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Sociodemographic and gender determinants of late-life suicide in users and non-users of antidepressants

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Background: The treatment of depression is a main strategy for suicide prevention in older adults. Our aim was to examine factors related to suicide in older adults (75+) with and without antidepressant (AD) therapy. **Methods:** A national population-based register study, including all Swedish residents aged ≥75 years between 2006 and 2014 ($N = 1\,413\,806$). A nested case–control design was used to investigate sociodemographic factors associated with suicide among users and non-users of ADs. Risk estimates were calculated in adjusted conditional logistic regression models for the entire cohort and by gender. **Results:** In all, 1305 individuals died by suicide (70% men). The suicide rate in men who used ADs was over four times higher than women with such treatment. Being unmarried was a risk factor for suicide in men but not in women. Being born outside of Nordic countries was associated with increased suicide risk; a 3-fold risk increase was observed in non-Nordic women without AD treatment. Lower suicide risk was observed in blue-collar women who used ADs, whereas a higher risk was found in blue-collar men who did not. **Conclusions:** Our differential findings on factors associated with suicide can offer clues for gender-specific preventive strategies that go beyond the healthcare sphere.

Introduction

Adults aged 75 and over have high suicide rates compared with younger age groups.[1] At the same time, there is a lack of research focusing specifically on the oldest age group.[2] 'Late-life' studies tend to include a wide age range, in some cases starting at age 50.[3,4] Also, older people are more likely than younger persons to die on their first suicide attempt,[5] and prospective studies that focus on suicide outcomes in the 75+ age group are sorely needed.

Depression is considered a major contributing factor for the development of suicidal behaviour in older adults.[6] It has been estimated that three quarters of all late-life suicides may be prevented if depression could be successfully treated.[7] Therefore, the identification and subsequent treatment of late-life depression is considered a major suicide prevention strategy.[8] Antidepressants (ADs) have been associated with decreased suicide risk in late-life.[9] However, despite their widespread use in this age group,[10] suicide rates remain high in the oldest population.[11] Therefore, a better knowledge of factors associated with suicide among older adults with and without AD treatment will help to inform and tailor suicide prevention efforts. Gender-specific data are essential in this connection. Older adult women consume more ADs and show better adherence to suicide preventive programmes,[8] yet suicide rates are far higher in men in this age group.[12]

The availability of high-quality national registers in Sweden makes it possible to examine phenomena associated with suicide in relation to AD use. We recently applied this approach to a study of older adults with newly initiated AD treatment.[13] That study provided risk estimates for new users of AD only, but the size of the cohort was a limitation in terms of testing for some potential associations with suicide. For instance, in that study, we showed increased risk of non-fatal suicidal behaviour in women (but not men) born outside of Nordic countries.[13] Given changes in migration patterns in recent years,[14] as well as the paucity of up-to-date research on suicide in the older adults born in foreign countries, we aimed to investigate risk estimates for the total 75 and over population. We hypothesized that we would find a gender differential with pronounced risk of suicide in foreign-born women, especially among those who were not treated for depression. Our new user study also suggested a gender differential with regard to previous occupational status.[13] Women who had upper white-collar jobs had an increased risk of non-fatal suicidal behaviours. Again, the size of the cohort made it difficult to draw conclusions regarding suicide. Thus, we hypothesized that we would see increased risk of suicide in upper white-collar women in a total population cohort, and that this risk would be particularly elevated among women who were on ADs.

The aims of the current study were to examine sociodemographic factors associated with suicide in a total national cohort of Swedish residents aged 75+, with and without exposure to ADs and also to carry out gender-specific analyses. The latter is important considering the large difference between suicide rates in older men and women, and the current dearth of gender-specific findings in late-life suicide.[2]

Methods

Study design and study population

We conducted a population-based register study including all Swedish residents aged 75 and over between 1 January 2006 and 30 June 2014. For inclusion, individuals were required to be registered residents during the year prior to cohort entry. Users of ADs were followed from the date of first AD purchase during the study period (index date). All were followed until 31 December 2014, or until migration or death, whichever occurred first.

