

Patterns of Variation in Botanical Supplement Use among Hispanics and Latinos in the United States

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Abstract

Background: The prevalence of botanical supplement use among Hispanics/Latinos in the United States varies widely, thwarting efforts to understand patterns of use in these rapidly growing populations. In this systematic review of the literature, we present an analysis of patterns of botanical supplement use across available studies including Hispanics/Latinos in the United States, 1998-2011.

Methods: Search strategies included CINAHL, EMBASE, Global Health, CAB Abstracts, AMED and Medline resulting in 33 studies reporting botanical supplement prevalence among Hispanic/Latino adults, limiting studies to those with similar outcomes and Hispanic/Latino sample $\geq 1\%$.

Results: Median prevalence of botanical supplement use among Hispanics/Latinos varied from 12% for ≤ 30 days of use to 27% for 6-12 months of use and 45% for 2+ years of use. Variation in prevalence of botanical use among Hispanics/Latinos was largely dependent on study design factors, particularly sampling strategy and target population. Patterns associated with higher median prevalence included regional (42%, 95% CI: 35, 57%) vs. national (15%; 8, 22%) samples, convenience (45%; 35, 63%) vs. probability sampling (21%; 10, 42%), and majority Hispanic/Latino (45%; 32, 67%) vs. majority non-Hispanic/Latino (21%; 15, 42%) samples. Studies targeting Hispanic/Latino populations with botanical assessments specific to these populations resulted in higher prevalence estimates (49% vs. 18%). The most common botanicals reported by Hispanics/Latinos across studies were chamomile, aloe, and garlic.

Conclusions: Although studies with probability sampling are less affected by selection bias, most target the general US population and exclude botanical supplements common among Hispanic/Latino populations. Improved estimates of botanical supplement use among Hispanics/Latinos require culturally-relevant assessment instruments and strategies. Assessments of botanical supplement use in other ethnic populations, e.g., among immigrants from Asian countries, are also likely to suffer from information bias.

Keywords: Dietary supplements; Hispanic/Latino; complementary and alternative medicine; prevalence

Introduction

Rationale

In the United States (US), botanical dietary supplements are regulated by the Food and Drug Administration under the 1994 Dietary Supplement Health and Education Act. The Act defines dietary supplements as “a product (other than tobacco) that is intended to supplement the diet that bears or contains one or more of the following dietary ingredients: an herb or other botanical, a vitamin, a mineral, an amino acid, a dietary substance for use by man to supplement the diet by increasing the total daily intake, or a concentrate, metabolite, constituent, extract, or combinations of these ingredients” [1].

Botanical supplements are popular in the US; national surveys estimate that approximately 18% of the US population uses botanical supplements [2,3]. The literature supports a wide body of prevalence data on botanical supplement use in the general population, but less is known about use patterns in minority populations, including Hispanics/Latinos [3-6]. Among studies in these populations, prevalence estimates vary widely and the reasons for these large variations are obscure. Due to the increasing population of Hispanic/Latino patients and the biological activity of botanical supplements, it is important that health care and public health professionals understand their likelihood of botanical use.

Hispanic/Latino populations encompass people from diverse

cultural traditions with differences in dialects, primary language, and traditions [7]. In some Hispanic/Latino populations, attitudes and beliefs about the use of botanical medicines are part of a cultural belief system transmitted through female relatives [7-11]. Surveys and interviews with Hispanic/Latino immigrants report a belief that botanical remedies are safer than prescription drugs and consistent with family traditions [11,12]. Medications are not eschewed, however; herbal teas are often consumed along with medications, especially among diabetics [8,13]. In fact, conventional medical care and physician's advice may be highly valued [14]. However, herbal remedies may be chosen both because they are consistent with cultural practices and are cheaper and easier to obtain; one study, annual income was the strongest predictor of alternative medicine use (chiefly botanicals) [14]. In other studies, especially in areas of the country far from the

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US-Mexican border, botanical use may be less common because it is less available.

Unlike in the general population, factors related to botanical supplement use among Hispanics/Latinos are incompletely understood. Education appears either to play a limited role or a role that varies across degrees of acculturation [15,16]. Moreover, the operational definition of acculturation itself is variable. Most studies including acculturation as a covariate limit its definition to length of residence in the US and/or primary language [17,18], the latter possibly conflated with employment opportunity and income rather than Hispanic/Latino identity [14]. Some studies report higher prevalence estimates among recent immigrants [19-22], but others find no association between length of residence and the prevalence of botanical supplement use [14,17,23,24]. Moreover, a closer examination of the studies suggests that overall prevalence may not differ much by acculturation, regardless of its measurement, but by the types of botanicals used.

Objectives

The objective of this systematic review was to examine patterns in the prevalence of botanical supplement use among US Hispanics/Latinos through a comprehensive examination of the biomedical literature. Specifically, we wished to answer the question: What study-related characteristics could be associated with higher prevalence estimates? A secondary objective was to quantify disclosure rates of botanical supplement use to health care providers within our sample of studies as well as to examine patterns in studies associated with those rates. Finally, because the specific botanical supplements used in Hispanic and Latino populations were reportedly different from the general population, we wished to document those differences.

