

# Characteristics of Yoga Users: Results of a National Survey

Gurjeet S. Birdee, MD, MPH<sup>1,2</sup>, Anna T. Legedza, ScD<sup>4</sup>, Robert B. Saper, MD, MPH<sup>3</sup>, Suzanne M. Bertisch, MD, MPH<sup>1,2</sup>, David M. Eisenberg, MD<sup>1</sup>, and Russell S. Phillips, MD<sup>1,2</sup>

<sup>1</sup>Division for Research and Education in Complementary and Integrative Medical Therapies, Harvard Medical School, Boston, MA, USA; <sup>2</sup>Division of General Medicine and Primary Care, Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, USA; <sup>3</sup>Department of Family Medicine, Boston Medical Center, Boston University School of Medicine, Boston, MA, USA; <sup>4</sup>Vertex Pharmaceuticals, Cambridge, MA, USA.

**BACKGROUND:** There are limited data on the characteristics of yoga users in the U.S.

**OBJECTIVE:** To characterize yoga users, medical reasons for use, perceptions of helpfulness, and disclosure of use to medical professionals.

**METHODS:** Utilizing cross-sectional survey data from the 2002 National Health Interview Survey (NHIS) Alternative Medicine Supplement ( $n=31044$ ), we examined correlates of yoga use for health. The estimated prevalence from 2002 NHIS of yoga for health was 5.1% corresponding to over 10 million adults.

**RESULTS:** In 2002, yoga users were predominately Caucasian (85%) and female (76%) with a mean age of 39.5 years. Compared to non-yoga users, yoga users were more likely female (OR 3.76, 95% CI 3.11–4.33); less likely black than white (OR 0.65, 95% CI 0.53–0.80); tended to be younger; and more likely college educated (OR 2.70, 95% CI 2.37–3.08). Musculoskeletal conditions (OR 1.61, 95% CI 1.42–1.83), mental health conditions (OR 1.43, 95% CI 1.22–1.67), severe sprains in the last 12 months (OR 1.49, 95% CI 1.22–1.81), and asthma (OR 1.27, 95% CI 1.05–1.54) were independently associated with higher yoga use, while hypertension (OR 0.78, 95% CI 0.64–0.95) and chronic obstructive lung disease (OR 0.69, 95% CI 0.48–1.00) were associated with lower use. Yoga was most commonly used to treat musculoskeletal or mental health conditions, and most users reported yoga to be helpful for these conditions. A majority of yoga users (61%) felt yoga was important in maintaining health, though only 25% disclosed yoga practice to their medical professional.

**CONCLUSIONS:** We found that yoga users are more likely to be white, female, young and college educated. Yoga users report benefit for musculoskeletal conditions and mental health, indicating that further research on the efficacy of yoga for the treatment and/or prevention of these conditions is warranted.

**KEY WORDS:** yoga; complementary and alternative medicine (CAM); behavioral medicine.

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## INTRODUCTION

Yoga represents a body of practices with an ancient history originally derived from India. In Sanskrit, the word yoga derives from “yug” meaning to yoke, referring to the discipline of aligning the mind and body for spiritual goals.<sup>1</sup> Yoga has also been practiced for potential health benefits, with increasing attention in popular culture to prevent illness and treat disease. The definition of yoga encompasses a variety of practices which may include postures (*asanas*), breathing exercises (*pranayama*), meditation, mantras, lifestyle changes (e.g., diet, sleep, hygiene), spiritual beliefs, and/or rituals. Different yoga styles utilize and/or emphasize different practices reflecting the varied practice of yoga in India and the United States. The popularity of yoga is evident with an estimated prevalence varying from 3.7% in 1997<sup>2</sup> to 5.1% in 2002, corresponding to 10.4 million adults in the U.S.<sup>3</sup>

Despite the popularity of yoga use in the United States, little is known about the characteristics of yoga users. Utilizing a nationally conducted survey from 1997, Saper et al. characterized yoga users as mostly well-educated, younger females with an independent association with lung disease.<sup>2</sup> This prior study included only 143 respondents who used yoga at least once in their lifetime, and the sample size was insufficient to assess reasons for yoga use and perceptions of helpfulness. We have limited knowledge about the trends of yoga use among individuals with medical conditions, or the medical conditions yoga is used to treat. To characterize yoga users for health in the United States, we report our analysis of yoga users derived from a nationally representative sample, the 2002 National Health Interview Survey (NHIS).

