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# The study of geographic differences in the prevalence of disability among Taiwanese population

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ABSTRACT

The present study analyzes data of the governmental reported general population and population of persons with disabilities from 2002 to 2009, to describe the disability prevalence and to test the overtime change with particular focused on the geographic differences in Taiwan. In average, the disability prevalence was 42.06‰ (range = 31.06‰–80.04‰ in different areas) of the general population during the past 8 years. We found that the disability prevalence in general population ($R^2 = 0.991$; $p < 0.001$), disability prevalence in men ($R^2 = 0.992$; $p < 0.001$) and in women ($R^2 = 0.991$; $p < 0.001$) were significantly increased in curve tests of the study. The disability number were more populous in north or west urban areas (such as Taipei County, Taipei City, Taoyuan County, Taichung County, Kaohsiung City), however, those areas of higher disability prevalence were more likely to locate in east and central remote areas (such as Taitung County = 80.04‰; Yunlin County = 71.95‰; Hualien County = 71.59‰; Chiayi County = 63.51‰ and Yilan County = 59.91‰). The study highlights that the uneven distribution of disability prevalence will bring challenges of health and social welfare services for this group of population. We suggest the authorities should scrutinize the disparity of disability prevalence in different geographic area to examine the equality of social welfare resources distribution in Taiwan.



## 1. Introduction

Disability prevalence for various communities, countries, racial and ethnic groups has been documented in the previous studies (Fujiura & Yamaki, 1997; Newacheck, Stein, Bauman, Hung, 2003; Wen, 2004; Deboy, Jones, Field, Metcalf, & Tormoehlen, 2008; Altman & Gulley, 2009; Dallo, Al Snih, & Ajrouch, 2009). In the U.S. non-institutionalized adult population, disability prevalence estimates ranged from as low as 15.3% to as high as 36.4%, while in Canada the estimates ranged from 13.4% to 37.3% (Altman & Gulley, 2009). The definition of disability varies across countries, and the comparison among countries and populations should clarify the real meaning of disability or it will be the disorientation of the health care policy and related services (Lin, 2003).Our previous studies have revealed that people with disabilities, intellectual disability or autism are more inclining to ill health risk (Lin, Lin, Chen, et al., 2010; Lin, Lin Lin, et al., 2010; Lin, Lin, & Lin, 2010; Yen & Lin, 2010) and need more medical care or health promotion than does the general population (Hsu et al., 2009; Lai, Hung, Lin, Chien, & Lin, 2011; Lin & Lin, 2011; Lin, Hung, Lin, & Lai, 2011a; Lin, Lin, Chu, & Lin, 2011b; Yen, Lin, Loh, Shi, & Shu, 2009a; Yen, Loh, & Lin, 2009b). However, the high rate of not consulting among those with disability and comorbidity is

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an important public health problem (Andrews, Henderson, & Hall, 2001). Patterson (2008) indicated that several variables at the adult education program level are linked to disability prevalence, including disability incidence, educational background of learners, and learner age. McDermott and Turk (2011) suggested that we need to identify the disability prevalence to quantify service and support needs, to study the life course of people with specific disabilities, and to accurately target prevention strategies. Mudrick (2002) also highlighted that the challenges to identifying disability among people involve not only determining the appropriate paradigm for defining disability, but also applying that paradigm to people in a meaningful way. Our aims of the present paper were to describe the disability prevalence and to test the overtime change from 2002 to 2009, with particular focused on the geographic differences in Taiwan.

## 2. Methods

The present study analyzes data of the governmental reported general population and population of persons with disabilities by administrative area (23 cities and counties; did not include offshore islands Kinmen County and Lienchiang County) in Taiwan from 2002 to 2009 (MOI, 2011a,b). The data set was complied by the Department of Statistics and Department of Social Welfare Services, Ministry of the Interiors, Taiwan, Republic of China, which was a well-established disability register system regulated by the Taiwan Physical and Mental Disabled Protection Act (1997). Currently, there are 16 disability classifications which examined and accredited by health and social welfare authorities in Taiwan, these disabilities are: (1) vision disability; (2) hearing mechanism disability; (3) balancing mechanism disability; (4) voice or speech mechanism disability; (5) limbs disability; (6) intellectual disability; (7) losing functions of primary organs; (8) suffering facial damage; (9) unconscious chronically; (10) senile dementia; (11) autism; (12) chronic psychosis; (13) multi-disability; (14) epilepsy; (15) physical or mental disability caused by infrequent disease; and (16) other disabilities. We use statistical methods include number and percentage to describe the prevalence of disabilities by gender and administrative area, and a curve test to examine the overtime change of disability prevalence from 2002 to 2009 in Taiwan.

