



Birth Cohort and Racial/Ethnic Differences in the Age of First Oral and Anal Sex Among U.S. Men Who Have Sex with Men

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Abstract

Earlier age of first sex has potential direct and indirect health effects later in life. Though there are multiple nationwide general population studies on ages of first sex, there is no such nationwide study of first male–male oral or anal sex among men who have sex with men (MSM). This may be important for understanding racial/ethnic disparities in HIV and sexually transmitted infection acquisition among young racial/ethnic minority MSM. Our study examined the birth cohort and racial/ethnic differences in ages of first male–male oral and anal sex using a diverse 2015 U.S. nationwide sample of 10,217 sexually active MSM. The mean age of first male–male oral sex was 18.0 years. Compared with older birth cohorts, those MSM born 1990–2000 were more likely to have younger age of first male–male oral sex. Compared to white MSM, Hispanic MSM and non-Hispanic black MSM were more likely to have younger age of first male–male oral sex with a man. The mean age of first male–male anal sex was 20.3 years. Compared with older birth cohorts, those MSM born 1990–2000 were more likely to have younger age of first male–male anal sex. Compared to white MSM, MSM of all other racial/ethnic groups were more likely to have younger age of first male–male anal sex. These findings emphasize the need for comprehensive and MSM-inclusive sexual health education for young teens and online sexual health resources for young gay, bisexual, queer, and other MSM.

Keywords Men who have sex with men (MSM) · Gay · Anal sex · Oral sex · Debut · Sexual orientation

Introduction

Earlier age of first sexual intercourse has potential direct health effects such as teen pregnancies and sexually transmitted infections (STIs), and indirect health effects such as increased number of sexual partners, problem substance use and mental health disorders later in life (Heywood, Patrick, Smith, & Pitts, 2015; Kaestle, Halpern, Miller, & Ford, 2005; Sandfort, Orr, Hirsch, & Santelli, 2008; Vasilenko, Kugler, & Rice, 2016; Zimmer-Gembeck & Helfand, 2008). The average age of initiation of first sexual intercourse for U.S. youth is approximately 17 years, with boys initiating sex less than a year before girls (Abama & Martinez, 2017; Cavazos-Rehg et al., 2009). The age of first sex

is also younger for racial/ethnic minority youth and youth from economically disadvantaged backgrounds (Abama & Martinez, 2017; Biello, Ickovics, Niccolai, Lin, & Kershaw, 2013; Zimmer-Gembeck & Helfand, 2008). Studies have also shown that the prevalence of having ever engaged in sex is decreasing among some teens, and age of first sex has been increasing for those in more recent birth cohorts (Abama & Martinez, 2017; Ethier, Kann, & McManus, 2018). When sexual intercourse is specified in these studies, it is most typically defined as penetrative penile–vaginal sex. Other types of sexual intercourse, such as oral or anal intercourse, are either not included in the definition, not reported by gender of sex partner, or not specifically reported in the literature for most studies. One study has reported initiation of oral or anal sex (though not by partner gender) and found that age of first oral sex occurs slightly later than penile–vaginal sex and approximately 1 year prior to penile–anal sex (Halpern & Haydon, 2012).

There is even less published information on sexual identity differences in the age of initiation of sexual intercourse. Where data do exist, non-heterosexual males initiated sex at an earlier age than heterosexual males (Brown, Masho, Perera, Mezuk, & Cohen, 2015; Glick et al., 2012), but these studies used broad

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definitions of sexual intercourse, did not differentiate initiation of sex with men and conflated initiation of any type of sex among homosexual- or bisexual-identified respondents with age of first male–male sex. Other studies have focused more specifically on age of first sex among men who have sex with men (MSM), often for purposes of examining sexual health risks with highly specified samples such as MSM living with HIV infection or MSM in only a single major U.S. city (Glick & Golden, 2014; Outlaw et al., 2011). These studies also found that, similar to the general population studies, racial/ethnic minority MSM may also initiate sex with men at earlier ages. There have been no published nationwide studies with MSM that differentiated between age of initiation of oral and anal sex or have examined the potential birth cohort effect noted among youth in general.

Better understanding age of initiation of first male–male sexual intercourse is important to public health in several ways. MSM are at substantially higher risk of acquiring HIV and other STIs compared to other groups (Centers for Disease Control and Prevention, 2016a, 2016b; Singh, Song, Johnson, McCray, & Hall, 2018). Condomless anal intercourse poses the greatest per-act sexual transmission risk of HIV infection (Patel et al., 2014). In addition to the increased risk of HIV infection, MSM experience high rates of oropharyngeal and rectal STIs which are often asymptomatic and require substantial public health resources to diagnose and treat (Centers for Disease Control and Prevention, 2017). The risk is magnified for racial/ethnic minority MSM who have the highest rates of newly acquired HIV infection, mainly due to high HIV incidence among racial/ethnic minority MSM 13–24 years of age (Singh et al., 2018). Earlier age of initiation of sexual intercourse with men may result in a longer period at risk of HIV/STI acquisition and may partly explain these racial/ethnic disparities (Maulsby et al., 2014). More recent agent-based models have been created to better understand HIV and STI transmission and acquisition, particularly for young racial and ethnic minority MSM (Goodreau et al., 2017; Jones et al., 2019). These models are also being increasingly used to estimate potential population-level effects of various prevention strategies, such as increased screening and pre-exposure prophylaxis (Goodreau et al., 2018; Hamilton et al., 2018; Jenness et al., 2016, 2019). The models currently do not address the potential for demographic group variation in the cumulative time at risk of HIV infection. One of the first steps in better understanding whether the agent-based models are improved with these parameters is determining whether there are racial, ethnic and birth cohort differences in age of first sex.

