Socioeconomic Risk Factors in the Precipitation of Suicide in the Elderly

Marco Innamorati[*,1], Antonino Tamburello[1], David Lester[3], Silvia Rigucci[2], Mario Amore[4], Cristina Di Vittorio[4], Paolo Girardi[2], Roberto Tatarelli[2] and Maurizio Pompili[2,5]

[1]*Università Europea di Roma, Italy*

[2]*Department of Psychiatry, Sant'Andrea Hospital, Sapienza University of Rome, Italy*

[3]*The Richard Stockton College of New Jersey, Pomona, NJ, USA*

[4]*Department of Neurosciences Division of Psychiatry, University of Parma, Italy*

[5]*McLean Hospital - Harvard Medical School, MA, USA*

Abstract: Suicide among the elderly is a critical public health problem. Large socioeconomic inequalities are present in suicide mortality cases, but the association is complex and may be different for elderly men and women. Reducing these differences could significantly reduce the burden of excess mortality, at least in elderly men. The aim of the present paper is to review research concerning the socioeconomic risk factors associated with suicide in the elderly. It is noted that the association between suicide risk and socioeconomic factors is likely to be overestimated when the effect of psychiatric status is not considered.

Keywords: Suicide, elderly, socioeconomic factors, risk factors.

INTRODUCTION

Suicide among older adults is a critical public health issue. International statistics indicate an average of one suicide every 90 minutes among those 65 years of age and older [1]. In a recent cross-national study of 62 developing and developed countries, Shah [2] reported an increase in suicide rates with age in men and in women in 25 and 27 countries, respectively.

The suicide rates for the elderly in many countries are higher than those of any other age group, with the rates among people aged 75+ roughly three times that of adolescents [3]. Pooled international data published by the World Health Organization [4] show a rise in the rate of completed suicide with age. For men, the rate increases from 19.2 per 100 000 inhabitants per year in those aged 15-24 years to 55.7 in those 75+. For women, the respective rates are 5.6 and 18.8. However, there are large differences from country to country [5].

Several risk factors have been proposed to explain suicide behavior, both at the group (or societal) level and at the individual level [6] (Table **1**). In 2002, the World Health Organization proposed an ecological model, which included individual, interpersonal, community and societal variables, to explain suicide [7]. The variables at the national or regional level may be seen as largely responsible for the variation in societal conditions that foster different national suicide rates, while the variations in the individual lives of the people explain why a particular individual succumbs to suicide whereas others, in broadly similar social circumstances, do not [8].

Table 1. Risk Factors for Elderly Suicide

Male gender
Older age
Widowed or divorced status
Cumulative loss
Recent stressful life events
Family dischord
Bereavement
Psychiatric disorders especially mood disorders
Psychiatric admission in the past months
Hopelessness
Previous suicidal behavior
Social dependency or loneliness
Personality traits: timidity, shy seclusiveness, hypochondriasis, hostility, rigid independence
Substance abuse disorders
Health and illness
Pain
Availability of lethal means of suicide (e.g. firearms)
Neurobiological factors (e.g. serotonergic CNS dysfunction) associated with impulsivity and aggression
Abnormalities in executive function associated with specific neuroanatomical pathologies

At the individual level, several categories of risk factors have been proposed to explain elderly suicide, such as demographic, clinical and socioeconomic variables. Depression has been reported as the most common

*Address correspondence to this author at the Università Europea di Roma, Psy.D. Piazza Filattiera 12, 00139 Roma, Italy; Tel.: +39 06 8105981; E-mail: innamorati.marco@libero.it

1874-8279/09

psychiatric disorder in elderly suicides [9]. Beautrais [10] suggested that the risk of serious suicidal behavior was higher among those who had a current mood disorder, a psychiatric hospital admission within the previous year, and limited social networks. However, mood disorders are generally underdiagnosed in older adults [11]. Furthermore, suicide prevention in the elderly is complicated by the fact that suicide occurs with fewer warning signs because the elderly are less likely to express suicidal ideation directly, to make prior non-fatal suicide attempts or engage in self-harming behavior [9, 12, 13]. In addition, violent methods of suicide are common in older suicides [14], methods which are generally more lethal than other methods.

