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A Longitudinal Study about the Effect of Practicing Yan Xin Qigong on Medical Care Cost with Medical Claims Data

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Abstract: *We use 7-year longitudinal medical claims data and statistical models to study the relationship between practicing Yan Xin Qigong (YXQG), a traditional advanced Chinese Qigong that has been integrated with modern science and technology, and practitioners' medical care utilization and the associated costs. We find that for the sampled practitioners, their average monthly medical visits and the associated costs are significantly lower after practicing YXQG. After controlling for other factors, the longer of practicing YXQG, the more likely there was a fall in average medical visits and medical costs. The main findings are robust to various estimation methods.*

Keywords: *medical care cost, medical care utilization, Yan Xin Qigong, economic impact,*

JEL classification codes: *J1 (health)*

1. INTRODUCTION

Traditional medicine is defined by the World Health Organization (WHO) as "the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures that are used to maintain health, as well as to prevent, diagnose, improve or treat physical and mental illnesses" (WHO, 2012). It has been used widely to maintain well-being and treat diseases in the resource-poor settings. According to the WHO, in some Asian and African countries, up to 80% of the population uses traditional medicine for primary health care (WHO, 2012). It is gaining popularity in industrialized countries. In North America, about 70% of the population has used traditional medicine at least once a year (Barnes *et al.*, 2004). In

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2002, the WHO launched its first ever comprehensive traditional medicine strategy to promote safe, effective, and affordable traditional medicine (WHO, 2002). The "Beijing Declaration", made in the first WHO Congress on Traditional Medicine held in Beijing in 2008, recognized traditional medicine as a resource that may contribute to improving health outcomes, including those mentioned in the Millennium Development Goals (WHO, 2008).

As there is increasing enthusiasm of using traditional medicine worldwide, recognition of the need of scientifically investigating the effectiveness of traditional medicine on population health and its economic impact is also growing. This study makes an effort in this direction by exploring the relationship between practicing Yan Xin Qigong (YXQG) and practitioners' medical care utilization and medical care cost.

Qigong is the foundation and an important component of Traditional Chinese Medicine as well as traditional Chinese technologies to promoting and preserving health and wellness. It has been widely used in medicine and health promotion in China and the regulation of Qigong has been under official administration by the Chinese government. One of the objectives of promoting Qigong is to reduce medical costs through improving population health. To our knowledge, little scientific evidence has been gathered about the impact of Qigong practice on medical care costs at the population level. This study took advantage of longitudinal medical claims data collected for a group of Canadians who were practicing Yan Xin Qigong (YXQG) between 1995 and 2002. We report the first investigation of the relationship between practicing YXQG and practitioners' medical care utilization and costs using statistical methods.

The remainder of the paper is organized as follows. The second section describes YXQG and YXQG practice. The Third section presents the data and methods used in the study. The fourth section demonstrates the results; and the fifth section provides discussion and conclusions.

2. YAN XIN QIGONG AND YAN XIN QIGONG PRACTICE

Qi is described as the basic element of human vital energy in classic Chinese literatures. Qigong briefly means "Qi at work", which includes the training of Qi and its function, utility, and effects. The concept of external Qi has been implanted in Chinese medical textbooks as curriculum in medical schools in China.

Yan Xin Qigong is a Traditional Chinese Advanced Qigong which includes technologies and methods of simultaneous training of mind and body under the support of the high-level energy of external Qi of YXQG (YXQG-EQ). YXQG has been under laboratory studies since the late 1980s. A body of substantial experimental studies has been conducted to show the health effects of YXQG-EQ at molecular, cellular, and microorganism levels (Yan *et al.* 1999, 2001, 2004, 2005, 2006, 2007a, 2008a, 2010). Long-term clinical observations and ongoing studies have shown that patients with cancer and other medical conditions received significant beneficial

effects from exposure to external Qi of YXQG without noticeable side effects (Ming, 1988; Yan et al. 2003, 2008b). Based on the evaluation of its history and theory as well as evidence gathered from laboratory and clinical case studies and positive health effects reported by its large number of practitioners, in 1998, the Chinese government agencies recommended YXQG to the public as a well-developed, safe and effective wellness method (*People's Daily*, 1998). YXQG was introduced to North America in early 1990s. Studies of socio-demographic profile of YXQG practitioners in North America showed that the majority YXQG practitioners were Asian and college-educated or above (Yan *et al.* 2007b). The practitioners organized regular learning and practicing sessions.

