

The trends of utilization in traditional Chinese medicine in Taiwan from 2000 to 2010

A population-based study

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Abstract

Introduction: There is no study exploring the trend of utilization in traditional Chinese medicine (TCM) from 2000 to 2010. The objective of this study was to investigate the trends of TCM utilization among 3 cross-sectional cohorts of 2000, 2005, and 2010.

Method: This study was a cross-sectional analysis of TCM utilization over time. We compared the mean TCM visits among 3 cohorts of 2000, 2005, and 2010. We derived 3 randomly sampled cohorts of nearly 1 million representative beneficiaries in each of 2000, 2005, and 2010 from National Health Insurance Research Database for this research. Multivariate logistic regression was performed to evaluate the relative relationship in categorical variables correlating to TCM users. The percentage change (% change) in mean TCM visits between 2000 and 2005 (2010) was used to evaluate the trends of TCM utilization during the period.

Results: The ratio of TCM users increased throughout cohorts. The ratio of TCM users among women was more than that among men in all cohorts of 2000, 2005, and 2010 (adjusted odds ratio = 1.47; 1.52; 1.62). The mean TCM visits increased from 2000 to 2010. The percentage change in mean TCM visits among women was more than that among men. The group aged less than 20 years had the least percentage change in mean TCM visits (18.8%); nevertheless, the group aged 20 to 34 years had the largest change (30.2%). The high socioeconomic status group had the largest percentage change in mean visits to TCM, whereas the central region had the least percentage change. Neoplasms had the greatest increase in percentage change in mean TCM visits among all disease categories; in contrast, diseases of the respiratory system had the greatest decrease.

Conclusion: Both the ratio of TCM users and mean TCM visits increased gradually from 2000 to 2005 and further to 2010. Women used TCM more than men, and this is expected to continue in the future. The high socioeconomic status group used TCM more and more over time. The picture of TCM need among different types of cancer patients should be explored in further research because of the substantial increase in TCM utilization for the disease category of neoplasms.

Abbreviations: AOR = adjusted odds ratio, CAM = complementary and alternative medicine, CHM = Chinese herbal medicine, ICD-9-CM = International Classification of Diseases, ninth revision, Clinical Modification, NHI = National Health Insurance, NHIA = National Health Insurance Administration, NHIRD = National Health Insurance Research Database, NHRI = National Health Research Institute, SES = socioeconomic status, TCM = traditional Chinese medicine, WM = western medicine.

Keywords: Chinese herbal medicine, disease categories, national health insurance, traditional Chinese medicine, utilization of traditional Chinese medicine

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1. Introduction

Recently there has been an increasing trend in utilization of complementary and alternative medicine (CAM).^[1] Herbs are being used by 75% of the people in the world for their basic healthcare needs.^[2] Medical doctors should know about patients' use of CAM concurrently when taking their medical history, because the frequency of CAM use has greatly increased.^[3] This increase is due to both the interest of patients in CAM for seeking help as well as exploration of the effectiveness of various therapies and interventions by researchers.^[4]

Traditional Chinese medicine (TCM), an important category of CAM, is famous for Chinese herbal medicine (CHM) and acupuncture, and is increasing in popularity in many countries.^[5] Some pharmaceutical drugs composed of a form derived from CHM like artemisinin and 3-*n*-butylphthalide are also popular globally and successfully marketed.^[6–8] People go to TCM clinics to seek treatment of diseases or to augment or replace other treatments or Western medicine (WM).^[9] People use TCM not only because of searching for treatment of disease or regarding as adjunct to WM, but also because of the few side effects of TCM, need of tonic care or health promotion, and expectation of removing the root of diseases.^[9,10]

The utilization of TCM is common among Asian immigrants in Western countries and in Asian, including China, Hong Kong, Singapore, Korean, Japan, and Taiwan.^[11] Usage of TCM is extensive in Taiwan not only because TCM is a part of Chinese culture left from ancient Chinese, but also because TCM is an important part of the medical system in Taiwan.^[12]

The National Health Insurance (NHI) program, a milestone of the medical system, was implemented in 1995 in Taiwan.^[13,14] All residents with a registered dwelling in Taiwan are mandated to join the universal health insurance program.^[13] More than 99% of residents in Taiwan were enrolled in the NHI program by the end of 2010.^[14,15] The NHI program covers both WM and TCM, but there is different insurance coverage between them under the program.^[16] NHI covers both inpatient and ambulatory care of WM, and ambulatory care of TCM, but excludes inpatient TCM care.^[13] The enrollees under the NHI program can seek medical care from either WM or TCM or both, and from public or private medical facilities or both.^[13,17]

The data of the NHI program are an administrative dataset.^[18] All the claims data and file of registry in the NHI program are collected in the National Health Insurance Research Database (NHIRD), which is maintained by the National Health Research Institutes (NHRI), and which provides an optimal platform for research.^[5,15] The NHIRD has been used by researchers to explore some issues and publish articles in Taiwan.^[18]

