

Egocentric Sexual Networks of Men Who Have Sex with Men in the United States: Results from the ARTnet Study

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Supplemental Appendix

Supplemental Table 1. Heterogeneity in Network Degree by Demographics and HIV Status, Stratified by Partnership Type and Anal versus Oral Sexual Activity, among MSM in the United States

	Main and Casual		Main		Casual	
	AI	OI	AI	OI	AI	OI
	<i>Mean (95% CI)</i>	<i>Mean (95% CI)</i>	<i>Mean (95% CI)</i>	<i>Mean (95% CI)</i>	<i>Mean (95% CI)</i>	<i>Mean (95% CI)</i>
Total Sample	1.00 (0.97-1.03)	1.17 (1.14-1.20)	0.41 (0.39-0.43)	0.44 (0.43-0.46)	0.59 (0.57-0.61)	0.73 (0.70-0.75)
Race/Ethnicity						
Black, Non-Hispanic	0.95 (0.84-1.07)	1.08 (0.96-1.20)	0.29 (0.23-0.35)	0.30 (0.24-0.37)	0.67 (0.57-0.77)	0.78 (0.68-0.89)
White, Non-Hispanic	1.01 (0.98-1.05)	1.20 (1.17-1.24)	0.42 (0.40-0.45)	0.46 (0.44-0.48)	0.59 (0.56-0.61)	0.74 (0.71-0.77)
Hispanic	1.00 (0.93-1.08)	1.11 (1.03-1.19)	0.42 (0.37-0.47)	0.44 (0.39-0.49)	0.58 (0.53-0.64)	0.67 (0.61-0.74)
Other/Multiple	0.94 (0.85-1.03)	1.08 (0.99-1.18)	0.37 (0.31-0.43)	0.40 (0.35-0.47)	0.57 (0.50-0.64)	0.68 (0.60-0.76)
Age						
15–24	0.72 (0.68-0.77)	0.80 (0.76-0.85)	0.39 (0.36-0.42)	0.41 (0.38-0.45)	0.33 (0.30-0.36)	0.39 (0.36-0.43)
25–34	0.95 (0.90-1.01)	1.07 (1.01-1.13)	0.48 (0.45-0.52)	0.51 (0.47-0.55)	0.47 (0.43-0.51)	0.56 (0.52-0.60)
35–44	1.20 (1.12-1.29)	1.36 (1.28-1.45)	0.47 (0.42-0.52)	0.50 (0.45-0.55)	0.73 (0.67-0.80)	0.86 (0.80-0.94)
45–54	1.25 (1.17-1.32)	1.50 (1.42-1.59)	0.39 (0.35-0.44)	0.44 (0.40-0.49)	0.85 (0.79-0.92)	1.06 (0.99-1.13)
55–65	1.11 (1.04-1.18)	1.44 (1.36-1.53)	0.29 (0.26-0.33)	0.35 (0.31-0.39)	0.82 (0.75-0.88)	1.09 (1.02-1.17)
Census Region and Division						
<i>West</i>	1.00 (0.95-1.06)	1.16 (1.10-1.22)	0.40 (0.36-0.43)	0.43 (0.40-0.47)	0.60 (0.56-0.65)	0.73 (0.68-0.78)
Pacific	1.10 (1.03-1.17)	1.27 (1.20-1.35)	0.41 (0.36-0.45)	0.44 (0.39-0.48)	0.69 (0.63-0.75)	0.83 (0.77-0.90)
Mountain	0.80 (0.72-0.89)	0.93 (0.84-1.02)	0.38 (0.32-0.44)	0.42 (0.36-0.48)	0.42 (0.36-0.49)	0.51 (0.44-0.58)
<i>Midwest</i>	0.99 (0.93-1.05)	1.16 (1.09-1.22)	0.42 (0.38-0.46)	0.46 (0.42-0.50)	0.57 (0.52-0.61)	0.70 (0.65-0.75)
