

COVID-19

# The Association of the COVID-19 Pandemic on Male Sexual Function in the United States: A Survey Study of Male Cannabis Users



Tony Chen, MD, Hriday P. Bhambhvani, BS, Alex M. Kasman, MD, MS, and Michael L. Eisenberg, MD

## ABSTRACT

**Introduction:** International studies have suggested that social disruptions caused by the COVID-19 pandemic have led to sexual dysfunction, but the impact on males in the United States is less defined.

**Aim:** To examine changes in male sexual function during the COVID-19 pandemic and to evaluate associated demographic variables.

**Methods:** Prepandemic survey data was collected between October 20, 2019 and March 1, 2020 on adult males in the United States. Follow-up survey data collected for comparison during the COVID-19 pandemic between August 1, 2020 and October 10, 2020 included International Index of Erectile Function (IIEF) scores, Patient Health Questionnaire for Depression and Anxiety with 4 items (PHQ-4) scores, and questions regarding sexual frequency. Questions were also asked about mask-wearing habits, job loss, relationship changes, and proximity to individuals who tested positive for COVID-19.

**Main Outcome Measures:** Differences in prepandemic and pandemic male sexual function assessed by self-reported IIEF domain scores and sexual frequency

**Results:** Seventy six men completed both prepandemic and pandemic surveys with a mean age of 48.3 years. Overall, there were no differences in either overall IIEF score or any subdomain score when comparing men's pre-pandemic and pandemic survey data. There was an increase in sexual frequency during the pandemic with 45% of men reporting sex ten or more times per month during the pandemic compared to only 25% of men prior to the pandemic ( $P = .03$ ). Among the subgroup of 36 men who reported a decrease in IIEF, the decrease was an average of 3.97, and significantly associated with higher PHQ-4 depression subscale scores (1.78 vs 1.03,  $P = .02$ ).

**Conclusion:** The COVID-19 pandemic is associated with increased sexual frequency and no change in overall sexual function in males in the United States. Interventions intended to promote male sexual health during the COVID-19 pandemic should include a focus on mental health. **Chen T, Bhambhvani HP, Kasman AM, et al. The Association of the COVID-19 Pandemic on Male Sexual Function in the United States: A Survey Study of Male Cannabis Users. Sex Med 2021;9:100340.**

Copyright © 2021 The Authors. Published by Elsevier Inc. on behalf of the International Society for Sexual Medicine. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

**Key Words:** Erectile Dysfunction; IIEF; Covid-19; Pandemic; Sexual Function; Depression

## INTRODUCTION

The World Health Organization officially declared the COVID-19 viral outbreak a global pandemic in March 2020.

Received December 30, 2020. Accepted February 14, 2021.

Stanford University School of Medicine, Stanford, CA, USA

Copyright © 2021 The Authors. Published by Elsevier Inc. on behalf of the International Society for Sexual Medicine. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

<https://doi.org/10.1016/j.esxm.2021.100340>

Sex Med 2021;9:100340

The first shelter-in-place orders in the United States were soon enacted in the state of California on March 17, 2020 in an effort to limit spread of the virus, with other states following in the following weeks. While varied by state, changes to everyday life impacted Americans' school, work, and life activities drastically. As of December 8, 2020, the United States had 15 million confirmed cases, with 283,835 deaths.<sup>1</sup>

The COVID-19 pandemic has upended societal norms in the U.S. on an unprecedented scale. Research into the impacts of the pandemic's socioeconomic fallout in addition to shelter-in-place orders on health-related behaviors of the American public are still

emerging. The situation has led to unemployment and housing instability, increased rates of depression and anxiety, and ongoing uncertainty regarding future outlook and return to normalcy.<sup>2</sup> One domain that is of particular importance is male sexual function. Sexual health is defined by the WHO as “. . . a state of physical, emotional, mental and social well-being in relation to sexuality; it is not merely the absence of disease, dysfunction or infirmity.”<sup>3</sup> Sexual dysfunction can arise from stresses and disruptions in any of the interrelated psychological, biological, or social domains responsible for sexual function.

