



The National HIV Behavioral Surveillance (NHBS) Detroit Partner Study

Partnership characteristics and female knowledge of male partner risk behavior in heterosexual couples

Carrie Oleszkowicz, MPH
Epidemiology Analyst
MDCH, HIV Surveillance
OleszkowiczC@michigan.gov

Michigan Department
of Community Health



Rick Snyder, Governor
Olga Dazzo, Director

Overview of NHBS



- The National HIV Behavioral Surveillance system (NHBS)
 - Multi-site project sponsored by the Centers for Disease Control and Prevention (CDC)
 - Monitors behaviors that place people *at risk* for HIV infection
 - Questionnaire and optional HIV testing
 - Sexual behaviors
 - Drug use
 - HIV testing behaviors
 - Access to and use of prevention services

Overview of NHBS



National HIV Behavioral Surveillance

- Importance of behavioral surveillance
 - Monitor **behaviors** that lead to HIV infection
 - Unlike other HIV surveillance activities, participants are mostly **uninfected**
 - Used to help control epidemic through the development and evaluation of HIV prevention programs

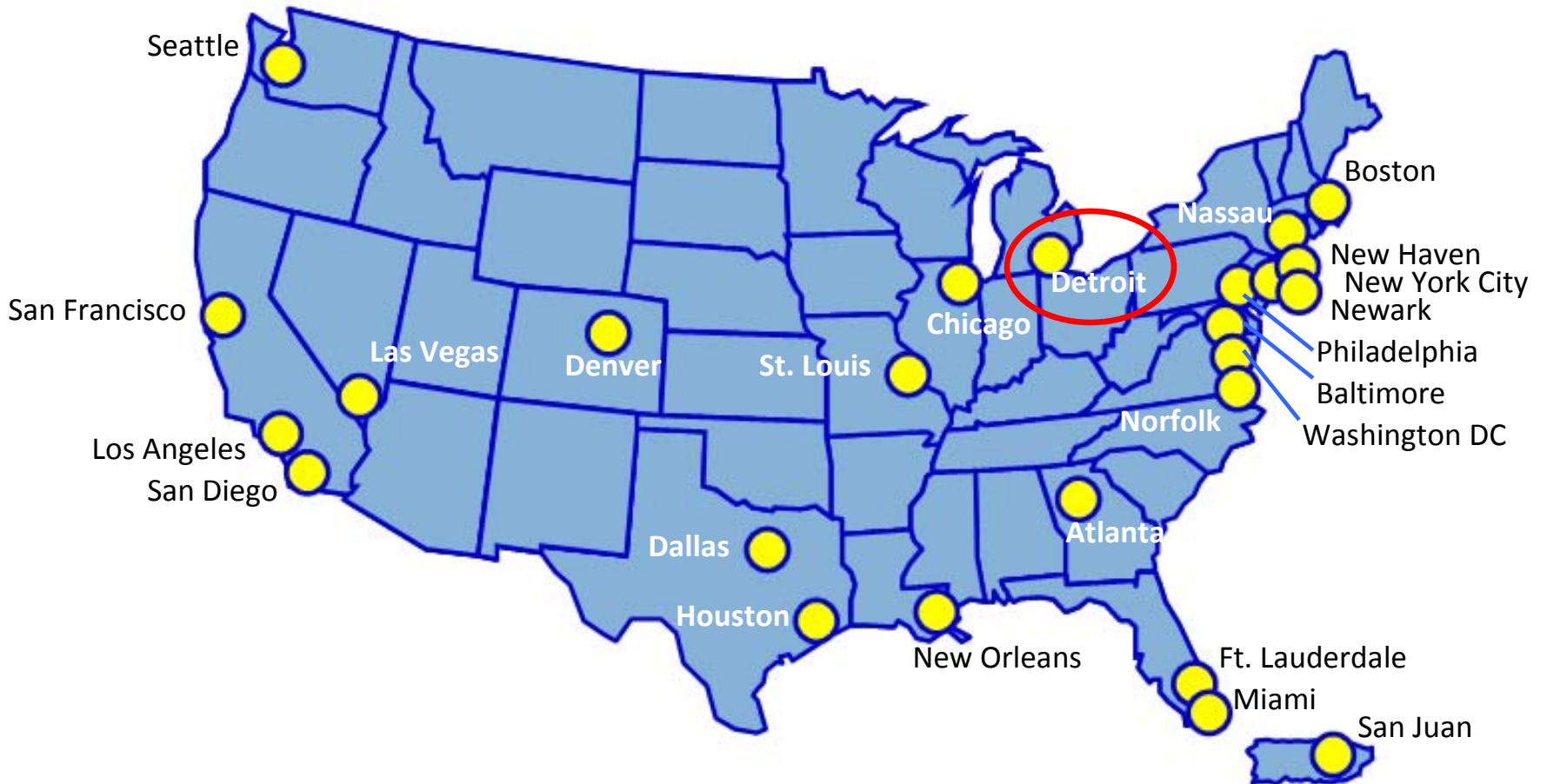
Overview of NHBS



National HIV Behavioral Surveillance

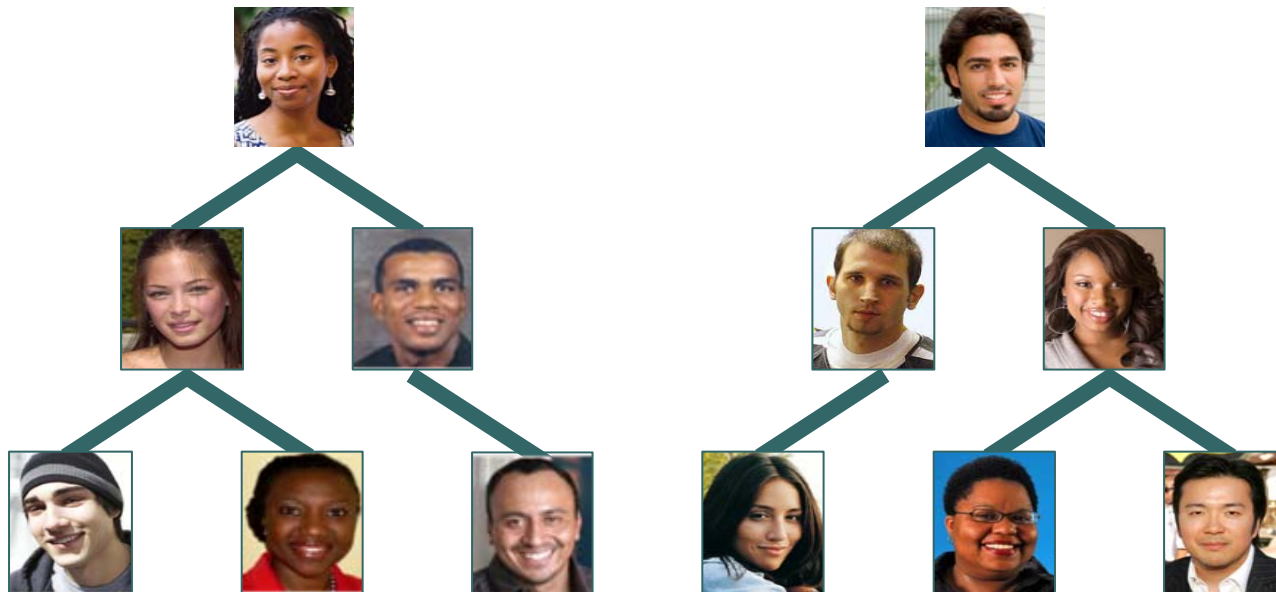
- NHBS activities rotate each year between three different groups at-risk for HIV
 - MSM (men who have sex with men)
 - IDU (injecting drug users)
 - HET (heterosexuals)
 - HET1 (2006-2007) → *Partner study*

NHBS-HET1 Sites



NHBS-HET1 Recruitment

- Detroit used a peer-referral method called **respondent-driven sampling (RDS)**





Overview of NHBS-HET1

- The HET1 cycle defined “high risk areas” to use in the recruitment process
 - High rates of **poverty**
 - High rates of **HIV attributed to heterosexual transmission**
- Detroit HET1 participants lived in or were recruited by someone that lived in a “high risk area”
 - Thought to have a **higher risk of acquiring HIV infection** compared to general heterosexual population
- **Important to remember: HET1 participants had a connection to an area with high poverty and high rates of HIV**



Eligibility

NHBS-HET1

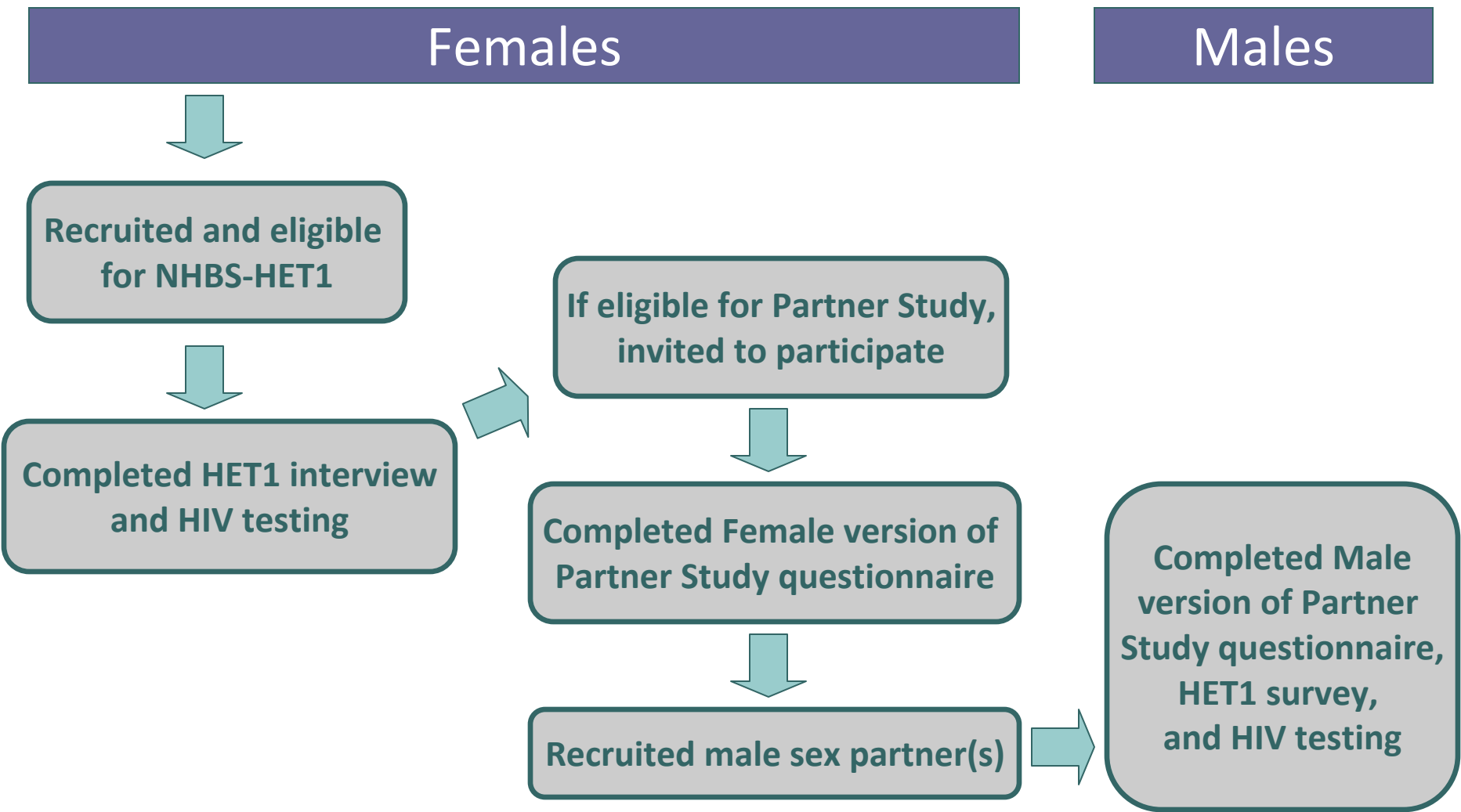
- Males and females
- 18-50 years of age
- Had an opposite sex partner in the past 12 months
- Resident of a select metropolitan statistical area (major city)
- Was a resident or was recruited through RDS by a resident of a high-risk area (high rates of heterosexually-acquired HIV and high rates of poverty)



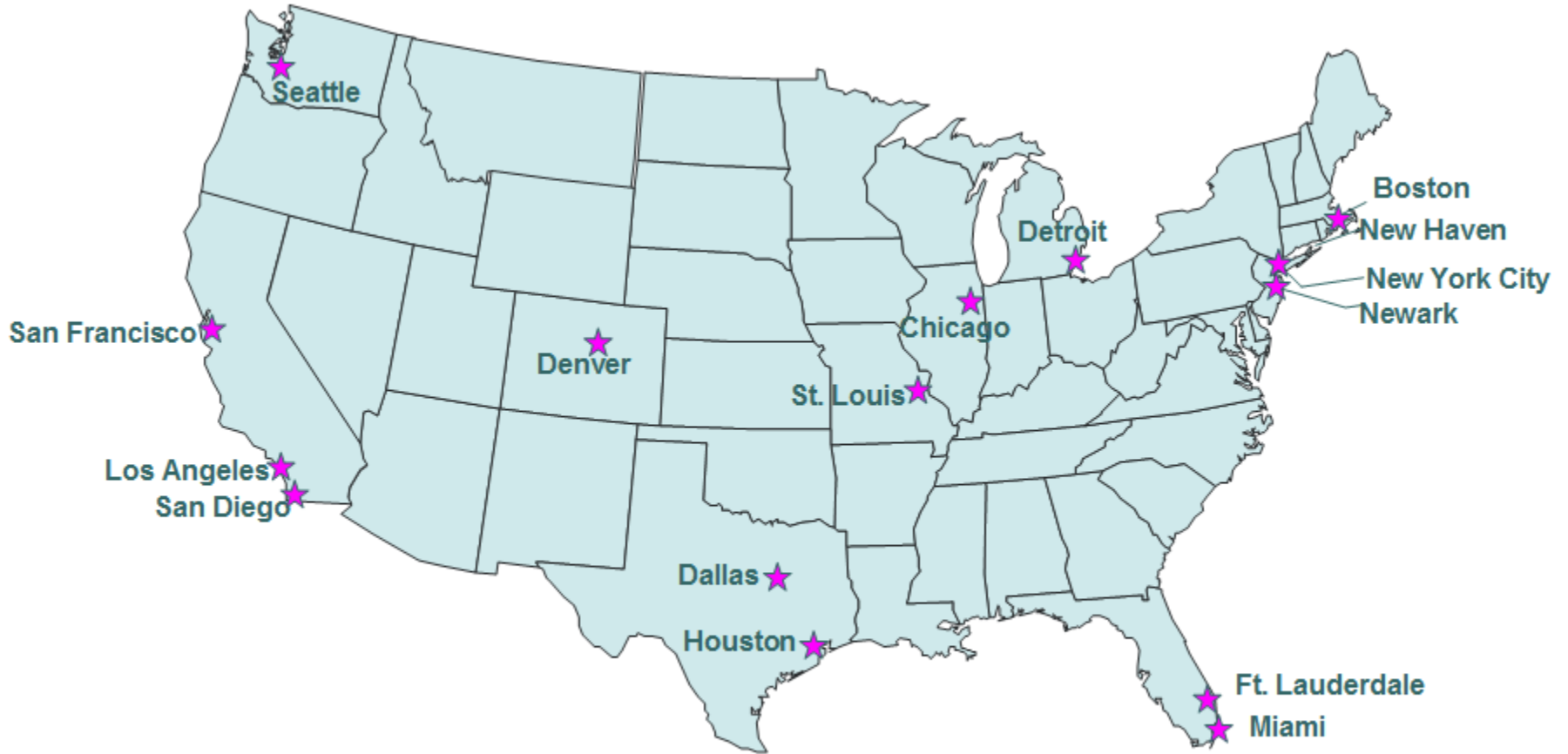
Partner Study

- Black and Hispanic females who participated in NHBS-HET1
- Had a recent male sex partner (past 3 months)
- Willing to recruit 1 or 2 recent male sex partners at least 18 years of age