TCM utilization has been discussed in several articles, but the trends of TCM utilization have seldom been explored. TCM usage by children between 2 cross-sectional cohorts has been published recently.^[19] However, no study has investigated the trend of TCM utilization by the whole population among 3 cohorts. This issue is important, because TCM utilization of the whole population can provide a much more extensive picture of TCM utilization than can data only on children.^[13]

The objective of this study was to investigate the trends of TCM utilization from 2000 to 2010. We compared the mean TCM visits among 3 cohorts of 2000, 2005, and 2010, and derived 3 randomly sampled cohorts of nearly 1 million representative beneficiaries in 2000, 2005, and 2010 from NHIRD for this research. The results of this study may serve as a

reference for medical providers to improve preparedness and inform the health policies of government.

2. Method

2.1. Data source

This study was a cross-sectional analysis of TCM utilization over time. All data of the NHI program used in this study were derived from the NHIRD, which is maintained by the NHRI of Taiwan.^[18] The NHIRD contains patient sex, date of birth, all records of clinical visits and hospitalizations, drugs prescribed, and their dosages and diagnosis codes, which are encoded with the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM).^[15] For the sake of confidentiality and ethical considerations, the identification numbers of all individuals and facilities of the dataset, which we obtained from NHIRD, were encrypted and transformed with a random alphanumeric string.^[15]

2.2. Study samples

For this research, we derived the dataset of randomly sampled groups totaling almost 1 million insured beneficiaries from NHIRD in each of 3 cohorts: 2000, 2005, and 2010. All ambulatory TCM visits used by these representative beneficiaries in the 3 cohorts were analyzed for trends of TCM utilization. Diagnosis of medical records in the NHIRD was coded according to the ICD-9-CM. The distribution of ambulatory visits in different disease categories was grouped by the primary diagnosis. In order to compare the mean TCM visits to WM visits among different disease categories, we also derived the mean WM visits for the 3 cohorts from NHIRD. In each cohort, the representative beneficiaries who had at least 1 ambulatory TCM visit were defined as TCM users, whereas the representative beneficiaries who had no ambulatory TCM visits were defined as non-TCM users.

2.3. Study variable

Gender, age, region, and income were chosen as independent variables to explore their effects on TCM utilization. Age was grouped into 5 groups: <20, 20 to 34, 35 to 49, 50 to 64, and ≥ 65 years. Region was divided into 6 geographic regions: Taipei, Northern, Central, Southern, Kao-ping, and Eastern regions. Income was used as an indicator of socioeconomic status (SES) and classified into 4 levels. We classified sampled beneficiaries with well-defined monthly income into 3 categories: low, middle, and high levels of SES. The ranges of income between low to middle levels of SES and between middle to high levels of SES were the same. Those without defined income were regarded as "other" level of SES.

2.4. Statistical analysis

SAS software, version 9.3 (SAS Institute Inc, Cary, North Carolina) was used to integrate, manage, and analyze the data. The data analysis comprised descriptive statistics, including the demographic characteristics of TCM users and non-TCM users. A chi-square test (χ^2) was used to examine the relationships between the categorical variables and the differences between TCM users and non-TCM users. The relative relationship of ratio of TCM users in different demographic factors was calculated by

Table 1

Ratios of TCM users of selected enrollees under NHI in 3 cohorts of 2000, 2005, and 2010.