Several survey studies across the globe have sought to describe the impacts of the pandemic on male sexual behavior and have described large proportions of study participants reporting a negative impact on sexual frequency, and/or satisfaction.<sup>4–6</sup> However, significant limitations in many of these studies are cross-sectional study designs and a reliance on patient recall regarding pre-pandemic functionality.

Our research group has been prospectively collecting sexual function data on a longitudinal patient cohort.<sup>7,8</sup> A baseline survey was completed before the Spring 2020 COVID-19 shelter-in-place orders, making this a unique pre-pandemic dataset available for comparison.

The aim of the present study is to investigate whether the COVID-19 pandemic had deleterious effects on male sexual function, as measured by International Index of Erectile Function (IIEF) scores and sexual frequency responses. This study also seeks to investigate whether demographic factors such as relationship status changes, job status changes, or proximity to COVID-19 positive individuals are associated with potential changes in sexual function.

## METHODS

### Study Population

A retrospective cohort study design was employed. We leveraged a convenience sample of adults surveyed for a separate study of sexual function which began enrollment immediately prior to the onset of the COVID-19 pandemic, between October 20, 2019 and March 1, 2020 that comprised our pre-COVID dataset.<sup>8</sup> These were adults who visited a partner cannabis dispensary and were invited to complete an uncompensated, anonymous online survey on the Qualtrics (Provo, UT) platform. The partner dispensary was chosen based on its large customer base, national presence, and willingness to distribute our survey. The same group of adults was then invited to complete a follow-up survey between August 1, 2020 and October 10, 2020 within the pandemic and nationwide social distancing protocol time periods, comprising the pandemic dataset. Sexually inactive participants were excluded from analyses regarding sexual function due to established limitations of the IIEF in quantifying the sexual function of sexually inactive men.<sup>9</sup> This study was approved by the Institutional Review Board at the Stanford University School of Medicine.

## Survey Instruments

All participants were administered the same pre-pandemic and pandemic surveys. The prepandemic survey has been described in detail previously and includes questions on demographic information and past medical history, as well as the IIEF.<sup>8</sup> The IIEF is a validated questionnaire consisting of 15 questions, each scored on a Likert scale from 0 to 5, for a maximum possible score of 75 with the following subdomains: erectile function (30 points), orgasmic function (10 points), sexual desire (10 points), intercourse satisfaction (15 points), and overall satisfaction (10 points). The pandemic survey consisted of the IIEF as well as questions regarding sexual frequency, mask wearing habits, job loss during the pandemic, whether participants knew someone who tested positive, changes in relationship during the pandemic, and anxiety/depression symptoms during the pandemic. Anxiety and depression symptoms were screened for using the validated Patient Health Questionnaire for Depression and Anxiety with 4 items (PHQ-4).<sup>10</sup> The PHQ-4 is a validated screening tool for anxiety and depression consisting of two depression screening questions (PHQ-2) and two generalized anxiety disorder screening questions (GAD-2). Each question is scored on a Likert scale ranging from 0 to 3, for a total of 6 possible points for each subscore, and scores  $\geq 3$  for were considered anxiety or depression for their respective scales, as previously described.<sup>11</sup>

## Statistical Analysis

Participants were analyzed using descriptive statistics, including proportions, median, and mean  $\pm$  standard deviations. Categorical variables were analyzed by the  $\chi^2$  test or Fisher's exact test as appropriate. Normally distributed continuous variables were analyzed by Student's *t*-test, while skewed continuous variables were analyzed by the Wilcoxon rank-sum test. Prepandemic and pandemic measures of IIEF were analyzed using paired *t*-tests. Prepandemic and pandemic measures of sexual frequency were analyzed using the Wilcoxon signed-rank test for ordered categorical data.<sup>12</sup>

All data were analyzed using R v3.5.3 (R Foundation for Statistical Computing, Vienna, Austria). The significance level for all statistical tests was set at 0.05, and all tests were two-sided.