## METHODS

### Data Source

We utilized data from the 2002 NHIS for analysis. The National Center for Health Statistics and Centers for Disease Prevention and Control conducts NHIS, which provides health information of the civilian, non-institutionalized, household population of the United States. The multistage stratified sampling design ran-

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domly selected households for surveying. Respondents receive the survey face-to-face in English and/or Spanish. NHIS consists of a basic module with the Family Core, the Sample Adult Core, Sample Child Core, and in 2002 an Alternative Medicine Supplement. The final adult sample included 31,044 respondents with an overall response rate of 74%.

The Family Core collected information on sociodemographics, health status, insurance status, and use/access of health care for each family member. The Sample Adult Core collected data on medical conditions and utilization of health care from a randomly selected adult of the household. In 2002, this adult also received the Alternative Medicine Supplement that obtained data about the use of 21 complementary and alternative therapies including yoga.

Within the Alternative Medicine Supplement, the survey asked a series of questions regarding mind body practices including yoga: *Have you ever practiced any of the following types of exercise for your own health or treatment?* (yoga, tai chi, or qi gong) Prior yoga practice prompted a question regarding current practice: *During the past 12 months, did you practice yoga?* For the following series of questions we restricted our analysis to those that practiced exclusively yoga and not tai chi or qi gong in the last 12 months. Those respondents that reported yoga practice in the last 12 months were queried about use and helpfulness for specific medical conditions: (1) *Did you practice yoga... to treat a specific health problem or condition?* (2) *For what health problems or conditions did you use yoga...?* (3) *How much do you think yoga... helped your (medical condition)? Would you say a great deal, some, only a little, or not at all?* Those who used yoga for specific conditions were also asked if "...A conventional medical professional suggested...to try yoga...". The use of yoga for general health maintenance was also ascertained: *During the past 12 months, how important was your use of yoga... in maintaining your health and well-being? Would you say very important, somewhat important, slightly important, or not at all important?* Lastly, respondents were asked about disclosure of yoga practice to medical professionals: *During the past 12 months, did you let any of these conventional medical professionals know about your use of yoga...?*

## Statistical Analysis

We identified the primary outcome for the study as yoga use within the last 12 months. We examined potential correlates of yoga use including sociodemographic characteristics, health behaviors, health status, weight, and medical conditions. We excluded categories containing fewer than 30 respondents. Among sociodemographic factors, we included age categories (18–29, 30–39, 40–49, 50–64, ≥65), sex, race (white, black, other), household income (≤\$19,999, \$20,000–34,999, \$35,000–64,999, ≥\$65,000), region (Northeast, South, Midwest, West), education (less than college, any college or more) and insurance status (insured, uninsured). We explored other important health correlates utilizing data on current smoking status (smokers, non-smokers), current alcohol intake (abstainers, light, moderate, heavy), health status (good, very good, or excellent versus poor or fair) and body mass index (<18.5, 18.5–24.9, 25–29.9, ≥30 kg/m<sup>2</sup>). For analysis, we collapsed the most common medical conditions reported into multiple categories: (1) musculoskeletal (arthritis, rheumatoid arthritis, gout, lupus, fibromyalgia, joint pain); (2) severe sprains in the last year; (3)

mental health (depression, anxiety); (4) asthma; (5) chronic obstructive pulmonary disease (chronic bronchitis, emphysema); (6) cardiovascular (myocardial infarction, coronary heart disease, angina, congestive heart failure, other heart condition); (7) hypertension; and (8) neurologic (seizure, stroke, Parkinson's disease, multiple sclerosis, neuropathy). Severe sprains was categorized separately from musculoskeletal conditions to identify subjects with acute musculoskeletal injuries.

