

EDUCATION

Sexual Health Knowledge of U.S. Medical Students: A National Survey



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ABSTRACT

Background: Sexual health is a critical component of overall wellness; however, only half of U.S. medical schools currently require formal instruction in sexuality.

Aim: This study sought to quantify the sexual health knowledge of undergraduate medical students using a novel survey tool evaluating 6 domains: sexual function and dysfunction; fertility and reproduction; sexuality across the lifespan; sexual minority health; society, culture, and behavior; as well as safety and prevention.

Methods: A novel 32-question survey tool was developed by subject matter experts from the University of Minnesota Program in Human Sexuality. Survey questions were derived from the 2012 and 2014 Summits on Medical School Education in Sexual Health as well as the Sexuality Information and Education Council of the United States Guidelines for Kindergarten through 12th Grade. The total knowledge score was calculated out of 30 points (excluding 2 terminology questions that were subjective). Medical students at 178 allopathic and osteopathic medical schools in the United States were invited to take the online survey.

Outcomes: Students performed below a passing rate (70%) in 4 of the 6 knowledge categories and below a passing rate overall in the knowledge assessment.

Results: Survey respondents ($n = 1,014$) scored an average of 66% correct (approximately 20/30). Overall, students scored lowest on questions regarding safety and prevention ($\bar{x} = 49\%$) and highest on questions regarding sexuality across the lifespan ($\bar{x} = 75\%$). Higher knowledge scores were associated with the following variables ($P < .05$): medical school year, race/ethnicity, sexual orientation, religious affiliation, future medical specialty choice, program type (MD/DO), and taking a human sexuality course in medical school.

Clinical Implications: Medical students may be under-prepared to address essential sexual health issues in future clinical practice.

Strengths & Limitations: To the knowledge of the authors this is the only contemporary study seeking to measure U.S. medical student sexual health knowledge. Limitations include sample population size and diversity as well as a non-validated survey tool.

Conclusion: Significant advances must be made in undergraduate medical education in order to prepare future physicians to address critical issues such as sexually transmitted disease, family planning, and health disparities.

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Key Words: Sexual Health; Sexuality; Sexual and Gender Minorities; Sexually Transmitted Diseases; Undergraduate Medical Education; Medical Schools

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INTRODUCTION

Sexuality is a critical component of overall wellness and directly relates to a multitude of health outcomes such as acquisition of sexually transmitted disease, unintended pregnancy, and lifelong mental health.^{1–6} Given the impacts of sexual health literacy on patient outcomes, concerns have been raised regarding the adequacy of sexual health education in undergraduate medical education.^{7–9}

Currently only half of U.S. medical schools require formal instruction in sexuality despite the likelihood that physicians of all specialties will encounter patients with sexual health concerns.^{10–14} Furthermore, special patient populations (eg, sexual and gender minorities, racial minorities, people living with disabilities) face unique sexual health disparities.^{15–18} For example, the rate of suicide attempts approaches 40% in the transgender community, while African American men who have sex with men comprised 39.2% of new HIV infections diagnosed in 2015.^{19,20} Considering the relationship between sexuality and adverse health outcomes, it is imperative that the next generation of physicians is trained to appropriately identify sexual health issues and act as effective sexual health counselors.^{21,22}

Prior research has addressed gaps in undergraduate medical education by focusing largely on student attitudes, comfort, and self-reported confidence in sexual health knowledge.^{12,22–25} While self-assessment of sexual health attitudes has been a traditional metric, concerns have emerged that these markers may inaccurately reflect depth of knowledge as trainees frequently overstate their mastery of health topics when surveyed.²⁶

Pioneering work by William Miller and Harold Lief in the 1970s resulted in the development of the Sexual Knowledge and Attitude Test, a tool used to objectively evaluate sexual health knowledge.²⁶ Unfortunately, no updates to the Sexual Knowledge and Attitude Test have been published in subsequent decades.^{23,27,28} In 2003, Fayers et al²⁹ revisited the concept of evaluating the sexual health knowledge of medical students at the University of Bristol. Their research concluded that British medical students had inaccurate factual knowledge about important sexual health issues, however their study was limited in scope of knowledge assessed as well as the population surveyed.²⁹ No contemporary studies have objectively assessed the depth of U.S. undergraduate medical student sexual health knowledge with a standardized metric in a broad population of trainees.

The aims of this study were to: (1) explore how knowledgeable a convenience sample of medical students in the United States are about various sexual health topics, and (2) examine if knowledge-level varies by demographics, other personal characteristics, future specialty interest, or history of a formal education in sexual health.