To better understand the ongoing sexual health needs of U.S. MSM, we have conducted the annual American Men's Internet Survey (AMIS) which reaches a large and geographically diverse sample (Sanchez, Sineath, Kahle, Tregear, & Sullivan, 2015). In 2015, we asked AMIS participants what age they were when they first had sex with a man. The purpose of the present

study is to describe the ages of first oral and anal sex with a man for this diverse sample of sexually active U.S. MSM and determine whether these ages of first sex significantly differed by birth cohort or race/ethnicity.

Method

Participants and Procedure

AMIS is conducted in annual rounds with a goal of at least 10,000 complete surveys from eligible U.S. MSM each year. The AMIS methods have been previously reported in detail (Sanchez et al., 2015). Briefly, participants are recruited each year through convenience sampling from a variety of Web sites and through social media applications using banner ads and e-mail blasts to members (hereafter referred to as “ads”). Men who click on ads are taken directly to the survey Web site hosted on a secure server administered by SurveyGizmo (Boulder, CO, USA). Participants are eligible to participate if they are age 15 years or older, male sex at birth, reside in the USA and report oral or anal sex with a man at least once at any time in the past. Participants who meet the eligibility criteria and consent to participate in the study start the online survey immediately. The survey is self-administered, can be taken on a computer or mobile device and is comprised of questions on demographics, sexual behaviors, substance use, HIV and sexually transmitted infection testing and diagnosis, and use of HIV prevention services. No incentive is provided to participants.

Measures

The AMIS round of data collection conducted from September 2015 to April 2016 included questions on the age of first oral and anal sex with a man: “How old were you the first time you had oral sex (mouth on the penis) with a man?” and “How old were you the first time you had anal sex (penis in the butt) with a man?”. For this study, only responses of age of 10+ years were used for age of initiation and implausible sex debut ages (e.g., where the age of sexual debut was reported to be greater than their age at the time of survey completion) were re-coded as missing. Year of birth was calculated from self-reported age at the time of the survey and collapsed into a four-level birth cohort variable: those born between 1950 and 1969, between 1970 and 1979, between 1980 and 1989, and between 1990 and 2000. Race and ethnicity were asked using the standard two-question US Office of Management and Budget 1997 standard format in which persons are asked to report their race with multiple selections possible and are asked separately whether they identify as Hispanic or Latino (Office of Management and Budget, 1997). Responses to these questions are then categorized into a single race/ethnicity measure using the same scheme employed by federal HIV/STI case surveillance

systems (Centers for Disease Control and Prevention, 2018, 2019). Because of relatively few responses for some race categories, we used the four-level categorization scheme typical in these studies (An, Wejnert, Bernstein, & Paz-Bailey, 2017; Shadaker, Magee, Paz-Bailey, & Hoots, 2017; Singh, Mitsch, & Wu, 2017). Those who identify as Hispanic or Latino are categorized as Hispanic in the combined measure regardless of response to the race question. Those who identify their race as only black, African-American or only white are categorized into black, non-Hispanic and white, non-Hispanic categories. All other responses (American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, other race or multiple responses) were categorized into the other or multiple race category. Self-reported HIV status was determined from responses to questions about having ever had an HIV test, results of the most recent HIV test and having ever had a positive in HIV test. Participants were categorized as self-reported HIV-positive, HIV-negative or unknown status. Residential county population density was categorized using the National Center for Health Statistics (NCHS) Rural–Urban classification scheme (Ingram & Franco, 2014). We further collapsed these categories into a binary variable: urban (urban, suburban and medium metropolitan) and rural (small metropolitan, micropolitan and non-core).

Statistical Analyses

Eligible participants were included in analyses if they were unduplicated by IP address, completed the survey, ever had sex with a man in the past 12 months, provided a valid U.S. ZIP code and were between the ages of 15 and 59 at the time of survey completion. Log-rank tests were used to compare the equality of survival until the first oral or anal sex with a man across race/ethnicity and birth cohort groups. These two independent measures were chosen because they are key measures of disparity in HIV and STI infection among MSM, and they were the only demographic factors collected in AMIS that were likely contemporary with adolescent sexual development. All other measures were taken for more recent or current time frames and pose substantial temporality concerns for a cross-sectional analysis of outcomes occurring in adolescence for most participants. Wilcoxon two-sample tests were also used to compare the mean ages of first oral or anal sex with a man across groups. For participants who reported ages of first oral and anal sex with a man, the age difference was also calculated as age at first anal sex minus age at first oral sex age, and mean age differences were compared between groups using Wilcoxon two-sample tests. Cox proportional hazard modeling was used to assess independence of the associations between race/ethnicity or birth cohort and age of first oral sex and anal sex. Interactions between race/ethnicity and birth cohort in relation to age of first oral and anal sex were assessed with likelihood ratio tests. For significant interactions, results are presented as hazard

ratios and 95% confidence intervals within the race/ethnicity by birth cohort strata. Analyses were all conducted using SAS 9.4 (SAS Institute, Cary, NC) with statistical significance denoted at $\alpha = 0.05$.

Results

Of the 10,217 AMIS participants who had sex with a man in the past 12 months, 8331 (81.5%) answered the questions on age of first oral or anal sex with a man and were included in these analyses. MSM participants were most commonly under 35 years of age (birth cohorts 1980–1989 and 1990–2000), from the Southern United States, from urban or suburban counties, HIV-negative and non-Hispanic white (Table 1). Overall, 99.9% (8320/8331) of MSM had ever had oral sex with a man and 95.2% (7931/8331) had ever had anal sex with a man—95.1% (7922/8331) of MSM had both oral and anal sex with a man.

