Population Percentage and Population Size of Men who Have Sex with Men in the United States, 2017-2021: a Meta-analysis of 5 Population-based Surveys.

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Abstract

Background: Male-to-male sexual transmission continues to account for the greatest proportion of new human immunodeficiency virus (HIV) diagnoses in the United States (US). However, calculating the prevalence and incidence of HIV and other STIs attributed to male-to-male sexual transmission requires regularly updated estimates of the number and proportion of men who have sex with men (MSM) in the U.S., which are not collected by census surveys.

Objective: The purpose of this analysis was to estimate the number and percent of men who have sex with men in the United States from population-based surveys.

Methods: We used data from 5 population-based surveys to calculate weighted estimates of the proportion of MSM in the US and pooled these estimates using meta-analytic procedures. We estimated the proportion of MSM utilizing sexual behavior-based questions for 3 recall periods and utilizing self-reported identity and attraction. The total number of MSM and Other men in the United States were calculated from estimates of the percentage of MSM who reported sex with another man in the past 12 months.

Results: The percentage of MSM varied by recall period: 3.3% indicated sex with another male in the past 12 months, 4.7% in the past 5 years, and 6.2% ever. There were comparable percentages of men who identified as Gay or Bisexual (3.4%) or who indicated that they are attracted to other men (4.9%) based on pooled estimates. Our estimate of the total number or MSM in the United States is 4,477,012 based upon recent sexual history (sex with another man in the past 12 months).

Conclusions: Population estimates of the number and percentage of MSM in the United States and the number of gay/bisexual men or men attracted to other men are important for calculating population-specific disease rates.

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Background

Male-to-male sexual transmission continues to account for the greatest proportion of new human immunodeficiency virus (HIV) diagnoses in the United States (US). However, calculating the prevalence and incidence of HIV and other STIs attributed to male-to-male sexual transmission requires regularly updated estimates of the number and proportion of men who have sex with men (MSM) in the U.S., which are not collected by census surveys.

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Results

The percentage of MSM varied by recall period: 3.3% (95%CI =1.7%, 4.9%) indicated sex with another male in the past 12 months, 4.7% (95%CI = 0.0%, 33.8%) in the past 5 years, and 6.2% (95%CI = 2.9%, 9.5%) ever. There were comparable percentages of men who identified as Gay or Bisexual (3.4%, 95% CI = 2.2%, 4.6%) or who indicated that they are attracted to other men (4.9%, 95% CI = 3.1%, 6.7%) based on pooled estimates. Our estimate of the total number of MSM in the United States is 4,230,000 (95% CI = 2,179,000 – 6,281,000) based upon history of recent sexual behavior (sex with another man in the past 12 months).

Conclusion

We calculated the pooled percentage and number of MSM in the US from a meta-analysis of population-based surveys collected from 2017-2021. These estimates update and expand upon those derived by CDC in 2012 by including estimates of the percent of MSM based upon sexual identity and sexual attraction. The percentage and number of MSM in the US is an important indicator for calculating population-specific disease rates and eligibility for preventive interventions such as preexposure prophylaxis.

Key Words: sexual behavior, identity, attraction, men who have sex with men, population

Introduction

Men have been the epicenter of HIV infections in the United States (US) since the beginning of the epidemic, accounting for the largest proportion of new cases each year[1]. Most new HIV infections are among gay, bisexual, and other men who have sex with men (collectively referred to as MSM)[1]. In 2021, 67% of new HIV infections in the US were among MSM[2]. To better understand national rates of HIV infections, medication adherence, and preventative measures among MSM, it is imperative to have accurate estimates of the proportion and number of MSM in the United States[3]. However, the most

recent published national estimates for MSM populations were published over a decade ago[4].

There is currently no census-based question on same-sex behavior that yields data to estimate a national proportion or count of MSM in the US, though there is one question about being part of a same-sex household[5]. However, these data exclude MSM who are not domiciled with a male partner or who decline to report that their housemate is a partner. Therefore, previous estimations of MSM in the US have focused on periodically conducted representative surveys, such as the General Social Survey (GSS)[6] or National Health and Nutrition Examination Survey (NHANES)[7]. In 2012, Centers for Disease Control and Prevention (CDC) scientists used meta-analysis[4] to determine the population size of MSM in the US and calculate disease rates and rate ratios for HIV and primary and secondary syphilis.[4] Subsequent analyses by Grey, et al.[8] extended national estimates of MSM to smaller-area estimates, such as states and counties.

