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Chiropractic Care for Spine Conditions: Analysis of National Health Interview Survey

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Abstract

Objective: To estimate the use of chiropractic care and perceived value for spinal conditions.

Methods: National Health Interview Survey (NHIS) data from the Sample Adult for 1997, 2002, 2007 and 2012 and the Adult Alternative Medicine for 2002, 2007, and 2012 files were analyzed. National Population Estimates (NPE) was generated by applying the complete survey design structure. Odds ratios (OR) and 95% confidence intervals (CI) were generated to explore the likelihood that the respondents reporting spine-related problems would see Doctors of Chiropractic (DC) or other providers compared to those reporting no spine-related problems.

Results: Reported use of chiropractic increased from 7.61% in 1997 to 10.11% in 2012 (p-value<0.001); the NPE increased by 8,023,162 adults. The OR of seeing a DC among those with the spine-related complaint was significantly higher (ranging over time from 4.31 to 3.09) than other providers, except in 2012 in which physical therapists were highest. For respondents reporting spine-related complaints, the OR was 2.40 (95%CI=1.28-4.50) for using chiropractic compared to osteopathic manipulation. Respondents with spine-related conditions were more likely to have a DC as their personal healthcare provider [OR(95%CI=3.48(2.60-4.65)]. Over 96% of those who did reported that it helped and were less likely to report using prescription medication [OR(95%CI) = 0.44(0.35-0.55)], over-the-counter medication [OR(95%CI) = 0.80(0.65-0.99)], surgery [OR(95%CI) = 0.35(0.23-0.52)], or physical therapy [OR(95%CI)=0.50(0.40-0.63)]. They were less likely to report receiving a recommendation from a medical doctor to seek chiropractic manipulation [n=224 (19.15%); OR(95%CI=0.49(0.39-0.62)].

Conclusion: The general use of chiropractic in the United States is slowly increasing but utilization is still low compared to that of primary care providers like MDs and NPs. A majority of NHIS 2012 respondents with spine-related problems used chiropractic manipulation for treatment and those who did were more likely to report that it helped and less likely to report using prescription and over-the-counter medications, surgery or physical therapy. Yet chiropractic care was hardly being recommended by medical doctors.

Keywords

Chiropractic, Primary Care, Neck Pain, Spine Health Services Research

Introduction

The World Federation of Chiropractic (WFC)'s Identity of the Profession Task Force recommended in 2005 that Doctors of Chiropractic (DC) should position themselves as "the spinal health care experts in the health care system" [1]. As part of the development of this recommendation, the Task Force conducted an international survey of chiropractors. This survey found that most respondents thought that chiropractic should be seen as a type of primary health care with either focused scope (55%) or broad scope (36%) [1]. However, respondents also expressed the belief that the public and the medical profession did not have a clear perception of the chiropractic profession. Their general sense was that the public sees the scope of chiropractic as the management of back and neck pain, or the management of spinal problems. Building on this, the Identity of the Profession Task Force recommended that the profession strengthen and clarify this general sense so that the public views DCs as spinal health experts with a stronger focus on prevention, management, and rehabilitation of spinal conditions.

Since 2005, there have been several commentaries further articulating and providing a rationale for the spine care expert position for chiropractic [2-7]. Nelson and colleagues stated that positioning DCs as spine care experts is the way for the chiropractic profession too, "establish cultural authority and increase the market share of the public…" [2] citing that >90% of chiropractic patients seek care for back pain.

In 2011, Murphy and others suggested a primary spine care model to the chiropractic profession such that practitioners become the go-to clinical provider for all things spine-related. This model had added diagnostic skills as need, along with understanding medical and complete management of the spine care patient including knowledge of the more common psychosocial aspects associated with chronic pain [5]. Essentially, these providers would become the spine-care gatekeepers routing care and performing triage as the primary contact in these cases. Palmer Chiropractic College also commissioned a Gallup Poll looking into the perceptions of Americans related to the role of chiropractor's play [8]. This poll found that in 2014, more than half of those responding stated that they held a positive opinion of chiropractors when it came to the management of neck and back pain. A minority found them of interest for advising on wellness or primary health issues.

In 2016, this journal published a series of commentaries on the topic of chiropractic identity and opinions ranged from the idea of focusing on correction or management of subluxation in the more historical sense [9] to advanced clinical practice and spine care as a specialty for the profession [10,11]. Interestingly, one author summed it up in that, "For any statement of professional identity to be effective, it requires widespread adoption by the profession" [11]. Public utilization patterns taken from a large, public health database might also be important in the discussion.