The NHIS has a complex sampling survey design with stratification, clustering, and oversampling of some subpopulations, requiring weighted analyses. We utilized SAS-callable SUDAAN version 8.1 (Research Triangle Institute, Research Triangle Park, NC.) for all analyses to produce weighted national estimates. Using chi square tests of independence, we compared the sociodemographic characteristics, health behaviors, health status, weight, and medical conditions of yoga users versus non-yoga users. We identified independent factors associated with yoga using multivariable logistic regression analysis. Among the candidate factors considered for the initial regression model, we only selected factors associated with yoga use at a *p*-value of ≤0.20 in univariate analysis. We utilized a backward elimination strategy with a *p*-value of ≤0.05 to identify significant correlates of yoga use. The final model included factors independently associated with yoga use (Wald statistic of *p*-value of ≤0.05) while controlling for sociodemographic characteristics, health behaviors, health status, and body mass index (BMI). We used descriptive statistics to report the importance of yoga use for health maintenance. We also identified frequency and helpfulness of yoga use for specific medical conditions as categorized above: (1) musculoskeletal; (2) sprains in the last year; (3) mental health, (4) asthma; (5) chronic obstructive lung disease (COPD); (6) cardiovascular; (7) hypertension; and (8) neurologic. We categorized helpfulness into two categories: (1) helpful (great deal or some); and (2) not helpful (little or none). We examined the frequency that health care professionals recommended yoga for specific medical conditions. Lastly we report the rates of disclosure for yoga use to health care professionals. This study was reviewed by our institutional review board and considered to be exempt from full board review.

## RESULTS

Table 1 displays the selected characteristics of yoga and non-yoga users in the United States in 2002. As previously reported, 5.1% of the U.S. population used yoga for health in the last 12 months (*n*=1593) representing 10.4 million individuals.<sup>3</sup> Among yoga users the mean age was 39.5. We found statistically significant differences between yoga users and non-yoga users by sociodemographic characteristics. Notably, yoga use was higher among females and white individuals and less common among those 65 or older. Yoga use was more common among those who lived in the Northeast or Midwest. Yoga use was also more common among those with a higher education. Yoga users had lower smoking rates than non-yoga users, but higher alcohol consumption and better health status. The three most common medical conditions reported by yoga users included musculoskeletal conditions, mental health conditions, and asthma. The prevalence of yoga use was highest among those with severe sprains, asthma, mental health conditions, and musculoskeletal conditions; while yoga

**Table 1. Characteristics of Study Population by Yoga Use for Health (%)<sup>\*</sup>**

Characteristics	Yoga users (n=1593) % <sup>*</sup>	Non-yoga users (n=29948) % <sup>*</sup>	Prevalence of yoga use by characteristic %
<b>Demographics</b>			
Age (years) <sup>†</sup>			
Less than 30	26	22	6.1
30 to 39	27	19	6.9
40 to 49	23	21	5.4
50 to 64	20	21	4.7
65 or greater	4	17	1.2
Gender <sup>†</sup>			
Male	24	49	2.5
Female	76	51	7.4
Race <sup>†</sup>			
White	84	80	5.3
African American	6	12	2.5
Other	10	8	12.5
Income <sup>†</sup>			
≤\$19,999	12	21	3.0
\$20,000–34,999	15	20	3.8
\$35,000–64,999	25	27	4.7
≥\$65,000	48	32	7.3
Region <sup>†</sup>			
West	26	19	6.8
Midwest	27	38	3.7
South	24	24	5.0
Northeast	23	19	6.0
Education <sup>†</sup>			
Less than college	50	77	3.4
College	50	23	10.5
Insurance <sup>†</sup>			
Insured	88	84	5.3
Uninsured	12	16	3.9
<b>Health behaviors</b>			
Smoking <sup>†</sup>			
Non-smoking	83	78	5.4
Smoking	17	22	3.9
Alcohol <sup>†</sup>			
Abstainers	18	37	2.5
Light	56	41	6.8
Moderate	18	14	6.4
Heavy	8	8	7.0
Health status <sup>†</sup>			
Excellent, very good, or good	95	87	5.5
Fair or poor	5	13	1.9
BMI (kg/m <sup>2</sup> ) <sup>†</sup>			
<18.5 <sup>‡</sup>	N/A	N/A	N/A
18.5–24.9	55	37	7.5
25–29.9	29	34	4.4
≥30	10	23	2.3
<b>Medical conditions</b>			
Severe sprain <sup>†</sup>	13	8	8.2
Asthma <sup>†</sup>	14	10	6.7
Mental health <sup>†</sup>	20	16	6.3
Musculoskeletal <sup>†</sup>	55	48	5.7
Neurologic <sup>†</sup>	3	5	3.5
COPD <sup>†</sup>	4	6	3.3
Cardiovascular <sup>†</sup>	7	11	3.1
Hypertension <sup>†</sup>	13	25	2.7

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease.

