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Original Article

Preventive Screening of Women Who Use Complementary and Alternative Medicine Providers

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Abstract

Background: Many women use complementary and alternative medicine (CAM). Although CAM use has been associated with reductions in conventionally recommended pediatric preventive care (e.g., vaccination), little is known about associations between CAM use and receipt of recommended preventive screening in women.
Methods: Using Washington State insurance data from 2000 to 2003, the authors generated clustered logistic regression models, examining associations between provider-based CAM use and receipt of screening tests for *Chlamydia trachomatis*, breast cancer, and cervical cancer: (1) contrasting women who used CAM providers only (alternative use) and women who used both conventional and CAM providers (complementary use) with women who used conventional care only and (2) testing associations between screening and use of four specific CAM provider types—naturopathic physicians, chiropractors, massage therapists, and acupuncturists.
Results: Both alternative and complementary use was associated with reduced *Chlamydia* screening. Cancer screening increased with complementary use but decreased with alternative use of CAM. Use of naturopathy was associated with decreased mammography, whereas all four CAM therapies were positively associated with Papanicolaou testing.
Conclusions: When used in conjunction with conventional care, use of provider-based CAM may signal high interest in various types of health-promoting behavior, including cancer screening. Negative associations between CAM and *Chlamydia* screening and between naturopathy and mammography require additional study. Interventions with CAM providers and their patients, aimed at improving rates of conventionally recommended screening, might encourage greater focus on preventive care, an important task when CAM providers serve as women's only contact with the healthcare system.

Introduction

Use of complementary and alternative medicine (CAM) has increased in the United States over the past 20 years,[1–3] and a variety of studies based on national[2–6] and regional[7–11] self-report surveys and on insurance claims[12–16] have found disproportionate use of CAM among women. Most people who use CAM providers use these therapies as complements, rather than alternatives, to conventional care. A study based on the 1996 U.S. Medical Expenditure Panel Survey found about 85% of U.S. users of provider-based CAM to have used conventional physicians as well, with only 15% using CAM providers exclusively.[17] Although much has been written about associations between CAM use and preventive care of children (in particular, pediatric vaccination),[18–25] considerably less is known about associations between CAM and adult preventive care. Reported results for adults have varied, depending on the sample used and the types of CAM and preventive care considered. Studies have found higher rates of some types of vaccination among adult users of CAM (broadly defined) than among nonusers,[26,27] similar rates of cancer screening for users and nonusers of provider-based CAM,[28] and higher rates of several types of preventive care among persons using practitioner-based CAM as a complement to conventional medical care than among those who rely exclusively on conventional care.[29] All have based their findings on self-reports from healthcare consumers, and although all included women, none focused solely on females.

Women in the United States bear substantial disease burden as a result of three diseases. *Chlamydia trachomatis* infection, typically an asymptomatic sexually transmitted disease (STD), can have serious consequences if left untreated: pelvic inflammatory disease (PID), ectopic pregnancy, infertility, miscarriage, premature birth, infant mortality, and neonatal

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infection.[30] *C. trachomatis* is the most commonly reported notifiable infection in the United States, and all 50 states and the District of Columbia require reporting of detected cases.[31] Because of its frequent asymptomatic presentation, adequate detection relies on routine screening. In 2001, the United States Preventive Services Task Force (USPSTF) recommended that clinicians routinely screen all sexually active women aged ≤25 years.[30] The Centers for Disease Control and Prevention (CDC) has recommended annual screening through age 25.[32]

Breast cancer is the most commonly diagnosed cancer among women in the United States and is the second leading cause of cancer-related female deaths.[33] Researchers have suggested that mortality in women aged 50–69 years might be reduced 20%–35% through use of mammographic screening,[34] and a small qualitative study reported that women overwhelmingly saw mammography as beneficial.[35] Although controversy over appropriate use of the technique exists, numerous organizations[36–43] have recommended routine mammography for women, beginning at 40 or 50 years, with at least biennial frequency. Despite considerable support for mammographic screening, however, two studies reported declining use of the procedure between 1999 and 2005.[44,45] Research based on the National Health Interview Survey (NHIS) found >70% of women who had not been screened recently but who had received recent healthcare reported no recommendation for mammography from their healthcare provider.[46] The *Healthy People 2010* project has set a goal of 70% mammographic screening for women aged ≥40 years.[47]

Worldwide, cervical cancer is the second most common cancer in women and third in order of cancer-related female deaths. Decreased incidence and mortality in the United States are largely the result of widely used cytological screening,[48,49] with failure to be screened constituting the most important risk factor for occurrence.[50] The USPSTF has strongly recommended regular screening for cervical cancer through the use of cervical cytology (Papanicolaou [Pap] testing) at least every 3 years for all women aged 21–65 years with intact cervix and history of sexual activity.[51] The American Cancer Society also recommends routine screening, although at more frequent intervals among women in the earliest affected age group.[39] The *Healthy People 2010* project has set as a goal the screening of 90% of women aged ≥18 years.[47]