Data from a population-based sample, rather than one of a specialized population of professionals or patients, could provide insight into whether the public sees chiropractic as a spine specialty, through typical utilization patterns. The National Health Interview Survey (NHIS) is a population-based survey, rather than one which samples patients or practitioners. The NHIS has been in existence since 1957, with 1963 being the earliest questionnaires available to refer to online (http://www.cdc.gov/nchs/nhis/about_nhis.htm).

The NHIS is conducted annually by the National Center for Health Statistics (NCHS) of the U.S. Centers for Disease Control and Prevention (CDC). The survey involves computer-assisted interviews with a nationally representative cross-section of American households; only civilian, non-institutionalized people are included. The survey is administered in components, some of which are the core and others supplemental, and the captured data are stored in separate files. The core components which include the family, household, person, injury episode, child core sample (Sample Child), and the adult core sample (Sample Adult), are administered every year while the supplements such as cancer screening, child alternative medicine (Child CAM), adult alternative medicine (Adult CAM), etc., are not. For example, the

alternative medicine components (CAM) sponsored by the then NIH's National Center for Complementary and Alternative Medicine (or presently, National Center for Complementary and Integrative Health, have been administered only 3 times: in 2002, 2007 and 2012. However, when administered, all components are administered to the same cross-section of Americans sampled for the given year.

It is relevant to this study that chiropractic was included in the 1963 NHIS survey, but was excluded from separate analysis as follows: "For the purposes of this survey, consulting MD's, osteopaths or dentists (for dental conditions) will be considered as talking to a doctor but consulting chiropractors, chiropodists, podiatrists, naturopaths… or other types of people giving medical care will not be counted" [12]. A published report of 1974 NHIS data included data on chiropractic use, with 3.6% of the overall population and 6.2% of respondents aged 17 and older reporting use within the past 12 months [13].

The next published report of chiropractic use gathered via the NHIS was the 2002 survey when the NHIS first administered the complementary and alternative medicine (CAM) supplemental components of the survey [14,15]. Chiropractic was reported to have been used in the past 12 months by 7.5% of respondents in 2002 [14,15]. In the next (2007) NHIS CAM survey, which seemed to be administered every 5 years, it was 8.6% [16], although the question NHIS chose to ask respondents if they had seen a provider for "chiropractic or osteopathic manipulation," thus making it impossible to separate the two. For the 2012 CAM survey, 8.5% reported the use of chiropractic or osteopathic manipulation [17]. Within the dataset, questions were added that allow investigators to distinguish chiropractic from osteopathic manipulation, although the published NHIS report did not do so [17]. Since 1997, concurrent with the CAM survey, the general NHIS questionnaire administered to the larger core sample has included a question exclusively on visiting a chiropractor. This fact has been largely ignored, and has not been included in the NHIS reports, perhaps because chiropractic was the only CAM profession included as a CAM therapy in the larger survey population. We believe we are the first investigators to utilize not just the CAM subsample dataset, but also the larger general NHIS core sample (Sample Adult) to gather information on chiropractic use [14,16,18,19].

Spine conditions are among the top ten reasons for outpatient medical visits, thus we would expect chiropractic use to increase as the public increasingly recognizes DCs to be specialists in spinal care. Furthermore, the WFC Identity initiative was launched in 2005, so any effects it may have had on a large scale would be expected to be reflected in the more recent NHIS data. Although data are available indicating that a high proportion of chiropractic patients present with spine-related complaints [20], population- (rather than the patient-) based data provide a more relevant perspective on the public's view of chiropractic. If DCs are considered spine specialists then people with spine-related complaints should be more likely to use DCs as compared to other providers.

The purpose of this study was to explore the use of chiropractic care specifically for the treatment of spinal conditions as described by the public in response to question from the US NHIS. Consequently, the study was designed to measure:

1) If the overall prevalence of chiropractic use has increased between 1997 and 2012.
2) The proportion of people with spine-related complaints seeing DCs is greater than those seeking this care for non-spine-related complaints.
3) If the likelihood of people with spine-related complaints seeing chiropractors is significantly greater than for those seeing other types of providers.
4) How likely those with spine-related problems who used chiropractic were to report that it helped.

Methods

Prior to its start date, the study was approved by both the research committee and the institutional review board of Parker University in Dallas, Texas, USA. This study was a secondary analysis of NHIS data. Data from the Sample Adult (SA) for 1997, 2002, 2007 and 2012 and from the Adult CAM (ACAM) for 2002, 2007 and 2012 (the only years the CAM survey

was conducted) files were used for this study. These samples consist of adults randomly selected from the civilian, non-institutionalized US population.