NHBS-HET1 Partner Study Participant Flow



Partner Study Nationwide





Background

- **Black females are disproportionately affected by HIV/AIDS**
- **22%** of prevalent HIV/AIDS cases in Michigan are women
 - **74%** of all female HIV/AIDS cases are black females, with **62%** attributed to heterosexual transmission
- In SE Michigan, the rate of new HIV diagnoses among black females is **14.8** times the rate among white females



Overview of Partner Study

- Initiated to give insight into the factors in minority female heterosexual relationships that may be putting minority females at risk of acquiring HIV
- **Topics of Partner Study questionnaire:**
 - Couple (male-female pair) relationship characteristics
 - Couple sexual behavior in the past 3 months
 - Female knowledge of male partner risk behavior



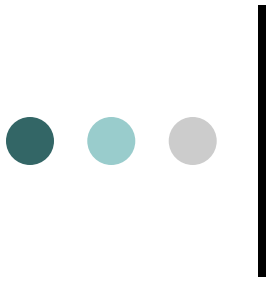
Detroit Partner Study Analysis Sample

- **107 couples analyzed**
 - Each considered a **unique partnership** (unique male-female pair)
- Majority of females (84%) recruited 1 male partner
- 15 females (16%) recruited 2 male partners
- 1 male was recruited by 2 different females
- Analysis of select questions from male and female versions of Partner Study questionnaire and NHBS-HET1 survey



Analysis of data

- **Individual analysis**
 - Demographics (92 females and 106 males)
- **Response-level analysis** (107 female responses and 107 male responses; 214 total responses)
 - Includes male and female duplicates
 - Look at female responses and male responses separately
- **Couple-level analysis** (107 unique couples)
 - Compare female response and male response for each couple
 - Percent agreement and percent disagreement
 - Limitations of agreement/disagreement



Demographics



Demographics

Gender

Female recruiters	92
Male partners	106
<i>Total</i>	198

 *107 unique couples*

Race/Ethnicity

	<i>Females</i>	<i>Males</i>
Black	91 (99%)	100 (94%)
White	0	4 (4%)
Other/multiracial	1 (1%)	2 (2%)



Demographics *cont.*

Age	Females	Males	Total
18-29	33 (36%)	33 (31%)	66 (33%)
30-39	15 (16%)	22 (21%)	37 (19%)
40-50	44 (48%)	41 (39%)	85 (43%)
51+	N/A	10 (9%)	10 (5%)
Median Age (range)	38 (18-50)	38 (18-70)	

Education

<High school	55 (28%)
High school diploma/GED	92 (46%)
Some college or technical school	42 (21%)
College graduate or beyond	9 (5%)



Demographics *cont.*

Employment Status

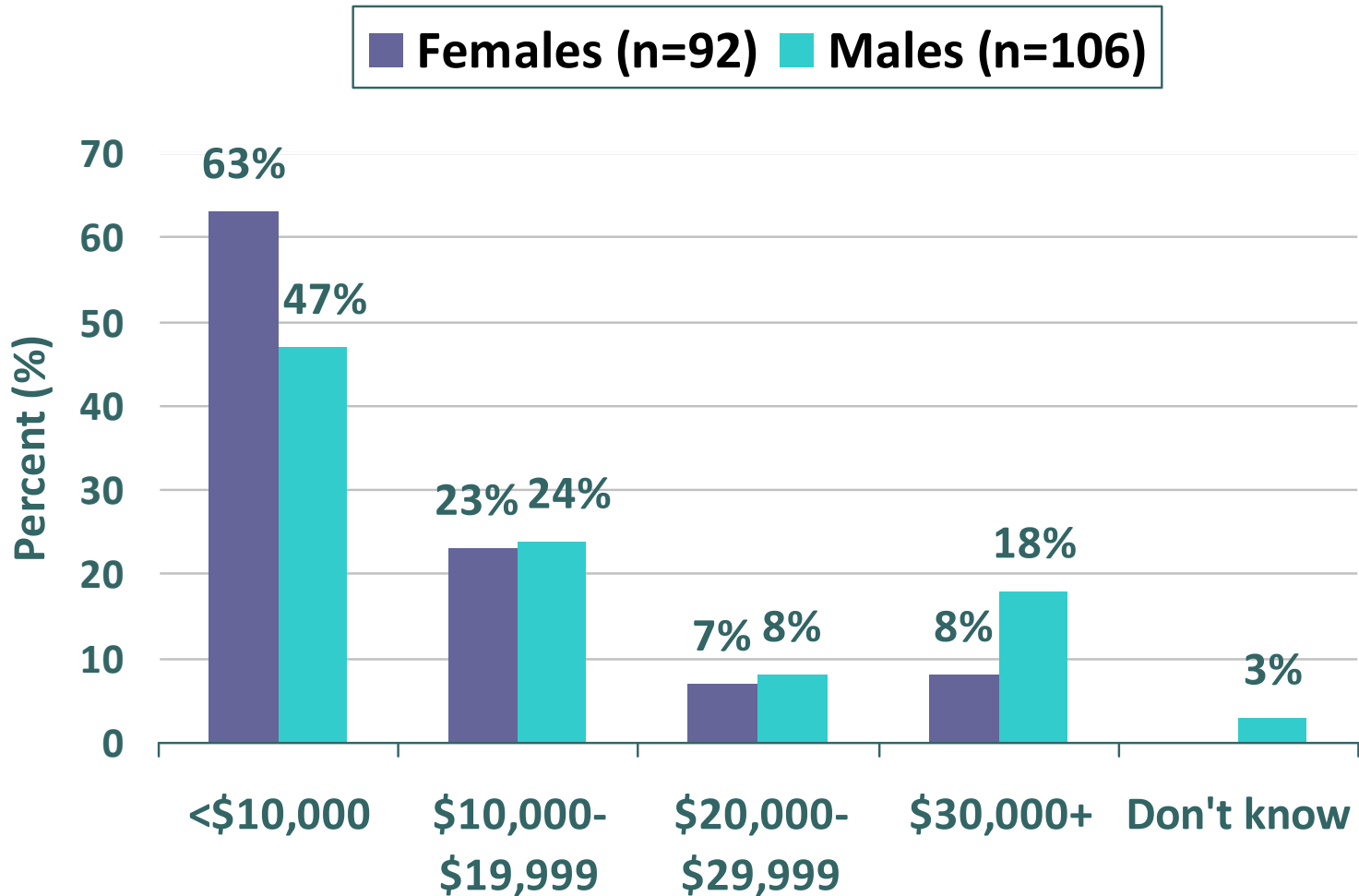
Employed	75 (38%)
Unemployed	76 (38%)
Disabled	20 (10%)
Other*	27 (14%)

Income

<\$10,000	108 (55%)
\$10,000-\$19,999	46 (23%)
\$20,000-\$29,999	15 (8%)
\$30,000+	26 (13%)

**Other includes homemaker, full-time student, retired, and other*

Combined Household Income for Previous Year (before taxes) (N=198)





Demographics *cont.*

Homelessness*

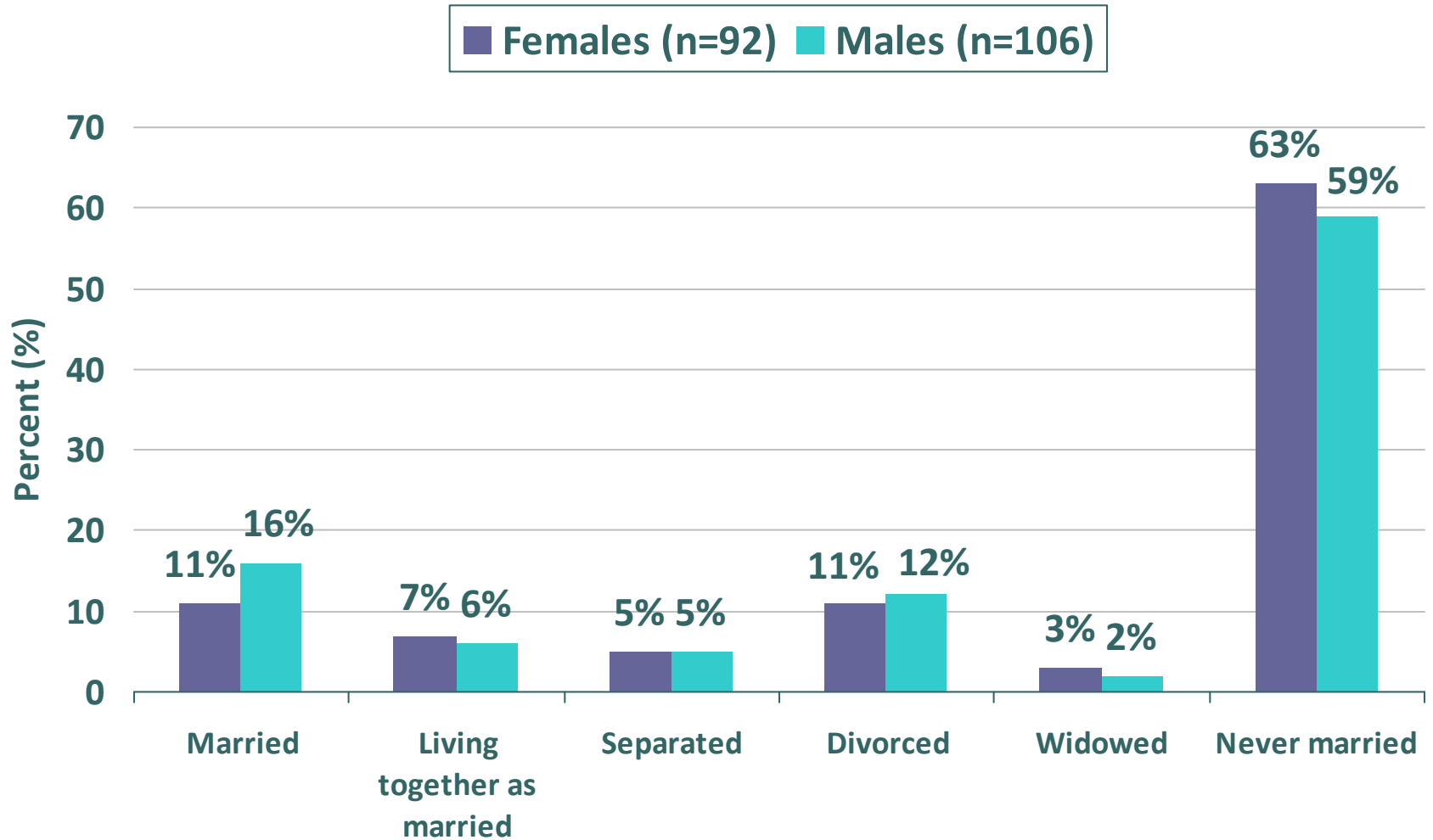
Homeless at time of interview	7 (4%)
Homeless during 12 months prior to interview	17 (9%)
Not homeless	174 (88%)

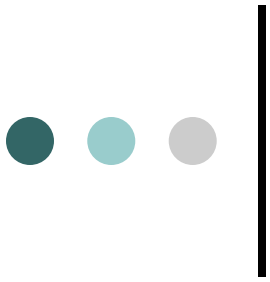
Incarceration (in jail or prison)

Incarcerated (12 months prior to interview)	28 (14%)
Not incarcerated (12 months prior to interview)	170 (86%)

**Defined as living on the street, in a shelter, or in a Single Room Occupancy hotel (SRO)*

Marital Status (N=198)