## 3. Results

Table 1 presents the average disability population and prevalence rate by administrative area from the year 2002 to 2009 in Taiwan. In average, there were 956,549 persons with disabilities and the disability prevalence was 42.06‰ (range = 31.06‰–80.04‰) of the general population during the past 8 years. Table 2 and Fig. 1 described and tested the trend change of disability prevalence by year from 2002 to 2009 in Taiwan. We found that the disability prevalence in general population ($R^2 = 0.991$; $p < 0.001$), disability prevalence in men ($R^2 = 0.992$; $p < 0.001$) and in women ($R^2 = 0.991$; $p < 0.001$) were significantly increased during the past 8 years.

In the analysis, we found that the most top 5 disability populous areas were in north or west cities such as Taipei County (116,607 persons), Taipei City (109,771 persons), Taoyuan County (61,098 persons), Taichung County (61,057 persons),

**Table 1**
Disability population and prevalence rate by administrative area, 2002–2009.

| Administrative area | All | Men | Women |
|---|---|---|---|
| | *N* (‰) | *N* (‰) | *N* (‰) |
| All | 956,549 (42.06) | 553,778 (48.02) | 398,147 (35.67) |
| Taipei County | 116,607 (31.06) | 69,044 (36.70) | 47,563 (25.40) |
| Yilan County | 27,666 (59.91) | 15,759 (66.43) | 11,907 (53.01) |
| Taoyuan County | 61,098 (32.30) | 36,655 (38.09) | 24,442 (26.31) |
| Hsinchu County | 18,465 (38.32) | 11,045 (44.18) | 7420 (32.01) |
| Miaoli County | 27,050 (48.25) | 16,051 (54.74) | 10,999 (41.14) |
| Taichung County | 61,057 (39.69) | 35,845 (45.69) | 25,212 (33.45) |
| Changhua County | 57,326 (43.59) | 33,944 (50.01) | 23,382 (36.75) |
| Nantou County | 30,236 (56.40) | 17,662 (63.49) | 12,574 (48.76) |
| Yunlin County | 52,646 (71.95) | 29,912 (77.77) | 22,734 (65.50) |
| Chiayi County | 35,241 (63.51) | 19,890 (68.23) | 15,352 (58.27) |
| Tainan County | 51,995 (47.02) | 29,786 (52.41) | 22,209 (41.32) |
| Kaohsiung County | 50,164 (40.42) | 28,959 (45.20) | 21,206 (35.52) |
| Pingtung County | 45,633 (50.99) | 26,591 (57.34) | 19,042 (44.17) |
| Taitung County | 19,010 (80.04) | 11,548 (91.81) | 7462 (66.79) |
| Hualien County | 24,796 (71.59) | 14,679 (81.18) | 10,117 (61.72) |
| Penghu County | 5315 (57.26) | 3013 (62.71) | 2302 (51.40) |
| Keelung City | 16,441 (41.75) | 9490 (47.79) | 6951 (36.17) |
| Hsinchu City | 12,959 (33.16) | 7685 (38.82) | 5273 (26.94) |
| Taichung City | 32,828 (31.64) | 18,938 (37.25) | 13,889 (26.25) |
| Chiayi City | 11,996 (44.17) | 6796 (50.34) | 5200 (38.07) |
| Tainan City | 25,836 (34.05) | 14,885 (39.33) | 10,951 (28.09) |
| Taipei City | 109,771 (41.82) | 62,386 (48.69) | 47,385 (35.27) |
| Kaohsiung City | 57,790 (38.11) | 33,215 (43.85) | 24,574 (32.38) |

