Nursing Inequalities in Elderly Suicides: An Empirical Study of Taiwan

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1. Introduction

Suicide is one of the leading causes of death in many countries. Approximately 1 million people commit suicide every year, and the national average of suicides was over 12 per 100,000 people in the general population in some European countries. Elderly suicides tend to increase with age. In the United States, persons aged 65 years and older (except for Asian/Pacific Islanders) comprised the greatest percentage of suicides during 2005-2009. In Taiwan, suicide mortality rates have doubled since the mid-1990s. Deaths from suicide accounted for 3.3% of the total number of deaths, with mortality rates of 28.0 and 12.3 per 100,000 for men and women, respectively. Psychological, social, biological, cultural, and environmental factors have been shown to affect suicide rates. Poor mental health has been cited as a major risk for suicide ideation in the older population. Individual risk factors, such as age, disease, unemployment, marital status, and major life events were also observed to contribute to suicidal ideation.

Studies have also examined the long-term socioeconomic factors that contribute to suicide mortality. Most elderly people are unemployed, and their concerns regarding the resulting financial burden on other family members may lead to suicidal notions. Dependency ratio is another factor that may contribute to this phenomenon. Observations in clinical settings indicated that older people frequently felt inhibited in requesting health care services. This may lead to more frequent reports of physical symptoms to nursing staff. Thus, the response of nurses to affirm the value of elderly patients’ wellbeing in such circumstances may be critical to the progression of suicidal ideation. Our study applied a macro-observation design to previous studies of elderly suicide in Taiwan to investigate whether client-to-caregiver ratios influenced suicide rates among elderly patients. We examined the pooled panel data of 22 cities in Taiwan from 2001 to 2009. Our study was unable to assess the effects of some economic and sociological...
variables (e.g., income per capita, unemployment rate, divorce rate, medical expenditures) using multiple regression models because these socioeconomic factors were not statistically consistent among the selected previous studies. Therefore, although such factors have been shown to influence suicide rates, it is unclear whether our results can be generalized to countries other than Taiwan. However, National Health Insurance has now been available in Taiwan for 17 years, and most elderly Taiwanese people receive medical care at little or no cost. The tendency toward the existence of extended family units in Taiwan may also represent a mitigating factor because housing is commonly transferred from one generation to the next. Thus, we used the elderly living allowance as a measure of the individual socioeconomic status. We determined that nursing inequalities significantly affected elderly suicide rates. As suicide is a major and preventable public health problem, we propose that the observed correlation between elderly suicides and patient-to-caregiver ratios provide crucial information that can be used to develop effective policies for the prevention of elderly suicides.

2. Methods

2.1. Data sources

Our empirical analysis used two data sets provided by the Taiwan Department of Health of the Executive Yuan, Taiwan, and the Taiwan Demographic Fact Book produced by the Taiwan Ministry of the Interior. For our purposes, death by suicide was defined as those coded E950-E958 according to the International Classification of Disease, Ninth Revision (ICD-9). These data comprised a longitudinal population-based survey of a nationwide sample of 23,224,912 residents. Our study was designed to evaluate the impact of the number of available caregivers on elderly suicide outcomes.

2.2. Study variables

The dependent variable, number of elderly suicides, was obtained from the national-level authority data for people aged 65 years and over, who had reported suicidal ideation. Multiple independent variables were examined. The primary predictor variable was the number of nurses per million people in that city. The measures of social welfare were examined, and the dependency ratio and population density were also observed to be significant predictors. The age dependency ratio was defined as the number of people aged 65 years and over divided by the number of people aged 15 to 64 years. Population density was defined as the number of persons per square kilometer. Allowance was defined as the amount of living allowance for older adults in medium- and low-income families (NTS). People defined as living alone lived without other family members and received routine living assistance from caregivers. The living alone group consisted of a composite of medium- and low-income people, such as veteran servicemen. The remaining variables were more difficult to identify, such as socioeconomic status and public resource allocation.