Exposure to ADs

We first identified individuals with ≥1 purchase of an AD during the study period. To investigate the factors associated with suicide, a person with a prescription fill for ≥1 AD in the past 180 days was classified as an AD user. The 180-day period was chosen as a conservative duration since patients in Sweden can purchase 3 month's supply at each fill. For persons with multidose prescriptions, a period of 30 days was considered sufficient as these prescriptions are in most cases automatically renewed every 14 days. To minimize the issue of indication bias, persons taking exclusively tricyclic ADs were excluded from the group analyses as these medications are primarily prescribed to older adults for pain conditions in Sweden.

Data sources

Data from national registers were merged through the personal identity number. Statistics Sweden replaced that number with a random serial number after the final data linkage. The Swedish Prescribed Drug Register was employed to identify users of ADs. The National Patient Register, which includes all specialized healthcare contacts in inpatient and outpatient care, was used to identify individuals with a previous episode of non-fatal self-harm. Suicide deaths were determined by the Cause of Death Register. Sociodemographic data were collected from the longitudinal integration database for health insurance and labour market studies and the Total Population Register. Older persons residing in institutions were identified by the National Care and Social Service database.

Study outcome

Persons who died by suicide were identified based on the International Classification of Disease (ICD)-10: Intentional self-harm (X60–X84) and harm of undetermined intent (Y10–Y34), as well as sequelae of intentional self-harm (Y87.0) and of events of undetermined intent (Y87.2).

Sociodemographic characteristics

In the nested-control design, data for each individual were extracted for the year preceding the matching time. Sociodemographic characteristics included gender, age group, marital status, annual disposable household income, social allowance, country of birth, residence in institution, education level and occupation category at retirement.

Statistical analysis

A nested case–control design was used to investigate the factors associated with suicide in the total cohort and among users and non-users of ADs separately. Each person who died by suicide was matched with 50 living individuals of the same gender and age group. These controls were randomly selected within the appropriate risk sets at the time when the case died by suicide. The nested case–control data were analyzed using conditional logistic regression with each case and its controls forming a separate stratum. In order to minimize the risk of misclassification, we considered the date of suicide to define the exposure to AD status in the regression analysis rather than the index date of purchase of ADs. All sociodemographic variables were included in the univariate and the adjusted models.

We also included in the adjusted models: the concomitant use of other psychoactive medications, episode of non-fatal self-harm during the preceding year and use of specialized psychiatric care as a proxy for more serious mental disorder. Gender interaction was incorporated into the model. Owing to the rarity of suicide, estimated odds ratios may be considered incidence rate ratios (IRRs).[15] *P* values and 95% confidence intervals (CIs) were also reported. All analyses were then stratified by gender. A sensitivity analysis was performed excluding residents in institutions. Data analyses were performed by SAS version 9.4 (SAS Institute Inc, NC, USA).

No patients were recruited for this study as it was based solely on national register data. All data were matched by Statistics Sweden and analyzed anonymously. The study was approved by the Regional Ethical Review Board in Gothenburg (no: 111-15) in accordance with national regulations.

Results

In all, 1 413 806 individuals aged 75 years and over were included in the study. The mean age of the total cohort was 80.5 years (range 75–112 years) and half were married. Most were born in Sweden and very few received social benefits. About one-fourth were exposed to at least one AD during the study period (table 1). Users of ADs had a higher proportion of widows/widowers, and a lower mean income compared with non-users. The relative proportion of AD users was high in residents in institutions and among users of anti-dementia drugs (Supplementary material S1).

Suicide rates

Overall, 1305 persons (907 men and 398 women) died by suicide during the 8-year study period. There were 70.2 suicides per 100 000 person-years in AD users (146 per 100 000 person-years in men and 35 per 100 000 person-years in women) and 13.4 per 100 000 in the AD non-users (23 per 100 000 person-years in men and 6 per 100 000 person-years in women).