**Table 2**
Disability prevalence in difference year and curve test.

| | Year | | | | | | | | Curve test | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | $R^2$ | $p$-value |
| All | 36.87 | 38.04 | 40.00 | 41.13 | 42.82 | 44.41 | 45.12 | 46.30 | 0.991 | <0.001 |
| Men | 42.83 | 43.91 | 46.00 | 47.18 | 49.06 | 50.82 | 51.54 | 52.90 | 0.992 | <0.001 |
| Women | 30.68 | 31.95 | 33.78 | 34.89 | 36.42 | 37.86 | 38.58 | 39.62 | 0.991 | <0.001 |

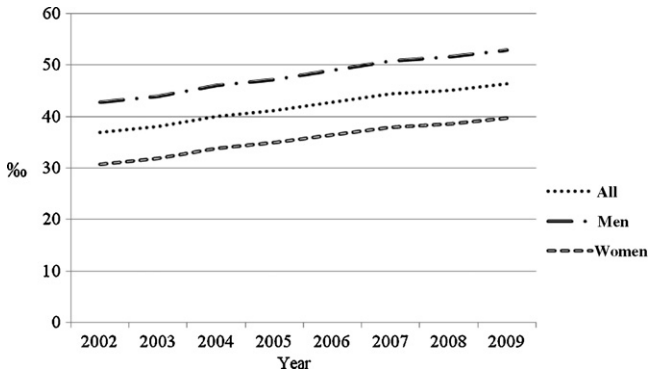


**Fig. 1.** Disability prevalence rate by gender, 2002–2009.

Kaohsiung City (57,790 persons) (Fig. 1). The least disability population area was in an offshore island – Penghu County (5,137 persons). However, those areas of higher disability prevalence were more likely to locate in east and central remote counties such as Taitung County (80.04‰), Yunlin County (71.95‰), Hualien County (71.59‰), Chiayi County (63.51‰) and Yilan County (59.91‰) (Fig. 2). Administrative areas of Taipei County (31.06‰), Taoyuan County (32.30‰), and Hsinchu City (33.16‰) seem to have less disability prevalence than other areas.

With regard to the gender difference of disability population, the results in Table 1 showed that the disability prevalence in men was 48.02‰ (range = 36.70‰–91.81‰), and in women was 36.67‰ (range = 25.40‰–66.79‰). Those administrative areas – Taitung County (91.81‰), Hualien County (81.18‰), Yunlin County (77.77‰), Chiayi County (68.23‰) and Yilan County (66.43‰) have higher disability prevalence in men than other areas (Fig. 3). Women disability rate were more prevalent in the following areas such as Taitung County (66.79‰), Yunlin County (65.50‰), Hualien County (61.72‰), Chiayi County (58.27‰) and Yilan County (53.01‰) (Figs. 4 and 5).

