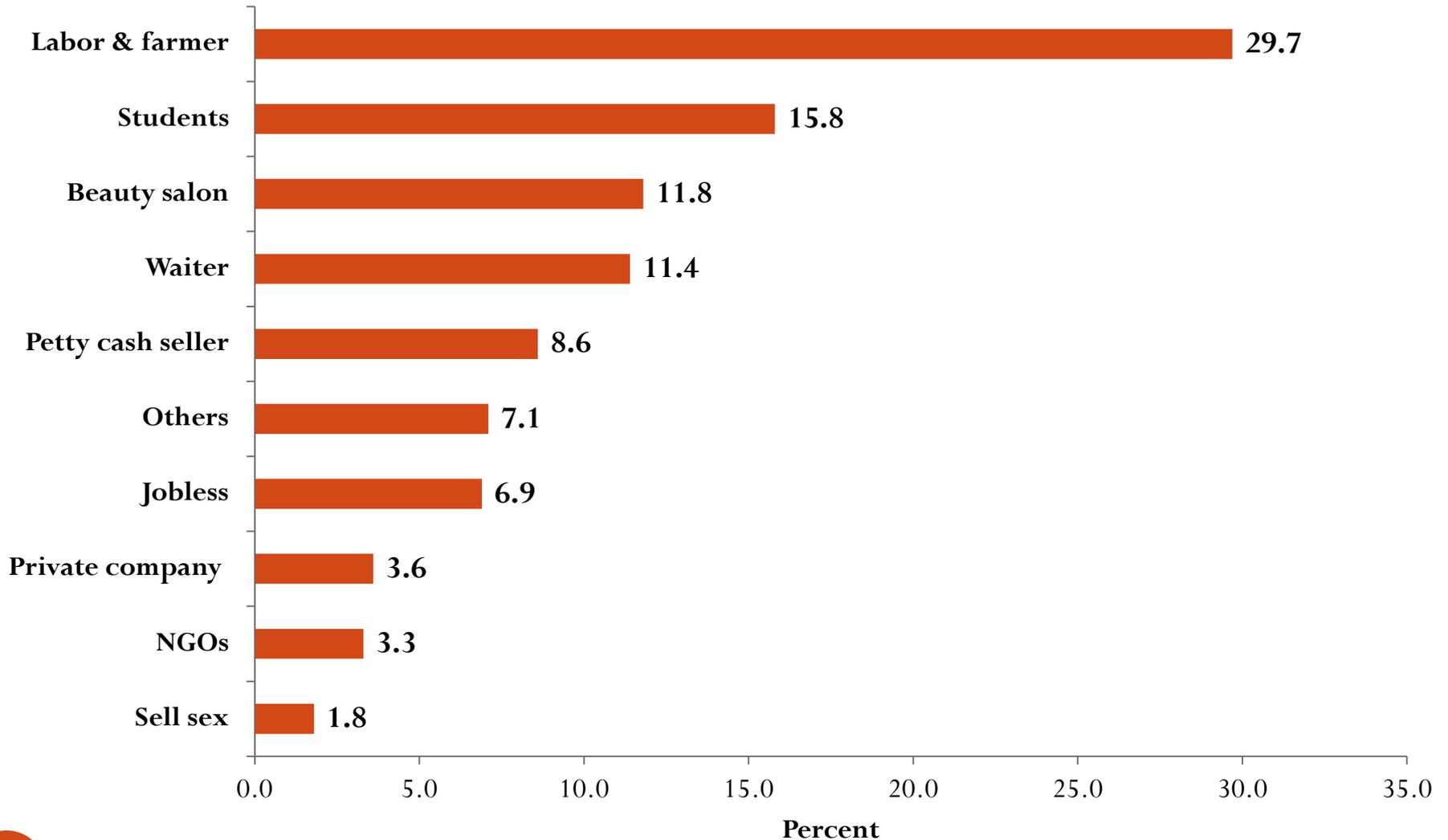
HIV prevalence by MSM self identity

Note: Definition is different from theMSM & TG program perspective. **It was based on the self reported from the participants**, sexual based preference