	2000 (n = 922,176)						2005 (n = 999,398)						2010 (n = 998,432)									
	Users			Nonusers			Users			Nonusers			Users			Nonusers						
	n	%	AOR	n	%	χ ²	n	%	AOR	n	%	χ ²	n	%	AOR	n	%	χ ²	AOR			
Total	245,199	26.59	676,977	73.41			282,719	28.29	716,679	71.71			286,186	28.66	712,246	71.34						
Gender																						
Men	107,610	22.91	362,037	77.09	<0.0001		118,756	23.97	376,778	76.03	<0.0001		116,182	23.63	375,458	76.37	<0.0001			1.00		
Women	137,589	30.40	314,940	69.60			163,963	32.54	339,901	67.46			170,004	33.55	336,788	66.45				1.63 (1.62–1.64)		
Age																						
<20	56,072	20.88	212,458	79.12	<0.0001		56,186	22.22	196,622	77.78	<0.0001		49,905	22.53	171,593	77.47	<0.0001				1.00	
20–34	70,152	28.75	173,875	71.25			77,997	31.07	173,051	68.93			77,161	31.98	164,129	68.02					1.60 (1.57–1.62)	
35–49	67,438	30.59	153,012	69.41			77,342	31.47	168,398	68.53			75,196	31.24	165,481	68.76					1.55 (1.53–1.57)	
50–64	32,149	29.53	76,728	70.47			46,085	30.84	103,359	69.16			56,074	30.28	129,087	69.72					1.50 (1.48–1.52)	
> =65	19,388	24.15	60,904	75.85			25,109	25.02	75,249	74.98			27,850	25.36	81,956	74.64					1.28 (1.26–1.30)	
SES																						
Other	62,273	23.68	200,663	76.32	<0.0001		76,395	25.61	221,958	74.39	<0.0001		72,659	24.72	221,217	75.28	<0.0001					1.00
Low	76,913	27.39	203,921	72.61			73,482	29.22	178,011	70.78			79,404	29.81	186,942	70.19						1.26 (1.25–1.28)
Middle	48,510	29.20	117,595	70.80			67,714	30.92	151,269	69.08			62,691	31.45	136,630	68.55						1.40 (1.38–1.42)
High	57,503	27.09	154,798	72.91			65,128	28.25	165,441	71.75			71,432	29.90	167,457	70.10						1.40 (1.38–1.42)
Region																						
Northern	30,322	23.68	97,724	76.32	<0.0001		35,756	24.96	107,522	75.04	<0.0001		38,450	25.80	110,601	74.20	<0.0001					1.00
Taipei	84,203	24.58	258,432	75.42			94,630	26.12	267,606	73.88			97,546	26.85	265,817	73.15						1.02 (1.01–1.03)
Central	58,216	34.34	111,301	65.66			64,714	35.36	118,293	64.64			64,138	35.08	118,704	64.92						1.63 (1.60–1.65)
Southern	33,015	25.96	94,161	74.04			39,664	28.43	99,834	71.57			39,067	28.63	97,378	71.37						1.23 (1.21–1.25)
Kao-Ping	34,373	25.69	99,410	74.31			42,111	28.33	106,518	71.67			41,535	28.63	103,523	71.37						1.20 (1.18–1.22)
Eastern	5,070	24.12	15,949	75.88			5,844	25.69	16,906	74.31			5,450	25.15	16,223	74.85						1.04 (1.01–1.08)

AOR = adjusted odds ratio, NHI = National Health Insurance, SES = socioeconomic status, TCM = traditional Chinese medicine.

multivariate logistic regression and expressed by adjusted odds ratio (AOR). Mean visits of all sampled enrollees (or TCM users) was the value derived from the number of all visits divided by all sampled enrollees (or TCM users). The percentage change (% change) in mean TCM visits between 2000 and 2005 (2010) was calculated by dividing the difference in mean TCM visits between 2000 and 2005 (2010) by mean TCM visits in 2000.

2.5. Ethic consideration

All the names and identification numbers of enrollees and names of medical facilities in the dataset from NHIRD in our study were encrypted as a random alphanumeric series to protect the privacy of study subjects and fulfill ethical considerations. So no one can identify any enrollee or facility from the dataset; therefore, the approval of Institutional Review Board is exempted.

3. Results

3.1. Ratios of TCM users among different Cohorts of 2000, 2005, and 2010

The final samples contained 922,176 beneficiaries in 2000, 999,398 in 2005, and 998,432 in 2010 after removing incomplete data. Table 1 shows that the ratio of TCM users increased from 26.59% in 2000 to 28.29% in 2005 and further to 28.66% in 2010. The ratio of TCM users among women was more than that among men in all 3 cohorts. This difference between genders in the number of TCM users increased gradually from 2000 to 2010 (AOR=1.47 in 2000; 1.52 in 2005; 1.62 in 2010).

The ratio of TCM users in all age groups increased consistently from 2000 to 2005 and further to 2010, except the 2 groups aged

35 to 49 years and 50 to 64 years, which both increased from 2000 to 2005 and decreased slightly in 2010. Compared with the group aged <20 years, the group aged 35 to 49 years had the highest ratio of TCM users in 2000 and 2005. (AOR=1.68; 1.61); the group aged 20 to 34 years had the highest ratio of TCM users in 2010 (AOR=1.60).

The ratio of TCM users in all SES groups except the other SES group increased constantly from 2000 to 2010. Compared with the other SES group, the middle SES group had the highest ratio of TCM users in 2000 and 2005 (AOR=1.37; 1.32); the middle and high SES groups had the highest ratio of TCM users in 2010 (AOR=1.40).

The ratio of TCM users in all regions increased from 2000 to 2005 and further to 2010 except for those in the central and southern regions, which increased from 2000 to 2005, but decreased by 2010. Compared with the northern region, the central region had highest ratio of TCM users in all 3 cohorts (AOR=1.75; 1.71; 1.63). This indicates that the ratio of TCM users in the central region decreased gradually from 2000 to 2010.