METHODS

Study Design

Medical students at 178 allopathic (MD granting) and osteopathic (DO granting) medical schools in the United States were invited to take an online, confidential survey to assess their knowledge of sexual health. Either a student or administrator from each school was identified as a contact for survey distribution. The authors first identified student representatives from private alumni social media networks (Facebook and LinkedIn) whose enrollment in medical school could be verified. Students were asked to disseminate the survey using their school's private

Facebook group or e-mail list. For the remainder of schools, a contact was identified from publicly available information on the school website. Several schools provided contact information for medical students associated with a student interest group related to human sexuality (eg, the president of the Obstetrics and Gynecology Student Interest Group or Medical Students for Choice). When a student contact could not be identified, the survey was provided to the dean of student affairs, the dean of medical education, or a reasonable substitute (eg, associate or senior associate dean, vice dean, or dean of research) for distribution. The survey was not disseminated through public forums (eg, Reddit, Student Doctor Network) in which current enrollment in medical school could not be verified.

The study protocol was submitted to the University of Minnesota Institutional Review Board and determined to be exempt in December 2016. Study data were collected and managed using Research Electronic Data Capture tools hosted at the University of Minnesota.³⁰ In order to encourage participation and increase anonymity, the respondents were not asked to indicate their medical school, and a public survey link was used (ie, not tied to individual respondent e-mail addresses). Because of the nature of this convenience sample, response rate was not tracked. A random survey completer was chosen to receive a gift card as compensation for their time. The survey was open for completion between April 17 and June 30, 2017.

A novel survey tool was developed in order to assess sexual health knowledge in the undergraduate medical student population (Appendix A). Knowledge categories and questions were derived from the 2012 and 2014 Summits on Medical School Education in Sexual Health as well as the Sexuality Information and Education Council of the United States Guidelines for Kindergarten through 12th Grade.^{3,25,31} Broad topics were chosen based upon representation in the University of Minnesota Medical School Human Sexuality Curriculum, which has been previously offered as a model for national curricula in Coleman et al.⁹ Prior to widespread dissemination, the tool was piloted by 2 medical students at the University of Minnesota for acceptability and the overall number of questions was reduced in order to encourage survey completion. The survey tool was subsequently reviewed by 3 faculty members at the University of Minnesota Program in Human Sexuality (1 MD, 1 MD/PhD, and 1 PhD), 1 faculty collaborator at Harvard Medical School, and the president of the American Sexual Health Association, where further revision was made to the content and wording of the survey tool. After a pilot of 70 questions, the final 30 knowledge questions were selected based upon participant feedback regarding question clarity and relevance to clinical practice.

The total knowledge score was calculated out of 30 points (excluding 2 terminology questions that were subjective). The total knowledge score was made up of 6 topics that each contained 5 questions: (1) sexual function and dysfunction; (2) fertility and reproduction; (3) sexuality across the lifespan; (4) sexual minority health; (5) society, culture, and behaviors; and (6) safety and

Table 1. Sample demographics and characteristics

N	1,014
Age, (n = 935), mean \pm SD	26.27 \pm 3.00
Missing demographic data, n (%)	79 (7.79%)
Race/ethnicity, n (%)	
Asian	172 (16.96%)
African American	39 (3.85%)
Hispanic/Latino	59 (5.82%)
White	541 (53.35%)
Native American	4 (0.39%)
Other	14 (1.38%)
>1 Race	77 (7.59%)
Decline to state	29 (2.86%)
Gender identity, n (%)	
Male	346 (34.12%)
Female	577 (56.90%)
Non-binary	2 (0.20%)
Other	2 (0.20%)
Decline to state	8 (0.79%)
Sex assigned at birth, n (%)	
Male	350 (34.52%)
Female	578 (57.00%)
Decline to state	7 (0.69%)
Sexual orientation, n (%)	
Heterosexual	793 (78.21%)
Homosexual	58 (5.72%)
Bisexual	40 (3.94%)
Asexual	10 (0.99%)
Pansexual	9 (0.89%)
Other	11 (1.08%)
Decline to state	14 (1.38%)
Environment raised in, n (%)	
Rural	173 (17.06%)
Urban	164 (16.17%)
Suburban	584 (57.59%)
Decline to state	14 (1.38%)
Political association, n (%)	
Liberal	573 (56.51%)
Neutral	203 (20.02%)
Conservative	119 (11.74%)
Decline to state	40 (3.94%)
Religious association, n (%)	
Christian	409 (40.34%)
Jewish	42 (4.14%)
Muslim	25 (2.47%)
Agnostic or spiritual	191 (18.84%)
Atheist	170 (16.77%)
Other	38 (3.75%)
Decline to state	60 (5.92%)
Relationship status, n (%)	
Single	272 (26.82%)
Dating casually	100 (9.86%)
In a long-term relationship	383 (37.77%)

(continued)

Table 1. Continued

Married	153 (15.09%)
Divorced	7 (0.69%)
Other	7 (0.69%)
Decline to state	13 (1.28%)

prevention. Participants could answer each question with true, false, or unsure (see [Appendix A](#) for full questionnaire). Upon completion of the survey each student received an electronic booklet containing the survey answers and references.