These past analyses focused on sexual behaviors to determine MSM status. Because some national surveys ask about sexual orientation or attraction, it also is possible to examine prevalence using orientation or attraction and to consider the concordance between self-reported sexual behavior and self-reported sexual identity/attraction. Currently, the GSS, NHANES, and the National Survey of Family Growth (NSFG)[9] contain both sexual behavior and sexual identity or attraction questions. These two measures are not always concordant, and the concordance can vary by age and race[10, 11]. It has been argued that for some public health uses of estimates, such as estimating populations of MSM in need of HIV prevention services or testing, behavior might be a better indication of need than identity[8]. However, willingness to report a same-sex orientation may affect willingness to seek prevention services.

It has been over a decade since Purcell, et al. (2012) published their national estimates of MSM, and in that time it has been cited over 200 times[12]. However, there have also been major policy decisions, such as the 2015 Supreme Court decision affirming the right for same-sex couples to marry in *Obergefell v. Hodges,* that may affect our understanding of the proportion of the population who are MSM. Since the landmark 2015 decision, public support for marriage equality has grown consistently year-over-year, indicating larger acceptance of LGBTQIA+ persons[13]. Therefore, we sought to update national behavior prevalence estimates of MSM and explore whether there are enough data to provide estimates of MSM based on orientation or attraction. Following the methods of Purcell, et al (2012) [4], we used population-based surveys and meta-analysis to estimate separate estimates of each survey and year combination and then aggregate estimates into single, nationally-representative proportions of MSM in the United States.

Methods

Study Selection

To determine which population-based surveys to include in our analysis, we started with the selection methods utilized by Purcell, et al. (2012). We examined the sources used in the previous estimates to identify if data collection was ongoing. We then completed a literature search using PubMed and Google Scholar to identify additional sources that include questions about sexual behavior and/or sexual identify/attraction. We searched utilizing key terms for measurement (prevalence, estimation), male-to-male sexual behavior or identity (men who have sex with men, male-to-male sexual contact, gay, bisexual), geography (United States), and survey (population-based survey). Abstracts were screened by the lead author in consultation with the co-authors for data sources that utilized population-based surveys for estimation.

Studies eligible for inclusion were population-based surveys with available complex survey methodology documentation to allow weighting to obtain estimated population proportions of MSM and 95% confidence intervals (CIs). Surveys that recruited predominantly in populations likely to have a high proportion of MSM (i.e. HIV-infected persons, sexually transmitted infection clinics, etc.) were excluded to minimize overestimation. We identified 4 ongoing population-based surveys from Purcell, et al. (2012) that currently include questions about sexual behavior and/or sexual identity/attraction: the GSS[6], NHANES[7], NSFG[9], and National Survey on Drug Use and Health (NSDUH)[14]. Additionally, we identified the National Health Interview Survey (NHIS)[15] as another eligible study (Table 1). Gallup[16] and the U.S. Census Pulse Household Survey[17] also estimate the proportion of men who identify as gay or bisexual; however, we were unable to gain access to CIs for reported point estimates and, therefore, excluded these data from our analysis.

Survey-specific MSM Estimation

We analyzed data from the most recent survey years available at the time of analyses to estimate numbers of MSM. NHANES, which collects survey data in 2-year increments, created a combined 2017- March 2020 dataset to account for the disrupted collection period in 2020 due to COVID-19. We utilized this dataset rather than 2017-2018 to allow for the inclusion of the most up-to-date data years. No other dataset included data from 2020.
To determine the study-level prevalence of MSM by sexual behavior, we considered questions about anal or oral sex with another male for three time periods: ever, in the past 5 years, and in the past 12 months. Survey specific questions are outlined in Supplementary Table 1. For sexual identity, we categorized men who indicated that “Gay”, “Homosexual”, or “Bisexual” best described them to be MSM. For sexual attraction, we considered men who indicated that they are “equally attracted to males and females”, “mostly attracted to the same sex”, or “only attracted to the same sex” to be MSM.
Data were analyzed accounting for the complex sample design[18]; proportions of MSM and variances were estimated for each behavioral domain, for attraction and for orientation.