West North Central	0.99 (0.88-1.11)	1.14 (1.02-1.27)	0.45 (0.38-0.53)	0.49 (0.41-0.57)	0.54 (0.46-0.63)	0.65 (0.56-0.75)
East North Central	0.99 (0.91-1.06)	1.16 (1.08-1.24)	0.41 (0.37-0.46)	0.44 (0.39-0.49)	0.57 (0.52-0.63)	0.72 (0.66-0.79)
<i>South</i>	1.00 (0.96-1.05)	1.16 (1.12-1.22)	0.42 (0.39-0.45)	0.45 (0.42-0.48)	0.59 (0.55-0.62)	0.72 (0.68-0.76)
West South Central	1.03 (0.95-1.12)	1.20 (1.11-1.30)	0.42 (0.36-0.47)	0.46 (0.40-0.52)	0.62 (0.55-0.69)	0.75 (0.68-0.83)
East South Central	0.97 (0.84-1.10)	1.17 (1.03-1.31)	0.45 (0.36-0.54)	0.48 (0.39-0.57)	0.52 (0.43-0.62)	0.69 (0.59-0.80)
South Atlantic	0.99 (0.94-1.06)	1.15 (1.08-1.21)	0.41 (0.37-0.45)	0.44 (0.40-0.48)	0.58 (0.54-0.63)	0.71 (0.66-0.76)
<i>Northeast</i>	1.01 (0.95-1.08)	1.22 (1.15-1.30)	0.40 (0.36-0.45)	0.44 (0.40-0.49)	0.61 (0.56-0.66)	0.78 (0.73-0.84)
Middle Atlantic	1.04 (0.96-1.12)	1.24 (1.16-1.33)	0.40 (0.35-0.45)	0.44 (0.39-0.49)	0.64 (0.58-0.71)	0.81 (0.74-0.88)
New England	0.94 (0.83-1.07)	1.17 (1.04-1.31)	0.41 (0.33-0.49)	0.45 (0.37-0.54)	0.54 (0.45-0.63)	0.72 (0.62-0.83)
Urbanicity (County)						
Large Central Metro	1.04 (1.00-1.09)	1.24 (1.19-1.29)	0.41 (0.38-0.44)	0.45 (0.42-0.48)	0.64 (0.60-0.67)	0.79 (0.75-0.83)
Large Fringe Metro	0.99 (0.93-1.05)	1.15 (1.09-1.22)	0.39 (0.36-0.43)	0.42 (0.38-0.46)	0.59 (0.55-0.64)	0.73 (0.68-0.78)
Medium Metro	0.98 (0.92-1.05)	1.12 (1.05-1.19)	0.45 (0.40-0.49)	0.47 (0.43-0.52)	0.54 (0.49-0.59)	0.64 (0.59-0.69)
Small Metro	0.97 (0.88-1.07)	1.12 (1.02-1.23)	0.43 (0.37-0.49)	0.46 (0.40-0.53)	0.54 (0.48-0.62)	0.66 (0.58-0.74)
Micropolitan	0.86 (0.74-0.98)	1.05 (0.93-1.19)	0.39 (0.32-0.48)	0.42 (0.34-0.51)	0.47 (0.38-0.56)	0.63 (0.53-0.74)
Nonmetro	0.91 (0.77-1.07)	1.06 (0.90-1.22)	0.34 (0.26-0.44)	0.39 (0.30-0.49)	0.58 (0.47-0.70)	0.67 (0.55-0.80)
HIV Status						
Negative	1.03 (0.99-1.06)	1.22 (1.18-1.25)	0.42 (0.40-0.44)	0.45 (0.43-0.48)	0.61 (0.58-0.63)	0.76 (0.74-0.79)
Positive	1.41 (1.30-1.52)	1.54 (1.42-1.66)	0.46 (0.39-0.52)	0.48 (0.42-0.55)	0.95 (0.86-1.05)	1.06 (0.96-1.16)
Unknown	0.64 (0.59-0.70)	0.74 (0.68-0.80)	0.34 (0.30-0.38)	0.37 (0.33-0.42)	0.30 (0.26-0.34)	0.36 (0.32-0.41)