report. **Men** referred to the insertive sex practices where **women** referred to receptive sex practices. **Transgender** referred to the bisexual sex practices
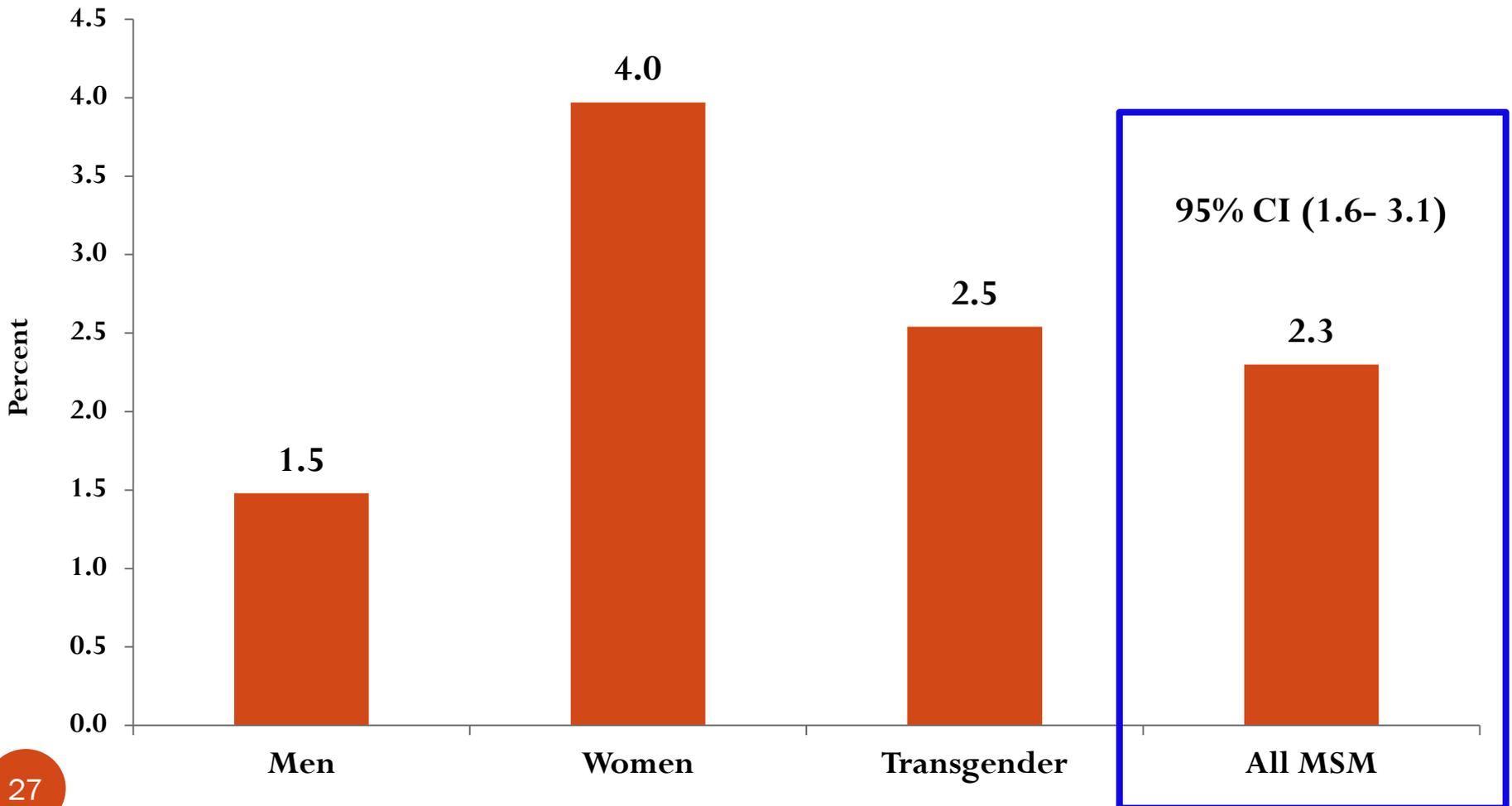
HIV prevalence by age groups