Suicide methods

Hanging was the most common method in men both with and without AD use (figure 1). Firearms were used in one quarter of the men without AD treatment, a proportion twice that observed among men using ADs. Poisoning was the most commonly employed method in women both with and without AD use.

Factors associated with suicide

In the total cohort

In the total cohort, age 80 or over was protective factors for suicide (figure 2 and Supplementary material S2). Lower risk for suicide was also associated with residence in institution (IRR = 0.22, 95% CI 0.15–0.31), and with upper secondary education compared with mandatory education (IRR = 0.82, 0.70–0.97). Suicide risk was, however, higher in the unmarried. The risk was also higher in those born outside of Nordic countries (IRR = 1.47, 1.12–1.93).

In AD users and non-users

In AD users, older age (≥80 years) and residence in institution were associated with lower risk for suicide (figure 2 and Supplementary material S2).

In AD non-users, increased suicide risk was seen in the 80–84 years olds (IRR = 1.52, 1.03–2.25), in those born in a non-Nordic country (IRR = 1.50, 1.04–2.16) and in those who were blue-collar workers before retirement (IRR = 1.36, 1.05–1.77).

Table 1 Characteristics of Swedish older residents aged ≥75 years between 2006 and 2014 ($N = 1\,413\,806$) and of ADs users and non-users

Characteristics	All 75+ (%) ($N = 1\,413\,806$)	Non-users of AD (%) ($N = 1\,004\,641$)	AD users (%) ($N = 373\,661$)	*P* value
Age (years): mean (SD), median	80.5 (6), 79	79.8 (5.9), 77	82.5 (5.9), 82	<0.0001[a]
Age range	75–114	75–112	75–114	
Age category				
75–79	765 950 (54)	605 939 (60)	139 170 (37)	<0.0001[c]
80–84	287 801 (20)	182 111 (18)	98 143 (26)	
85–89	220 091 (16)	130 342 (13)	84 983 (23)	
≥90	139 964 (10)	86 249 (9)	51 365 (14)	
Women	817 154 (58)	542 276 (54)	250 565 (67)	<0.0001[b]
Marital status				
Married/registered partnership	662 638 (47)	504 017 (50)	141 975 (38)	<0.0001[c]
Single	101 574 (7)	76 602 (8)	22 758 (6)	
Widow/widower	470 105 (33)	297 637 (30)	160 515 (43)	
Divorced	174 408 (12)	121 684 (12)	48 103 (13)	
Missing	5081 (0.4)	4701 (0.5)	310 (0.1)	
Country of birth				
Sweden	1 262 287 (89)	891 896 (89)	338 922 (91)	<0.0001[c]
Nordic countries except Sweden	70 472 (5)	51 701 (5)	16 736 (5)	
Other	81 047 (6)	61 044 (6)	18 003 (5)	
Income category, *n* (%)				
Q1	352 593 (25)	261 037 (26)	81 505 (22)	<0.0001[c]
Q2–Q3	706 761 (50)	482 813 (48)	205 932 (55)	
Q4	354 452 (25)	260 791 (26)	86 224 (23)	
Social allowance	8082 (0.6)	5944 (0.6)	1929 (0.5)	<0.0001[b]
Residence in institution	120 949 (9)	39 310 (4)	79 797 (21)	<0.0001[b]
Previous episode of self-harm	1952 (0.1)	400 (0.04)	1524 (0.4)	<0.0001[b]
Highest level of education				
Mandatory education	715 024 (51)	495 323 (49)	201 397 (54)	<0.0001[c]
Upper secondary school	315 145 (22)	220 776 (22)	85 758 (23)	
Higher education	298 434 (21)	223 028 (22)	68 438 (18)	
Last known occupation				
Upper white collar worker	318 624 (26)	238 184 (24)	72 969 (20)	<0.0001[c]
Lower white collar worker	176 836 (13)	120 495 (12)	51 504 (14)	
Blue collar worker	643 749 (46)	453 871 (45)	173 518 (46)	
Other	78 195 (6)	59 181 (6)	17 394 (5)	
Missing	196 402 (14)	132 910 (13)	58 276 (16)	
Specialized psychiatric care	26 395 (2)	7406 (0.7)	18 075 (5)	<0.0001[b]