In light of the reported disproportionate use of CAM by women and the equivocal research findings examining associations between CAM and various forms of preventive care, it is important to investigate relationships between women's use of CAM and screening that has potential for dramatically decreasing female disease burden. In this article, we examine associations between provider-based CAM therapies and screening for *C. trachomatis*, breast cancer, and cervical cancer. We concentrate on provider-based therapies because provider recommendation has been acknowledged as an important impetus for screening. Inasmuch as self-reports of CAM use are prey to recall error and may result in inaccurate estimates of actual use, we base our analyses on insurance claims from Washington State, where insurance reimbursement to state-licensed CAM providers is required by law. We consider the impact of complementary vs. alternative use of CAM therapies, as well as associations between screening and use of four specific CAM provider types that are licensed by the state and thus are eligible for insurance coverage: naturopathic physicians, acupuncturists, chiropractors, and massage therapists.

Methods

Study Samples and Outcomes

Two Washington State insurance companies provided data for female enrollees from 1 through 64 years of age—one company for calendar years 2000–2003; the other, for 2001–2003. We have described the data acquisition process, data cleaning, and creation of cross-company analysis variables elsewhere.[52–53] The University of Washington Human Subjects Division approved the research procedures.

The Healthcare Effectiveness Data and Information Set (HEDIS)[54] includes standards for measuring performance on each of the three outcomes of interest, using codes from the International Classification of Diseases (ICD-9-CM)[55] and Current Procedural Terminology (CPT).[56] The Appendix summarizes the codes used to identify these outcomes and to select the sample appropriate for each test (viz., codes identifying sexually active women, those with bilateral mastectomy, and those with hysterectomy).[54] For each measurement year, we used any evidence for sexual activity, mastectomy, or hysterectomy available in claims for that year or any previous year for which the insurance companies provided data (2000–2003). In selecting the sample for each outcome, we excluded women whom we could not unambiguously link to a specific insurance product, those who had no claims attributable to any CAM or conventional provider during the outcome period of interest, and those who did not have continuous insurance enrollment during that period.

Following HEDIS guidelines, we computed a dichotomous Chlamydia screening outcome for each sexually active woman aged 16–25 years for each of the 4 measurement years: 0 = no screening during the measurement year, 1 = screening occurred. To test breast cancer screening, we computed for each of three biennia (2000–2001, 2001–2002, 2002–2003) a dichotomous outcome, including all women aged 52–64 during the second year in the biennium and who had no evidence of bilateral mastectomy: 0, no mammogram during the 2-year period; 1, one or more mammograms. To test cervical cancer screening, we computed for each of two 3-year time blocks (2000–2002, 2001–2003) a dichotomous outcome for all women who were at least 21 years old during the final year of the period and for whom there was no evidence of hysterectomy: 0, no Pap test during the 3-year period; 1, one or more Pap tests.

Predictors

We computed five dichotomous predictors for each of the outcomes, measuring whether, during the period relevant to the outcome, the enrollee had visits with each of five types of healthcare provider: naturopathic physician, chiropractor, acupuncturist, massage therapist, or conventional care provider (medical doctor, doctor of osteopathy, physician's assistant, advanced registered nurse practitioner, or physical therapist). We also constructed a summary measure indicating whether the enrollee received conventional care only, CAM care only, or a combination of conventional and CAM care during the period. Inasmuch as healthcare could vary from one measurement period to another, a women included

in multiple measurement periods might be categorized as receiving conventional care only during one measurement period, CAM care only during another, and both CAM and conventional care during yet another.

Covariates

Multiple regression models included the following enrollee-level covariates: insurance company, measurement year (the final year of the period if the outcome encompassed multiple years), the insurance product type for the measurement year (preferred provider organization, point of service, health maintenance organization, or fee-for-service), age on birthday in the measurement year, morbidity burden (the resource utilization band [RUB], a six-category ordinal measure of disease burden: 0, nonuser; 1, healthy user; 2, low morbidity; 3, moderate; 4, high; 5, very high),[57] and the ruralness of the enrollee's place of residence (a 10-category ordinal variable ranging from metropolitan to rural).[58] In addition, we computed three ecological variables from U.S. Census Bureau statistics for calendar year 2000, based on the first three digits of the enrollee's ZIP code: median education of adults, median family income, and percentage racial/ethnic minority. These three variables represented the community context in which the enrollee lived, not the education, income, or racial/ethnic status of the enrollee, herself.

