

Effects of the Universal Health Insurance Program on the Health Outcomes of Children and Adolescents - The Experience of Taiwan

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Abstract

Purposes

Before Taiwan established, in 1995, the universal National Health Insurance (NHI) program with comprehensive health benefits for all its citizens, more than 85% of children and adolescents were uninsured. Little is known about the effects of the NHI program on the health outcomes of children and adolescents.

Methods

We conducted a nationwide interrupted time-series (Joinpoint) analysis to examine the effects of the NHI program on amenable mortality among children and adolescents for the period 1981-2005. Age and gender standardized cause-specific mortality rates were calculated from the death and population registry data maintained by the Ministry of Health and Welfare, and the Ministry of the Interior.

Results

Our study found the implementation of the NHI program in Taiwan was associated with a significant reduction in deaths from causes amenable to health care, which surpassed the underlying decline in other causes. Two inflection points resulting in three distinct trend periods were identified using Joinpoint

regression between 1981 and 2005. The steady decline in amenable mortality from 1981 (annual percentage change, APC=-10.40) halted in 1987 (APC=-2.85) but then accelerated downwards after 1997 (APC=-5.44).

Conclusions

The universal National Health Insurance scheme has improved the health outcomes of children and adolescents in Taiwan.

Introduction

A growing body of evidence supports that increase health insurance coverage among children and adolescents is associated with better access to healthcare[1]. Therefore, many developed countries have expanded health insurance coverage among population[2], including the State Children's Health Insurance Program (SCHIP) and the president Obama's health care reform in the United States. In line with most developed countries, Taiwan has also established the National Health Insurance (NHI) program to provide universal coverage and comprehensive health benefits to all its residents in 1995, since then the majority of the previous uninsured, 40 percent of total population, 85 percent of the children and adolescents, have become insured[3].

Although plentiful evidence demonstrating the positive impact of health insurance provision on access and utilization among children[1,4-6], particularly among those with special health care need[7], and among those in Taiwan[8], few studies indicate

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that health insurance has achieved a better health outcome[9], among children and adolescents[7]. We therefore conducted an analysis of nationwide data to evaluate the effects of NHI on health outcome, measured by amenable mortality, of children and adolescents. We hypothesize that the introduction of NHI has improved the health outcome of the children and adolescents in Taiwan. The result can inform important health policy decision.

Methods

We applied an interrupted time-series design to examine the trends and changes in amenable and non-amenable mortality among children and adolescents less than 15 years of age between 1981 and 2005. To account for changes in population composition, we calculated age-standardized mortality rates (ASMR) using direct standardization to the 2000 WHO world standard population[10]. The data were collected from the death registry data maintained by the Ministry of Health and Welfare, and the population data from the household population registration system provided by the Ministry of the Interior, respectively. These were used to calculate age, sex and cause-specific mortality rates, coded using the ninth revision of the International Classification of Diseases and Deaths (ICD-9).

The causes of death considered to be amenable to health care in this study were as defined and justified by Nolte and McKee[11]. They include causes such as bacterial infections, treatable cancer, diabetes, cardiovascular and cerebrovascular disease, and complications of common surgical procedures. In this study, neonatal death and external causes of death such as accidents, suicide and assault which are considered as less associated with medical care were excluded.

We used joinpoint regression analysis[12] to identify points at which a significant change over time in the linear slope of a trend occurred. The analysis starts with minimum number of inflections

(joinpoints), and tests whether one or more additional joinpoints should be added to the model. Each joinpoint indicates a statistically significant change, either increase or decrease, in trend. The annual percentage change (APC) was estimated for each of those trends. All joinpoint regression analyses were performed using Joinpoint version 3.2 software obtained from the US National Cancer Institute[13].

Results

Figure 1 indicates the trends of crude mortality rates in amenable and non-amenable deaths per 100,000 populations. The crude mortality rates decreased 45% (from 14.9 to 8.2) in amenable and 35% (from 16.3 to 10.6) in non-amenable mortality from 1994 to 2006 respectively. Figure 2 and table 1 display the trends and estimated APCs in amenable and non-amenable mortality. Two inflection points resulting in three distinct trend periods were identified by joinpoint regression between 1981 and 2005 in both amenable and non-amenable mortality. The decline in amenable and non-amenable mortality was significant during the 1980s before implementation of the NHI program. However, the decline trend retarded science 1987 and again descended immediately after implementation of the NHI program.

The steady reduction in amenable mortality from 1981 (APC=-10.40; 95% confidence interval [CI], -12.18 to -8.59) halted in 1987 (APC=-2.85; 95% CI, -4.28 to -1.39) but then accelerated downwards after 1997 (APC=-5.44, 95% CI -7.70 to -3.14). Regarding non-amenable mortality, the estimated APCs in 1981–1987, 1987–1997, and 1997–2005 were -5.22, -1.09, and -3.96, respectively. Although similar declining trends were also observed in non-amenable mortality, the estimated APC was greater in amenable mortality.

