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# Research in Developmental Disabilities



## Determining factors for utilization of preventive health services among adults with disabilities in Taiwan

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### ABSTRACT

Taiwan has provided free health checks for adults since 1995. However, very little previous research has explored the use of preventive health services by physically and mentally disabled adults. The present study aimed to understand this use of preventive health services and the factors that influence it. Research participants included disabled people registered in a Ministry of the Interior database in 2008 (a total of 785,746 adults who met the conditions for being physically or mentally disabled and using preventive health services). These data were merged with the Bureau of Health Promotion's 2006–2008 dataset on preventive health and the 2006–2008 health insurance database published by the National Health Research Institutes. In addition to descriptive and bivariate analysis, the study used logistic regression analysis to investigate the factors that influence the use of adult preventive health services. The results showed that 15.81% of physically and mentally disabled adults used preventive health services. The rate of use among females was significantly higher than the rate among males, and rates were higher among residents of relatively less urbanized areas. Usage rates were also universally higher among sufferers of chronic diseases. However, more serious disabilities had lower usage rates. From the logistic regression analysis, we ascertained that the factors that influenced the use of preventive health services were gender, age, level of urbanization, monthly salary, low-income household status, aboriginal status, catastrophic disease/injury status, chronic diseases, type of disability, and severity of the disability. The study's main conclusion is that although Taiwan's Department of Health has provided free preventive health services for more than 15 years, the usage rate of this care among the disabled remains low. Demographic features, health status, and type of disability are the main factors influencing the use of preventive healthcare services.

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## 1. Introduction

By the end of 2008, the number of physically and mentally disabled persons in Taiwan totaled 1,040,585, or 4.52% of the total population (Ministry of the Interior, 2009). To advance the health of Taiwan's public, the Department of Health (DOH) has provided adult preventive health services (in the form of health checks) since 1995. According to the Bureau of Health

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Promotion (BHP) regulations, the targets of adult preventive health services can be divided into three categories: (1) people aged 40–64 years, who may undergo one health check every 3 years; (2) people aged 65 years and over, who may undergo one health check each year; and (3) sufferers of poliomyelitis aged 35 and over, who may undergo one health check each year. The services included under “adult preventive health services” are physical examination, health education guidance, blood tests, and urinalysis.

In 2004, the overall rate of use of adult preventive health services among the 40- to 64-year-old category was 42%, while the rate of use among the 65-year-old and over category was 38%. The number of people using adult preventive health services increased from 1.21 million in 1999 to 1.63 million in 2006 (DOH, 2008), showing a significant increase in the public use of these services.

The physically and mentally disabled may not be able to express the nature of their medical ailments because of physiological or psychological disabilities. Because visits to the doctor may require more time and difficulty and may be less convenient for them than for the general population, physically and mentally disabled adults may not obtain necessary treatments. Previous studies have indicated that the usage rates for preventive health services among the physically and mentally disabled are lower than the rates among the general population (Phillips, Meyer, & Aday, 2000; Ramirez, Farmer, Grant, & Papachristou, 2005; Shabas & Weinreb, 2003; Tezzoni, McCarthy, Davis, Harris-David, & O'Day, 2001). Fewer females among the physically and mentally disabled population receive cervical smears or breast screening than their able-bodied counterparts (Jones & Beatty, 2003). The more serious the mental or physical disability, the lower the usage rate of preventive health services (Diab & Johnston, 2004). However, the findings on these rates are contradictory. Wei, Findley, & Sambamoorthi (2006) analysis of the 1999–2002 Medical Expenditure Survey (MEPS) found that more physically or mentally disabled females (50.1%) availed themselves of influenza vaccinations than did their able-bodied counterparts (39.0%), and more physically or mentally disabled females underwent cholesterol tests (92.6%) than did their able-bodied counterparts (90.9%). Ramirez et al. (2005) found that the proportions of the disabled who underwent the prostate-specific antigen test (46.06%), colorectal endoscopy (41.91%), and the fecal occult blood test (22.52%) were lower than the proportions of their able-bodied counterparts (52.36%, 43.35%, and 23.08%).