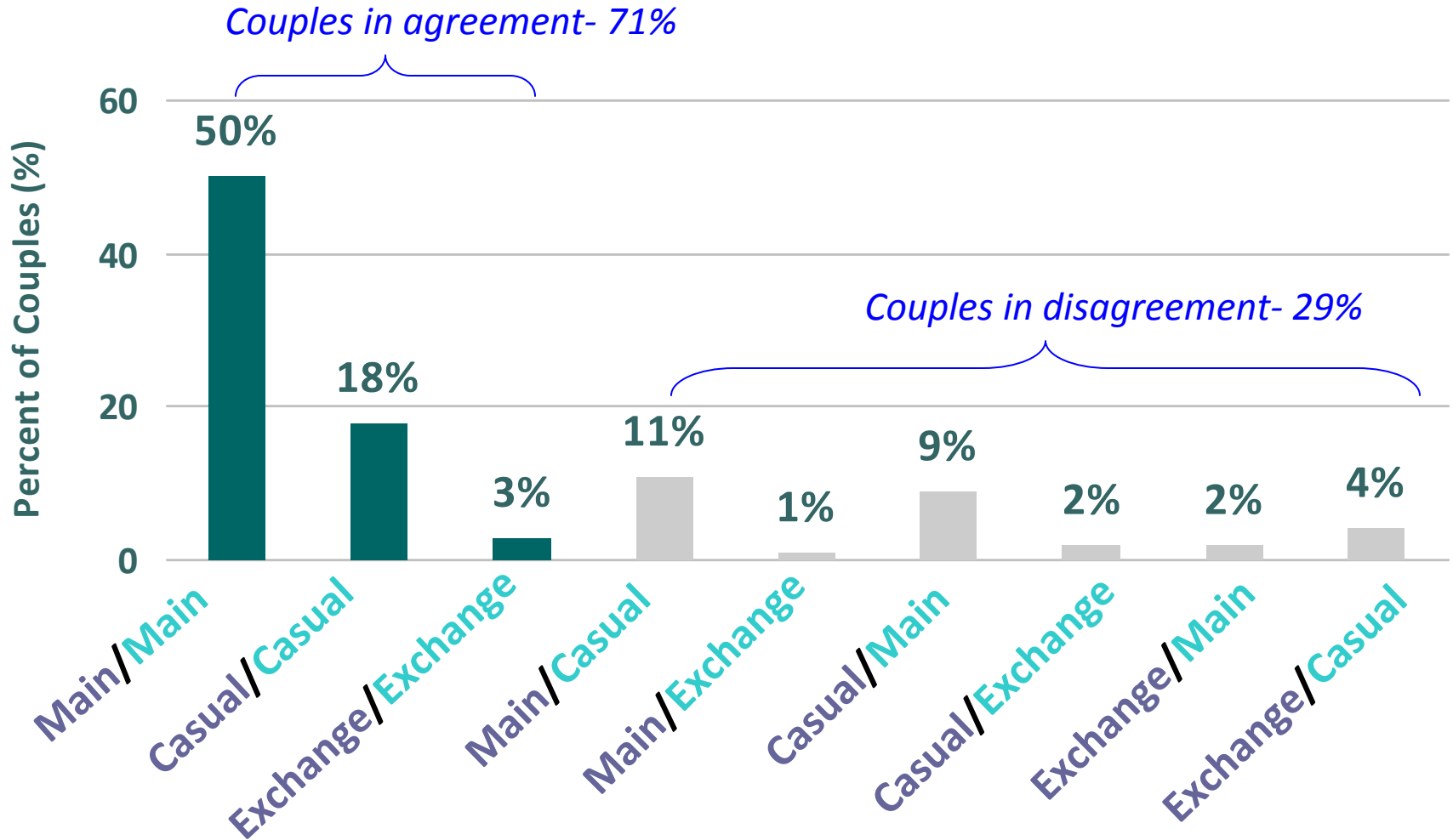
Partnership Characteristics



Type of Partner

- Participants were asked to classify their partner as either a main, casual, or exchange partner
 - **Main partner:** a partner you have sex with and someone you feel committed to above anyone else and someone you would call boyfriend/girlfriend, husband/wife, significant other, or life partner
 - **Casual partner:** a partner you have sex with but do not feel committed to or don't know very well
 - **Exchange partner:** someone you had sex with in exchange for things like money or drugs

Type of Partner- *Couple-level analysis* (Female Response/*Male Response*)


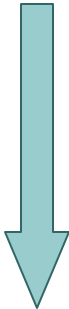
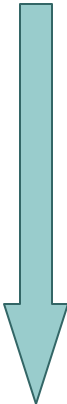
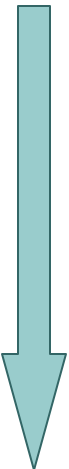




Discussion of risk factors

- *“Next, I’m going to ask about some issues you may have discussed with <initials of partner>. For each one, please answer yes or no if you have **discussed** it with <initials of partner> **in the past 3 months**”*

Discussion of Risk Factors

Topic	Response-level		Couple-level		
	Percent of female 'yes'	Percent of male 'yes'	Agree Yes	Agree No	Disagree
Number of his current sex partners	 <p>Percent of all female or male responses=yes, includes duplicates</p>		 <p>Agree conversation occurred</p>	 <p>Agree conversation did NOT occur</p>	 <p>Couple in disagreement</p>
Number of his past sex partners					
Whether male EVER had sex with a man					
Whether male CURRENTLY has sex with men					
His HIV status					
His drug use history					
His STD history					
Using condoms					

Discussion of Risk Factors

Past 3 months

Topic	Response-level		Couple-level		
	Percent of female 'yes'	Percent of male 'yes'	Agree Yes	Agree No	Disagree
Number of his current sex partners	41%	38%			
Number of his past sex partners	42%	32%			
Whether male EVER had sex with a man	37%	18%			
Whether male CURRENTLY has sex with men	30%	13%			
His HIV status	41%	38%			
His drug use history	46%	46%			
His STD history	38%	26%			
Using condoms	54%	48%			

Discussion of Risk Factors

Past 3 months

Topic	Response-level		Couple-level		
	Percent of female 'yes'	Percent of male 'yes'	Agree Yes	Agree No	Disagree
Number of his current sex partners	41%	38%	21%	41%	38%
Number of his past sex partners	42%	32%	13%	39%	48%
Whether male EVER had sex with a man	37%	18%	8%	52%	40%
Whether male CURRENTLY has sex with men	30%	13%	5%	62%	34%
His HIV status	41%	38%	18%	38%	44%
His drug use history	46%	46%	22%	31%	47%
His STD history	38%	26%	10%	46%	44%
Using condoms	54%	48%	34%	32%	35%



Physical Abuse and Forced Sex (1)

“No matter how well a couple gets along, there are times when they disagree. Please tell me if any of these things has ever happened with <initials of partner>”

Female PS Questionnaire:

- *“Has <initials of male partner> ever slapped, punched, shoved, kicked, shaken or otherwise physically hurt you?”*
 - 20% of female responses were ‘yes’

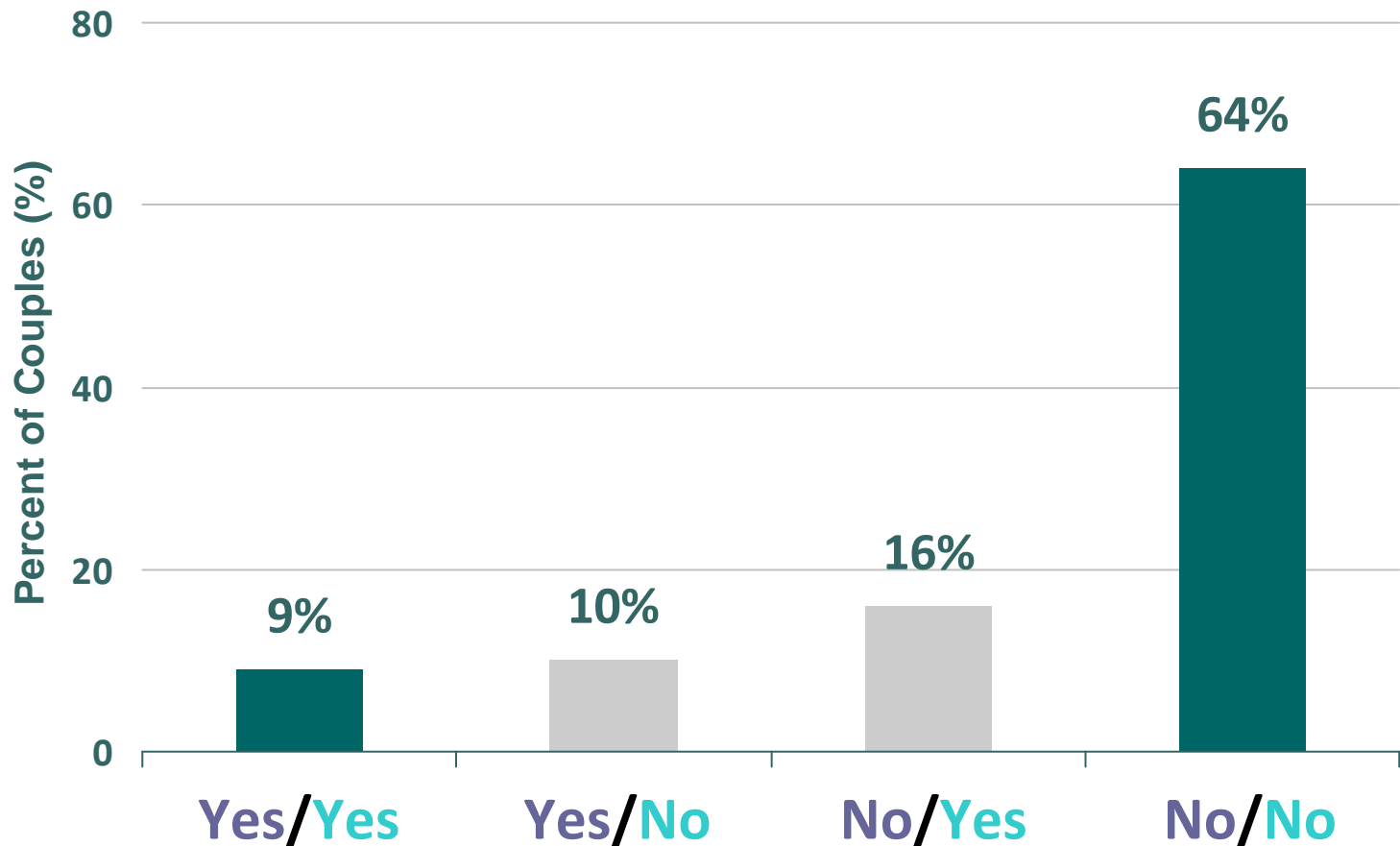
Male PS Questionnaire:

- *“Have you ever slapped, punched, shoved, kicked, shaken, or otherwise physically hurt <initials of female partner>?”*
 - 25% of male responses were ‘yes’

Male Ever Physically Abused Female

(Female Response/Male Response)

Couple-level analysis





Physical Abuse and **Forced Sex** (2)

“No matter how well a couple gets along, there are times when they disagree. Please tell me if any of these things has ever happened with <initials of partner>”

Female PS Questionnaire:

- *“Has <initials of male partner> ever forced or pressured you to have vaginal, oral or anal sex when you did not want to?”*
 - **13% female responses were ‘yes’**

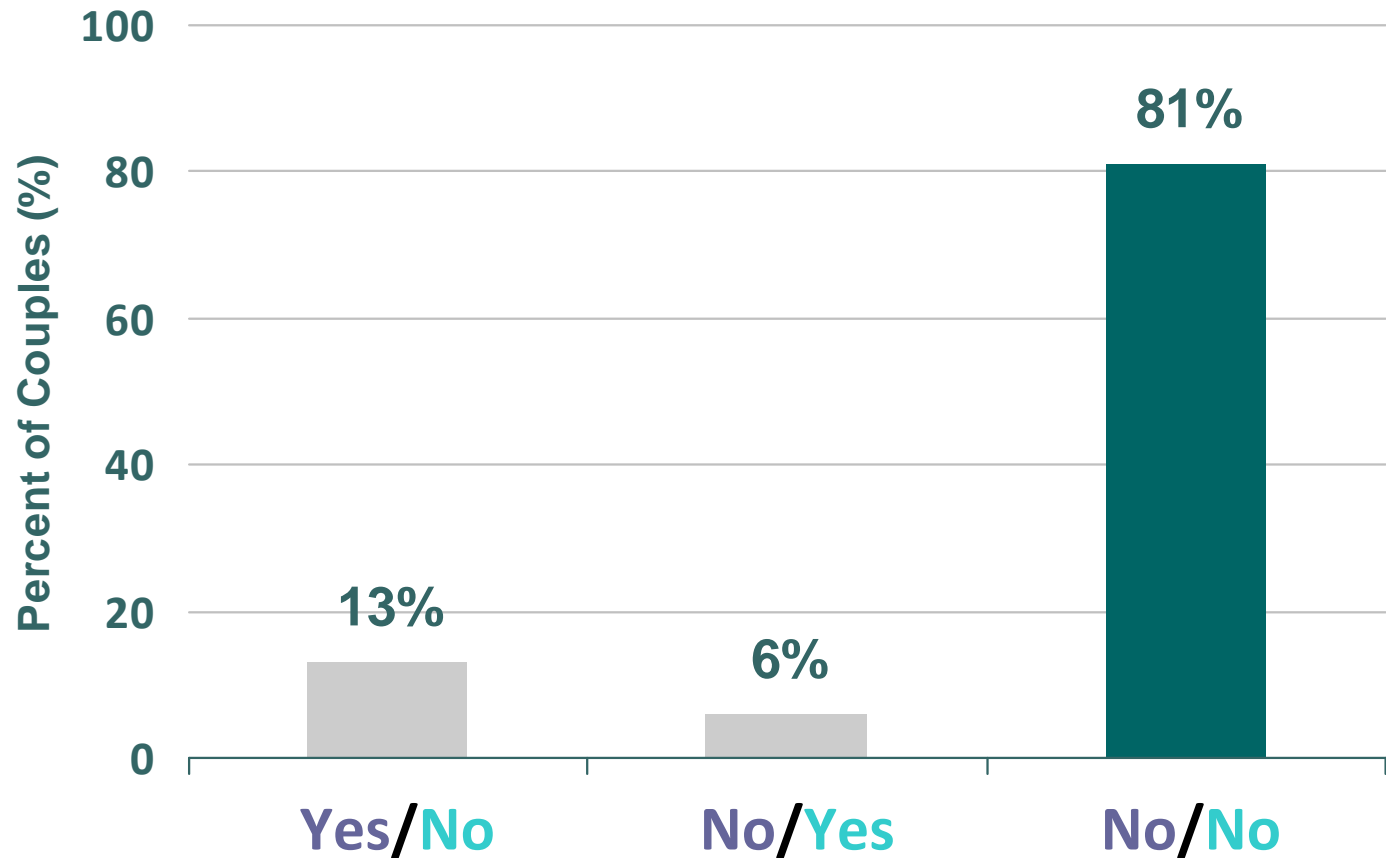
Male PS Questionnaire:

- *“Have you ever forced or pressured <initials of female partner> to have vaginal, oral, or anal sex when she did not want to?”*
 - **6% of males responses were ‘yes’**

Male Ever Forced Sex

(Female Response/Male Response)

Couple-level analysis



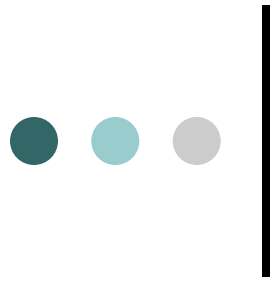
No couples responded "Yes/Yes" 29



Summary of findings: Partnership characteristics

- 71% of couples agreed on partner type with half of couples in agreement that their partner was a main partner
- Discussion of male partner's HIV risk behaviors:
 - More females reported having a conversation with their male partner on many of the HIV-related topics
 - Agreement that conversation took place about male's HIV-related risk behaviors <25% for all risk behaviors
 - High disagreement on communication of male partner's HIV risk behaviors and using condoms (34%-47%)
- More males reported physically abusing the female
- More females reported the male forced sex

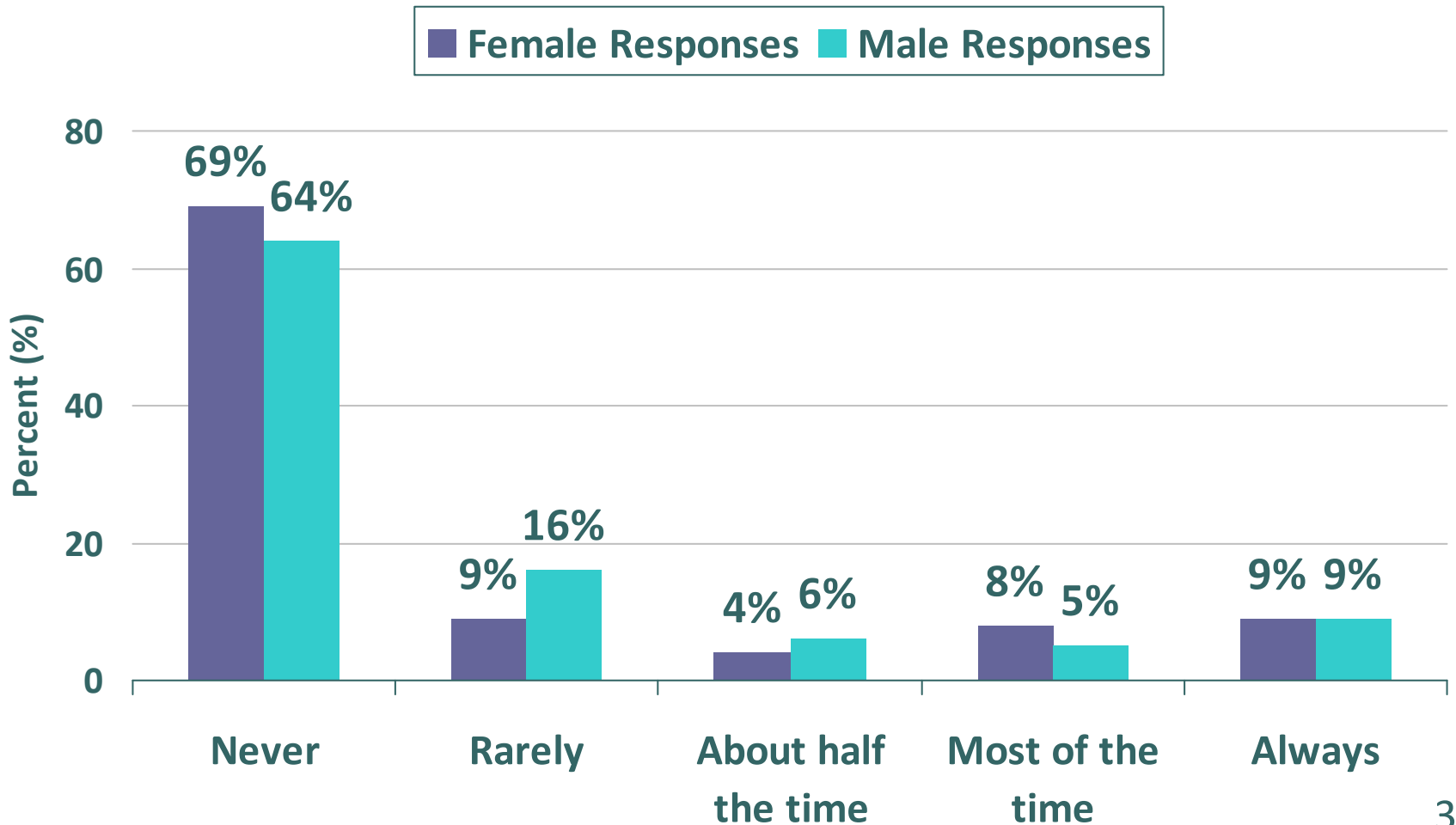
Inadequate communication of HIV related topics in couples



Couple Sexual Behavior in the Past Three Months

Condom Use for Vaginal Sex During the Past 3 Months

Response level analysis (214 responses)





Vaginal Sex and Condom Use

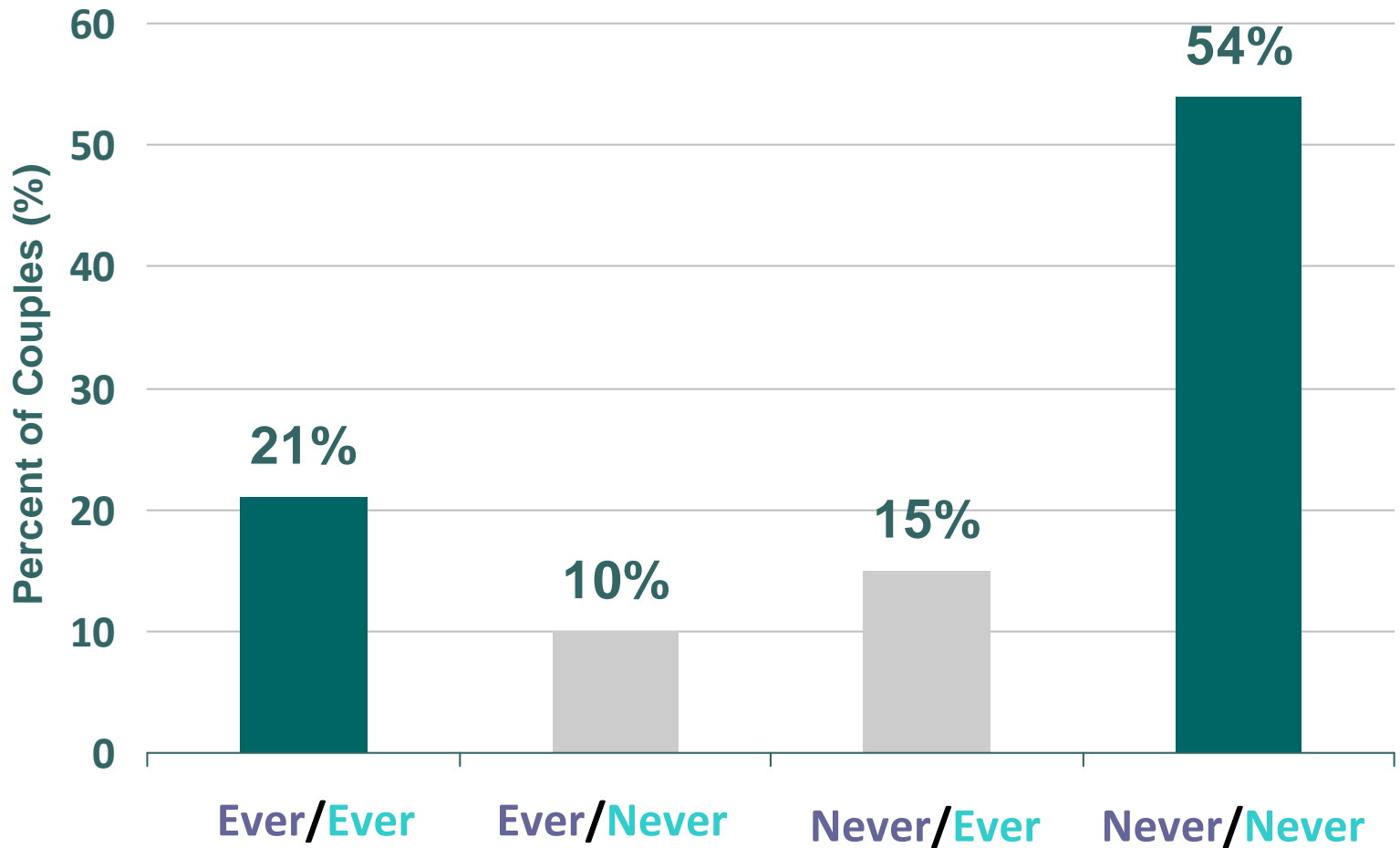
Simplified frequency of condom use into two categories

- Ever vs. never
- “Ever” category composed of always, most of the time, about half the time, and rarely categories

Ever vs. Never Condom Use for Vaginal Sex

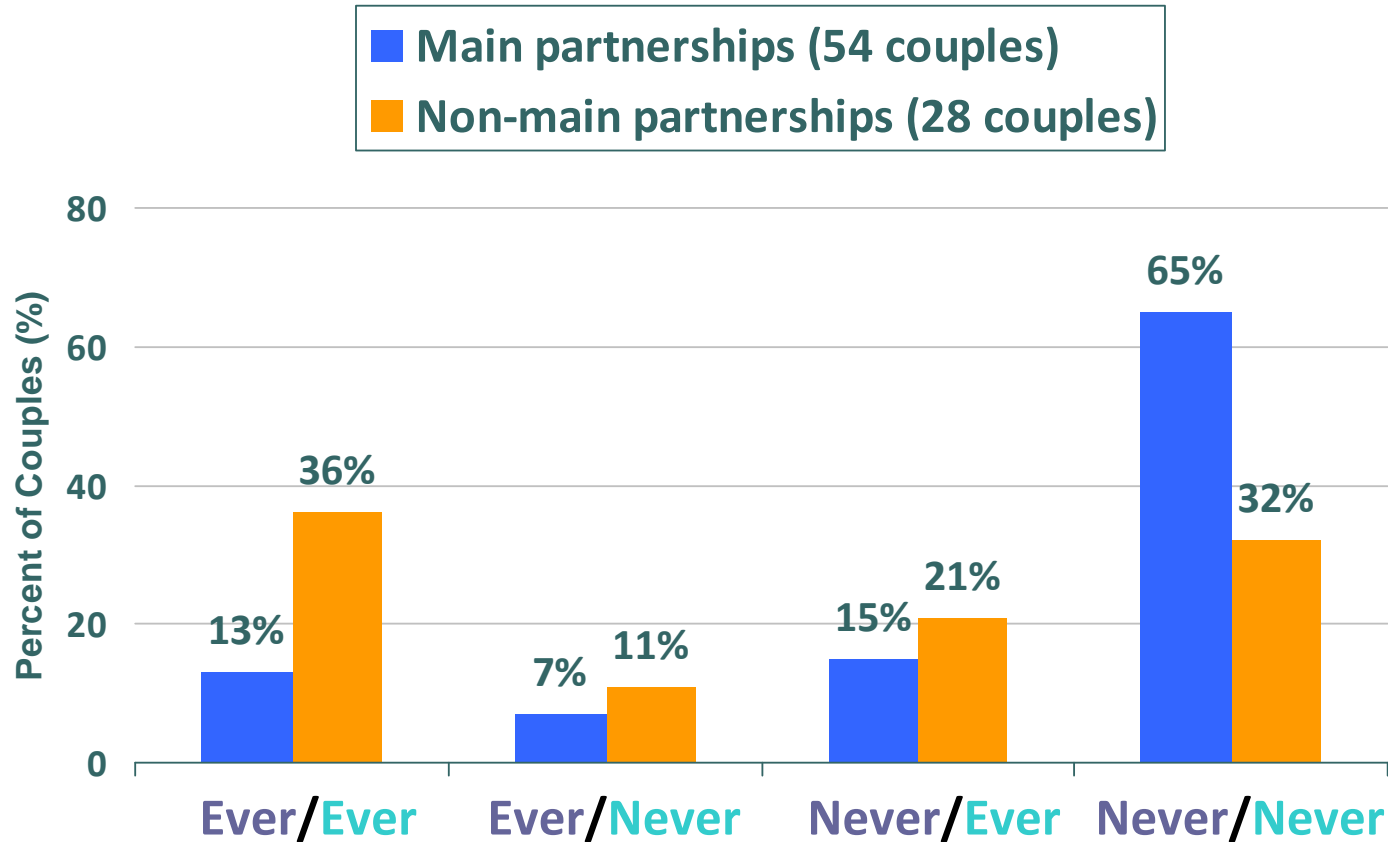
(Female Response/Male Response)

Couple-level analysis



Ever vs. Never Condom Use for Vaginal Sex by Main and Non-Main Partnerships

(Female Response/Male Response)



**Compares couples in agreement that their partner was a main partner (main/main) with couples in agreement that their partner was a non-main partner (casual/casual, casual/exchange, exchange/casual, and exchange/exchange). Excludes couples in disagreement on whether partner was a main or non-main partner (25 dyads)*

