

**Analysis of trend of mortality and patterns of suicide and
self-inflicted injury in urban and rural townships in Taiwan:
urbanization or geography?**

**Wen-Shen Isabella Chung¹, MSc
Chi Pang Wen¹, MD, DrPH
Shan Pou Tsai², PhD
Ken Nan Kuo¹, MD**

**¹Division of Health Policy Research and Development
Institute of Population Sciences, National Health Research Institutes, TAIWAN
²University of Texas School of Public Health, Houston, Texas, U.S.A.**



(台灣)國家衛生研究院群體健康科學研究所衛生政策研究組

Division of Health Policy Research and Development, Institute of Population Sciences
National Health Research Institutes, Miaoli, Taiwan

Introduction

Suicide and self-inflicted injury (briefly named as suicide) have been observed with various patterns and death rates in urban and rural areas. Some studies for suicide mortality in Taiwan found that non-domestic gas or vapor (charcoal burning) had been a highly fatal and epidemic means since about 10 years ago, particularly in metropolitan areas. Yet, mortality differences on major causes of death among the north and the south or between ethnic groups (the general population and indigenous people staying in mountains) remained visibly large and Taiwan's landscape varies from the geographic locations because mountains and hills whereas little literature reported suicide mortality statuses in urban and rural areas among geographic locations.

Materials and Methods

Data

We acquired township-specific data for population and death registration from 1971 to 2009 from the government. 358 townships of 23 counties/cities in Taiwan were classified as 19 areas by 5 geographic locations (north, middle, south, east, and off-island) and 4 urbanisation levels based on population and population density in 2005.

Statistical Analysis

Mortality rates of age-standardized to WHO 2000 standard population (ASRs), and Standardized Mortality Ratios (SMRs) with 95% confidence intervals were calculated. Pearson Correlation Coefficients (r) and stepwise regression models were used to assess risk factors for suicide mortality. For preventing co-linearity, only one of highly



(台灣)國家衛生研究院群體健康科學研究所衛生政策研究組

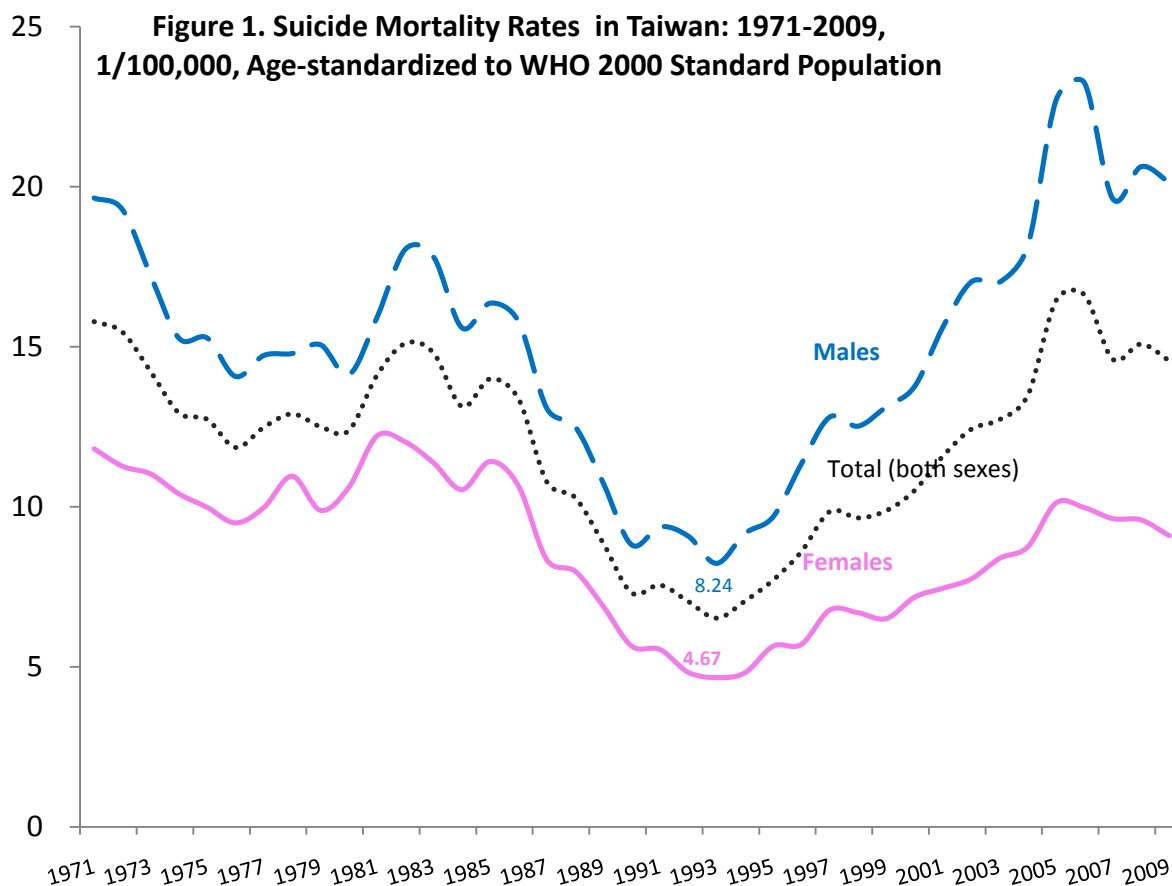
Division of Health Policy Research and Development, Institute of Population Sciences
National Health Research Institutes, Miaoli, Taiwan