Variables

To explore the respondents' relative value of chiropractic care among other options for spine-related conditions, we included questions on whether chiropractic manipulation helped with a spine-related "top condition," whether or not those who used it reported less use of prescription or over-the-counter medication, had surgery or received physical therapy in combination. Also of interest was whether or not a medical doctor referred a patient with a spine-related "top condition" to a chiropractor.

For all binary variables defined from "Yes/No" responses, we considered "yes" and "no" as valid responses; other responses, such as "refused," "not ascertained," "don't know" or missing responses were coded as missing and eliminated from the analysis. Similarly, for variables from questions whose responses were "mentioned" (affirmative) and "not mentioned" (otherwise), only these two options were considered valid while the others coded as missing, as above.

Chiropractic Use:

In all 4 years (1997, 2002, 2007 and 2012), respondents were asked if they had seen or talked to a chiropractor within the past 12 months; they were also asked this in the 2002 ACAM survey. In the 2007 and 2012 ACAM surveys, respondents were asked if they had seen a practitioner for chiropractic or osteopathic manipulation within the past 12 months. In 2012, they were further queried as to whether the type of practitioner was a chiropractor, osteopathic physician, or both. Therefore, we were able to separate the use of chiropractic from osteopathic practitioners in 2012. Furthermore, we were able to construct a variable representing total chiropractic use by combining respondents with a "yes" response to *either* use of a chiropractor for manipulation (ACAM survey) *or* seeing/talking to a chiropractor (SA survey), within the past 12 months. In the 2007 ACAM file, chiropractic and osteopathic manipulation could not be separated because the additional questions described above were not included.

Another question in the 2012 ACAM survey asked respondents to choose from a list of three therapies that were most important for their health. A selection of various CAM modalities that included "chiropractic or osteopathic manipulation" was presented. This was recorded in the dataset as 3 separate variables for the most important ("top") therapy, the second, and the third. We were able to separate chiropractic from osteopathic manipulation for a top therapy as described above.

Spine-Related Problem:

This variable was constructed by combining 3 SA variables: PAINECK= neck pain past 3 months; PAINLB= back pain past 3 months (excluding aches and pain that are fleeting or minor); AFLHCA4= Back/neck problem causes difficulty with activities. This variable was considered positive if the respondent indicated that it interfered with various daily activities, including responses ranging from "only a little difficult" to "can't do at all." However, the survey question did not ask respondents what type of care they sought for any health problems; they were asked separately if they had used the services of a number of health care providers, but not why they had used them.

Perceived Value of Chiropractic Care for Spine-Related Problems:

In the 2012 ACAM survey, follow-up questions to the "top therapies" required the respondents to choose the most important conditions from a list, for which they had used a top therapy. We created a variable, "spine-related top condition" representing those who selected either "neck pain or problem" or "back pain or problem" as their most important condition. They were also asked to state how much they thought the therapy helped with the condition, whether they used prescription or over-the-counter medication, had surgery, or received physical therapy for the condition as well as whether they used it because it was recommended by a medical doctor. Another follow-up question asked whether their reason for using the "top therapy" was "It focuses on the whole person, mind, body, and spirit", "It treats the cause and not just the symptoms", etc. Valid responses to these follow-up

questions were "Yes" or "No". The success of the therapy or whether it helped was constructed in terms of "A great deal", "Some", "Only a little", and "Not at all". For comparison purposes, we constructed a "Help/not help" variable which collapsed the first three categories in to "help".

Personal Health Care Provider:

The ACAM defined and asked about the term as follows: "A personal health care provider is a health professional who knows you well and is familiar with your health history. This can be a general doctor, a specialist doctor, a nurse practitioner, a physician's assistant, or another type of provider. Do you have one or more persons you think of as your personal health care provider?" However, the only response choices were 1) Medical doctor (MD, DO) including specialists 2**)** Nurse, Nurse Practitioner, or Physician Assistant and 3) Chiropractor, Acupuncturist, or Naturopath. The subsequent questions specifically about the use of chiropractic for manipulation enabled us to create a variable isolating a DC as a personal health care provider.

Usual Place of Care:

The ACAM defined and asked about the term as follows: "Earlier you said you have a place where you usually go when you are sick. What type of provider(s) do you see there?" The answer choice was similar as in the variable for "personal health care provider" above and we were able to separate DC (or chiropractic office) in the same way.

Data Analysis

The analytical data were imported into the Statistical Analysis System (SAS) version 9.3 (SAS Institute Inc., Cary, NC). Both the SA and ACAM datasets for each year were merged into a single data set, retaining only the variables relevant for the analysis. Analytical variables were then defined as described above (under "Variables").