3. DATA AND METHODS

Sample

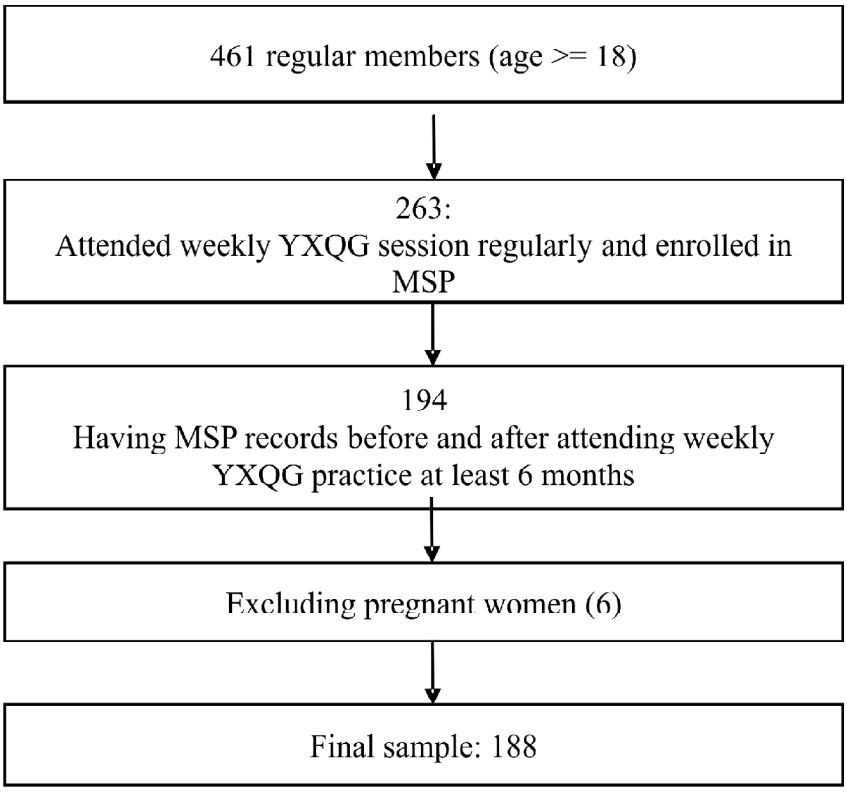
The medical claims data on medical care utilization and the related costs were collected in 2002 from a group of individuals who were practicing YXQG at the Vancouver Yan Xin Qigong Cultivation Center. The Center is a non-profit organization and facilitates the learning and practicing activities for local YXQG practitioners by offering free weekly practice sessions. In 2002, the Center had 461 regular members with age over 18.

Members were informed about the study and voluntarily participated in the study. For the purpose of study, we selected those who met two requirements: (1) took YXQG practice as major wellness-promotion method and attended free weekly practicing sessions for at least six months, and (2) enrolled in "Medical Services Plan" (MSP), a mandatory health insurance program provided by the government of British Columbia to its lawful residents (Ministry of Health of British Columbia, 2008). There were 263 volunteers who met the requirements. To ensure a reasonable time period for comparing the outcome variables before and after practicing YXQG, the study only included those who joined the MSP at least six months before practicing YXQG and practiced YXQG for at least six month. Pregnant women were not included for presumably different medical care needs. The final sample had 188 individuals. The selecting process is illustrated in Figure 1.