Socioeconomic factors that characterize the individual or group within the social structure may be used to improve the prediction of suicide in the elderly. Maki and Martikkainen [15] investigated census records linked with cause of death records to analyze socioeconomic differences in the suicides of men and women aged 25+ in Finland during the years 1971-2000. The authors reported that: (i) socioeconomic differences in suicide are much larger among men than among women; (ii) the relative socioeconomic difference among women for suicide was similar to that found for total mortality [16]; and (iii) the relative socioeconomic difference among men was considerably larger for suicide than for total mortality. Although these differences were largest among those in their thirties, they were also considerable among older men. In contrast, for women, socioeconomic differences in suicide were largest in the younger age groups, but started to decrease among those over 60 years of age, and were negligible in the oldest groups.

Lorant *et al.* [17] presented a European overview of socioeconomic inequalities in suicide mortality among men and women in ten European populations using education and housing tenure as indicators of socioeconomic inequalities. The results indicated that a low level of educational attainment was a risk factor for male suicide in eight of the ten countries. Suicide inequalities were smaller and less consistent in women.

Thus, there is evidence that large socioeconomic inequalities are present in suicide mortality and reducing these differences could significantly reduce the burden of excess mortality, at least in elderly men. The aim of the present paper is to review research concerning the socioeconomic risk factors associated with suicide risk in the elderly.

METHOD

We performed careful MedLine and PsycINFO searches from 1980 to 2008. The following search terms were used: "elderly" OR "older adults", suicid*, (which comprises suicide, suicidal, suicidality, and other suicide-related terms), risk factors, and socioeconomic factors. In addition, each category was cross-referenced with the others using the MeSH method (Medical Subjects Headings). Selection of papers suitable for this study allowed the inclusion only of those articles published in English peer-reviewed journals. Included were those studies that added an original contribution to the literature. A total of 4511 articles were located through our search, and the most relevant articles were selected for this overview.

SOCIOECONOMIC RISK FACTORS

An increased risk of suicide in relation to socioeconomic factors at the individual level has been reported. For example, associations between suicide and factors such as unemployment and other labour market marginalisation, lower income, educational underachievement, and being single have been reported both in young people and adults [18-27]. However, the association between suicide risk and socioeconomic factors is likely to be overestimated when the effects of psychiatric status are not considered [27, 28]. Recently, Agerbo, Qin, and Mortensen [29] investigated suicide in both families and persons with psychiatric disorders and socioeconomic disadvantages in Denmark. Compared with siblings and population-based controls, the risk of suicide was increased among people with a history of admission for a psychiatric illness, who had been unemployed, who were recipients of social benefits, who were disability pensioners or students, who had a lower income or less educational attainment, or who were single. When all the factors were considered simultaneously, suicide risk was significantly associated with admission for a psychiatric illness, employment status and marital status in both the sibling and in the case-control designs, while suicide risk was associated with educational attainment only in the case-control design.

Kim *et al.* [30] investigated the association between suicide risk and social class in Korea and found that lower social class constituted a higher risk for suicide, even after controlling for confounding variables.

Consistent with the results of Chiu *et al.* [31], Pompili and colleagues [32], investigating suicides who were resident in the province of Parma and Piacenza (Italy) and who died between 1994-2004, found that elderly suicides had less education attainment than young suicides. In this study, the probability of having education underachievement was 14.6 times higher in the elderly suicides than suicides in those aged 36-64.