Materials and Methods

Information sources

The senior author developed the study protocol, including the strategy for study identification: electronic database searches (CINAHL, EMBASE, Global Health, CAB Abstracts, AMED, and Medline) with keywords: herbal, herb, medicinal plant, botanical, dietary supplement, and Hispanic or Latino along with a manual search of retrieved references (Figure 1). The search included only citations published in the biomedical literature from 1998 until 2011, excluding dissertations, meeting abstracts, non-English publications, and studies outside the United States. The following studies met the protocol's eligibility criteria:

- Adult populations (age 18 and older);
- Adequate Hispanic/Latino sample, defined as $n \geq 10$ and proportion ≥ 0.01 ;
- All quantitative data collection methods accepted (face-to-face, telephone, and self-administered written questionnaires);
- Prevalence reported for botanical supplement use.

Data collection process

Two authors reviewed abstracts resulting from electronic database searches and identified studies meeting eligibility requirements. The two extracted information systematically with entry into a database file. A third author adjudicated any disagreements in data extraction. Outcomes collected included the following: 1) study sampling techniques (probability vs. convenience); 2) data source; 3) year of publication; 4) publication journal; 5) data collection type (face-to-

face interview, telephone interview, written survey); 6) language of study instruments (English, or English plus Spanish); 7) time period of the recall (e.g., use over the past 1-2 weeks, month, etc.); 8) location of study in the US (national, Mexican border, southeast, Midwest); 9) definition of botanical supplements in study (e.g., "herbal remedies" vs. "non-vitamin, non-mineral dietary supplements" vs. "biologically-based therapies"); 10) sample population characteristics (age and gender distributions, education, insurance, US born, years in the US, and, where applicable, health conditions represented); 11) study size, including the size of the Hispanic/Latino sample population; 12) and commonly reported botanicals. In addition, the authors captured disclosure of botanical supplement use to health care providers.

To examine the impact of sample characteristics across studies, we limited the analysis to studies including a prevalence estimate of botanical supplement use among Hispanics/Latinos where Hispanics/Latinos made up at least 1% of the sample with a sub-sample size of ≥ 10 . Of the studies using the same dataset, we chose the study with the largest sample size. For example, if the study was based on the 2002 National Health Interview Survey (NHIS) sample, we used the report with estimates for the entire population rather than estimates for subgroups, such as older adults or patients with diabetes. We included only studies with a reasonably similar outcome, defining the prevalence of herb use, herbal medicine, herbal therapy, or "herbal and home remedies". We excluded qualitative studies and those in which botanical supplement use for specific conditions was reported (rather than botanical supplement use among those with a particular condition).

Sources of bias

We evaluated sources of bias within studies, including recall bias, selection bias, and information bias, but made no attempt to restrict the sample of studies by any definition of study quality. To assess recall bias, we considered the recall period and target population (patients vs. general public). To evaluate selection bias, we examined the study sampling strategy, response rate, and target population. Finally, to gauge information bias, we considered the study instrument, both in terms of language and the specific botanicals included.

Summary measures and synthesis of results

Summary measures were limited to presentation of median

PubMed (Medline) Search

- 1 herb.mp. (7548)
- 2 herbal.mp. (37152)
- 3 medicinal plant.mp. or medicinal plants/ 58227
- 4 botanical.mp. (5949)
- 5 dietary supplement.mp.(41747)
- 6 1 or 2 or 3 or 4 or 5 (132783)
- 7 Hispanic.mp. (29372)
- 8 Latino.mp. (22104)
- 9 7 or 8 (31216)
- 10 6 and 9 (275)
- 11 limit 10 to English (273)
- 12 limit 11 to humans (261)
- 13 limit 12 to Publication date from 1998/01/01 to 2011/12/31 (233)
- 14 limit 13 to adults (181)

Figure 1: Sample database search for systematic review of the prevalence of botanical supplement use among Hispanics and Latinos in the United States 1998-2011. The search of Medline/PubMed is presented. The original search was undertaken in 2011, but was updated 5/4/2012.

prevalence statistics along with nonparametric bivariate tests (Mann Whitney U, Kruskal-Wallis). We calculated the median prevalence of botanical use (%) along with its binomial-based confidence interval for each stratum. Medians are reported to limit the influence of outliers. All analyses were conducted using Stata software Version 12 (Stata Corp LP, College Station, Texas 77845-4512). Stata employs confidence interval calculation methods based on a binomial distribution as described in Mood and Graybill [25].

To assess prevalence across studies controlling for recall, we stratified by the study instrument recall period: use over 1-2 weeks, 6 months to 1 year, and 2 or more years (including lifetime use). To examine sources of selection bias, we compared prevalence estimates according to the study’s sampling strategy (convenience vs. probability), the size of the study, and the proportion of Hispanics/Latinos in the sample. We also examined the target age (designed for older adults ≥65 years old vs. <65), the gender distribution (percent male) and the population target (patients vs. general population). Education and insurance data definitions varied too much to include in our analysis. We examined the influence of both the primary language of the study—categorized as English and Spanish vs. English alone and the representativeness of the study—regional vs. national. We classified type of publication as a complementary and alternative medicine (CAM) journal or a general biomedical journal. We examined the relationships among the study variables using a Spearman correlation procedure. Due to its public health and clinical relevance, we also captured disclosure of botanical supplement use to health care professionals among the studies we assessed. Finally, we examined the specific botanical supplements reported by Hispanics/Latinos across the studies qualifying for the review. We extracted the 10 most prevalent botanical supplements reported in each study and documented the number of studies in which they were reported.