3.2. The trend of mean TCM visits from 2000 to 2010

Table 2 displays the percentage change in mean TCM visits from 2000 to 2005 (2010). The mean TCM visits per enrollee was 1.22 in 2000 then increased to 1.46 in 2005, and 1.56 in 2010. The percentage change in mean TCM visits was 19.7% and 27.9%, respectively, from 2000 to 2005 (2010). The percentage change in mean TCM visits from 2000 to 2005 was larger than that from 2005 to 2010. It could be seen that the increasing trend of mean TCM visits was less steep from 2005 to 2010.

Mean TCM visits among both women and men increased over time. The mean TCM visits among women increased more than

Table 2
Trend of mean TCM visits among 3 cohorts of 2000, 2005, and 2010.

	2000		2005		2010		% Change of mean visits from 2000 to 2005		% Change of mean visits from 2000 to 2010	
	Mean of TCM users	Mean of all	Mean of TCM users	Mean of all	Mean of TCM users	Mean of all	TCM users	All	TCM users	All
Total	4.58	1.22	5.16	1.46	5.45	1.56	12.7	19.7	16.0	27.9
Gender										
Men	4.40	1.01	4.85	1.16	4.98	1.18	10.2	14.9	11.7	16.8
Women	4.72	1.44	5.39	1.75	5.77	1.94	14.2	21.5	18.2	34.7
Age										
<20	4.07	0.85	4.30	0.96	4.47	1.01	5.7	12.9	9.0	18.8
20-34	4.02	1.16	4.46	1.39	4.72	1.51	10.9	19.8	14.8	30.2
35-49	4.98	1.52	5.68	1.79	5.88	1.84	14.1	17.8	15.3	21.1
50-64	5.16	1.52	5.81	1.79	6.12	1.85	12.6	17.8	15.7	21.7
>=65	5.75	1.39	6.50	1.63	6.70	1.70	13.0	17.3	14.2	22.3
SES										
Others	4.71	1.12	5.28	1.35	5.53	1.37	12.1	21.2	17.4	22.6
Low	4.52	1.24	5.07	1.48	5.25	1.56	12.3	19.8	16.2	26.5
Middle	4.46	1.30	5.07	1.57	5.41	1.70	13.5	20.2	21.2	30.5
High	4.63	1.25	5.22	1.48	5.62	1.68	12.8	17.7	21.5	34.1
Region										
Taipei	4.09	1.01	4.78	1.25	5.14	1.38	16.9	23.8	20.4	36.6
Northern	3.95	0.93	4.58	1.14	4.88	1.26	15.9	22.6	19.1	35.5
Central	5.44	1.87	5.68	2.01	6.07	2.13	4.4	7.5	10.4	13.9
Southern	4.89	1.27	5.48	1.56	5.62	1.61	12.1	22.8	13.0	26.8
Kao-Ping	4.65	1.19	5.49	1.56	5.62	1.61	18.1	31.1	17.3	35.3
Eastern	4.17	1.00	4.83	1.24	5.16	1.30	15.8	24.0	19.2	30.0

% Change = percentage change, SES = socioeconomic status, TCM = traditional Chinese medicine.

that of men from 2000 to 2005 (2010). The mean TCM visits in all age groups increased through cohorts. The group aged less than 20 years had the least percentage change in visits to TCM from 2000 to 2005 (2010), while the group aged 20 to 34 years had the most. The percentage change in mean TCM visits of all SES groups increased from 2000 to 2005 (2010). The middle SES group had the greatest percentage change in mean TCM visits from 2000 to 2005; however, the high SES group had the largest percentage change from 2000 to 2010. The percentage change in mean TCM visits in all regions increased over time. The central region had the least percentage change in mean TCM visits from 2000 to 2005 (2010), while the Taipei region had the most.

3.3. The comparison of mean TCM visits among different disease categories

Table 3 exhibits the mean TCM visits per thousand enrollees in different disease categories. The top 5 disease categories of mean visits for TCM were diseases of the respiratory system (302.3, 287.6, and 274.1); diseases of the musculoskeletal system and connective tissue (198.8, 220.8, and 204.6); injury and poisoning (187.5, 232.8, and 215.9); diseases of the digestive system (134.2, 165.6, and 190.3); and symptoms, signs, and ill-defined conditions (171.2, 284.4, and 332.2) in 2000, 2005, and 2010. The top disease category in terms of most mean TCM visits was diseases of the respiratory system in 2000 and 2005 (302.3 and 287.6) and symptoms, signs, and ill-defined conditions (332.2) in 2010.

The 5 disease categories behind the lowest numbers of TCM visits in 2000, 2005, and 2010 were infectious and parasitic diseases (5.6, 6.3, and 5.2); diseases of the blood and blood-forming organs (2.4, 3.4, and 4.1); complications of pregnancy, childbirth, and the puerperium (1.0, 2.7, and 2.1); congenital anomalies (0.7, 1.7, and 2.1); and neoplasms (2.6, 6.5, and 11.5).