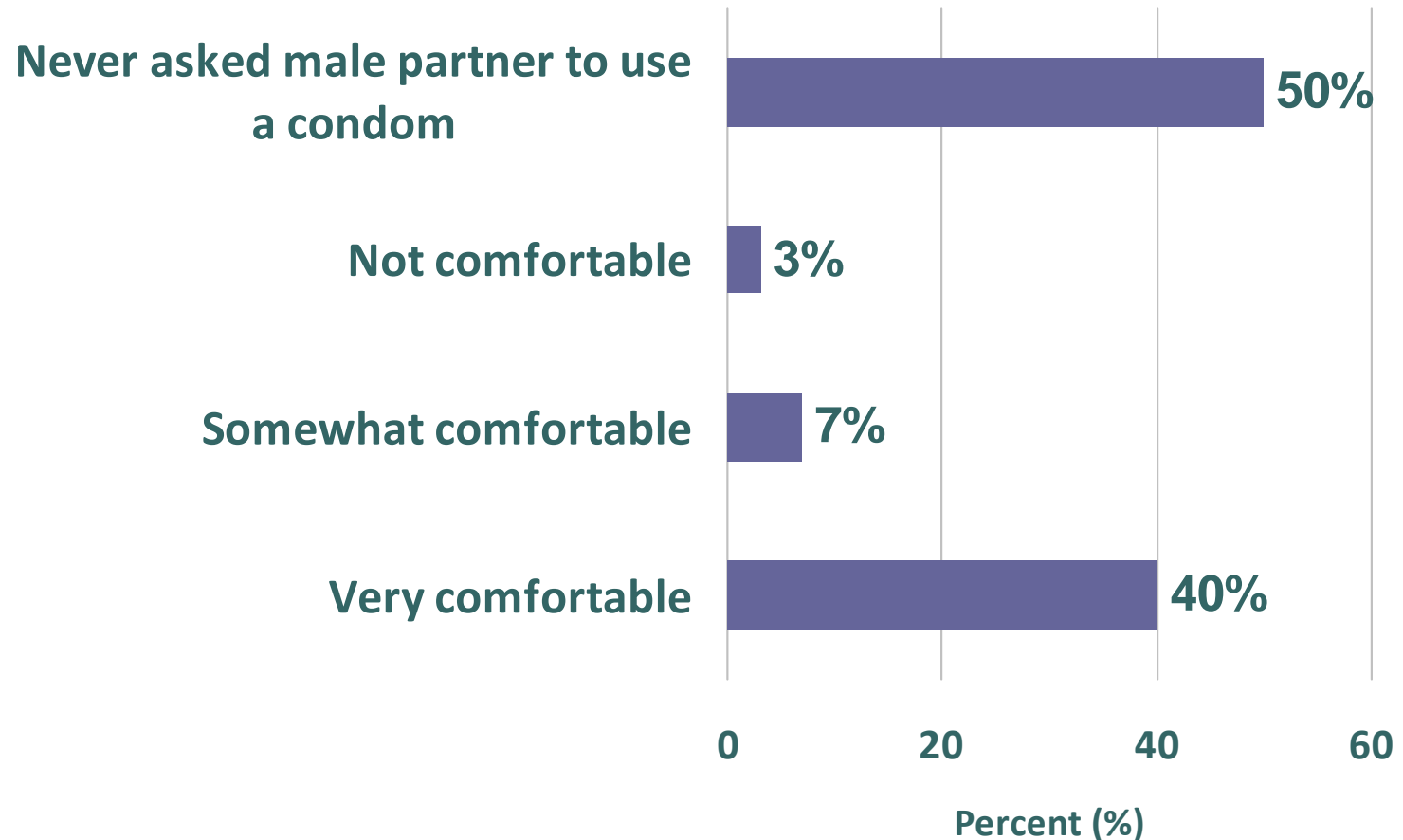


Female Level of Comfort Asking Male to Use Condoms

- *“During the past 3 months, how comfortable were you asking <initials of partner> to use a condom during vaginal or anal sex? Were you:*
 - *Very comfortable*
 - *Somewhat comfortable*
 - *Not comfortable, or*
 - *You never asked him to use a condom”*

Female Level of Comfort Asking Male to Use Condoms

107 female responses



Female Level of Comfort Asking Male to Use Condoms

107 female responses

Female responses: condom use for vaginal sex during past 3 months (43 responses)

Never: 40%

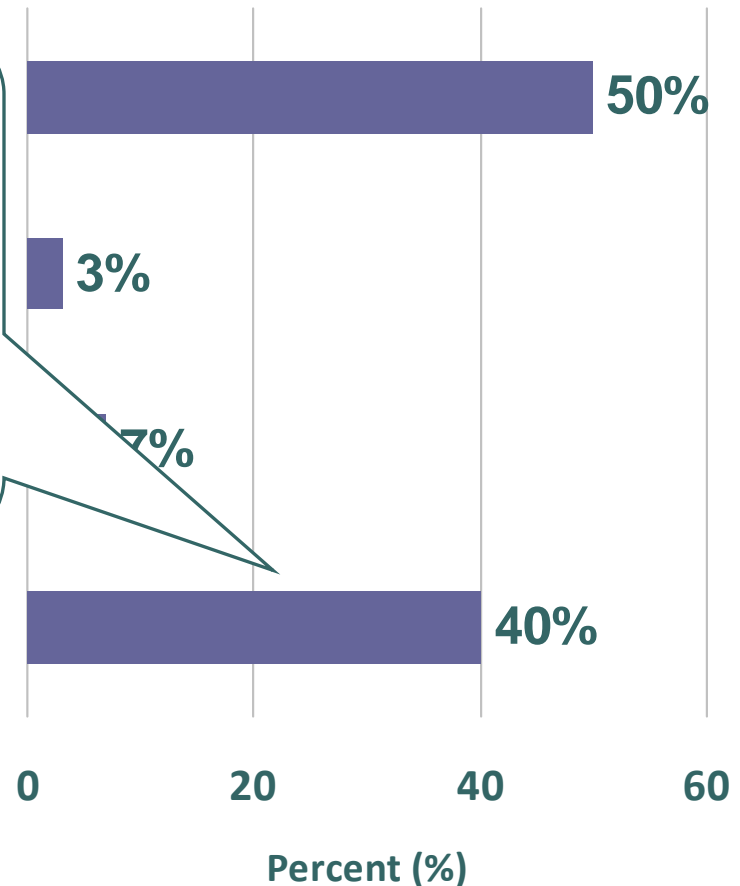
Rarely: 14%

About half the time: 7%

Most of the time: 16%

Always: 23%

Very comfortable





Anal Sex and Condom Use

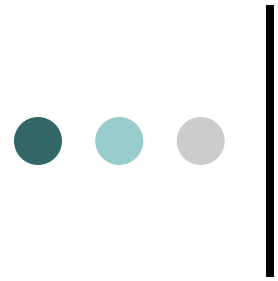
Couple-level analysis

- Few couples in agreement (9%, 10 couples) that they had anal sex during the previous 3 months (71% agreed they did not and 20% in disagreement)
- Of the 10 couples in agreement that they had anal sex, 6 couples agreed they never used condoms for anal sex
- Unprotected anal sex more efficient route of HIV/STI transmission compared to unprotected vaginal sex



Summary of findings: Couple sexual behaviors in the **past 3 months**

- *Low condom use reported for vaginal and anal sex*
 - **21%** of couples in agreement that they **EVER used condoms**
 - **54%** in agreement that they **NEVER used condoms**
 - 6% of all couples in agreement that they NEVER used condoms for anal sex
- 50% of females reported that they NEVER asked male partner to use a condom
- 40% of females reported they were “very comfortable” asking their male partner to use a condom- but, 54% of these females reported they “never” or “rarely” used condoms with their partner for vaginal sex



Female Knowledge of Male Partner Risk Behavior



Keep in mind...

- Partner study questionnaire did NOT have questions for males about their knowledge of their female partner's risk behaviors
- Study design sought to investigate female knowledge of male risk behavior
- NHBS-HET1 analysis shows females also have high prevalence of individual HIV risk behaviors (such as multiple sex partners and drug use)
- **Assumption that male told the truth** (if disagreement between members of couple, female assumed to have **incorrect perception**)



Male Risk Factors and Female Perceptions

Concurrency: sexual relationships that overlap in time



Male Partner Concurrency

- Any sexual relationships that overlapped in time with the couple's sexual relationship
 - Median=4 years
 - Length of couple sexual relationships ranged from <1 year to 20 years
 - Concurrent sexual relationship(s) may have occurred at any time during the course of the couple's relationship
 - Do not know the duration of concurrent partnerships



Male Partner Concurrency

- 74% of males (n=79) reported concurrent sexual relationships
 - 75% (n=59) reported >1 concurrent sexual relationships
- Median: 3
- Range: 1-39
- Few males reported having sex with men during couple sexual relationship (3% of males)
 - None of the females were aware that their male partner had sex with men during their sexual relationship



Male Partner Concurrency- Female's perception

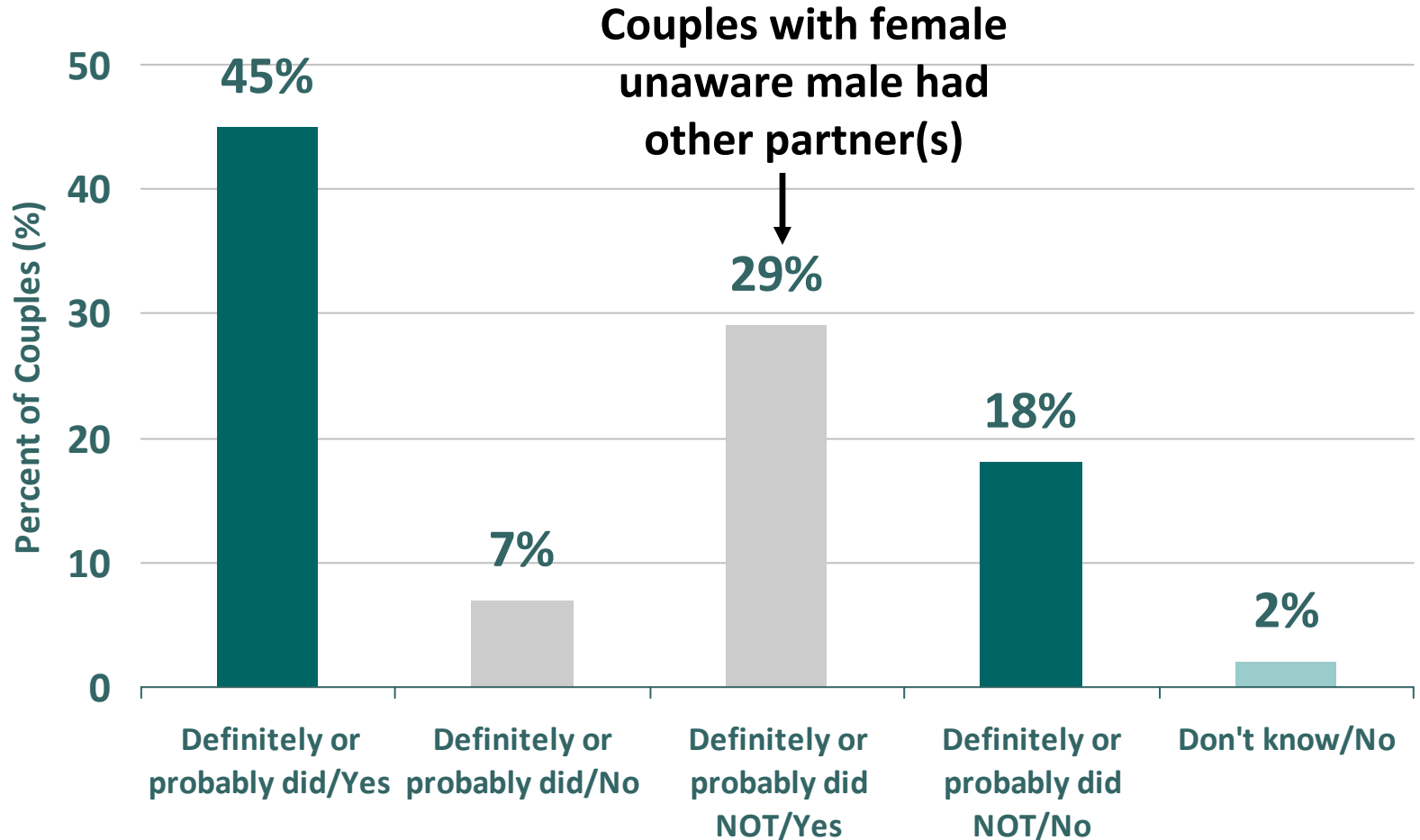
- Question for females:

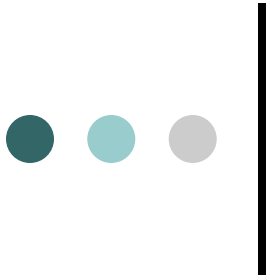
- *“As far as you know, during the time you were having a sexual relationship with [partner's initials] did he have sex with other people? Would you say he:*

- *Definitely did not*
 - *Probably did not*
 - *Probably did*
 - *Definitely did*
 - *Refused to answer*
 - *Don't know”*
- Female **unaware** (if male said 'yes')
- Female **aware** (if male said 'yes')

Male Concurrent Sexual Relationships

(Female Perception/Male Response)





Male HIV Risk Factors/Behaviors that Ever Occurred and Female Partner's Perceptions

