

# 行政院國家科學委員會專題研究計畫 成果報告

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## 前言

在本多年期研究計畫經費贊助下，於執行研究計畫期間，已有數篇論文產出與國際會議發表，目前尚有兩篇完稿論文投稿審查中，其中一篇已經初審修正後再審中，以下謹以該篇論文為主軸作為期末報告。

(Revised manuscript under peer review. Please do not quote.)

# Application of Frequent Itemsets Mining to Analyze Patterns of One-Stop Visits in Taiwan

## INTRODUCTION

The people in Taiwan have free choice of healthcare providers and therapies within the universal National Health Insurance (NHI) program starting in 1995. The NHI provides comprehensive benefits in ambulatory care for western and Chinese medicines, dentistry, medications, laboratory examinations, surgeries, and inpatients services. The NHI and its contracted hospitals don't set a limit of physician visits within a day by a patient [1]. A patient can visit ambulatory clinics of any specialty in hospitals directly without formal referral and is only charged by a differential copayment [2,3]. The great freedom in Taiwan's NHI caused not only a high number of annual visits per capita [1], but also a unique "one-stop shopping phenomenon" [4], which refers to visits of several specialties at the same facility in one day by a patient. A previous study estimated 7.6% of people in Taiwan had one-stop visits during a year [4].

Most literatures referring to one-stop shopping of health care focused on improving the service process through integrated settings. For example, the medical mall, developed in the USA in late 1980s, created a one-stop shop for ambulatory primary care, dental services, specialties for referral, pharmacy, physical therapy, government services, diagnostics, and other health care needs [5]. The integrated process for patients could save time intervals between their physician consultation, assessment, investigation and management [6-9]. Hospitals also provided additional services to their patients and visitors, with mall-like retail shops in or around their facilities, letting patients feel as at the mall [10].

The visits to multiple specialties, if not integrated, would increase not only the expense but also the potential risk of polypharmacy [11]. Although the percentage of persons with one-stop visits in Taiwan has been reported in a previous study [4], the patterns of one-stop visits needed to be further clarified. To our knowledge, there was no study on patterns of visits to multiple specialties in one day, especially for a large population.

In the current study, we analyzed a nationally representative claims dataset of 1 million people in Taiwan to calculate the frequency of one-stop visits. Because the one-stop shopping phenomenon is not rare in Taiwan and medical practice includes 24 specialties and 22 subspecialties, the number of combination patterns of specialties visited by patients would be hardly calculable with regular statistics or database programs. We thus adopted one of data mining techniques (the frequent itemsets mining) to compute the combination patterns of specialties in the one-stop visits. The analysis of the special case of one-stop visits in Taiwan will extend the application of data mining techniques to health services research.

## METHODS

### Data Sources

The single-payer NHI in Taiwan has covered almost all inhabitants (22,314,647 beneficiaries at the end of 2005, equaling 98.0% of all population). The NHI's electronic claims datasets, merged into a large computerized database as the National Health Insurance Research Database (NHIRD), have been released to the public for research purpose since 1999 [12]. The database contains original claims for reimbursement plus registration files of beneficiaries and healthcare facilities. The identification numbers of persons and healthcare facilities in the datasets have been encrypted to protect privacy, but the encrypted identification numbers remain unique so that record-linking within datasets is feasible. All researchers who apply for use of the NHIRD are required to sign a written agreement declaring that they could not violate the privacy of patients or healthcare providers and should acknowledge the NHIRD on publication.

One special subset of NHIRD, the *Longitudinal Health Insurance Database for 2005* (LHID2005), contains all the registration and original claims data of 1,000,000 persons from 1996 to 2008. These 1,000,000 persons were randomly sampled from the 22,717,053 beneficiaries of the NHI program during the period from 1 January to 31 December 2005. According to NHIRD, there was no significant difference in the age, gender distribution and utilization between the people in the LHID2005 and those in the complete NHIRD datasets. Our analysis was limited to the year 2005.