The 3 disease categories with most upward percentage change of mean visits for TCM from 2000 to 2005 and from 2000 to 2010 were neoplasms (152.4 and 243.7); congenital anomalies (157.2 and 216.6); and complications of pregnancy, childbirth, and the puerperium (175.3 and 109.1). Above all, the disease category of neoplasms had greatest upward percentage change in mean TCM visits from 2000 to 2010 (343.7); nevertheless, the disease category of respiratory system had the greatest downward percentage change in mean TCM visits from 2000 to 2005 and 2000 to 2010 (-4.9, -9.3).

4. Discussion

Past studies have investigated changes in TCM utilization between several years in 1 cohort. Our study explored TCM utilization among 3 cohorts of 2000, 2005, and 2010. This research method makes the sample more representative of the population. To the best of our knowledge, this is the first study to explore the trend of TCM utilization among 3 different cohorts with a large-scale sample.

The increase over time in ratio of TCM users has been reported in previous studies.^[13,19] The trend of increasing TCM utilization was similar to the trend of TCM or CAM utilization reported in previous studies in Taiwan, the United States, and Europe.^[13,20,21] Increase of ratio of TCM users and mean TCM visits may be related to the following reasons. First, the NHI coverage for TCM makes medical service of TCM cheaper and easily accessed for enrollees under the NHI program.^[15] Second, development of TCM began more than 2000 years ago, and it is part of the culture and daily life.⁹ Third, people regard TCM as a substitute for or adjunct to WM treatment, and believe that TCM can treat the root of diseases.^[22,23]

TCM users among women were more than those among men, and this difference between genders increased as time went on.

Table 3
Mean TCM and WM visits per thousand enrollees and % change in different disease categories from 2000 to 2010.

Disease categories	ICD-9-CM codes	2000 (n=922,176)		2005 (n=999,398)		2010 (n=998,432)		% Change of mean visits from 2000 to 2005		% Change of mean visits from 2000 to 2010	
		TCM	WM	TCM	WM	TCM	WM	TCM	WM	TCM	WM
Neoplasms	140-239	2.6	169.6	6.5	213.8	11.5	289.9	152.4	26.0	343.7	70.9
Congenital anomalies	740-759	0.7	17.0	1.7	18.0	2.1	20.7	157.2	5.8	216.6	22.0
Complications of pregnancy, childbirth, and puerperium	530-679	1.0	42.2	2.7	34.2	2.1	36.6	175.3	-19.0	109.1	-13.3
Symptoms, signs, and ill-defined conditions	780-799	171.2	445.0	284.4	644.2	332.2	778.6	66.1	44.8	94.1	74.9
Diseases of skin and subcutaneous tissue	680-709	36.8	643.1	50.8	771.5	68.8	783.5	38.3	20.0	87.1	21.8
Diseases of blood and blood-forming organs	280-289	2.4	21.0	3.4	22.4	4.1	25.8	45.0	7.1	74.5	22.9
Endocrine, nutritional and metabolic diseases, and immunity disorders	240-279	13.4	377.7	20.1	509.2	23.3	625.1	50.6	34.8	73.9	65.5
Mental disorders	390-459	7.6	186.5	9.0	325.5	12.6	394.3	19.1	74.5	66.0	111.4
Diseases of circulatory system	290-319	20.9	630.2	26.7	857.3	36.0	1,017.7	27.9	36.0	72.3	61.5
Diseases of genitourinary system	580-629	80.7	711.1	105.9	676.1	133.8	677.8	31.1	-4.9	65.7	-4.7
Diseases of nervous system and sense organs	320-389	31.4	857.6	35.9	986.1	45.1	1,031.9	14.0	15.0	43.3	20.3
Diseases of digestive system	520-579	134.2	1,802.6	165.6	1,973.3	190.3	2,102.5	23.4	9.5	41.9	16.6
Injury and poisoning	800-999	187.5	496.2	232.8	571.0	215.9	589.0	24.2	15.1	15.2	18.7
Diseases of musculoskeletal system and connective tissue	710-739	198.8	709.6	220.8	873.2	204.6	995.4	11.0	23.1	2.9	40.3
Infectious and parasitic diseases	001-139	5.6	295.8	6.3	334.8	5.2	377.9	12.6	13.2	-7.5	27.8
Diseases of respiratory system	460-519	302.3	4,750.0	287.6	4,167.4	274.1	3,366.6	-4.9	-12.3	-9.3	-29.1

% change=percentage change, TCM=traditional Chinese medicine, WM=Western medicine.

This result of this study that the increase of percentage change in mean TCM visits was higher for women than that for men was consistent with studies in the United States and in Taiwan.^[11,13,24,25] Women seemed to prefer TCM more than men did.^[11] There is no doubt that the ratio of TCM users among women will be more than that among men in the future.