Data

Medical Services Plan insured medically required services provided by physicians and supplementary health care practitioners enrolled with MSP, as well as all hospital and laboratory services and diagnostic procedures. Residents only needed to pay a monthly insurance premium and bore no cost for received medical care services. Medical care providers enrolled in the MSP were paid by the government on a fee-for-service basis. Residents could buy other insurance programs to cover the services which were not insured under the MSP, such as cosmetic surgery, medical examinations or dental services that are not medically required (Ministry of Health of

Figure 1: Sampling Process



British Columbia, 2008). The costs of these services were not included in our study since they were deemed to be not medically required.

The participants voluntarily requested the Medical Claims History Records from the Ministry of Health of the British Columbia. The data included information on individual's date of birth, gender, service items (e.g. lab tests or minor surgery), name of medical care providers, total cost of each service, date of service, and service type (e.g. general practice). The earliest date of records is January 1 1995 and the end date is August 31 2002. The participants voluntarily shared a copy of their records with the Center and agreed to submit the data for the purpose of research in their consent forms. The participants also provided information of the starting dates (month, year) of practicing YXQG to the Center. To ensure confidentiality, participants' names and their Personal Health Numbers were removed from their submitted records.

Outcome Variables

The MSP Records provided the date and the total cost for each item of services. We were able to construct two outcome variables for each individual: monthly medical

visits and monthly total cost of medical visits. The unit of analysis was the outcome variables per month per person. Services provided on the same day were considered as one visit. For 188 individuals during the study period, there were 15,143 units of analysis in total. The large size of the data ensured the power of statistical analyses. The monthly medical cost was adjusted for the inflation rate with 1995 as the base year. The average monthly medical cost was about Canadian $36, and the average number of visits per month was about 0.86 (Table 1).

Table 1
Descriptive Statistics of the Sampled Individuals (N = 188)

	Mean	*Standard Deviation*	*Minimum*	*Maximum*
Monthly spending ($)	36.06	87.03	0	1,982
Monthly visit	0.858	1.555	0	21
Age	45	11.42	18	82
Female	0.628	0.485	0	1
YXQG months	35.03	15.88	7	81

Independent Variables

To study the relationship between practicing YXQG and practitioners' medical visits and the associated cost, we measured YXQG practice using the number of months that the participants had regularly attended weekly YXQG practice session ("YXQG months"). For each individual in the study, the "YXQG months" takes value zero before he/she started practicing YXQG and takes value 1 in the first month of YXQG practice, and then takes value 2 in the second month of practice and so on. About 64% of the individuals started practicing YXQG from 1999. The average practicing time is about 35 months with a minimum of seven months and a maximum of 81 months (Table 1).

Health status is an important determinant of health care utilization. The information is not available in the MPS Records. Following Pradhan and Prescott (2002), we included age and sex of the individual as a proxy for health care needs. The mean age was about 45 with a maximum age of 82. About 63% of the participants were female (see Table 1). Year indicators were included to control for time-related unobserved factors that might influence medical visits and the related cost. Year 1999 was chosen as the reference year.

Factors such as the level of patients' copayments and their income may affect an individual's medical care utilization and the associated cost, shown in previous studies (Glied, 2000; Zweifel and Manning, 2000). Nevertheless, they are not relevant to our study since the MSP imposed zero cost on patients. An expansion of medical services covered by the MSP over time suggests an increasing trend of medical care utilization and the associated cost during the study period. We used year indicators to capture the effect of service expansion on medical care costs. Fee-for-service arrangement for providers may lead to the overuse of medical care utilization and incur more medical cost – a result from both moral hazard and physician-induced

demand (Glied, 2000; Zweifel and Manning, 2000; McGuire, 2000). The payment scheme for providers existed over the study period and its effect on utilization and cost could be considered time-invariant and controlled with panel data model used in the analysis.

Statistical Analysis

Descriptive analyses included (1) before-after comparison of medical care utilization and the associated cost and (2) trends of medical care utilization and its cost between 1995 and 2002. Regression analyses used panel-data models which enabled us to control for the unobserved time-invariant factors. To check for the autocorrelation for the outcome variables, we conducted the Woodridge test. The results of the F-test showed that the hypothesis of zero correlation between error terms within individuals cannot be rejected.