In total, 35 504 persons taking tricyclic ADs and no other type of AD were excluded.
SD, standard deviation.
a: The Student's *t* test for comparison between ADs users and non-users.
b: The χ^2 test for dichotomous variable to establish if there are differences between users and non-users.
c: The χ^2 test for variables with multiple categories to test for differences across categories.

Gender-stratified analyses

Differences unfolded in the gender-stratified analyses (figure 3 and Supplementary material S3). In men, suicide risk was higher in those who were unmarried, in the total cohort and in both users and non-users of ADs. In the total cohort of women, a 2-fold increase in suicide risk was seen in women who were born outside of Nordic countries (IRR = 2.11, 1.34–3.33). Risk was further elevated in women born outside of Nordic countries who did not use ADs (IRR = 3.50, 1.91–6.41).

Being a blue-collar worker before retirement had a differential effect between genders and when considering the AD use. In men who did not use ADs, having had a blue-collar job was associated with increased suicide risk (IRR = 1.51, 1.13–2.02). In women who used ADs, having had a blue-collar job was protective; suicide risk was only half that of those having had upper white-collar positions (IRR = 0.56, 0.34–0.92).

The results of the sensitivity analyses excluding residents in institution were similar to the main analyses (Supplementary material S4).

Discussion

In this national cohort of persons aged 75+, being unmarried was a risk factor for suicide in men in both AD users and non-users, whereas such associations were not seen in women. Suicide risk was elevated 3-fold in women without AD treatment who were born outside of Nordic countries. Regarding occupational history, lower suicide risk was observed in blue-collar women who used ADs and higher risk in blue-collar men who did not.

Regarding marital status, one partial explanation of our finding of a differential association with suicide may be that the oldest men lacking partners may be more prone to social isolation,[16] and loneliness. Another issue might be the interaction of male stereotypes (being strong and stoical) and mental illness stereotypes, leading to the exacerbation of the effect of stigma on seeking mental health services.[17] The vast gender differential was also found in the group with AD treatment. Therefore, primary, mental health care and social workers need strategies not only to reach depressed older men but also to ensure that the unmet needs of these men are recognized and treated. Representations of the oldest men in information folders and websites may be an initiative to increase their identification. Healthcare centres for older men might be another initiative, in line with centres developed specifically for young men. For depressed older men, there could be a focus on not only on adherence and response to AD treatment,[18] but also on psychosocial strategies to decrease isolation and provide a sense of self-worth and capability also in the context of functional decline.

Although it is known that immigrant populations present a higher risk of suicide compared with native populations,[19] we could identify no total population studies providing suicide risk estimates for men and women in the oldest segment of the population. A Swedish