TCM users were mainly the enrollees in the middle groups by age, 35 to 49 and 50 to 64 in this study, similar to findings in past studies.^[13,15,26,27] By 2010, TCM users increased faster among younger adults (age 20–34) than other age groups, which might be related to a positive attitude toward TCM among the younger generation.^[28] The percentage change of mean TCM visits increased most in the group aged 20 to 34 years from 2000 to 2010, and this is comparable to the result shown in Table 1 that the group aged 20 to 34 years had the highest within-group ratio of TCM users in 2010.

Consistent with the result of previous studies, the within-group ratio of TCM users was lowest in the group aged less than 20 years in all 3 cohorts.^[13] Because the mean TCM visits and the percentage change in mean TCM visits were both least in the group aged less than 20 years, it is expected that the group aged less than 20 years will be the age group with the least TCM utilization in the future. This result indicates that young people preferred WM over TCM when seeking medical service. A similar phenomenon has been reported among residents in Hong Kong.^[29] This effect might be influenced by parents, and indicates that pediatric TCM should be further developed and popularized in the future.

The highest TCM utilization in the group aged ≥ 65 years of TCM users might be caused by greater susceptibility to infectious diseases and aging with chronic conditions.^[30] Physicians of TCM should make efforts to take care of the related diseases of the aged to fulfill their need for TCM treatment.

In the past, CAM was used mainly by people with middle or high SES, as they were the only ones who could afford it.^[3,24,31] However, as enrollees under NHI, more than 99% of residents in Taiwan can afford TCM treatment now.^[14] The preference for TCM by people with high SES has been increasing recently. The reasons for TCM usage by people with high SES may be the same in the past as at present—belief in TCM and using TCM as an adjunct to WM.^[22,23]

The preference for TCM by people with high SES reflects the increasing ratio of TCM users in the group with high SES in 2010. Children with high SES also had the highest TCM utilization, and this may be because the behavior of seeking medical service and the SES of children are both related to their parents.^[32] Recently, the rise in TCM utilization by people with high SES could result from belief in TCM and using TCM as an adjunct to WM as well as expectation of better quality of life and improvement of constitution through supplementary TCM treatment.^[10,22,23]

There are 6 regional divisions under National Health Insurance in charge of regional affairs. They are the Taipei, Northern, Central, Southern, Kao-ping, and Eastern divisions.^[33] The medical sources, public transportation, lifestyles, and configuration of the population are different in these 6 regions.^[34] It is reasonable to discuss differences in TCM utilization by region as the outcomes of different regional responses to the TCM needs there, which may be used as a reference for policy making by the National Health Insurance Administration (NHIA).

The ratio of TCM users in the central region was still the highest among the 6 regions in 2010, which could be due to the presence there of the earliest professional TCM physician training school, China Medical University. Establishment of

China Medical University, resulting in a greater number of TCM physicians and more TCM clinics and TCM departments in hospitals in the central region. This may have given rise to more TCM users in the region.

The central region had the weakest increasing trend of percentage change in mean TCM visits, which implies that the first priority for selection of workplace for TCM physicians should be to avoid the central region. The Taipei region had the highest increase of percentage change in mean TCM visits, which may have resulted from the convenience of transportation, high accessibility of TCM service, and high population density around Taipei and New Taipei cities.^[34]

The disease categories with the top 5 mean TCM visits were all the same in 2000, 2005, and 2010 in this study, similar to the results of related studies.^[13,15,19,35] As a previous study stated, respiratory tract infection was the most common cause of ambulatory visits by children.^[36] On the basis of the reduction in percentage change of mean visits in both TCM and WM ambulatory visits for diseases of the respiratory system from 2000 to 2010, we deduced that the reduction in ambulatory TCM visits for diseases of the respiratory system resulted from a decrease in medical need due to diseases of the respiratory system, not the transfer of medical care from TCM to WM. The reduction of ambulatory visits for diseases of the respiratory system might be due to climate change or advertisements fostering disease prevention.

Symptoms, signs, and ill-defined conditions surpassed diseases of the respiratory system in the mean TCM visits by 2010 and became the most common disease category in TCM usage.^[13,15,19,35] Utilization of WM for symptoms, signs, and ill-defined conditions also increased by 2010. It will be worth exploring the increase of medical requirements by disease type within the disease category of symptoms, signs, and ill-defined conditions.

The 5 disease categories with the fewest mean TCM visits were similar to those found by a previous study.^[15] The increase of 343.70% in TCM utilization for neoplasms from 2000 to 2010 may have resulted from the implementation of screening for 4 major cancers by the government to detect potential cancer patients. TCM may have become an alternative option or adjunct to WM for cancer treatment, consequently pushing up TCM utilization for neoplasms.^[37] However, it would be worthwhile to explore the kinds of cancer patients who seek TCM treatment. Such information could be useful for policymaking and arrangement of medical resources.