The negative binomial model has been applied extensively in studies of medical visits by assuming that the number of medical visits has a negative binomial distribution given the independent variables (Jones, 2000; Mullahy, 1997; Pohlmeier and Ulrich, 1995). The model can address the issues such as overdispersion or excess zeros. To decide whether a fixed-effects model or a random-effects model (with random intercepts for the individuals) should be used in the analysis, we conducted a Hausman test. The results suggested a random effects model. To test the sensitivity of the findings to the estimation methods, we also include the statistical results from the fixed-effects model. The Huber-White standard estimators were used to calculate the standard errors.

When medical expenditure variable is used as an outcome measure, the following issues arise: a large proportion of zero values and a skewed distribution of non-zero values. A log-transformation of medical expenditure is usually proposed to accommodate skewness. However, as previous studies pointed out, heteroskedastity may bias estimates derived from logged dependent variable models (Duan, 1983; Manning, 1998). We examined the presence of the heteroskedasticity with the Breusch-Pagan test (Breusch and Pagan, 1979). The results showed that the null hypothesis of constant variance is rejected. Generalized linear models (GLMs) have been recommended to conduct the analysis when the heteroskedasticity is present (Manning, 1998; Manning and Mullahy, 2001; Buntin and Zaslavsky 2004). GLMs may directly model both the mean and variance functions on the original scale of dependent variables. We followed the approach by Buntin and Zaslavsky (2004). To choose the link function between medical cost and the right-hand side variables and the family of distribution of medical cost, we examined the distribution of medical cost and conducted a series of statistical tests such as the Park test suggested by Manning and Mullahy (2001). The tests showed that the Gamma-like distribution was preferred. To check the robustness of the results, we also provided regression results derived from a random effects model with the Poisson-like distribution. Stata version 11 was used for statistical analyses.

4. RESULTS

Figure 2 shows the average monthly medical visits before and after practicing YXQG among different population groups with the 95 per cent confidence intervals. The average monthly medical visit for the participants was 0.97 before practicing YXQG and 0.71 after practicing YXQG. The 95 per cent confidence interval shows that the mean difference of average monthly visits is significant at the 0.05 level. For both men and women, the average medical visits before practicing YXQG were significantly higher than that after practicing YXQG. In each age group, those who practiced YXQG had significantly lower number of medical visits than those who did not.

Figure 2: Comparison of the Average Monthly Visits Before and After Practicing YXQG