correlated variables ($r \geq 0.70$), was selected in regression models.

Results

Table 1. Number of Towns and Population in the Geographic Locations and Urbanization Levels in Taiwan, 2007-2009

Geographic locations	Total		Urban area		Suburban area		Rural area		Mountainous area	
	Towns	Population	Towns	Population	Towns	Population	Towns	Population	Towns	Population
North	77	9,712,962	44	8,573,816	17	956,539	12	153,976	4	28,631
Middle	106	5,752,831	17	2,325,445	60	2,930,520	25	447,745	4	49,121
South	127	6,349,421	24	3,481,080	58	2,305,242	33	490,605	12	59,944
East	39	1,034,184	4	389,470	8	325,538	18	256,796	9	55,199
Remote area	9	93,308	0	0	1	55,126	7	53,888	1	4,025
Total	358	22,942,706	89	14,769,811	144	6,572,965	95	1,403,010	30	196,920



(台灣)國家衛生研究院群體健康科學研究所衛生政策研究組

Division of Health Policy Research and Development, Institute of Population Sciences

National Health Research Institutes, Miaoli, Taiwan

Figure 2. Suicide Mortality Rates in Taiwan: 1971-2009, by Locations and Urbanization Levels, 1/100,000, Age-standardized to WHO 2000 Standard Population