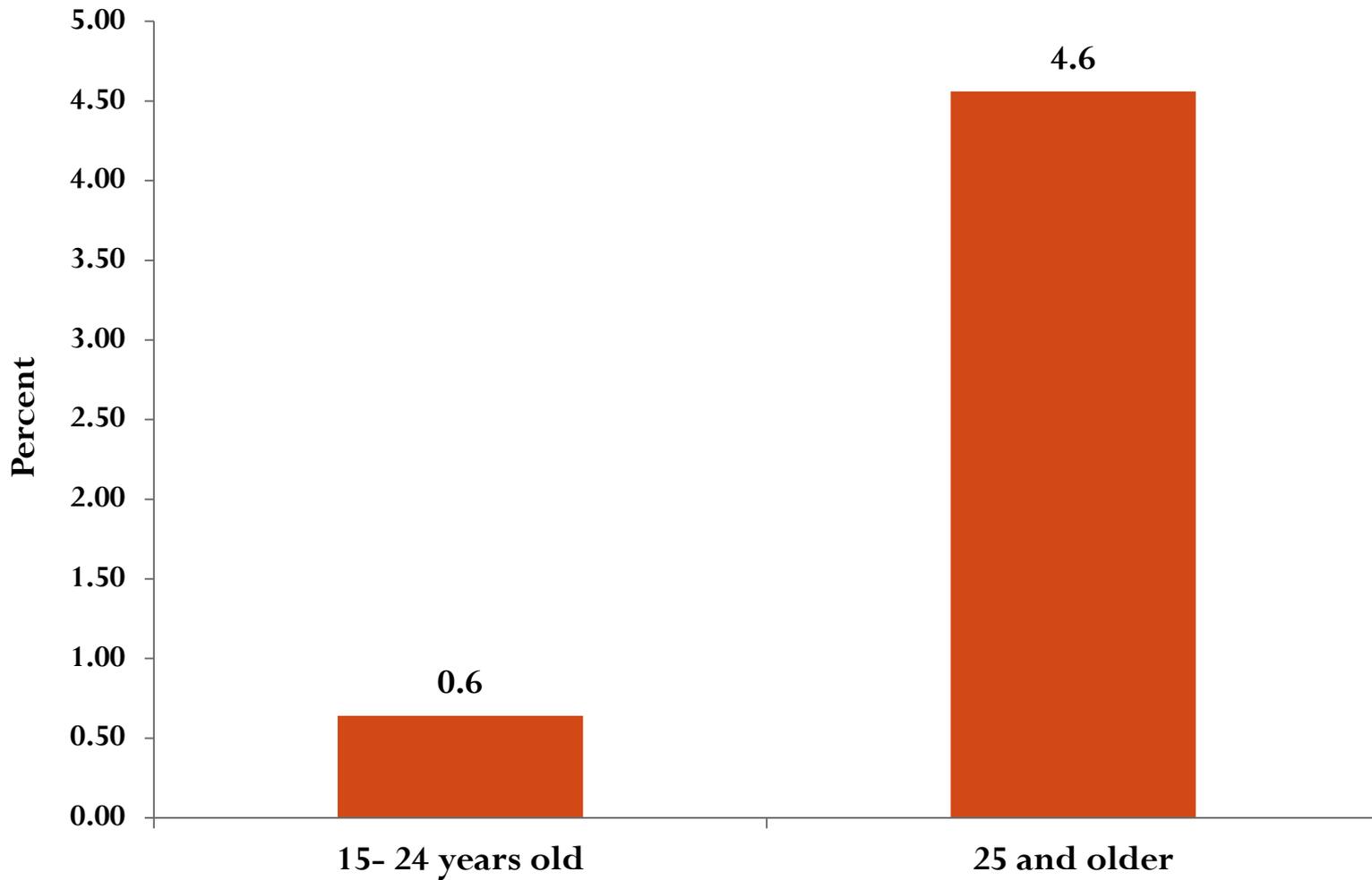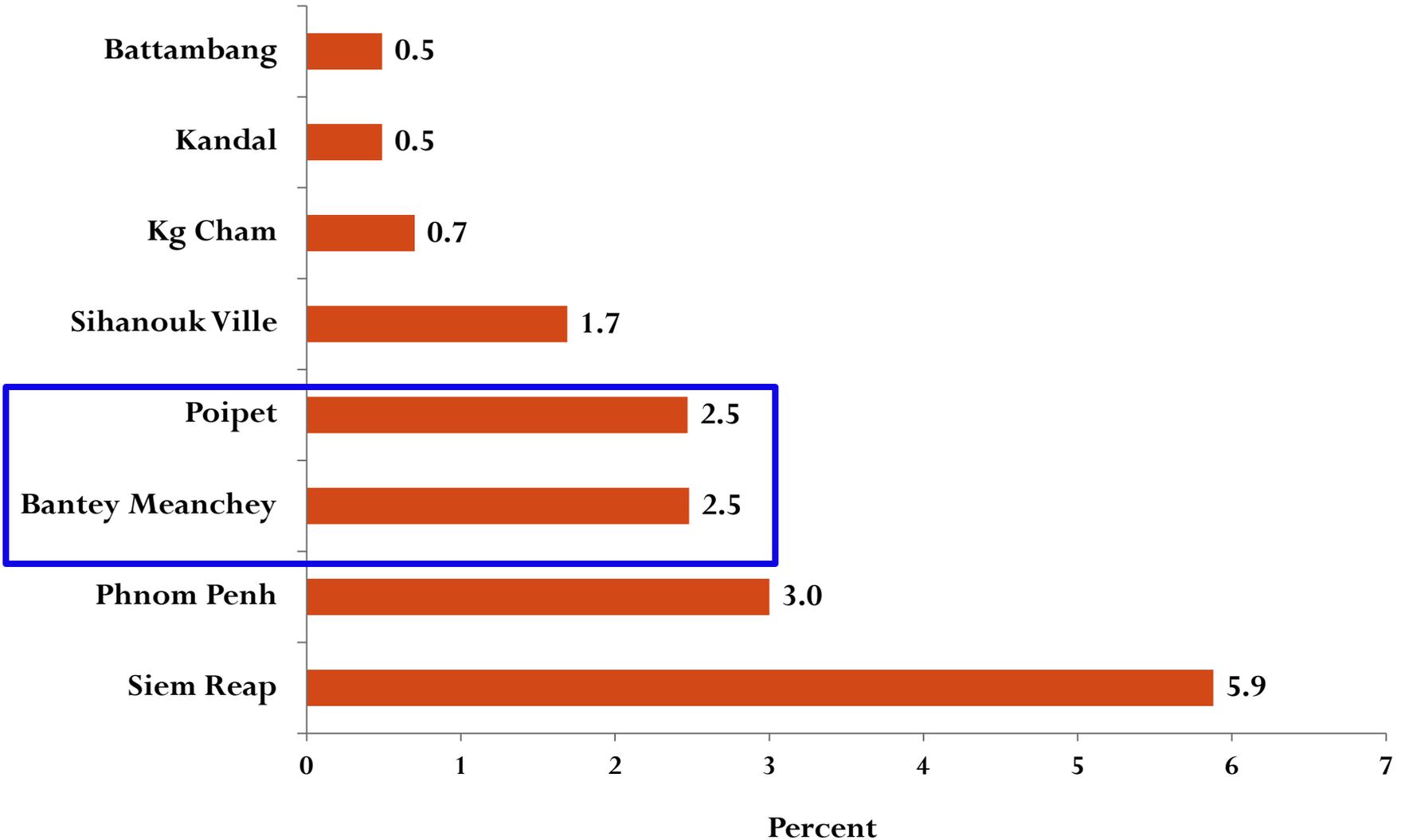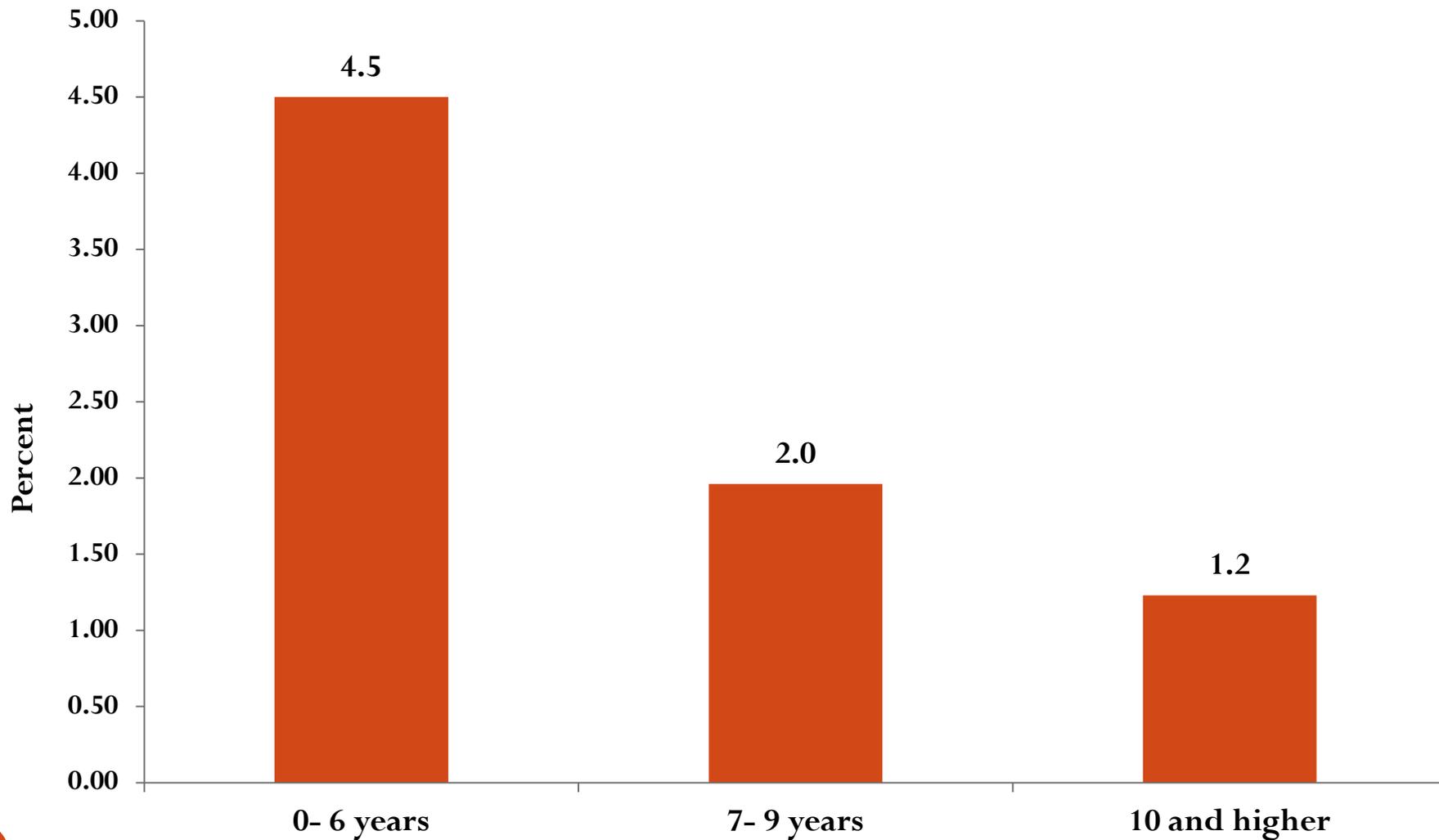
Bros Khmer 2010 & MSM 2014
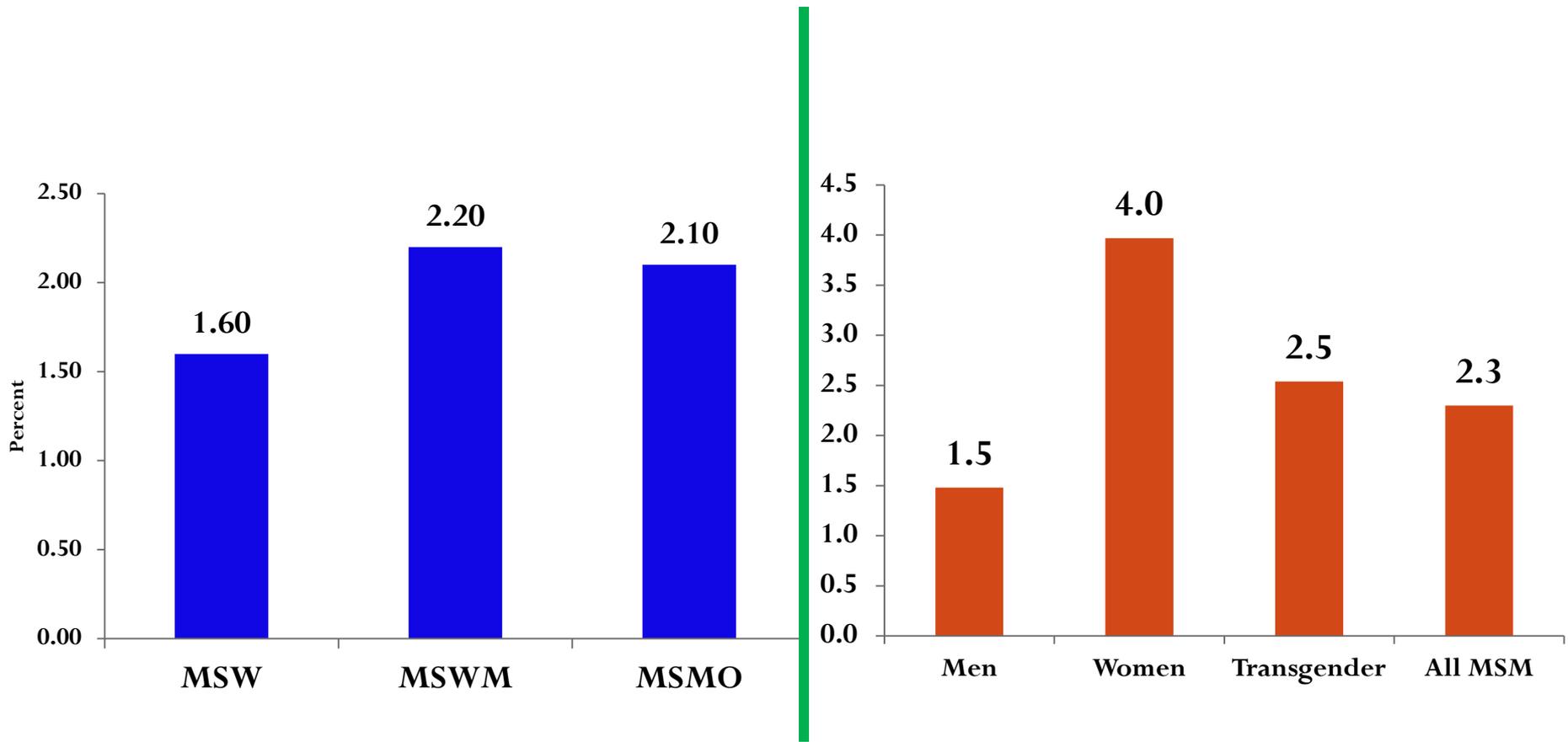
Bros Khmer 2010, PRASIT/NCHADS-USAID