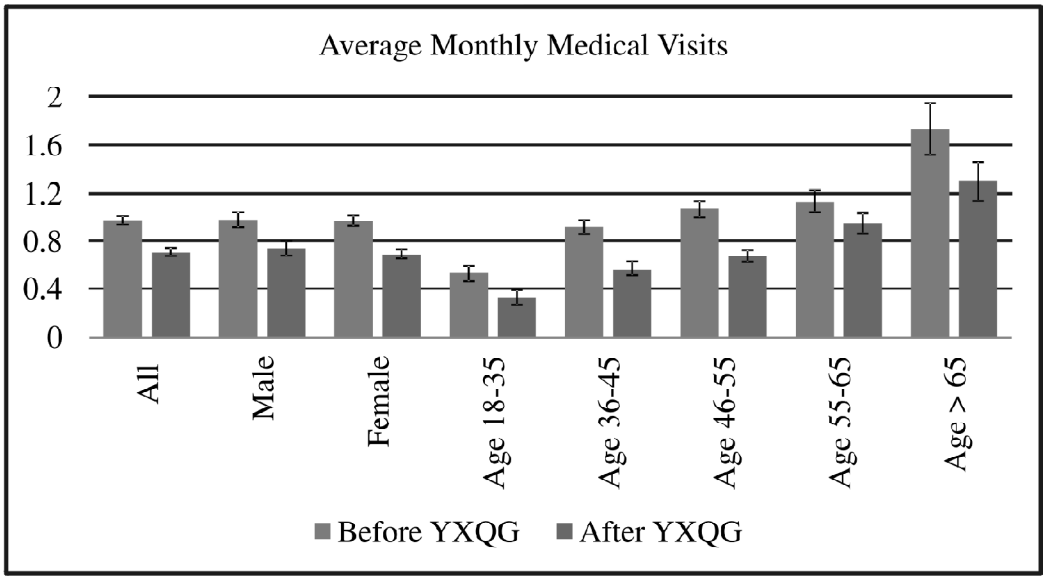


Figure 3 presents the comparison for average monthly medical care cost. The results were consistent with those of medical visits. The average monthly cost of the sampled population before practicing YXQG was $41 and $30 after practicing YXQG. The 95 per cent confidence interval shows that the mean difference of average monthly cost is significant at the 0.05 level. On average, both men and women incurred most medical cost before practicing YXQG. Figure 4 presents the trends of average monthly medical visits and spending between 1995 and 2002 for the study subjects. The average monthly medical visits fell from 0.95 in 1995 to 0.59 in 2002. The average monthly medical cost fell from $39 in 1995 to $27 in 2002. As will be seen in Tables 2 and 3, while age had positive effects on both monthly medical care utilization and costs, the length of YXQG practice had stronger negative effects, which led to the decreasing trend in Figure 4.

Figure 3: Comparison of the Average Monthly Medical Cost Before and After Practicing YXQG

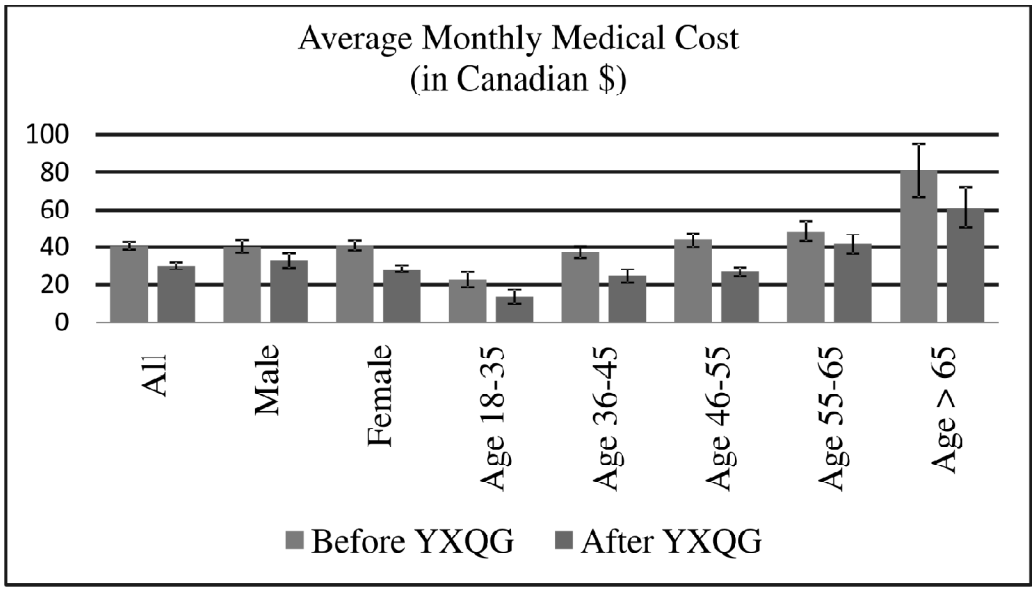
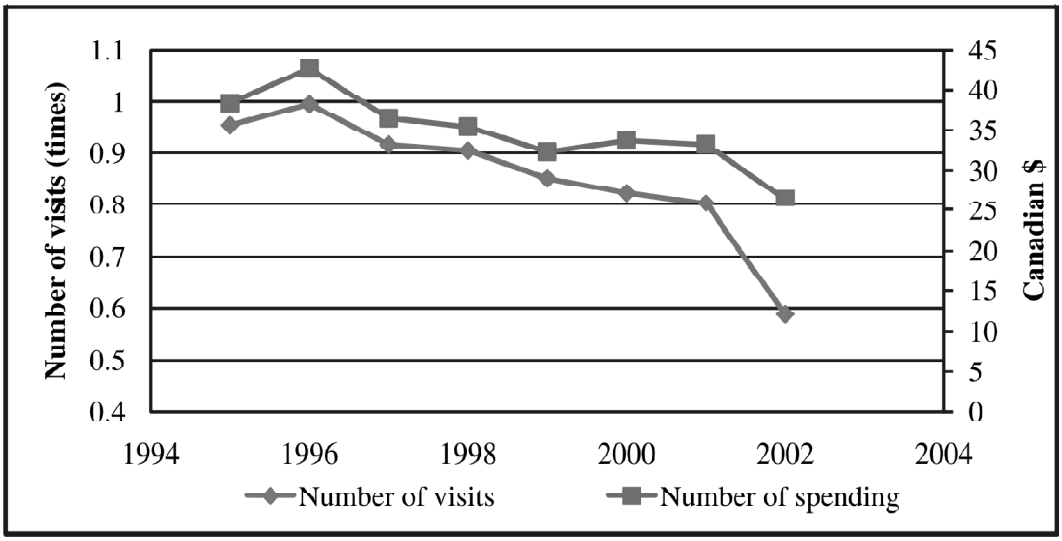