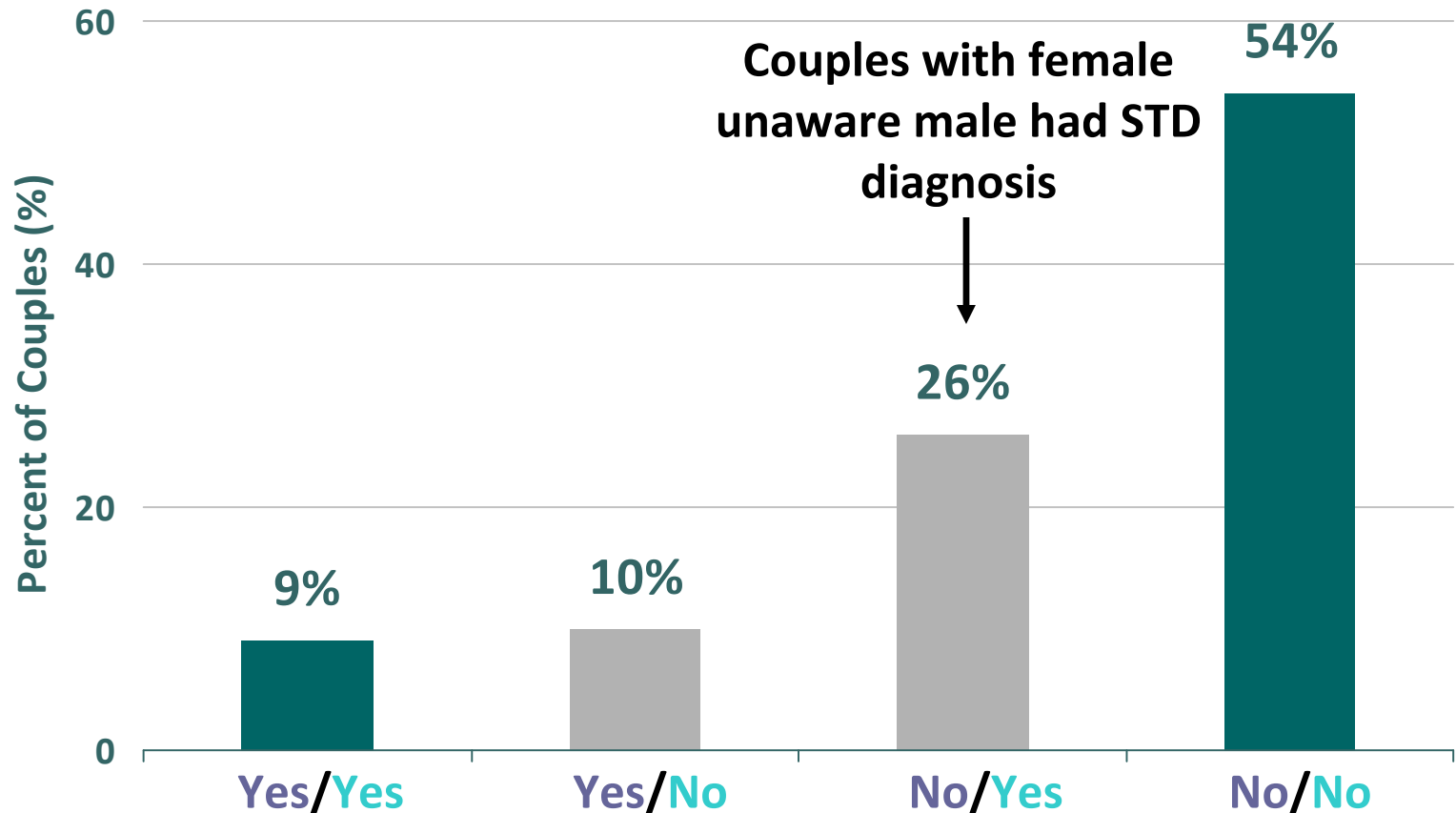


Male Risk Factors and Female Perceptions

Ever diagnosed with an STD

Female Knowledge of Male Partner STD Diagnosis (Female Response/Male Response)

- 36% of males (n=38) reported ever having an STD diagnosis





Male Risk Factors and Female Perceptions

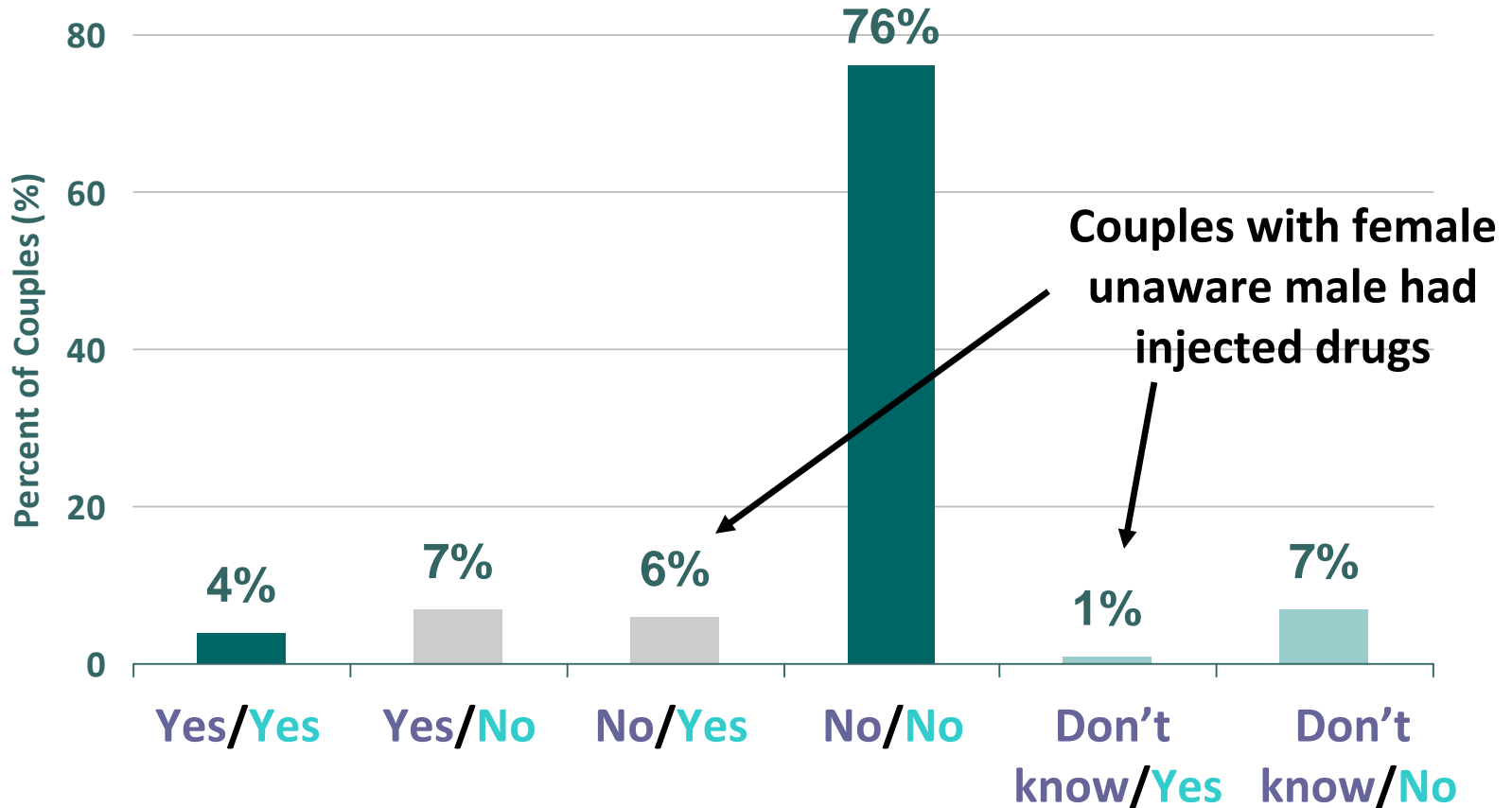
Ever inject drugs

Ever use crack cocaine

Male Ever Injected Drugs

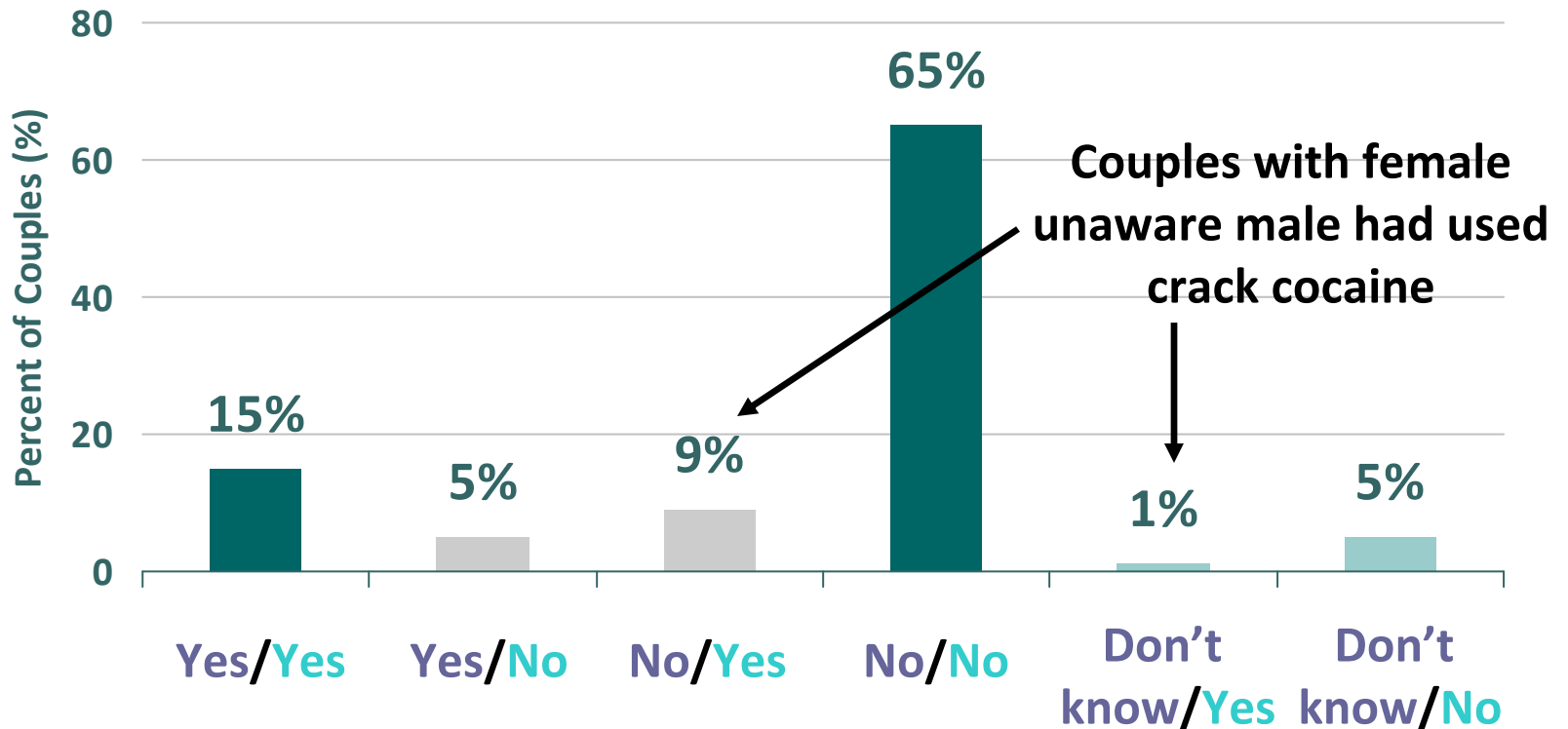
(Female Perception/Male Response)

- 10% of males (n=11) ever injected drugs



Male Ever Used Crack Cocaine (Female Perception/Male Response)

- 25% of males (n=26) ever used crack cocaine





Male Risk Factors and Female Perceptions

Ever been arrested and in jail or prison at least 24 hours

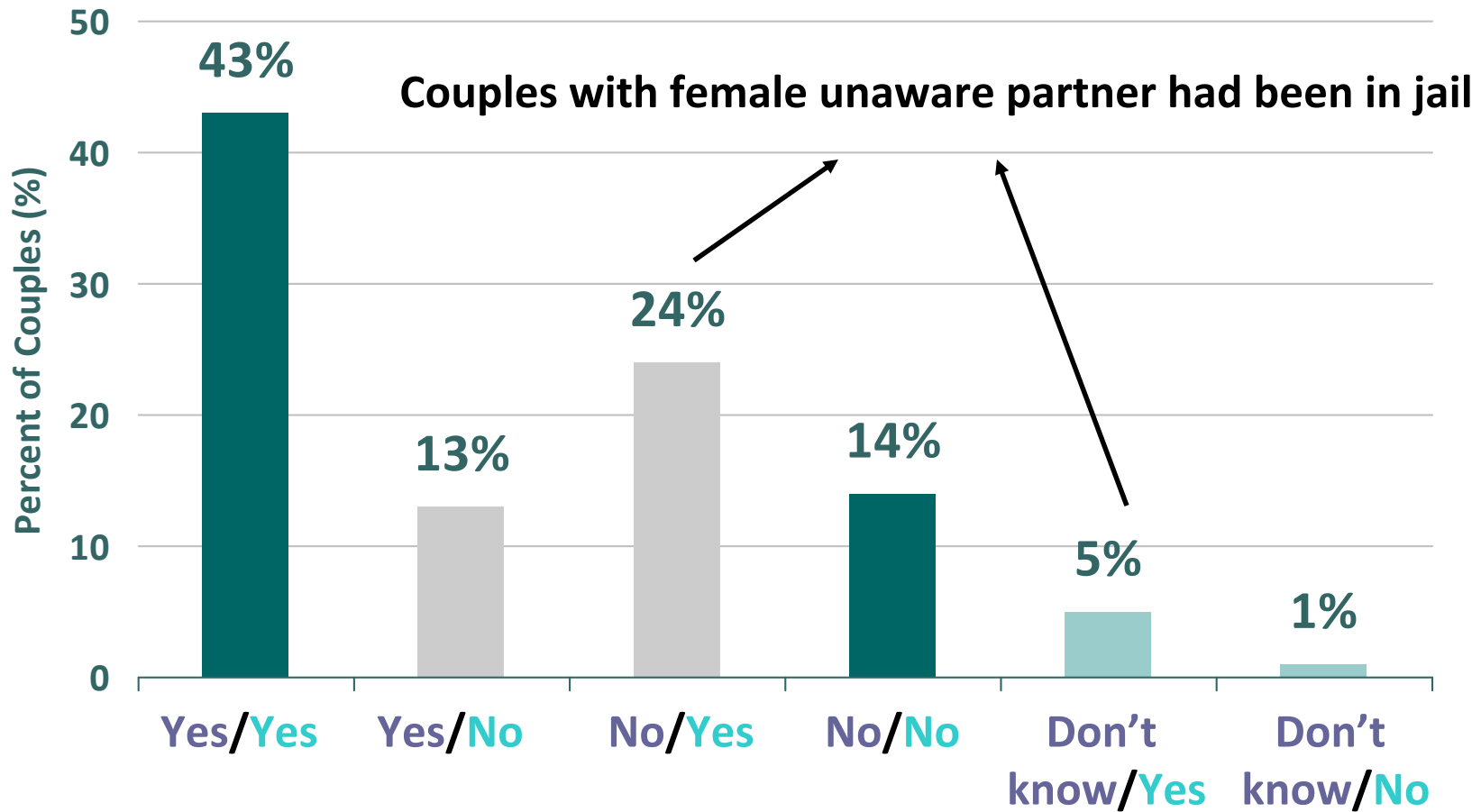


Male Ever Been in Jail or Prison

Individual analysis, 106 males

- **72%** of males (n=76) had ever been arrested by the police and held for at least 24 hours
 - **25%** of males who had ever been arrested (n=19) had been arrested in the 12 months prior to interview
 - Among those *not* arrested during the previous 12 months (n=57):
 - Median length of stay: 23 days
 - Range: 1 day-1825 days (5 years)