The mean TCM visits for diseases of the skin and subcutaneous tissue; diseases of the blood and blood-forming organs; and diseases of the genitourinary system vastly surpassed mean WM visits from 2000 to 2010. Many diseases in these 3 disease categories are related to chronic conditions or degenerative organ function.^[38] TCM are considered to have the following characteristics: tonic care, health promotion, suitability to different health needs, clearing the root of the disease, and few side effects.^[10] These characteristics of TCM encourage patients with diseases in these 3 disease categories to use TCM. Therefore, TCM utilization for these 3 disease categories rose more than WM utilization did.

Even though this population-based investigation can minimize the bias due to sufficiently large national representative samples from population. There were still several limitations in this study. First, visits to medical facilities, which were not contracted with the NHIA were not included in the claims data from NHIRD in this study. Second, people who went to visit medical facilities

contracted with NHIA and took CHM (yin-pian) rather than scientific granules or powder were not recorded in the claim data we analyzed. Third, the claims data from NHIRD we analyzed did not include the visits to traditional Chinese pharmacies, from which people bought CHM to add to their diet for the purpose of tonic supplement for strong constitution, health care, and taste of food.^[22]

5. Conclusions

Both the ratio of TCM users and mean TCM visits increased consistently from 2000 to 2005 and continued rising, albeit less steeply, through 2010. It can be predicted that women will have higher TCM utilization than men in the future. Preference for TCM increased among those with high SES during the study time period. The central region had the largest mean TCM visits, but the least increase of percentage change in mean TCM visits; therefore, the Taipei region had the greatest increase of percentage change in mean TCM visits from 2000 to 2010. Diseases of the respiratory system had the highest mean TCM visits in 2000, and this decreased over time. Among all disease categories explored in this study, neoplasms had the highest percentage change in mean TCM visits from 2000 to 2010.