As Emile Durkheim theorized long ago [33], variables at the societal (aggregate) level pertaining to the socioeconomic environment may be important determinants of suicide risk in emergent and high-income countries, variables such as levels of deprivation or social fragmentation [26, 34, 35], societal integration [36, 37], isolation (low population density and high proportions of households with only one member) [38], urban/rural proportions [39-41], unemployment [24, 38, 42], low educational attainment at the regional level [43], state public welfare expenditures [44] and access to health care [45, 46].

Miller *et al.* [47] conducted a multilevel case-control study in New York City to investigate the association among suicide risk and income inequality. The authors found that persons living in neighborhoods characterized by a more inequitable distribution of income had an increased likelihood of committing suicide relative to the likelihood of sustaining a fatal accident. This effect was modified by age. Income inequality was associated with an increased likelihood of death due to suicide among persons under the age of 35 but not among persons 35-64 years of age. The low-income effect on suicide rates has also been found in Sweden [48, 49], in Australia, where male suicide mortality

was correlated with low income, low education attainment and unemployment [50], and in Japanese middle-aged men [51].

Shah [52] investigated the relationship between elderly suicide rates and the Human Development Index (a composite index measuring average achievement on three basic dimensions of human development - life expectancy, educational attainment and socio-economic status) and reported a significant curvilinear relationship in male elderly. The findings of this cross-national ecological study were used to develop a theoretical four-step sequential stage model to explain the curvilinear relationship between elderly suicide rates and the Human Development Index. The model assumed that elderly suicide rates and the Human Development Index of countries can both be dichotomized into two categories: high and low. Countries with a low human development stage have low socioeconomic status, poorly developed healthcare services, and reduced life expectancy, factors which result in higher mortality at younger age and a reduced number of elderly suicides. Improvement in the socioeconomic status of countries and development of healthcare services will lead to a gradual transition from "low elderly suicide rate - low human development society stage" to a "high elderly suicide rate - low human development society stage." As societies develop further, a change from lower to higher human development status will occur, healthcare services and life expectancy will improve, and this, in turn, will result in an increasing number of elderly at risk of suicide. Finally, in socio-economically well-developed countries, elderly suicide rates may progressively decline over time as a result of improved efforts to control the risk factors for elderly suicides, to enhance protective factors for elderly suicides and to improve the delivery of medical care.

Wu and Bond [53] investigated suicide rates of younger people aged 15-24 and the elderly aged 65-74 in 54 nations using societal variables in conjunction with psychological measures of citizen characteristics as mediators. Their results showed that the divorce rate, the sex ratio (females per 1,000 males), and life expectancy predicted suicide rates in both the young and the elderly, while the Gini index (a measure of statistical dispersion, widely used to indicate the degree of inequality in a nation's income distribution. It ranges between 0 [perfect equality: everyone has exactly the same income] and 1 [perfect inequality: one person has all the income, and everyone else has zero income]: a low Gini coefficient indicates more equal income or wealth distribution, while a high Gini coefficient indicates more unequal distribution) added to the above three factors, further strengthening the prediction of elderly suicide rates. In addition, several psychological mediators were found: home satisfaction was a mediator for both age groups, while life satisfaction, perceived health, happiness, a sense of freedom of choice, and a sense of family importance also mediated elderly suicide rates fully or partially. Moreover, the authors reported differences in the influence of societal and individual risk factors in suicide rates. There were two societal variables (the Gini index and the sex ratio) and five psychological variables (home satisfaction, perceived state of health, sense of free choice/control, life satisfaction, and happiness) showing a higher correlation with elderly suicide rates, indicating that the elderly are more likely than their younger counterparts to be affected adversely by the level of family integration and the societal conditions of a country.

Unemployment as a marker of low socioeconomic status has been associated with suicide risk in young adults [22, 54-57], and may occasionally be associated with a higher suicide risk even in older adults [42, 43]. However, both Shah [58] and Gunnell *et al.* [59] found no significant associations between elderly suicide rates and unemployment. Perhaps the elderly are more protected from any economic crises hitting the economies of their countries than are working-age men [60, 61].