## RESULTS

Out of 520 men who completed the pre-COVID survey, 107 men completed the follow-up survey for a response rate of 20.6% and 76 sexually active respondents was included in this study. Participant demographics and clinical characteristics are summarized in [Table 1](#). Participant age  $\pm$  standard deviation was  $48.3 \pm 14.3$  years. Most men were married or in a domestic partnership ( $n = 48$ , 63.2%) and had not visited their primary care provider in the last three months ( $n = 45$ , 59.2%). 29 (38.2%) knew someone who tested positive for COVID-19 and 31 (40.8%) experienced job loss or reduction during the pandemic. Most men reported always wearing a face mask ( $n = 42$ , 55.3%). Per the PHQ-4 questionnaire, 18 men (23.7%)

**Table 1.** Baseline characteristics of participants

Characteristic	N (%)
Total	76 (100%)
Age (mean (SD))	48.33 (14.28)
Age	
<30	9 (11.8)
30–39	16 (21.1)
40–49	15 (19.7)
50–59	17 (22.4)
60+	19 (25.0)
Region	
West	28 (36.8)
International	12 (15.8)
Midwest	9 (11.8)
Northeast	10 (13.2)
South	15 (19.7)
Unknown	2 (2.6)
Relationship status	
Married/Domestic partnership	48 (63.2)
In a relationship	15 (19.7)
Single	13 (17.1)
Weight (mean (SD))	188.75 (40.32)
Height (mean (SD))	177.72 (8.68)
BMI	
Normal	23 (34.8)
Underweight	1 (1.5)
Overweight	30 (45.5)
Obese	5 (7.6)
Extremely Obese	7 (10.6)
PCP Visits in last 3 months	
0	45 (59.2)
1	24 (31.6)
2+	7 (9.2)
Know someone who tested positive	
No	47 (61.8)
Yes	29 (38.2)
Experienced job loss or reduction	
No	45 (59.2)
Yes	31 (40.8)
Mask-wearing frequency	
Always	42 (55.3)
Often	14 (18.4)
Sometimes	8 (10.5)
Rarely	5 (6.6)
Never	7 (9.2)
Relationship changed during the pandemic	
No	72 (94.7)
Yes	3 (3.9)
Unknown	1 (1.3)
PHQ-4 Anxiety	
No	58 (76.3)
Yes	18 (23.7)
PHQ-4 anxiety score (mean (SD))	1.62 (1.70)
PHQ-4 Depression	
No	63 (82.9)
Yes	13 (17.1)
PHQ-4 depression score (mean (SD))	1.34 (1.37)

**Table 2.** Comparisons of sexual frequency and function pre and during pandemic

Characteristic	Prepandemic	Pandemic	P-value
IIEF (mean (SD))			
Erectile domain	28.18 (3.10)	28.24 (2.46)	.88
Orgasm domain	9.39 (1.12)	9.63 (0.80)	.08
Sexual desire domain	8.54 (1.33)	8.46 (1.12)	.56
Intercourse satisfaction domain*	12.70 (2.12)	12.64 (1.85)	.84
Overall satisfaction domain†	8.63 (1.50)	8.57 (1.45)	.75
Overall score‡	67.32 (6.55)	67.54 (5.36)	.75
Quantity of sex in the last 4 weeks (N, %)			.03
0	10 (22.73)	7 (15.91)	
1-5	10 (22.73)	9 (20.45)	
6-9	13 (29.55)	8 (18.18)	
10+	11 (25.00)	20 (45.45)	

\*Prepandemic intercourse satisfaction score was unknown for 3 participants.

†Prepandemic overall satisfaction score was unknown for 1 participant.

‡Prepandemic overall IIEF score was unknown for 4 participants.

screened positive for anxiety, and the average anxiety subscale score was 1.62. 13 men (17.1%) screened positive for depression, and the average depression subscale score was 1.34.

Comparisons of sexual function and frequency are detailed in Table 2. Overall, there were no differences in overall IIEF score or any subdomain score in the prepandemic period vs the pandemic period. Among the 44 men with known sexual frequency, there was an increase in sexual frequency following the pandemic. For example, while 11 (25.0%) men reported 10+ sexual encounters in the past four weeks pre-pandemic, the numbers increased to 20 (45.5%) men during the pandemic ( $P = .03$ ). Within the paired sample of 76 participants, post-hoc power calculations demonstrated that our study had 99.0% power to detect a mean difference of 5.0 IIEF points with a standard deviation of 10.0, and 98.8% power to detect a difference in sexual frequency with Wilcoxon signed-rank test.