Previous research has indicated that the factors that influence whether the public accepts preventive health services include gender (Bertakis, Azari, Helms, Callahan, & Robbins, 2000; Green & Pope, 1999; Owens, 2008; Smith, Cokkinides, & Eyre, 2007), ethnic group (Makuc, Freid, & Kleinman, 1989), educational level (Dolan Mullen et al., 1997), and income (Makuc et al., 1989). Generally speaking, higher income represents a greater probability of using preventive health services, whereas educational level and the probability of using each type of preventive health service are directly proportional to one another. In Taiwan, a study has found that the use of preventive care among women depends on a variety of factors, such as age, marital status, income level, education, and health status (Lin, Ma, Yang, Chang, & Yeh, 2009).

If we integrate the findings of previous research, we find that the use of medical services by the physically and mentally disabled differs from that of the general population. To date, however, most studies have emphasized the use of medical services by the general population, with very little research into the use of preventive healthcare by the disabled. For this reason, the present study focuses on the physically and mentally disabled and explores their use of preventive healthcare and the factors that determine this use. It is hoped that this study might serve as a reference in the formulation of preventive health policy for disadvantaged groups.

## 2. Materials and methods

### 2.1. Data source and processing

This study focused its analysis on adults aged 40 and over. The research participants included physically and mentally disabled persons registered in 2008 in a database of the Ministry of the Interior. Information on these participants was merged with the preventive health services files of the Bureau of Health Promotion in 2006–2008 and the health insurance medical claims database published by the National Health Research Institutes. The following variables were recorded.

(1) Demographic characteristics: gender, age, aboriginal status, residence, premium-based monthly salary, and low-income household status; (2) health and disability status: catastrophic illness/injury, relevant chronic illnesses (including cancer, endocrine and metabolic diseases, mental disorders, diseases of the nervous system, diseases of the circulatory system, diseases of the respiratory system, diseases of the digestive system, diseases of the genitourinary system, diseases of the musculoskeletal system and connective tissue, disorders of the eye and adnexa, infectious diseases, congenital anomalies, diseases of the skin and subcutaneous tissue, diseases of the blood and blood-forming organs, and diseases of the ear and mastoid process); (3) classification of disability: type of disability and severity of disability; (4) utilization of preventive health services among the disabled.

### 2.2. Participants

According to Taiwan's Disability Rights Protection Acts, disability can be classified into 18 categories: visual impairment, hearing impairment, balance impairment, sound or speech impairment, limb impediment, mental retardation, major organ malfunction, facial injury, persistent vegetative state, refractory epilepsy, dementia, autism, chromosomal abnormalities, congenital metabolic disorders, other congenital defects, multiple disabilities, chronic mental illness, and other disabilities

caused by rare diseases recognized by central health authorities. The severity of disability is classified into four categories: very severe, severe, moderate, and mild.

This study included the participants aged 40 or older and excluded individuals with persistent vegetative state (4176 persons) who are unsuitable for the use of preventive health services, and individuals suffering from poliomyelitis aged 35–39 years in the analysis. Since those with disability due to poliomyelitis belong to the group of physical disability, they could not be distinguished from those with physical disability in the dataset. A total of 785,746 persons with disabilities were identified as meeting the requirements for preventive health services.

### 2.3. Statistical analysis

We first used descriptive statistics to understand characteristics of the disabled subject such as gender, age, level of urbanization, type of physical or mental disability (categorized into 18 types and four levels), educational level, marital status, and aboriginal status. Then we analyzed the disabled persons' use of adult preventive health services in terms of the numbers of occasions and percentages. We used the  $\chi^2$  test to compare variations in disabled persons' use of preventive health services. The variables with  $p < 0.05$  from the  $\chi^2$  test were submitted to a logistic regression analysis, and the factors influencing the use of adult preventive health services by the disabled were investigated separately. In the logistic regression analysis, the use of adult preventive health services was the dependent variable. Independent variables included demographic features (gender, age, level of urbanization, premium-based monthly salary, low-income household status, educational level, marital status, aboriginal status, etc.), health status (relevant chronic diseases, catastrophic disease/injury, etc.), qualifications for physically or mentally disabled status (category of physical or mental disability, level of severity of disability), and the use of other preventive health services. There were eight levels of urbanization, from "areas at the highest level of urbanization" to "areas at the lowest level of urbanization."

## 3. Results

### 3.1. Basic characteristics of the physically and mentally disabled (Table 1)

This study identified 785,746 physically and mentally disabled persons who met the conditions for adult preventive health services, of whom 55.84% ( $N = 438,766$ ) were males. The largest category included persons 70 years of age and over (37.57%,  $N = 295,198$ ). The largest category for premium-based salary was "dependent population" (34.33%,  $N = 269,753$ ). Aborigines constituted a mere 1.57% of the participants ( $N = 12,348$ ). The largest category in terms of educational level was "elementary school or lower" (51.96%,  $N = 408,271$ ). The largest group for type of physical or mental disability was "limb impediment(s)" (41.90%,  $N = 329,264$ ). The largest category of disability level was "mild disability."