### Study Design

In 2005, the 1-million-person cohort had 15,037,163 ambulatory visit records. Only those with physician consultations of western medicine, dentistry, and traditional Chinese medicine were analyzed. We excluded the visits to emergency departments, prescription refills, home care by nurses, and preventive services without physician consultation.

One-stop visits in the current study were operationally defined as more than one visit for different specialties at the same healthcare facility on the same day by a patient. At first, the patients who had one-stop visits were extracted. The numbers and percentage of patients with one-stop visits in each age group and gender were calculated. We also compared them with the 1-million-person cohort.

The NHI in Taiwan divided medical specialties into 24 specialties and 22 subspecialties. The subspecialties, existing mostly at hospitals, were considered as different ones from their main specialties in our study. As to the combination patterns of specialties in one-stop visits, there would be theoretically 1,035 two-specialty combinations, 15,180 three-specialty combinations, 163,185 four-specialty combinations, and so on. If the number of visits in a day by a patient was not limited, the total kinds of possible specialty combinations would be about  $7 \times 10^{13}$ . The ordinary statistical software programs don't provide a user-friendly and efficient

solution without additional module or scripting. Besides, the statistical software is usually not suitable for processing a large amount of data. To overcome these difficulties, we adopted the frequent itemsets mining to tackle our research problem.

The frequent itemsets mining, a type of association rule mining, was developed in 1990s to analyze which groups of goods or sets of items were frequently purchased together. It has been used extensively in commercial marketing [13-15]. The most important concept of frequent itemsets mining is "minimal support". Among all items bought by a customer in one transaction there can be many subsets of items (itemsets), i.e. many possible combinations of individual items. If an itemset is repeatedly purchased with the frequency not less than the minimal support, then it is marked as a frequent itemset. The preset minimal support enables efficient computing of large-scale data. We have applied such a data mining technique to analyze the Taiwan's NHI claims databases in previous researches [16-18].

In the current study, the one-stop visits made by a patient to the same facility in one day correspond to items of one transaction in frequent itemsets mining. We set the minimal support for visit frequency at different levels iteratively, from 1000, 500, 100 and so on, to obtain frequent combinations of specialties (itemsets) in one-stop visits. The frequent combinations of specialties would be stratified by number of specialties (number of items in an itemset) in the final display.

### **Data Processing**

The open-source software Perl (version 5.10.0) [19] was used for computing. The module of Data::Mining::AssociationRules version 0.1 by Dan Frankowski [20] was modified and integrated into the programming script. The regular statistics were displayed. In calculating the percentages of patients, the denominator was 1,000,000 according to the registry for beneficiaries in 2005.

## **RESULTS**

There were 504,183 women and 495,817 men among the 1,000,000-person cohort in 2005. The ambulatory care visits with physician consultation amounted to 13,682,469 visits, and 79,371 (7.9%) persons did not have any visit during the year. The average number of visits per person was 13.7 (SD 14.6) in 2005. Nearly one fourth ( $n = 3,342,907$ ) of visits were made to outpatient departments of hospitals.

One-stop visits occurred 144,132 times and involved 296,822 visits (2.2% of all visits) by 66,294 (6.6%) persons. The percentage of the persons with one-stop shopping behavior increased with age after age 10 and reached to the highest in the age group  $\geq 80$  years as 27.5% (5,662 of 20,579). In general, women were more likely to have this behavior than men (7.2% vs. 6.0%) (Table 1).

When we set the minimal support for visit frequency at 1000, only 41 two-specialty itemsets were found in all visits. Until the minimal support set at 100, one three-specialty itemset began to appear. When the minimal support set at 10, the four-specialty itemsets could be obtained. The largest number of specialties visited at the same facility in one day by a patient was six. The overall number of different

combinations was 4,709 (Table 2).

Among one-stop visits, the most frequently visited specialties were ophthalmology, internal medicine, and cardiology. These three specialties had accounted for 72,607 (24.4%) visits in all one-stop visits (Table 3).