Discussion

Our study reveals that the implementation of NHI

Table 1 Joinpoint analyses on amenable/non-amenable mortality ratea in Taiwan, 1981-2005.

Trends	Time Period	Amenable causes		non-Amenable causes	
		APC	95% CI	APC	95% CI
Trend 1	1981-1987	-10.40*	-12.18 – -8.59	-5.22*	-6.99 – -3.41
Trend 2	1987-1997	-2.85*	-4.28 – -1.39	-1.09	-2.29 – 0.13
Trend 3	1997-2006	-5.44*	-7.70 – -3.14	-3.96*	-5.66 – -2.23

Note: APC= annual percent change; CI=confidence interval.
 a gender and age standardized mortality rates using the 2000 WHO world standard population
 * APC is statistically significantly different from zero (2-sided p< 0.05).

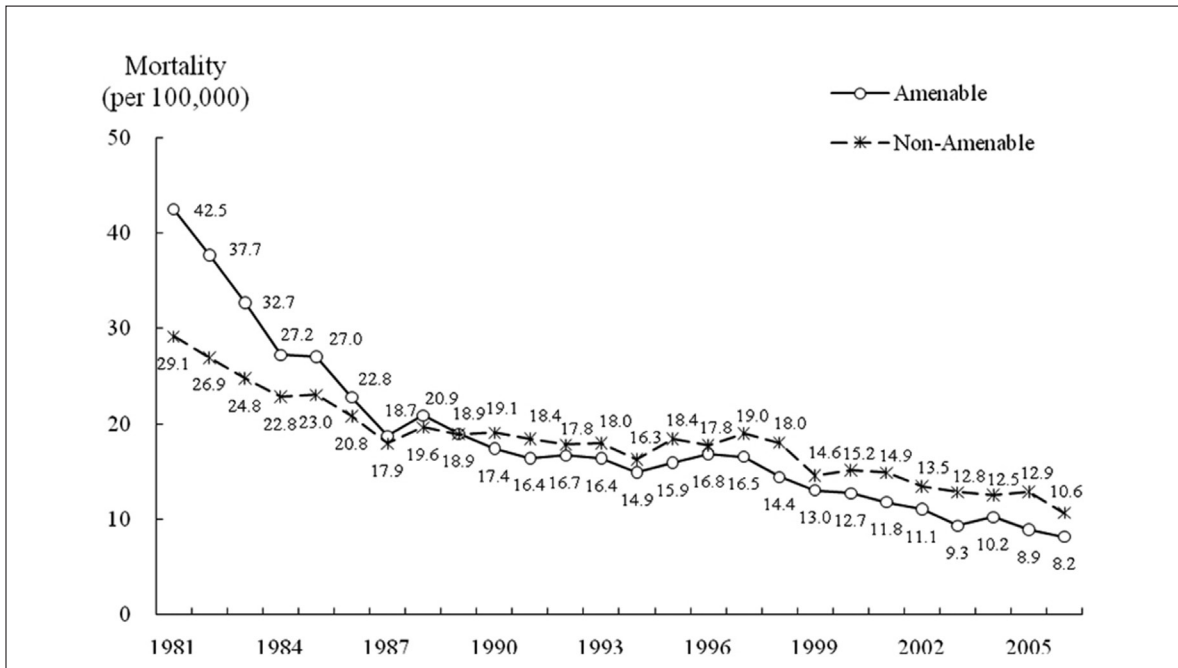


Figure 1 Crude mortality rate of amenable/non-amenable deaths per 100,000 children and adolescents in Taiwan, 1981-2006

