

1 **Prevalence, patterns, and predictors of yoga use: Results of a US nationally**
2 **representative survey**

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34

35 **Abstract**

36 Introduction

37 The purpose of this study was to investigate the prevalence, patterns, and predictors of yoga
38 use in the US general population.

39 Methods

40 Using cross-sectional data from the 2012 National Health Interview Survey (NHIS) Family
41 Core, Sample Adult Core, and Adult Complementary and Alternative Medicine
42 questionnaires (n=34,525), weighted frequencies for lifetime and 12-month prevalence of
43 yoga use; and for patterns of yoga practice were analyzed. Using logistic regression analyses,
44 sociodemographic predictors of lifetime yoga use were analyzed. Analyzes were conducted in
45 2015.

46 Results

47 Lifetime and 12-month prevalence of yoga use were 13.2% and 8.9%, respectively. Compared
48 to non-practitioners, lifetime yoga practitioners were more likely female; younger; non-
49 Hispanic White; college educated; higher earners; living in the West; and of better health
50 status. Among those who had practiced in the past 12 months, 51.2% attended yoga classes;
51 89.9% used breathing exercises; and 54.9% used meditation. Yoga was practiced for general
52 wellness or disease prevention (78.4%), to improve energy (66.1%), or to improve immune
53 function (49.7%). Back pain (19.7%), stress (6.4%) and arthritis (6.4%) were the main
54 specific health problems for which people practiced yoga.

55 Conclusions

56 About 31 million US adults have ever used yoga; and about 21 million practiced yoga in the
57 past 12 months. Disease prevention; as well as back pain relief were the most important health

58 reasons for yoga practice. Yoga practice is associated with age, gender, ethnicity,
59 socioeconomic, and health status.

60

61 **Introduction**

62 Rooted in Indian, yoga has nowadays been adapted for use as a complementary and
63 integrative medicine therapy in North America, Australia and Europe¹. In the latter setting
64 yoga is mainly regarded as a mind-body practice², promoting physical and mental well-being
65 through the yoga practices of physical postures (*asana*), breathing techniques (*pranayama*),
66 and meditation (*dyana*)³.

67 In recent years, an increasing number of clinical trials have investigated the therapeutic
68 potential of yoga for a variety of medical conditions⁴⁻¹⁴; as well as in preventive medicine¹⁴⁻¹⁷.
69 A detailed knowledge of current prevalence, patterns, and predictors of yoga use for health
70 reasons is needed to evaluate its overall public health impact.

71 This current report presents the most recent findings of yoga use from the 2012 NHIS.
72 Specifically, this report examines the lifetime and 12-month prevalence of yoga use; patterns
73 of yoga use; and the prevalence estimates of specific yoga practices in the US general
74 population. Additionally, reasons for using yoga, sources of yoga information, and outcomes
75 of practice were analyzed; and predictors for yoga use identified.

76 **Methods**

77 *Data source*

78 This analysis used data from the NHIS 2012, a nationally representative survey that monitors
79 the health of the non-institutionalized US population through the collection of health-related
80 data. Specifically, data from the Family Core, the Sample Adult Core, and the Adult
81 Complementary and Alternative Medicine questionnaire were used for this analysis (see
82 eText for additional information).

83 A total of 42,366 households were eligible and 34,525 adults provided data (response rate:
84 79.7%)¹⁸.

85 *Statistical analysis*

86 Weighted distributions and frequencies were analyzed descriptively for lifetime prevalence
87 and 12-month prevalence of yoga use; general information on yoga practice (practice format,
88 costs, patterns of yoga practice); health conditions for which yoga was practiced, reasons for
89 yoga practice, and reported outcomes of yoga practice. Chi square tests were used to compare
90 socio-demographic characteristics between individuals who had ever used yoga and those
91 who had not. Independent predictors of yoga use were identified using multiple logistic
92 regression analysis (see eText for additional information and further analyses). Statistical
93 analysis was performed in 2015 using IBM SPSS ® software (release 20.0, IBM, USA) and
94 STATA (Stata Statistical Software: Release 9. College Station, TX: StataCorp LP).

95 **Results**

96 *Prevalence of yoga use*

97 Lifetime prevalence of yoga use for health reasons was 13.2% (n=4,422), representing 31.00
98 million US adults that had ever practiced yoga (Table 1). One-third (33.7%) of those had told
99 their personal health care provider about their yoga practice. Predictors of ever having used
100 yoga are presented in Table 2. Among those who had ever practiced yoga, 2,974 individuals
101 (67.3%) had also practiced in the past 12 months, representing 20.96 million US adults or a
102 12-month prevalence of 8.9% (Table 1; see eText and eTable 1 for additional information).