As to the combinations of specialties in one-stop visits, internal medicine plus ophthalmology was the most frequent combination with a visited frequency of 3,552 times (2.5% of 144,132 times of one-stop visits), followed by cardiology plus neurology with a visited frequency of 3,183 times (2.2%). The two-specialty combinations (itemsets) with a visited frequency  $\geq 1000$  were selectively displayed in Table 4. The most frequent three-specialty combination was cardiology plus neurology and gastroenterology, but only with a visited frequency of 111 times (0.08%) (Table 5).

## DISCUSSION

The association rule mining, also known as market basket analysis, has been used to analyze the large database for the commercial marketing for more than one decade [14]. Our research team had successfully applied this data mining technique in medical researches, especially to analyze the co-prescriptions of drugs. We had identified the drugs prescribed in combination with antacids from the Taiwan NHI claims [16]. We had also analyzed the prescription patterns of Chinese herbal medicine for patients with allergic rhinitis [17], and chronic hepatitis [18] in Taiwan. In the current study, we further extended the frequent itemsets mining, a type of association rule mining, to the study of patient's behavior. Our approach offered another novel application of this data mining technique.

The possible reasons of the one-stop shopping phenomenon in Taiwan would be as follows: First, the NHI and its contracted hospitals don't set a limit of physician visits within a day by a patient. Direct visits to any specialty clinic in hospitals without formal referral are only charged by a differential copayment. Second, the hospitals are very easily accessible in this densely populated island country. They generally provide varieties of specialties in their outpatient departments and advanced medical equipments in ambulatory cares. It is very convenient for the patients to have different kinds of medical services at one site in a day. Third, the number of people with multimorbidity might increase in Taiwan's aging society. The current practice of medicine in Taiwan is fragmented into many subspecialties without integration and the multimorbid patients might not be treated efficiently.

Our study revealed that the elderly were more likely to have one-stop shopping behavior and the percentage was above 25% in those aged 70 and over. Multimorbidity in the elderly might be the major reason. Before age 70, the percentage of one-stop shopping among men was lower than that among women. Perhaps men tended to delay health help-seeking [21]. After age 70, the gender disparity reversed. Because of shorter life expectancy, men might have poorer health at the late stage of life.

If one patient could choose any number of 46 specialties of the same healthcare

facility in a day, there would be theoretically a hundred trillion of combination patterns. In reality, the time constraint prevents a patient from visiting too many specialties in one day. In the current study, the greatest number of visited specialties in a one-stop shopping was only six, far fewer than the number of items held in a shopping basket of a supermarket. The number of combination patterns in our study was correspondingly fewer than that in commercial market basket analyses.

In the current study, ophthalmology was the most frequently visited specialty in one-stop visits, although it was only at the 7th place among all ambulatory visits in Taiwan [4]. A study of multimorbidity in Sweden also found that comorbidity occurred beyond chance and the most frequent pattern of co-existing diseases was visual impairment with heart disease [22]. The comorbidity of the visual problem with other diseases reflected the prevalence of diseases among specific patient groups at the demand side in Taiwan. On the other hand, the underlying reason might be at the supply side in that the ophthalmologist's techniques could not be easily substituted by other specialists and the hospitals offered more advanced equipments than practicing ophthalmologists.

As comorbidity usually increased with age and in patients with chronic conditions, the other top frequently visited specialties in one-stop visits for cardiology, internal medicine, orthopedics, gastroenterology, and neurology were compatible with the chronic conditions usually seen in the elderly [23,24]. The otorhinolaryngology in the 7th place might just reflect the high service volume of this specialty in Taiwan's ambulatory care for diseases of the respiratory system [4].

As for the combination patterns, the top ones with minimal support of 1000 might reflect the frequent comorbid conditions in patients with one-stop visits. Many combinations, such as those between cardiology, neurology, gastroenterology and endocrinology, could be substituted by family medicine or internal medicine to decrease the fragmentation of care. On the other hand, some combinations might reflect the necessity of different specialties' management, such as internal medicine, cardiology, endocrinology, neurology, otorhinolaryngology or family medicine plus ophthalmology, orthopedics, surgery, urology or rehabilitation. These combinations could be considered into integrated care clinics if the healthcare facilities intend to improve the service process and patient satisfaction.