Comparisons of men whose sexual function increased vs those whose function decreased following the pandemic are detailed in Table 3. Among men whose IIEF decreased, it decreased by an average of 3.97 (SD 3.03). Among men whose IIEF increased or stayed same, it increased on average by 4.44 (SD 6.00). Participants whose function decreased during the pandemic had higher PHQ-4 depression subscale scores than those whose function increased (1.78 vs 1.03,  $P = .02$ ). Change in sexual function was not associated with anxiety, mask wearing habits, knowing someone who tested positive, relationship change, or job loss/reduction during the pandemic.

**Table 3.** Comparison of men whose function remained stable or increased in the pandemic vs those whose function decreased

Characteristic	Overall IIEF same or increased (N = 36)*	Overall IIEF decreased (N = 36)*	P-value
Change in IIEF score (mean (SD))	+4.44 (6.00)	-3.97(SD3.03)	
Age (mean (SD))	49.94 (13.98)	45.28 (14.24)	0.17
Age			0.15
<30	3 (8.3)	6 (16.7)	
30–39	8 (22.2)	8 (22.2)	
40–49	4 (11.1)	10 (27.8)	
50–59	12 (33.3)	5 (13.9)	
60+	9 (25.0)	7 (19.4)	
Region			0.60
West	13 (36.1)	14 (38.9)	
International	5 (13.9)	7 (19.4)	
Midwest	6 (16.7)	3 (8.3)	
Northeast	3 (8.3)	6 (16.7)	
South	8 (22.2)	6 (16.7)	
Unknown	1 (2.8)	0 (0.0)	
Relationship status			0.76
Married/Domestic partnership	21 (58.3)	24 (66.7)	
In a relationship	8 (22.2)	6 (16.7)	
Single	7 (19.4)	6 (16.7)	
Weight (mean (SD))	190.14 (30.19)	187.25 (46.92)	0.76
Height (mean (SD))	177.88 (9.04)	177.55 (8.51)	0.88
BMI			0.51
Normal	9 (27.3)	12 (38.7)	
Underweight	1 (3.0)	0 (0.0)	
Overweight	15 (45.5)	15 (48.4)	
Obese	4 (12.1)	1 (3.2)	
Extremely obese	4 (12.1)	3 (9.7)	
PCP visits in last 3 months			0.04
0	16 (44.4)	26 (72.2)	
1	17 (47.2)	7 (19.4)	
2+	3 (8.3)	3 (8.3)	
Know someone who tested positive			0.63
No	21 (58.3)	24 (66.7)	
Yes	15 (41.7)	12 (33.3)	
Experienced job loss or reduction			0.63
No	23 (63.9)	20 (55.6)	
Yes	13 (36.1)	16 (44.4)	
Mask-wearing frequency			0.22
Always	18 (50.0)	22 (61.1)	
Often	6 (16.7)	7 (19.4)	
Sometimes	3 (8.3)	4 (11.1)	
Rarely	5 (13.9)	0 (0.0)	
Never	4 (11.1)	3 (8.3)	
Relationship changed during the pandemic			0.51
No	34 (94.4)	34 (94.4)	
Yes	2 (5.6)	1 (2.8)	
Unknown	0 (0.0)	1 (2.8)	
PHQ-4 anxiety score (mean (SD))	1.47 (1.65)	1.94 (1.74)	0.24
PHQ-4 depression score (mean (SD))	1.03 (1.08)	1.78 (1.55)	0.02

\*4 men whose pre-pandemic overall IIEF score was unknown were excluded

## DISCUSSION

This study is the first to examine sexual activity and function during the COVID-19 pandemic among the United States male population using available prepandemic survey respondent data for comparison. While no changes were seen in male sexual function as assessed by IIEF, the current report identified an increase in sexual frequency during the COVID pandemic. Interestingly, factors related to COVID caused stressors such as proximity to others who have tested positive for COVID-19, job losses, or relationship changes did not have an impact on sexual function. However, self-reported depression was associated with decreased sexual function.