Table 1: Characteristics of Eligible Studies for Meta-Analysis on Population Size of MSM in the United States

Study Name	Population Surveyed	Sampling Method	Data Collection Periods	Recall Periods	MSM Questions Category
General Social Survey (GSS)	National household survey of the general U.S. population of non-institutionalized persons aged ≥18 years.	2018: In-person probability sample of household in the U.S. 2021: Phone and mail-to-web based probability sample of households	2018, 2021	Past Year, Past 5 years, Ever	Sexual behavior, Sexual identity

		in the U.S. due to COVID-19. For both, one individual in each household completed the survey			
National Health and Nutrition Examination Surveys (NHANES)	National household survey of the general U.S. population of non-institutionalized persons aged ≥12 years. Sexual behavior questions only asked of persons 18-59 years	Complex stratified, multistage cluster sample. Administration includes individual in-person interviews with representative sample of population	2017-2020	Past Year, Ever	Sexual behavior, Sexual identity
National Household Survey on Drug Use and Health (NSDUH)	National household survey of the general U.S. population of non-institutionalized persons aged ≥12 years. Sexual behavior questions only asked of persons aged 18-59 years.	Complex stratified, multistage cluster sample; Administration through individual in-person interviews with representative sample of population	2018, 2019	N/A	Sexual identity, Sexual attraction
National Survey of Family Growth (NSFG)	National household survey of the general U.S. population of non-institutionalized persons aged 15-44 years.	A nationally representative multi-stage area probability sample. Conducted through individual in-person	2017-2019	Past year, Ever	Sexual behavior, Sexual identity, Sexual attraction

	Oversampling of Black and Hispanic adults	interviewing. Sensitive questions answered privately by self-administration utilizing computer-assisted personal interviewing (CAPI)			
National Health Interview Survey (NHIS)	National household survey of the general U.S. population of non-institutionalized persons aged 18 years and older	Continuously collected complex stratified, multistage cluster sample using computer-assisted personal interviewing	2019	N/A	Sexual identity

Meta-analysis

We applied Rao's meta-analytic method to pool survey-specific results into a single estimate with confidence bounds [19] as follows. First, for each recall period (e.g. ever sex, past 5 years, past 12 months) and for each identity/attraction estimate, we multiplied the population-level prevalence by the inverse of its variance. Then, we summed these weighted prevalence estimates across studies and then divided by the sum of the weights. Because surveys included in our analysis were conducted over several years and with differing sample designs and age-ranges, we included a corresponding between-studies variance term [20] before deriving the overall prevalence estimates.

We examined heterogeneity of prevalence estimates across surveys using the Q-statistic[19] and Higgins' I-index[21]. Pooled estimates for the overall prevalence of MSM were based on random-effects models, which provide a more conservative estimate of the variance, generating potentially more accurate inferences about a population of studies beyond what we present in this analysis[4]. All meta-analytic calculations were completed in R using the "meta" package[22].

Calculation of Count of MSM and Other Men in the United States

To calculate the total number of MSM and non-MSM, aged 18 and older, in the United States, we took our recently derived past-12-month estimate of the proportion of MSM among men and its 95% CI and multiplied it by the 2022 population estimate of men aged 18 and older in the United States from the U.S. Census Bureau[23]. The number of MSM was then subtracted from the total estimated number of men aged 18 and older in the

United States to compute the population size of other men.

Results

MSM Estimates based upon sexual behavior

The estimated proportions of men who have sex with other men, by recall period, for each of the included population-based surveys that contained sexual behavior-based questions and the pooled estimates obtained from the meta-analysis are presented in Table 2. The pooled estimates were 3.3% (last 12 months; 95% CI = 1.7%, 4.9%); 4.7% (last five years; 95% CI = 0.0%, 33.8%) and 6.2% (lifetime; 95% CI = 2.9%, 9.5%). Tests for heterogeneity were significant for both the “past 5 years” and “ever sex” recall periods, but not for the past 12 months recall period.