In the current study, the patterns of specialty combinations in one-stop visits were extremely diverse and the number of visits in each combination, even the most frequent one, was relatively low. The practical meaning is that it would be difficult for hospitals to offer customized, integrated, and efficient services under circumstances of low economies of scale. The one-stop visits are indeed convenient to patients who need various specialties to treat their problems. But the risk of induced demand and polypharmacy deserves further attention. The NHI in Taiwan has to establish a more regulated referral system with family physicians as health gatekeepers, especially for those with multiple chronic diseases.

## Limitations

Our study has some limitations. First, the income and residence of beneficiaries were not available in the NHIRD for privacy protection. The influence of socioeconomic



factors on one-stop visits couldn't be explored. Second, the claims didn't contain data about the referral. We couldn't differentiate whether the one-stop visits were initiated by physicians' referral in the same healthcare facility or out of patients' free choice. Third, our study design might overlook the influence of disease types. In the NHI, only three diagnoses could be coded in one ambulatory visit. The coding was undertaken by physicians for administrative purpose and seldom verified. Fourth, our study was limited to specialties visited in one day. If a patient visited several specialties of the same healthcare facility in a short period of days, it might otherwise imply the inefficiency of managerial operation. Finally, because the phenomenon of one-stop visits is a special, if not unique, case of health care in one specific country (Taiwan), our data-mining approach can be applied to other countries only when a similar environment without strict regulation on patient access to health care exists and extensive datasets are openly available to analysis.

## Conclusions

With the data mining technique, we had successfully analyzed the diverse patterns of specialty combinations in one-stop visits from large-scale datasets, what was hardly feasible with an ordinary statistical method. Our approach demonstrated another novel application of frequent itemsets mining to the research of patients' behaviors. The results could provide useful information either for the hospital manager to set up integrated care of health service and for the policymaker to rebuild the health care system.

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**Table 1.** Distribution of patients with one-stop visits<sup>a</sup> in 2005, stratified by age and sex

Age Group	All Persons in the 1,000,000-Person Cohort		Numbers of Patients With One-Stop Visits		
	Female	Male	Female (%)	Male (%)	All Sex (%)
0-9	54,683	59,992	1,207 (2.2)	1,673 (2.8)	2,880 (2.5)
10-19	66,756	71,573	1,083 (1.6)	1,205 (1.7)	2,288 (1.7)
20-29	91,275	77,842	2,896 (3.2)	1,740 (2.2)	4,636 (2.7)
30-39	84,568	81,441	3,775 (4.5)	2,230 (2.7)	6,005 (3.6)
40-49	80,722	81,209	5,738 (7.1)	3,729 (4.6)	9,467 (5.8)
50-59	58,388	57,176	7,321 (12.5)	4,650 (8.1)	11,971 (10.4)
60-69	34,279	31,454	6,472 (18.9)	4,563 (14.5)	11,035 (16.8)
70-79	23,252	24,811	5,643 (24.3)	6,707 (27.0)	12,350 (25.7)
≥80	8,899	9,368	2,390 (23.3)	3,272 (31.7)	5,662 (27.5)
All Age	504,183	495,817	36,525 (7.2)	29,769 (6.0)	66,294 (6.6)

<sup>a</sup>One-stop visits were defined as more than one ambulatory care visits for different specialties at the same healthcare facility on the same day by a patient.

**Table 2.** Numbers of specialty combinations (itemsets)<sup>a</sup> for one-stop visits<sup>b</sup> at different minimal supports for visit frequency of an itemset, stratified by number of specialties in an itemset

Minimal Support for Visit Frequency	No. of Specialty Combinations				
	2-Specialty Itemsets	3-Specialty Itemsets	4-Specialty Itemsets	5- Specialty Itemsets	6- Specialty Itemsets
1,000	41	0	0	0	0
500	106	0	0	0	0
100	255	1	0	0	0
50	341	19	0	0	0
10	776	285	9	0	0
1	2,070	1,876	655	98	10

<sup>a</sup>Subsets of specialties visited by a patient at the same health care facility on the same day.

