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Public Health

journal homepage: www.elsevier.com/puhe

Original Research

Inpatient expenditures on alcohol-attributed diseases and alcohol tax policy: a nationwide analysis in Taiwan from 1996 to 2010

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ARTICLE INFO

Article history:

Received 19 July 2013

Received in revised form

7 August 2014

Accepted 8 September 2014

Available online 18 November 2014

Keywords:

Alcohol-attributed disease

Medical expenditure

Tax

Time-series

ARIMA

ABSTRACT

Objectives: To assess the two opposing effects of alcohol tax policy interventions (tax rate increase in 2002 and decrease in 2009) on hospitalization in monetary terms of alcohol-attributed diseases (AADs) in Taiwan.

Study design: An interrupted time-series analysis.

Methods: Admissions data from 1996 to 2010 were retrieved from the National Health Insurance Research Database claims file and analysed in this study. Data for 430,388 males and 34,874 females aged 15 or above who were admitted due to an AAD were collected. An interrupted time-series analysis examining the effects of the implementation of alcohol tax policy on quarterly adjusted hospital inpatient charges (HICs) for AADs was employed. **Results:** The study showed significant ($p < 0.001$) changes in the adjusted HICs for AADs in 2002. Quarterly HICs showed an abrupt 14.8% decline (i.e., a 1.3 million US dollar reduction) after the first tax policy was implemented. No change in quarterly HICs for AADs was found after the alcohol tax increase. The total cost of treating these AAD inpatients over the course of the 15-year period was 640.9 million US dollars. Each inpatient with an AAD costs an average of \$900–\$2000 depending on the patient's sex and age with the cost increasing gradually after the two tax interventions. More than 80% of the HICs were attributed to alcoholic liver diseases. Psychoses accounted for 6%–18% of the total HICs. Alcohol abuse and alcohol poisoning accounted for less than 2% of the total HICs.

Conclusions: This study provides evidence that alcohol taxation has resulted in an immediate reduction of medical expenditures related to AADs. The policy of increasing alcohol tax rates may have favourable influences on health care resources related to treating AADs.

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<http://dx.doi.org/10.1016/j.puhe.2014.09.004>

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Introduction

Alcohol-related problems impose a substantial economic burden on society.^{1–3} Alcohol abuse has serious adverse effects on health, which increase the demand for health care.⁴ The World Health Organization has estimated that the use of alcohol leads to about 3.7% of total global mortality and is also responsible for 4.4% of the global disease burden.⁵ A reviewed study suggested that the global economic burden of alcohol abuse ranged between US \$210–665 billion in 2002; it is also estimated that 1.3–3.3% of total global health costs were related to alcohol abuse.⁶ According to Thavorncharoensap and his colleague's review, the economic burden of alcohol on society accounts for 0.45%–5.44% of Gross Domestic Product (GDP) in selected countries.⁷ The disease burden is closely related to the average volume of alcohol consumption and is highest among poor people and those who are marginalized from society.⁸ Reducing the economic burden of this public health problem will require finding effective strategies for prevention and treatment.

Anderson et al. have reported that banning alcohol from advertising and making it more expensive and less available are highly cost-effective strategies to reduce alcohol-related harm.⁹ Furthermore, previous studies have established the effects of alcoholic beverage taxes and prices on sales and drinking behaviours,^{10–12} with a few studies examining the effects of alcohol taxes on alcohol-related morbidity or mortality. Wagenaar et al. reported that increasing alcohol tax rates would reduce alcohol-related mortality.¹³ Elder et al. supported this finding based on their review of 72 studies. An inverse relationship emerged between the taxes on and/or price of alcohol and indices of excessive drinking or alcohol-related health outcomes.¹⁴