Several international studies have attempted to characterize the impacts of the COVID-19 pandemic on their native populations' sexual function and have reported heterogeneous results. An early study from China in April 2020 using a single-survey convenience sample of 270 men and 189 women had 40% of men indicating a decrease in sexual frequency and 32% decreasing sexual satisfaction.<sup>4</sup> A cross-national study across Bangladesh, India, and Nepal of 93 men and 26 women had no significant change in weekly sexual intercourse frequency, with a 55% majority of respondents indicating that COVID-19 lockdowns did not affect sexual life.<sup>13</sup> Jacob et al's March 2020 United Kingdom study of 868 individuals, 320 of whom were male, reported a mean of 3.23 sexual activity episodes per week for the male cohort, but their definition included solo masturbation and nonpenetrative intercourse.<sup>6</sup> Cocci et al's Italian survey of 1515 male and female participants reported increased sexual desire, no change in frequency of sexual intercourse, but decreased sexual satisfaction.<sup>5</sup> These findings should be considered only in context of their respective nationalities as international experiences with the COVID-19 pandemic are unique both in disease prevalence and government response. Combined with the fact that culture and attitudes surrounding sex vary greatly between countries,<sup>14</sup> the generalizability of non-U.S. studies to the American male population is extremely limited.

Domestically, very few studies have examined the temporal relationship between the COVID-19 pandemic and male sexual response. A study from the Kinsey Institute of 1,559 adults, 1144 (73.4%) of whom were from the United States, and 23.4% of whom were male, 40% of reported sex life declined regardless of gender identity.<sup>15</sup> Hensel et al's cross-sectional survey of approximately 1,000 male and female U.S. adults in April 2020 shows nearly half of adults reporting a decrease in sexual behaviors, and that decreased partnered sexual behaviors were associated with enacting more COVID-19 protective behaviors and depressive symptoms.<sup>16</sup> Of note, the study is still in preprint and has not yet completed peer-review.

While the studies above have examined the associations between male sexual function and the COVID pandemic, they did not use validated survey instruments such as the IIEF or PHQ-4, and they were retrospective with susceptibility to recall

bias. A defining feature of this study is its ability to compare respondents' pandemic answers with matched responses from their prepandemic surveys, and its use of validated survey instruments. Our definition of sexual activity is also narrower than other studies and asks about partnered intercourse. Our finding of increased sexual frequency with maintained erectile function during the COVID period are consistent with some of the other study results that also found no significant detriment as a result of the pandemic response. This could be explained by the fact that 63 (82.9%) men in the study were in a relationship prepandemic, and that 94.7% continued to be partnered in the pandemic period. Fewer outlets for social recreation and fewer options for interpersonal interaction may have enhanced bonding opportunities between couples. The current report suggests that sexual frequency increased but sexual function or satisfaction did not change. Studies where respondents indicated a worsening of sexual function or frequency during the COVID pandemic could be potentially explained by recall bias confounding individual estimation pre-pandemic sexual function.

Depression symptoms in the United States have been estimated to be more than 3-fold higher during the COVID-19 pandemic than in the period of time before it.<sup>17</sup> Depression is bidirectionally associated with erectile dysfunction: depressed mood and associated antidepressant medications may cause erectile dysfunction, while erectile dysfunction may lead to or exacerbate depressive symptoms.<sup>18</sup> Our subanalysis of men who did report a decrease in erectile function during the pandemic identified a significantly higher PHQ-4 depression subscale score compared to men with no change in their IIEF score. Depression is often undertreated.<sup>19</sup> This study's findings highlight the importance of supporting mental health in men as an integral component of supporting sexual health. While our survey looked at some potential contributors of depressive disorder such as relationship and employment status, there are a multitude of stressors that may not have been captured (eg, family job loss, decrease in physical activity due to gym closures, home schooling, or lack of social interaction due to local social distancing guidelines).