<sup>b</sup>One-stop visits were defined as more than one ambulatory care visits for different specialties at the same healthcare facility on the same day by a patient.

**Table 3.** Numbers of visits and patients in all one-stop visits<sup>a</sup> in 2005, stratified by consulted specialty (selected)

Specialty	No. of Visits (% , n <sup>b</sup> =296,822)	No. of Patients (n=66,294)
Ophthalmology	27,060 (9.1)	14,697
Cardiology	24,769 (8.3)	11,733
Internal medicine	20,778 (7.0)	11,989
Orthopedics	19,711 (6.6)	12,143
Gastroenterology	18,831 (6.3)	10,833
Neurology	17,801 (6.0)	8,947
Dermatology	15,522 (5.2)	9,500
Otorhinolaryngology	14,368 (4.8)	9,645
Urology	14,352 (4.8)	7,928
Endocrinology	12,735 (4.3)	5,895
Surgery	12,351 (4.2)	8,777
Family medicine	12,249 (4.1)	8,102
Gynecology	11,945 (4.0)	8,556
Rehabilitation	9,923 (3.3)	6,050
Pulmonology	9,367 (3.2)	5,510
Psychiatry	8,851 (3.0)	4,136
Others	46,209 (15.6)	29,020

<sup>a</sup>One-stop visits were defined as more than one ambulatory care visits for different specialties at the same healthcare facility on the same day by a patient.

<sup>b</sup>The total visit counts of all one-stop visits.

**Table 4.** Patterns of two-specialty combinations in one-stop visits<sup>a</sup> in 2005 (selected)

Specialty Combination	Visited Frequency (%, n <sup>b</sup> =144,132)	No. of Patients
Internal medicine + Ophthalmology	3,552 (2.5)	2,047
Cardiology + Neurology	3,183 (2.2)	1,575
Cardiology + Gastroenterology	3,085 (2.1)	1,786
Internal medicine + Orthopedics	2,758 (1.9)	1,870
Cardiology + Ophthalmology	2,745 (1.9)	1,512
Cardiology + Endocrinology	2,636 (1.8)	1,070
Internal medicine + Surgery	2,523 (1.8)	1,884
Ophthalmology + Dermatology	2,319 (1.6)	1,573
Family medicine + Ophthalmology	2,260 (1.6)	1,466
Otorhinolaryngology + Ophthalmology	2,238 (1.6)	1,681
Cardiology + Orthopedics	2,108 (1.5)	1,304
Endocrinology + Ophthalmology	1,968 (1.4)	1,166
Orthopedics + Ophthalmology	1,944 (1.3)	1,290
Cardiology + Urology	1,912 (1.3)	997
Neurology + Gastroenterology	1,809 (1.3)	1,068
Ophthalmology + Neurology	1,788 (1.2)	1,085
Cardiology + Chest medicine	1,703 (1.2)	1,055
Internal medicine + Rehabilitation	1,514 (1.2)	971
Others	120,050 (83.3)	84,919 <sup>c</sup>

<sup>a</sup>One-stop visits were defined as more than one ambulatory care visits for different specialties at the same healthcare facility on the same day by a patient.

<sup>b</sup>Total times of one-stop visits.