Table 2: Estimated Proportion of Men who have sex with Men for Individual Studies and Combined Meta-Analysis by Behavior, NSFG, NHANES, and GSS surveys, United States, 2017-2021

Study Name	Time Period	Recall Period	Sample size	Estimated Prevalence	Lower 95% CI	Upper 95% CI	Q*	I^{2*}
GSS	2018	Past 12 months	502	2.9%	1.4%	4.4%		
GSS	2021	Past 12 months	809	5.0%	3.3%	6.7%		
NSFG	2017-2019	Past 12 months	5206	3.1%	2.4%	3.8%		
NHANES	2017-2020	Past 12 months	3338	2.7%	1.9%	3.4%		
Pooled Result		Past 12 months		3.3%	1.7%	4.9%	6.8 (p=0.0803)	55.6 %
GSS	2018	Past 5 years	559	2.5%	1.2%	3.8%		
GSS	2021	Past 5 years	904	7.1%	5.1%	9.1%		
Pooled Result		Past 5 years		4.7%	0.0%	33.8%	14.4 (p<0.0001)	93.1 %
GSS	2018	Ever Sex	500	3.1%	1.6%	4.6%		
GSS	2021	Ever Sex	807	7.8%	5.6%	10.0%		
NSFG	2017-2019	Ever Sex	5163	7.0%	6.9%	7.0%		
NHANES	2017-2020	Ever Sex	3338	6.9%	5.6%	8.2%		
Pooled Result		Ever Sex		6.2%	2.9%	9.5%	25.9 (p<0.000	88.4 %

							1)	

**Q-statistic follows a chi-square distribution to determine the presence or absence of heterogeneity in a set of studies in a meta-analysis; I^2 quantifies the degree of heterogeneity in a meta-analysis*

MSM Estimates based upon sexual identity and sexual attraction

Table 3 contains the estimated prevalence and 95% CIs, along with the pooled aggregate results, by self-reported sexual identity and attraction. The pooled estimated prevalence of gay and bisexual men by sexual identity was 3.4% (95% CI = 2.2%, 4.6%), which comes from 8 collection cycles across 5 different surveys. Both tests for heterogeneity (Q-statistic and I^2 indicated heterogeneity across surveys (I^2 = 95.4%, Q = 152.4, P<0.0001). The pooled estimated prevalence of gay and bisexual men by sexual attraction was 4.9% (95% CI = 3.1%, 6.7%), with significant heterogeneity across the 3 collection periods from 2 surveys (I^2 = 79.2, Q = 9.6, P=0.008). We calculated pooled estimates of the proportion of gay and bisexual men by including a broader definition that includes men who are responded that they are “mostly attracted to women”. This broader definition resulted in a proportion of MSM of 9.3%, which is substantially higher than any other proportion calculated from this analysis. Therefore, for the purposes of this paper, we used the stricter definition of MSM based on attraction (i.e. men who indicated that they are “equally attracted to males and females”, “mostly attracted to the same sex”, or “only attracted to the same sex”).

Our data indicate limited fluidity in respondents’ identification and attraction. For the GSS, which has both sexual identity or attraction questions and sexual behavior questions, approximately 0.6% of straight-identifying men in 2018 sample and 2.6% in the 2021 sample also reported anal or oral sex with another man in the past 5 years. Similarly, for the 2017-2019 NSFG, of men who identified as straight, 4.4%-5.9% also reported anal or oral sex with another man ever, and 0.9% - 2.2% reported anal or oral sex in the past 12 months.

Table 3: Estimated Proportion of Men Who Identify as Gay or Bisexual for Individual Studies and Combined Meta-Analysis by Identity and Attraction, GSS, NSDUH, NSFG, NHANES, and NHIS surveys, United States, 2017-2021

Study Name	Time Period	Identity or Attraction	Sample size	Estimated Prevalence	Lower 95% CI	Upper 95% CI	Q	I^2
GSS	2018	Identity	629	2.2%	1.1%	3.2%		
GSS	2021	Identity	1012	6.4%	4.7%	8.0%		
NSDUH	2018	Identity	20,162	4.6%	4.1%	5.0%		
NSDUH	2019	Identity	19,923	4.2%	3.8%	4.6%		
NSFG*	2017-2019	Identity	5206	2.5%	1.9%	3.2%		
NSFG*	2017-2019	Identity	5206	2.6%	1.9%	3.3%		
NHIS	2019	Identity	14,733	2.1%	1.8%	2.4%		
NHANES	2017-2020	Identity	2595	4.6%	3.5%	5.7%		
Pooled		Identity		3.4%	2.2%	4.6%	152.4	95.4

Result							(p<0.0001)	%
NSDUH	2018	Attraction	20,162	5.3%	4.8%	5.7%		
NSDUH	2019	Attraction	19,923	5.3%	4.9%	5.7%		
NSFG	2017-2019	Attraction	5206	4.0%	3.2%	4.8%		
Pooled Result		Attraction		4.9%	3.1%	6.7%	9.6 (p=0.0081)	79.2 %

*The NSFG contains two different questions about a respondent's sexual identity, therefore, we included both estimates for 2017-2019.