Analyses

We tested each of the three preventive care outcomes with two multivariate logistic regression models: (1) comparing women who used CAM services as an alternative and those who used CAM as a complement to conventional care with a reference group comprising women who used conventional providers for all healthcare and (2) looking at use of each of four specific provider types (naturopathic physician, acupuncturist, massage therapist, and chiropractor) adjusted for each of the other types, plus conventional provider and covariates. Because many women were enrolled for multiple measurement years, thus violating the assumption of independent observations, we clustered years within enrollees to provide adjusted standard error (SE) estimates. Primary predictors, covariates, and outcomes were all specific to the woman-by-measurement-year record. We have rounded all p values to the nearest three decimal digits; thus, $p = 0.000$ signifies probability <0.0005. We used Microsoft Access 2002 for data management, SPSS 14.0.0 (Chicago, IL) for descriptive statistics, and Stata 8.2 (College station, TX) for regression modeling.

Results

Characteristics of samples

During each measurement year, women in the three samples lived primarily in urban areas, where median household income was between $47,000 and $52,000, about half of all adults had gone to college for a year or more, and 16%–17% of residents were members of racial/ethnic minority groups. The predominant insurance products were preferred provider organizations and point-of-service plans, and women on average experienced moderate disease burden (as defined by their RUB). A majority of the women in each sample received their healthcare exclusively from conventional providers, with 11%–14% of the young women in the *Chlamydia* screening sample and 22%–29% of those in the older breast and cervical cancer screening samples receiving care from CAM providers, typically from chiropractors and as complements to conventional care (Table 1).

Screening for C. trachomatis

A total of 34,513 sexually active women between the ages of 16 and 25 years produced 57,634 records used to evaluate screening for *C. trachomatis*. Each year, women in the sample averaged 21 years of age, and about 26%–27% of them received tests for *Chlamydia* (Table 1). Women who saw CAM providers averaged 7.9 visits annually to those providers, ranging from 1 to 129 visits. Women were more likely to see a CAM provider if they lived in geographic areas with lower population density, average income, and racial/ethnic minority representation; were older; had greater disease burden; or were enrolled in a fee-for-service product. CAM use increased over the 4-year period (data not shown).

After adjustment for covariates, the multivariate model of *Chlamydia* screening suggested a significant reduction in *Chlamydia* screening when CAM was used as either an alternative or complement to conventional care (Table 2). When adjusted for receipt or nonreceipt of conventional care and other CAM therapies, use of chiropractic and naturopathy had significant negative associations with *Chlamydia* screening rates (Table 3). Multivariate models showed significantly higher screening rates in areas with higher racial/ethnic minority representation, lower family income, and denser population; women were more likely to be screened if they were older, had greater disease burden, or were enrolled in non-fee-for-service insurance products. Although screening rates increased slightly over time, the change over the 4-year period was not statistically significant.

Breast cancer screening

The breast cancer screening sample comprised 71,083 unduplicated women, who constituted 131,879 analysis records. During each of the three measurement years (2001–2003), women averaged between 56 and 57 years of age, and more than three-quarters received mammograms (Table 1). Women seeing CAM providers averaged 8.1 annual visits to those providers, with range of 1 to 342 visits during the 2 years comprising the breast cancer screening interval. Women were more likely to see CAM providers if they were younger, had higher disease burden, or were enrolled in fee-for-service products; use increased significantly over the 3 measurement years; and rates were higher in geographic areas with lower education, income, and percentage of minority residents (data not shown).

Compared with women who relied exclusively on conventional providers, those who used CAM therapies as an alternative to conventional health care were significantly *less* likely to obtain mammograms, whereas those who used CAM as a complement were significantly *more* likely to be screened (Table 2). Of the four specific CAM therapies, naturopathy had a significant negative association with women's receipt of mammography, and massage had a significant positive association with this type of screening (Table 3). The multivariate models showed higher mammography rates with increasing age, disease burden, enrollment in a health