This is the first study to investigate sexual function and activity during the United States COVID-19 social distancing time period utilizing matched prepandemic respondent sexual function data. However, the study findings must be interpreted in light of its limitations. Self-reported answers are inherently susceptible to recall bias in any survey-based research study even when validated instruments are utilized.<sup>20</sup> The low response rate, and pre-existence of other studies reporting decreased sexual function during the COVID-19 pandemic may be potential sources of bias. Our reported findings were significant within the context of the cohort studied, but the limited number of patients included ( $n = 76$ ) limit the generalizability of findings to the greater U.S. male population. Also, while the effects of cannabis use on male sexual function are not clearly defined,<sup>21</sup> the



potential difference between cannabis users and nonusers is another limitation of the study methodology. To limit survey-length and increase survey response rates, relevant questions such as a more detailed sexual history, or use of erectogenic medications, were not included. Finally, the United States' population's experience with the pandemic is fluid, variable by region, and susceptible to change. The results described in this study apply to a sample of the population experiencing the pandemic in the Fall of 2020, and ongoing developments such as worsening or improving disease severity and prevalence, COVID-19 treatment/vaccine development and implementation, additional economic stimulus or lack thereof, may all affect how individuals' social and personal lives are affected, and thereby their sexual function. Future studies aiming to provide a deeper understanding of COVID-19 effects on male sexual function will require a larger population with potential for regional subanalyses.

In conclusion, in this sample of United States males, the COVID-19 pandemic is associated with increased sexual frequency and no change in overall sexual function. However, for men experiencing depression as a result of the pandemic, there was a reported decline in sexual function. Therefore, any interventions intended to promote male sexual health during the COVID-19 pandemic should include a focus on mental health.

**Corresponding Author:** Tony Chen, MD, Stanford University School of Medicine, 300 Pasteur Drive Grant S285, Stanford, CA, 94305-6104 USA. Tel: 626-673-5838; E-mail: [chentony@stanford.edu](mailto:chentony@stanford.edu)

*Conflict of Interest:* The authors report no conflicts of interest.

*Funding:* None.

## STATEMENT OF AUTHORSHIP

Tony Chen: Conceptualization, Data Curation, Investigation, Methodology, Project Administration, Software, Writing-Original Draft, Writing-Reviewing and Editing; Hriday P. Bhambhani: Data Curation, Formal Analysis, Methodology, Software, Writing-Original Draft, Writing-Review and Editing; Alex M. Kasman: Data Curation, Methodology, Resources, Software, Writing-Reviewing and Editing; Michael L. Eisenberg: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Supervision, Writing-Reviewing and Editing.