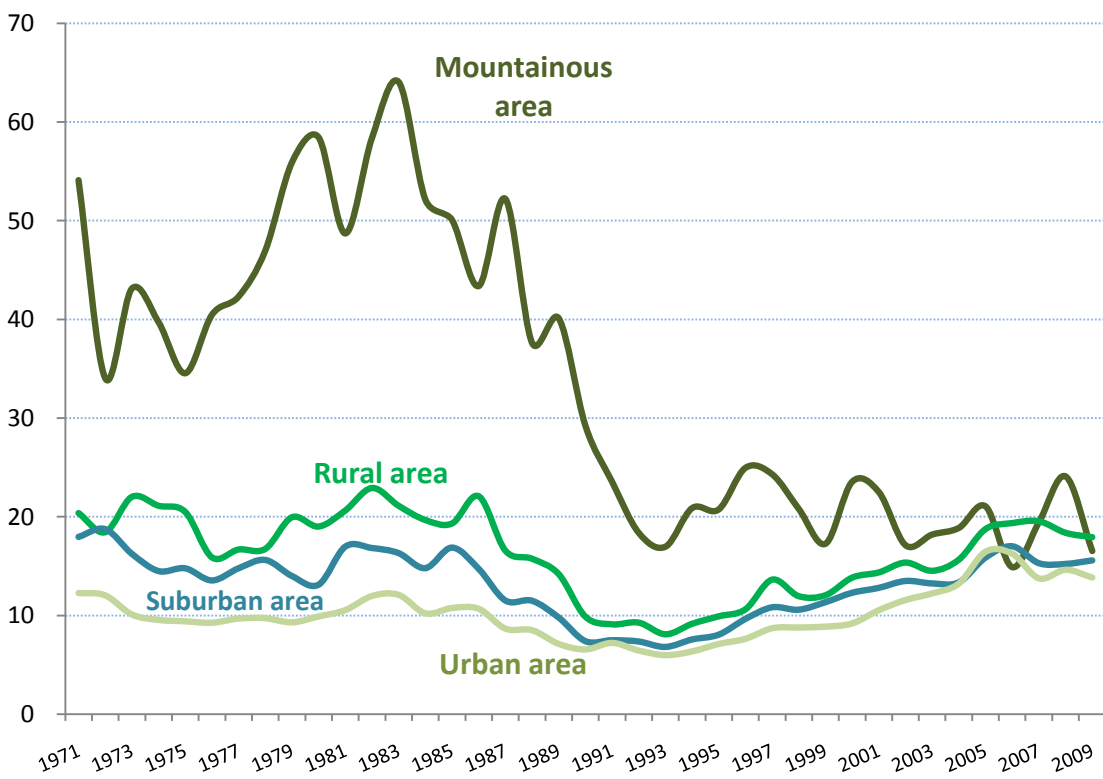
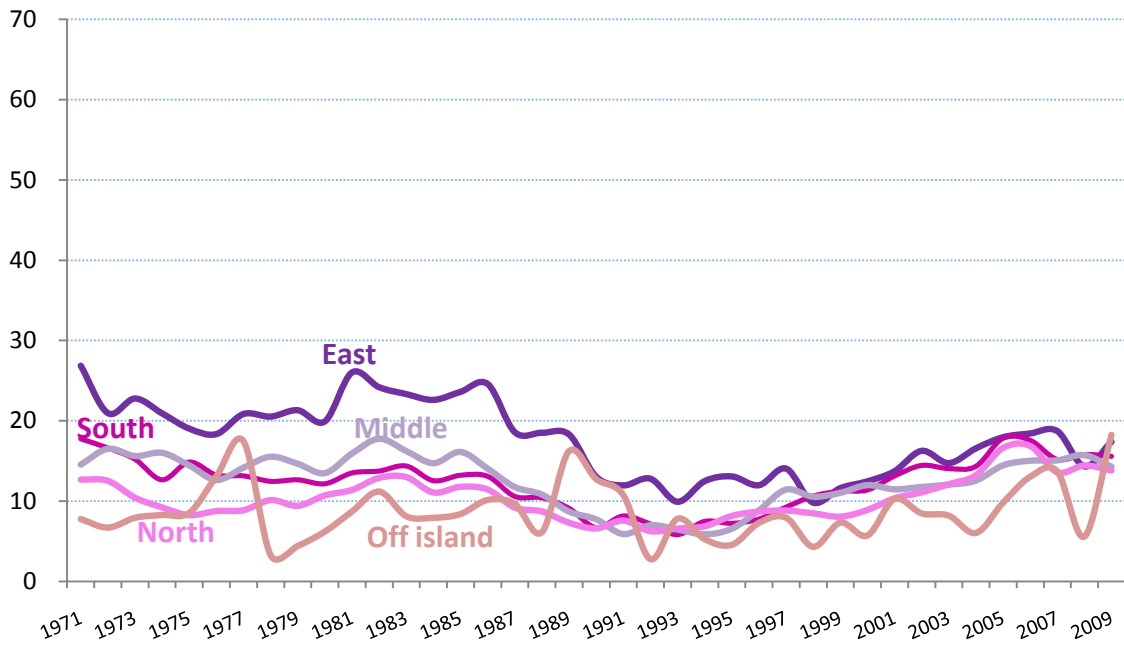