Age of First Oral Sex with a Man

The mean age of first oral sex with a man was 18.0 years. Overall, 34.1% of MSM had oral sex with a man by age 15, 65.9% by age 18 and 92.8% by age 25 (Table 2). Compared with older birth cohorts, those MSM born 1990–2000 (age 15–20) were significantly more likely to have younger age of first oral sex with a man. The birth cohort differences in age of first oral sex show that though a greater percentage of the oldest cohort (1950–1969) may have had oral sex in preteen years, the younger cohorts (1980–1989 and 1990–2000) had greater cumulative percentage of having engaged in oral sex by age 18 (Fig. 1). This resulted in those MSM born 1990–2000 (M first oral sex = 16.8 years; Table 2) having first oral sex nearly 1 year younger than the next closest birth cohort (1980–1989) and 2.6 years younger than the oldest cohort (1950–1969).

Compared to non-Hispanic white MSM, Hispanic MSM and non-Hispanic black MSM were significantly more likely to have younger age of first oral sex with a man (Table 3). These racial/ethnic differences in age of first oral sex appear in preteen non-Hispanic black MSM and are present by the mid-teens for Hispanic MSM (Fig. 2), resulting in both of these groups having first oral sex an average of 1 year earlier than non-Hispanic white MSM (M's of 17.2 years versus 18.2 years, respectively; Table 3). Some of the birth cohort differences may partly explain the racial/ethnic differences in earlier age of first oral sex with a man (Table 4 and Supplemental Table). For instance, the black versus white MSM differences in age of first oral sex were only significant for those born in the 1950–1969 and 1980–1989 cohorts, whereas the Hispanic versus white MSM differences were only significant for those in the two youngest cohorts (1980–1989 and 1990–2000).

Table 1 Characteristics of MSM participants in the American Men's Internet Survey by race/ethnicity, USA, 2015

Participant characteristics	Total		Black, non-Hispanic		Hispanic		White, non-Hispanic		Other or multiple races	
	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)
<i>Age (years)</i>										
15–19	907	(10.9)	29	(5.3)	184	(15.2)	591	(10.2)	103	(13.6)
20–24	1786	(21.4)	72	(13.2)	320	(26.4)	1194	(20.5)	200	(26.3)
25–29	1477	(17.7)	102	(18.8)	249	(20.5)	972	(16.7)	154	(20.3)
30–34	789	(9.5)	70	(12.9)	133	(11.0)	517	(8.9)	69	(9.1)
35–39	565	(6.8)	63	(11.6)	101	(8.3)	348	(6.0)	53	(7.0)
40–44	498	(6.0)	50	(9.2)	64	(5.3)	338	(5.8)	46	(6.1)
45–49	673	(8.1)	49	(9.0)	58	(4.8)	516	(8.9)	50	(6.6)
50–54	884	(10.6)	59	(10.8)	61	(5.0)	714	(12.3)	50	(6.6)
55–59	752	(9.0)	50	(9.2)	44	(3.6)	623	(10.7)	35	(4.6)
<i>Region</i>										
Midwest	1753	(21.0)	77	(14.2)	124	(10.2)	1412	(24.3)	140	(18.4)
Northeast	1669	(20.0)	95	(17.5)	196	(16.1)	1240	(21.3)	138	(18.2)
South	3040	(36.5)	305	(56.1)	476	(39.2)	2026	(34.9)	233	(30.7)
West	1863	(22.4)	66	(12.1)	414	(34.1)	1135	(19.5)	248	(32.6)
US dependent areas	6	(0.1)	1	(0.2)	4	(0.3)	0	(0.0)	1	(0.1)
<i>Population density^a</i>										
Rural	1537	(18.4)	67	(12.3)	126	(10.4)	1180	(20.3)	164	(21.6)
Urban/suburban	6785	(81.4)	476	(87.5)	1083	(89.2)	4631	(79.7)	595	(78.3)
<i>Self-reported HIV status</i>										
Positive	712	(8.5)	116	(21.3)	130	(10.7)	406	(7.0)	60	(7.9)
Negative	5782	(69.4)	355	(65.3)	797	(65.7)	4112	(70.7)	518	(68.2)
Unknown	1837	(22.1)	73	(13.4)	287	(23.6)	1295	(22.3)	182	(23.9)
Total	8331		544	(6.5)	1214	(14.6)	5813	(69.8)	760	(9.1)

^aThere were nine participants missing information needed to determine the population density of the area where they lived

Age of First Anal Sex with a Man

The mean age of first anal sex with a man was 20.3 years. Overall, 9.6% of MSM had anal sex with a man by age 15, 46.1% by age 18 and 83.1% by age 25 (Table 5). Compared with older birth cohorts, those MSM born 1990–2000 were significantly more likely to have younger age of first anal sex with a man. These birth cohort differences in age of first anal sex appear in mid- to late-teen MSM (Fig. 3). This resulted in those MSM born in 1990–2000 (M first anal sex = 17.8 years, Table 5) having first anal sex with a man 1.6 years younger than the next closest birth cohort (1980–1989) and 6.2 years younger than the oldest cohort (1950–1969).

Compared to non-Hispanic white MSM, MSM of all other racial/ethnic groups were significantly more likely to have younger age of first anal sex with a man (Table 6). Compared to non-Hispanic white MSM (M first anal sex = 20.9 years), Hispanic MSM on average had anal sex 2.3 years younger (M, 18.3 years), black MSM had anal sex 1.9 years younger (M, 19.0 years), and MSM of other or multiple races had anal sex

1.3 years younger (M, 19.6 years). These racial/ethnic differences in age of first anal sex by race/ethnicity appear by the early teens (Fig. 4). Even when accounting for birth cohort differences, racial/ethnic minority MSM remained significantly more likely to have engaged in anal sex at earlier ages compared to non-Hispanic white MSM (Table 7 and Supplemental Table).