Due to its low cost and certain cultural traditions, the domestic rice spirit produced by the Taiwan Tobacco and Wine Monopoly Bureau (TTWMB) has always been the most popular alcoholic beverage in Taiwan (with approximately 200 million bottles sold per year up until 2002). In the 1990s, the US government, acting at behest of the US beverage industry, requested that Taiwan lower tariffs on imports for goods, including alcohol. A new alcohol management and tax system went into effect on January 1, 2002, as a condition of Taiwan's World Trade Organization (WTO) accession. Rice alcohol tax rates increased from \$0.73 per liter of alcoholic beverage to approximately \$5 at the time of the legislated claim, and rose slightly further to \$6.16 per liter in 2003. The retail prices for rice spirits were estimated to increase by seven times on average due to this tax claim, and since 2002, the volume of rice spirits sold per year has decreased to 10 million bottles. Subsequently, a new policy was introduced in June 2009 whereby rice alcohol tax rates were reduced to \$1.60 per liter. This constituted a 74% reduction from the prior \$6.16 per liter rate.

Recently, two Taiwanese studies provided evidence that alcohol taxation has resulted in an immediate reduction of mortality and morbidity caused by alcohol-attributed diseases (AAD).^{15,16} However, to date there have been no estimates of the likely health care economic effect of taxation. This paper attempts to fill this gap by conducting a nationwide analysis to assess the impact of alcoholic beverage taxes on disease

hospitalization in monetary terms. Rather than analysing alcohol-related causes, AAD admissions to hospitals have been emphasized as the end-point of this study in order to best reflect the direct influence posed by alcohol tax rates. The admission data used covered the 15-year period from 1996 to 2010.

Methods

Data sources

Taiwan launched a single-payer National Health Insurance Program (NHIP) in March 1995. Approximately 99% of Taiwan's 23 million people are enrolled in this program. When people fall ill, government assistance allows them to pay lower medical costs to contracted health care institutions. The Bureau of National Health Insurance (BNHI) created the National Health Insurance Research Database (NHIRD) to collect data from the NHIP to facilitate research. Admissions data analysed in this study were retrieved from the NHIRD claims files. For every 50 inpatient claims, the BNHI performs an expert review on one claim chosen at random to ensure the accuracy of claim filings. Furthermore, false diagnosis reports incur severe penalties, which are imposed by the BNHI. Datasets from two NHIP research databases, specifically, the 'monthly claims summary for inpatient claims' and the 'inpatient expenditures by admissions' datasets from 1996 to 2010, were analysed.

The following information was obtained from the relevant health certificates from the two claims datasets: gender, cause of disease, date of admission, and inpatient charges. The age of a patient was defined as the time between the date of birth and the date of admission. The primary diagnoses for each admission are coded in the NHIRD database according to the International Classification of Diseases, Ninth Revision, using ICD-9-CM codes. The number of admissions and medical care charges were counted every three months according to the admission date of hospitalization, i.e., the number of admissions for the January–March, April–June, July–September, and October–December periods were counted. All participants with an AAD diagnosis were selected as study subjects for the model in order to estimate the effects of alcohol taxation. It is very possible that the causes for a disease in Taiwan are different from those in Western countries. For example, Taiwanese liver cancer is mostly caused by hepatitis B virus. To reduce the uncertainty of disease cause, AADs has been noted with a direct cause – the disease condition defined as 100% alcohol caused based on alcohol attributable fraction (AAF)¹⁷ – including alcoholic liver disease, alcohol psychoses, alcohol abuse, alcohol dependence syndrome, alcoholic polyneuropathy, alcoholic cardiomyopathy, alcoholic gastritis, and acute alcohol poisoning, all based on the International Classification of Disease (ICD)-9 codes. Almost all the patients in Taiwan with severe alcoholic disorders were able to be included in this study because of the high accessibility of hospitals here. These patients were classified by age into two broad groups, i.e., teens and adults (age 15–64) and the elderly (age ≥ 65). All hospital inpatient charges (HICs) derived from hospitalization, including examination, treatment, drug, radiation

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