### 3.2. The use of preventive health services among the disabled (Table 1)

Of the disabled participants who met the conditions for the use of adult preventive health services, 15.81% ( $N = 124,257$ ) used these services. The rate of use among disabled females (16.57%) was slightly higher than the rate among disabled males (15.22%). If we distinguish the usage rates by age, the rate of use was greatest among the 60- to 64-year-old age group (23.72%). If we distinguish the usage rates by level of urbanization, the rate of use was greatest among disabled persons residing in areas at level 8 (18.05%) and lowest among those residing in areas at the highest levels of urbanization. When examining premium-based monthly salary, the highest rate of use was found for those in the category of "NT\$30,300–36,300 (New Taiwan Dollars)" (21.69%). The rate of use among aborigines was 23.63%, slightly higher than the usage rate among the non-aboriginal disabled population (15.69%). If we distinguish usage rates by educational level, the rate of use was greatest among disabled persons educated to the junior high school level (17.48%). When examining marital status, the highest rate of use was found among the unmarried population (16.12%). The highest rate of use was found among those suffering from infectious diseases (20.14%), while the lowest rate of use was among those suffering from cancer (12.15%). Of the different types of disabilities, the highest rates of use were among those suffering from chronic epilepsy (23.33%) and the mildly disabled (18.26%). The more severe the level of disability, the lower the rate of use was.

### 3.3. Factors influencing the use of adult preventive health services (Table 2)

The study found that age, level of urbanization, premium-based salary, low-income household status, aboriginal status, marital status, catastrophic injury/disease status, relevant chronic diseases, type of physical or mental disability, and the severity of the disability significantly influenced the use of adult preventive health services among disabled persons ( $p < 0.05$ ). These findings indicate that the probability of using such services among males is 0.88 times lower than the probability among females (95%CI = 0.87–0.89). In terms of age, the probability of use was highest among the 60- to 64-year-old group, 1.36 times higher than that of the 40- to 44-year-old group (95%CI = 1.32–1.41). The probability of use was lowest among the 70-year-old and older group, 0.46 times lower than that of the 40- to 44-year-old group (95%CI = 0.45–0.48). In terms of the level of urbanization, the probability of using adult preventive health services was greatest among those living

Table 1

Use of adult preventive health services among the physically or mentally disabled: basic characteristics and bivariate analysis.