Urbanicity

Rural residence has been noted to be an important factor in elderly suicide mortality in some studies. For example, Araki and Murata [51] reported that age-specific suicide mortality was positively related to rural residence in Japanese elderly men. These findings are consistent with data from other countries [62-65].

Shah [66] investigated world data on elderly suicide rates for both genders in those aged 65-74 and 75+ and found a curvilinear relationship between male elderly suicide rates and the percentage of the population living in urban areas, consistent with data from Finland [67, 68]. Shah proposed an explanatory model pertaining to early, middle, and advanced stages of urbanization. In countries at an early stage of urbanization, elderly suicide rates may increase both in the elderly remaining behind in rural areas and in those migrating to urban areas. The elderly who remain behind while their children migrate to urban areas may lose their role and status in the family, as well as emotional and financial support from their children. On the other hand, the elderly who migrate to urban areas may experience social disruption. In countries at the middle stage of urbanization, the elderly may begin to adjust to the social adversities, and their suicide rate may reach a plateau. Finally, in countries at an advanced stage of urbanization, elder suicide rates may decline.

Not consistent with these generalizations are the results of Qin [69] who investigated suicide in relation to the level of urbanicity in Denmark, in the context of other factors, in 21,169 with 423,128 population controls. Qin found that people living in more urbanized areas are at a higher risk of suicide than their counterparts in less urbanized areas. However, the excess rate is largely eliminated when adjusted for marital status, income and ethnic differences, and it is reversed when further adjusted for psychiatric status. Moreover, the impact of urbanicity on suicide risk differed significantly by sex. Urban living increased the rate of suicide among women, especially women aged 65+, and it decreased the rate among men across all ages except for men aged 75+.

Thus, the association between urbanization and suicide has to be evaluated carefully in light of other sociodemographic and clinical factors, as was demonstrated also by the study of Isometsa *et al.* [70] who reported that urban suicides were associated with psychiatric comorbidity and with stressful life events, whereas rural suicides were more often associated with physical and medical problems.

The association between rural/urban residence and suicide in the elderly also has to be evaluated in the light of the provision of medical and psychiatric services [59, 71, 72] and other social resources. For example, Shah, Padayatchi and Das [73] examined the relationship between international elderly suicide rates and elderly dependency ratios (the ratio of people over the age of 65 years to people under the age of 65 years) and found significant positive correlations between suicide rates and the elderly dependency ratio in the elderly (both in those aged 65-74 and those 75+). This implies that a greater number of younger people who are potentially available to provide support when needed is a protective factor for elderly suicide. On the other hand, the migration of younger workers from rural areas to towns and a higher female labor force participation rate [42, 43] may imply lower social support and a higher suicide rate in the elderly.

Healthcare Policies

An inverted U-shaped curve relationship between elderly suicide rates and the percentage of the total health budget spent on mental health, the number of psychiatric beds, and psychiatrists per capita population has been reported [71], while improved healthcare for the elderly is found to be associated with a decline in elder suicide rates [59, 72]. However, further examination of this relationship over time within countries is needed to be sure that these associations are valid [74].

Giles-Sims and Lockhart [8] conducted cross-sectional research on elderly suicide rates in the United States to describe how macrosocial indicators of social integration contribute to elderly suicide rates over the American states. The authors identified five significant associations: (i) income was inversely related to suicide rates, especially for men; (ii) the state's adherence to a religious denomination was inversely associated with suicide rates; (iii) suicide rates among the elderly declined when the state's nursing facilities received more adequate material support and as the state regulated nursing facilities more carefully; (iv) firearm availability had a strong positive relationship with elderly suicide rates; and (v) a factor named "suicide imitation," measured by the contiguity of the state to those with higher elder suicide rates, was strongly associated with suicide rates. The results of the study led the authors to conclude that state's socioeconomic status and policies have a major impact on the elderly, affecting the social consequences of their physical and psychological problems and the provision of effective means for the elderly to cope with their difficulties.