Male Ever Been in Jail/Prison- *Couple-level* (Female Perception/**Male Response**)





Male Risk Factors and Female Perceptions

Ever tested for HIV



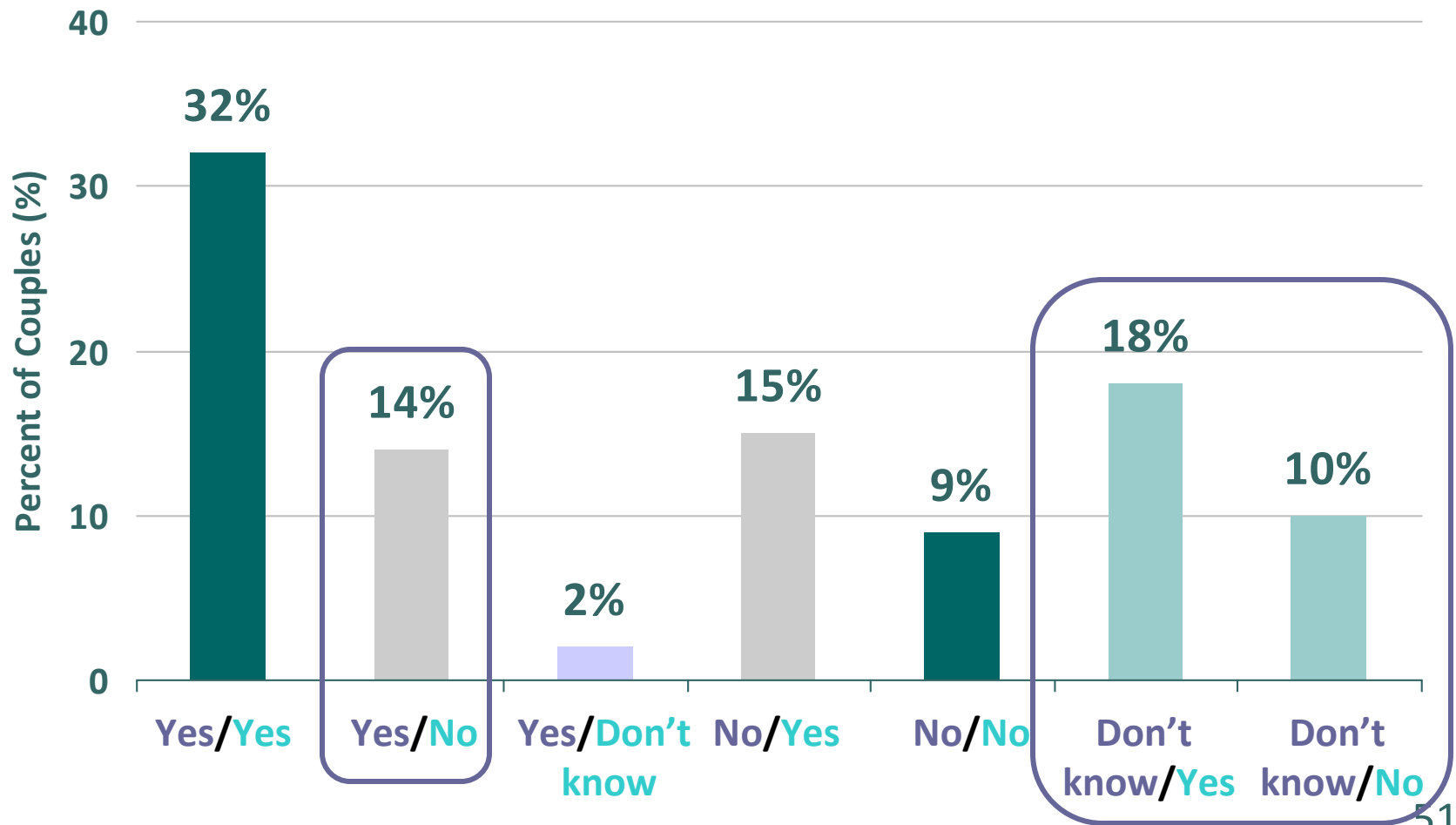
Ever Tested for HIV

Individual analysis

- 64% of males (n=68) who participated in the Partner Study reported they had ever been tested for HIV
- 71% of females (n=65) who participated in the Partner Study had ever been tested for HIV

Male Ever Tested for HIV

(Female Perception/**Male Response**)





Female Awareness of Male HIV-related Behaviors (107 couples)

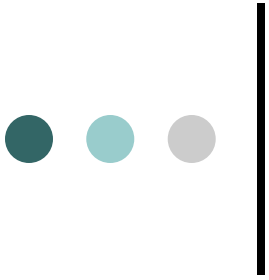
	Percent of male 'yes' responses
Had other partners during relationship (concurrent partners)	74%
Ever diagnosed with an STD	36%
Ever injected drugs	10%
Ever used crack cocaine	25%
Ever been in jail or prison	72%
Ever tested for HIV	64%

Female Awareness of Male HIV-related Behaviors

	Percent of male 'yes' responses	Female partner aware	
Had other partners during relationship (concurrent partners)	74%	61%*	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid red; width: 30px; height: 20px; margin-right: 5px;"></div> =less than ½ aware </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid blue; width: 30px; height: 20px; margin-right: 5px;"></div> =less than 2/3 aware </div> </div>
Ever diagnosed with an STD	36%	26%	
Ever injected drugs	10%	36%**	
Ever used crack cocaine	25%	59%	
Ever been in jail or prison	72%	60%	
Ever tested for HIV	64%	49%	

*Female reported "definitely did" or "probably did"

**Only 11 couples had males report they had ever injected drugs and 4/11 couples the female was aware



Discussion



Discussion


From the literature...

- Studies suggest there are likely **many interrelating factors** contributing to black females higher risk of HIV infection
 - Contextual factors (social and economic)
 - Sexual networks (prevalence of HIV in partner pool, pattern of connections)
 - Individual risk behaviors (concurrency)
 - Discussion of sexual/behavioral history with partner



Discussion

From the literature...

- Studies suggest there are likely **many interrelating factors** contributing to black females higher risk of HIV infection
 - **Contextual factors (social and economic)**
 - Sexual networks (prevalence of HIV in partner pool, pattern of connections)
 - Individual risk behaviors (**concurrency**)
 - Discussion of sexual/behavioral history with partner
- 



Discussion

From the literature...

- Contextual factors
 - Income, education (low)
 - Incarceration rates (high)
 - Male: female sex ratio (low)
 - Marriage rates (low)
- **Influence prevalence of partnership concurrency and other HIV risk behaviors**

Adimora AA, Schoenbach VJ (2002). Contextual factors and the black-white disparity in heterosexual HIV transmission. Epidemiology 13:707-712.

Adimora AA, Schoenbach VJ (2005). Social context, sexual networks, and racial disparities in rates of sexually transmitted infections. J Infect Dis 191 Suppl 1:S115-22.



Discussion

From the literature- concurrency

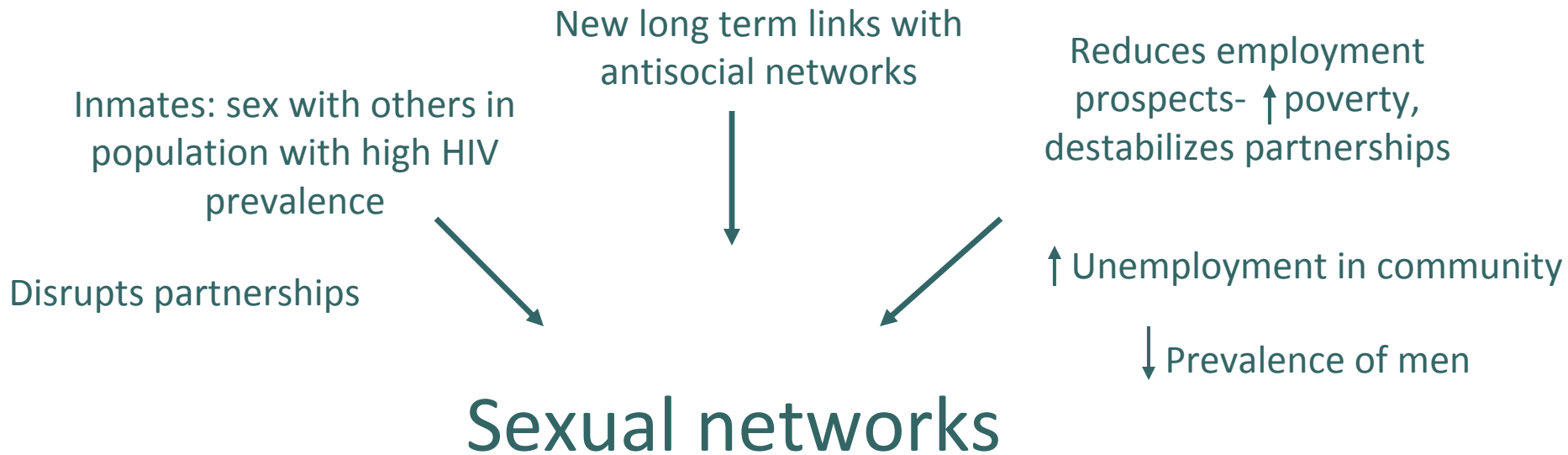
- Black heterosexuals report more sex partners and higher concurrency
- Sexual relationships that overlap in time
- Enhance the transmission of HIV and other STIs in mathematical modeling studies

Adimora AA et al., 2002; Adimora AA et al., 2007; Morris M & Kretzschmar M, 1997; Watts CH & May RM, 1992.

Context-Network Relationships

From the literature- attributed to Ada Adimora

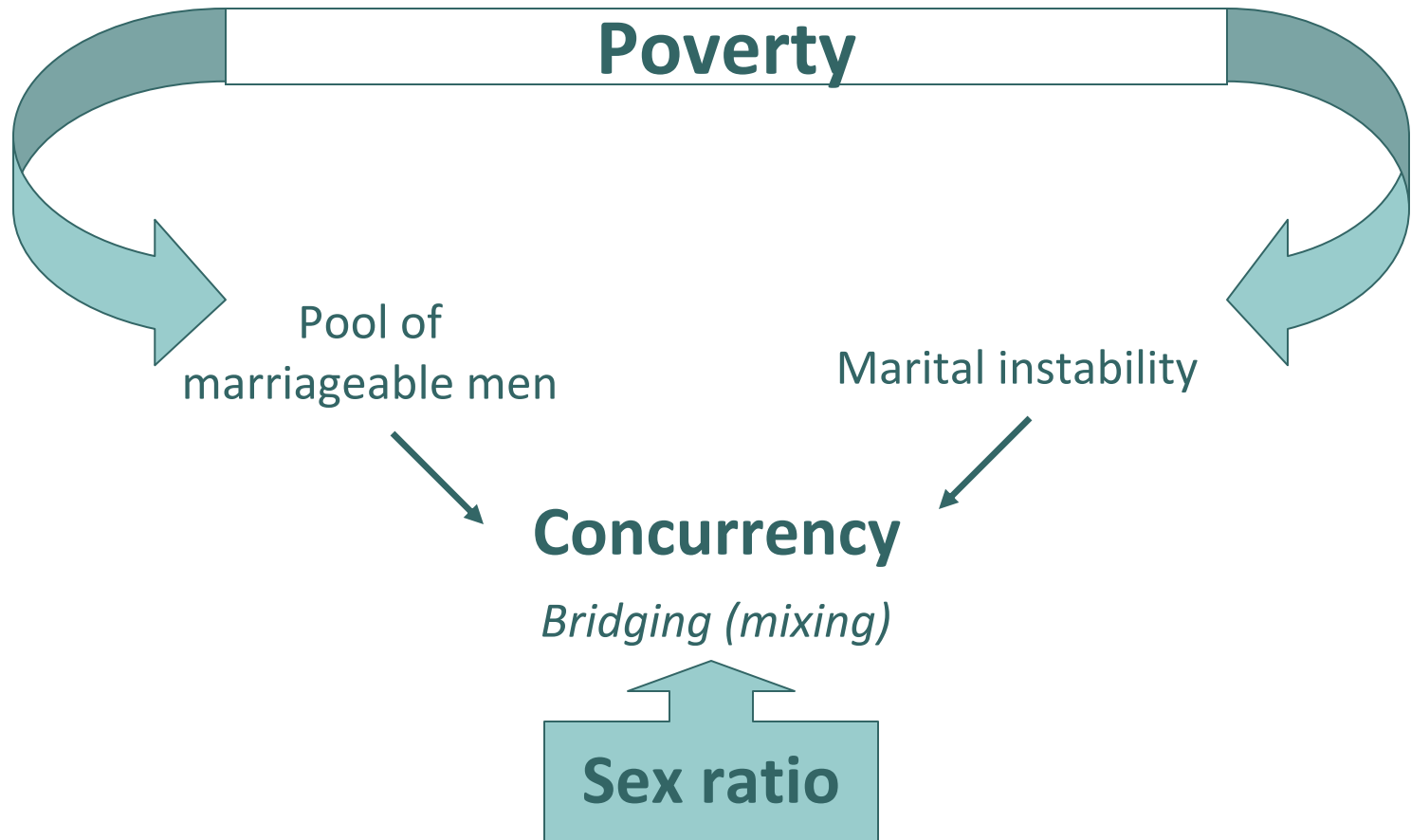
Incarceration



Adimora AA, Schoenbach VJ (2005). Social context, sexual networks, and racial disparities in rates of sexually transmitted infections. J Infect Dis 191 Suppl 1:S115-22.