National Population Estimates (NPE), valid weighted frequencies representing the non-institutionalized United States general population, were generated by applying the complete complex survey design structure, which included clustering, stratification, and weighting. NPEs are included to provide perspective.

To test if the overall prevalence of chiropractic use has increased between 1997 and 2012, we compared NHIS data on chiropractic use from the SA file from 1997, 2002, 2007, and 2012. We also calculated the prevalence of chiropractic use for 2002 and 2007 by merging the SA and ACAM data for purposes of comparison. A binomial test for the difference in two proportions was used to test the difference in chiropractic use from 1997 to 2012. The result was assessed at the 5% level of significance (alpha = 0.05).

To test if the proportion of people with spine-related complaints seeing DCs is greater than those seeking this care for non-spine-related complaints, we compared the proportion of the respondents in the SA file with and without spine-related problems who reported seeing a DC for each year included. We also tested the likelihood that people in the 2012 ACAM file (the only year with this capability) with a spine-related "top condition" (see variable construction below under "Variables") who reported having used chiropractic manipulation as their top therapy is higher than those with non-spine-related conditions. We used a binary logistic regression model to compute odds ratios (OR) and 95% confidence intervals (CI) to assess the likelihood that those who reported seeing a DC were more likely to report having spine-related problems compared to non-spine related problems separately for each year included in this analysis. This was also done to assess how likely respondents in 2012 ACAM with spine-related "top condition" would report using chiropractic manipulation as "top therapy".

To measure if the likelihood of people with spine-related complaints seeing chiropractors is significantly greater than for those seeing other types of providers, we compared the proportion of the respondents in the SA file with and without spine-related problems who reported seeing a DC pairwise with those seeing a medical/osteopathic doctor (MD), physical/occupational therapist (PT) or nurse practitioner/physician assistant (NP) in each of the stated years. In addition, we compared the proportion of 2012 survey respondents in the SA and ACAM merged data with spine-related complaints who reported a DC as their "personal health care provider"

(see definition below under "Variables") Vs those reporting an MD or NP as their personal health care provider or their places of work as the respondents' usual place of care. We also assessed the likelihood that people in the 2012 ACAM file with a spine-related "top condition" would use chiropractic manipulation as their top therapy rather than osteopathic manipulation. Odds ratios and 95% CIs were calculated to explore the likelihood that the respondents with spine-related problems would see each of the providers (DC, MD, PT, and NP, as defined in the statement of the hypothesis H3 above) compared to those without spine-related problems based on the SA data for each year. This was also done to assess the likelihood that the respondents in the 2012 ACAM with spine-related "top condition" would report using chiropractic compared to osteopathic manipulation as "top therapy" as well as how likely they were to report that the therapy helped. We also made bivariate comparisons to determine the likelihood that those with a spine problem saw the specific providers after adjusting for use of other providers, based on the assumption that respondents were likely to see more than one provider (adjusted OR = AOR). The binomial test for the difference in two proportions was used to test the difference in reported spine-related problems among those seeing DC pairwise to those seeing the other providers (MD, PT, and NP), for each year, also assessed at the significance level of alpha = 0.05. In addition, using 2012 AS and ACAM merged data, ORs and 95% CIs were calculated to explore the likelihood that the respondents with spine-related complaints would report having the various providers (DC, MD, and NP) as their personal providers as well as their places of work being the respondents' usual place of care.

Results

Overall Prevalence of Chiropractic Use over Time:

Table-1 shows the actual number, NPE, and proportions of each for DCs and other provider types for the years 1997, 2002, 2007, and 2012. The proportion of respondents reporting use of all provider types increased overtime except for that of MDs, which remained approximately constant. The majority of respondents (over 66%) reported using an MD; 10-20% used NPs; approximately 7-9% used DCs or PTs.

The reported use of chiropractic on the SA survey rose 1.54% from 1997 to 2012 (p <0.001). This translated into an increase of the NPE over 15 years of 5,775,936 adults. Using the combined data from the SA and ACAM surveys in 2012, the reported use of chiropractic increased by 2.50% from 1997 to 2012 (p <0.001) which translates to an increase in the NPE of 8,023,162 adults.

Care Seeking By Respondents with Spine-Related Problems:

Just over 31% of the SA reported having a spine-related problem each year. The proportion of those who saw a DC and reported having a spine-related problem went from 67.52% in 1997 to 59.32% in 2012, with ORs of 4.31 (CI, 3.97-4.69) and 3.09 (CI, 2.88-3.32), respectively, as compared to those without spine problems (**Table-2**). The proportions for PT use were 63.02% in 1997 and 58.32% in 2012, with ORs of 3.44 (CI, 3.16-3.74) and 2.90 (CI, 2.69-3.13) respectively, for those with spine-related problems compared to those without. The proportions were smaller and less variable for NPs and MDs, with the proportions in 2012 being 47.36% for NPs (OR= 1.93, CI = 1.82-2.04) and 38.88% for MDs (OR = 1.75, CI = 1.67-1.84). As shown in **Table-2**, pairwise comparison between those with spine-related problems who saw a DC compared with the other providers showed a statistically significant (p<0.001) difference in proportion across the years except between DC and PT in 2012 (p=0.417).