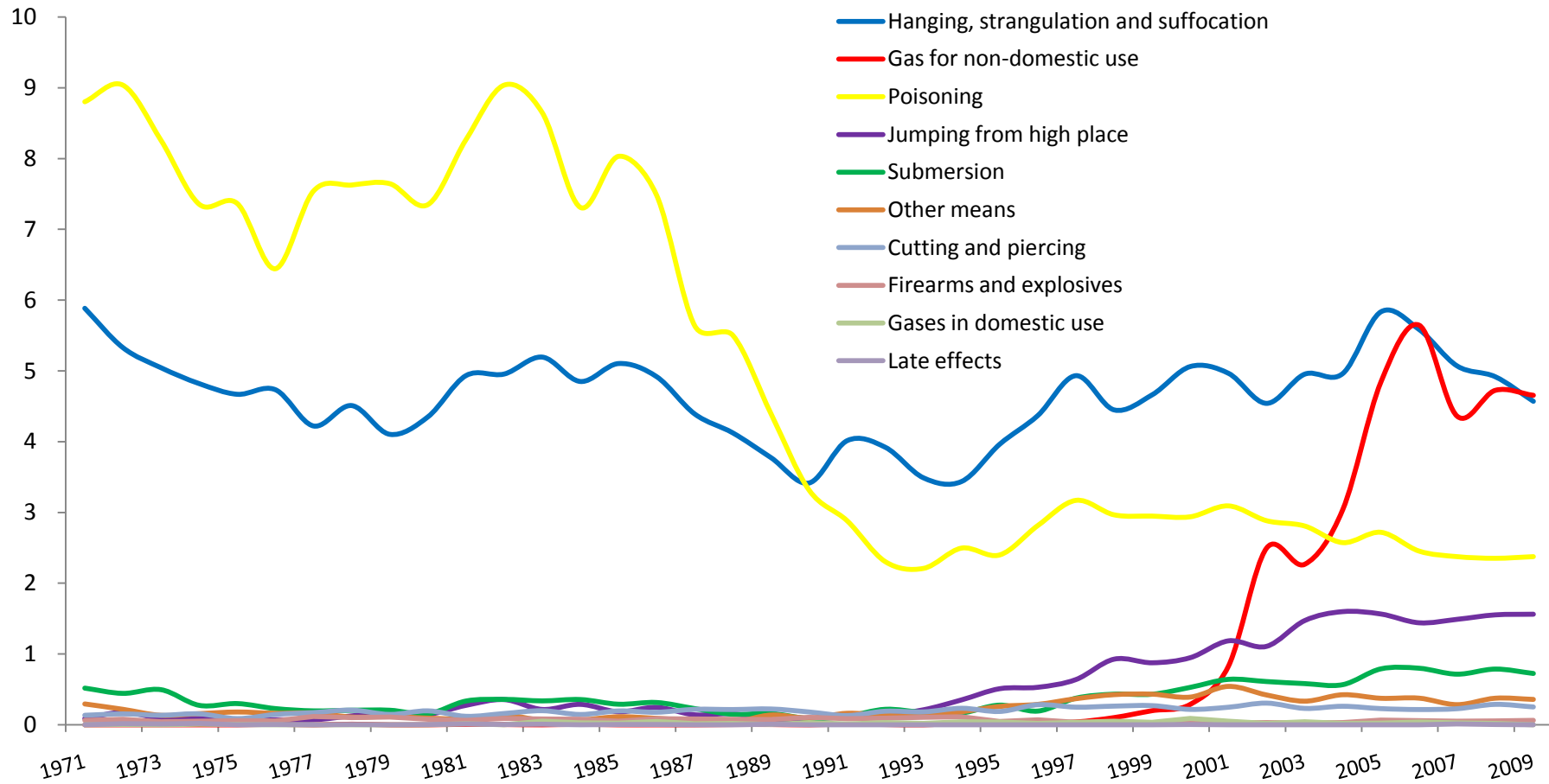