Table 1. Characteristics of Women Included in Analyses of Preventive Care

Measurement year	*2000*	*2001*	*2002*	*2003*
Annual *Chlamydia* screening, sexually active women aged 16–25[a]				
Total sample size	11,062	14,914	16,560	15,098
Healthcare received during measurement year				
% with conventional care only	89.3	87.3	86.0	86.1
% with both conventional and CAM care	10.5	12.4	13.4	13.3
% with CAM care only	0.2	0.4	0.6	0.6
% with any conventional care	99.8	99.6	99.4	99.4
% with any CAM care	10.7	12.7	14.0	13.9
% with naturopathy	1.2	1.5	1.7	1.8
% with acupuncture	0.3	0.6	0.5	0.7
% with massage	1.1	1.8	2.5	2.8
% with chiropractic	9.0	10.5	11.5	11.2
% with *Chlamydia* screening	26.7	25.9	27.4	27.0
Geographic area characteristics				
Median percentage racial/ethnic minority population[b]	16	17	17	16
Median household income[b]	$51,126	$50,899	$50,958	$50,870
Median education level of adults[b,c]	3	3	3	3
Median extent rural[d,e]	1	1	1	1
Enrollee characteristics				
Median age in measurement year	21	21	21	21
Median morbidity burden[f]	3	3	3	3
Insurance product in measurement year				
% fee for service	7.3	6.1	5.9	6.1
% point-of-service	42.2	38.9	41.3	44.6
% preferred provider organization	44.9	50.1	48.4	45.9
% health maintenance organization	5.6	4.9	4.4	3.3
Breast cancer screening, every 2 years, women aged 52–64[g]				
Total sample size		37,545	47,952	46,382
Healthcare received during measurement year and prior year				
% with conventional care only		78.1	75.3	74.3
% with both conventional and CAM care		21.4	24.3	25.3
% with CAM care only		0.5	0.5	0.4
% with any conventional care		99.5	99.5	99.6
% with any CAM care		21.9	24.7	25.7
% with naturopathy		2.8	3.6	4.3
% with acupuncture		1.9	2.9	3.4
% with massage		3.5	5.1	6.3
% with chiropractic		18.1	19.9	19.9
% with mammogram		75.1	75.6	75.3
Geographic area characteristics				
Median percentage racial/ethnic minority population[g]		17	17	16
Median household income[h]		$50,310	$47,528	$47,286
Median education level of adults[c,h]		3	3	3
Median extent rural[d,i]		1	1	1
Enrollee characteristics				
Median age in measurement year		56	57	57
Median morbidity burden[f]		3	3	3
Insurance product in measurement year				
% fee for service		8.1	4.8	4.5
% point-of-service		33.9	29.1	32.9
% preferred provider organization		53.4	62.9	59.7
% health maintenance organization		4.6	3.3	3.0
Cervical cancer screening, every 3 years, women aged 21–64[j]				
Total sample size			107,027	107,964
Healthcare received during measurement year and 2 prior years				
% with conventional care only			73.2	71.1
% with both conventional and CAM care			26.4	28.5
% with CAM care only			0.4	0.3
% with any conventional care			99.6	99.7
% with any CAM care			26.8	28.9

(*Continued*)

Table 1. (Continued)

Measurement year	*2002*	*2003*
% with naturopathy	4.0	5.1
% with acupuncture	2.5	3.8
% with massage	5.7	7.9
% with chiropractic	21.9	22.5
% with Pap test	74.3	75.3
Geographic area characteristics		
Median percentage racial/ethnic minority population[j]	17	17
Median household income[k]	$51,318	$48,606
Median education level of adults[c,k]	3	3
Median extent rural[d,l]	1	1
Enrollee characteristics		
Median age in measurement year	46	47
Median morbidity burden[f]	3	3
Insurance product in measurement year		
% fee for service	6.8	6.6
% point-of-service	40.2	39.0
% preferred provider organization	49.0	51.1
% health maintenance organization	4.0	3.3

[a]Women in this sample were enrolled in a single identifiable product during the measurement year, were between the ages of 16 and 25 years on their birthday in the measurement year, had at least one insurance claim that could be identified with either a conventional or CAM provider during the measurement year, and had claims evidence that they were sexually active during or prior to the measurement year.

[b]Based on 2000 U.S. census and reduced sample sizes with available data: 10,958 women in the 2000 sample, 14,730 in the 2001 sample, 16,471 in the 2002 sample, and 15,025 in the 2003 sample.

[c]Education level: 1, high school graduate; 2, less than 1 year college; 3, 1+ years college with no degree, 4, associate's degree; 5, baccalaureate degree; 6, postbaccalaureate degree.

[d]Rural-urban commuting area codes: 1, metropolitan core; 2, metropolitan high commuting area; 3, metropolitan low commuting area; 4, micropolitan core; 5, micropolitan high commuting area; 6, micropolitan low commuting area; 7, small town core; 8, small town high commuting area; 9, small town low commuting area; 10, rural.

[e]Based on reduced samples with available data: 10,712 women in the 2000 sample, 14,394 in the 2001 sample, 16,110 in the 2002 sample, and 14,728 in the 2003 sample.

[f]Based on the Johns Hopkins ACG System's resource utilization band (RUB): 0, nonuser; 1, healthy user; 2, low morbidity; 3, moderate; 4, high; 5, very high.

[g]Women in this sample were enrolled for both the measurement year and the preceding year, were covered by a single identifiable product during the measurement year, were between the ages of 52 and 64 years on their birthday in the measurement year, had at least one insurance claim that could be identified with either a conventional or CAM provider during the measurement year or the previous year, and had no claims evidence that they had had a bilateral mastectomy by the end of the measurement year.

