explanations for this. It is possible that the 65–74 age group, due to better physical health and mobility, were more able to turn to alternative methods than the 75+ group; the older group would be more likely to have been in physical pain and hence have access to more medication; and, despite a number of initiatives, the health of older adults is still largely neglected, and this may be more apparent as they reach the age of 75+. In addition, their prescriptions may not be being monitored correctly, giving them more opportunity to die by overdose.

The reduction in rates for suicide by "non-opiod analgesics, antipyretics and antiheumatics" in elderly women in both age bands are contrary to those previously observed (Lindesay, 1986; Nowers and Irish, 1988; Shah and De, 1998). A number of studies have found that the decline in suicides by barbiturates was partially offset by an increase in the number of suicides by non-opiate analgesics (Lindesay, 1986; Nowers and Irish, 1988; Dennis, 1995; Shah and De, 1998), especially among older women (Nowers and Irish, 1988; Shah and De, 1998). This decline among elderly women, and the lack of an increase among elderly men, is therefore encouraging.

The availability of method is an important factor in suicide (Kelly and Bunting, 1998), and for elderly people it is relatively easy to stockpile medication, requiring little physical effort. The evidence for the fall in suicides by barbiturates indicates that removal of means is an effective preventative strategy in the elderly, and that more careful prescribing practices could lead to a lower suicide rate in this age group. In light of the results of this study, it must be recognized that different methods of suicide by drug poisoning show declines in different elderly age and sex bands, and hence there is a need to aim particular preventative strategies at these different groups.

Acknowledgments

We are grateful to the University of Central Lancashire for funding LB as a student intern to conduct this research.

References

Cattell, H. R. and Jolley, D. (1995). One hundred cases of suicide in elderly people. *British Journal of Psychiatry*, 166, 451–457.

Dennis, M. and Lindesay, J. (1995). Suicide in the elderly: the United Kingdom perspective. *International Psychogeriatrics*, 7, 263–274.

Kelly, S. and Bunting, J. (1998). Trends in suicide in England and Wales, 1982–1996. *Population Trends*, 92, 29–41.

Lindesay, J. (1986). Trends in self-poisoning in the elderly 1974–1983. *International Journal of Geriatric Psychiatry*, 1, 37–43.

Lindesay, J. (1991). Suicide in the elderly. *International Journal of Geriatric Psychiatry*, 6, 355–361.

Nowers, M. and Irish, M. (1988). Trends in the reported rates of suicide by self-poisoning in the elderly. *Journal of the Royal College of General Practitioners*, 38, 67–69.

Shah, A. K. (2007). Elderly suicide rates in the United Kingdom: trends from 1979 to 2002. *Medicine, Science and the Law*, 47, 56–60.

Shah, A. K. and De, T. (1998). Suicide in the elderly. *International Journal of Psychiatry in Clinical Practice*, 2, 3–17.

Tadros, G. and Salib, E. (2000). Age and methods of fatal self-harm (FSH). Is there a link? *International Journal of Geriatric Psychiatry*, 15, 848–852.

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doi:10.1017/S1041610209991451

A replication of the curvilinear relationship between population growth and elderly suicide rates in a cross-national study

A curvilinear (U-shaped) relationship between population growth rates and elderly suicide rates fitting the quadratic equation $y = a + bx + cx^2$ (where y is the elderly suicide rate, x is the population growth rate and a, b and c are constants) has been reported (Shah, 2009a). A theoretical model with three sequential stages incorporating population growth, elderly population size, the proportion of elderly in the general population, life expectancy and birth rates has been proposed to explain the findings (Shah, 2009a).

An identical curvilinear relationship was also observed between "predicted" future population growth rates and elderly suicides (Shah, 2009b). As "predicted" future population growth, which has not yet occurred, cannot directly explain an increase in suicide rates, the accuracy of the curvilinear relationship between population growth and elderly suicide rates has been questioned (Shah, 2009b). The "predicted" future population growth rate may

Table 1. Curve estimation regression models for the relationship between elderly suicide rates and the average annual population growth rate

	R^2	DEGREES OF FREEDOM	F	SIGNIFICANCE VALUE	REGRESSION EQUATION
Males 65–74 years	0.37	82	24.37	$p < 0.0001$	$y = 38.01 - 23.20x + 3.97x^2$
Males 75+ years	0.26	82	14.46	$p < 0.0001$	$y = 52.36 - 22.53x + 1.07x^2$
Females 65–74 years	0.32	82	19.51	$p < 0.0001$	$y = 9.75 - 4.97x + 0.36x^2$
Females 75+ years	0.20	82	10.52	$p < 0.0001$	$y = 13.99 - 7.42x + 0.78x^2$

y = Suicide rates.
x = Average annual population growth rate.

be a proxy measure for other correlates of elderly suicides or other variables may predict both elderly suicide rates and the future population growth rates (Shah, 2009b). An additional source of bias in the previous study was that only one-year cross-sectional data on elderly suicide rates were used because suicide rates can randomly fluctuate year on year (Shah and Coupe, 2009). Therefore, a study designed to replicate the curvilinear relationship between population growth and elderly suicide rates was undertaken: (i) using a one-year average of five years of data on suicide rates; and (ii) using more recent data on both elderly suicide rates and population growth than used in the previous study.

Data on elderly suicide rates for males and females in the age-bands 65–74 years and 75+ years were ascertained from the World Health Organization (WHO) website (http://www.who.int/whosis/database/mort/table1.cfm). For a small number of countries only the raw figures for the number of suicides were available from the WHO website. Suicide rates for these countries were calculated by dividing the number of reported suicides by the population size in the relevant age-band and sex group available on the same website. Data were ascertained for the latest five consecutive years. The one-year average suicide rate was calculated by dividing the sum of suicide rates for the latest five consecutive years by five. The median (range) for the latest year for the suicide rate data was 2005 (1983–2007). Data on the average annual population growth were also ascertained from the WHO website (http://www.who.int/countries/afg/en/) and were for the year 2006.

Curve estimation regression models were used to examine the curvilnear relationship between elderly suicide rates and the average annual population growth fitting the quadratic equation $y = a + bx + cx^2$ (as defined above).

A full dataset for elderly suicide rates and all the other measured variables was available for 85 countries. Table 1 illustrates the curve estimation regression models, whereby the relationship between suicide rates in both sexes in both the elderly age-bands and the average annual population growth rates was curvilinear (U-shaped curve) and fitted the quadratic equation $y = a + bx + cx^2$.

The significant curvilinear (U-shaped curve) relationship between suicide rates and average annual population growth rates in both sexes in both elderly age-bands, using the one-year average of five years of data on suicide rates and the latest available data set (different from the earlier study), confirmed the findings of the earlier study using only one-year cross-sectional data on suicide rates. This suggests that this relationship is robust and accurate.

References

Shah, A. K. (2009a). The relationship between population growth and elderly suicide rates: a cross-national study. *International Psychogeriatrics*, 21, 379–383.

Shah, A. K. (2009b). The relationship between annual predicted future growth rate and elderly suicide rates. *International Psychogeriatrics*, 21, 414–415.

Shah, A. K. and Coupe, J. (2009). A comparative study of elderly suicides in England and Wales, Scotland and Northern Ireland: trends over time and age-associated trends. *International Psychogeriatrics*, 21, 581–587.

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https://doi.org/10.1017/S1041610209991451 Published online by Cambridge University Press