Results

Study selection

Figure 2 portrays the search and selection process. After excluding studies without the appropriate population, language or outcome, 121 studies remained for more complete review. A review of study references yielded an additional 27. Six studies were excluded because of inadequate Hispanic/Latino sample size and another 9 studies lacked prevalence for Hispanics/Latinos. Twenty-three studies were excluded due to a duplicate data source. Of the remaining studies, 18 were qualitative, 15 reported the use of botanicals for treatment of a specific illness, and 22 reported the prevalence of all dietary supplements combined (Web Table 6). An additional 22 studies did not meet criteria for other reasons. References for and descriptions of excluded studies are provided in the Appendix.

Study descriptions

Thirty-three studies of botanical use prevalence among Hispanics/Latinos constituted the analysis sample, including studies inquiring about current botanical use—within the past 30 days or less — Table 1 [22,26-29], within the past 6-12 months — Tables 2a and 2b [6,24,29-45], and use within 2 or more years — Table 3 [4,21,23,46-52]. Tables present data on study type (regional vs. national), sampling strategy (convenience vs. probability), target population, sample size (total and Hispanic/Latino), prevalence of botanical supplement use, botanical definitions, other variables collected in the study, study response rate, rate of disclosure of use of botanical supplements to physicians, and sample age range. Across the 32 studies, the total number of Hispanics/Latinos was 18,316 with a total N across studies of 96,523. Study size ranged from 30 to 29,990 with Hispanic/Latino sample sizes of 11 to 3,599. More than half (53%) of the studies reported at least 500 subjects. Two-thirds of the studies included non-Hispanics, about half had a minority Hispanic/Latino sample, and 12% included fewer than 50

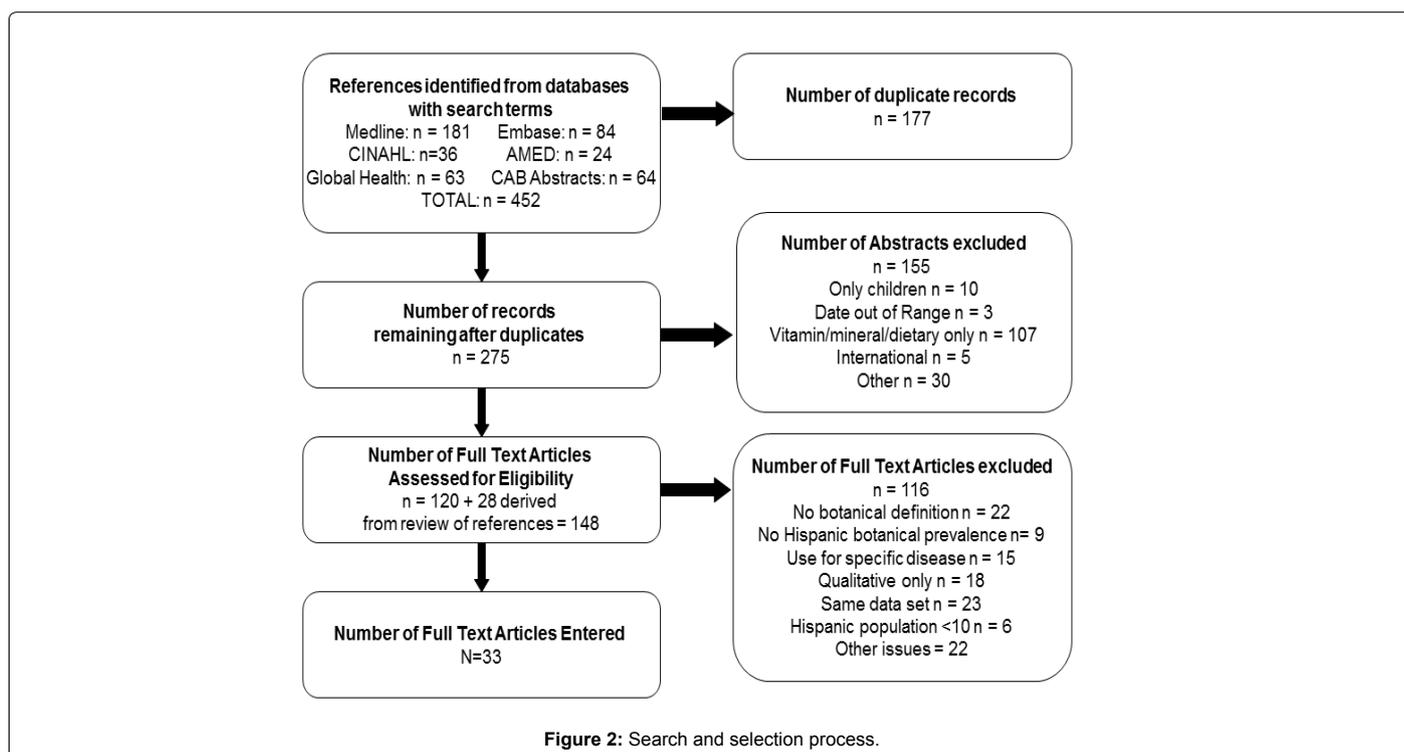


Figure 2: Search and selection process.