Table-3 shows what respondents utilized chiropractic manipulation for when they considered it their top therapy. Spine-related conditions or problems were the most important to the respondents; back pain or problem (n=893, 52.19%) and neck pain or problem (n=269, 15.69%) combine to 75.14% of those who used chiropractic or osteopathic manipulation as their top therapy (OR,14.25; CI=12.30-16.49). As shown in **Table-4**, of these, 97.09% used chiropractic manipulation (OR, 13.84; CI=12.00-16.02), making this choice of provider 2.40 times as likely as osteopathic manipulation for those conditions (OR, 2.40; CI=1.28-4.50)].

Table-1: Proportion of respondents from the Sample Adult (SA) and Adult Complementary and Alternative Medicine (ACAM) files of the National Health Interview Survey who reported having seen/talked to a chiropractor within the past 12 months, compared to other provider types.*

Provider use		1997	2002	2007	2012
Overall sample	n	36,116	31,044	23,393	34,525
	NPE	19,52,76,321	20,58,25,095	22,31,80,965	23,49,20,670
DC	n	2,726	2467	1907	3112
	%	7.61	8.03	8.3	9.14
	NPE	1,55,73,363	1,69,95,541	1,91,36,616	2,13,49,299
	%	8.03	8.34	8.72	9.23
CAM-adjusted DC[1]	n	-	2,752	-	3,437
	%		8.96		10.11 [2]
	NPE	-	1,91,23,019	-	2,35,96,525
	%		9.39		10.2
MD	n	23,671	20,733	15,200	22,774
	%	66.11	67.46	66.22	67.02
	NPE	12,86,80,380	13,83,86,031	14,51,78,569	15,49,57,097
	%	66.43	67.93	66.23	67.25
PT	n	2450	2424	1915	2985
	%	6.84	7.89	8.34	8.78
	NPE	1,29,01,592	1,60,12,978	1,86,99,109	1,99,83,878
	%	6.66	7.86	8.25	8.64
NP	n	3,606	3,929	3,434	6,561
	%	10.07	12.8	14.96	19.31
	NPE	1,96,81,127	2,70,26,336	34217012	4,43,89,576
	%	10.16	13.29	15.61	19.21

*Abbreviations: NPE= National Population Estimate; DC=Doctor of Chiropractic; MD=General medical or osteopathic physician; PT= Physical therapist or occupational therapist; NP= Nurse practitioner, physician assistant or midwife

[1]Merging the AS and ACAM files revealed an additional 285 respondents who reported having seen a chiropractor in the ACAM sample but were not recorded in the SA file.

[2]The 2012 ACAM sample had a variable capturing those who "saw a provider for chiropractic/osteopathic manipulation" and another variable that distinguished between chiropractic and osteopathic manipulation. Using these variables revealed an additional 325 respondents who reported having seen a chiropractor but were not recorded in the SA file.

Table-2: Proportion of (and the likelihood that) respondents from the Sample Adult (SA) and Adult Complementary and Alternative Medicine (ACAM) files of the National Health Interview Survey with a spine-related problem would report having seen/talked to various provider types within the past 12 months.*

		1997	2002	2007	2012
Spine-related problem	n	12,652	9977	7289	12035
	%	35.1	32.18	31.18	34.87
	NPE	6,70,14,865	6,57,02,076	6,87,39,980	7,90,69,911
	%	34.38	31.97	30.83	33.67
...and saw DC	n	1,840	1,683	1,175	2,039
	%	67.52	61.22	61.68	59.32
	OR	4.31	3.79	4.04	3.09
	(95% CI)	(3.97, 4.69)	(3.49, 4.10)	(3.67, 4.46)	(2.88, 3.32)
...and saw PT	n	1,544	1,400	1,024	1,741
	%	63.02	57.8	53.47	58.32
	OR	3.44	3.18	2.79	2.9
	(95% CI)	(3.16, 3.74)	(2.92, 3.46)	(2.54, 3.06)	(2.69, 3.13)
...and saw NP	n	1,771	1,815	1,581	3,106
	%	49.11	46.23	46.04	47.36
	OR	1.91	1.99	2.13	1.93
	(95% CI)	(1.78, 2.04)	(1.86, 2.13)	(1.98, 2.29)	(1.82, 2.04)
...a saw MD	n	9,276	7,476	5,376	8,850
	%	39.21	36.1	35.38	38.88
	OR	1.71	1.75	1.82	1.75
	(95% CI)	(1.63, 1.79)	(1.66, 1.85)	(1.71, 1.94)	(1.67, 1.84)
DC-PT	Difference (%)	4.5	3.42	8.21	1
	p-value[1]	<0.001	0.012	<0.001	0.417
DC-NP	Difference (%)	18.41	14.99	15.64	11.96
	p-value	<0.001	<0.001	<0.001	<0.001
DC-MD	Difference (%)	39.2	25.12	26.3	20.44
	p-value	<0.001	<0.001	<0.001	<0.001