[h]Based on 2000 U.S. census and reduced sample sizes with available data: 37,066 women in the 2001 sample, 47,791 in the 2002 sample, and 46,280 in the 2003 sample.

[i]Based on reduced samples with available data: 36,534 women in the 2001 sample, 47,228 in the 2002 sample, and 45,844 in the 2003 sample.

[j]Women in this sample were enrolled for both the measurement year and the 2 preceding years, were covered by a single identifiable product during the measurement year, were between the ages of 21 and 64 years on their birthday in the measurement year, had at least one insurance claim that could be identified with either a conventional or CAM provider during the measurement year or the previous 2 years, and had no claims evidence that they had had a hysterectomy by the end of the measurement year.

[k]Based on 2000 U.S. census and reduced sample sizes with available data: 106,504 women in the 2002 sample and 107,681 in the 2003 sample.

[l]Based on reduced samples with available data: 104,348 women in the 2002 sample and 106,066 in the 2003 sample.

maintenance organization, or residence in an area with higher average education and lower racial-ethnic minority representation; rates decreased significantly over the 3 measurement years.

Cervical cancer screening

A sample of 145,773 unduplicated women provided data for 214,991 analysis records for cervical cancer screening. Women in the sample averaged 46–47 years of age, and 74%–75% had Pap tests (Table 1). Women who saw CAM providers averaged 10.0 annual visits to those providers, ranging from 1 to 522 visits during the 3 years comprising the cervical cancer screening interval. Use of CAM increased over the 2 measurement years and was significantly higher among women who were younger, had higher disease burden, were enrolled in fee for service products, or lived in rural areas or areas with lower average education, income, and racial/ethnic minority representation (data not shown).

Use of CAM as an alternative to conventional care produced significantly lower Pap testing rates, and use of these therapies as a complement produced significantly higher rates than those reported for women who used conventional care exclusively (Table 2). All four CAM therapies had positive associations with receipt of Pap tests (Table 3). Pap testing rates increased between 2002 and 2003 and were higher among women who were younger, had greater disease burden, were enrolled in point-of-service products, or lived in urban areas or areas with higher average income, education, and minority representation.

Table 2. Multivariate Associations with Women's Preventive Care Outcomes[a]: CAM Care as Complement or Alternative to Conventional Care (Boldface Indicates Associations with $P < 0.05$)

	Chlamydia *screening*[b]		*Breast cancer screening*[c]		*Cervical cancer screening*[d]	
	OR	p	*OR*	p	*OR*	p
Medical care						
Conventional care only	1.000	–	1.000	–	1.000	–
Both	**0.879**	**0.000**	**1.044**	**0.031**	**1.199**	**0.000**
CAM care only	**0.354**	**0.000**	**0.006**	**0.000**	**0.061**	**0.000**
Measurement year[e]	1.018	0.054	**0.973**	**0.000**	**1.033**	**0.000**
Geographic area						
% racial/ethnic minority[f]	**1.003**	**0.007**	**0.998**	**0.001**	**1.002**	**0.002**
Median family income[f,g]	**0.995**	**0.000**	1.002	0.061	**1.005**	**0.000**
Median adult education[f,h]	0.986	0.256	**1.094**	**0.000**	**1.135**	**0.000**
Extent rural[i]	**0.970**	**0.000**	0.998	0.617	**0.976**	**0.000**
Enrollee age	**0.986**	**0.000**	**1.021**	**0.000**	**0.979**	**0.000**
Morbidity burden[j]	**1.454**	**0.000**	**1.464**	**0.000**	**1.453**	**0.000**
Insurance product						
Fee for service	1.000	–	1.000	–	1.000	–
Point-of-service	**1.335**	**0.000**	1.043	0.271	**1.128**	**0.000**
Preferred provider organization	**1.190**	**0.000**	1.019	0.606	0.984	0.536
Health maintenance organization	**1.278**	**0.000**	**1.166**	**0.009**	1.080	0.061

[a]Associations were tested using logistic regression models with standard errors corrected for clustering of years within enrollees. The three models, one for each of the preventive care outcomes, included all predictors shown on the rows, with an additional adjustment for insurance company. The *p* value testing the association between each covariate and outcome was based on a Z-score.

[b]For each measurement year, the sample included women with continuous coverage under a single identifiable insurance product for the measurement year, aged 16–25 years in the measurement year, with one or more claims for either conventional or CAM care during the measurement year, and with claims-based evidence of sexual activity by the end of the measurement year. The analysis sample included 55,943 woman-year records with data on all variables.

[c]For each measurement year, the sample included women with continuous coverage for both the measurement year and the prior year, who were covered by a single identifiable insurance product during the measurement year, aged 52–64 years in the measurement year, with one or more claims for either conventional or CAM care during at least 1 of the 2 years, and with no claims-based evidence of a bilateral mastectomy by the end of the measurement year. The analysis sample included 129,597 woman-year records with data on all variables.