Statistical Methods

Software (SAS, Version 9.4; SAS Institute Inc, Cary, NC, USA) was used for analyses, and 2-tailed P values $< .05$ were considered statistically significant. Sample demographics and characteristics were summarized overall using descriptive statistics. Variable distributions were assessed for normality using histograms and quantile-quantile plots. First, the associations between participant demographics/characteristics and knowledge score (total percentage correct) were assessed using simple linear regression in bi-variate analyses. If the overall type III F test for a model with a categorical predictor was significant, pairwise comparisons with a reference category were reported. In order to control for confounding relationships, predictors with a $P < .20$ in the bi-variate models were included in a multivariable linear regression model (full model). Then, predictors that were not statistically significant in the full model ($P \geq .05$), were removed to produce the final, reduced model (variable selection details further described in “Results” section). This article focuses on the predictors that made it into the full model. For more stability in our final model, we chose the group with the largest sample size as our reference group for race, sexual orientation, religion, type of medical school program, and medical school sexual health education courses. For future medical specialty choice, we chose obstetrics and gynecology as our reference group, as we hypothesized that this group would score the highest on the knowledge test. For these same reasons, we chose “in a human sexuality course” as the reference group for sexual education in medical school. Lastly, χ^2 tests (or Fisher exact tests where necessary) were used to compare the demographics of participants who answered false to at least 1 of the terminology questions to participants who answered true to both terminology questions (not including those who answered unsure). Knowledge score was also compared between the 2 terminology groups using a 2-sample t test.

RESULTS

Participants

There were 1,096 surveys started, and of these, 78 did not complete any of the sections in the survey, leaving 1,018 with at least 1 section of the survey completed. $N = 4$ of these

participants indicated they were not medical students, and were excluded from analysis. Of the 1,014, 93% ($n = 944/1,014$) completed the whole survey, and 935 completed the demographic information. Participants who completed at least 1 section of the survey ($n = 1,014$) were included in our final sample. The included participants were, on average (mean \pm SD), 26.27 ± 3.00 years old, 53% white, 57% female, 78% heterosexual, and 38% in a long-term relationship (Table 1). The majority (63%) were in an allopathic (MD granting) program and at a public university (63%) (Table 2).

Overall, students scored an average of 66% correct (approximately 20/30 questions). Students scored highest in the category of sexuality across the lifespan ($\bar{x} = 75\%$ correct) and lowest in the category of safety and prevention ($\bar{x} = 49\%$ correct) (Table 3). Students performed highest on topics such as vaccination, menopause, and male physiology. Topics that students had the most difficulty with included contraception, sexual

minority health, and sexuality in people living with intellectual and/or physical disability (Appendix B).

Bivariate Associations and Variable Selection

When examining the bi-variate associations between each participant characteristic and knowledge score, even though our cutoff for the bivariate tests was $P < .20$, there were several statistically significant associations indicated by $P < .05$. The following variables were all associated with knowledge score at $P < .05$ in the bivariate tests: age, medical school year, race/ethnicity, gender, sexual orientation, political affiliation, religious affiliation, relationship status, anticipated medical specialty, program type (MD/DO), self-rating of human sexuality education in medical school, receiving instruction on how to take a sexual health history, and taking a human sexuality course in medical school. The only item examined that was not associated with knowledge score was the environment the participant grew up in (rural, urban, or suburban).

When adding the predictors from the statistically significant bi-variate regression results to a multivariable regression model, several were no longer statistically significant: age, gender, political affiliation, relationship status, self-rating of medical school sexual health education, instruction in taking a sexual health history, future medical specialty choice, geographic region, and medical school sexual health education courses. These items were removed from the model and then added individually to check for significance without the other dropped items. Future medical specialty choice and medical school sexual health education courses were added back in to create the final model.

The final regression model contained medical school year, race, sexual orientation, religion, future medical specialty choice, type of medical school program (MD/DO), and medical school sexual health education courses (Table 4).

Demographics

In the final multiple regression model, knowledge score varied significantly by race. Students who identified as white scored significantly higher than students who identified as non-white. No significant difference was found between students identifying as white and African American or more than 1 race (Table 4). Sexual orientation was associated with sexual health knowledge scores, with students identifying as non-heterosexual (ie, homosexual, bisexual, asexual, or pansexual) scoring significantly higher than heterosexual students. Students who identified as Christian scored significantly lower than those who identified as atheist or agnostic/spiritual. No significant difference was found between students identifying as Christian vs Jewish or Muslim (Table 4).