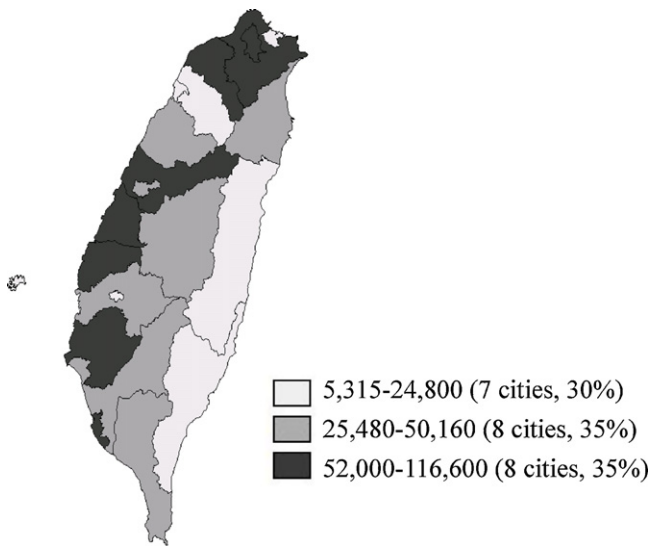


**Fig. 2.** Disability population number by administrative area, 2002–2009.

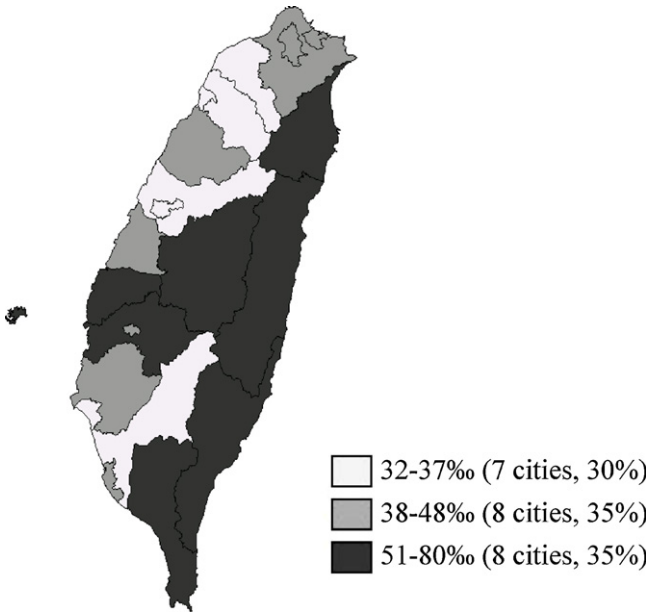


**Fig. 3.** Disability prevalence by administrative area, 2002–2009.

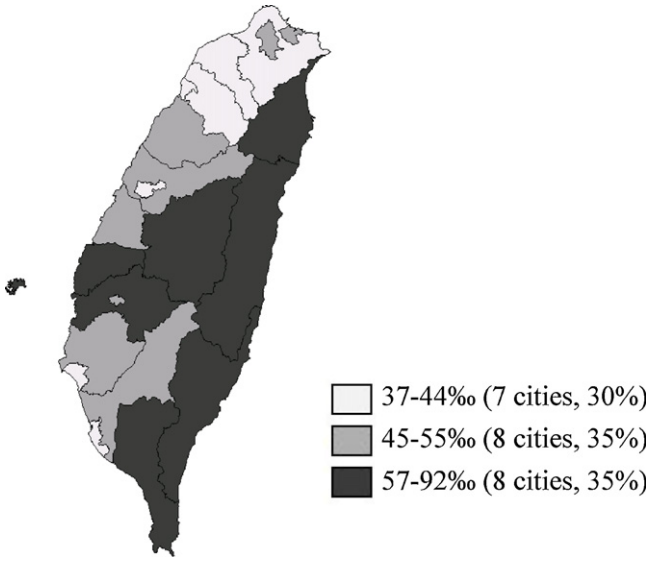


**Fig. 4.** Disability prevalence in men by administrative area, 2002–2009.

## 4. Discussions

The present study presents the information of geographic differences in disability prevalence and its overtime change in Taiwan. Results showed that the average prevalence of disability was 42.06‰ from 2002 to 2009, disability prevalence in general population or in men and women were significantly increased during the past 8 years. The disability number were more populous in north or west coast areas, however, those areas of higher disability prevalence were more likely to locate in east and central remote areas. The uneven distribution of disability prevalence will bring challenges of health and social welfare services for this group of population in Taiwan.

Comparing to the previous studies of disability prevalence, the results varied across countries. In China, Alhajj et al. (2010) investigated disabilities by using a sample of rural residents in northern China, they found there was 7.0% cases reported having disabilities. Kisioglu, Uskun, & Ozturk (2003) reported that the disability prevalence in Turkey was 5.3%, and significantly increased by the age. In Iceland, Thorlacius, Stefansson, & Olafsson (2007) revealed that the prevailing trend