Table 4 shows the total population size of men aged 18 and older in the United States and the number of MSM and non-MSM men, derived by utilizing the proportion of MSM from the 3.3% pooled estimate for sexual behavior in the past-12 months (95% CI = 1.7%, 4.9%). We estimate that there were 4,230,000 MSM aged ≥18 years in the United States (95% CI: 2,179,000 to 6,281,000).

Table 4: Population Size of Men Aged 18 and Older in the United States, 2022 and Number of MSM and non-MSM Using Past-12-Months Proportion Estimate of MSM from Meta-Analysis

	MSM Proportion	**MSM Population Size**	**non-MSM Population Proportion**	**non-MSM Population Size**
MSM Estimation	3.3%	4,230,000	96.7%	123,945,000
Lower 95% CI	1.7%	2,179,000	98.3%	125,996,000
Upper 95% CI	4.9%	6,281,000	95.1%	121,894,000

Discussion

Our meta-analysis of data from 5 population-based surveys indicated that 3.3% of the US male population report recent sex with men, and 3.4% - 4.9% of the US male population report gay or bisexual identity and/or sexual attraction to men. We found substantial overlap between estimates based on behavioral measures and measures based on orientation or attraction. Our behavioral estimates are all within one percentage point of the CDC's three behavior estimates from over a decade ago[4]. Additionally, compared to our current analysis, they include more national surveys that asked about sexual behavior or identification[4]. Although there is growing interest in understanding the experiences and risks of MSM, there is a smaller number of ongoing population-based studies that examine these issues.

Previous estimates by Purcell et al (2012) have also been used extensively in calculating rates of disease among MSM. We hope that these updated percentages of MSM will be used in future analyses to calculate rates of health states and conditions among MSM. For example, time periods for syphilis diagnoses can be matched to time periods for the estimated MSM population size. Then the count of syphilis diagnoses among MSM can be divided by the estimated population size of MSM for that same recall period and transformed into rates per 100,000 population.

For our calculation of the total number of MSM in the United States, we chose to use the prevalence of male-male sex during the past 12 months. This differs from the prior paper by Purcell, et al. (2012) [4] , which utilized the estimated prevalence from self-reported sex with a man in the past 5 years. Our decision was both practical and methodical. Q-statistics and I^2 for the pooled "past 5 years" estimates indicated heterogeneity across surveys (Q = 14.4, p-value <0.0001; I^2 = 93.1%). Additionally, our "past 5 years" estimates also had very wide 95% CIs (0.0%-33.8%), indicating a substantial amount of instability in the estimate. Of the behavior-based estimates in our analysis, self-reported sex in the past 12 months had the lowest heterogeneity. Additionally, for considering current risk for sexually transmitted infections, using an estimate based upon recent sexual activity may allow us to enumerate those MSM who are currently most at risk for disease acquisition or most appropriate for prevention services.

Estimates from "past five years" or "lifetime" behavioral data might be used in other circumstances. For example, Purcell's use of the 'past five years' measure to estimate number of MSM in the US in 2012 was designed to include a broader section of MSM, including those who were not recently sexually active. Such denominators might be relevant for characterizing the impact on MSM other types diseases, depending on the timelines for exposure and pathogenesis. Having three separate behavioral measurements with different recall periods allows users to determine which estimate makes the most sense for their public health purposes.

We expanded on prior work by calculating the prevalence of self-reported sexual identity and attraction to update and to understand the percentage of MSM in the US. Identity and attraction are neither mutually exclusive nor perfectly concordant, and they do not necessarily overlap with behavior. The term "men who have sex with men" (or MSM) specifically refers to sexual behavior, but identity and attraction refer to how men classify themselves - an important distinction for epidemiologists and sexual health researchers who seek to avert disease transmission associated with male-male sex. Identity or attraction are not risk factors for sexually transmitted infections but may be proxies for current or future risks and for needs for prevention services. However, as our data show, identity and attraction are not necessarily specific or sensitive[24]: a person who identifies as straight may still engage in anal or oral sex with another man, a man identifying as gay or bisexual may have anal or vaginal sex with a female. Providing additional prevalence estimates for orientation and attraction gives users more choices to fit their needs when trying to estimate these proportion of men who identify as gay/bisexual or are attracted to men, based on their programmatic goal or research question. Furthermore, including this new estimate of sexual identify and attraction aligns with new reports form the U.S. Census Bureau, which began collecting data on sexual orientation in 2021. According to those data, 6.5% of cis-gendered U.S. men reported identifying as gay or bisexual[25].