Figure 3. Trend of Suicide Patterns in Taiwan: Mortality Rates of Age-standardized to WHO 2000 Standard Population, 1/100,000.



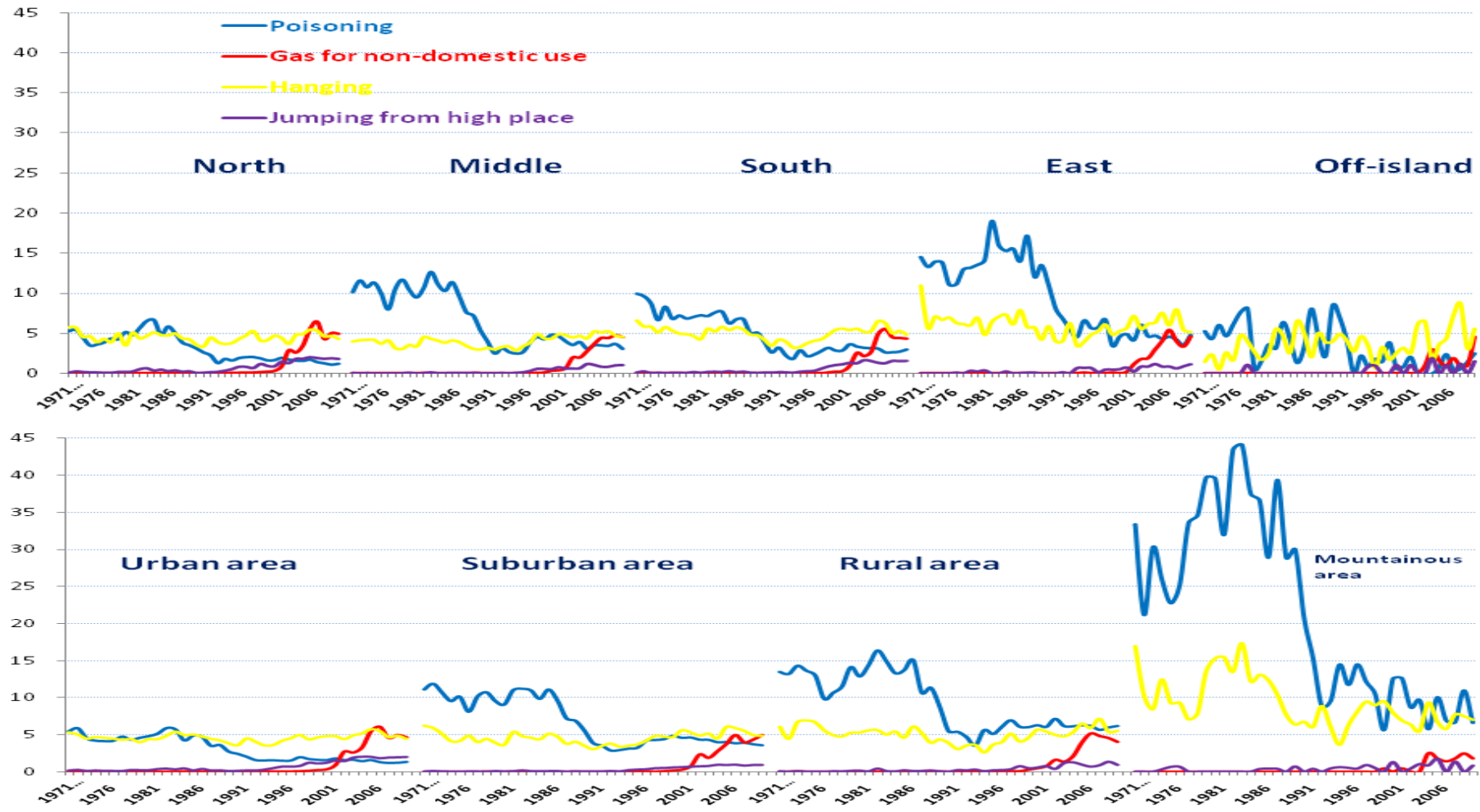
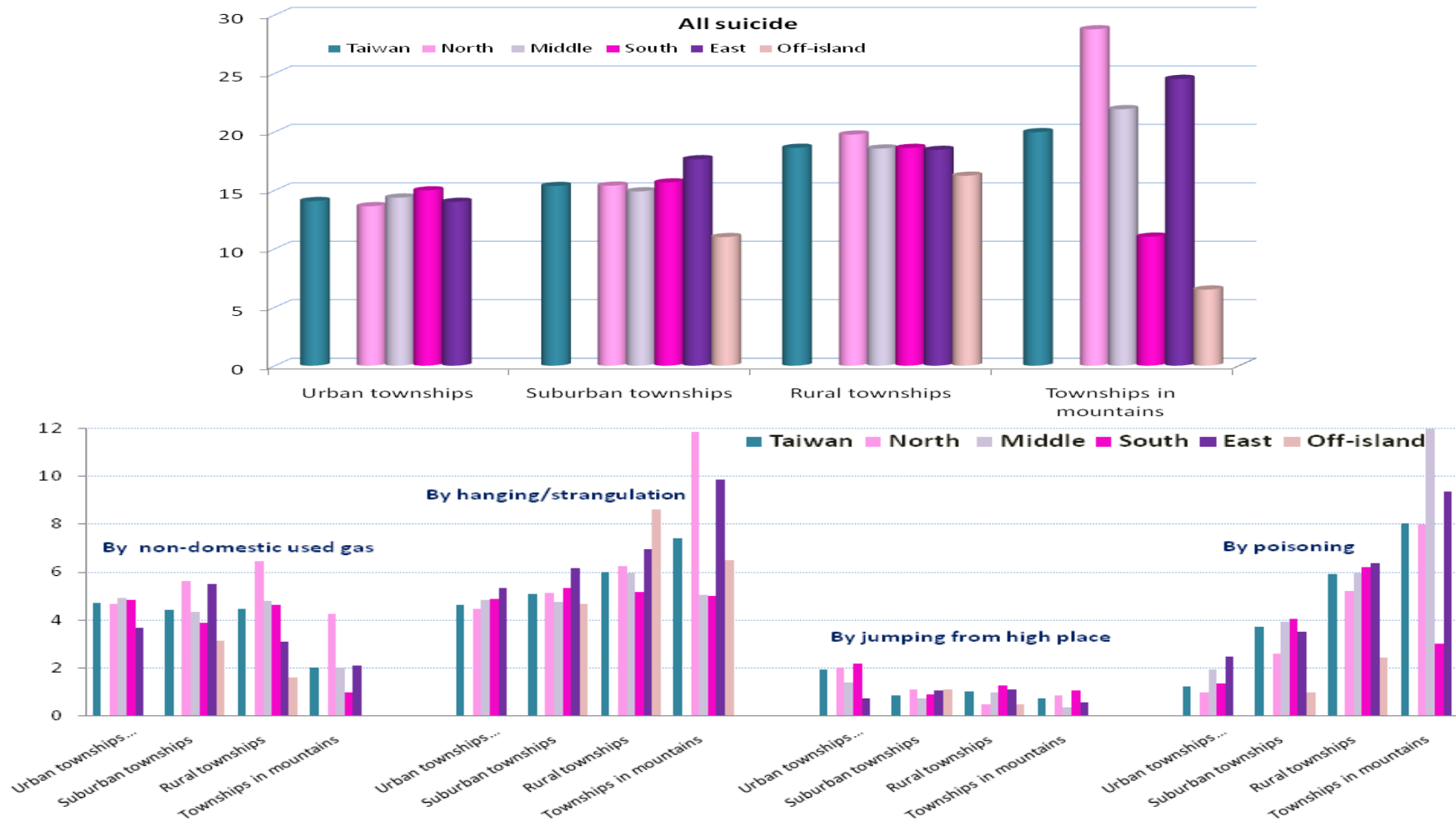