[d]For each measurement year, the sample included women with continuous coverage for the entire period spanning the measurement year and the 2 prior years, who were covered by a single identifiable insurance product during the measurement year, aged 21–64 years in the measurement year, with one or more claims for either conventional or CAM care during at least 1 of the 3 years, and with no claims evidence of a hysterectomy by the end of the measurement year. The analysis sample included 210,408 woman-year records with data on all variables.

[e]Measurement year was computed as a deviation from the earliest measurement year for the outcome (2000 for *Chlamydia* screening, 2001 for breast cancer screening, and 2002 for cervical cancer screening).

[f]Based on the 2000 U.S. census for the geographic area comprising the first three digits of the enrollee's ZIP code of residence.

[g]Median family income was computed in $1000 increments.

[h]Median education level was modeled as an ordinal predictor: 1, high school graduate; 2, less than 1 year college; 3, 1+ years college with no degree; 4, associate's degree; 5, baccalaureate degree; 6, postbaccalaureate degree.

[i]Extent rural was modeled as an ordinal predictor: 1, metropolitan core; 2, metropolitan high commuting area; 3, metropolitan low commuting area; 4, micropolitan core; 5, micropolitan high commuting area; 6, micropolitan low commuting area; 7, small town core; 8, small town high commuting area; 9, small town low commuting area; 10, rural.

[j]Based on the Johns Hopkins ACG System's resource utilization band (RUB): 0, nonuser; 1, healthy user; 2, low morbidity; 3, moderate; 4, high; 5, very high.

Discussion

Analysis of claims data from two Washington State insurers suggests that, compared with women who use conventional healthcare exclusively, women who use CAM as an alternative form of care are less likely to be screened for breast and cervical cancer, but women who use CAM as a complement to conventional care are more likely to be screened. The findings support the notion that women who use a variety of healthcare providers, including both conventional and CAM practitioners, may be highly engaged in health-promoting behaviors, including preventive services. Other researchers have invoked this reasoning as a potential explanation for higher rates of leisure time physical activity reported by CAM users than by nonusers.[59] Researchers have also found associations between CAM use and such health-promoting behaviors as regular exercise,[60–62] nonuse of tobacco,[60,61] nonuse or moderation in use of alcohol,[62] and healthy diet choices.[62] In at least one study, respondents more often indicated general health maintenance rather than treatment of existing medical conditions as a primary reason for use of CAM therapies.[60] On the other hand, use of CAM as an alternative to conventional care may reflect dissatisfaction with, or mistrust of, conventional practices, including some that are recommended for preventive care.

Use of each of four categories of CAM provider (naturopathic physicians, chiropractors, acupuncturists, and massage therapists) was associated with significantly higher Pap testing rates. However, only the use of massage therapists was independently associated with increased mammography, and women who saw naturopathic physicians were significantly less likely than their counterparts to receive mammograms.

Table 3. Multivariate Associations with Women's Preventive Care Outcomes[a]: Impact of Specific Types of CAM Care (Boldface Indicates Associations with $P < 0.05$)

	Chlamydia *screening*[b]		*Breast cancer screening*[c]		*Cervical cancer screening*[d]	
	OR	p	*OR*	p	*OR*	p
Medical care						
Conventional care	**2.389**	**0.000**	**154.730**	**0.000**	**19.934**	**0.000**
Naturopathy	**0.830**	**0.032**	**0.736**	**0.000**	**1.351**	**0.000**
Acupuncture	0.920	0.509	1.028	0.597	**1.161**	**0.000**
Massage	1.040	0.569	**1.196**	**0.000**	**1.324**	**0.000**
Chiropractic	**0.866**	**0.000**	1.035	0.118	**1.066**	**0.000**
Measurement year[e]	1.018	0.056	**0.973**	**0.000**	**1.030**	**0.000**
Geographic area						
% Racial/ethnic minority[f]	**1.003**	**0.007**	**0.998**	**0.001**	**1.002**	**0.003**
Median family income[f,g]	**0.995**	**0.000**	1.002	0.072	**1.006**	**0.000**
Median adult education[f,h]	0.986	0.260	**1.098**	**0.000**	**1.126**	**0.000**
Extent rural[i]	**0.970**	**0.000**	0.997	0.603	**0.976**	**0.000**
Enrollee age	**0.986**	**0.000**	**1.020**	**0.000**	**0.980**	**0.000**
Morbidity burden[j]	**1.455**	**0.000**	**1.467**	**0.000**	**1.448**	**0.000**
Insurance product						
Fee for service	1.000	–	1.000	–	1.000	–
Point-of-service	**1.334**	**0.000**	1.047	0.225	**1.124**	**0.000**
Preferred provider organization	**1.190**	**0.000**	1.020	0.594	0.992	0.750
Health maintenance organization	**1.277**	**0.000**	**1.173**	**0.006**	1.064	0.132

[a]Associations were tested using logistic regression models with standard errors corrected for clustering of years within enrollees. The three models, one for each of the preventive care outcomes, included all predictors shown on the rows, with an additional adjustment for insurance company. The *p* value testing the association between each covariate and outcome was based on a Z-score.