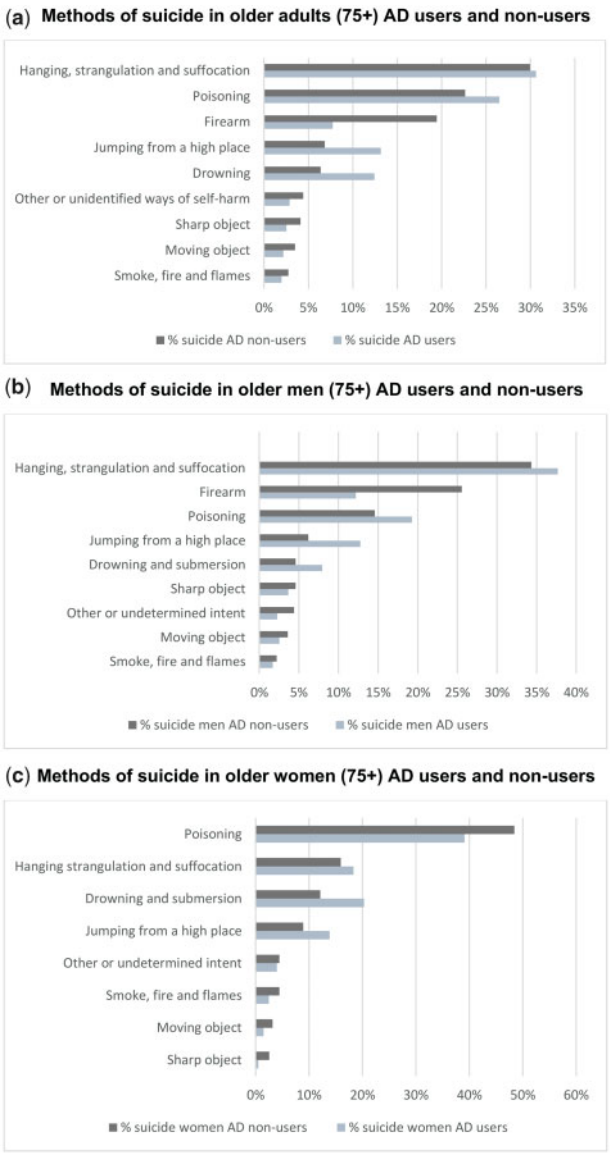

Figure 1 Methods of suicide in Swedish older adults aged ≥75 years with and without AD treatment and by gender

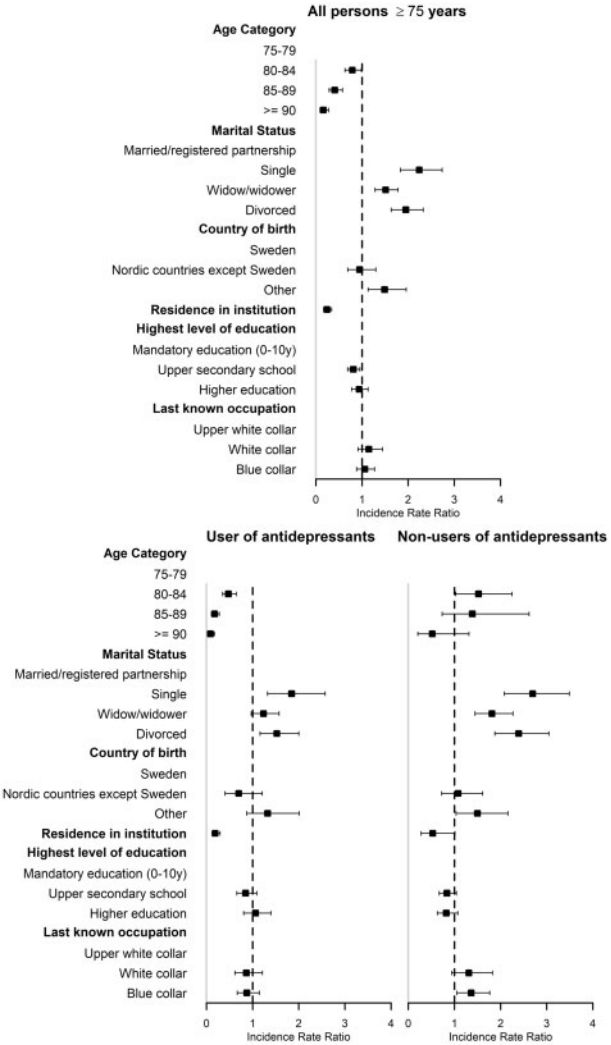

Figure 2 Factors associated with suicide in Swedish older adults aged ≥75 years and in ADs users and non-users. The regression models were adjusted for age, country of birth, marital status, highest level of education, last registered occupation, monthly individual disposable income, use of specialized psychiatric care, use of other psychoactive medications, residence in institution and previous non-fatal self-harm