AI: Anal Intercourse; OI: Oral Intercourse

Supplemental Table 2. Heterogeneity in One-Time Partner Acquisition Rates (per Week), by Demographics and HIV Status, Stratified by Anal versus Oral Sexual Activity, among MSM in the United States

	AI	OI
	Mean (95% CI)	Mean (95% CI)
Total	0.088 (0.079-0.096)	0.064 (0.057-0.071)
Race/Ethnicity		
Black, Non-Hispanic	0.068 (0.041-0.104)	0.039 (0.020-0.067)
White, Non-Hispanic	0.091 (0.082-0.102)	0.068 (0.060-0.077)
Hispanic	0.085 (0.065-0.109)	0.060 (0.043-0.080)
Other/Multiple	0.072 (0.050-0.100)	0.050 (0.032-0.074)
Age (years)		
15-24	0.058 (0.046-0.072)	0.034 (0.025-0.045)
25-34	0.080 (0.066-0.097)	0.043 (0.033-0.056)
35-44	0.112 (0.089-0.139)	0.076 (0.057-0.098)
45-54	0.119 (0.097-0.144)	0.095 (0.076-0.118)
55-65	0.094 (0.074-0.117)	0.101 (0.080-0.125)
Region and Division		
<i>West</i>	0.097 (0.080-0.115)	0.065 (0.052-0.081)
Pacific	0.108 (0.087-0.132)	0.073 (0.056-0.093)
Mountain	0.074 (0.050-0.103)	0.050 (0.031-0.075)
<i>Midwest</i>	0.084 (0.068-0.104)	0.058 (0.044-0.074)
West North Central	0.083 (0.054-0.120)	0.057 (0.034-0.088)
East North Central	0.085 (0.065-0.109)	0.058 (0.042-0.078)
<i>South</i>	0.082 (0.069-0.096)	0.058 (0.047-0.070)
West South Central	0.086 (0.062-0.114)	0.046 (0.029-0.067)
East South Central	0.062 (0.034-0.100)	0.090 (0.056-0.135)
South Atlantic	0.085 (0.068-0.103)	0.057 (0.044-0.072)
<i>Northeast</i>	0.089 (0.071-0.110)	0.079 (0.062-0.099)
Middle Atlantic	0.091 (0.070-0.117)	0.071 (0.052-0.094)
New England	0.084 (0.053-0.126)	0.101 (0.066-0.145)
Urbanicity (County)		
Large Central Metro	0.108 (0.094-0.122)	0.074 (0.063-0.086)
Large Fringe Metro	0.082 (0.066-0.101)	0.063 (0.049-0.080)
Medium Metro	0.067 (0.052-0.085)	0.052 (0.039-0.069)
Small Metro	0.064 (0.043-0.092)	0.038 (0.023-0.060)
Micropolitan	0.058 (0.032-0.096)	0.063 (0.036-0.101)
Nonmetro	0.075 (0.040-0.126)	0.057 (0.027-0.103)
HIV Status		
Negative	0.090 (0.081-0.100)	0.068 (0.060-0.077)
Positive	0.164 (0.129-0.206)	0.092 (0.066-0.124)
Unknown	0.031 (0.020-0.046)	0.025 (0.015-0.038)

AI: Anal Intercourse; OI: Oral Intercourse

Supplemental Table 3. Heterogeneity in Duration (in Weeks) of Ongoing Sexual Partnerships by Demographics and HIV Status of Ego Participant, Stratified by Anal versus Oral Sexual Activity, among MSM in the United States

	Ongoing Partnerships	AI Partnerships		OI Partnerships	
	N (%)	Main	Casual	Main	Casual
		<i>Mean (SD, Med)</i>	<i>Mean (SD, Med)</i>	<i>Mean (SD, Med)</i>	<i>Mean (SD, Med)</i>
Total	5837 (100.0)	259.1 (315.6, 137.3)	133.2 (191, 71.3)	273.5 (337.6, 140.6)	133.0 (197.2, 69.7)
Race/Ethnicity					
Black, Non-Hispanic	297 (5.1)	265.5 (271.3, 169.9)	167.1 (210.5, 91.4)	267.8 (291.9, 147.3)	153.8 (206.1, 79.9)
White, Non-Hispanic	4284 (73.4)	272.5 (330.8, 144.9)	132.7 (190.5, 70.7)	286.1 (349.3, 153.1)	134.9 (202.2, 69.6)
Hispanic	771 (13.2)	211.5 (270.3, 100.8)	121.8 (176.9, 64.4)	224.0 (295.0, 105.9)	120.7 (171.7, 63.1)
Other/Multiple	485 (8.3)	215.7 (246.7, 128.0)	131.2 (200.7, 70.9)	242.3 (304.0, 123.1)	120.8 (181.0, 67.0)
Age					
15–24	1079 (18.5)	76.9 (72.5, 55.2)	68.9 (86.5, 38.3)	74.9 (72.2, 53.2)	66.2 (74.4, 38.1)
25–34	1382 (23.7)	198.9 (177.4, 154.1)	97.7 (137.8, 51.0)	196.1 (178.0, 150.1)	95.7 (133.8, 49.4)
35–44	966 (16.5)	318.9 (284.2, 248.8)	128.6 (168.2, 77.4)	324.6 (288.1, 248.8)	129.0 (174.6, 75.6)
45–54	1273 (21.8)	405.8 (377.1, 271.5)	162.6 (233.1, 86.0)	433.7 (399.3, 288.0)	161.5 (228.9, 85.7)
55–65	1137 (19.5)	541.1 (515.9, 343.4)	181.3 (228.7, 103.9)	575.9 (535.0, 376.9)	178.2 (248.8, 93.1)
HIV Status					
Negative	4602 (78.8)	266.5 (315.6, 147.7)	131.1 (186.7, 73.1)	281.7 (335.2, 153.1)	130.8 (193.9, 69.3)
Positive	677 (11.6)	330.1 (364.7, 218.9)	162.4 (219.5, 79.4)	364.9 (418.3, 220.6)	163.8 (224.8, 79.4)
Unknown	558 (9.6)	159.9 (247.1, 70.6)	100.7 (171.8, 50.0)	156.6 (243.5, 70.1)	104.6 (174.7, 52.3)