Education

The students in this sample reported learning about human sexuality in a variety of settings prior to medical school. The most common were from personal experience, at their high school, and

Table 2. Medical school and program information

N	1,014
Medical school year, n (%)	
1	281 (27.71%)
2	154 (15.19%)
3	259 (25.54%)
4*	244 (24.06%)
Missing	76 (7.47%)
Anticipated specialty, n (%)	
Emergency medicine	108 (10.65%)
Family medicine	137 (13.51%)
Internal medicine	151 (14.89%)
Neurology	21 (2.07%)
Obstetrics and gynecology	83 (8.19%)
Pediatrics	91 (8.97%)
Psychiatry	41 (4.04%)
Surgery	118 (11.64%)
Urology	3 (0.3%)
Other specialty	65 (6.41%)
Missing/undecided	196 (19.33%)
Program type, n (%)	
Allopathic, MD	636 (62.72%)
Osteopathic, DO	302 (29.78%)
Missing	76 (7.50%)
School type, n (%)	
Public	640 (63.12%)
Private	298 (29.39%)
Missing	76 (7.50%)
School location in the United States, n (%)	
Northwest	6 (0.59%)
Midwest	197 (19.43%)
Northeast	78 (7.69%)
West	294 (28.99%)
South	114 (11.24%)
Southeast	249 (24.56%)
Missing	76 (7.50%)

*Includes $n = 1$ 5th year.

Table 3. Overall section average scores (% correct)

Variable	N	Mean	SD	Minimum	Maximum
Terminology*	1,007	87.88	26.61	0	100
Sexual function and dysfunction	989	72.96	19.54	20	100
Fertility and reproduction	974	64.23	24.95	0	100
Sexuality across the lifespan	960	75.08	22.28	0	100
Sexual minority health	953	63.44	21.32	0	100
Society, culture, and behaviors	948	69.22	22.23	0	100
Safety and prevention	944	49.05	22.88	0	100
Overall†	944	65.65	13.11	20.00	96.67

*Opinion, % indicates agreement with statements rather than correct responses.

†Does not include terminology questions.

from their friends. Additionally, more than 1 in 3 respondents named pornography as a source of sexuality education (Table 5).

In medical school, only 20% (199/1,014) of the participants reported learning about human sexuality in a human sexuality course, while 7% (72/1,014) reported they had not learned about human sexuality at all in medical school. A majority of participants (83%, 842/1,014) had received instruction on how to take a sexual health history. Lastly, when asked to rate their human sexuality education in medical school a majority of students rated their education as “neither adequate nor inadequate,” or “inadequate,” “poor” (Table 5).

In the final multiple regression model, later year in medical school was significantly associated with a higher knowledge score. Each 1-year increment of medical education was associated with a knowledge score increase of $3.22 \pm 0.37\%$ (Table 4).

Students attending allopathic medical schools ($n = 636$) had significantly higher scores than students attending osteopathic medical schools. Students who indicated they had learned about human sexuality in a specific course performed significantly better than students who learned human sexuality in other courses such as psychiatry or microbiology (Table 4).

Intended Specialty

Students indicated that practitioners of family medicine, obstetrics and gynecology, internal medicine, and psychiatry were the most appropriate specialties to discuss sexuality with their patients. 6 students selected that sexual health should not be discussed with patients by a physician of any specialty (Table 6). Intended medical specialty was also found to be a statistically significant factor in sexual health knowledge in the final multiple regression model, where students intending to pursue obstetrics and gynecology, urology, and neurology had higher knowledge scores than their peers (Table 4).

Terminology

In this survey 18.7% of students ($n = 823$) indicated that a patient engaging in oral-genital contact did not qualify as having “had sex.” Similarly, 6% ($n = 61$) did not consider a patient engaging in penile-anal contact as having “had sex.”

When comparing demographics among participants who answered false to at least 1 of the terminology questions ($n = 194$, 19%) to participants who answered true to both terminology questions ($n = 813$, 81%) (excluding $n = 7$ who answered unsure), we found a few statistically significant differences. Non-heterosexual participants ($n = 128$) were more likely to answer true for both terminology questions than heterosexual participants ($n = 793$) (90% vs 80%, $P = .0065$). Those who had prior instruction in taking a sexual health history ($n = 841$) were more likely to answer true for both terminology questions than those who had not ($n = 92$) (82% vs 74%, $P = .0499$). There were no other statistically significant associations between demographics and the terminology question responses; however, the terminology question response was associated with the total knowledge score. Those who answered true to both terminology questions scored 66% in their overall knowledge score compared to an overall knowledge score of 62% for those who answered false to at least 1 terminology question ($P = .0002$).

DISCUSSION

In this national survey of U.S. undergraduate medical students, participants performed below a passing rate (70%) in 4 of the 6 knowledge categories and below a passing rate overall in the knowledge assessment. Similar findings have been reported previously in Fayers et al,²⁹ where United Kingdom medical students scored an average of 60% correct on a 10-question sexual health knowledge survey.

Given the lack of curriculum time devoted to subjects such as sexual and gender minority health it is not surprising that students under-performed in this area. For example, a 2009 survey of 77 medical schools found that only 43% covered lesbian, gay, bisexual, and transgender health issues.³² However, the authors did not anticipate that students would perform poorly on topics that are generally well covered such as prevention of sexually transmitted infections (STIs) and contraception.