Age Difference between First Oral Sex and First Anal Sex with a Man

On average, MSM first had oral sex with a man 2.5 years (SD = 4.9 years) before they first had anal sex with a man. Compared with white MSM (M [SD] = 2.8 [5.4] years difference between first oral and anal sex), black MSM (1.8 [3.4] years), Hispanic/Latino MSM (1.5 [3.1] years) and MSM of other or multiple races (1.9 [3.7] years) had significantly (all $p < .001$) shorter time differences between first oral and anal sex. Compared with the youngest MSM born in 1990–2000 (M [SD] = 1.1 [1.8] years difference between first oral and anal sex), those born in 1980–1989 (1.8 [2.9] years), 1970–1979 (2.8 [4.5] years) and

Table 2 Age of initiation of oral sex with a man by birth cohort of MSM participants in the American Men’s Internet Survey, USA, 2015

Had oral sex by age x^a	All		Birth cohort							
			1950–1969		1970–1979		1980–1989		1990–2000	
	(N=8331)		(N=2164)		(N=1085)		(N=2038)		(N=3044)	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
10	156	(1.9)	76	(3.5)	20	(1.8)	33	(1.6)	27	(0.9)
11	321	(3.9)	140	(6.5)	46	(4.2)	70	(3.4)	65	(2.1)
12	873	(10.5)	346	(16.0)	125	(11.5)	194	(9.5)	208	(6.8)
13	1436	(17.2)	525	(24.3)	191	(17.6)	317	(15.6)	403	(13.2)
14	2118	(25.4)	694	(32.1)	284	(26.2)	476	(23.4)	664	(21.8)
15	2837	(34.1)	872	(40.3)	357	(32.9)	638	(31.3)	970	(31.9)
16	3734	(44.8)	1046	(48.3)	441	(40.6)	849	(41.7)	1398	(45.9)
17	4451	(53.4)	1158	(53.5)	502	(46.3)	1041	(51.1)	1750	(57.5)
18	5486	(65.9)	1321	(61.0)	601	(55.4)	1284	(63.0)	2280	(74.9)
19	6149	(73.8)	1433	(66.2)	679	(62.6)	1459	(71.6)	2578	(84.7)
20	6605	(79.3)	1515	(70.0)	743	(68.5)	1568	(76.9)	2779	(91.3)
21	7036	(84.5)	1624	(75.0)	808	(74.5)	1700	(83.4)	2904	(95.4)
22	7298	(87.6)	1689	(78.0)	863	(79.5)	1780	(87.3)	2966	(97.4)
23	7481	(89.8)	1731	(80.0)	901	(83.0)	1847	(90.6)	3002	(98.6)
24	7612	(91.4)	1760	(81.3)	925	(85.3)	1898	(93.1)	3029	(99.5)
25	7728	(92.8)	1800	(83.2)	953	(87.8)	1938	(95.1)	3037	(99.8)
Log-rank p value ^b			<.001		<.001		<.001		Ref	
Mean [SD] age of first oral sex	18.0 [5.7]		19.4 [8.8]		18.9 [6.07]		17.7 [4.14]		16.8 [2.8]	
Rank-sum p value ^c			<.001		<.001		<.001		Ref	

^aNumber and percentages are cumulative. For example, by 18 years of age, 5486 (65.9%) total participants ever had oral sex with a male partner

^bLog-rank p value comparing equality of survival until first oral sex of one birth cohort to referent group of those MSM born 1990–2000

^cRank-sum p value by Wilcoxon two-sample test comparing mean age of first oral sex of one birth cohort to referent group of those MSM born 1990–2000

Fig. 1 Age of initiation of oral sex with a man by birth cohort of MSM participants in the American Men’s Internet Survey, USA, 2015

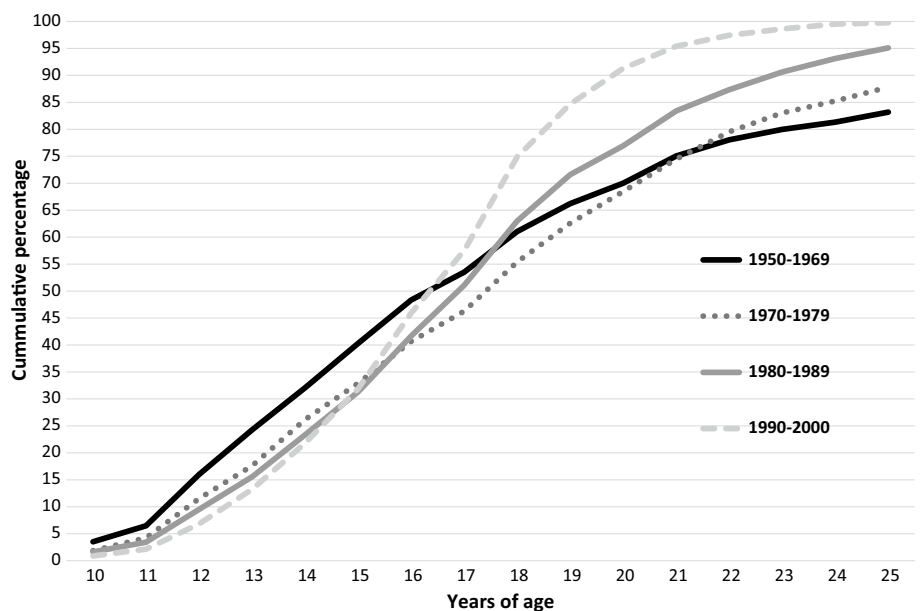


Table 3 Age of initiation of oral sex with a man by race/ethnicity of MSM participants in the American Men’s Internet Survey, USA, 2015