AI: Anal Intercourse; OI: Oral Intercourse

Supplemental Table 4. Linear Model of Duration (in Weeks) of Ongoing Sexual Partnerships by HIV and Age Status to Demonstrate Confounding Effects of Age on HIV Predictions

Model Variables	Overall		Main		Casual	
	<i>HIV</i>	<i>HIV + Age</i>	<i>HIV</i>	<i>HIV + Age</i>	<i>HIV</i>	<i>HIV + Age</i>
Intercept	186.7	-13.8	281.0	-187.1	131.0	13.3
HIV Status						
Positive	36.6	5.0	79.3	12.9	30.2	2.8
Unknown	-57.4	-1.6	-124.9	-21.1	-29.4	10.4
Age (years)	---	-3.6	---	5.4	---	-1.9

Supplemental Table 5. Mixing Matrix of Partnerships by Race/Ethnicity of Ego and Partner, Across All Partnership Types, for All Anal or Oral Sex Partnerships among MSM in the United States

		Partner Race				
		N (Row Percent)				
		<i>Black</i>	<i>Hispanic</i>	<i>Other</i>	<i>White</i>	<i>Unknown</i>
Ego Race	<i>Black</i>	369 (45.3)	94 (11.5)	66 (8.1)	267 (32.8)	19 (2.3)
	<i>Hispanic</i>	214 (9.3)	796 (34.5)	176 (7.6)	973 (42.2)	149 (6.5)
	<i>Other</i>	115 (8.1)	277 (19.4)	233 (16.3)	688 (48.2)	115 (8.1)
	<i>White</i>	1074 (9.2)	1819 (15.6)	996 (8.6)	7094 (60.9)	664 (5.7)

Supplemental Table 6. Mixing Matrix of Partnerships by Ego-Reported HIV Status of Ego and Partner, Across All Partnership Types, for All Anal or Oral Sex Partnerships among MSM in the United States

		Partner HIV Status		
		N (Row Percent)		
		<i>HIV-Negative</i>	<i>HIV-Positive</i>	<i>Unknown</i>
Ego HIV Status	<i>HIV-Negative</i>	8752 (68.4)	432 (3.4)	3604 (28.2)
	<i>HIV-Positive</i>	581 (39.6)	367 (25.0)	518 (35.3)
	<i>Unknown</i>	1028 (53.4)	33 (1.7)	863 (44.9)