Variable name	N = 78,5746	%	Used		Did not use		$\chi^2$ p-Value
			n <sub>1</sub> = 12,4257	%	n <sub>2</sub> = 66,1489	%	
Overall rate of use				15.81			
Gender							<.0001
Female	346,980	44.16	57,482	16.57	289,498	83.43	
Male	438,766	55.84	66,775	15.22	371,991	84.78	
Age							<.0001
40–44 years	47,697	6.07	7788	16.33	39,909	83.67	
45–49 years	97,739	12.44	17,431	17.83	80,308	82.17	
50–54 years	98,149	12.49	19,342	19.71	78,807	80.29	
55–59 years	92,266	11.74	19,713	21.37	72,553	78.63	
60–64 years	73,209	9.32	17,364	23.72	55,845	76.28	
65–69 years	81,488	10.37	9837	12.07	71,651	87.93	
=70 years	295,198	37.57	32,782	11.11	262,416	88.89	
Level of urbanization <sup>a</sup>							<.0001
Level one	89,779	11.43	10,088	11.24	79,691	88.76	
Level two	159,934	20.35	24,213	15.14	135,721	84.86	
Level three	115,598	14.71	18,276	15.81	97,322	84.19	
Level four	67,412	8.58	10,480	15.55	56,932	84.45	
Level five	117,954	15.01	20,279	17.19	97,675	82.81	
Level six	89,506	11.39	15,368	17.17	74,138	82.83	
Level seven	96,002	12.22	16,608	17.3	79,394	82.7	
Level eight	49,561	6.31	8945	18.05	40,616	81.95	
Insured amount							<.0001
Dependent population	269,753	34.33	34,158	12.66	235,595	87.34	
<15,840	189,394	24.1	31,399	16.58	157,995	83.42	
16,500–22,800	228,759	29.11	39,745	17.37	189,014	82.63	
24,000–28,800	29,930	3.81	6273	20.96	23,657	79.04	
30,300–36,300	26,302	3.35	5706	21.69	20,596	78.31	
38,200–45,800	25,722	3.27	4976	19.35	20,746	80.65	
48,200–57,800	5331	0.68	766	14.37	4565	85.63	
60,800–72,800	6223	0.79	782	12.57	5441	87.43	
76,500–87,600	4332	0.55	452	10.43	3880	0.59	
Low-income household							<.0001
Yes	36,185	4.61	8623	23.83	27,562	76.17	
No	749,561	95.39	115,634	15.43	633,927	84.57	
Aborigine							<.0001
Yes	12,348	1.57	2918	23.63	9430	76.37	
No	773,398	98.43	121,339	15.69	652,059	84.31	
Educational level							<.0001
Elementary school and under	408,271	51.96	63,187	15.48	345,084	84.52	
Junior high school	107,247	13.65	18,750	17.48	88,497	82.52	
Senior (vocational) high school	107,688	13.71	17,850	16.58	89,838	83.42	
Junior college and university or above	59,140	7.53	8665	14.65	50,475	85.35	
Unclear	103,400	13.16	15,805	15.29	87,595	84.71	
Marital status							<.0001
Married	453,659	57.74	73,109	16.12	380,550	83.88	
Unmarried	82,473	10.5	13,795	16.73	68,678	83.27	
Divorced or widowed	34,998	4.45	5560	15.89	29,438	84.11	
Unclear	214,616	27.31	31,793	14.81	182,823	85.19	
Catastrophic injury or disease							<.0001
Yes	220,873	28.11	31,884	14.44	188,989	85.56	
No	564,873	71.89	92,373	16.35	472,500	83.65	
Relevant diseases							<.0001
Cancer							<.0001
Yes	55,086	7.01	6693	12.15	48,393	87.85	
No	730,660	92.99	117,564	16.09	613,096	83.91	
Endocrine and metabolic disease							<.0001
Yes	337,660	42.97	64,308	19.05	273,352	80.95	
No	448,086	57.03	59,949	13.38	388,137	86.62	
Mental illnesses							<.0001
Yes	263,994	33.6	51,368	19.46	212,626	80.54	
No	521,752	66.4	72,889	13.97	448,863	86.03	
Disease of the nervous system							<.0001
Yes	167,171	21.28	29815	17.84	137,356	82.16	
No	618,575	78.72	94,442	15.27	524,133	84.73	
Disease of the circulatory system							<.0001
Yes	448,886	57.13	77,083	17.17	371,803	82.83	
No	336,860	42.87	47,174	14	289,686	86	

Table 1 (Continued)