Figure 4: Trends of Average Monthly Medical Visits and Monthly Medical Cost for Sampled Practitioners



The coefficients of the length of practicing YXQG ("YXQG months") on monthly medical visits generated from the random-effects and fixed-effects negative binomial model are presented in Table 2. The estimates of "YXQG months" were negative (-0.017 and -0.018 for each model respectively) and statistically significant at the 0.05

level. The estimates were robust to the choice of models. Among other variables, age had a positive and significant effect on the number of monthly medical visits: older individuals tended to use more medical care than younger individuals holding everything else constant. The estimates for gender and year indicators were not statistically significant. Table 3 presents the estimates of practicing YXQG using the panel GLMs with Gamma-like and Poisson-like distributions. The findings were consistent with those of monthly visits. "YXQG months" from the two models were negative (-0.012 and -0.015 respectively) and statistically significant at the 0.05 level. The estimates were not sensitive to estimation methods.

Table 2
Regression Results for Monthly Medical Visits (N = 15,143)

	Random-Effects Negative Binomial Regression				*Fixed-Effects Negative Binomial Regression*			
	Coefficients	*P>|z|*	*95% Confidence*	*Interval*	*Coefficients*	*P>|z|*	*95% Confidence*	*Interval*
Age*	0.026	0.000	0.021	0.031	0.023	0.000	0.017	0.028
Female	0.027	0.647	-0.090	0.145	-0.033	0.628	-0.167	0.101
YXQG months*	-0.017	0.000	-0.021	-0.014	-0.018	0.000	-0.022	-0.014
1995	-0.001	0.977	-0.100	0.097	-0.022	0.670	-0.121	0.078
1996	0.058	0.233	-0.037	0.152	0.040	0.413	-0.055	0.135
1997	-0.016	0.740	-0.109	0.078	-0.028	0.557	-0.122	0.066
1998	0.001	0.976	-0.090	0.092	-0.004	0.928	-0.095	0.087
2000	0.060	0.212	-0.034	0.155	0.067	0.165	-0.028	0.162
2001*	0.258	0.000	0.152	0.364	0.274	0.000	0.167	0.380
2002	0.106	0.138	-0.034	0.247	0.132	0.069	-0.010	0.275
Constant	-1.318	0.000	-1.590	-1.047	-1.124	0.000	-1.438	-0.810

*: statistically significant at the 0.01 level for the two models

Table 3
Regression Results for Monthly Medical Cost (N = 15,143)