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HIV prevalence by provinces

HIV prevalence among by educational level

HIV prevalence by occupations

Occupation	Percent
Others	1.0
Manual labor	1.8
Waiter	2.2
Jobless	2.7
Petty cash seller	2.8
NGOs	3.6
Beauty salon	4.7
Sell sex	17.2

Percent
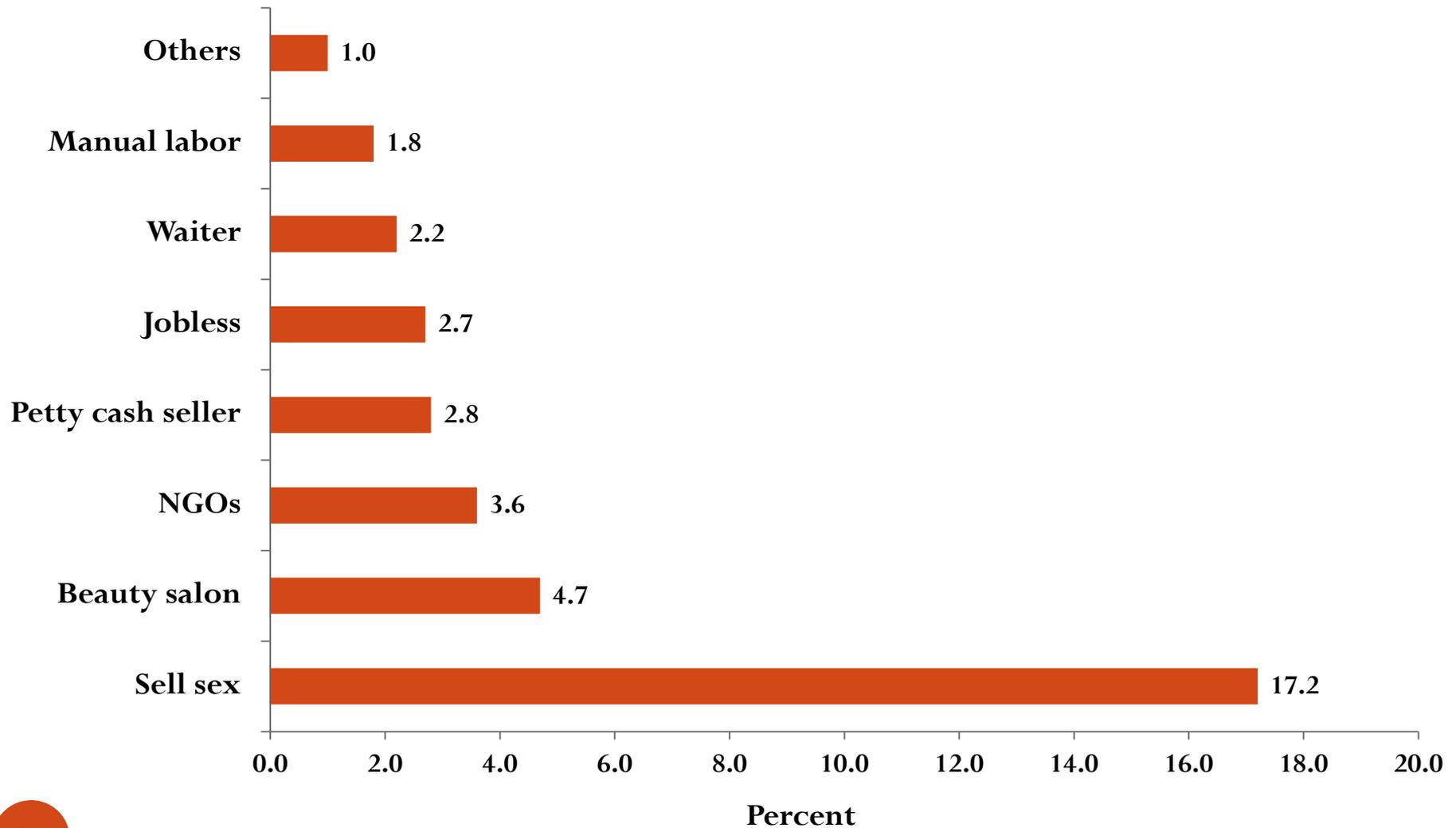
Conclusions on ANC women

- HIV prevalence has declined further among pregnant women attending antenatal clinics

- HIV prevalence among ANC weighted for the difference between urban/rural was 0.28% (~0.3%)

- HIV prevalence among ANC women at PC (urban ANCs) has been consistently higher than among those who are at RD (rural ANCs)

- **HIV prevalence among PMTCT women was as low as twice of the ANC women.** Therefore, using the PMTCT data to represent the ANC women should be cautious in Cambodia context.