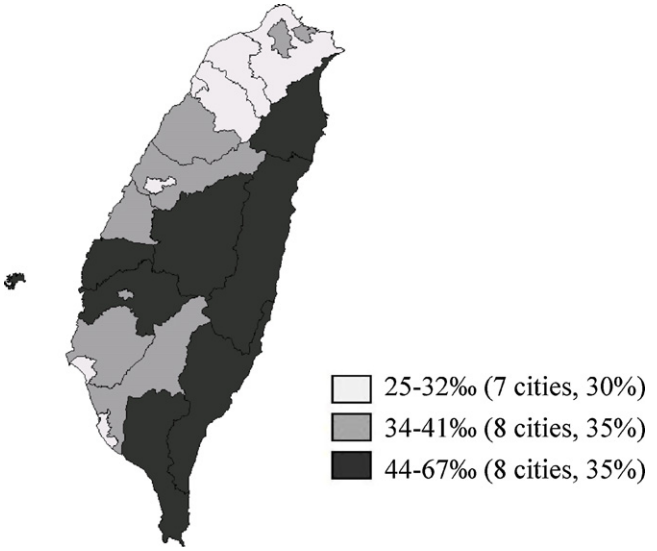


**Fig. 5.** Disability prevalence in women by administrative area, 2002–2009.

over the last decade of increasing disability has continued, and the prevalence of disability pension was 8.6% for females and 5.5% for males in 2005. The disability prevalence in older age population was higher than the younger age. Winblad, Jaaskelainen, Kivela, Hiltunen, & Laippala (2001) estimated the prevalence of disability at the age of 75+ measured by the Katz Index of Activities of Daily Living (ADL), they found prevalence was 14.4%–20.1% at difference birth cohorts and significant risk factors for disability were the declining disability of women and age. Prevalence of disability among Spain's non-institutionalized elderly population aged 60 years and over is very high, a total of 72.9% of subjects reported some type of disability (Graciani, Banegas, Lopez-Garcia, & Rodriguez-Artalejo, 2004). In conclusion, the cross-cultural comparisons of disability prevalence varied across countries. Therefore, Altman and Gulley (2009) highlighted that understanding and interpreting national prevalence estimates of disability required more thoughtful attention to the purposes for which data were being collected, the specific definition of disability and the methodology used in the data collection and analysis.

Many factors affected the number and prevalence of disability. Parahyba, Stevens, Henley, Lang, & Melzer (2009) analyzed the longitudinal data of 1998–2003 Brazilian National Household Surveys, they found that there was a strong linear relationship between increased income and reduced disability prevalence for most of the income distribution. Chirikos (1986) conducted a detailed analysis of self-reported work disability over the past 25 years shows that two-thirds of such disability is attributable to the growing prevalence of chronic diseases. Graciani et al. (2004) also confirmed that this might be explained by a greater number of chronic diseases and a higher percentage of subjects with low educational level. In addition, Guerrero, Sniezek, & Sehgal (1999) revealed that injury is a major cause of disability in addition to a leading cause of death in the US.

The prevalence of disability increased markedly for both black and white children between 1979 and 2000 in US National Health Interview Survey, and black children have higher rates of disability primarily owing to their increased exposure to poverty (Newacheck et al., 2003). Laditka and Jenkins (2001) also concluded that larger percentages of women, Blacks, and less educated persons are classified disabled under all scales compared with men, Whites, and more educated persons. Msall, Hogan, Rogers, & Avery (1998) analyzed data of the US National Health Interview Survey-Disability Supplement, they found a strong significant impact on functional limitations for family structure, mothers education and family income in an ordered logistic regression.

Disabilities increased with age and were more prevalent among women and persons with less schooling, and the principal causes were diseases and injuries (Castro et al., 2008). However, many studies have different findings of age effect on the disability prevalence. In France, Peres, Helmer, Letenneur, Jacqmin-Gadda, & Barberger-Gateau (2005) found that a significant decline in disability prevalence was observed over 10 years of in older people aged 75–84. Donald, Foy, & Jagger (2010) conducted a 10-year cohort study in Gloucestershire, UK, they found that the prevalence of disability affecting activities of daily living appears to have reduced over 10 years in older people.

Although the disability prevalence may be varied across countries due to different purposes and disability identification systems, and it is difficult to make appropriate comparisons of the disability data. However, the present paper provides valuable information of disability prevalence and its overtime change by geographic differences in Taiwan. We highlight that health and social welfare authorities should scrutinize the disparity of disability prevalence in different geographic area to examine the equality of social welfare resources distribution in Taiwan.

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