103 *Patterns of yoga use*

104 Among individuals who had practiced yoga in the past 12 months, 51.2% attended yoga
105 classes or received other formal yoga training. The average number of yoga classes attended
106 in the past 12 months was 18.58 ± 18.45 (median: XX; range: 1-52); at an average cost per
107 yoga class of $US\$23.16 \pm 28.59$ (median: XX; range: \$1-\$300). The majority of yoga

108 practitioners included breathing exercises (89.9%) and meditation (54.9%) as part of their
109 yoga practice (see eText and eTables 2-4 for additional information).

110 Regarding reasons for yoga practice, most respondents reported practicing yoga to improve
111 their general wellness or for general disease prevention (78.4%), to improve their energy
112 (66.1%), or to improve their immune function (49.7%) (Figure 1). Of the 88 medical
113 conditions investigated, back pain (19.7%), stress (6.4%), and arthritis (6.4%) were the top
114 three specific health problems for which people practiced yoga.

115 The main sources of yoga information used by respondents were DVD's and CDs (36.5%),
116 the Internet (26.9%), and printed media (24.3%) (Figure 1). Most practitioners reported
117 positive outcomes resulting from their yoga practice, predominantly citing reduced stress
118 (84.7%), improved overall health (81.0%), improved emotional well-being (67.5%), improved
119 sleep (59.1%), and increased sense of control over their health (56.9%) as an outcome of their
120 yoga practice (Figure 1).

121 **Discussion**

122 Findings from the 2012 NHIS indicate that the prevalence of yoga use among the US general
123 population has increased markedly over the previous decades, with an estimated 13.2% of US
124 adults ever having practiced yoga in 2012, compared with 7.5% in a 1998 non-NHIS survey¹⁹.

125 The 12-month prevalence of 8.9% concurs with findings from a previous national survey²⁰
126 and indicates a substantial increase in recent yoga use, from 6.1% in the 2007 NHIS survey
127 (relative increase 45.9%)²¹ and 5.1% in the 2002 NHIS survey (relative increase 94.1%)².

128 Predictor's of lifetime prevalence of yoga practice are mostly comparable to previous yoga
129 surveys^{19,20,22}. Yoga users were more likely to be younger, female, non-Hispanic White, and
130 from the West than non-yoga users. While the 1998 survey found that 'the baby boomer'
131 generation was more likely to practice yoga than younger or older adults¹⁹, already the 2002
132 NHIS found a clear decrease of yoga use with increasing age²². Again in line with previous

133 surveys, yoga practice was also associated with higher education, higher personal income, and
134 better health status.

135 As with previous surveys^{19,22}, the main health reasons for practicing yoga remain
136 musculoskeletal conditions and stress. As the main reported outcomes of yoga practice were
137 improved health and reduced stress, this suggests practitioners may perceive yoga as a form
138 of medical therapy which enables them to self-manage their health; and concurs with patient
139 reports of the use of yoga for management of symptoms of chronic diseases^{23,24}. This
140 perception may be aided by the increase in clinical evidence of the effectiveness and safety of
141 yoga for a range of health conditions.

142 Besides treating specific conditions, almost 80% of respondents practiced yoga to improve
143 their general wellness, or for general disease prevention. Clinical evidence supports the use of
144 yoga to prevent a wide range of health conditions^{6,14-16,25-29}. A specific focus on quality of life
145 outcomes within clinical trials has identified yoga practice to improve perceived wellness in a
146 variety of sub-populations including the elderly³⁰, and women with breast cancer^{31,32}.

147 In line with studies on complementary therapies use^{33,34}, information sources on yoga
148 included ‘traditional’ sources, like books, magazines, and the media. However, the most
149 commonly used sources were visual ones like videos and the internet, which might be most
150 appropriate for a movement-based practice such as yoga. While prior studies reported the use
151 of mainly nonprofessional information sources³³ more than 6% of yoga users cited scientific
152 articles as an important information source.

153 See eText for additional discussion of findings.

154 **Limitations**

155 The data were drawn from a cross-sectional survey; as such, the results can only suggest
156 association, not causation. The interpretations which can be drawn from the findings are

157 strengthened, however, by the regression analysis which controls for confounding variables.
158 The survey is collected by self-report and as such is at risk of recall bias or measurement
159 error.

160 **Conclusion**

161 The number of yoga practitioners in the US general population has substantially increased in
162 recent years. The findings of this study warrant the attention of policy makers responsible for
163 supporting population health, as well as primary care practitioners, yoga specialists and
164 consumers. Continued research attention regarding the clinical benefits of yoga is clearly
165 justified.

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171 **Figure captions**

172 Figure 1: Most frequently reported a) reasons for practicing yoga; b) reported sources of
173 information on yoga; and c) outcomes of practicing yoga (% of respondents); n=2,974.