These results could have important implications for future clinical practice. STI acquisition and unintended pregnancy have significant impacts on the morbidity and mortality of Americans and incur over \$20 billion annually in direct

Table 4. Final multivariable regression results

Predictor	Knowledge score regression results (%) $\beta \pm SE$	Reference category adjusted mean knowledge score (%) $\pm SE$	P value*
Intercept	65.36 \pm 1.93		<.0001 [†]
Medical school year	3.22 \pm 0.37		<.0001 [†]
Race			.0005 [†]
White	Reference	68.00 \pm 0.52	
Asian	−4.00 \pm 1.22		.0011 [†]
African American	−3.54 \pm 2.04		.0839
Hispanic/Latino	−3.80 \pm 1.64		.0207 [†]
Other/Native American	−8.77 \pm 2.95		.0030 [†]
>1 Race	−1.06 \pm 1.54		.4922
Sexual orientation			<.0001 [†]
Heterosexual	Reference	66.00 \pm 0.44	
Non-heterosexual	4.66 \pm 1.18		<.0001 [†]
Religion			.0026 [†]
Christian	Reference	65.05 \pm 0.60	
Atheist	3.96 \pm 1.13		.0005 [†]
Jewish	2.65 \pm 2.02		.1907
Muslim	−0.65 \pm 2.55		.8000
Agnostic or spiritual	3.05 \pm 1.05		.0037 [†]
Future medical specialty choice			.0266 [†]
Obstetrics and gynecology	Reference	71.23 \pm 1.28	
Urology	2.13 \pm 6.52		.7443
Psychiatry	−4.89 \pm 2.29		.0329 [†]
Neurology	−2.98 \pm 2.80		.2871
Family medicine	−4.12 \pm 1.63		.0119 [†]
Emergency medicine	−4.60 \pm 1.69		.0067 [†]
Surgery/anesthesiology	−5.14 \pm 1.67		.0021 [†]
Other	−5.44 \pm 1.95		.0054 [†]
Internal medicine	−6.28 \pm 1.62		.0001 [†]
Pediatrics	−5.71 \pm 1.80		.0015 [†]
Type of medical school program, MD/DO			.0001 [†]
Allopathic, MD	Reference	67.83 \pm 0.51	
Osteopathic, DO	−3.67 \pm 0.96		.0001 [†]
Medical school sexual health education courses			.0131 [†]
In a human sexuality course	Reference	69.02 \pm 0.90	
In other courses	−2.91 \pm 1.03		.0050 [†]
Not at all/do not know	−3.62 \pm 1.67		.0301 [†]

*Left-justified P values are from overall F test.

[†]P < .05; multivariable linear regression.

medical costs.¹² Students in this survey scored an average of 49% correct in the category of safety and prevention and an average of 64% correct in the category of fertility and reproduction, which covered the topic of contraception. While STI transmission and pregnancy prevention are widely covered in medical school, research by Steinauer et al³² has shown that these topics often lack depth (eg, 95% of medical institutions surveyed reported teaching about oral contraceptive pills but only 77% reported teaching about intrauterine devices) and that there is wide variance between schools. It is possible that students performed poorly in these categories given such inconsistencies in educational content, however limitations in the

wording of questions in our survey tool (including a question on STI transmission) may have also confounded these results (see discussion of limitations below).

Our survey included 2 questions not used in the overall knowledge score calculation regarding the students' definition of the term "had sex." These questions were excluded from the knowledge score on the basis that this definition is a personal opinion. Nearly 1 in 5 students in this study did not consider a patient engaging in oral-genital contact as having "had sex," with a smaller cohort (6%, n = 61) answering similarly for penile-anal contact. In their 1999 study "Would You Say You 'Had Sex' If...?" Sanders and Reinisch³³ asked the general public to define

Table 5. Sexuality education

N	1,014
Overall, my human sexuality education in medical school has been	
Excellent	41 (4.04%)
Adequate	328 (32.35%)
Neither adequate nor inadequate	245 (24.16%)
Inadequate	180 (17.75%)
Poor	69 (6.80%)
Unsure	62 (6.11%)
Prefer not to answer	13 (1.28%)
Missing	76 (7.50%)
I have received instruction on how to take a sexual health history	
Yes	842 (83.04%)
No	74 (7.30%)
Unsure	18 (1.78%)
Prefer not to answer	3 (0.30%)
Missing	77 (7.59%)
Prior to medical school, I learned about human sexuality in the following settings (could choose multiple)	
Elementary school	258 (25.44%)
Middle school	532 (52.47%)
High school	687 (67.75%)
College	607 (59.86%)
My parents	367 (36.19%)
My community	119 (11.74%)
Personal experience	703 (69.33%)
Educational books or websites	450 (44.38%)
Pornography	337 (33.23%)
My friends	626 (61.74%)
A significant other or partner	496 (48.92%)
Other	28 (2.76%)
None	10 (0.99%)
In medical school I learned about human sexuality (could choose multiple)	
In a human sexuality course	199 (19.63%)
In other courses	557 (54.93%)
Longitudinally across several courses	343 (33.83%)
Other	93 (9.17%)
Not at all	72 (7.10%)
Do not know	31 (3.06%)

the term “had sex” and found that 60% of respondents did not include oral-genital contact in their definition, and 19% answered similarly for penile-anal contact. These results highlight the potential limitations of questions such as “Do you have sex with men, women, or both?” that are often taught as part of routine sexual health history taking. Given the variable interpretation of the phrase “have sex,” it is important to teach medical students to establish mutual understanding with their patients and to be comfortable discussing specific sexual behaviors.