<sup>\*</sup> Percents are weighted to reflect national estimates

<sup>†</sup> p ≤ .005 for differences between yoga and non-yoga users

<sup>‡</sup> Due to small numbers, BMI scores < 18.5 not reported

use was lowest among those with neurologic conditions, COPD, cardiovascular conditions, and hypertension.

In our multivariable regression analysis (see Table 2), several sociodemographic factors were independently associated with yoga use in the last 12 months. Use was inversely associated with age. We also found that yoga users were less likely to be male or black; more likely to live in the West than the Midwest or South; and had more years of education. Income and insurance status were not statistically significant correlates of yoga use. Regarding health behaviors, yoga users were less likely to smoke and more likely to drink alcohol. Yoga users were more likely to report a higher health status. Fewer yoga users were obese.

**Table 2. Factors Associated Independently with Yoga Use for Health among Adults in the US<sup>\*</sup>**

	Adjusted odds ratio (95% confidence intervals)
<b>Demographics</b>	
Age (years)	
Less than 30	1.00 [Reference]
30 to 39	0.97 [0.81–1.16]
40 to 49	0.80 [0.66–0.97]
50 to 64	0.69 [0.57–0.84]
65 or greater	0.23 [0.17–0.31]
Sex	
Male	1.00 [Reference]
Female	3.71 [3.14–4.38]
Race	
White	1.00 [Reference]
Black/African American	0.66 [0.54–0.81]
Other	1.14 [0.87–1.50]
Region	
West	1.00 [Reference]
Midwest	0.73 [0.61–0.88]
South	0.64 [0.53–0.76]
Northeast	0.86 [0.70–1.05]
Education	
Less than college	1.00 [Reference]
Any college or more	2.64 [2.32–3.01]
<b>Health behaviors</b>	
Smoking	
Non-smoker	1.00 [Reference]
Smoker	0.69 [0.58–0.81]
Alcohol	
Abstainer	1.00 [Reference]
Light	1.99 [1.69–2.35]
Moderate	2.62 [2.13–3.23]
Heavy	2.28 [1.74–2.99]
Health status	
Fair or poor	1.00 [Reference]
Excellent, very good, or good	1.65 [1.24–2.20]
BMI (kg/m <sup>2</sup> )	
18.5–24.9	1.00 [Reference]
Less than 18.5 <sup>†</sup>	N/A
25–29.9	0.84 [0.72–0.98]
Greater than 29.9	0.40 [0.33–0.48]
<b>Health conditions</b>	
Musculoskeletal	1.56 [1.37–1.78]
Mental health	1.49 [1.26–1.76]
Severe sprain	1.54 [1.26–1.87]
Asthma	1.33 [1.09–1.63]
COPD	0.69 [0.48–1.00]
Hypertension	0.80 [0.66–0.98]

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease.

<sup>\*</sup> Odds ratios have been adjusted for sociodemographic characteristics, health behaviors, BMI, and medical conditions with a p-value of ≤0.05

<sup>†</sup> Due to small numbers, BMI scores < 18.5 not reported

We found that mental health conditions, musculoskeletal conditions, severe sprains in the last year, and asthma were independently associated with yoga use after controlling for sociodemographic factors, health behaviors, health status, and weight. Hypertension and COPD had a negative association with yoga use in our final regression model. Our analysis demonstrated no statistically significant correlation between yoga use and neurologic or cardiovascular conditions.