174

175 Table 1: Weighted socio-demographic characteristics in n (%) for those who had never used
 176 yoga, those who had ever use yoga, and those who had used yoga in the past 12 months
 177 among adults in the US.

	Never used yoga (n= 195,971,306)	Ever used yoga (n=30,998,492)	Used yoga in the past 12 months (n=20,955,758)
Age			
18 to 29	40,840,640 (20.8%)	8,443,980 (27.2%)	6,160,335 (29.4%)
30 to 39	31,133,741 (15.9%)	7,277,198 (23.5%)	5,201,014 (24.8%)
40 to 49	35,198,461 (18.0%)	5,353,250 (17.3%)	3,656,161 (17.4%)
50 to 64	51,406,839 (26.2%)	7,056,198 (22.8%)	4,425,359 (21.1%)
65 or greater	37,391,625(19.1%)	2,867,866 (9.3%)	1,512,889 (7.2%)
Gender			
Male	100,645,386 (51.4%)	8,688,871 (28.0%)	5,514,996 (26.3%)
Female	95,325,920 (48.6%)	22,309,621 (72.0%)	15,440,762 (73.7%)
Ethnicity / Race			
Non-Hispanic White	128,803,199 (65.7%)	23,752,301 (76.6%)	15,815,420 (75.5%)
Hispanic	31,337,099 (16.0%)	2,745,328 (8.9%)	1,918,602 (9.2%)
Black	24,540,007 (12.5%)	2,166,246 (7.0%)	1,566,946 /7.5%)
Asian	9,699,394 (4.9%)	2,108,214 (6.0%)	1,463,336 (7.0%)
Other	1,591,607 (0.9%)	226,403 (0.7%)	191,454 (0.9%)
Region			
West	41,727,449 (21.3%)	9,783,818 (31.6%)	6,548,938 (31.3%)
Northeast	35,589,375 (18.2%)	5,694,945 (18.4%)	3,720,001 (17.8%)
Midwest	44,565,292 (22.7%)	7,054,995 (22.8%)	4,967,926 (23.7%)

South	74,089,190 (37.8%)	8,464,734 (27.3%)	5,718,893 (27.3%)
Marital status			
Not in a relationship	77,384,569 (29.5%)	12,584,795 (40.6%)	8,532,925 (40.7%)
In a relationship	118,586,737 (60.5%)	18,413,697 (59.4%)	12,422,833 (59.3%)
Education			
Less than college	85,144,107 (43.4%)	4,931,963 (15.9%)	3,074,308 (14.7%)
Some college or more	109,012,782 (55.6%)	26,021,180 (83.9%)	17,844,189 (85.2%)
Income			
Less than \$20,000	32,748,201 (16.7%)	6,133,318 (19.8%)	4,205,450 (20.1%)
\$20,000 to \$34,999	23,539,103 (12.0%)	3,965,394 (12.8%)	2,681,419 (12.8%)
\$35,000-\$64,999	29,804,649 (15.2%)	5,895,656 (19.0%)	4,266,260 (20.4%)
\$65,000 or more	19,728,380 (10.1%)	5,296,914 (17.1%)	3,675,774 (17.5%)
Health status			
Poor to fair	27,318,219 (13.9%)	1,820,562 (5.9%)	1,092,031 (5.2%)
Good to excellent	168,549,959 (86.0%)	29,174,809 (94.1%)	19,860,606 (94.8%)

179 Table 2: Predictors associated independently with having ever used yoga among adults in the
 180 US.

	Adjusted odds ratio (95% confidence interval)
Age	
18 to 29	1.00 (Reference)
30 to 39	0.90 (0.80,1.02)
40 to 49	0.62 (0.54,0.70)
50 to 64	0.50 (0.44,0.56)
65 or greater	0.48 (0.39,0.51)
Gender	
Male	1.00 (Reference)
Female	3.22 (2.95,3.52)
Ethnicity / Race	
Non-Hispanic White	1.00 (Reference)
Hispanic	0.53 (0.46,0.61)
Black	0.49 (0.42,0.58)
Asian	0.78 (0.66,0.93)
Other	0.84 (0.52,1.36)
Region	
West	1.00 (Reference)
Northeast	0.64 (0.56,0.72)
Midwest	0.58 (0.51,0.65)
South	0.49 (0.44,0.55)
Marital status	

Not in a relationship	1.00 (Reference)
In a relationship	0.87 (0.80,0.95)
Education	
Less than college	1.00 (Reference)
Some college or more	2.83 (2.52,3.17)
Income	
Less than \$20,000	1.00 (Reference)
\$20,000 to \$34,999	0.96 (0.85,1.08)
\$35,000-\$64,999	1.13 (1.01,1.27)
\$65,000 or more	1.69 (1.48,1.92)
Health status	
Poor to fair	1.00 (Reference)
Good to excellent	1.29 (1.05,1.58)

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