<sup>c</sup>One patient might have more than one different combinations

**Table 5.** Patterns of three-specialty combinations in one-stop visits<sup>a</sup> in 2005 (selected)

Specialty Combination	Visited Frequency ( %, n <sup>b</sup> =144,132)	No. of Patients
Cardiology + Neurology + Gastroenterology	111 (0.08)	48
Cardiology + Neurology + Endocrinology	93 (0.06)	41
Cardiology + Endocrinology + Ophthalmology	77 (0.05)	51
Cardiology + Gastroenterology + Orthopedics	73 (0.05)	39
Internal medicine + Ophthalmology + Dermatology	72 (0.05)	46
Cardiology + Neurology + Ophthalmology	72 (0.05)	37
Cardiology + Ophthalmology + Orthopedics	68 (0.05)	48
Cardiology + Endocrinology + Gastroenterology	65 (0.05)	37
Cardiology + Neurology + Urology	63 (0.04)	37
Cardiology + Ophthalmology + Dermatology	62 (0.04)	41
Cardiology + Gastroenterology + Ophthalmology	61 (0.04)	38
Cardiology + Chest medicine + Gastroenterology	61 (0.04)	32
Orthopedics + Ophthalmology + Dermatology	60 (0.04)	40
Cardiology + Gastroenterology + Urology	60 (0.04)	40
Ophthalmology + Dermatology + Neurology	56 (0.04)	32
Others	9,308 (6.46)	7,286 <sup>c</sup>

<sup>a</sup>One-stop visits were defined as more than one ambulatory care visits for different specialties at the same healthcare facility on the same day by a patient.

<sup>b</sup>Total times of one-stop visits.

<sup>c</sup>One patient might have more than one different combinations



## 計畫成果自評

本研究計畫成果內容係依照原申請計畫逐步執行，與原計畫相符，亦達成預期目標。本研究團隊於研究計畫執行期間的成果可分為四個面向：(一) 利用全民健康保險研究資料庫的歸人抽樣檔，瞭解特殊病患的 pathway and access to medical care，首篇論文已發表 (Pattern and consequences of first visits to obstetricians/gynecologists by adolescents: a nationwide study in Taiwan. J Chin Med Assoc 2010;73(3):144-149.)，另有一篇論文則係探討精神科就診情形，已完成初稿。(二) 藉助研究經費特別訂購全民健康保險研究資料庫資料，特別是持有重大傷病卡的病患 cohort data，建立架構以提供實證資料給各種研究構想，首篇論文已發表 (The effect of weather on peritoneal dialysis prescription - seasonal variation in PD dialysate utilization. Perit Dial Int 2010;30:320-328.)，預期未來陸續會有其他成果發表。(三) 探討 doctor-shopping 與 polypharmacy 的關係，意即欲瞭解是 seeking help 或 seeking drugs，初步成果兩篇已於國際會議發表 (Relationship of doctor shopping and polypharmacy: a nationwide study in Taiwan. Value Health 2008;11:A39.)、(Benzodiazepine use among frequent attenders to emergency departments: a nationwide study in Taiwan. Value Health 2009;12:A364.)。(四) 利用資料探勘的技術 (特別是 association rule mining) 分析 doctor-shopping 行為，已完成兩篇論文投稿審查中，其中一篇已經初審修正後再審中。

## 出席國際學術會議心得報告

計畫編號	NSC 96-2416-H-004-007-MY2
計畫名稱	解構台灣民眾「逛醫院」現象
出國人員姓名 服務機關及職稱	周麗芳 國立政治大學 財政學系 教授
會議時間地點	2010年5月15至19日 美國喬治亞州亞特蘭大市 Hilton Atlanta
會議名稱	ISPOR (International Society for Pharmacoeconomics and Outcomes Research) 15th International Annual Meeting
發表論文題目	Drugs cheaper than threepenny: the market of extremely low-priced drugs within the National Health Insurance in Taiwan

### 一、參加會議經過

國際藥品經濟與效果研究學會 (International Society for Pharmacoeconomics and Outcomes Research, ISPOR) 係相當活躍的國際學術組織，本會加上全球各地分會，擁有超過 8000 名會員。ISPOR 在台灣亦有分會 (Taiwan Chapter)。ISPOR 每年舉行三大會議，北美與歐洲各一，另一則在其他地區舉行 (2010 年 9 月在泰國普吉市)。ISPOR 出版有「Value in Health」月刊，為 SCI 期刊資料庫收錄，2009 年的 Impact Factor 為 3.032，在 Health Care Sciences & Services 類別 69 種期刊中排名第 7。