## REFERENCES

1. Anon: Coronavirus in the U.S.: Latest map and case count. Available at: <https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html>. Accessed December 8, 2020.
2. Blustein DL, Guarino PA. Work and unemployment in the time of COVID-19: the existential experience of loss and fear. *J Humanist Psychol.* 2020;60:702–709. Available at: <http://journals.sagepub.com/doi/10.1177/0022167820934229>. Accessed March 24, 2021.
3. Anon: Sexual health. Available at: [https://www.who.int/reproductivehealth/topics/sexual\\_health/sh\\_definitions/en/](https://www.who.int/reproductivehealth/topics/sexual_health/sh_definitions/en/). Accessed August 12, 2020.
4. Li W, Li G, Xin C, et al. Challenges in the practice of sexual medicine in the time of COVID-19 in China. *J Sex Med.* 2020;17:1225–1228. Available at: <https://linkinghub.elsevier.com/retrieve/pii/S174360952030597X>. Accessed March 24, 2021.
5. Cocci A, Giunti D, Tonioni C, et al. Love at the time of the Covid-19 pandemic: preliminary results of an online survey conducted during the quarantine in Italy. *Int J Impot Res* 2020;32:556–557. Available at: <http://www.nature.com/articles/s41443-020-0305-x>. Accessed March 24, 2021.
6. Jacob L, Smith L, Butler L, et al. Challenges in the practice of sexual medicine in the time of COVID-19 in the United Kingdom. *J Sex Med.* 2020;17:1229–1236. Available at: <https://linkinghub.elsevier.com/retrieve/pii/S1743609520306081>. Accessed March 24, 2021.
7. Kasman AM, Bhambhani HP, Wilson-King G, et al. Assessment of the association of cannabis on female sexual function with the female sexual function index. *Sex Med.* 2020;8:699–708. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/32713800>. Accessed March 24, 2021.
8. Bhambhani HP, Kasman AM, Wilson-King G, et al. A survey exploring the relationship between cannabis use characteristics and sexual function in men. *Sex Med.* 2020;8:436–445. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/32561331>. Accessed March 24, 2021.
9. Rynja S, Bosch R, Kok E, et al. IIEF-15: unsuitable for assessing erectile function of young men? *J Sex Med.* 2010;7:2825–2830. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/20487234>. Accessed March 24, 2021.
10. Kroenke K, Spitzer RL, Williams JBW, et al: An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics* 50: 613–21. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19996233>. Accessed March 24, 2021.
11. Löwe B, Wahl I, Rose M, et al. A 4-item measure of depression and anxiety: validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. *J Affect Disord* 2010;122:86–95. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19616305>. Accessed March 24, 2021.
12. Whitley E, Ball J. Statistics review 6: Nonparametric methods. *Crit Care* 2002;6:509–513. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/12493072>. Accessed March 24, 2021.
13. Arafat SMY, Alradie-Mohamed A, Kar SK, et al. Does COVID-19 pandemic affect sexual behaviour? A cross-sectional, cross-national online survey. *Psychiatry Res* 2020;289:113050 Available at: <https://linkinghub.elsevier.com/retrieve/pii/S0165178120309781>. Accessed March 24, 2021.
14. Mackay J. Global sex: Sexuality and sexual practices around the world. *Sex Relatsh Ther.* 2001;16:71–82. Available at: <https://>

- [www.tandfonline.com/doi/full/10.1080/14681990123347](https://www.tandfonline.com/doi/full/10.1080/14681990123347). Accessed March 24, 2021.
15. Lehmiller JJ, Garcia JR, Gesselman AN, et al. Less sex, but more sexual diversity: changes in sexual behavior during the COVID-19 coronavirus pandemic. *Leis Sci*. 2020;1-10 Available at: <https://www.tandfonline.com/doi/full/10.1080/01490400.2020.1774016> . Accessed March 24, 2021.
  16. Hensel DJ, Rosenberg M, Luetke M, et al. Changes in solo and partnered sexual behaviors during the COVID-19 pandemic: findings from a U.S. probability survey. *medRxiv* 2020.06.09.20125609. Available at: <http://medrxiv.org/content/early/2020/06/12/2020.06.09.20125609.abstract> . Accessed March 24, 2021.
  17. Ettman CK, Abdalla SM, Cohen GH, et al. Prevalence of depression symptoms in US adults before and during the COVID-19 pandemic. *JAMA Network* 2020;3:e2019686. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/32876685>. Accessed March 24, 2021.
  18. Shiri R, Koskimäki J, Tammela TLJ, et al. Bidirectional relationship between depression and erectile dysfunction. *J Urol* 2007;177:669-673. Available at: <http://www.jurology.com/doi/10.1016/j.juro.2006.09.030>. Accessed March 24, 2021.
  19. Bijl RV, de Graaf R, Hiripi E, et al. The prevalence of treated and untreated mental disorders in five countries. *Health Aff* 2003;22:122-133. Available at: <http://www.healthaffairs.org/doi/10.1377/hlthaff.22.3.122>. Accessed March 24, 2021.
  20. Chen T, Eisenberg ML. Challenges in Survey-Based Research. *J Sex Med*. 2020. Available at: <https://linkinghub.elsevier.com/retrieve/pii/S1743609520308833>. Accessed March 24, 2021.
  21. Shamloul R, Bella AJ. Impact of cannabis use on male sexual health. *J Sex Med*. 2011;8:971-975. Available at: <https://linkinghub.elsevier.com/retrieve/pii/S1743609515334901>. Accessed March 24, 2021.