* Abbreviations: NPE= National Population Estimate; DC=Doctor of Chiropractic; MD=General medical or osteopathic physician; PT= Physical therapist or occupational therapist; NP= Nurse practitioner, physician assistant or midwife; OR (95%CI) = Odds ratio (95% confidence interval); % = valid percent (based only on those who answered question)

[1]p-values from binomial test for the difference in proportion of respondents with a spine-related problem who saw/talked to a DC compared pairwise to those who saw/talked to MD, PT, and NP

Table-3: Health conditions for which respondents from the Adult Complementary and Alternative Medicine (ACAM) file of the 2012 National Health Interview Survey (NHIS) used chiropractic or osteopathic manipulation as top therapy

Condition/complaint	n	%
Back pain or problem	893	52.19
Neck pain or problem	269	15.72
Other specify (open-ended response)	152	8.88
Joint pain or stiffness/Other joint condition	98	5.73
Muscle or bone pain	73	4.27
Arthritis	42	2.45
Chronic pain	33	1.93
Severe headache or migraine	29	1.69
Sprain or strain	13	0.76
Fracture, bone/joint injury	12	0.7
Fibromyalgia	8	0.47
Recurring headache, other than migraine	5	0.29
Rheumatoid arthritis	5	0.29
Insomnia or trouble sleeping	4	0.23
Knee problems (not arthritis, not joint injury)	4	0.23
Neurological problems	4	0.23
Injury other than fracture, bone/joint injury	4	0.23
Frequent stress	4	0.23
Feeling anxious, nervous or worried	3	0.18
Nerve damage, including carpal tunnel syndrome	3	0.18
Poor circulation in your legs	3	0.18
Sinusitis	3	0.18
Acid reflux or heartburn	2	0.12
High cholesterol	2	0.12
Fatigue or lack of energy more than 3 days	2	0.12
Hearing problem	2	0.12
Jaw pain	2	0.12
Abdominal pain	1	0.06
Asthma	1	0.06
Depression	1	0.06
Diabetes	1	0.06
Gynecologic problem	1	0.06
Hay fever	1	0.06
Problems with being overweight	1	0.06
COPD	1	0.06
Stomach or intestinal illness	1	0.06

Table-4: Proportion of (and the likelihood that) respondents from merged Sample Adult (SA) and Adult Complementary and Alternative Medicine (ACAM) file of the 2012 National Health Interview Survey with a spine-related problem would report having various health care providers as personal provider and seeing them at their usual place of care.*

	N	n (%)	OR (95% CI)
Have personal healthcare provider	22,758	8,449 (37.13)	1.28 (1.20, 1.36)
Personal provider is:			
DC	199	128 (64.32)	3.48 (2.60, 4.65)
MD	21,721	8,028 (36.96)	0.70 (0.64, 0.75)
NP	1,479	640 (43.27)	1.32 (1.18, 1.46)
Usual place of care is:			
DC	117	73 (62.39)	3.15 (2.17, 4.58)
MD	26,537	9,551 (36.00)	0.79 (0.72, 0.86)
NP	2,475	9857 (39.80)	1.19 (1.09, 1.29)

*Abbreviations: DC=Doctor of Chiropractic; MD=General medical or osteopathic physician; PT= Physical therapist or occupational therapist; NP= Nurse practitioner, physician assistant or midwife; OR (95%CI) = Odds ratio (95% confidence interval); % = valid percent (based only on those who answered question, N)

The pair-wise differences in proportion between respondents with spine-related problems who have DC as personal health provider (as well as see them at their usual places of care) and MD and NP are statistically significant with $p<0.001$.