Here, we calculated 3 updated prevalence estimates for MSM, a new estimate for gay/bisexual men, and a new estimate for men who are attracted to other men. Going forward, we plan to update these estimates at regular intervals and to share public use datasets through AIDSVu.org [26]. We propose to update these estimates every 5 years given the pace at which the national population-based surveys are implemented and published. We do not anticipate a substantial change in the estimates in the coming 5 years. Comparing the newly calculated "past 12 months" estimate to the "past 12 months" estimate from Purcell, et al. (2012) we found a relatively small change over a decade of time (3.3% vs. 2.9%, respectively) [4]. However, the visibility of sexual behavior and identity in our culture has shifted rapidly over the past few decades, and regular updated analyses will allow us to identify any unexpected shifts should they emerge and to provide estimates that always include the most recently collected data.

Limitations

This analysis has important limitations. First, meta-analyses rely on the strengths of the underlying studies. The surveys that we used are minimally biased in terms of sampling – 5 population-based surveys – but they have varying sample sizes of MSM (which comprise a small subpopulation of the sampled population). Thus, the individual survey estimates that feed into our pooled estimates have varying confidence limits around their point estimates. Furthermore, these surveys have varying age ranges for inclusion in the survey and thus may not be exactly transferable across surveys. Like Purcell, et al. (2012) we were unable to directly calculate stratified estimates of the proportion of MSM by race, ethnicity, or age because of small sample sizes within stratifications.

There is also the potential for misclassification of a respondent's true sexual behavior, identity, or attraction leading to an under-estimation of the count and percentage of MSM in the US from our calculation. A recent analysis in Canada found that 13.5% of the gay and bisexual male population (based upon sexual behavior) reported being unlikely to disclose their sexual identity on government surveys[27]. However, it is unclear whether these estimates of misclassification are transferrable to the United States population. Additionally, although we provide estimated percentages of MSM by sexual attraction and sexual identity, our final estimation of the total MSM population for the US was solely based upon sexual behavior (anal or oral sex) in the past 12 months, rather than identity/attraction alone or a combination of identity/attraction and behavior.

Lastly, we did not adjust for differing age ranges between individual surveys. This may have implications for our outcomes; however, only one survey, the NSFG, included men younger than 18 in their estimate, and the number of respondents <18 years old who answered that they had ever had sex with another man was <0.5% of the total respondents for NSFG and is, therefore, unlikely to have a significant impact on the results. Only the NSFG included data from men aged <18 years; all other estimates for sexual behavior or identity/attraction used men ≥18 years of age.

Conclusions

The National HIV/AIDS Strategy (NHAS) and the Ending the HIV Epidemic Initiative in the U.S. (EHE) each highlight prevention of HIV among MSM as key to meeting the goal of decreasing new HIV infections by 90% by 2030[28]. Developing updated, accurate estimates of this population at risk is critical to better understanding the disproportionate burden of HIV and risk for HIV among MSM. Updated estimates of the MSM population sizes can help to guide resource allocation and programmatic efforts and support key benchmarks for progress as we seek to end the HIV epidemic and other health concerns that disproportionately impact MSM. Providing public, updated estimates of behaviors across different time periods and data on orientation and attraction can offer choices to researchers and health departments seeking to serve these populations.

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Conflicts of Interest

PSS reports a relationship with Merck & Co that includes consulting and/or advisory and funding grants.

Data Availability

Data from all population-based surveys are publicly available at their respective survey websites except for the 2017-2020 NHANES sexual behavior data. The survey-specific datasets generated from NHANES during this study are not publicly available due to being “limited access data”, but they can be accessed a National Center for Health Statistics Research Data Center.

Ethical Considerations

This analysis is considered non-human subjects research by the Emory University internal review board (IRB). Therefore, it is not required to undergo IRB review.

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