DISCUSSION

The aim of the present study was to review research concerning the socioeconomic risk factors associated with suicide in the elderly. The review indicated that socioeconomic inequalities are related to suicide rates, although the association is complex and may be different for male and female elderly. Most studies indicate that men are more affected by socioeconomic factors than women, who seem to be less vulnerable to social factors than men.

Some socioeconomic factors, such as urbanicity, different labor market policies and income inequalities may affect suicide rates in elderly both directly, increasing the number of stressors that they have to face, and indirectly, affecting the level of social support from the younger caregivers. However, the association between suicide rates and socioeconomic factors is likely to be overestimated when the effects of psychiatric status are not considered [27, 28]. Furthermore, the association between elderly suicide rates and macro-socioeconomic factors indicated in the studies reviewed may be due to the ecological fallacy [75].

In conclusion, public health and socio-economic policy makers, and clinicians have to carefully evaluate the incidence of socioeconomic factors in the precipitation of suicide in the elderly, especially in the elderly men.

REFERENCES

[1] Department of Health & Human Services. National strategy for suicide prevention. [updated 2008; cited 2009 March, 8]; http://mentalhealth.samhsa.gov/suicideprevention/elderly.asp

[2] Shah A. The relationship between suicide rates and age: an analysis of multinational data from the World Health Organization. Int Psychogeriatr 2007; 19: 1141-52.

[3] World Health Organization. Figures and facts about suicide. Geneve: WHO 1999; Report No.: WHO/MNH/MBD/99.1.

[4] World Health Organization. Distribution of suicides rates (per 100 000) by gender and age, 2000. Geneva: WHO 2002; [updated 2002; cited 2008 March, 20]; http://www.who.int/mental_health/prevention/ suicide/suicide_rates_chart/en/index.html

[5] Shah A, Bhat R, McKenzie S, Koen C. Elderly suicide rates: cross-national comparisons and association with sex and elderly age-bands. Med Sci Law 2007; 47: 244-52.

[6] Lester D, Yang BJ. Microsocionomics *vs* macrosocionomics as a model for examining suicide. Psychol Rep 1991; 69: 735-8.

[7] World Health Organization. World report on violence and health. Geneva: World Health Organization 2002.

[8] Giles-Sims J, Lockhart C. Explaining cross-state differences in elderly suicide rates and identifying state-level public policy responses that reduce rates. Suicide Life Threat Behav 2006; 36: 694-708.

[9] Conwell Y, Duberstein PR, Caine ED. Risk factors for suicide in later life. Biol Psychiatry 2002; 52: 193-204.

[10] Beautrais AL. A case control study of suicide and attempted suicide in older adults. Suicide Life Threat Behav 2002; 32: 1-9.

[11] Suominen K, Isometsa E, Lonnqvist J. Elderly suicide attempters with depression are often diagnosed only after the attempt. Int J Geriatr Psychiatry 2004; 19: 35-40.

[12] Kasl-Godley JE, Gatz M, Fiske A. Depression and depressive symptoms in old age. In: Nordhus IH, Vanderbos GR, Fromholt P, Eds. Clinical Geropsychology. Washington, DC: American Psychological Association 1998; pp. 211-7.

[13] Salib E, Rahim S, El-Nimr G, Habeeb B. Elderly suicide: an analysis of coroner's inquests into two hundred cases in Cheshire 1989 - 2001. Med Sci Law 2005; 45: 71-80.

[14] Conwell Y, Rotenberg M, Caine ED. Completed suicide at age 50 and over. J Am Geriatr Soc 1990; 38: 640-4.

[15] Maki NE, Martikainen PT. Socioeconomic differences in suicide mortality by sex in Finland in 1971-2000: a register-based study of trends, levels, and life expectancy differences. Scand J Public Health 2007; 35: 387-95.

[16] Mackenbach JP, Kunst AE, Groenhof F, *et al.* Socioeconomic inequalities in mortality among women and among men: an international study. Am J Public Health 1999; 89: 1800-6.