Most yoga users (58%,  $n=1381$ ) felt that yoga was an important part of maintaining their health and well-being. A smaller percentage of yoga users reported using yoga to treat specific medical conditions (16%). Among medical conditions, 10.5% and 3.3% of yoga users reported using yoga to specifically treat musculoskeletal and mental health conditions, respectively. A majority of these yoga users reported yoga as helpful for their mental health (83%) and musculoskeletal condition (76%). The frequencies of other medical conditions (severe sprains, asthma, hypertension, COPD, neurologic) among yoga users were insufficient for analysis. Of those that used yoga for specific conditions, 22% reported that their conventional medical professional recommended yoga use. Only 25% of all yoga users disclosed their practice for health to their medical professional.

## DISCUSSION

The results of the 2002 NHIS survey suggest that 5% of civilian non-institutionalized U.S. adults in 2002 used yoga for health, reflecting over 10 million yoga users.<sup>3</sup> We found substantial differences in the use of yoga for health; users were more likely to be young, female, college educated, and white. While yoga users smoked less, they were more likely to drink alcohol. Yoga users tended to have a better health status and were more likely to be normal weight rather than obese. Yoga users were more likely to have mental health conditions (depression and anxiety), musculoskeletal conditions (arthritis, rheumatoid arthritis, gout, lupus, fibromyalgia, and joint pain), severe sprains and asthma, but less likely to have hypertension and COPD. A majority of yoga users reported yoga as important for maintaining their health, while a smaller number used yoga to treat specific conditions. Of those yoga users that practiced yoga for specific medical conditions, most used yoga for mental health and musculoskeletal conditions. Approximately 3 of 4 yoga users felt that yoga helped these two conditions. While most yoga users did not disclose their use to a medical professional, more than 1 in 5 reported that a medical professional recommended yoga for a specific condition.

Our results are similar to a previous report on yoga users based on a smaller nationally representative survey conducted in 1998.<sup>2</sup> Although the methodologies of the two surveys differed, a higher prevalence of use is reported in 2002 of 5.1%<sup>3</sup> compared to a rate of 3.7%<sup>2</sup> in 1998. As with our analysis, yoga users in 1998 consisted mostly of well-educated, younger females. This prior study was limited by a sample size with 143 respondents who used yoga at least once in their lifetime, and 76 who used yoga within the last 12 months. Of those that used yoga at least once in a lifetime, lung disease was the only medical condition independently associated with increased yoga use. The results of our analysis based on a larger sample size of yoga users ( $n=1593$ ), found asthma positively and COPD negatively associated with yoga use. A

recent study has also identified that yoga users are less likely to be obese.<sup>4</sup>

A majority of yoga users identified yoga as being helpful for health maintenance. We also found that yoga users tended to report a higher health status as compared to non-yoga users. This suggests that yoga is being used mostly for health maintenance among healthier individuals. In mainstream media and culture, yoga is identified as a conventional form of exercise.<sup>5</sup> As a form of aerobic exercise measured by metabolic equivalents, many forms of yoga may be categorized as low aerobic intensity.<sup>6,7</sup> In this regard, yoga may have a potential role in patients with limited aerobic capacity or limitations that restrict use of conventional exercise. Given a growing prevalence of use and high perceived benefit for general well being, the potential mechanism and application of yoga for health requires rigorous evaluation.

Our findings suggest that patients with certain medical conditions, such as musculoskeletal, mental health, severe sprains, or asthma, are more likely to use yoga than the general population. Among yoga users, 16% reported using yoga to specifically treat musculoskeletal and mental conditions with yoga. Recently there has been increasing research on the use of yoga for specific medical conditions including those related to the musculoskeletal, psychiatric, cardiovascular, and respiratory system.<sup>8</sup> However, many studies are methodologically flawed with absence of control groups, varying yoga interventions, poor definition of medical conditions and/or lack of allocation concealment.