- Three provinces included KHK, SHV and PVH should be paid more attention in terms of program intervention given the higher contained prevalence

Conclusions on MSM

- Overall HIV prevalence among MSM was 2.3%

- However, the prevalence is different from types of MSM especially high among **self identified as women and transgender)**.

- High among MSM aged > 24 years old (4.6%); and among low educational level (4.5%)

- HIV high prevalence **may concentrate on some occupations and paid sex works,** and some provinces including SRP, BMC and PNP

- This confirm the **Bros Khmer 2010** where HIV prevalence were also high in these provinces though the design and MSM defined population were different from this survey

- Focused prevention intervention should be further focused on these provinces and targeted some MSM sub-groups (i.e. ages, education, job, site)

Acknowledgements

- National Center for HIV/AIDS, Dermatology and STDs (NCHADS)

- Provincial Health Department and Provincial AIDS Programs in the 22 provinces

- KHANA

- All study participants who gave consent to participate in this HSS 2014.

Thank You

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)
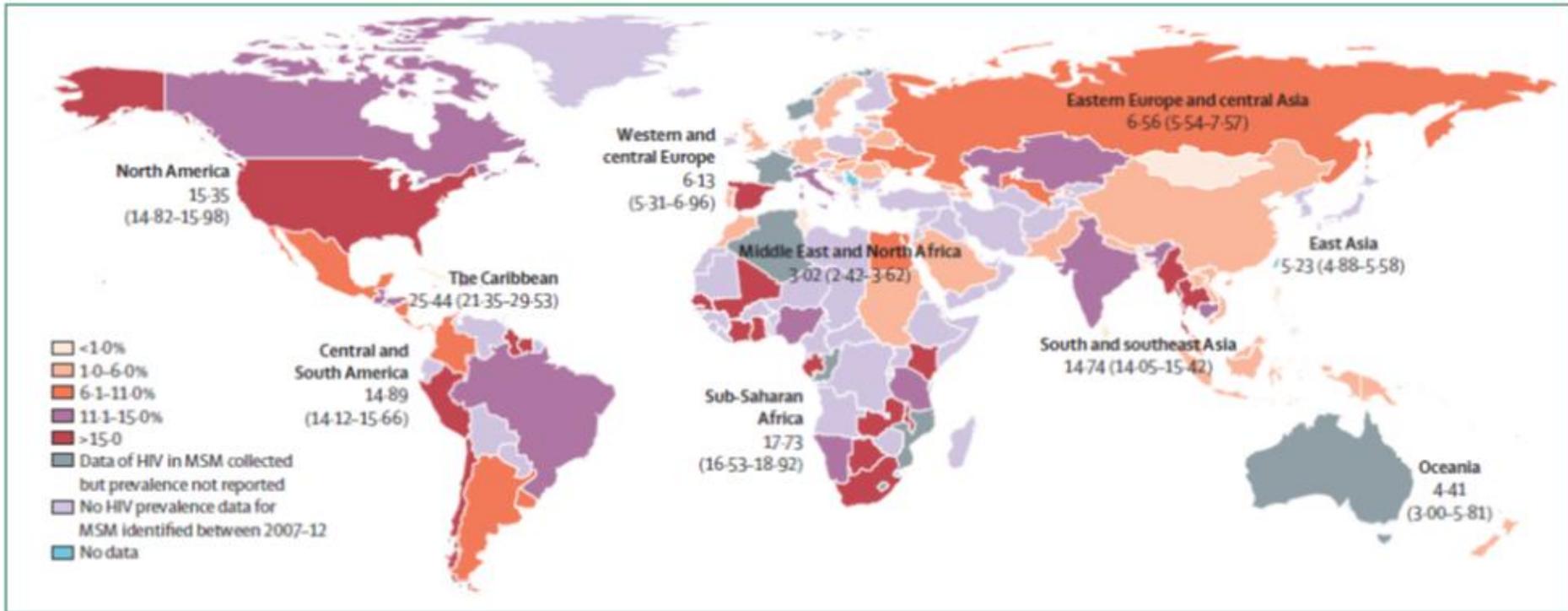
Global HIV prevalence in MSM, from studies published 2007–2011 (Beyrer et al. Lancet 2012)
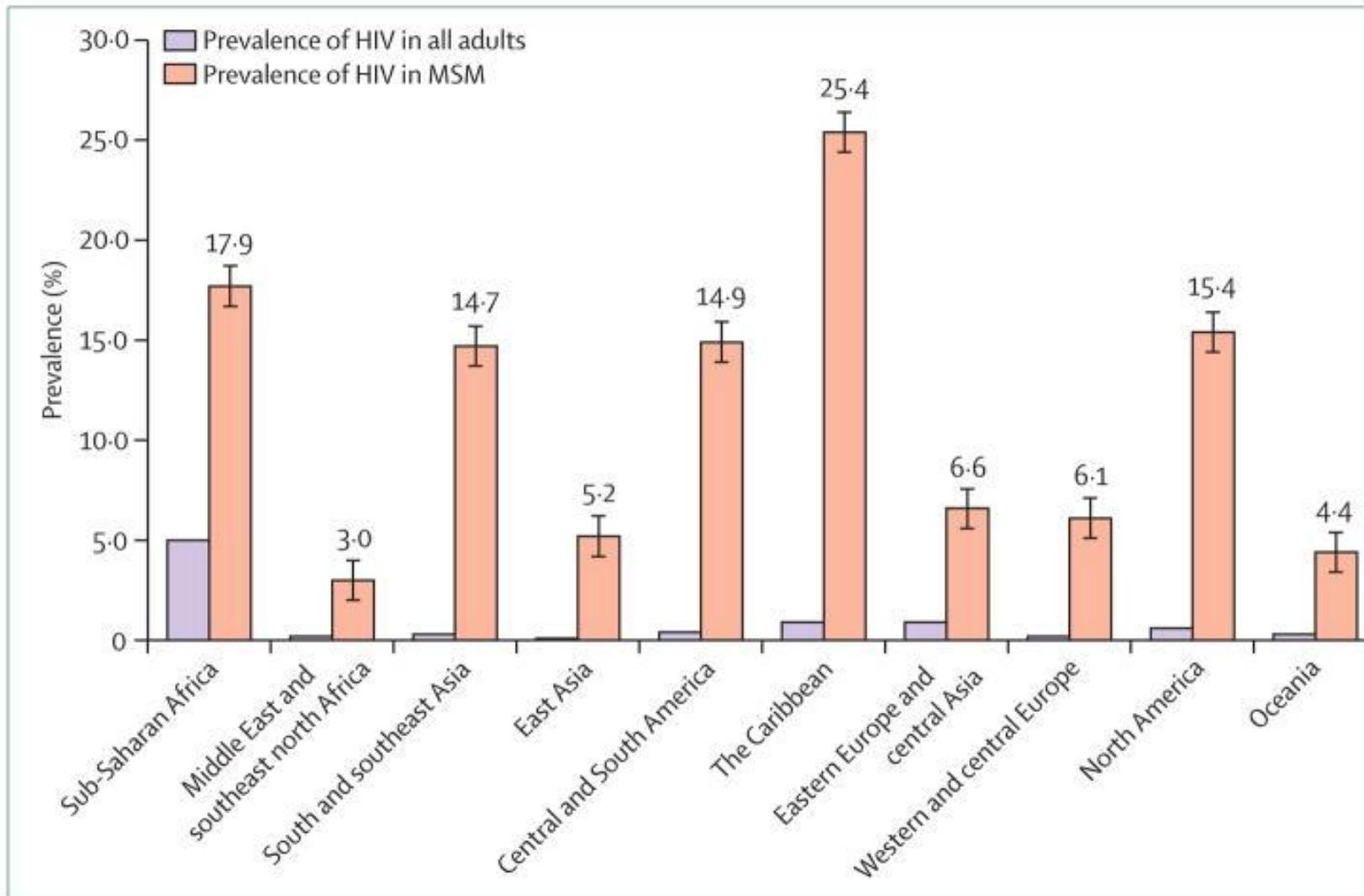
Global prevalence of HIV in MSM compared with regional adult prevalence (UNAIDS, 2010)