[17] Lorant V, Kunst AE, Huisman M, Costa G, Mackenbach J. Socio-economic inequalities in suicide: a European comparative study. Br J Psychiatry 2005; 187: 49-54.

[18] Agerbo E, Nordentoft M, Mortensen PB. Familial, psychiatric, and socioeconomic risk factors for suicide in young people: nested case-control study. BMJ 2002; 325: 74.

[19] Gould MS, Fisher P, Parides M, Flory M, Shaffer D. Psychosocial risk factors of child and adolescent completed suicide. Arch Gen Psychiatry 1996; 53: 1155-62.

[20] Agerbo E, Mortensen PB, Eriksson T, Qin P, Westergaard-Nielsen N. Risk of suicide in relation to income level in people admitted to

hospital with mental illness: nested case-control study. BMJ 2001; 322: 334-5.
[21] Lewis G, Sloggett A. Suicide, deprivation, and unemployment: record linkage study. BMJ 1998; 317: 1283-6.
[22] Blakely TA, Collings SC, Atkinson J. Unemployment and suicide. Evidence for a causal association? J Epidemiol Commun Health 2003; 57: 594-600.
[23] Gunnell D, Lopatatzidis A, Dorling D, Wehner H, Southall H, Frankel S. Suicide and unemployment in young people. Analysis of trends in England and Wales, 1921-1995. Br J Psychiatry 1999; 175: 263-70.
[24] Kposowa AJ. Unemployment and suicide: a cohort analysis of social factors predicting suicide in the US National Longitudinal Mortality Study. Psychol Med 2001; 31: 127-38.
[25] Timonen M, Viilo K, Hakko H, Vaisanen E, Rasanen P, Sarkioja T. Risk of suicide related to income level in mental illness. Psychiatric disorders are more severe amount suicide victims of higher occupational level. BMJ 2001; 323: 232.
[26] Whitley E, Gunnell D, Dorling D, Smith GD. Ecological study of social fragmentation, poverty, and suicide. BMJ 1999; 319: 1034-7.
[27] Qin P, Agerbo E, Mortensen PB. Suicide risk in relation to socioeconomic, demographic, psychiatric, and familial factors: a national register-based study of all suicides in Denmark, 1981-1997. Am J Psychiatry 2003; 160: 765-72.
[28] Mortensen PB, Agerbo E, Erikson T, Qin P, Westergaard-Nielsen N. Psychiatric illness and risk factors for suicide in Denmark. Lancet 2000; 355: 9-12.
[29] Agerbo E, Qin P, Mortensen PB. Psychiatric illness, socioeconomic status, and marital status in people committing suicide: a matched case-sibling-control study. J Epidemiol Commun Health 2006; 60: 776-81.
[30] Kim MD, Hong SC, Lee SY, *et al.* Suicide risk in relation to social class: a national register-based study of adult suicides in Korea, 1999-2001. Int J Soc Psychiatry 2006; 52: 138-51.
[31] Chiu HF, Yip PS, Chi I, *et al.* Elderly suicide in Hong Kong--a case-controlled psychological autopsy study. Acta Psychiatr Scand 2004; 109: 299-305.
[32] Pompili M, Innamorati M, Masotti V, *et al.* Suicide in the elderly: a psychological autopsy study in a north Italy area (1994-2004). Am J Geriatr Psychiatr 2008; 16: 727-35.
[33] Berkman LF, Glass T, Brissette I, Seeman TE. From social integration to health: Durkheim in the new millennium. Soc Sci Med 2000; 51: 843-57.
[34] Congdon P. Suicide and parasuicide in London: a small-area study. Urban Stud 1996; 33: 137-58.
[35] Gunnell D, Shepherd M, Evans M. Are recent increases in deliberate self-harm associated with changes in socio-economic conditions? An ecological analysis of patterns of deliberate self-harm in bristol 1972-3 and 1995-6. Psychol Med 2000; 30: 1197-203.
[36] Cutright P, Fernquist RM. The culture of suicide through societal integration and religion: 1996-1998 Gender-specific suicide rates in 50 American states. Arch Suicide Res 2004; 8: 271-85.
[37] Fernquist RM, Cutright P. Societal integration and age-standardized suicide rates in 21 developed countries, 1955-1989. Soc Sci Res 1998; 27: 109-27.
[38] Hempstead K. The geography of self-injury: spatial patterns in attempted and completed suicide. Soc Sci Med 2006; 62: 3186-96.
[39] World Health Organization. World Health Statistics Annual. Geneva: WHO 1989.
[40] Martiello MA, Cipriani F, Voller F, Buiatti E, Giacchi M. The descriptive epidemiology of suicide in Tuscany, 1988-2002. Epidemiol Psichiatr Soc 2006; 15: 202-10.
[41] Hirsch JK. A review of the literature on rural suicide: risk and protective factors, incidence, and prevention. Crisis 2006; 27: 189-99.
[42] Yamasaki A, Araki S, Sakai R, Yokoyama K, Voorhees AS. Suicide mortality of young, middle-aged and elderly males and females in Japan for the years 1953-96: time series analysis for the effects of unemployment, female labour force, young and aged population, primary industry and population density. Ind Health 2008; 46: 541-9.