Variable name	N = 78,5746	%	Used		Did not use		$\chi^2$ p-Value
			n <sub>1</sub> = 12,4257	%	n <sub>2</sub> = 66,1489	%	
Disease of the respiratory system							<.0001
Yes	215,826	27.47	41,490	19.22	174,336	80.78	
No	569,920	72.53	82,767	14.52	487,153	85.48	
Disease of the digestive system							<.0001
Yes	327,257	41.65	64,739	19.78	262,518	80.22	
No	458,489	58.35	59,518	12.98	398,971	87.02	
Disease of the urinary system							<.0001
Yes	85,923	10.94	10,660	12.41	75,263	87.59	
No	699,823	89.06	113,597	16.23	586,226	83.77	
Disease of the skeletal and muscular system and connective tissue							<.0001
Yes	334,626	42.59	64,647	19.32	269,979	80.68	
No	451,120	57.41	59,610	13.21	391,510	86.79	
Disease of the eyes and auxiliary organs							<.0001
Yes	115,684	14.72	20,025	17.31	95,659	82.69	
No	670,062	85.28	104,232	15.56	565,830	84.44	
Infectious diseases							<.0001
Yes	48,748	6.2	9818	20.14	38,930	79.86	
No	736,998	93.8	114,439	15.53	622,559	84.47	
Congenital malformation							<.0001
Yes	19,562	2.49	3602	18.41	15,960	81.59	
No	766,184	97.51	120,655	15.75	645,529	84.25	
Skin and subcutaneous tissue disorders							<.0001
Yes	109,881	13.98	21,816	19.85	88,065	80.15	
No	675,865	86.02	102,441	15.16	573,424	84.84	
Diseases of the blood and blood-forming organs							<.0001
Yes	53,402	6.8	9566	17.91	43,836	82.09	
No	732,344	93.2	114,691	15.66	617,653	84.34	
Diseases of the ear and mastoid process							<.0001
Yes	85,013	10.82	16,864	19.84	68,149	80.16	
No	700,733	89.18	107,393	15.33	593,340	84.67	
Type of physical or mental disability							<.0001
Limb impediment	329,264	41.9	53,913	16.37	275,351	83.63	
Hearing impediment	101,289	12.89	17,271	17.05	84,018	82.95	
Major organ malfunction	100,308	12.77	10,243	10.21	90,065	89.79	
Multiple impediments	74,008	9.42	10,645	14.38	63,363	85.62	
Mental illness	65,588	8.35	14,636	22.32	50,952	77.68	
Visual impairment	47,812	6.08	7728	16.16	40,084	83.84	
Dementia	29,937	3.81	3864	12.91	26,073	87.09	
Mental retardation	21,042	2.68	3503	16.65	17,539	83.35	
Speech impediment	8899	1.13	1225	13.77	7674	86.23	
Impaired balance	2752	0.35	391	14.21	2361	85.79	
Facial disfigurement	2710	0.34	386	14.24	2324	85.76	
Refractory epilepsy	1573	0.2	367	23.33	1206	76.67	
Rare diseases	282	0.04	44	15.6	238	84.4	
Congenital defect	176	0.02	25	14.2	151	85.8	
Other <sup>b</sup>	106	0.01	16	15.09	90	84.91	
Level of severity of physical or mental illness							<.0001
Mild	288,794	36.75	52,739	18.26	236,055	81.74	
Moderate	261,874	33.33	41,356	15.79	220,518	84.21	
Severe	145,469	18.51	21,721	14.93	123,748	85.07	
Very severe	89,609	11.4	8441	9.42	81,168	90.58	

<sup>a</sup> Level one: the most urbanized areas.

<sup>b</sup> Other: includes autism, chromosomal abnormalities, congenital metabolic disorders.

in level-7 areas, 1.75 times higher than that of those living in level-one areas (95%CI = 1.70–1.80). For premium-based salary, the probability of use among those at the “NT\$30,300–36,300” level was 1.20 times greater than the probability of use for those at the lowest level of “NT\$15,840” (95%CI = 1.16–1.24). The probability of use among low-income individuals was 1.42 times greater than among those from non-low-income households (95%CI = 1.38–1.46). The probability of use among aborigines was 1.18 times higher than that of non-aborigines (95%CI = 1.13–1.24). The probability of use among those suffering from catastrophic injuries or diseases was 0.79 times lower than the probability of use among those not suffering from such injuries or diseases (95%CI = 0.77–0.80). For the category of relevant chronic diseases, the probability of use was highest among those suffering from diseases of the digestive system (OR = 1.37, 95%CI = 1.35–1.39), followed by those suffering from endocrine and metabolic diseases (OR = 1.34, 95%CI = 1.32–1.36). In terms of type of disability, compared to those with limb impediments, the probability of use was highest among those with mental disorders (OR = 1.41,

Table 2

Factors influencing the disabled to use adult preventive health services: logistic regression analysis.