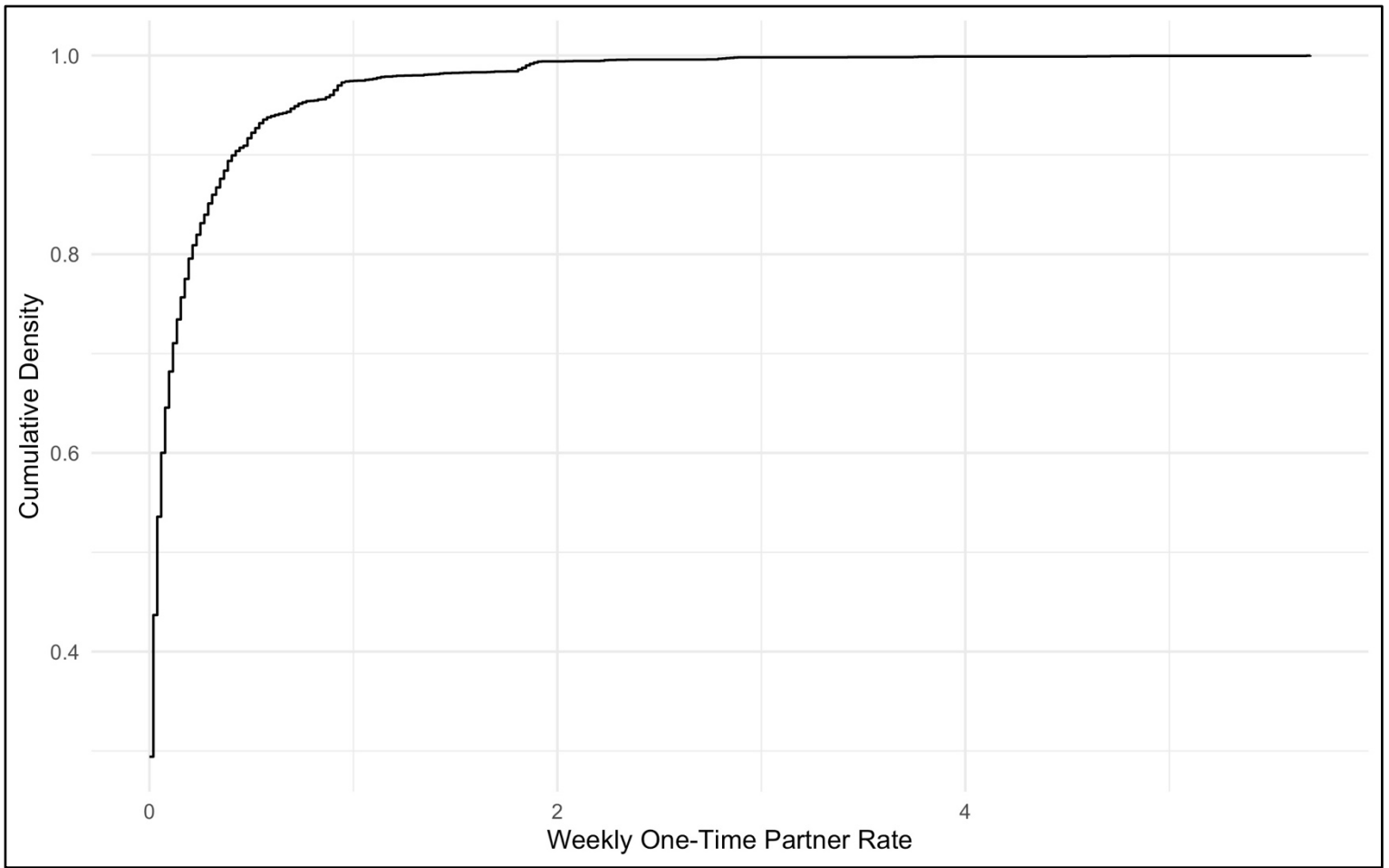
Supplemental Table 7. Distribution of Partnership Mixing by HIV Status for Main and Casual Partnerships Compared to Expected Distributions from Random Mixing and Proportional Mixing Network Models

	ARTnet Data		Random Mixing Model ^A		Proportional Mixing Model ^B	
	N	%	N	%	N	%
HIV Combination						
Negative-Negative	5393	62.8%	3447	57.8%	3714	62.1%
Negative-Positive	715	8.3%	788	13.2%	1094	18.3%
Negative-Unknown	1600	18.6%	1387	23.3%	904	15.1%
Positive-Positive	270	3.1%	45	0.8%	80	1.3%
Positive-Unknown	246	2.9%	160	2.7%	133	2.2%
Unknown-Unknown	358	4.2%	138	2.3%	55	0.9%
Total Edges	8582	100.0%	5965	100.0%	5980	100.0%

^A Exponential random graph model (ERGM) for main and casual partnerships with only a term for overall mean degree based on ARTnet data (see Table 2), given the ARTnet empirical distribution of HIV status (see Table 1).

^B ERGM for main and casual partnerships with terms for mean degree stratified by HIV status based on ARTnet data (see Table 2), given the ARTnet empirical distribution of HIV status (see Table 1).

Supplemental Figure 1. Cumulative Density Plot of Weekly One-Time Partner Acquisition Rate among MSM in the United States.



Supplemental Figure 2. Density Plot of Partner Ages, Stratified by Partnership Type, among MSM in the United States.