First author, Year, Journal	Study type, sampling strategy, target population	N (H-L/Total) Prevalence (H-L/Total)	Botanical- related outcomes	Response rate disclosurea	Age mean (SD), min-max
Kelly, 2006, <i>J Alternative Complement Med</i> [26]	National survey (Slone), probability, US adults	1,109/13,436 15%/17%	Use of herbal/natural supplements in the past week	68% nr	18+24% >65
Loera, 2001, <i>J Gerontology</i> [22]	National cohort study (EPESE), probability, Older Mexican Am. in southwestern US	2734 10%	Use of folk medicine, herbs, herbal remedy over prior 2 weeks	83% nr	65+70% <75
Ness, 2005, <i>Gerontologist</i> [27]	National survey (Health and Retirement Study), probability, Older adults	77/1099 12%/19%	Current regular use of herbal supplements	79% nr	nr 65+
Raji, 2005, <i>Annals Pharmacother</i> [28]	Regional cohort: HPS (TX), probability, Older adults (>76)	128/365 5%/6%	Use of herbal supplements in the past two weeks	61% nr	77+ majority>80
Rivera, 2005, <i>Am Surgeon</i> [29]	Regional survey (TX), probability, Mexican-American surgical patients	115/115; 12 month: 62%; 30 days: 43%	Use of herbal products past 12 months & 30 days	7.6% nr	48.6 19-81

Abbreviations: H-L: Hispanic or Latino; nr: not reported; a. Disclosure of use of botanical supplements to health care providers.

Table 1: Studies assessing botanical supplement use in the past 7-30 days among US Hispanics/Latinos 1998-2011.

First author, Year, Journal	Study type, Sampling strategy, Target population	N (H-L/Total) Prevalence (H-L/Total)	Botanical outcomes	Response Rate Disclosurea (H-L/Total)	Age mean (SD), min-max
Bair, 2008, <i>Menopause</i> [30]	National cohort: SWAN, probability, middle-aged women	283/3295 9%/18%	Herbal remedy use in the past 12 months	70% complete data, nr	45.7, 42-52
Burge, 2002, <i>Am J Pub Health</i> [31]	Regional survey (TX), convenience, family practice patients	460/575 27%/24% + 15%/14% used home remedies	Herbal remedy use in the past 12 months	78%, nr/43%	43.8
Cherniack, 2004, <i>Alt Comp Therap</i> [32]	Regional survey (NY), convenience, Primary care patients ≥60	27/209 37%/32%	Use of herbs in the past 12 months	nr	74.7
Fennell, 2004, <i>Preventive Med</i> [33]	National survey: NHIS 2000, probability, US population	2,901/24,834 7%/15%	Use of any mixed or single herb or botanical in the past 12 months	72% N nr/24%	18+ 42% <40
Gordon, 2005, <i>BMC Geriatrics</i> [34]	Regional survey (CA), probability, Older women in Northern CA	147/3,109 21%/25%	Use of any herbal supplement past 12 months	72% nr	65-84
Graham, 2005, <i>J Nat Med Assoc</i> [35]	National survey: NHIS 2002, probability, US population	3,599/29,990 17%/19%	Use of herbal medicine in past 12 months	73% 31%/40%	18+
Keegan, 2000, <i>J Holistic Nursing</i> [36]	Regional survey (TX), convenience, general public (grocery store)	60/120 52%/32%	Use of herbal medicine in past 12 months	nr 55%/27%	80+% under 50
Kronenberg, 2006, <i>Am J Public Health</i> [37] Loera, 2007, <i>Complement Ther Clin Pract</i> [38]	National survey of CAM use, probability, US adult women	1,057/3,921 18%/15%	Use of medicinal herbs and teas in the past year	79% (69% H-L) nr	18-50+ 83% of Hisp <50
Loera, 2007, <i>Complement Ther Clin Pract</i> [38]	National cohort study (EPESE), probability, Older Mexican Am. in southwestern US	1445 28%	Use of CAM/herbal medicine in the past 12 months	83% (1/2 sample censored) nr	71 (5.2)
Mackenzie, 2003, <i>Alt Ther Health Med</i> [39]	National survey (National Comparative Minor Health Care Survey), probability, US population	581/3452 23%/19%	Use of herbal medicine over the past 12 months	60%	nr
Ortiz, 2006, <i>J Am Pharm Assoc</i> [40]	Regional survey (FL), convenience, Hispanics in South Florida	142 74%	Use of herbal supplements in past 12 months	71% nr	39 18-65+

Abbreviations: H-L: Hispanic or Latino; nr: not reported; NHIS: National Health Interview Survey; EPESE: Established populations for the Epidemiologic Study of the Elderly. a. Disclosure of use of botanical supplements to health care providers.

Table 2a: Studies assessing botanical supplement use in the past 12 months among US Hispanics/Latinos.