[43] Agbayewa MO, Marion SA, Wiggins S. Socioeconomic factors associated with suicide in elderly populations in British Columbia: an 11-year review. Can J Psychiatry 1998; 43: 829-36.
[44] Zimmerman SL. States' spending for public welfare and their suicide rates, 1960 to 1995: what is the problem? J Nerv Ment Dis 2002; 190: 349-60.
[45] Tondo L, Albert MJ, Baldessarini RJ. Suicide rates in relation to health care access in the United States: an ecological study. J Clin Psychiatry 2006; 67: 517-23.
[46] Rihmer Z, Rutz W, Barsi J. Suicide rate, prevalence of diagnosed depression and prevalence of working physicians in Hungary. Acta Psychiatr Scand 1993; 88: 391-4.
[47] Miller JR, Piper TM, Ahern J, *et al.* Income inequality and risk of suicide in New York City neighborhoods: a multilevel case-control study. Suicide Life Threat Behav 2005; 35: 448-59.
[48] Ferrada-Noli M. Social psychological *vs* socioeconomic hypotheses on the epidemiology of suicide: an empirical study. Psychol Rep 1996; 79: 707-10.
[49] Ferrada-Noli M. Social psychological variables in populations contrasted by income and suicide rate: Durkheim revisited. Psychol Rep 1997; 81: 307-16.
[50] Cantor CH, Slater PJ, Najman JM. Socioeconomic indices and suicide rate in Queensland. Aust J Public Health 1995; 19: 417-20.
[51] Araki S, Murata K. Factors affecting suicide in young, middle-aged and elderly men. J Biosoc Sci 1986; 18: 103-8.
[52] Shah A. The relationship between elderly suicide rates and the human development index: a cross-national study of secondary data from the World Health Organization and the United Nations. Int Psychogeriatr 2009; 21: 69-77.
[53] Wu WC, Bond MH. National differences in predictors of suicide among young and elderly citizens: linking societal predictors to psychological factors. Arch Suicide Res 2006; 10: 45-60.
[54] Inoue K, Tanii H, Fukunaga T, *et al.* A correlation between increases in suicide rates and increases in male unemployment rates in Mie prefecture, Japan. Ind Health 2007; 45: 177-80.
[55] Inoue K, Tanii H, Fukunaga T, *et al.* Significant correlation of yearly suicide rates with the rate of unemployment among men results in a rapid increase of suicide in Mie Prefecture, Japan. Psychiatry Clin Neurosci 2006; 60: 781-2.
[56] Yamasaki A, Sakai R, Shirakawa T. Low income, unemployment, and suicide mortality rates for middle-age persons in Japan. Psychol Rep 2005; 96: 337-48.
[57] Reed JA, Smith RS, Helmer SD, Lancaster BA, Carman CG. Rates of unemployment and penetrating trauma are correlated. South Med J 2003; 96: 772-4.
[58] Shah A. Possible relationship of elderly suicide rates with unemployment in society: a cross-national study. Psychol Rep 2008; 102: 398-400.
[59] Gunnell D, Middleton N, Whitley E, Dorling D, Frankel S. Why are suicide rates rising in young men but falling in the elderly?-- a time-series analysis of trends in England and Wales 1950-1998. Soc Sci Med 2003; 57: 595-611.
[60] Chang SS, Gunnell D, Sterne JA, Lu TH, Cheng AT. Was the economic crisis 1997-1998 responsible for rising suicide rates in East/Southeast Asia? A time-trend analysis for Japan, Hong Kong, South Korea, Taiwan, Singapore and Thailand. Soc Sci Med 2009; 68: 1322-31.
[61] Gavrilova NS, Semyonova VG, Evdokushkina GN, Gavrilov LA. The response of violent mortality to economic crisis in Russia. Popul Res Policy Rev 2000; 19: 397-419.
[62] Charlton J. Trends and patterns in suicide in England and Wales. Int J Epidemiol 1995; 24(Suppl 1): S45-52.
[63] Saunderson TR, Langford IH. A study of the geographical distribution of suicide rates in England and Wales 1989-92 using empirical bayes estimates. Soc Sci Med 1996; 43: 489-502.
[64] Hughes HW, Keady J. The Strategy for Action on Farmers' Emotions (SAFE): working to address the mental health needs of the farming community. J Psychiatr Ment Health Nurs 1996; 3: 21-8.
[65] Parron T, Hernandez AF, Villanueva E. Increased risk of suicide with exposure to pesticides in an intensive agricultural area. A 12-year retrospective study. Forensic Sci Int 1996; 79: 53-63.
[66] Shah A. A cross-national study of the relationship between elderly suicide rates and urbaninzation. Suicide Life Threat Behav 2008; 38: 714-9.
[67] Stack S. The effect of modernization on suicide in Finland: 1800-1984. Sociol Perspect 1993; 36: 137-48.