	GLM Random Effects with Gamma-like Distribution				*GLM Random Effects with Poisson-like Distribution*			
	Coefficients	*P>|z|*	*95% Confidence*	*Interval*	*Coefficients*	*P>|z|*	*95% Confidence*	*Interval*
Age*	0.030	0.000	0.020	0.039	0.027	0.000	0.018	0.037
Female	0.079	0.598	-0.216	0.375	0.009	0.950	-0.271	0.289
YXQG months*	-0.012	0.033	-0.022	-0.001	-0.015	0.002	-0.025	-0.006
1995	0.228	0.066	-0.015	0.471	0.175	0.097	-0.032	0.382
1996*	0.280	0.020	0.045	0.515	0.261	0.010	0.061	0.460
1997	0.122	0.264	-0.092	0.336	0.114	0.204	-0.062	0.291
1998	0.149	0.184	-0.071	0.369	0.131	0.162	-0.053	0.314
2000	0.116	0.341	-0.123	0.355	0.176	0.142	-0.059	0.410
2001	0.202	0.189	-0.100	0.503	0.299	0.040	0.013	0.585
2002	0.055	0.741	-0.272	0.382	0.168	0.330	-0.170	0.507
Constant	2.039	0.000	1.435	2.644	2.205	0.000	1.635	2.774

*: statistically significant at the 0.05 level for the two models

The magnitudes of reduction in monthly medical visits and monthly medical cost after practicing YXQG are summarized in Table 4. Since the sizes of the coefficients were very close, we only reported the estimates for monthly visits from the random effects with negative binomial model and for monthly medical cost from the panel GLMs with Gamma-like distribution. Based on the final regression models, the percentages of reduction in medical care utilization and medical cost were calculated by comparing the predicted values in each of the two outcome variables at the sampled characteristics of the predictors under the condition that the individuals did not practice YXQG at all in three years (the average time of practicing YXQG) with those under the condition that the individuals had practiced YXQG for three years. The standard error of the estimate was obtained based on the delta method (e.g., Casella and Berger, 2002). The results showed that after practicing YXQG, the average number of monthly medical visits decreased by 45% and the 95% confidence interval was [38%, 51%], and the average monthly cost decreased by36% with a 95% confidence interval of [24%, 47%].

Table 4
Estimated Reductions in Monthly Medical Visits and Monthly Medical Cost after Practicing YXQG

		95%	
	Mean	*Confidence*	*Interval*
Average number of monthly visits Negative binomial model with Random effects % fall in average monthly visits after practicing YXQG	45%	38%	51%
Average monthly medical cost (Canadian $) GLM with Gamma-like family % fall in average monthly medical cost after practicing YXQG	36%	24%	47%

5. DISCUSSION AND CONCLUSIONS

This study examined the effect of practicing YXQG on practitioners' medical care utilization and the associated cost based on 7-year longitudinal medical claims data. We found that, for the sampled population, the average monthly medical visits and medical care costs had been decreasing over the study period and significantly lower after practicing YXQG. Other things being equal, the longer of practicing YXQG, the more likely there was a fall in average medical visits and medical costs. The main findings were statistically significant and robust to various estimation methods.

This study has the following advantages: the medical claims data obtained from the Ministry of Health of British Columbia provided accurate and reliable longitudinal information on participants' medical care utilization and medical cost. The data were free from measurement errors that usually plagued self-reported health spending data (Lu, 2009). The longitudinal nature allowed us to use panel

models to control for time effects and unobserved time-invariant factors. Sensitivity tests were conducted to check the robustness of the findings. At the time of the study, we were not able to obtain the access to medical claims data for YXQG practitioners in regions other than Vancouver. This imposed the limitation to the generalization of the findings among YXQG practitioners. Due to unavailable health status data for the study subjects, we were not able to identify the health effects of practicing YXQG on them. To have a more comprehensive understanding of the impact of practicing YXQG on medical costs, our future study will adopt randomization design and collect data on health status of YXQG practitioners.

As the high cost of medical care has emerged as a serious concern globally, integrating traditional medicine into health care systems has been an important component of health sector strategy in countries such as China and Canada (British Columbia Region). Studies that measure the effectiveness of traditional medicine and its impact on reducing medical cost may provide important evidence to policy makers for using traditional medicine properly and efficiently. This study adds value to ongoing scientific research in this area.

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