今 (2010) 年 ISPOR 在美國喬治亞州亞特蘭大市舉行的第十五屆國際會議，為期五天，依往例會議前兩天 (5 月 15 日至 16 日) 係在週末，舉辦短期教育課程 (short course program, educational symposium)，後三天 (5 月 17 日至 19 日) 為科學研究性質活動。ISPOR 年度國際會議，參與者一年比一年增加，今年有 1,024 件 poster presentations、60 場 research podiums、38 場 workshops、12 場 issue panels。台灣學界向來參與 ISPOR 盛會相當踴躍，今年有國立陽明大學醫學院衛生福利研究所黃文鴻教授 (曾任衛生署藥政處長，也是筆者二十多年前就讀碩士班時的老師) 率領研究團隊參加。

此次會議 poster presentations 主要分成幾大部分：(第一天) Methods & Concepts、Cancer、Diabetes/Endocrine Disorders、GI Disorders、Urinary/Kidney Disorders、(第二天) Health Care Decision Maker's Case Studies、Health Policy、Mental Health、Muscular-Skeletal Disorders、Neurological Disorders、Sensory Systems Disorders、(第三天) Cardiovascular Disorders、Individual's Health、Infections、Respiratory-Related Disorders、Systemic Disorders/Conditions。所有論文摘要皆收錄於「Value in Health」期刊 2010 年第 13 卷第 3 期。本人此次與會發表論文被歸類在 Health Policy 類下 Health Care Costs & Management 主題 (PHP50) (Value in Health 2010;13(3):A90.)。

本人發表論文題目為：「Drugs cheaper than threepenny: the market of extremely low-priced drugs within the National Health Insurance in Taiwan」(threepenny: 英國 1971 年以前的三便士硬幣，相當於台幣一元，另意指無價值的、便宜的)，主要探討台灣低價藥

品市場的現況規模，特別以藥品單價為一元作為劃分點，研究資料來自國家衛生研究院全民健康保險研究資料庫 2007 年門診系統抽樣檔與特約藥局完整申報檔，研究結果顯示：健保給付的口服藥品品項中，三分之一的品項單價小於等於一元；在所有開立的口服藥品處方中，低價藥品佔了開立品項總數的將近一半，然而總金額卻只佔 4.1%，還不及銷售第一名的單一品項的總金額。低價藥品是台灣醫療體系相當獨特的現象，值得進一步深入研究。

此次會議不僅舉辦了眾多各類活動，也提供寬敞空間供各國學者自由討論意見交流，是相當成功的國際會議。本人係近年內第四次參加 ISPOR 會議，欣見 ISPOR 與藥品經濟逐年蓬勃發展。

## 二、與會心得

藥品在醫療扮演重要的角色，製藥亦是生技產業的主軸，藥品經濟則能協助相關議題的規劃評估。與世界先進大國相較，台灣藥品市場規模並不大，不過，台灣有全民健保，又有量大價廉的全民健康保險資料庫可供學術研究使用，是台灣學界得天獨厚之處。台灣目前已有不少學者利用健康保險資料庫發表藥品流行病學、藥品利用、藥品經濟的研究，成果豐碩，國際能見度應更高於以往。

## **DRUGS CHEAPER THAN THREEPENNY: THE MARKET OF EXTREMELY LOW-PRICED DRUGS WITHIN THE NATIONAL HEALTH INSURANCE IN TAIWAN**

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Taiwan, <sup>2</sup>Institute of Hospital and Health Care Administration, School of Medicine, National Yang-Ming University, Taipei, Taiwan,

<sup>3</sup>Department of Family Medicine, Taipei Veterans General Hospital, Taipei, Taiwan,

<sup>4</sup>Pharmacy Department, Taipei Veterans General Hospital, Taipei, Taiwan,

<sup>5</sup>Institute of Pharmacology, School of Medicine, National Yang-Ming University, Taipei, Taiwan