[b]For each measurement year, the sample included women with continuous coverage under a single identifiable insurance product for the measurement year, aged 16–25 years in the measurement year, with one or more claims for either conventional or CAM care during the measurement year, and with claims-based evidence of sexual activity by the end of the measurement year. The analysis sample included 55,943 woman-year records with data on all variables.

[c]For each measurement year, the sample included women with continuous coverage for both the measurement year and the prior year, who were covered by a single identifiable insurance product during the measurement year, aged 52–64 years in the measurement year, with one or more claims for either conventional or CAM care during at least 1 of the 2 years, and with no claims-based evidence of a bilateral mastectomy by the end of the measurement year. The analysis sample included 129,597 woman-year records with data on all variables.

[d]For each measurement year, the sample included women with continuous coverage for the entire period spanning the measurement year and the 2 prior years, who were covered by a single identifiable insurance product during the measurement year, aged 21–64 years in the measurement year, with one or more claims for either conventional or CAM care during at least 1 of the 3 years, and with no claims evidence of a hysterectomy by the end of the measurement year. The analysis sample included 210,408 woman-year records with data on all variables.

[e]Measurement year was computed as a deviation from the earliest measurement year for the outcome (2000 for *Chlamydia* screening, 2001 for breast cancer screening, and 2002 for cervical cancer screening).

[f]Based on the 2000 U.S. census for the geographic area comprising the first three digits of the enrollee's ZIP code of residence.

[g]Median family income was computed in $1000 increments.

[h]Median education level was modeled as an ordinal predictor: 1, high school graduate; 2, less than 1 year college; 3, 1+ years college with no degree; 4, associate's degree; 5, baccalaureate degree; 6, postbaccalaureate degree.

[i]Extent rural was modeled as an ordinal predictor: 1, metropolitan core; 2, metropolitan high commuting area; 3, metropolitan low commuting area; 4, micropolitan core; 5, micropolitan high commuting area; 6, micropolitan low commuting area; 7, small town core; 8, small town high commuting area; 9, small town low commuting area; 10, rural.

[j]Based on the Johns Hopkins ACG System's resource utilization band (RUB): 0, nonuser; 1, healthy user; 2, low morbidity; 3, moderate; 4, high; 5, very high.

Although possible reasons are speculative, this association may relate to concerns among naturopathic patients about radiation risk.

Results for *Chlamydia* screening were considerably different from those for cancer screening. Young, sexually active women who used provider-based CAM therapies were less likely to be screened for *Chlamydia* irrespective of whether the CAM therapy was used as an alternative or a complement to conventional care. In particular, women who saw chiropractors or naturopathic physicians were less likely to receive this type of screening.

Although rates for breast cancer screening in our sample exceeded *Healthy People 2010* goals, cervical cancer screening was considerably below the federal target, and *Chlamydia* screening rates were extremely low (and likely overestimated actual rates because of our inability, using insurance claims alone, to identify all sexually active insured women). Our tests for secular trends in screening supported other researchers' findings, based on women's self-report, that after adjustment for other factors, mammographic screening for breast cancer may be declining over time.[44,45] In contrast, cervical cancer screening increased significantly over the two time periods considered. CAM use in all three samples increased significantly over time and was higher among women with higher disease burden, those enrolled in fee for service insurance products, and those living in areas with lower average income and racial/ethnic minority representation.

These findings make an important contribution to the literature on associations between CAM use and preventive care. Although associations in children have been more

widely studied, researchers have largely neglected consideration of links between CAM and women's preventive care. The disproportionate use of CAM by women increases the importance of this topic, particularly when the focus is on screening for conditions that impose a heavy disease burden on women worldwide. Our reliance on insurance claims allowed us to avoid the problem of recall bias, which has threatened the reliability of previous studies based on self-report.