Variable name	Unadjusted model			Adjusted model				
	OR	95%CI	p-Value	OR	95%CI	p-Value		
Gender								
Female	–	–	–	–	–	–		
Male	0.9	0.89	0.92	<.001	0.88	0.87	0.89	<.001
Age								
40–44 years	–	–	–	–	–	–		
45–49 years	1.11	1.08	1.15	<.001	1.09	1.06	1.12	<.001
50–54 years	1.26	1.22	1.3	<.001	1.19	1.15	1.23	<.001
55–59 years	1.39	1.35	1.43	<.001	1.24	1.21	1.28	<.001
60–64 years	1.59	1.55	1.64	<.001	1.36	1.32	1.41	<.001
65–69 years	0.7	0.68	0.73	<.001	0.55	0.53	0.57	<.001
=70 years	0.64	0.62	0.66	<.001	0.46	0.45	0.48	<.001
Level of urbanization <sup>a</sup>								
Level one	–	–	–	–	–	–		
Level two	1.41	1.43	1.5	<.001	1.47	1.43	1.51	<.001
Level three	1.48	1.45	1.52	<.001	1.56	1.51	1.6	<.001
Level four	1.45	1.41	1.5	<.001	1.49	1.44	1.53	<.001
Level five	1.64	1.6	1.68	<.001	1.73	1.68	1.77	<.001
Level six	1.64	1.59	1.68	<.001	1.72	1.67	1.77	<.001
Level seven	1.65	1.61	1.7	<.001	1.75	1.7	1.8	<.001
Level eight	1.74	1.69	1.79	<.001	1.67	1.61	1.72	<.001
Insured amount								
<15,840	–	–	–	–	–	–		
Dependent population	0.73	0.72	0.74	<.001	0.91	0.89	0.92	<.001
16,500–22,800	1.06	1.04	1.08	<.001	1.09	1.07	1.11	<.001
24,000–28,800	1.33	1.29	1.38	<.001	1.16	1.13	1.2	<.001
30,300–36,300	1.39	1.35	1.44	<.001	1.2	1.16	1.24	<.001
38,200–45,800	1.21	1.17	1.25	<.001	1.07	1.03	1.11	<.001
48,200–57,800	0.84	0.78	0.91	<.001	0.85	0.78	0.92	<.001
60,800–72,800	0.72	0.67	0.78	<.001	0.76	0.7	0.82	<.001
76,500–87,600	0.59	0.53	0.65	<.001	0.62	0.56	0.69	<.001
Low-income household								
No	–	–	–	–	–	–		
Yes	1.72	1.67	1.76	<.001	1.42	1.38	1.46	<.001
Aborigine								
No	–	–	–	–	–	–		
Yes	1.66	1.6	1.73	<.001	1.18	1.13	1.24	<.001
Educational level								
Elementary school and under	–	–	–	–	–	–		
Junior high school	1.16	1.14	1.18	<.001	1	0.98	1.02	0.788
Senior (vocational) high school	1.09	1.07	1.071	<.001	0.98	0.96	1	0.071
Junior college and university or above	0.94	0.92	0.96	<.001	0.98	0.96	1.01	0.248
Unclear	0.99	0.97	1	0.128	1.02	0.99	1.04	0.16
Marital status								
Unmarried	–	–	–	–	–	–		
Married	0.96	0.94	0.98	<.001	1.04	1.02	1.07	0.000
Divorced or widowed	0.94	0.981	0.97	0.000	1.01	0.98	1.05	0.461
Unclear	0.87	0.85	0.89	<.001	0.91	0.89	0.93	<.001
Catastrophic injury or disease								
No	–	–	–	–	–	–		
Yes	0.86	0.85	0.88	<.001	0.79	0.77	0.8	<.001
Suffering from a Relevant diseases								
Cancer	0.72	0.7	0.74	<.001	0.96	0.93	0.99	0.014
Endocrine and metabolic disease	1.52	1.521	1.54	<.001	1.34	1.32	1.36	<.001
Mental illness	1.49	1.47	1.51	<.001	1.2	1.18	1.22	<.001
Disease of the nervous system	1.21	1.19	1.22	<.001	0.98	0.96	0.99	0.005
Disease of the circulatory system	1.27	1.26	1.29	<.001	1.271	1.19	1.23	<.001
Disease of the respiratory system	1.4	1.38	1.42	<.001	1.23	1.21	1.24	<.001
Disease of the digestive system	1.65	1.63	1.67	<.001	1.37	1.35	1.39	<.001
Disease of the urinary system	0.73	0.72	0.75	<.001	0.81	0.79	0.83	<.001
Disease of the skeletal and muscular system and connective tissue	1.57	1.55	1.59	<.001	1.3	1.28	1.32	<.001
Disease of the eyes and auxiliary organs	1.14	1.12	1.16	<.001	1.02	1	1.04	0.028
Infectious diseases	1.37	1.34	1.4	<.001	1.16	1.13	1.19	<.001
Congenital malformation	1.21	1.16	1.25	<.001	1.01	0.97	1.05	0.66
Skin and subcutaneous tissue disorders	1.39	1.37	1.41	<.001	1.2	1.17	1.22	<.001
Diseases of the blood and blood-forming organs	1.18	1.15	1.2	<.001	1.12	1.1	1.15	<.001
Diseases of the ear and mastoid process	1.37	1.34	1.39	<.001	1.08	1.06	1.1	<.001
Type of physical or mental disability								

Table 2 (Continued)