The number of available physicians per city was not assessed because it had a high correlation with the number of available nurses (power corr. = 0.871, p < 0.001), and we observed a significant positive relationship with the number of elderly suicides using general regression or fixed-effect regression in our prior studies. We presumed both to be concurrent factors, rather than representing a causal relationship. In brief, the panel data represented 22 cities in Taiwan between 2001 and 2009. Three off-shore island cities were excluded.

2.3. Statistical analysis

We constructed three models of outcome corresponding to the ordinary least squares (OLS) linear regression of city fixed effects and both city and time effects, respectively. We employed OLS to minimize possible effects of unknown variables. For example, whether suicide attempts resulted in deaths may reflect different local problems or a traditional burden. However, long-term care, unemployment status, and disposal family income are likely to influence decisions regarding suicide, and the omission of such data in such a study would result in biased conclusions. A data set containing observations on multiple phenomena (cross-sectional data) observed over multiple time periods (time series data) is called panel data. In time series data, both the values and the ordering of the data points have meaning. In cross-sectional data sets, the values of the data points have meaning, but the order of the data points does not have any meaning. Hence, panel data analysis uses the before and after comparison method to hold constant the unobserved factors that differ from one city to the next but do not change over time within the city by subtracting one single simple regression equation from the next regression equation.

The goal of this study is to determine whether a change in one variable causes a change in another variable, and the data set of this study contains observations on multiple phenomena observed over multiple time periods. Although the time series (year 2001 to 2009) and cross-sectional data (22 cities) are both one-dimensional, the two-dimensional panel data analysis is suitable for this empirical study to eliminate the effects of such omitted variables that may vary across cities, but are constant over time on a broader scale.

3. Results

3.1. Study population and descriptive statistics

Our integrated database from 2001 to 2009 indicated that elderly suicides in the 22 cities ranged from 5 to 125 and averaged 35.763 with a standard deviation of 22.719 (Table 1). The mean number of nurses per million people ranged from 16.58 to 110.02 and averaged 44.510 with a standard deviation of 17.511 (Table 1). Table 1 presents all the variable definitions, descriptive statistics, and corresponding standard deviations. Fig. 1 provides the trends of suicides. Generally, most cities exhibited an increase in both the number of elderly suicides and the number of available nurses.

3.2. Comparison of features between simple regression and fixed-effect analysis

We imposed nine models for analysis. A two-sided p value of the individual coefficient was considered statistically significant at the 10%, 5%, or 0.1% significance level. Model 1 lists a simple regression for which nurse number, dependency ratio, living alone, and the amount of elderly living allowance for medium- and low-income families were statistically significant. The coefficient for numbers of nurses was −0.186 (p < 0.05), which implies that a greater number of nursing staff resulted in fewer elderly suicides. The independent variable of the dependency ratio had a similar but stronger effect (the coefficient was −2.341, p < 0.001). Elderly living allowance, per 10,000 New Taiwan Dollars, for medium- and low-income families was also significant (p < 0.001), but its coefficient was just 0.028. It was not so meaningful. Living alone was a major issue in the cause of elderly suicides (the coefficient was 6.106, p < 0.001). Model 2 described the regression result by city
effect. The coefficient of number of nurses remained statistically significant and negative. Although the coefficient of the dependency ratio and elderly living allowance became positive and negative, respectively, they remained statistically significant. However, living alone was no longer significant. Model 2 implied that the efficiency of the most independent variable probably changed in different cities, but the variable of number of nurses did not vary across cities. Its coefficient was near to Model 1, and it also means that more nurses result in fewer elderly suicides (−0.189, p < 0.05). Model 3 represents the fixed effects of both city and time through linear regression, in which the coefficient of number of nurses and elderly living allowance were statistically significant and negative. The coefficient of the number of nurses here was −0.334 (p < 0.1); its influence was twice as great as that of Model 1 or Model 2 when we fixed the effect of both cities and years.