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%

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

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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%)

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

Factors Associated Inconsistent Condom Use among MSM in Cambodia

- Older age: ≥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

Siyan 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
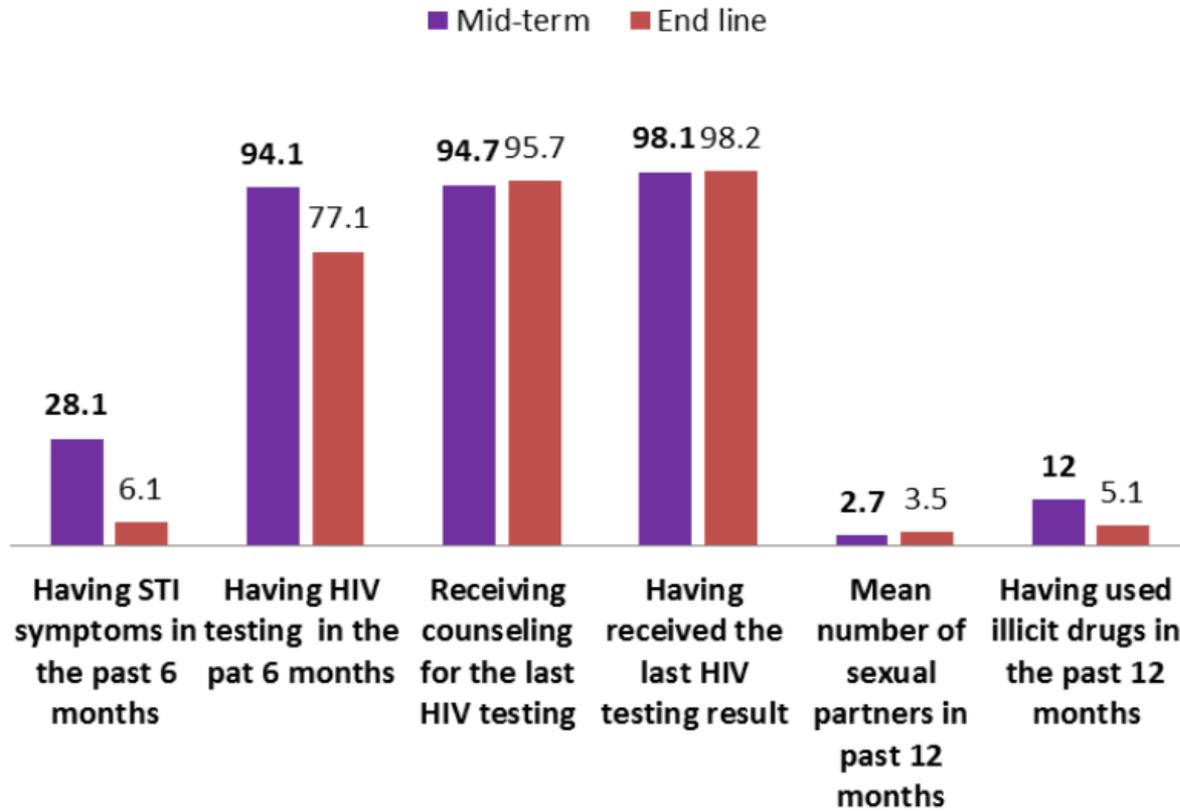
Figure: Comparisons of STI, HIV testing and counseling, sexual behavior, and drug use among MSM under the SAHACOM Project at midterm and end line
Source: Siyan Yi et al. *Journal of International AIDS Society* 2015 (In press)

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

1. OD Serey Sophaon
2. OD Poipet
3. OD Siem Reap
4. OD Tbong
5. OD Chaktomouk
6. OD Reusey Keo
7. OD Sen Sok
8. OD Battambang
9. K Cham K. Siem
10. Memut
11. OD K Chhnaing
12. OD Smach Mean Chhey
13. OD Kampong Leav
14. OD Neak Leung
15. OD Svay Chhrum
16. OD Chi Phou Bavet
17. OD Takhmao
18. OD Kean Svay
19. Preah Sihanouk

Target Province

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.

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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

Number of venues/hotspots				
Provinces	From GIS	Phase 1 : adding new sites from programs	Phase2 : adding new sites from KII	Total
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
Total	**505**	**108**	**28**	**641**