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References

- [1] Hori S, Mihaylov I, Vasconcelos JC, et al. Patterns of complementary and alternative medicine use amongst outpatients in Tokyo, Japan. *BMC Complement Altern Med* 2008;8:14.
- [2] Lin MH, Chang HT, Tu CY, et al. Prevalence of polyherbacy in ambulatory visits to traditional Chinese medicine clinics in Taiwan. *Int J Environ Res Public Health* 2015;12:9639–57.
- [3] Eisenberg DM, Kessler RC, Foster C, et al. Unconventional medicine in the United States: Prevalence, costs, and patterns of use. *N Engl J Med* 1993;328:246–52.
- [4] Hung YC, Tseng YJ, Hu WL, et al. Demographic and prescribing patterns of Chinese herbal products for individualized therapy for ischemic heart disease in Taiwan: population-based study. *Plos One* 2015;10:e0137058.
- [5] Wang HM, Lin SK, Yeh CH, et al. Prescription pattern of Chinese herbal products for adult-onset asthma in Taiwan: a population-based study. *Ann Allergy Asthma Immunol* 2014;112:465–70.
- [6] Diao X, Deng P, Xie C, et al. Metabolism and pharmacokinetics of 3-n-butylphthalide (NBP) in humans: the role of cytochrome P450s and alcohol dehydrogenase in biotransformation. *Drug Metab Dispos* 2013;41:430–44.
- [7] Cui LY, Zhu YC, Gao S, et al. Ninety-day administration of dl-3-n-butylphthalide for acute ischemic stroke: a randomized, double-blind trial. *Chin Med J (Engl)* 2013;126:3405–10.
- [8] Klayman DL. Qinghaosu (artemisinin): an antimalarial drug from China. *Science* 1985;228:1049–55.
- [9] Lam TP. Strengths and weaknesses of traditional Chinese medicine and Western medicine in the eyes of some Hong Kong Chinese. *J Epidemiol Community Health* Oct 2001;55:762–5.
- [10] Chung VC, Ma PH, Lau CH, et al. Views on traditional Chinese medicine amongst Chinese population: a systematic review of qualitative and quantitative studies. *Health Expect* 2014;17:622–36.
- [11] Shih CC, Liao CC, Su YC, et al. Gender differences in traditional Chinese medicine use among adults in Taiwan. *Plos One* 2012;7:e32540.
- [12] Shih WT, Yang YH, Chen PC. Prescription patterns of Chinese herbal products for osteoporosis in Taiwan: a population-based study. *Evid-Based Compl Alt* 2012;2012:752837.
- [13] Chen FP, Chen TJ, Kung YY, et al. Use frequency of traditional Chinese medicine in Taiwan. *BMC Health Serv Res* 2007;7:26.
- [14] Chu SM, Shih WT, Yang YH, et al. Use of traditional Chinese medicine in patients with hyperlipidemia: a population-based study in Taiwan. *J Ethnopharmacol* 2015;168:129–35.
- [15] Chang LC, Huang N, Chou YJ, et al. Utilization patterns of Chinese medicine and Western medicine under the National Health Insurance Program in Taiwan, a population-based study from 1997 to 2003. *BMC Health Serv Res* 2008;8:170.
- [16] Chang MY, Liu CY, Chen HY. Changes in the use of complementary and alternative medicine in Taiwan: a comparison study of 2007 and 2011. *Complement Ther Med* 2014;22:489–99.
- [17] Chen HY, Lin YH, Wu JC, et al. Prescription patterns of Chinese herbal products for menopausal syndrome: analysis of a nationwide prescription database. *J Ethnopharmacol* 2011;137:1261–6.
- [18] Cheng CL, Kao YH, Lin SJ, et al. Validation of the National Health Insurance Research Database with ischemic stroke cases in Taiwan. *Pharmacoepidemiol Drug Saf* 2011;20:236–42.
- [19] Huang TP, Liu PH, Lien AS, et al. A nationwide population-based study of traditional Chinese medicine usage in children in Taiwan. *Complement Ther Med* 2014;22:500–10.
- [20] Barnes PM, Bloom B, Nahin RL. Complementary and alternative medicine use among adults and children: United States. *Natl Health Stat Report* 2007;2008:1–23.
- [21] Zuzak TJ, Bonkova J, Careddu D, et al. Use of complementary and alternative medicine by children in Europe: published data and expert perspectives. *Complement Ther Med* 2013;21:S34–47.
- [22] Chien PS, Tseng YF, Hsu YC, et al. Frequency and pattern of Chinese herbal medicine prescriptions for urticaria in Taiwan during 2009: analysis of the national health insurance database. *BMC Complement Altern Med* 2013;13:209.
- [23] D'Crus A, Wilkinson JM. Reasons for choosing and complying with complementary health care: an in-house study on a South Australian clinic. *J Altern Complement Med* 2005;11:1107–12.
- [24] Cassidy CM. Chinese medicine users in the United States. Part I: utilization, satisfaction, medical plurality. *J Altern Complement Med* 1998;4:17–27.
- [25] Wolsko PM, Eisenberg DM, Davis RB, et al. Insurance coverage, medical conditions, and visits to alternative medicine providers: results of a national survey. *Arch Intern Med* 2002;162:281–7.
- [26] Paramore LC. Use of alternative therapies: estimates from the 1994 Robert Wood Johnson Foundation National Access to Care Survey. *J Pain Symptom Manag* 1997;13:83–9.
- [27] Chen FP, Kung YY, Chen TJ, et al. Demographics and patterns of acupuncture use in the Chinese population: the Taiwan experience. *J Altern Complement Med* 2006;12:379–87.
- [28] Huber R, Koch D, Beiser I, et al. Experience and attitudes towards CAM—a survey of internal and psychosomatic patients in a German university hospital. *Altern Ther Health M* 2004;10:32–6.
- [29] Chan MF, Mok E, Wong YS, et al. Attitudes of Hong Kong Chinese to traditional Chinese medicine and Western medicine: survey and cluster analysis. *Complement Ther Med* 2003;11:103–9.
- [30] Fu S, Huang N, Chou YJ. Trends in the prevalence of multiple chronic conditions in Taiwan from 2000 to 2010: a population-based study. *Prev Chronic Dis* 2014;11:E187.
- [31] Wiles J, Rosenberg MW. 'Gentle caring experience'. Seeking alternative health care in Canada. *Health & Place* 2001;7:209–24.
- [32] Shih CC, Liao CC, Su YC, et al. The association between socioeconomic status and traditional Chinese medicine use among children in Taiwan. *BMC Health Serv Res* 2012;12:27.
- [33] National Health Insurance Administration: Organization and Duty. Available from: http://www.nhi.gov.tw/webdata/webdata.aspx?menu=17&menu_id=659&webdata_id=3513&WD_ID=664. Accessed on February 10, 2016.
- [34] National Health Insurance Administration: Information Download. Available from: <http://www.nhi.gov.tw/webdata/webdata.aspx?menu=>

- 17&menu_id= 1023&WD_ID=1043&webdata_id=805. Accessed on February 10, 2016.
- [35] Kang JT, Lee CF, Chen CF, et al. Factors related to the choice of clinic between Chinese traditional medicine and Western medicine. *J Formos Med Assoc* 1994;93(suppl 1):S49–55.
- [36] Liao P, Ku M, Lue K, et al. Respiratory tract infection is the major cause of the ambulatory visits in children. *Indian J Pediatr* 2011;37:43.
- [37] Health Promotion Administration (2015): Introduction to Cancer Screening. Available from: <http://www.hpa.gov.tw/Bhpnet/Web/HealthTopic/Topic.aspx?id=20071225003020>. Accessed on March 26, 2016.
- [38] Centers for Medicare & Medicaid Service: ICD-9 Code Lookup. Available from: <https://www.cms.gov/medicare-coverage-database/statpages/icd-9-code-lookup.aspx>. Accessed on March 27, 2016.