[68] Stack S. Suicide: a 15-year review of the sociological literature. Part II: modernization and social integration perspectives. Suicide Life Threat Behav 2000; 30: 163-76.
[69] Qin P. Suicide risk in relation to level of urbanicity--a population-based linkage study. Int J Epidemiol 2005; 34: 846-52.
[70] Isometsa E, Heikkinen M, Henriksson M, Marttunen M, Aro H, Lonnqvist J. Differences between urban and rural suicides. Acta Psychiatr Scand 1997; 95: 297-305.
[71] Shah A, Bhat R. Are elderly suicide rates improved by increased provision of mental health service resources? A cross-national study. Int Psychogeriatr 2008; 20: 1230-7.
[72] Lodhi LM, Shah A. Factors associated with the recent decline in suicide rates in the elderly in England and Wales, 1985-1998. Med Sci Law 2005; 45: 31-8.
[73] Shah A, Padayatchi M, Das K. The relationship between elderly suicide rates and elderly dependency ratios: a cross-national study using data from the WHO data bank. Int Psychogeriatr 2008; 20: 596-604.
[74] Shah A, Bhat R. The relationship between elderly suicide rates and mental health funding, service provision and national policy: a cross-national study. Int Psychogeriatr 2008; 20: 605-15.
[75] Breault KD. Was Durkheim right? A critical survey of the empirical literature on Le Suicide. In: Lester D, Ed. Emile Durkheim: Le Suicide one hundred years later. Philadelphia: Charles Press 1994; pp. 11-29.

Received: April 8, 2009 Revised: May 6, 2009 Accepted: May 8, 2009