study conducted in the 90s demonstrated increased suicide risk in persons born in Eastern Europe or Finland.[20] Recent years have brought a changing pattern of migration in Sweden, mainly due to inflow from countries outside Europe, and brought on by violence and war.[21] Exposure to war, poverty and the migration process, compounded by social and financial adversity, underuse of healthcare services and discrimination, may all contribute to elevated mental ill health in immigrants.[22] In our study, the increased suicide risk among non-users of ADs born in a non-Nordic country compared with those born in Sweden may indicate untreated depression among this group. Research conducted among younger age groups has found that the proportion of untreated mental health problems is higher among immigrants compared with the rest of the population.[23] The prevalence of depression is higher among aging immigrants across a range of European countries.[24] Further, immigrants born outside of Europe have a lower consumption of ADs compared with the native populations.[25]

The gender-stratified analyses revealed a significantly heightened suicide risk in the oldest women born in non-Nordic countries, in particular, among those not treated with ADs. Previous research conducted among younger age groups has shown that, although immigrant women may suffer serious mental illnesses, they do not seek or receive adequate mental healthcare.[26] Substantial barriers that may limit access to mental health care in immigrant women include language insufficiency due to lower level of education compared with male immigrants,[27] ethno-cultural prohibitions on exposing personal or family matters to outsiders[28] and social stigma related to female psychological disorders.[29] The particularly elevated suicide risk in the older women born outside of Nordic countries, in particular, those not treated for depression indicates a need for innovative public health interventions to understand their perceptions of mental health care, in order to reach them. The potential heterogeneity of the socioeconomic conditions, duration of migration and country of origin of old immigrants warrants more research to better elucidate associations with suicide.

There was a complex pattern of associations regarding occupational history and suicide when considering ADs use and gender. Although a higher suicide risk was found in the total cohort among blue-collar workers not treated with ADs, a mixed trend was found in the gender-stratified analyses. The oldest women treated for depression and who have had higher positions before retirement had an increased suicide risk in late life. This group of women may constitute a selected group since higher leadership positions were difficult to reach for women born in the 1930s and 1940s.[30] Women