Variable name	Unadjusted model			Adjusted model				
	OR	95%CI	p-Value	OR	95%CI	p-Value		
Limb impediment	–	–	–	–	–	–		
Visual impairment	0.99	0.96	1.01	0.245	1.12	1.09	1.16	<.001
Hearing impediment	1.05	1.03	1.07	<.001	1.22	1.19	1.24	<.001
Speech impediment	0.82	0.77	0.87	<.001	0.94	0.88	1	0.036
Mental retardation	1.02	0.98	1.06	0.298	1.1	1.06	1.15	<.001
Multiple impediments	0.86	0.84	0.88	<.001	1.1	1.08	1.13	<.001
Major organ malfunction	0.58	0.57	0.59	<.001	0.76	0.74	0.78	<.001
Facial disfigurement	0.85	0.76	0.95	0.003	0.9	0.8	1	0.059
Dementia	0.76	0.73	0.78	<.001	1.13	1.08	1.17	<.001
Congenital defect	0.85	0.55	1.29	0.437	0.79	0.51	1.22	0.283
Mental illness	1.47	1.44	1.5	<.001	1.471	1.37	1.45	<.001
Impaired balance	0.85	0.76	0.94	0.002	0.77	0.69	0.86	<.001
Chronic epilepsy	1.55	1.38	1.75	<.001	1.17	1.04	1.32	0.010
Rare diseases	0.94	0.68	1.3	0.727	1	0.72	1.39	0.999
Other <sup>b</sup>	0.91	0.53	1.55	0.722	0.89	0.52	1.52	0.661
Level of severity of physical or mental illness								
Mild	–	–	–	–	–	–	–	–
Moderate	0.84	0.83	0.85	<.001	0.84	0.82	0.85	<.001
Severe	0.79	0.77	0.8	<.001	0.85	0.83	0.87	<.001
Very severe	0.47	0.45	0.48	<.001	0.61	0.59	0.63	<.001

<sup>a</sup> Level one: the most urbanized areas.

<sup>b</sup>Other: includes autism, chromosomal abnormalities, congenital metabolic disorders.

95%CI = 1.37–1.45). The probability of use was lowest among those suffering from major organ malfunction (OR = 0.76, 95%CI = 0.74–0.78). Regarding the severity of the disability, the greater the level of severity, the lower the subject's probability of use. The most severely physically or mentally disabled (OR = 0.61, 95%CI = 0.59–0.63) persons showed the lowest probability of using adult preventive health services.

#### 4. Discussion

Regarding the use of adult preventive health services by physically or mentally disabled persons, the current study found that the probability of use was significantly greater for females than for males. This is in agreement with the findings of many previous studies, which suggest that the usage rate of preventive health services is higher for females than for males (Bertakis et al., 2000; Green & Pope, 1999; Owens, 2008; Smith et al., 2007).

Regarding residence areas, the study found that the probability of using adult preventive health services was significantly greater among those living in areas with relatively low levels of urbanization than among those living in areas with the highest levels of urbanization. Generally speaking, the level of urbanization can reflect the availability of medical resources. However, since Taiwan implemented its National Health Insurance program, the accessibility of doctors to the public has significantly improved (Wen, Tsai, & Chung, 2008), and the public's usage rate of preventive health services in urban and rural township areas has increased accordingly. Lifestyle and social relationships in suburban or rural areas differ from those in urban areas in Taiwan. Residents of urban areas are more dependent on public media for information than on the word-of-mouth communications common in rural areas. Compared to urban areas, people in rural areas have stronger cohesion and prefer group activities. Therefore, it is very common for people in rural areas to receive preventive health care together. Accordingly, the probability of using medical resources may be higher, significantly increasing the rate of health checks. Furthermore, in recent years, Taiwan has improved mobile medical services in remote areas such as mountains and offshore islands. In these areas, cooperative health care institutions perform mobile medical care, bringing screening vehicles and doctors directly to villages to provide services. Thus, the usage rate of preventive health services is higher among residents of areas with low levels of urbanization than among those in areas with high levels of urbanization.

Regarding premium-based salary, although previous research has indicated that the usage rates and frequency of preventive health services are directly proportionate to income (Makuc et al., 1989), the present study found that participants whose premium-based salary was NT\$48,200 or above had lower usage rates for adult preventive health services, perhaps because many Taiwanese people of relatively high social and economic status choose to undergo self-paid health checks. Many hospitals provide relatively high-level adult health checks for a fee, which offer more detailed and more diverse health services.