Previous research has shown socio-cultural factors, such as gender or religion, are associated with comfort discussing

Table 6. Specialties that should discuss sexual health with patients (could choose multiple)

N	1,014
Family medicine	923 (91.03%)
Obstetrics and gynecology	896 (88.36%)
Internal medicine	895 (88.26%)
Psychiatry	847 (83.53%)
Pediatrics	820 (80.87%)
Urology	782 (77.12%)
Emergency medicine	766 (75.54%)
Dermatology	555 (54.73%)
Physical medicine and rehabilitation	482 (47.53%)
Neurology	469 (46.25%)
Plastic surgery	436 (43.00%)
Otolaryngology	380 (37.48%)
Pathology	283 (27.91%)
Neurosurgery	265 (26.13%)
Orthopedic surgery	253 (24.95%)
Ophthalmology	230 (22.68%)
Anesthesiology	202 (19.92%)
Radiology	181 (17.85%)
No specialties	6 (0.59%)

sexuality.^{22,28} Our study found that certain socio-cultural factors (eg, identifying as Christian) were associated with knowledge score, while others (eg, gender) were not. This discrepancy may be explained by conceding that self-reported comfort is not a reliable indicator of knowledge, however our study did not directly assess student comfort and we are unable to comment on this relationship directly.²⁶

Our study found no association between perceived adequacy of sexual health education and sexual health knowledge score. Given the lack of comprehensive sexual health education in medical school and variety of exposure to sexual health topics prior to medical school, it is possible that students are unaware of gaps in their knowledge. Student rating of education quality may also be an unreliable marker of knowledge acquisition.

Contrary to previous reports, the present study found that year in medical school was positively associated with knowledge scores.^{23,29} Fourth-year students scored an average of 12 points higher than first-year students independent of age, suggesting that sexual health knowledge is related to exposure and experiences in medical school. Variability in the timing and quality of human sexuality courses or clinical experiences may explain the discrepancy between this study and prior research, however our results support the conclusion that sexual health knowledge can be acquired throughout the 4 years of undergraduate medical education.

In this study 1 in 3 students considered pornography a source of sexuality education. Given the contemporary concerns surrounding pornography, this is of particular interest. Research has shown that the general public utilizes pornography as a source of sexual health information and that pornography may influence sexual behaviors.^{34,35} Considering that 50% of students receive

no sexual health education in medical school, it is of potential concern that unreliable sources of information (eg, pornography) might encompass a large portion of undergraduate medical student sexual health education. However, the extent and significance of pornography use as a source of sexual health information is not well established.^{36,37}

While knowledge acquisition is an important factor in subject mastery, it should be noted that factors such as clinical skills and attitudes are equally important when considering the quality of patient care. Research by Foley et al³⁸ has suggested that early teaching of sexual medicine is related to increased comfort discussing sexuality, however the clinical impact of increased sexual health knowledge itself has not been evaluated.

This survey was limited by several factors. There is no tool in this area that has been validated (that is, compared with a gold standard measurement such as students' academic transcripts). This survey is no exception, and given the novel nature of the survey tool we acknowledge that questions may be open to subjective interpretation. There were additional limitations in the survey structure, such as grouping the religious affiliations "spiritual" and "agnostic" together, which may have limited the generalizability of the religious affiliation results (full survey available in [Appendix A](#)).

Furthermore, we cannot say for certain what a clinically meaningful difference in knowledge score is (eg, the implications of a 5% difference in knowledge score between 2 groups of medical students). Given the large sample size ($n = 1,014$) of this study it is also possible that minor differences in performance have been conflated.

The survey was disseminated via social media contacts and/or publicly available contact information for individual undergraduate medical programs, which may have limited the diversity of our sample population. It is possible that students interested in human sexuality, who may have had higher levels of baseline knowledge, self-selected to participate in this research (eg, prior research has shown that identifying as conservative is associated with decreased comfort discussing sexuality, and participants in our study were 8 times more likely to identify as neutral or liberal than conservative).²²

According to the American Association of Medical Colleges and the American Association of Colleges of Osteopathic Medicine, 88,468 students (75% of all medical students) were enrolled in allopathic medical schools and 29,981 (25% of all medical students) were enrolled in osteopathic medical schools for the 2017–2018 year.* Of the medical students who participated in this survey a larger percent attended an osteopathic school (30%, 302/1,014) compared to the national average of 25%. The over-representation of DO students, who have educational requirements different than those of MD students, may have introduced bias into our sample. Our sample was also

limited in terms of racial diversity (eg, 17% of survey respondents identified as Asian vs 21% nationally) and geographic location (eg, 8% of survey respondents attended school in the Northeast vs 24% nationally[†]).^{39,40}