Personal Healthcare Providers and Usual Place of Care for Respondents with Spine-Related Complaints:

As shown in **Table-4**, of the 22,758 people in the 2012 SA and ACAM merged file who reported having a personal health provider, 37.13% had a spine-related complaint. Those with a personal healthcare provider who had a spine complaint were more likely to report their personal healthcare provider was a DC (OR, 3.48; CI = 2.60-4.65) and that their usual place of care was a DC office (OR, 3.15; CI = 2.17-4.58) than the other provider types and places of care, respectively.

Perceived Value of Chiropractic Manipulation for Spine-Related Problems:

Among the respondents of the 2012 ACAM survey with a spine-related "top condition" who used chiropractic manipulation as their top therapy, 1,235 (96.56%) reported that it helped them with their condition as follows: "A great deal" (n=871, 68.10%); "Some" (n=285, 22.28%); and "Only a little" (n=79, 6.18%) There was a 46% increased odds that it helped at least a little when compared to those who reported use of osteopathic manipulation, although the difference was not statistically significant (OR, 1.46; CI = 0.19-11.13). In addition, they were less likely to report that they also used the following for this problem: prescription medication [n=275 (21.66%); OR, 0.44; CI = 0.35-0.55], over-the-counter medication [n=434 (34.04%); OR, 0.80; CI = 0.65-0.99], had surgery [n=51 (3.99%); OR, 0.35; CI = 0.23-0.52], or received physical therapy [n=291 (22.81%); OR, 0.50; CI = 0.40-0.63]. However, they were also less likely to report receiving a recommendation from a medical doctor to seek chiropractic manipulation [n=224 (19.15%); OR, 0.49; CI = 0.39-0.62] as compared to those without spine-related top conditions.

806 (68.30%) of respondents with spine-related conditions who reported the use of chiropractic noted that they used it because "It focuses on the whole person, mind, body, and spirit" (OR, 1.06; CI = 0.85-1.32), and they were less likely to state that, "It treats the cause and not just the symptoms" [n= 295 (23.19%); OR, 0.29; CI = 0.23-0.36] as compared to without these views.

Discussion

This study explored whether respondents to the NHIS appeared to be utilizing chiropractic care for spine-related problems. Discussion is centered on the four objectives upon which we performed our analysis.

Overall Prevalence of Chiropractic Use:

There is an indication from these data that the prevalence of chiropractic use has increased between 1197 and 2012, and that the increase is statistically significant over the analysis period. However, the proportion of chiropractic users, in general, still remains proportionally low compared to users of MD care (from 7.61% to 10.11% over 15 years compared to 66.11% to 67.02%, respectively). DC use is more comparable to PT use, which went from 6.84% to 8.78% in the same 15-year period. NP use, in this same period for example, almost doubled, increasing from 10.07% to 19.31%. Thus, putting chiropractic use in perspective with that of the other providers, even though it has increased statistically significantly, it still remains much less utilized by the general public—perhaps because it is mostly utilized for spine-related complaints.

It is worth noting that Chiropractic has been uniquely included in the NHIS. It is the only provider-based CAM therapy regularly included in the core sample survey for many years although it has been largely ignored and seldom analyzed [13,14,16,18]. To our knowledge, ours is the only investigative team which has looked at this issue in depth. To estimate the prevalence of chiropractic use, we utilized information on chiropractic provided in both the core sample (SA) and the CAM sample (ACAM) surveys (see definition of the variable '*chiropractic use*' under methods) rather than using only the CAM sample is typically analyzed. This has resulted in a slightly higher proportion of chiropractic use than what has been typically reported. Thus, relying only on the CAM survey results might be recognized to slightly underestimate the prevalence of chiropractic use.

People Reporting Spine-Related Complaints Seeking Chiropractic Care:

Spine-related (back and neck) complaints comprised 75% of the "top complaints" for respondents who chose chiropractic manipulation as their top therapy (**Table-3**). The OR of seeing a DC among these compared to not reporting a spine-related complaint is much higher than the OR among the respondents who saw any other provider for similar conditions (**Table-2**). Never-the-less the OR decreased between 1997 and 2012 (ranging from 4.31 to 3.09) while remaining fairly constant for the other providers. This does not seem to be an artifact related to the wide confidence intervals since these do not overlap when comparing them for the two years. It is possible that within this time-frame, the proportion of people with non-spinal, musculoskeletal complaints seeking chiropractic care increased. For example, soft tissue strains and extremity conditions are frequently treated by DCs [20]. However, the high OR does support the hypothesis that adults with spine-related complaints are more likely to see a DC than those without spine-related complaints.