**OBJECTIVES:** The National Health Insurance in Taiwan always faces the problem of soaring drug expenditure. However, among the drug benefit scheme there is a great discrepancy in drug unit prices, with a lot of extremely low-priced drugs. The purpose of the study was to analyze the market situation of these cheap drugs. **METHODS:** The analysis was limited to the ambulatory setting. The data sources came from the claims datasets of prescriptions dispensed at contracted pharmacies (GO, complete) and at hospitals and clinics (OO, 1/500 sampling) in 2007, offered by the National Health Insurance Research Database in Taiwan. For favorable comparisons, the focus was on oral drugs with solid forms, e.g. tablets and capsules. The operational definition of a cheap drug was set to the unit price not greater than 1 New Taiwan dollar (NTD). One NTD was equal to 0.03 US dollar in 2010. **RESULTS:** During the year, 13,594 distinct drug items had been prescribed 803,961,618 times with total expenditure of 87,794,653,006 NTD. Among them, 8,795 oral drug items accounted for 687,629,169 prescribed items (85.5% of total prescribed items) and 63,177,684,194 NTD (72.0% of total drug expenditure). According to the last price of each oral drug item at the end of 1997, the average unit price was 10.3 +/- 92.4 NTD, with minimum 0.06, maximum 4,111, median 1.5, 25 percentile 0.8 and 75 percentile 4.3, and 2,873 items (32.7% of oral drug items) had a unit price <= 1 NTD. While the top one item among all oral drugs had already a market share of 5.2%, 19 items 25% and 99 items 50%, the cheap drugs with aggregate frequency of 323,571,583 prescribed items (47.1% of all prescribed oral drug items) only accounted for 2,583,591,026 NTD (4.1% of expenditure for oral drugs and 2.9% of total drug expenditure). **CONCLUSIONS:** The drug market of the National Health Insurance in Taiwan was abundant in cheap drugs. The unreasonably low prices of drugs might not guarantee the quality of pharmaceutical care and the sustainability of a healthy pharmaceutical industry in the long run.

無衍生研發成果推廣資料

96 年度專題研究計畫研究成果彙整表

計畫主持人：周麗芳		計畫編號：96-2416-H-004-007-MY2					
計畫名稱：解構台灣民眾「逛醫院」現象							
成果項目		量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）	
		實際已達成數（被接受或已發表）	預期總達成數（含實際已達成數）	本計畫實際貢獻百分比			
國內	論文著作	期刊論文	1	2	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%		
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（本國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
國外	論文著作	期刊論文	1	2	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	2	0	100%		
		專書	0	0	100%		章/本
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（外國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		

<p>其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)</p>	無
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科 教 處 計 畫 加 填 項 目	成果項目	量化	名稱或內容性質簡述
	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與(閱聽)人數	0	





# 國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

達成目標

未達成目標（請說明，以 100 字為限）

實驗失敗

因故實驗中斷

其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文： 已發表  未發表之文稿  撰寫中  無

專利： 已獲得  申請中  無

技轉： 已技轉  洽談中  無

其他：（以 100 字為限）

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以 500 字為限）

本研究團隊於研究計畫執行期間的成果可分為四個面向：（一）利用全民健康保險研究資料庫的歸人抽樣檔，瞭解特殊病患的 pathway and access to medical care，首篇論文已發表，另有一篇論文則係探討精神科就診情形，已完成初稿。（二）藉助研究經費特別訂購全民健康保險研究資料庫資料，特別是持有重大傷病卡的病患 cohort data，建立架構以提供實證資料給各種研究構想，首篇論文已發表，預期未來陸續會有其他成果發表。

（三）探討 doctor-shopping 與 polypharmacy 的關係，意即欲瞭解是 seeking help 或 seeking drugs，初步成果兩篇已於國際會議發表。（四）利用資料探勘的技術（特別是 association rule mining）分析 doctor-shopping 行為，已完成兩篇論文投稿審查中，其中一篇已經初審修正後再審中。