Figure 4. Trend of Suicide Patterns in Taiwan, by Locations and Urbanization Levels: 2007-2009, Mortality Rates of Age-standardized to WHO 2000 Standard Population, 1/100,000



Stepwise regression models showed suicide mortality rates in Taiwan were significantly positively associated with townships in rural area and mountains (partial $R^2=0.13$ and 0.04 , $p<.0001$) as well as the middle location (partial $R^2=0.003$, $p=.0004$), but the model R^2 is only 0.19 . Suicide patterns (model $R^2=0.23-0.45$, tables are not shown) were more related to urbanization levels (partial $R^2=0.06-0.25$, $p<.0001$, for rural and mountainous) than geographic locations (partial $R^2=0.0008-0.006$, $p<.05$).

Discussion and Conclusion

Suicide mortality and patterns in Taiwan were associated with urbanization levels and geographic locations. Rural townships are highly associated with suicide by gas for non-domestic use (charcoal burning) and jumping from high place were getting more prevalent in each geographic location. People residing in rural and mountainous townships are still vulnerable to suicide, especially in the north and the east. The study findings also suggest that urban townships in the south may need more attention than the other urban areas, which may imply the resources for the north and the south could be still distributed unequally. In conclusion, suicide mortality hasn't been controlled in Taiwan and rural townships are still vulnerable to suicide. For preventing suicide attempt, government may take the study findings into consideration when revising policy such as to strictly regulate the use of charcoal burning indoors both in urban or rural areas and regulate safety facilities for high buildings and bridges.