Despite these limitations, to the knowledge of the authors, this is the only contemporary study seeking to measure sexual health knowledge in the undergraduate medical student population. The results of this study quantify the need for improved sexual health training in undergraduate medical education. Increased representation of sexual health questions on national board certification exams may stress the importance of these subjects. Furthermore, standardized and in-depth recommendations from the Liaison Committee on Medical Education would help to ensure that all physicians in training have basic competencies across multiple domains of sexual health.

One challenge in implementing adequate sexual health curricula is that currently no national standard exists for undergraduate medical education and there are no established methods for evaluating knowledge.^{8,41} Concerns with the increasing amount of material medical students must learn as well as lack of consensus on what sexual health topics are of most importance complicate reform efforts. Bayer et al²⁵ have recently proposed specific sexual health competencies for undergraduate medical education that may serve as a foundation for developing a systemic 4-year curriculum. Published guidelines based on existing medical school curricula are also available.⁹

Future research should focus on evaluating the relationship between self-reported metrics (eg, comfort) and quantifiable knowledge, in addition to establishing the clinical significance of undergraduate medical student knowledge. More work is also necessary to determine what impact unreliable information sources (eg, pornography) may have on the sexual health knowledge of medical professionals.

CONCLUSION

Our results suggest that sexual health education may be deficient in undergraduate medical education. Advances must be made in medical school curricula in order to prepare future physicians to serve a broad group of patients with diverse sexual health attitudes and experiences.

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† Northeast defined as ME, VT, NH, NY, NJ, DE, MA, RI, and PA. Data derived from the American Association of Medical Colleges and the American Association of Colleges of Osteopathic Medicine for the 2015–16 academic year.

* Figures do not include medical students attending school in Puerto Rico as they were not included in the study

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REFERENCES

1. Satcher D, Hook EW III, Coleman E. Sexual health in America: improving patient care and public health. *JAMA* 2015; **314**:765-766.
2. World Health Organization. Defining sexual health. Available at: www.who.int/reproductivehealth/topics/sexual_health/sh_definitions/en/. Accessed November 15, 2017.
3. Coleman E, Elders J, Satcher D, et al. Summit on medical school education in sexual health: report of an expert consultation. *J Sex Med* 2013; **10**:924-938.
4. Stevenson RWD. Sexual medicine: why psychiatrists must talk to their patients about sex. *Can J Psychiatry* 2004; **49**:673-677.
5. Wang C, Jackson G, Jones TH, et al. Low testosterone associated with obesity and the metabolic syndrome contributes to sexual dysfunction and cardiovascular disease risk in men with type 2 diabetes. *Diabetes Care* 2011; **34**:1669-1675.
6. Sadosky R, Nusbaum M. Reviews: Sexual health inquiry and support is a primary care priority. *J Sex Med* 2006; **3**:3-11.
7. Criniti S, Crane B, Woodland MB, et al. Perceptions of US medical residents regarding amount and usefulness of sexual health instruction in preparation for clinical practice. *Am J Sex Ed* 2016; **11**:161-175.
8. Criniti S, Andelloux M, Woodland MB, et al. The state of sexual health education in US medicine. *Am J Sex Ed* 2014; **9**:65-80.
9. Coleman E. Sexual health education in medical school: a comprehensive curriculum. *Virtual Mentor* 2014; **16**:903-908.
10. Morreale MK, Arfken CL, Balon R. Survey of sexual education among residents from different specialties. *Acad Psychiatry* 2010; **34**:346-348.
11. Malhotra S, Khurshid A, Hendricks KA, et al. Medical school sexual health curriculum and training in the United States. *J Natl Med Assoc* 2008; **100**:1097-1106.
12. Shindel AW, Baazeem A, Eardley I, et al. Sexual health in undergraduate medical education: existing and future needs and platforms. *J Sex Med* 2016; **13**:1013-1026.
13. Wittenberg A, Gerber J. Recommendations for improving sexual health curricula in medical schools: results from a two-arm study collecting data from patients and medical students. *J Sex Med* 2009; **6**:362-368.
14. Laumann EO, Paik A, Rosen RC. Sexual dysfunction in the United States: prevalence and predictors. *JAMA* 1999; **281**:537-544.
15. Obedin-Maliver J, Goldsmith ES, Stewart L, et al. Lesbian, gay, bisexual, and transgender-related content in undergraduate medical education. *JAMA* 2011; **306**:971-977.
16. Tamas RL, Miller KH, Martin LJ, et al. Addressing patient sexual orientation in the undergraduate medical education curriculum. *Acad Psychiatry* 2010; **34**:342-345.
17. Harris KM, Gordon-Larsen P, Chantala K, et al. Longitudinal trends in race/ethnic disparities in leading health indicators from adolescence to young adulthood. *Arch Pediatr Adolesc Med* 2006; **160**:74-81.
18. Magoon K, Meadows-Oliver M. Adolescent sexual health and physical disability in primary care. *Pediatr Nurs* 2011; **37**:280-282.
19. Testa RJ, Hendricks ML. Suicide risk among transgender and gender nonconforming youth. In: Goldblum P, Espelage DL, Chu J, et al., eds. Youth suicide and bullying: challenges and strategies for prevention and intervention. New York: Oxford University Press; 2014. p. 121-133.
20. Singh S, Mitsch A, Wu B. HIV care outcomes among men who have sex with men with diagnosed HIV infection—United States, 2015. *MMWR Morb Mortal Wkly Rep* 2017; **66**:969-974.
21. Sobecki JN, Curlin FA, Rasinski KA, et al. What we don't talk about when we don't talk about sex: results of a national survey of US obstetrician/gynecologists. *J Sex Med* 2012; **9**:1285-1294.
22. Frank E, Coughlin SS, Elon L. Sex-related knowledge, attitudes, and behaviors of U.S. medical students. *Obstet Gynecol* 2008; **112**:311-319.
23. Shindel AW, Ando KA, Nelson CJ, et al. Medical student sexuality: how sexual experience and sexuality training impact U.S. and Canadian medical students' comfort in dealing with patients' sexuality in clinical practice. *Acad Med* 2010; **85**:1321-1330.
24. McGarvey E, Peterson C, Pinkerton R, et al. Medical students' perceptions of sexual health issues prior to a curriculum enhancement. *Int J Impot Res* 2003; **15**:S58-66.