Capture-Recapture Method
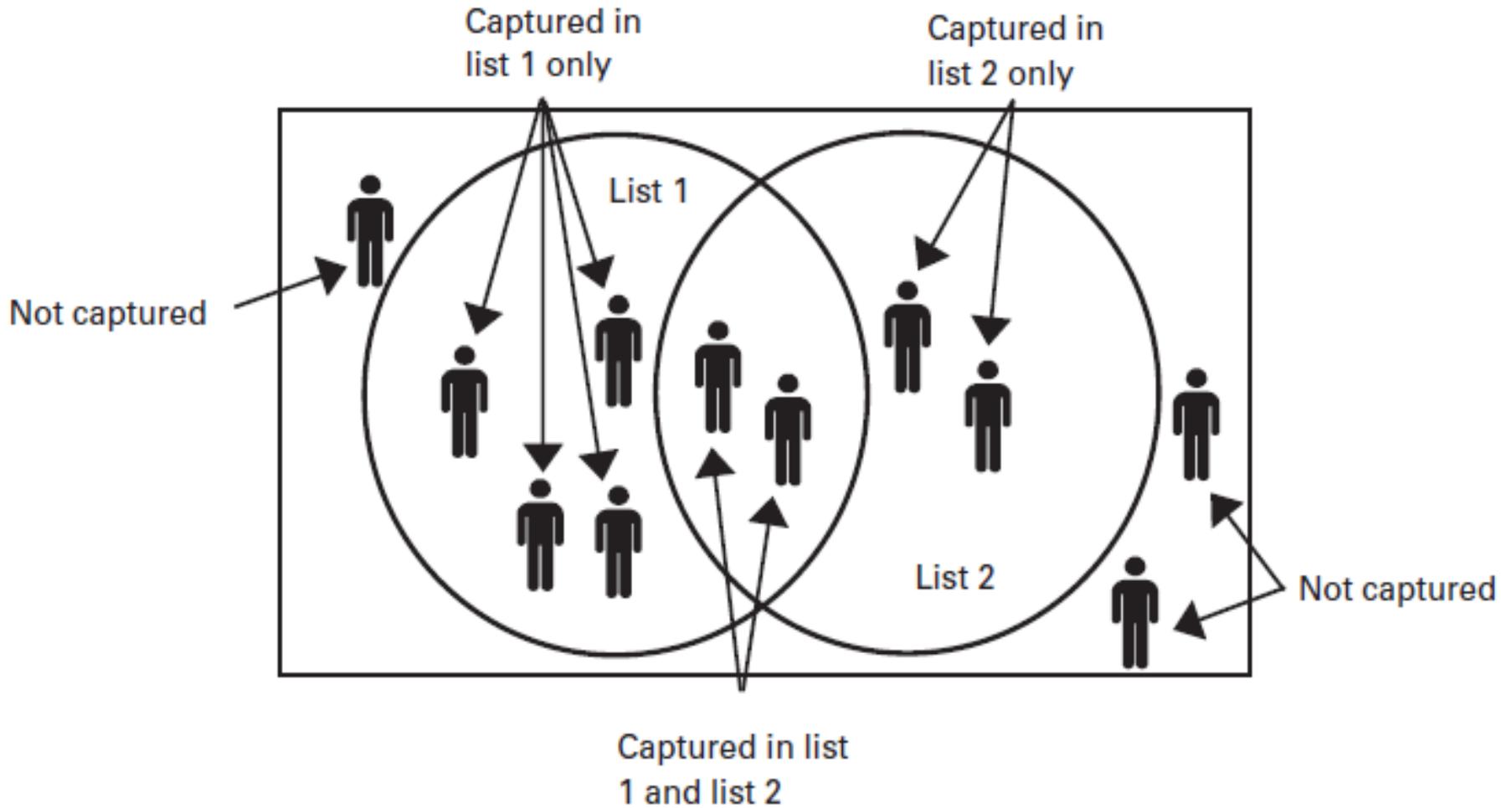
Capture and Recapture

- **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

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

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

(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	n =5,557 (%)
Mean ± (years, SD)	**24.8 (6.6)**
15-17	222 (4.0)
18-24	**2,998 (54.0)**
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 ± SD)	9.6 (3.6)
Never attended school	84 (1.5)
Grade 1-6	899 (16.2)
Grade 7-9	**1,700 (30.6)**
Grade 10-12	**1,952 (35.2)**
Grade 12 or higher	915 (16.5)
Planned to stay in the current city in the next 30 days	**2730 (90.4)**
Stayed in the current city in the past 30 days	**3929 (93.8)**

Occupation & Marital Status

Occupations	
Unemployed	513 (9.2)
Students	**933 (16.8)**
Office workers	781 (14.0)
Entertainment workers	586 (10.5)
Self-employed	**1,042 (18.8)**
Salon & hairdressers	779 (14.0)
Labor workers	835 (15.0)
Sex workers	40 (0.7)
Marital status	
Never married	**5,163 (92.7)**
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 (±SD)	**1.7 ± 4.8**
0	139 (16.6)
1	197 (23.5)
2-3	**254 (30.4)**
> 3	**247 (29.5)**
Types of sexual partners in the past 6 months	
Biological male only	**538 (70.5)**
Biological female only	17 (2.3)
Both	208 (27.2)

Places to meet sex partners in the past 12 months

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

Preferred Place to Get Condoms & Lube
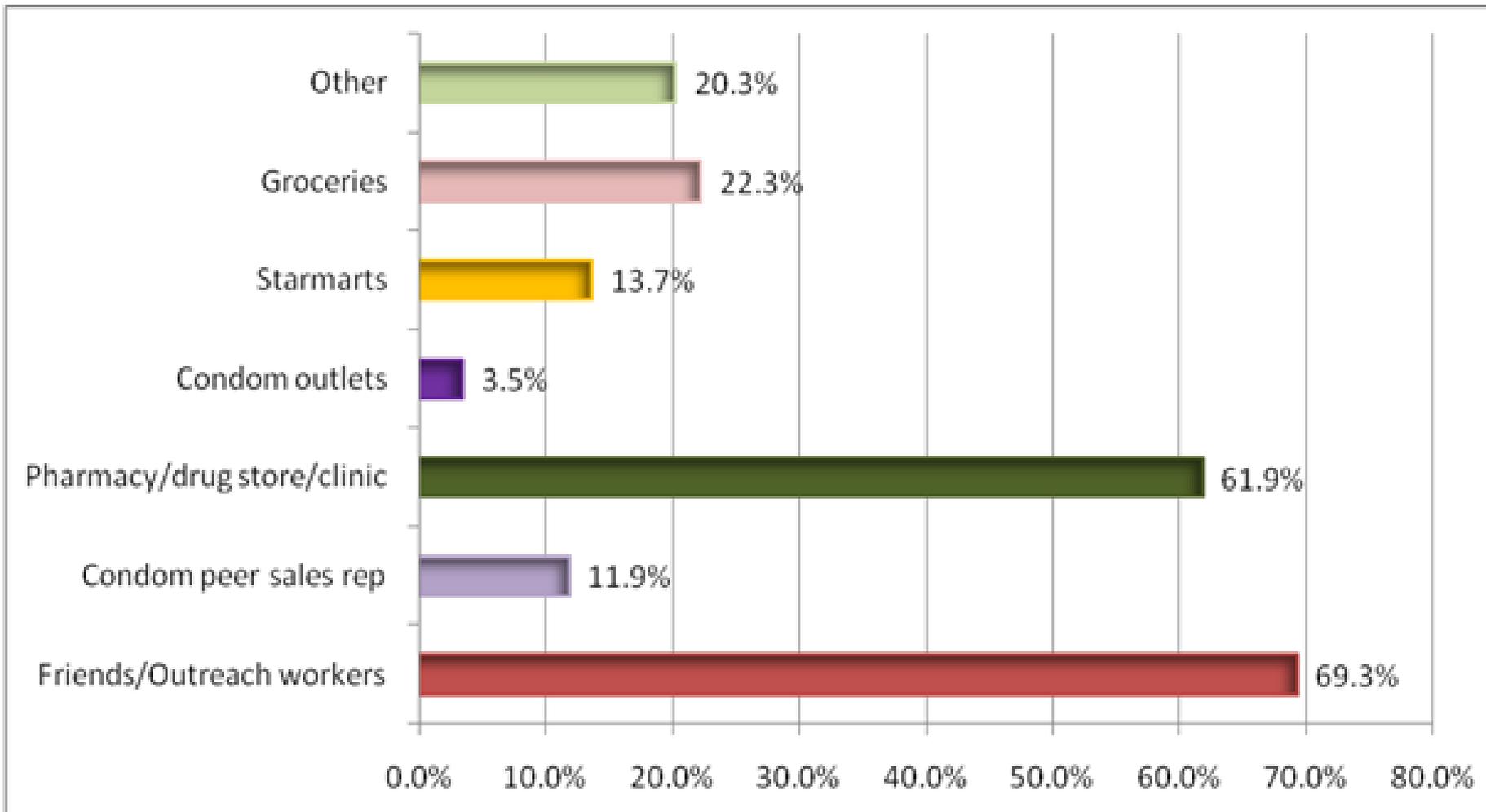
HIV & STI Testing