Hispanics/Latinos. Half of the studies were conducted within patient populations. Studies among patients included those with cancer [47], HIV [45], menopause [50], surgical patients [29,46], and pregnancy [42] as well as patients attending primary care clinics [21,23,24,41,51,52]. Regional studies included those from states along the Mexican border (Texas, New Mexico, Arizona, California: 50%) as well as in other parts of the country (Florida, New York, Massachusetts, Illinois: 28%). About a fourth of the study samples were representative of the national population. Twenty-two percent of studies were published in complementary and alternative medicine journals with the remainder in general biomedical journals. Information on exposures pertinent to prevalence estimates varied among studies: 59% collected data on income, 38% insurance, and 41% collected data on acculturation (birthplace or duration of US residence). The vast majority of studies

(91%) collected education status, but categorization was inconsistent. Botanical supplement prevalence estimates among Hispanics/Latinos ranged from 4.7 to 80%.

Twenty-two studies reported a response rate. Of those, 23% reported a response rate less than 70%. Probability sampling was employed by only 41% of the studies. More than 40% of studies were available only in English and 34% of studies used data instruments directed to the general public, excluding botanicals common among Hispanics/Latinos, including specific questions about botanical teas.

Summary prevalence estimates

Table 4 presents prevalence estimates for studies of botanical supplement use across a number of study variables. As expected, median prevalence estimates were higher for assessment periods of

6-12 months (27%) or 2 years or more (45%) as compared with ≤ 30 days (12%); many botanical supplements are consumed intermittently. Median prevalence estimates were higher in convenience (45%) vs. probability (21%) samples (Figure 3). In addition, regional studies reported higher prevalence estimates (42%) than nationally representative samples (15%). Sample characteristics associated with higher median prevalence of botanical use among Hispanics/Latinos included studies with: 1) patient populations (46 vs. 18%); 2) a focus on younger vs. older adults (42 vs. 12%); and 3) majority male vs. majority female samples (42 vs. 31%).

Studies with a majority Hispanic/Latino sample population reported a median prevalence of 45% (vs. 21%). Studies including botanicals common in Hispanic/Latino populations, such as botanical

teas, reported higher median prevalence estimates than those focusing on botanical supplements common in the general population (49% vs. 18%). Studies conducted only in English yielded a median prevalence of 18% while those conducted in Spanish and English had a median prevalence of 42%.

Variability in the estimates was high with wide binomial confidence intervals around the medians. In addition, because of considerable overlap in the categories and the small number of studies considered, the independent contributions of study and sample characteristics could not be determined. For example, studies with probability samples were likely to be designed for the national population, in English, with a minority Hispanic/Latino population, and inquiries about botanicals common to the general population, whereas convenience samples

First author, Year, Journal	Study type, Sampling strategy, Target population	N (H-L/Total) Prevalence (H-L/Total)	Botanical outcomes	Response Rate Disclosure ^a (H-L/Total)	Age mean (SD), min-max
White, 2009, J Am Board Family Medicine [24]	Regional survey (CA), convenience, Low-income Hispanic/Latino clinic patients	164 63%	Use of herbal/tea/plant-based substances in the past 12 months	100% nr	nr
Zeilmann, 2003, Pharmacother [41]	Regional survey (NM), convenience, Geriatric clinic patients	84/186 61%/49%	Use of herbal medicine in the past year	>95% 28%/26%	65->85
Bercaw, 2010, Birth Issues Perinatal Care [42]	Regional survey (TX), convenience, Hispanic women, childbearing age	485 19%	Herb use during pregnancy	90%, 66%	26.8 18-42
Ma, 2011, BMC Cancer [43]	Regional cohort study (CA), probability, Female breast cancer survivors <40	36/371 50%/59%	Use of any of a list of herbal remedies in the past six months	50%	At diagnosis: <35 to 40
Tsang, 2007, Top Clin Nutrition [6]	Regional survey (MA), convenience, Physically active adult members of ethnic minorities	11/106 18%/27%	Botanical supplement use in the past 6 months	nr 85%	18-65. 54% <35

Abbreviations: H-L: Hispanic or Latino; nr: not reported; ^aDisclosure of use of botanical supplements to health care providers.

Table 2b: Studies assessing botanical supplement use in the past 6-12 months among US Hispanics/Latinos.