25. Bayer CR, Eckstrand KL, Knudson G, et al. Sexual health competencies for undergraduate medical education in North America. *J Sex Med* 2017;14:535-540.
26. Miller WR, Lief HI. The sex knowledge and attitude test (SKAT). *J Sex Marital Ther* 1979;5:282-287.
27. Ross MW, Leshabari S, Rosser BRS, et al. Evaluation of an assessment instrument for a sexual health curriculum for nurses and midwifery students in Tanzania: the sexual health education for professionals scale (SHEPS). *Appl Nurs Res* 2018;40:152-156.
28. Gordon MJ. A review of the validity and accuracy of self-assessments in health professions training. *Acad Med* 1991;66:762-769.
29. Fayers T, Crowley T, Jenkins JM, et al. Medical student awareness of sexual health is poor. *Int J STD AIDS* 2003;14:386-389.
30. Harris P, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42:377-381.
31. Sexuality Information and Education Council on the United States. Guidelines for Comprehensive Sexuality Education: Kindergarten through 12th Grade. 3rd ed. Fulton, IL: Fulton Press.
32. Steinauer J, LaRochelle F, Rowh M, et al. First impressions: what are preclinical medical students in the US and Canada learning about sexual and reproductive health? *Contraception* 2009;80:74-80.
33. Sanders SA, Reinisch JM. Would you say you “had sex” if...? *JAMA* 1999;281:275-277.
34. Lim MS, Carrotte ER, Hellard ME. The impact of pornography on gender-based violence, sexual health and well-being: what do we know? *J Epidemiol Community Health* 2016;70:3-5.
35. Lim MSC, Agius PA, Carrotte ER, et al. Young Australians’ use of pornography and associations with sexual risk behaviors. *Aust N Z J Public Health* 2017;41:438-443.
36. Hare KA, Gahagan J, Jackson L, et al. Revisualizing ‘porn’: how young adults’ consumption of sexually explicit Internet movies can inform approaches to Canadian sexual health promotion. *Cult Health Sex* 2015;17:269-283.
37. National Union of Students. Students turn to porn to fill the gaps in their sex education. Available at: <https://www.nus.org.uk/en/news/students-turn-to-porn-to-fill-the-gaps-in-their-sex-education/>. Accessed March 20, 2018.
38. Foley S, Wittmann D, Balon R. A multidisciplinary approach to sexual dysfunction in medical education. *Acad Psychiatry* 2010;34:386-389.
39. American Association of Colleges of Osteopathic Medicine. 2015 Osteopathic medical profession report. Available at: <http://www.osteopathic.org/inside-aoa/about/aoa-annual-statistics/Documents/2015-OMP-report.pdf>. Accessed April 1, 2018.
40. Association of American Medical Colleges. Total enrollment by U.S. medical school and sex, 2013–2014 through 2017–2018. Available at: <https://www.aamc.org/download/321526/data/factstableb1-2.pdf>. Accessed April 1, 2018.
41. Galletly C, Lechuga J, Layde JB, et al. Sexual health curricula in U.S. medical schools: current educational objectives. *Acad Psychiatry* 2010;34:333-338.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jsxm.2018.05.019>.