From Model 4 to Model 9, we conducted the OLS and fixed-effect analysis again, but the dependent variables were elderly male suicides (Model 4 to Model 6) and elderly female suicides (Model 7 to Model 9), respectively. The coefficients of the variable of number of nurses on elderly female suicides were still significant when we used the fixed effect (−0.139, p < 0.1 in Model 8 and −0.203, p > 0.1 in Model 9). By contrast, the coefficients of number of nurses on elderly male suicides were not significant in the fixed-effect equation (Model 5 and Model 6). Other independent variables in male (Model 4 to Model 6) or female (Model 7 to Model 9) suicides equations revealed the same explanation as simple regressions (Model 1 to Model 3).

3.3. Comparison of the effect of study variables on elderly suicides

We found dependency ratio, elderly living allowance, and living alone statistics to be similar to Models 1 to 3. Although the number of elderly female suicides was significantly correlated with the volume of nurses in the fixed-effect analysis, elderly male suicides displayed no such relationship. Table 2 shows a comparison of the intercorrelations among these nine models. These data indicate that statistically significant links existed between elderly female suicides and number of nurses and that all the coefficients of nurse numbers were negative values. A popular assumption in the literature is that the aged dependency ratio is especially important for improving elderly health outcomes, which implies that higher age dependency results in fewer elderly suicides. However, the evidence in our study does not support this observation. Our findings show that greater numbers of available nursing staff is correlated with lower incidence of suicidal ideation in older adults, and indicate a possible causal relationship.

4. Discussion

Our study demonstrates a significant relationship between nursing labor volume and elderly suicides in Taiwan from 2001 to 2009. Most researchers have claimed that the main cause of elderly suicide was chronic illness, physical disability, depression, retirement, and other major life events. These hypotheses were based on mental, physical, and social domains, and did not address the effects of older people receiving consolation during the course of health care. In the health care system, nurses are an important medium for interaction with patients. A straightforward assumption is that the number of nurses who interact with patients contributes a cumulative effect in the warmth and encouragement that is communicated to patients. Many researchers found that nursing manpower played a key role in quality of care, patient-care outcomes, mortality, and rates of patient and family satisfaction. Such conclusions regarding the relationship between the abundance of nursing manpower and a decrease in the deaths of older people are congruent with the results of our study. Although some degree of bias may have been associated with such studies because data were derived primarily from in-patient clinical settings, we used cross-sectional and longitudinal nationwide data to strengthen the empirical evidence.

Our results suggest that suicide can be prevented for as many as 334 elderly people or 203 female elderly people with an
increase of one nurse per 1000 people, regardless of regional culture and local policies. In addition, we considered the potential correlations of both population density and older adults living alone with elderly suicide. The population density and older adults living alone were proxy variables that denoted general resource competition. We could not find a strong link between older adults living alone and suicide using a fixed-effect analysis. Meanwhile, the p value for population density in our study was 0.615, and its coefficient was 0.00026, suggesting that the presumption that older adults perceive themselves as a burden to society and that such perceptions somehow contribute to suicidal thoughts is invalid.

In Models 5 and Model 6, the significance of nurse-number coefficients differed from male to female elderly suicides. These phenomena demonstrated the gender paradox in suicide. We believed that cultural influences play an important role in the gender paradox of suicidal behaviors, but it was not in the scope of this paper. Interestingly, the coefficients of elderly living allowance in a fixed-effect equation (Models 3, 6, and 9) were all negative and significant. This can be realized on account of urbanization. The cases of elderly living allowance for medium- and low-income families were small in cities with middle and high urbanization levels. This fact leads its coefficients turning to negative and efficiency varying across cities from poor to rich.

5. Conclusion

This study presents evidence regarding the claim that elderly people intend to kill themselves when they need love and care, but none is there. This study’s hypothesis was that most elderly enter health care institutions not only because of illness, but also to seek a warm friendly environment in countries with a good level of social-insurance. Nurse staffing is likely a proxy of consolation. In summary, the results of our study imply that increasing the nursing workforce can reduce the number of elderly suicides, providing a potential solution to an important public health issue and reducing a significant financial burden of the national health care system.

References