Had oral sex by age x^a	Race/ethnicity									
	All		Black, non-Hispanic		Hispanic		White, non-Hispanic		Other or multiple races	
	<i>(N</i> = 8331)		<i>(N</i> = 544)		<i>(N</i> = 1214)		<i>(N</i> = 5813)		<i>(N</i> = 760)	
	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)
10	156	(1.9)	15	(2.8)	21	(1.7)	105	(1.8)	15	(2.0)
11	321	(3.9)	31	(5.7)	51	(4.2)	211	(3.6)	28	(3.7)
12	873	(10.5)	78	(14.3)	122	(10.0)	592	(10.2)	81	(10.7)
13	1436	(17.2)	118	(21.7)	202	(16.6)	983	(16.9)	133	(17.5)
14	2118	(25.4)	152	(27.9)	297	(24.5)	1483	(25.5)	186	(24.5)
15	2837	(34.1)	202	(37.1)	433	(35.7)	1948	(33.5)	254	(33.4)
16	3734	(44.8)	259	(47.6)	572	(47.1)	2569	(44.2)	334	(43.9)
17	4451	(53.4)	315	(57.9)	709	(58.4)	3030	(52.1)	397	(52.2)
18	5486	(65.9)	374	(68.8)	900	(74.1)	3715	(63.9)	497	(65.4)
19	6149	(73.8)	414	(76.1)	974	(80.2)	4200	(72.3)	561	(73.8)
20	6605	(79.3)	442	(81.3)	1026	(84.5)	4532	(78.0)	605	(79.6)
21	7036	(84.5)	468	(86.0)	1089	(89.7)	4842	(83.3)	637	(83.8)
22	7298	(87.6)	485	(89.2)	1117	(92.0)	5031	(86.5)	665	(87.5)
23	7481	(89.8)	502	(92.3)	1142	(94.1)	5146	(88.5)	691	(90.9)
24	7612	(91.4)	510	(93.8)	1149	(94.6)	5248	(90.3)	705	(92.8)
25	7728	(92.8)	516	(94.9)	1165	(96.0)	5326	(91.6)	721	(94.9)
Log-rank <i>p</i> value ^b			< .001		< .001		Ref		.104	
Mean [SD] age of first oral sex	18.0 [5.7]		17.2 [4.6]		17.2 [4.4]		18.2 [6.1]		17.8 [5.3]	
Rank-sum <i>p</i> value ^c			.004		< .001		Ref		.555	

^aNumber and percentages are cumulative. For example, by 18 years of age, 5486 (65.9%) total participants ever had oral sex with a male partner

^bLog-rank *p* value comparing equality of survival until first oral sex of one racial/ethnic group to referent group of white MSM

^cRank-sum *p* value by Wilcoxon two-sample test comparing mean age of first oral sex of one racial/ethnic group to referent group of white MSM

Fig. 2 Age of initiation of oral sex with a man by race/ethnicity of MSM participants in the American Men’s Internet Survey, USA, 2015

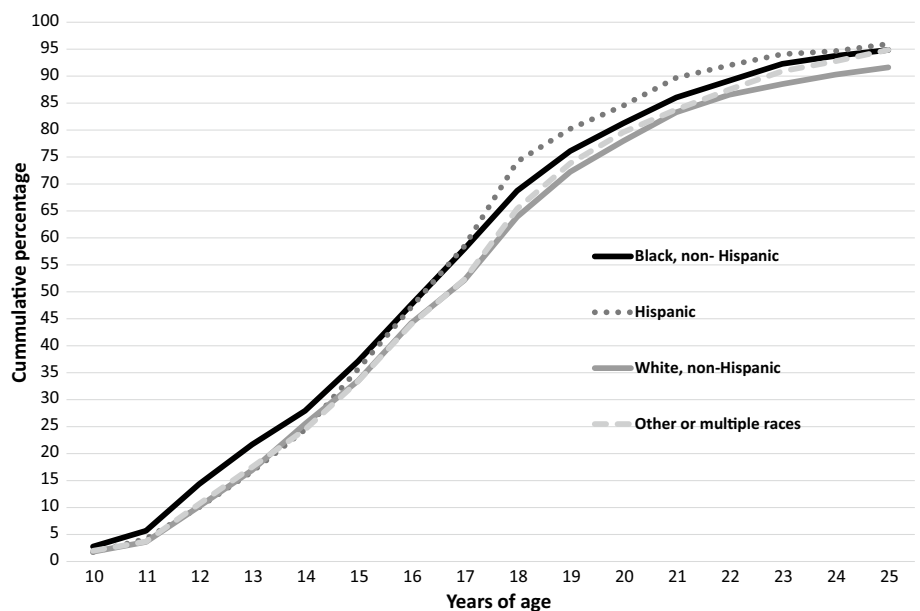


Table 4 Cox proportional hazard ratios and 95% confidence intervals of younger age of first oral sex with a man, by race/ethnicity and birth cohort of MSM participants in the American Men's Internet Survey, USA, 2015

Race/ethnicity	Birth cohort			
	1950–1969	1970–1979	1980–1989	1990–2000
Black, non-Hispanic	1.20 (1.02, 1.42)	1.17 (0.96, 1.44)	1.37 (1.16, 1.61)	1.12 (0.93, 1.35)
Hispanic	1.16 (0.98, 1.38)	1.05 (0.89, 1.25)	1.13 (1.01, 1.27)	1.23 (1.13, 1.36)
Other or Multiple races	1.02 (0.85, 1.22)	0.92 (0.75, 1.14)	1.09 (0.94, 1.28)	0.97 (0.87, 1.10)
White, non-Hispanic	Ref	Ref	Ref	Ref

Table 5 Age of initiation of anal sex with a man by birth cohort of MSM participants in the American Men's Internet Survey, USA, 2015