Over 97% of NHIS-2012 respondents whose main reason for seeking care is spine-related ("spine-related top condition") and sought spinal manipulation for care reported that the manipulation was performed by DCs. They were 2.4 times more likely to seek spinal manipulation from a DC than DO (**Table-5**). They were also much more likely to report having a DC as their personal healthcare provider and to utilize a DC office as their usual place of care (OR 4.96 and 4.47 respectively). However, these numbers are very small, since only 5.17% of the ACAM sample reported their main reason for seeking care to be spine-related.

An important yet more difficult to quantify issue is whether DCs are the public's first choice for spine-related problems and our results simply left us guessing.

Table-5: The likelihood (Odds ratio, OR and 95% confidence interval, CI) that respondents from the Adult Complementary and Alternative Medicine (ACAM) file of the 2012 National Health Interview Survey (NHIS) with spine-related condition as the most important condition used Chiropractic and Osteopathic manipulation as top therapy.

	n (%)	OR (95% CI)
Provider for manipulation	1,309 (75.14)	14.25 (12.30, 16.49)
DC	1,269(97.09)	13.84 (12.00, 16.02)
DO	20(1.56)	2.63 (1.56, 4.47)
Both	18(1.38)	1.85 (0.90, 3.82)
DC vs. DO	-	2.40 (1.28, 4.50)

*ACAM sample: n=34,525 (NPE = 234,920,670); Used top therapy for specific health reason: n=4,396 (NPE=29475996), 42.92% of those who answered the question on whether or not the top therapy was used for specific health reason; Most important condition is spine-related: n=1,788 (NPE=12386687), 40.76% of those who noted that they used top therapy for specific health reason

Perceived Value of Chiropractic Manipulation for Spine-Related Problems:

Over 96% of the 2012 NHIS ACAM survey respondents with spine-related problems who reported the use of chiropractic manipulation stated that the therapy helped them with their condition, with about a 46% increased odds that it helped when compared to osteopathic manipulation (although not statistically significant). Apart from the fact that chiropractic manipulation helped, they were less likely to report using prescription medications and surgery. Despite these potential benefits, these respondents also reported less likely to receive recommendations for chiropractic care from a medical doctor. Within this area of discussion is the consideration that since chiropractic patients are less likely to use medications for pain, perhaps a better referral system involving primary care providers would lessen the need for opiate medications and thereby play some role in the efforts to reduce the current abuse problems associated with this category of drugs in the United States.

This data also shows that although the public seems to support the premise that chiropractic is a system that focuses on the whole person (OR, 1.06; CI = 0.85-1.32), they were less likely to see it as treating "the cause and not just the symptoms" (OR, 0.29; CI = 0.23-0.36). The later seems to suggest that patients may not perceive a primary care role for the chiropractic profession; with primary care being defined as health care delivery for all the patient's health care needs. This is also in line with the Gallup Poll reported by Palmer Chiropractic College where DCs were much less likely to be the first providers the patient talked to about their health, or general health and wellness issues [8].

Limitations

Like all surveys, the NHIS is subject to respondent self-report bias. Furthermore, this analysis was limited by the questions that were included in the NHIS. Most noteworthy was combining the use of osteopathic and chiropractic manipulation into a single question in the 2007 CAM survey after chiropractic had been asked about individually in the 2002 CAM survey. Even though this was somewhat remedied in the 2012 survey by adding additional questions, it is curious that osteopathic and chiropractic manipulation were combined at all, especially when it appears that 97% of manipulation was provided by DCs. Analysis of specific CAM providers is complicated by combining them, as in the question about personal health care provider in which "chiropractor, acupuncturist, or naturopath" were combined as a single choice. Other than being considered as CAM, the systems and approaches have little in common. The adult core survey was limited in that it did not ask respondents, directly about which providers they saw for their health conditions, making only indirect linkages possible. As CAM use, in general,

continues to increase as well as be more integrated into the healthcare mainstream, it might behoove the NHIS to include all the more common CAM practices into the core survey. Questions might be constructed that provide better goodness-of-fit for gathering information about CAM use if CAM practitioners were more involved in questionnaire design, as they have been in the construction of an international CAM survey [21].

Additional research could further investigate chiropractic as the first choice for spinal health if this determination can be more adequately confirmed.

Conclusion

This analysis indicates that the general use of chiropractic in the United States is slowly increasing but utilization is still low compared to that of primary care providers like MDs and NPs. A majority of NHIS 2012 respondents with spine-related problems used chiropractic manipulation for treatment and those who did were more likely to report that it helped and less likely to report using prescription and over-the-counter medications, surgery or physical therapy. Yet chiropractic care was hardly being recommended by medical doctors. This may indicate that the US public continues to use DCs for episodic spine care rather than traditional primary care that may address general health and prevention.

Conflict of Interest

All authors have read and approved the final version of the manuscript. The authors have no conflicts of interest to declare.

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