HIV and STI Testing (n=838)	n (%)
Had HIV test in the past 6 months	**558 (66.6)**
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)	*n* (%)
Received information on HIV in the past 6 months	**600 (71.6)**
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 (C1)	Recapture (C2)	R	Total	95% CI	
Number by province	*n*	*n*		*n* (%)	Lower	Upper
BanteayMeanchay	307	514	238	663	634	692
Battambang	440	573	250	**1,008**	947	1,070
Kampong Cham	113	123	69	201	182	221
Kampong Chhnang (Urban)	59	115	32	212	170	254
Kampong Chhnang (Rural)	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	**3,685**	3,502	3,867
Prey Veng (Rural)	41	173	32	222	189	254
Siem Reap	366	430	212	**742**	696	789
Preah Sihanouk	65	118	52	148	134	161
Svay Rieng	53	44	32	73	65	81
Total	**3026**	**4198**	**1657**	**7,815**	**7,238**	**8,391**

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%)
Phnom Penh	3,685	751	2388	6823
Battambang	1,008	205	654	1868
Siem Reap	742	151	481	1375
Banteay Meanchey	663	135	430	1228
Kampong Chhnang (Urban)	212	43	137	393
Kampong Chhnang (Rural)	185	38	120	343
Kampong Speu	318	65	206	588
Kandal	284	58	184	527
Prey Veng (Rural)	222	45	144	410
Kampong Cham	201	41	131	373
Preah Sihanouk	148	30	96	273
Koh Kong	74	15	48	137
Svay Rieng	73	15	47	135
Total	7,815	1,509	4,802	13,719

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
Urban			
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
Total	**781,214**	**13,719**	**1.8**
Rural			
Prey Veng	104,537	410	0.4
Kampong Chhnang	55864	343	0.6
Total	**160,401**	**753**	**0.5**

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
Total	902,105	__	16,263	2,925,470	__	14,627	3,827,575	0.8	30,891

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
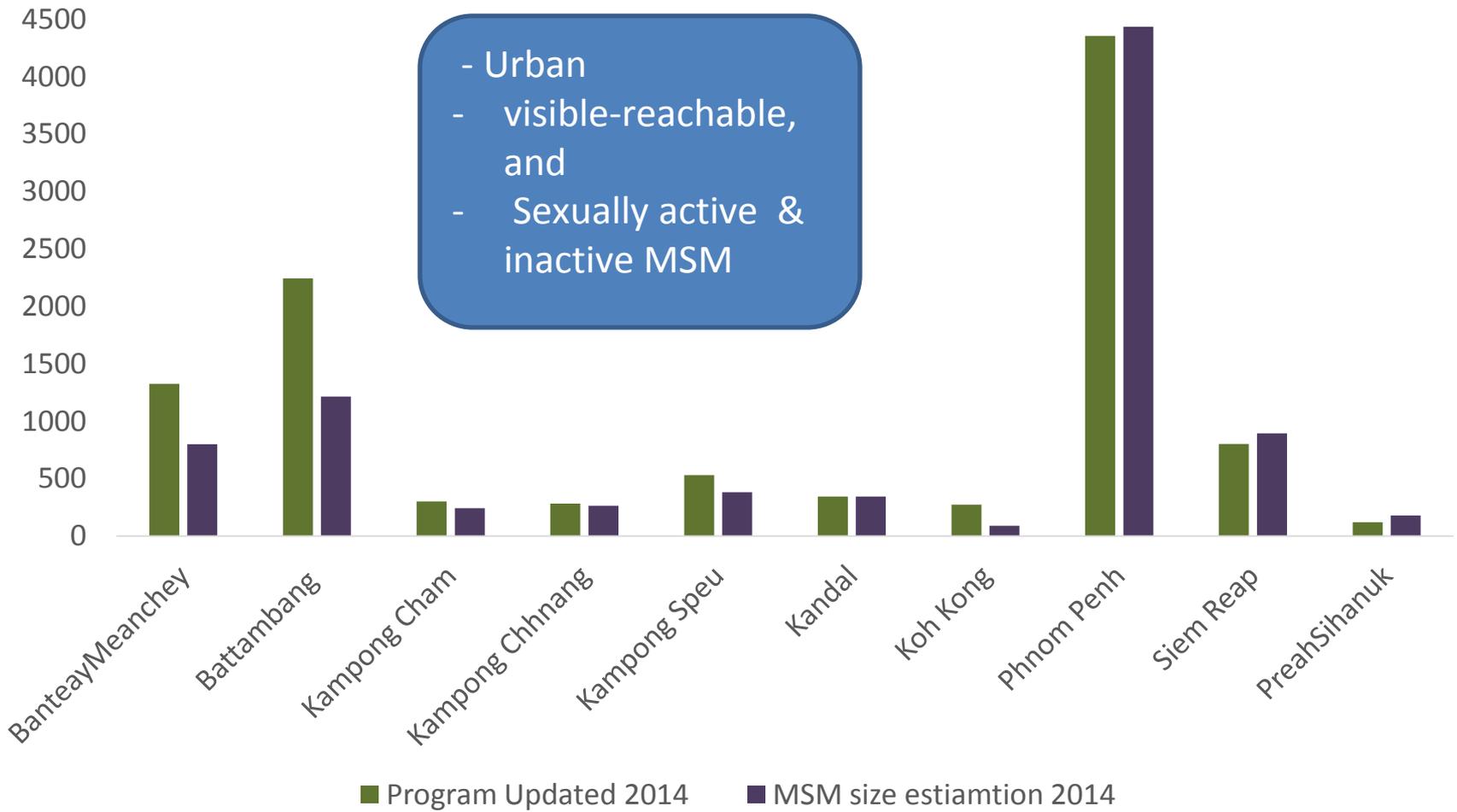   - 93.6% stayed in the current city in the past 30 days

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

- Urban
- visible-reachable, and
- Sexually active & inactive MSM

Categories (x-axis): BanteayMeanchey, Battambang, Kampong Cham, Kampong Chhnang, Kampong Speu, Kandal, Koh Kong, Phnom Penh, Siem Reap, PreahSihanuk

Legend: ■ Program Updated 2014 ■ MSM size estiamtion 2014

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**

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- Study participants, local authorities
- Research team members

Thank you!
Q & A