Had oral sex by age x^a	All		Birth cohort							
			1950–1969		1970–1979		1980–1989		1990–2000	
	<i>(N</i> = 8331)		<i>(N</i> = 2164)		<i>(N</i> = 1085)		<i>(N</i> = 2038)		<i>(N</i> = 3044)	
	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)
10	31	(0.4)	10	(0.5)	6	(0.6)	9	(0.4)	6	(0.2)
11	78	(0.9)	29	(1.3)	11	(1.0)	22	(1.1)	16	(0.5)
12	243	(2.9)	89	(4.1)	44	(4.1)	53	(2.6)	57	(1.9)
13	470	(5.6)	161	(7.4)	68	(6.3)	104	(5.1)	137	(4.5)
14	800	(9.6)	232	(10.7)	107	(9.9)	180	(8.8)	281	(9.2)
15	1286	(15.4)	333	(15.4)	159	(14.7)	297	(14.6)	497	(16.3)
16	1981	(23.8)	457	(21.1)	213	(19.6)	451	(22.1)	860	(28.3)
17	2677	(32.1)	586	(27.1)	257	(23.7)	620	(30.4)	1214	(39.9)
18	3843	(46.1)	785	(36.3)	371	(34.2)	941	(46.2)	1746	(57.4)
19	4655	(55.9)	902	(41.7)	468	(43.1)	1145	(56.2)	2140	(70.3)
20	5235	(62.8)	1021	(47.2)	542	(50.0)	1301	(63.8)	2371	(77.9)
21	5826	(69.9)	1148	(53.0)	640	(59.0)	1471	(72.2)	2567	(84.3)
22	6210	(74.5)	1251	(57.8)	704	(64.9)	1588	(77.9)	2667	(87.6)
23	6474	(77.7)	1320	(61.0)	758	(69.9)	1683	(82.6)	2713	(89.1)
24	6710	(80.5)	1375	(63.5)	810	(74.7)	1770	(86.8)	2755	(90.5)
25	6927	(83.1)	1472	(68.0)	854	(78.7)	1837	(90.1)	2764	(90.8)
Log-rank p value ^b			< .001		< .001		< .001		Ref	
Mean (SD) age of first anal sex	20.3 [6.7]		24.0 [10.1]		21.5 [6.3]		19.4 [4.04]		17.8 [2.6]	
Rank-sum p value ^c			< .001		< .001		< .001		Ref	

^aNumber and percentages are cumulative. For example, by 18 years of age, 3843 (46.1%) participants ever had anal sex with a male partner

^bLog-rank p value comparing equality of survival until first anal sex of one birth cohort to referent group of those MSM born 1990–2000

^cRank-sum p value by Wilcoxon two-sample test comparing mean age of first anal sex of one birth cohort to referent group of those MSM born 1990–2000

1950–1969 (4.8 [7.7] years) had significantly (all $p < .001$) longer time differences between first oral and anal sex with a man.

Discussion

Most sexually active MSM in our study had oral sex with a man by age 18 and had anal sex with a man by age 20. Between 15% (anal sex) and 34% (oral sex) of MSM had initiated sex with a man by age 15. The mean ages of first oral and anal sex in our

study were higher than those previously reported, but may be due to differences in the sampled populations and definitions of sexual initiation. For instance, a study of HIV-positive adolescent MSM found mean age of 14.5 for first sex of any type with male partners (Outlaw et al., 2011). An earlier study with MSM from only a few major cities found mean age of 16.5 for first sex of any type with male partners and 19.6 for first anal sex. An even smaller study with adolescent MSM recruited to examine HIV prevention needs found mean age of 15.0 for first oral sex and age 16.6 for first anal sex with male partners.

Fig. 3 Age of initiation of anal sex with a man by birth cohort of MSM participants in the American Men’s Internet Survey, USA, 2015

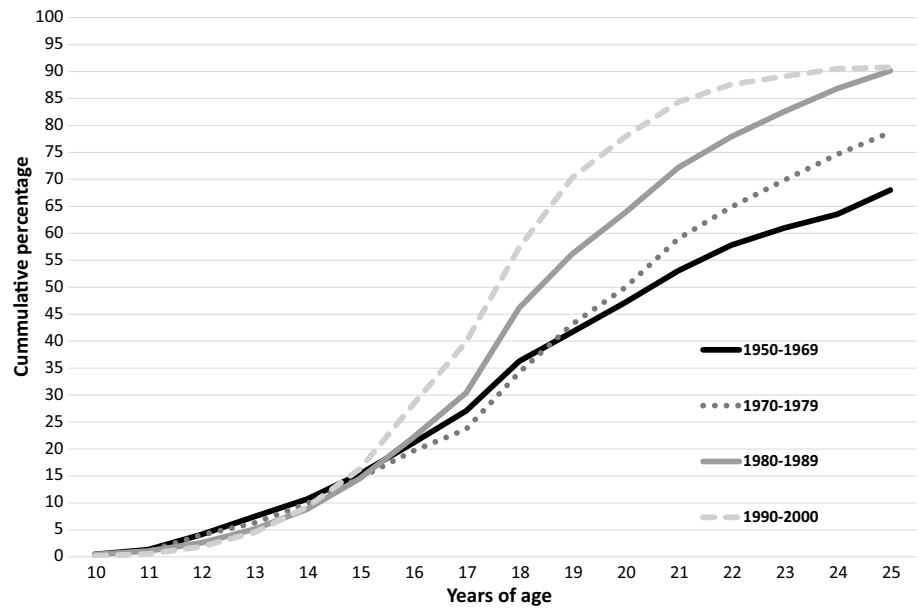


Table 6 Age of initiation of anal sex with a man by race/ethnicity of MSM participants in the American Men’s Internet Survey, USA, 2015