Our study has several limitations. First, it focuses on privately insured women living in Washington State. Attempts to generalize to uninsured or publicly insured women or to those living in other geographic regions would be problematic. Second, it cannot account for any CAM care or screening tests provided outside the auspices of insurance coverage. However, the Washington State mandate for insurance coverage of care delivered by state-licensed CAM providers increases the probability that these women sought care within their insurance benefit. Third, it limits consideration to four CAM provider types that are licensed by Washington State. The state does not license several other popular CAM provider types, such Reiki practitioners, traditional Chinese medicine providers, and homeopathic physicians, and any associations between use of these provider types and women's health screening are beyond the purview of this study. Fourth, our use of dichotomous indicators for receipt of care from each specified provider type was an arbitrary decision, aimed at simplification, but it ignores potential differences attributable to the number of encounters women had with specific types of providers. Fifth, our data did not allow consideration of the causal dynamics involved in differential screening rates between users and nonusers of CAM. This will be an important topic for future research. Sixth, because we received no claims data for years prior to 2000, any women who received hysterectomies or bilateral mastectomies before 2000 were inappropriately, but unavoidably, included in our analyses of cervical and breast cancer screening. Finally, insurance data are limited in their ability to reveal sexual activity status, and our sample likely underrepresented the group of women who should have been screened for *Chlamydia*.

Conclusions

Our findings suggest that use of CAM in combination with conventional medical care may increase activities related to cancer prevention in women, possibly because women who use a variety of healthcare providers are motivated to engage in high levels of health-promoting activity, including preventive care. However, the negative association between CAM care (particularly naturopathic and chiropractic care) and *Chlamydia* screening, as well as the negative association between naturopathic care and mammography, will require additional study to determine if these effects are primarily the result of self-selection of specific types of care by women who are independently averse to particular forms of screening or are the direct result of CAM practitioners' activities—either their failure to recommend screening or their active recommendations against it. Finally, the finding that all three types of screening are less likely among women who use CAM as an alternative to conventional care suggests that this population may be an important focus for future intervention efforts. When CAM providers are women's only contact with the healthcare system, their recommendations may serve as an important impetus for preventive screening.

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Disclosure Statement

The authors have no conflicts of interest to report.

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(*Appendix follows* →)

Appendix: CPT and ICD-9-CM Codes Used to Construct Outcome Measures

Chlamydia trachomatis *screening*

Any of the following codes indicated that a woman was sexually active:

(1) CPT = 11975-7, 57170, 58300-1, 58600, 58605, 58611, 58615, 58970, 58974, 58976, 59000-1, 59012, 59015, 59020, 59025, 59030, 59050-1, 59100, 59120-1, 59130, 59135-6, 59140, 59150-1, 59160, 59200, 59300, 59320, 59325, 59350, 59400, 59409-10, 59412, 59414, 59425-6, 59430, 59510, 59514-5, 59525, 59610, 59612, 59614, 59618, 59620, 59622, 59812, 59820-1, 59830, 59840-1, 59850-2, 59855-7, 59866, 59870-1, 59898-9, 76801-2, 76805, 76810-2, 76815-9, 76825-8, 76830, 76941, 76945-6, 80055, 81025, 82105-6, 82731, 83516, 83518-20, 84702-3, 86225-6, 86592-3, 86631-2, 87110, 87164, 87166, 87270, 87320, 87490-2, 87590-2, 87620-2, 87810, 87850, 88141-5, 88147-8, 88150, 88152-5, 88160-2, 88164-7, 88174-5, 88235, 88267, 88269
(2) ICD-9-CM = 042, 054.1, 078.19, 078.88, 079.4, 079.51-3, 079.88, 079.98, 091-9, 131.00, 614-6, 622.3, 623.4, 626.7, 628, 630-77, V01.6, V02.7-8, V08, V22-8, V61.5, V72.3-4, V74.5, V76.2, V73.88, V73.98

Any of the following codes indicated provision of a test for *Chlamydia trachomatis:*

CPT = 87110, 87270, 87320, 87490-2, 87800, 87810

Mammography for breast cancer screening

Any of the following indicated bilateral mastectomy:

(1) CPT = 19180.50, 19200.50, 19220.50, or 19240.50
(2) Modifier 09950 accompanying CPT = 19180, 19200, 19220, or 19240
(3) ICD-9-CM = 85.42, 85.44, 85.46, 85.48
(4) Two separate occurrences of CPT = 19180, 19200, 19220, 19240 on 2 different dates
(5) Two separate occurrences of ICD-9-CM = 85.41, 85.43, 85.45, 85.47 on 2 different dates

Any of the following indicated provision of a mammogram:

(1) CPT = 76090-2
(2) ICD-9-CM = 87.36-7, V76.11-2

Pap test for cervical cancer screening

Any of the following indicated provision of hysterectomy:

(1) CPT = 51925, 56308, 58150, 58152, 58200, 58210, 58240, 58260, 58262-3, 58267, 58270, 58275, 58280, 58285, 58290-4, 58550-1, 58552-4, 58951, 58953-4, 59135, 59525
(2) ICD-9-CM = 68.4-8

Any of the following codes indicated provision of a Pap test:

(1) CPT = 88141-5, 88147-8, 88150, 88152-5, 88164-7, 88174-5
(2) ICD-9-CM = 91.46, V76.2