First author, Year, Journal	Study type, Sampling strategy, Target population	N (H-L/Total) Prevalence (H-L/Total)	Botanical- related outcomes	Response Rate Disclosure ^a	Age mean (SD), min-max
Adusumilli, 2008, Holistic Nursing [46]	Regional survey (NY), Convenience, Patients presenting for surgery	270 / 2,186 37% / 38%	Herbal medicine use in 2 years before surgery	65% nr/7%	18+
Greenlee, 2009, Breast Cancer Res Treat [47]	Regional cohort baseline (CA), probability, Insured women with breast cancer	102/1,000 42%/47%	Use of botanical supplements over five years since diagnosis	51%nr	50-75
Howell, 2006, J Am Family Medicine [21]	Regional survey (IN), convenience, Hispanic family medicine patients	620 80%	Use of herbal remedies ever	nr 26%	<20 to ≥ 40 (14% ≥ 40)
Jernewall, 2005, AIDS Care [48]	Regional survey (NY, DC), convenience, HIV positive gay or bisexual H-L men	152 42%	Use of plant-based CAM (herbs, home remedies) ever	nr nr	39 29-69
Kuo, 2004BMC Complement Altern Med [23]	Regional survey (TX), convenience, urban primary care patients	30/98 50%/36%	Use (ever) of herbs or herbal products or natural medicines	98% nr	<30 to >50 48% of Hisp >50
Lundy, 2001, Complement Health Pract Review [49]	Regional survey (AZ), convenience, Low-income patients at family practice centers	386/516 35%/25%	Use of special herbs over the past two years	83% 36%	33 (14) Hisp 43 (18) NHW
Mahady, 2003, Menopause [50]	Regional survey (IL), convenience, Middle-aged women (40-60) attending clinics	59/500 75%/79%	Use of botanical supplement use, including herbal teas (ever)	75% 30%	50.3 40-60
Mikhail, 2004, J Altern Complement Med [49]	Regional survey, convenience, mix of Hispanic/Latino primary care patients and general population	179/179 36%/36%	Use of herbs to treat disease	100% 21%	49 (16)
Trangmar, 2008, Annals Family Medicine [51]	Regional survey (SC), convenience, family practice patients	70 67%	Use of herbal medicines or teas ever	nr nr	76% under 50
Zenk, 2001, Health Care Women Int [4]	Regional survey (IL), convenience, Middle-aged Mexican American women	30 47%	Use of herbal or natural remedies to help with symptoms or your health during midlife	nr nr	40-56

Table 3: Studies assessing botanical supplement use in the past 2+ years among US Hispanics/Latinos.

	Prevalence of use of botanical supplements				
	n	N	Median	95% CI	P ^a
Overall	33	96,702	37	21, 49	
Time period					
Over ≤30 days	5	17,749	12	4.7, 43	0.02
Over 6-12 months	18	73,378	27	19, 59	
Over 2+ years	10	5,575	45	36, 73	
Sample type					
Probability	13	83,011	21	9.9, 42	0.01
Convenience	20	13,691	45	35, 63	
Data collection method					
Interview	21	74,580	36	18, 56	0.6
Written	12	22,122	40	19, 52	
Publication type					
CAM journal	8	19, 679	36	20, 51	0.8
General journal	25	77,023	42	18, 59	
Regional vs. national					
Regional	26	16,675	42	35, 57	0.001
National	7	80,027	15	7.7, 22	
Sample population ^a					
General public	16	88,578	18	11, 37	0.003
Patients	16	7,945	46	37, 65	
Target age of population					
Adults ≥65	7	9,147	21	6.3, 53	0.07
Adults <65	26	87,555	42	24, 51	
Gender distribution					
Majority males	5	4,250	42	23, 50	0.5
Majority females	26	92,168	31	18, 49	
Language of instrument					
Spanish & English	20	16,880	42	29, 63	0.02
English only	13	79,822	18	9.9, 45	
Sample proportion of H-L					
Majority H-L	16	8,321	45	32, 67	0.02
Minority H-L	17	88,381	21	15, 42	
Size of H-L sample					
N < 250	18	8,239	45	37, 58	0.08
N ≥ 250	15	88,463	23	15, 37	
Botanicals common among H-L					
No	11	82,716	18	11, 37	0.003
Yes	22	13,986	49	35, 63	

Abbreviations: H-L—Hispanics -Latinos; n: number of studies; N: sum of sample populations; CI: confidence interval, calculated using binomial method; CAM: Complementary and alternative medicine. a. p values are based on Kruskal-Wallis (or Mann-Whitney U) rank nonparametric tests. All analyses were conducted in Stata 13. a. One study excluded due to including both patients and the general public. b. Two studies excluded due to non-report of gender distribution.

Table 4: Prevalence of the use of botanical supplements in studies including Hispanics/Latinos 1998-2011 across characteristics of included studies.

were more often conducted in a regional locale with study instruments designed for the local population.

Disclosure to Health Care Providers

Eight of the included studies provided information on disclosure of botanical supplement use to health care providers for the Hispanics/Latinos and non-Hispanics and 10 studies reported disclosure rates specifically for Hispanics/Latinos. For Hispanics/Latinos, disclosure rates ranged from 8 to 66% with a mean of 31% and median of 30. For studies including Hispanic/Latino and non-Hispanics, disclosure

rates ranged from 7 to 53% with a mean of 34 and median of 37. Interestingly, differences in disclosure rates between studies among patients and those in non-patient populations were not large: median 32% (95% CI: 14, 48) vs. 40% (95% CI: 17, 40). Studies that asked about disclosure of other complementary therapies (e.g., acupuncture, massage, meditation) in addition to botanicals reported higher rates of disclosure to physicians (37%; 95% CI: 24, 50), compared with studies that focused solely on botanicals (23% ; 95% CI: 7.1, 33) (p=0.15).

Common botanical supplements among Hispanics/Latinos

Ten of the studies reported the most common botanical supplements among Hispanics/Latinos (Table 5). These included chamomile, aloe, mint, and garlic [14,21,29,40,45,49]. It should be noted that, unlike consumption of botanical supplements in the general population, these botanicals are often consumed in teas or other raw forms. Note that other botanicals on the list are unusual in the general population as well, e.g., lime tree (linden), prickly pear cactus (nopal), and corn silk.