Had oral sex by age x^a	Race/ethnicity									
	All		Black, non-Hispanic		Hispanic		White, non-Hispanic		Other or multiple races	
	<i>(N</i> =8331)		<i>(N</i> =544)		<i>(N</i> =1214)		<i>(N</i> =5813)		<i>(N</i> =760)	
	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)
10	31	(0.4)	5	(0.9)	7	(0.6)	18	(0.3)	1	(0.1)
11	78	(0.9)	13	(2.4)	13	(1.1)	46	(0.8)	6	(0.8)
12	243	(2.9)	28	(5.1)	44	(3.6)	147	(2.5)	24	(3.2)
13	470	(5.6)	43	(7.9)	85	(7.0)	299	(5.1)	43	(5.7)
14	800	(9.6)	62	(11.4)	144	(11.9)	507	(8.7)	87	(11.4)
15	1286	(15.4)	102	(18.8)	238	(19.6)	807	(13.9)	139	(18.3)
16	1981	(23.8)	157	(28.9)	362	(29.8)	1255	(21.6)	207	(27.2)
17	2677	(32.1)	202	(37.1)	494	(40.7)	1722	(29.6)	259	(34.1)
18	3843	(46.1)	303	(55.7)	713	(58.7)	2458	(42.3)	369	(48.6)
19	4655	(55.9)	343	(63.1)	814	(67.1)	3064	(52.7)	434	(57.1)
20	5235	(62.8)	371	(68.2)	897	(73.9)	3484	(59.9)	483	(63.6)
21	5826	(69.9)	410	(75.4)	978	(80.6)	3907	(67.2)	531	(69.9)
22	6210	(74.5)	438	(80.5)	1016	(83.7)	4189	(72.1)	567	(74.6)
23	6474	(77.7)	453	(83.3)	1049	(86.4)	4374	(75.2)	598	(78.7)
24	6710	(80.5)	467	(85.8)	1069	(88.1)	4547	(78.2)	627	(82.5)
25	6927	(83.1)	486	(89.3)	1089	(89.7)	4704	(80.9)	648	(85.3)
Log-rank <i>p</i> value ^b			< .001		< .001		Ref		< .001	
Mean (SD) age of first anal sex	20.3 [6.7]		19.0 [4.8]		18.6 [4.8]		20.9 [7.3]		19.6 [5.8]	
Rank-sum <i>p</i> value ^c			< .001		< .001		Ref		< .001	

^aNumber and percentages are cumulative. For example, by 18 years of age, 3843 (46.1%) participants ever had anal sex with a male partner

^bLog-rank *p* value comparing equality of survival until first anal sex of one racial/ethnic group to referent group of white MSM

^cRank-sum *p* value by Wilcoxon two-sample test comparing mean age of first anal sex of one racial/ethnic group to referent group of white MSM

Fig. 4 Age of initiation of anal sex with a man by race/ethnicity of MSM participants in the American Men's Internet Survey, USA, 2015

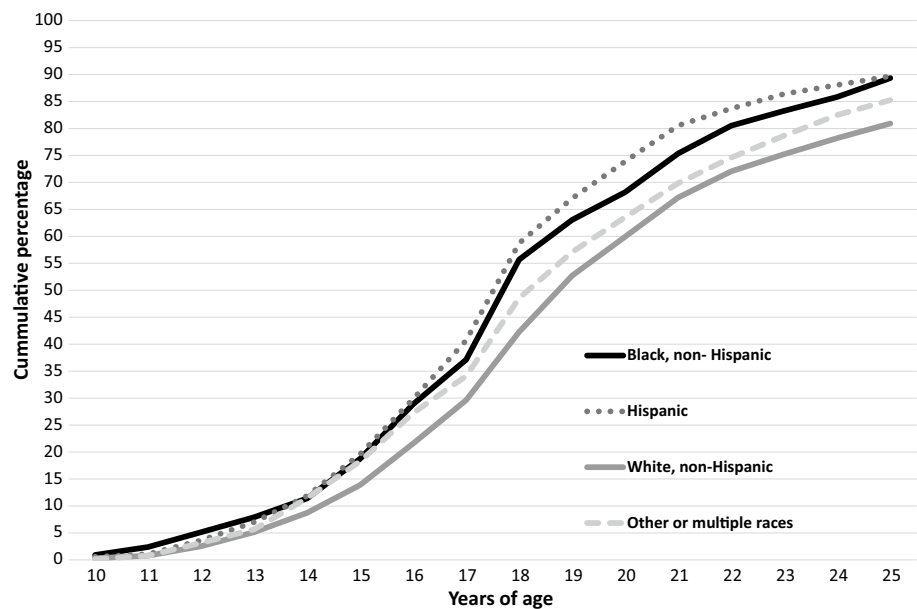


Table 7 Cox proportional hazard ratios and 95% confidence intervals of younger age of first anal sex with a man, by race/ethnicity and birth cohort of MSM participants in the American Men's Internet Survey, USA, 2015

Race/Ethnicity	Birth cohort			
	1950–1969	1970–1979	1980–1989	1990–2000
Black, non-Hispanic	1.68 (1.42, 1.99)	1.26 (1.03, 1.55)	1.45 (1.24, 1.75)	1.16 (0.96, 1.41)
Hispanic	1.46 (1.23, 1.73)	1.24 (1.04, 1.48)	1.18 (1.05, 1.33)	1.28 (1.16, 1.41)
Other or multiple races	1.29 (1.07, 1.55)	0.96 (0.78, 1.19)	1.09 (0.94, 1.27)	0.90 (0.80, 1.02)
White, non-Hispanic	Ref	Ref	Ref	Ref

Finally, a nationwide online survey that was similar in design to ours but was conducted 3 years earlier and with only approximately 800 MSM found mean age of 15.6 for first sex of any type with male partners and 17.6 for first anal sex. In addition to the larger scope and more recent sample of our study, some of the demographic group findings may partly explain the age differences between the present study and previously published studies.