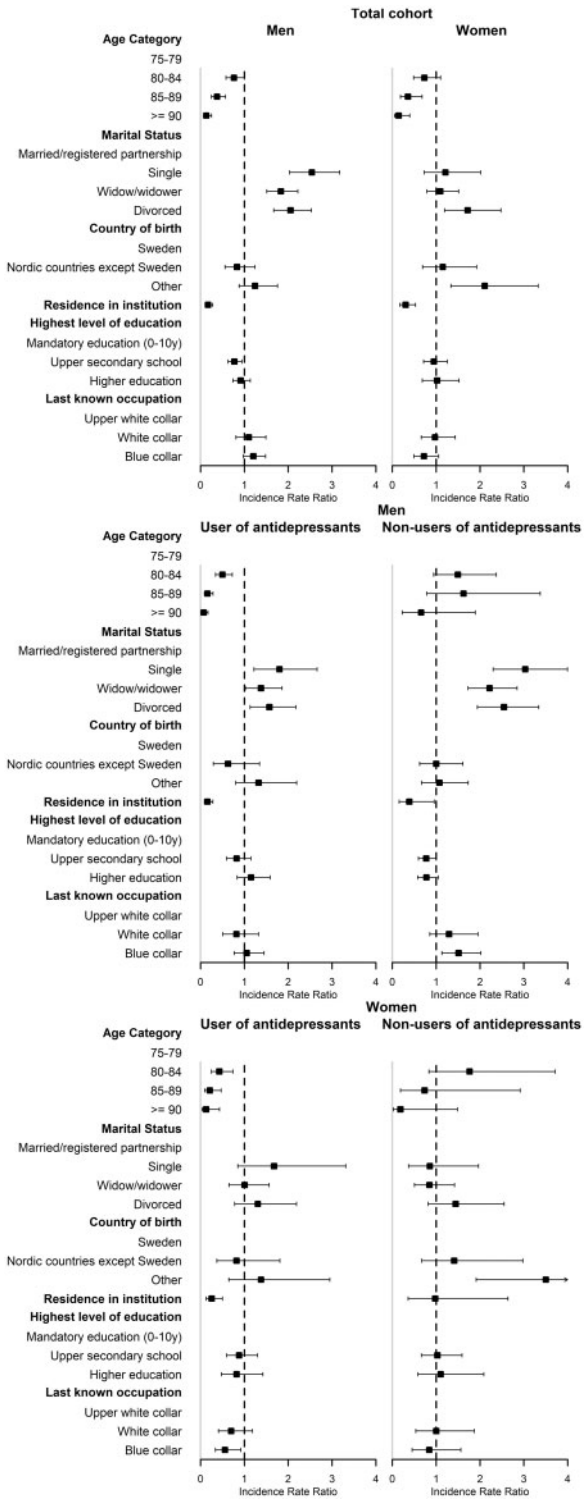

Figure 3 Factors associated with suicide in Swedish older men and women aged ≥75 years and in ADs users and non-users. The regression models were adjusted for age, country of birth, marital status, highest level of education, last registered occupation, monthly individual disposable income, use of specialized psychiatric care, use of other psychoactive medications, residence in institution and previous non-fatal self-harm.

who had higher positions might have had to struggle in work environments highly dominated by men, with job strain situations enhancing the need to adapt to masculinity ideals,[31] associated to the juggle in managing multiple expected family roles.[32] This might reflect an accumulated disadvantage leading to old age mental health problems and depression.[33] Further, women who have had leadership positions might have more difficulties adapting to status loss after retirement or to expected social roles in older ages, particularly when faced with compromised autonomy. We lacked data on behavioural risk factors such as smoking. Current or past smoker status might partially explain the increased suicide risk in women who had held white-collar jobs.[34,35] Smoking rates were elevated in women with more occupational prestige in the middle of the last century, which might be construed as an expression of gender equality and liberalization from norms.[36] More research is, however, needed to understand the factors behind the increased suicide risk in women treated for depression who have had upper-white collar positions.

Higher rates of alcohol use disorders in blue-collar working men might be one possible explanation for the elevated risk of suicide observed among male non-users of ADs with this socioeconomic background.[37] However, patterns of older adults' alcohol consumption have changed in recent years[38] and more research is needed to better understand associations with suicide.

Men without ADs were twice as likely to use shooting as a method of suicide. This might in part be related to differences in firearm availability. Swedish doctors are required to report to the authorities if a patient's condition (e.g. suicidal depression or dementia) renders firearm access unsafe, so it follows that men on ADs may have had less firearm access. Another partial explanation might be that gun ownership is more common in rural areas, where there might be less of a tendency to seek treatment for mental health issues. One may speculate that men who died by suicide and were not AD users might, to a greater extent, have suppressed their depressive emotions in response to dominant masculine ideals to avoid being perceived as weak and vulnerable.[39] A recent study conducted in younger men found that those with high traditional masculinity tend to report less depression and to use more violent methods of suicide.[40]

Although suicide rates tend to increase with ageing,[1] we found a differential risk of suicide in those aged 80 and over compared with the younger half of this population (75–79 years). This was not the case in non-users and expands on our previous findings focused on new users of ADs.[13] One plausible explanation may arise from the extensive use of ADs in institutions and in those using antidementia drugs, which were both associated with lower risk of suicide in our study. After the age of 85, a sizeable proportion of the population, including residents in institutions, have dementia which is one of the few psychiatric diagnoses not related to elevated suicide risk in most studies. Further, ADs are often prescribed to treat behavioural symptoms occurring in dementia. Although the relationship between suicide and use of ADs in institutions for older adults is not well understood, this setting may offer contact with peers, greater monitoring from mental health professionals and less access to lethal means of suicide, all of which may help to explain the lower risk of suicide. Further, some institutionalized older adults may not be physically or mentally capable of planning and carrying out a suicidal act.