Discussion

This unique comprehensive systematic review explores study characteristics associated with variations in the prevalence of botanical supplement use among Hispanics/Latinos. As we expected, we noted differences in prevalence related to the proportion of Hispanics/Latinos in the sample population, the sampling strategy, and sample characteristics. In regional samples, potentially biased by the sampling strategy, prevalence estimates were almost three times as high as in nationally-representative population surveys. However, in nationally-representative samples, ethnic minorities, especially recent immigrants, may be under-represented (40). For example, among studies of individuals along the Mexican border over a 6-12 month recall period, prevalence estimates of botanical supplement use range from 19 to 78% [24,29,31,34,36,38,41,44,45]. In contrast, prevalence estimates among Hispanics/Latinos in nationally-representative samples over a similar time period ranged from 7 to 23% [30,33,35,37,39]. Not surprisingly, because the language used to describe botanicals among Hispanics/Latinos differs from that of the general US public (including plant names, product formulations, and typical use patterns), assessment instruments designed for Hispanic/Latino populations produce higher prevalence estimates than those created for national samples. In some studies, supplement definitions consisted of commercial products only [26,35,39]; in others, information on any botanical substance (including herbal teas) used to prevent or treat a disease or illness was solicited [22,24,29,37,44-45,50,51]. As teas are commonly consumed in many Hispanic/Latino populations [52], botanical assessments that exclude them may result in serious underestimates. Among the studies of botanical supplement use in the past 6-12 months with instruments that target botanical supplements common among Hispanics/Latinos, prevalence of use among Hispanics/Latinos ranged from 18 to 80 %, median 50% [24,29,31,36-38,41,44,45,49] while among those that do not target Hispanic/Latino botanical supplements, the range was 7 to 42%, median 18% [6,30,33-35,39,43].

We identified a number of sources of bias in the studies. Studies based on national probability samples were either hampered by an overall poor response rate [35], did not report a response rate [33], or had a differential, lower response rate for Hispanics/Latinos [37]. In addition, studies utilizing the NHIS, with data collection by census staff, may have excluded certain Hispanic/Latino populations, such as recent or undocumented immigrants. Other probability samples used sampling frames biased toward individuals with higher incomes. For example, an otherwise excellent study limited its sample to older

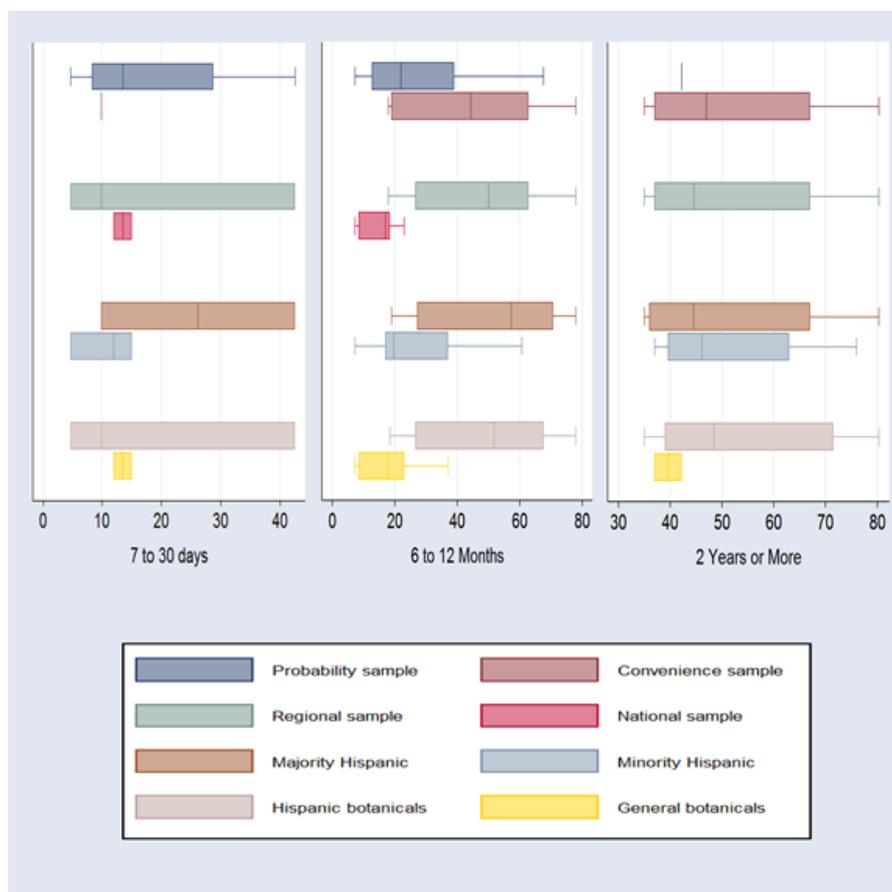


Figure 3: Prevalence of botanical supplement use among Hispanics/Latinos by sample characteristics.

English name	Spanish name	Number of studies reporting
Garlic	Ajo	11
Chamomile	Manzanilla	11
Aloe vera	Savila	9
Ginseng	Ginseng	5
Mints	Yerba Buena	5
Oregano	Oregano	5
Lime Tree (Linden)	Tilo, Flor de Tila	4
Prickly pear cactus	Nopal	4
Ginger	Jengibre	3
Wormwood	Ajenjo	3
Mullein	Gordolobo	3
Eucalyptus	Eucalipto	3
Cinnamon	Canela	3
Star anise	Anis estrella	2
Corn silk	Pelo de Elote	2

Twelve studies reported at least one botanical used commonly by Hispanics/Latinos. Of the studies reporting multiple botanicals, the top ten most common were chosen. Of those, only botanicals reported by at least two studies are listed.