The findings of the current study show that the rate of use among participants from low-income households was greater than the rate of use among participants from non-low-income households. This finding is at odds with previous findings in which higher income indicated a higher usage rate for preventive health services (Chang & Tun, 2008). However, this finding confirms that, since the implementation of the National Health Insurance program, Taiwan has improved the situation in which financial impediments prevented the public from visiting doctors.

This study found significant differences between different marital statuses and the usage rates for preventive health services. There were significantly lower usage rates among participants who were divorced or whose spouse was deceased than among participants who were married. This finding is in accordance with the findings of many previous studies on the relationship between marital status and the use of medical services. Studies have indicated that married people attach relatively greater importance to their health and adopt more preventive health or life habits (Goldmana, Korenmanb, & Weinstein, 1995; Suarez, Lloyd, Weiss, Rainblot, & Pulley, 1994). Research indicates that married people are more likely than unmarried people to have fixed locations at which they visit the doctor, which influences their behavior in relation to the use of medical services (Doescher et al., 2004).

In terms of health status, the findings of the current study show that the usage rates for preventive health services are significantly higher among those suffering from chronic diseases and those with catastrophic injuries or diseases than among those without catastrophic injuries or diseases, perhaps because people whose chronic disease is induced by their health status and those with catastrophic injuries or diseases attach more importance to preventive health checks. Previous studies have found that people with mild and moderate disabilities received more preventive health services than did people without disabilities (Diab & Johnston, 2004). Regarding the severity of physical or mental disabilities, the more severe a disability is, the lower the usage rate of preventive health services. Previous research has shown that the lowest usage rates for preventive health services are among groups of patients whose diseases are the most severe (Diab & Johnston, 2004). It is less convenient for patients with relatively serious disabilities to use preventive health services. The planning of health policies should therefore be focused on improving the use of preventive health services among the more severely disabled population. In Taiwan, global budgeting payments were employed to increase health care providers' willingness to spend time on oral health care for children with severe disabilities and to encourage treatment and care for severely disabled persons (Tsai et al., 2007). A similar financial incentive scheme could be implemented to enhance preventive health services for the disabled and to increase the utilization of these services.

Regarding the type of physical or mental disability, the lowest usage rates for preventive health services were among persons with major organ malfunction and rare diseases. As the data from the Ministry of the Interior show, 63.97% of physically or mentally disabled persons must visit doctors periodically, and 55.89% are unable to do so independently. Of the latter group, 68.77% suffer from rare diseases, and 41.58% of those with major organ malfunction are unable to visit a doctor independently. Of patients who are unable to visit a doctor independently, 88.12% are unable to independently complete the registration process, while 48.86% find it difficult to resolve transportation issues (Summary Report on the Survey of Life Needs among the Physically and Mentally Disabled in Taiwan, 2006). Accordingly, usage rates for preventive health services are relatively low.

In accordance with the findings of the current study, we suggest that the government should provide more channels to enable physically or mentally disabled persons to avail themselves of adult preventive health services and should increase levels of participation in preventive health services among the physically or mentally disabled through widespread mass media publicity and education by health institutions. At the same time, remuneration for conducting health checks among the disabled should be improved to increase physicians' willingness to provide these services.

## 5. Conclusion

The current study investigated the use of adult preventive health services by physically or mentally disabled persons. The main factors influencing whether the disabled used such services were gender, age, level of urbanization, income, low-income household status, aboriginal status, marital status, catastrophic injury/disease status, relevant chronic diseases, type of disability, and level of severity of disability.

For high-risk groups, such as persons of low social and economic status or advanced old age, who may have gone long periods without receiving health checks, we suggest that the public health system or medical institutions implement extensive publicity and related education programs for caregivers of the disabled to ensure that these high-risk groups receive periodic health checks. Medical institutions should encourage doctors to actively question disabled patients during medical appointments and to remind these patients to arrange health checks. Periodically, medical institutions should track and notify these disabled patients to make return visits in an attempt to facilitate supportive measures for follow-up and treatments. Medical institutions should also improve facilities with obstruction-free spaces and other planning that takes into account the mobility issues and convenience of physically or mentally disabled persons, thereby increasing these patients' satisfaction with medical visits.

Because the data for this study came from secondary databases, it was not possible to obtain information on some factors, such as individuals' health behavior and health beliefs. This limitation also affected the variables that could be used.

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