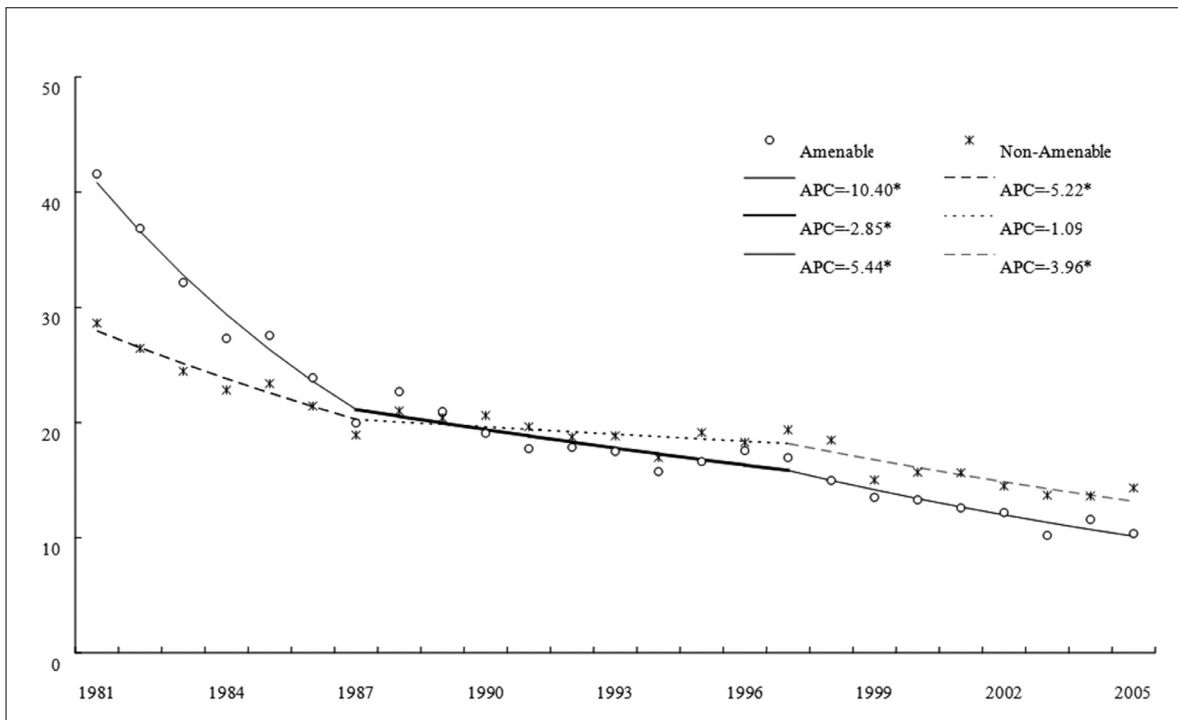


Figure 2 Trend of children and adolescents amenable/non-amenable mortality in Taiwan, 1981-2006 (Above: Crude mortality rate; Below: Joinpoint analyses)

Note: APC= annual percent change; CI=confidence interval.

* APC is statistically significantly different from zero (2-sided $p < 0.05$).

in Taiwan was associated with a significant reduction in amenable deaths among children and adolescents that surpassed the underlying decline in non-amenable deaths. These results are consistent with our research hypothesis and with previous studies which found NHI improve the health of the general population in Taiwan[14,15].

Most children and adolescents have been uninsured, prior to the introduction of NHI. The uninsured children and adolescents tend to have greater access barrier to health care and experience greater risk of multiple adverse consequences during childhood and later in life[7]. The NHI program, expands the social insurance coverage to all the residents in Taiwan, including previously uninsured children and adolescents, and allows children and adolescents to have better access to timely and adequate preventive, medical, traditional care, and prescribed medications. Therefore they are less likely to die from amenable causes.

Our study fills the knowledge gap by demonstrating the health effect of NHI among children and adolescents using a general population health measure, namely amenable deaths. Our study design, a population-based national natural experiment using a JP method, allows us to compare changes in amenable mortality across different periods in time using causes not amenable to health care as control. However, our study is also limited, by omitting potentially important factors, such as the possible changes in the delivery of health care or the ability to pay for care not covered by the NHI scheme.

Our finding shows that the expansion of health insurance coverage in Taiwan may have been effective in improving health outcome of children and adolescents. Taiwan's experience may be of relevance to the SCHIP or to the president Obama's health care reform[16,17]. It is reasonable to expect that the introduction of universal coverage elsewhere can also be of benefit in improving the access and thus the health outcome of the population.

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實施全民健康保險對兒童及青少年健康的影響－ 臺灣經驗

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摘要

目的

臺灣在 1995 年實施全民健康保險制度前，有超過 85% 的兒童及青少年並沒有健康保險的保障。然而全民健保實施對兒童及青少年健康的影響評估資訊卻相形較少。

方法

本研究以時間趨勢分析法，比較 1981 至 2005 年間兒童及青少年可避免死亡疾病死亡率的變動趨勢，尤其關注於實施全民健康保險後是否有顯著改變。研究資料分別取自衛生福利部死因資料統計及內政部戶籍人口資料檔，逐年計算年齡及性別標準化特定死因死亡率，以進行統計分析。

結果

研究結果顯示在實施全民健康保險後，兒童及青少年的可避免死亡疾病死亡率有顯著下降，且其下降的幅度大於非可避免死亡疾病的死亡率。可避免死亡疾病死亡率在 1981 至 2005 年間共分為兩個轉折點、三段趨勢，從 1981 年到 1987 年平均年死亡率改變百分比為顯著下降 -10.4、接者持平沒有顯著變動，而至 1997 年後再度呈現顯著下降趨勢，1997-2005 年間平均年死亡率改變百分比為 -5.44。

結論

本研究認為實施全民健康保險應有改善兒童及青少年的健康照護結果。

關鍵詞：全民健康保險、可避免死亡疾病、兒童及青少年