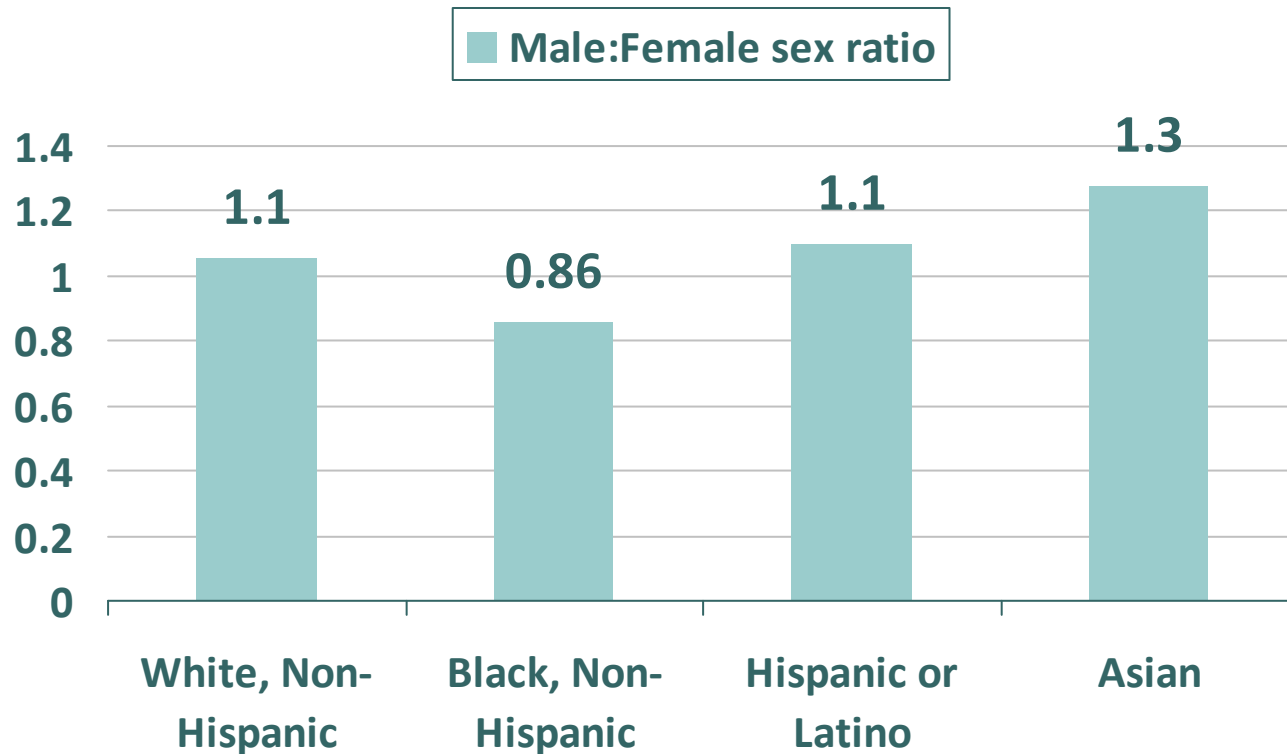
Context-Network Pathways

From the literature- attributed to Ada Adimora

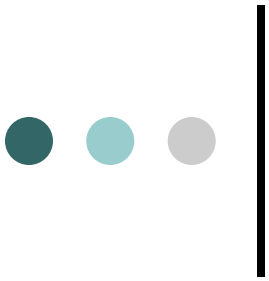


Adimora AA, Schoenbach VJ (2005). Social context, sexual networks, and racial disparities in rates of sexually transmitted infections. *J Infect Dis* 191 Suppl 1:S115-22.

Male:Female Sex Ratio by Race/Ethnicity, Detroit 2007



M:F sex ratio
under one=
more females
than males



Contextual factors and concurrency

Partner study data



Discussion

Demographics of Partner study sample

- 55% reported an income <\$10,000
- 28% reported less than a high school education
- 38% unemployed
- The majority of males (63%) and females (59%) reported that they were never married



Discussion

Partner study sample- Incarceration

- High incarceration
 - 72% of males ever arrested
 - 40% of female partners unaware
 - 25% of males had been arrested during the 12 months prior to interview
- Incarceration is associated with high risk partnerships, including multiple and concurrent partnerships



Discussion

Partner study sample- concurrency

- 74% of males reported concurrent sexual relationships, 75% of them reporting >1 concurrent relationship
 - Many females were unaware (39%)
 - High concurrency may not be surprising based on:
 - Low income
 - High unemployment
 - High incarceration
 - Majority never married
 - Low black male:female sex ratio in Detroit at time of partner study



Discussion of HIV risk factors



Discussion

From the literature-discussed HIV risk factors

- HIV-positive black women **less likely** to **discuss** a variety of HIV risk behaviors with their male partners (*prior to HIV diagnosis*) compared to HIV-negative black women
 - Number of past sex partners
 - Number of current sex partners
 - HIV status
 - STD history
 - Drug use history
 - Incarceration history

Forna FM, Fitzpatrick L, Adimora AA, McLellan-Lemal E, Leone P et al. (2006). A case-control study of factors associated with HIV infection among black women. J Natl Med Assoc. 98(11):1798-804.



Discussion

Partner study sample- discussed HIV risk factors

- Agreement that communication of male risk behaviors **did occur** during the past 3 months
 - Discuss number of his current sex partners: **21%**
 - Discuss number of his past sex partners: **13%**
 - Discuss whether male had ever had sex with a man: **7%**
 - Discuss whether male currently has sex with men: **5%**
 - Discuss his HIV status: **18%**
 - Discuss his drug use history: **22%**
 - Discuss his STD history: **10%**
 - Discuss using condoms: **34%**



Limitations of Partner Study

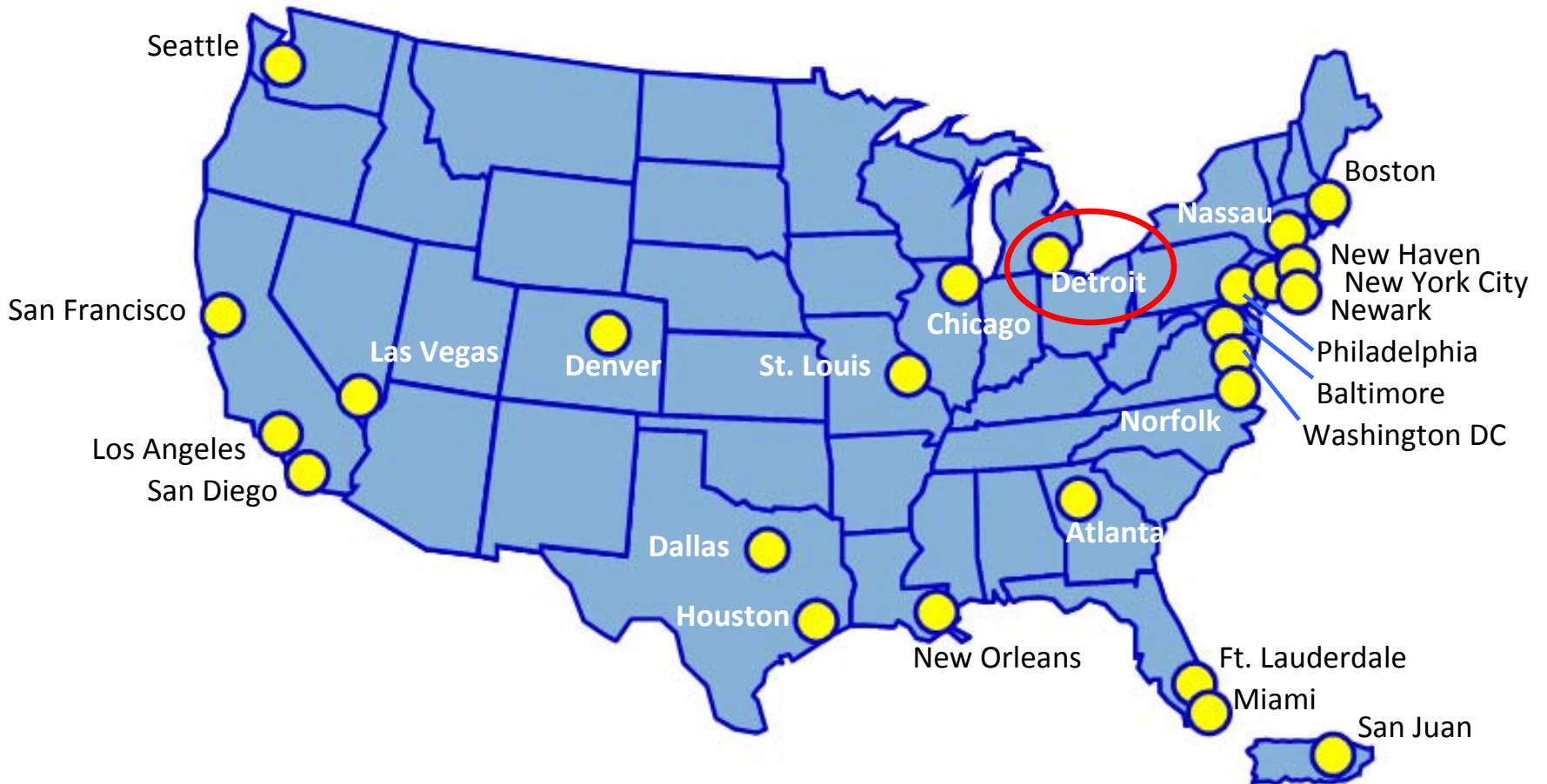
- Self-reported data
- Recall accuracy
- Possible reporting bias
- Differences in interpretation of questions and responses
- Participation of males dependent on female's recruitment choices
- Not a representative sample of heterosexual black and Hispanic women and their sex partners
- Did not have questions about male's perceptions of female partner's risk behaviors



HIV Testing Results- Partner Study

- All final HIV test results for males were negative
- **One positive HIV final test result for a female (1%)**
 - Female reported never being tested for HIV
 - One male partner during past 12 months; no unprotected sex
 - Never injected drugs
 - Unknown date of infection

NHBS-HET1 Sites





HIV Testing Results- Detroit HET1

- **Detroit HET1 sample** (n=786), HIV prevalence **<1%**
 - 6 positive HIV final test results
 - 3 male and 3 female
- **NHBS-HET1 nationwide sample** (n=14,837) had an HIV prevalence of **2%**
 - All sites targeted high poverty areas with high rates of HIV
 - 10-20 times greater estimated prevalence of HIV in non-IDU heterosexuals in U.S.



Implications for prevention

- Investigating the extent of couple agreement is important for understanding how partner level dynamics influence HIV risk behavior
 - Partner level HIV prevention strategies
 - **Improve communication** of HIV risk factors in couples
 - **Identifying barriers to condom use**



Implications for prevention

- **Multi-dimensional approach** to HIV prevention needed for black females
 - Social and economic environment
 - Community-level changes
- Individual HIV prevention for black females
 - **Know your sex partner's HIV status**
 - **Consistent condom use**

For more information

- Partner Study Data Summary and NHBS-HET1 Summary online
- Please visit MDCH HIV Statistics online-
www.michigan.gov/hivstd
 - Select “HIV/AIDS”
 - Select “Surveillance: Case Reporting and Projects”
 - National HIV Behavioral Surveillance link





Thank you!

- Renee McCoy
- Eve Mokotoff
- Emily Higgins
- Vivian Griffin
- Ed Rothman (CSCAR)
- Interviewers
 - Derrick Willis
 - Korin Makuannen
 - Marquetta Jones
 - Jamilah Drakeford
 - Meosia Lee-Turner
- Testing Organizations- provided space and HIV testing
 - DDHWP Counseling and Testing
 - DCHC
- Kathy Hageman
- Belinda Chandler and Leanne Savola



References (1)

- Adimora AA, Schoenbach VJ (2002). Contextual factors and the black-white disparity in heterosexual HIV transmission. *Epidemiology* 13:707-712.
- Adimora AA, Schoenbach VJ (2005). Social context, sexual networks, and racial disparities in rates of sexually transmitted infections. *J Infect Dis* 191 Suppl 1:S115-22.
- Adimora AA, Schoenbach VJ, Bonas DM, Martinson FE, Donaldson KH, Stancil TR (2002). Concurrent sexual partnerships among women in the United States. *Epidemiology* 13(3):320-7.
- Adimora AA, Schoenbach VJ, Doherty IA (2007). Concurrent sexual partnerships among men in the United States. *Am J Public Health* 97(12):2230-7.
- Boily MC, Baggaley RF, Wang L, et al (2009). Heterosexual risk of HIV-1 infection per sexual act: systematic review and meta-analysis of observational studies. *Lancet Infect Dis* 9(2):118-129.
- Catania JA, Binson D, Dolcini MM, et al. (1995). Risk factors for HIV and other sexually transmitted diseases and prevention practices among U.S. heterosexual adults: changes from 1990 to 1992. *Am J Public Health* 85:1492-99.
- Centers for Disease Control and Prevention. HIV Transmission Among Black Women – North Carolina, 2004 MMWR 2005; 54:89-94.
- Cornelius LJ, Okundaye JN, Manning MC (2000). Human immunodeficiency virus-related risk behavior among African-American females. *J Natl Med Assoc* 94:183-195.
- Dolcini MM, Coates TJ, Catania JA, Kegeles SM, Hauck WW (1995). Multiple sexual partners and their psychosocial correlates: the population-based AIDS in multiethnic neighborhoods (AMEN) study. *Health Psychol* 14:22-31.



References (2)

- Gallagher KM, Sullivan PS, Lansky A, Onorato IM (2007). Behavioral surveillance among people at risk for HIV infection in the U.S.: the National HIV Behavioral Surveillance System. *Public Health Rep* 122 Suppl 1:32-8.
- Grinstead OA, Peterson JL, Faigles B, Catania JA (1997). Antibody testing and condom use among heterosexual African Americans at risk for HIV infection. *Am J Public Health* 87:857-859.
- Khan MR, Doherty IA, Schoenbach VJ, Taylor EM, Epperson MW, Adimora AA (2009). Incarceration and high-risk sex partnerships among men in the United States. *J Urban Health* 86(4):584-601.
- Millett G, Malebranche D, Mason B, Spikes P (2005). Focusing “Down Low”: Bisexual Black Men, HIV Risk and Heterosexual Transmission. *J Natl Med Assoc.* 97 (7 Suppl.): 52S-59S.
- Morris M, Kretzschmar M (1997). Concurrent partnerships and the spread of HIV. *AIDS* 11:641-648.
- Peterson JL, Catania JA, Dolcini MM, Faigles B (1993). Multiple sexual partners among blacks in high-risk cities. *Fam Plan Perspect* 25:263-267.
- Pouget ER, Kershaw TS, Niccolai LM, Ickovics JR, Blankenship KM (2010). Associations of sex ratios and male incarceration rates with multiple opposite-sex partners: potential social determinants of HIV/STI transmission. *Public Health Rep* 125 Suppl 4:70-80.
- Watts CH, May RM (1992). The influence of concurrent partnerships on the dynamics of HIV/AIDS. *Math Biosci* 108:89-104.