with attempted suicide are more likely to be treated either in accident and emergency departments or on general medical wards before transfer to OAP units. Finally, a causal relationship between elderly suicide rates and provision of mental health services and its direction cannot be inferred from this cross-sectional ecological study.

**Conflict of interest**

None.

**References**


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The relationship between elderly suicide rates and smoking in England and Wales

Completed suicides have been shown to be associated with smoking cigarettes in cohort studies of mainly female registered nurses in the U.S.A. (Hemenway et al., 1993), both sexes in the Finnish general population (Tanskanen et al., 2000), male army recruits in the U.S.A. (Miller et al., 2000a), males in the U.S. general population (Davey Smith et al., 1992), army recruits in Sweden (Hemmingsson and Kriebel, 2003), males
aged 40–69 years in the general population in Japan (Iwasaki et al., 2005), and the elderly in a retirement community in the U.S.A. (Ross et al., 1990). Also, a Swiss case-control study of army recruits reported similar findings (Angst and Clayton, 1998). Additionally, positive correlation between prevalence rates of smoking and both general population (Shah and Bhandarkar, 2008) and elderly (Shah, 2008) male suicide rates has been observed in large cross-national ecological studies. This relationship between completed suicides and smoking was “dose-dependent” (Hemenway et al., 1993; Tanskanen et al., 2000; Miller et al., 2000a; Davey Smith et al., 1992; Hemmingsson and Kriebel, 2003; Iwasaki et al., 2005). Moreover, this relationship was maintained in some studies after controlling for confounding variables including demographic characteristics, socioeconomic characteristics, levels of alcohol consumption, psychiatric symptoms and physical health (Tanskanen et al., 2000; Miller et al., 2000a), but disappeared in other studies (Hemmingsson and Kriebel, 2003; Shah, 2008; Shah and Bhandarkar, 2008).

The relationship between smoking and completed suicides has mainly been examined in cohort or case-control studies at an individual-level in younger subjects, and there is a paucity of studies examining this relationship in the elderly. Therefore, the relationship between elderly suicide rates and the prevalence of smoking in England and Wales was examined.

Data on elderly suicide rates for males and females in the age-bands 65–74 years and 75+ years for England and Wales were ascertained from the World Health Organization website (http://www.who.int/whosis/database/mort/table1.cfm) for the 23-year period 1979 to 2001.

Data on the prevalence of smoking in England for the general population and those over the age of 60 years in males and females were ascertained from the Office of National Statistics for every alternate year between 1978 and 2000 and for the year 2001. These data on the prevalence of smoking were derived from serial General Household Surveys in England between 1978 and 2002.

The relationship between suicide rates in both elderly age-bands in both sexes and the prevalence of smoking in the general population and in those over the age of 60 years in the general population for males, females and both sexes combined was examined using Spearman’s correlation coefficient ($\rho$).

Data on elderly suicide rates and the prevalence of smoking were available for 10 separate years (nine of the alternate years between 1978 and 2000 and for the year 2001). Table 1 illustrates that there were significant positive correlations between suicide rates in both elderly age-bands in both sexes and the prevalence of smoking in the general population and in those over the age of 60 years in the general population for males, females and both sexes combined. There may be several possible explanations for these findings including methodological issues. Data on suicide rates were for England and Wales, whereas data on the prevalence of smoking were for only England. However, it is unlikely that the suicide rates for England and Wales were significantly influenced by the suicide rates for Wales as the population size of Wales is significantly smaller than that of England. The positive correlations may have

### Table 1. Correlations between elderly suicide rates and prevalence of smoking

<table>
<thead>
<tr>
<th>PREVALENCE OF SMOKING</th>
<th>SUICIDE RATES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MALES 65–74 YEARS</td>
</tr>
<tr>
<td>General population both sexes combined</td>
<td>$\rho = +0.92$</td>
</tr>
<tr>
<td>General population males</td>
<td>$\rho = +0.94$</td>
</tr>
<tr>
<td>General population females</td>
<td>$\rho = +0.89$</td>
</tr>
<tr>
<td>Those aged 60+ years, both sexes combined</td>
<td>$\rho = +0.97$</td>
</tr>
<tr>
<td>Those aged 60+ years, males</td>
<td>$\rho = +0.95$</td>
</tr>
<tr>
<td>Those aged 60+ years, females</td>
<td>$\rho = +0.89$</td>
</tr>
</tbody>
</table>

- $\rho < 0.0001$
- $P < 0.0001$
- $P < 0.0001$
- $P < 0.0001$
been spurious due to type 2 statistical errors because there were only a small number of data points (N = 10). Other confounding variables may independently influence the trends over time in both elderly suicide rates and the prevalence of smoking, leading to a spurious correlation between these two variables (epiphenomena). However, as noted above, this relationship was maintained in some previous studies after controlling for confounding variables including demographic characteristics, socioeconomic characteristics, levels of alcohol consumption, psychiatric symptoms and physical health (Tanskanen et al., 2000; Miller et al., 2000a). Such confounding variables were not examined in this study.

The positive correlations between suicide rates in both elderly age-bands in both sexes and the prevalence of smoking in the general population and in those over the age of 60 years in the general population for males, females and both sexes combined were consistent with the previously observed relationship between smoking and completed suicides in cohort and case-control studies at an individual-level in younger subjects, a cohort study of the elderly in a retirement community in the U.S.A. (Ross et al., 1990), and general population (Shah and Bhandarkar, 2008) and elderly (Shah, 2008) male suicide rates in large cross-national ecological studies. Thus, the findings of the current study may be genuine.

There has been much debate about the possible causal link between smoking and completed suicides (Davey Smith et al., 1992; Sheikh, 2000; Miller et al., 2000b). A number of potential explanations have been proposed. First, there may be a causal link between smoking and depressive illness (Hemenway et al., 1993; Tanskanen et al., 2000). This may be mediated through the central effects of nicotine (Tanskanen et al., 2000). Japanese suicide victims with a history of smoking had higher levels of nicotine and cotinine in their blood and urine (Moriya and Hashimoto, 2005; Moriya et al., 2006); the authors speculated that there may be a marked increase in smoking among habitual smokers before committing suicide. Second, depressed smokers may find it particularly difficult to quit smoking (Hemenway et al., 1993; Sheikh, 2000). Third, other factors, including low self-esteem (Hemenway et al., 1993) and alcohol and substance misuse (Phillips, 1992), may predispose to both smoking and suicide. Fourth, depressed patients may have a higher prevalence of smoking (Sheikh, 2000). Fifth, smoking and suicide may be linked to other disorders like cancer (Hemenway et al., 1993; Sheikh, 2000); occult carcinomas may clinically present with depressive illness (Shah and De, 1998), and occult carcinomas have been discovered at post mortem in elderly suicide victims (Catell, 1988). Finally, smoking may directly enhance suicidal behavior. There is evidence of serotonergic hypofunction in psychiatric patients with lethal suicidal behavior (Mann and Malone, 1997), and an inverse relationship between smoking and indices of serotonin function has been observed in psychiatric patients with depressive illness (Malone et al., 2003).

Caution should be exercised in attributing a causal relationship and the direction of causality from this cross-sectional ecological study due to ecological fallacy. Nevertheless, the observed relationship between elderly suicide rates and smoking suggests that there is a need to confirm this relationship in the elderly in individual-level case-control or cohort studies. If such a relationship is confirmed then there will be a need to examine the explanatory mechanisms for this relationship.

Conflict of interest

None.

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