Yoga has been studied for its efficacy in the treatment of musculoskeletal conditions including randomized controlled trials demonstrating potential benefit for lower back pain.<sup>9-12</sup> A recent practice guideline, published jointly by the American College of Physicians and the American Pain Society, suggests yoga as a therapeutic option for patients with lower back pain that does not improve with self-care options.<sup>13</sup> Yoga has shown potential benefit for other musculoskeletal conditions in the following studies: a randomized controlled trial (RCT) among patients with for osteoarthritis of the hand;<sup>14</sup> an uncontrolled pilot among patients withosteoarthritis of the knee;<sup>15</sup> a controlled trial for hand grip among patients with rheumatoid arthritis;<sup>16</sup> an uncontrolled pilot for hyperkyphosis;<sup>17</sup> and a RCT among patients with carpal tunnel syndrome.<sup>18</sup>

In addition, multiple randomized controlled trials have evaluated yoga for depression.<sup>19-22</sup> All of these studies suggest benefit, but conclusions are limited based on heterogeneity of yoga interventions, depression severity, and subjects' age, along with other methodological issues. Yoga may be beneficial for various anxiety disorders, especially obsessive compulsive disorders; however results are also preliminary and limited for similar reasons.<sup>23</sup>

Results of randomized controlled studies utilizing yoga for patients with asthma and COPD have been mixed. For asthma, studies have used various yoga interventions, including postures, meditation, and/or breathing exercises.<sup>24-30</sup> Comparison of these studies is difficult because individual studies used different yoga protocols and clinical outcomes. A few studies suggest benefit of yoga use for patients with COPD.<sup>31-33</sup>

The cardiovascular yoga literature is growing with potential applications for patients with coronary artery disease, heart failure, and hypertension.<sup>34-36</sup> Among subjects with hypertension, yoga interventions have demonstrated a benefit in seven of eight studies<sup>37-43</sup> with a single negative study.<sup>44</sup> We found a

negative association between yoga use and hypertension. This may suggest that yoga use lowers blood pressure. Alternatively, yoga users may be a select population less likely to have hypertension.

The decision to practice yoga for potential health benefits should be weighed against adverse effects. However, there are limited data on the potential adverse effects of yoga. Clinical trials of yoga lack adverse event reporting and few case reports are scattered through the literature.<sup>45-52</sup> We report a positive association of musculoskeletal conditions and severe sprains with yoga use that may represent injuries secondary to yoga. Alternatively adults who practice yoga may be more prone to musculoskeletal conditions and/or sprains. Another possibility is that individuals who have these conditions utilize yoga for treatment or to prevent re-occurrence. We report a low disclosure rate of yoga use to medical physicians (25%). This parallels other complementary medical therapies (23-37%).<sup>53-56</sup> In light of low disclosure rates and current literature, the actual frequencies or populations at risk for adverse events from yoga use remain unknown.

There are limitations to our study. Respondents self-reported all information; therefore the data may be subject to recall bias. Yoga users were defined by yoga use in the last 12 months, but the frequency of yoga use during this time period is unknown. Respondents were initially asked if they used yoga for health. There may be individuals who use yoga for personal or spiritual growth, rather than health, such that actual prevalence of yoga use may be higher. Given the cross-sectional survey design of NHIS, we cannot identify causal relationships between characteristics of yoga users and yoga use. For example, the lower likelihood of hypertension among yoga users does not necessarily mean that yoga lowers blood pressure. Lastly, our analysis from data collected in 2002 may not reflect current trends and characteristics of yoga users. Despite these limitations, this report represents the largest national survey of yoga use in the United States, and is the most detailed national portrayal of yoga use to date.

With ancient roots in India, yoga has evolved over two millennia from a discipline of mind and body for spiritual goals to a global practice aimed at maintaining physical health and psychological well being.<sup>57</sup> Yoga, as a mind body practice, emphasizes mental discipline as much as physical, both synergistically intended to help with personal transformation. How this transformation may translate into health benefits has yet to be determined. We identified differences in yoga use among individuals based on demographic characteristics and health conditions. Future research should identify which populations are most likely to benefit from yoga practice. Research is necessary to determine which types of yoga are most beneficial for specific conditions, especially specific musculoskeletal and mental health conditions. Only more rigorous randomized clinical trials with large sample sizes will elucidate the potential therapeutic and preventive applications of yoga. With more than 10 million yoga users in the U.S., this line of inquiry will likely be of increasing interest to the medical community in years to come.

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**Corresponding Author:** Gurjeet S. Birdee, MD, MPH; Division for Research and Education in Complementary and Integrative Medical Therapies, Harvard Medical School, 401 Park Drive, Suite 22-A West, Boston, MA 02215, USA (e-mail: Gurjeet\_Birdee@hms.harvard.edu).

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