Table 5: Most common among Hispanic/Latino populations in the United States.

women covered by a particular health plan [47]. Similarly, studies that utilized telephone surveys excluded those without telephones [39]. Studies using cohort follow-up samples [30,38] may have suffered from bias due to differential loss to follow up. Many convenience studies were likely to have been biased by differential non-response: non-

users of botanical supplement may have been less likely to respond. Some of the best studies with convenience samples, with close to 100% response rates were difficult to compare, due to differences in their target populations. One study was undertaken in a low-income clinic [24] and another among patients presenting for surgery [29].

Other potential sources of bias included recall and information bias. The majority of the studies asked respondents to recall their use of botanical supplements over a period of several months. It is unclear whether or not respondent characteristics, such as poor health [38] or adverse pregnancy outcomes [42] may have affected recall.

Variable botanical supplement definitions also affected prevalence estimates. Although we excluded studies of non-botanical dietary supplements from our final analysis, we cannot be certain that questions about “herbal products” [44] and “herbal remedies” [31] are the same.

In the general public, botanical supplement use is more prevalent among women and those with chronic conditions [3,53]. National studies have also predicted higher use of botanical supplement among older Hispanics/Latinos as compared with non-Hispanic whites [54]. However, among Hispanics/Latinos in the selected samples, botanical supplement use in studies targeting older adults was somewhat lower than studies targeting all adults or studies targeting middle-aged adults. In our sample of studies, we documented higher prevalence among patient populations, but studies with predominantly female populations did not have higher prevalence estimates.

The language of the study instrument had an impact on estimates. Not only did studies offered only in English exclude those who are less proficient in English, they also may have resulted in prevalence underestimates. In one study, most of the respondents did not know the English name for over 90% of the herbal products in the study [21]. Regional studies, even those with probability sampling, reported much higher prevalence estimates than national studies. The differentials are likely to be due to a combination of factors, including non-response bias in the convenience samples and exclusion of botanicals common among Hispanics/Latinos in the national samples.

Hispanic/Latino patient's rates of disclosure of botanical supplement use to physicians are low [21]. In the general population, a third to half of supplement users disclose their use to health care providers [55,56]. Despite an expectation that disclosure rates would be substantially lower among Hispanics/Latinos, due to language and access challenges [40], in the studies reported in this review, disclosure levels among Hispanics/Latinos (median 30%) were only slightly lower than those reported in previous studies. Across studies, >60% of individuals reported that they do not tell their health care provider about taking botanical supplements. Moreover, in a chart review, only 15% of botanical supplement use was documented in the medical record [13]. The lack of disclosure could put individuals at risk of adverse events related to botanical supplements or their interactions with prescription medications.

Our finding that disclosure rates were higher for studies targeting, and asking about disclosure of any complementary therapy as compared with botanical supplement studies suggests that individuals are even less likely to disclose use of botanicals than other complementary therapies. This finding merits further investigation as it has important implications for both clinical practice and public health assessments.

Taken together, these findings suggest that botanical use among Hispanics/Latinos is underestimated both in the biomedical literature and by healthcare providers. Botanical use is often a cultural practice [40], occupying a space outside the biomedical milieu. Accurate assessment of botanical use depends on careful inquiries about the use of not only dietary supplements, herbal products, and home remedies, in Spanish where appropriate, but also about special foods and teas as well as personal and family health practices. Anecdotally, Hispanics/Latinos may not think of herbal teas as herbal remedies or therapies, even when specifically taken for treatment of a minor illness (e.g. mint for upset stomach, linden for nervousness/insomnia, aloe for constipation) or for prevention of disease (nopal for diabetes prevention).

Limitations

This systematic review is limited in important ways. Variability in outcome definitions and recall periods make cross-study comparisons difficult—reported median prevalence estimates should be considered approximations. Biases, as described earlier, may also have enormous impacts on estimates. Moreover, available studies have insufficient information to determine if variations in prevalence are associated with differences in Hispanic/Latino background; for example, individuals from Puerto Rico may have very different use patterns than those from Mexico.

Although we made every effort to retrieve all studies reporting prevalence of botanical supplements among Hispanics/Latinos in the biomedical literature, we may have missed those not listed within the databases we searched. In addition, studies not published in the literature would be excluded.

Conclusions

Despite the limitations, this systematic review provides a unique, comprehensive examination of botanical supplement prevalence among Hispanics/Latinos, using all available data. Although the prevalence estimates are highly variable, clear patterns emerged. Of particular interest are the differences in prevalence associated with variables related to Hispanic/Latino ethnicity such as the proportion Hispanics/Latinos in the sample and the inclusion of botanicals common in the population. Studies directed toward non-Hispanic/Latino samples with inquiries in English only and inquiries regarding botanicals common in the general population only, may undercount botanical supplement use among Hispanics/Latinos. Additional prevalence studies in large Hispanic/Latino populations, with adequate data on Hispanic/Latino background are needed to address lingering uncertainties.

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