MSM who were born in more recent years were significantly more likely than those born in earlier years to have younger age at first oral or anal sex with a man. The time period between initiation of oral and anal sex was also significantly shorter for MSM born more recently. This could mean that studies which mainly or more substantially sampled younger MSM may have younger average ages of first sex with male partners. This birth cohort effect in younger age of first sex for younger MSM has been previously reported in a Swiss study (Balthasar, Jeannin, & Dubois-Arber, 2009), but was not found in the one other small US study that examined this association (Nelson, Gamarel, Pantalone, Carey, & Simoni, 2016). There are no predominant theories about why MSM who were born in the past few decades may be initiating sex at younger ages, but it

could be due to de-criminalization and changing social norms about male–male sex, increase in male teens' ability to find male sex partners using social media or increased willingness of youth to disclose their early male–male sexual experiences. It should also be noted that the trend we found of decreasing age of first sex is opposite that seen in general population studies of U.S. adolescents in more recent years, which has been attributed to improvements in sexual health education programs in schools (Lindberg & Maddow-Zimet, 2012). It is possible that MSM adolescents are not equally benefiting from these same programs which may struggle to provide comprehensive and inclusive sexual health information for non-heterosexual youth (Hall, Jones, Witkemper, Collins, & Rodgers, 2019). Further study regarding the underlying processes that are driving this change is warranted, particularly because young MSM experience disproportionately high burden of new HIV infection (Singh et al., 2018).

Racial/ethnic minority MSM were significantly more likely than white MSM to have younger age of first oral or anal sex with a man. These differences were not entirely explained by the overlapping birth cohort effects. The time period between initiation of oral and anal sex was also significantly shorter for

racial/ethnic minority MSM than it was for white MSM. Other previous studies of U.S. MSM that have examined racial/ethnic differences in age of first sex with male partners have not found a significant difference like we have, potentially due to their limited sample size and limited geographic scope compared to nationwide AMIS (Glick & Golden, 2014; Outlaw et al., 2011; Sanchez et al., 2015; Warren et al., 2008). Our findings are consistent with large-scale general population studies that have found the racial/ethnic differences in age of first sex (Abama & Martinez, 2017; Biello et al., 2013; Zimmer-Gembeck & Helfand, 2008). The mechanisms by which racial and ethnic identities are associated with early sexual histories are poorly understood, but identities are likely a proxy indicator for other cultural, familial, social, structural and socioeconomic factors (Cavazos-Rehg et al., 2009; Corbie-Smith, Henderson, Blumenthal, Dorrance, & Estroff, 2008; Outlaw et al., 2011).

The approximately 2 year earlier age of initiation of anal sex for black MSM and Hispanic/Latino MSM compared to white MSM could also be playing a role in increased HIV and STI incidence seen in these groups of young MSM (Garofalo, Hotton, Kuhns, Gratzner, & Mustanski, 2016; Kaestle et al., 2005; Sandfort et al., 2008; Singh et al., 2018). Recent agent-based modeling of HIV and STI transmission among young U.S. MSM had not previously accounted for duration at risk of infection because there were no consistently available parameters, particularly those among young MSM by racial and ethnic groups (Beck, Birkett, Armbruster, & Mustanski, 2015; Goodreau et al., 2017; Jones et al., 2019). The next step will incorporate these parameters into those agent-based models to determine whether variation in duration at risk of infection plays a key role in racial and ethnic disparities in HIV and STI infection. These updated models can also be used to re-estimate population-level effects of key preventions strategies (Hamilton et al., 2018; Jenness et al., 2016).

Several limitations of this study should be noted. AMIS data are not generalizable to all MSM in the U.S. or to all MSM online. The convenience sampling approach, although conducted with multiple types of Web sites and social networking applications intended to increase sample diversity, increases the potential for selection or enrollment biases. The surveys only involved self-report of behaviors. It is possible that earlier age of first sex may be less socially desirable and therefore may be misreported as being older. These behaviors potentially occurred many years prior to the interview and could be prone to differential recall bias where those with initiation of sex closer to the interview date may be more accurate. There were also many participants who reported having oral or anal sex at very young ages, possibly due to sexual abuse rather than consensual sex. Participants were not directly asked whether those first sexual encounters were consensual, but a subset were asked questions from the Adverse Childhood Experiences scale

which assesses sexual abuse of minors by an adult family member, friend or other (Anda, Butchart, Felitti, & Brown, 2010). We conducted a sensitivity analysis (data not reported) that excluded participants who reported these experiences. Average ages of first oral and anal sex increased overall and for all demographic groups by approximately 1 year. We found the racial/ethnic differences in age of oral sex were somewhat attenuated, but racial differences in initiation age of anal sex and birth cohort differences in oral and anal sex initiation age remained significant. Some studies of age of first sex have attempted to either restrict their definition to consensual sex or define consensual sex separately from non-consensual sexual abuse of minors, but none have been done with large samples of MSM (Finer & Philbin, 2013; Glick & Golden, 2014; Holmes, 2009; Sandfort et al., 2008). There is also no published research on how coercion may factor into age-appropriate sexual relationships of adolescent MSM, but one study of young adult males showed a high prevalence (67%) of sexual violence with partners (McKool, Stephenson, Winkell, Teten Tharp, & Parrott, 2017). A new adolescent couples HIV prevention trial is designed to capture some of this relationship data and may help inform better measurement of early sexual partnership dynamics (Gamarel, Darbes, Hightow-Weidman, Sullivan, & Stephenson, 2019). Finally, the study was intended to identify age of initiation of sex with men, but we did not ask questions about the age of initiation of sex with females to allow us to determine an absolute age of first sex for comparability with other previous general population studies.

Conclusion

A substantial proportion of U.S. MSM begin sexual activity with men in their teen years, and younger birth cohorts are even more likely to first have sex at these earlier ages. This finding combined with younger age of sexual initiation for racial/ethnic minority MSM may partly explain disparities in HIV acquisition for young black and Hispanic/Latino MSM and should be further explored. Because the majority of sexually active MSM begin engaging in sex with males in their teens, our study also emphasizes the need for comprehensive and MSM-inclusive sexual health education for young teens, such as San Francisco's Healthy Me, Healthy Us middle school curriculum (San Francisco Unified School District, 2018) and online sexual health resources specifically for young gay, bisexual, queer and other MSM, such as Northwestern University's QueerSexEd (Mustanski, Greene, Ryan, & Whitton, 2015; "Queer Sex Ed," 2018).

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Human Subjects Statement All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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