Methodological considerations

The relatively high age cut-off increases the public health relevance, as this is an age group with a particularly elevated suicide rate. The groups of cases and their controls were formed from national population registers, eliminating problems related to selection bias. We used a matched case–control design to eliminate the effects of age, gender and calendar time. Contact with psychiatric services was used as a proxy for mental illness severity in our adjusted analyses. However, persons with severe depression managed in primary care only are missed in the National Patient Register. Another consideration is that some subjects who refilled AD prescriptions may not have consumed their medication. Refilling a prescription for an AD was considered as a proxy for depression treatment but we acknowledge that this definition may involve an indication bias or a residual confounding.

The sociodemographic factors investigated in our study and the nature of the outcome are not susceptible to reverse causality. More research is, however, needed on possible mediators influencing these associations. When interpreting the association between the marital status and suicide, we lack data on age-related changes and morbidities that may affect the actual support received from the partner and burden the marital relationship in later life. Our data set did not include information on date of immigration, which is a limitation since time spent in the host country may influence the degree of acculturation. Further, a register study such as this cannot identify numerous pertinent behavioural risk factors including interpersonal conflicts, social isolation and problematic alcohol use that can all affect the risk of suicide. The lack of data on physical illness is also a significant imitation. A recent review focusing on a broader age range (65+) showed increased risk in persons diagnosed with cancer, neurological disorders, pain, COPD, liver disease, male genital disorders and arthritis/arthrosis. Finally, our results may not be generalized to other populations because of differences in socioeconomic conditions, availability of mental health services, prescription patterns, affordability of ADs and cultural differences in late-life suicidal behaviours.

Conclusions

This research offers clues to tailor gender-specific preventive strategies for older adults that will need to include a clearer evaluation of the effect of AD treatment as well as psychosocial interventions that go beyond the healthcare sphere.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Conflict of interest: None declared.

Key points

- Being unmarried was a risk factor for suicide among men in both ADs' users and non-users but not in women.
- Suicide risk was elevated 3-fold in older women born outside of Nordic countries and not treated by ADs.
- Suicide risk was lower in blue-collar women who used ADs, and higher in blue-collar men who did not.
- This national-based study offers clues to gender-specific suicide preventive strategies that go beyond the healthcare sphere.

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Short report

Improving mental health through neighbourhood regeneration: the role of cohesion, belonging, quality and disorder

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Poor mental health has been associated with socioeconomic deprivation. The aim was to describe possible mechanisms underpinning the narrowing of mental health inequalities demonstrated by Communities First, an area-wide regeneration programme in Wales, UK. Propensity score matched data from the Caerphilly Health and Social Needs Electronic Cohort Study, assessed changes in mental health, neighbourhood-level social cohesion, belongingness, quality and disorder. A multiple mediation analysis found c.76% of the total indirect effect was accounted for by neighbourhood quality and disorder. Targeted regeneration that increases neighbourhood quality and reduced neighbourhood disorder could mitigate the mental health inequalities associated with socioeconomic deprivation.

Introduction

In the UK, the Marmot Review of Health Inequalities and US National Institute on Minority Health and Health Disparities recommended community regeneration programmes are implemented to reduce health inequalities.[1] Caerphilly, Wales is a post-industrial area with historic social and health inequalities reporting mental health scores significantly below the Welsh average. A Welsh Government implemented regeneration programme 'Communities First', delivered to the 10% most deprived neighbourhoods in Wales (UK) was associated with a small improvement in the mental health of Communities First residents compared with propensity matched control group residents; hence inequalities narrowed.[2] Little is known of the mechanisms explaining this association. We examined the role of three factors in mediating the effect of Community First: social cohesion, neighbourhood belonging and neighbourhood quality and disorder.

Methods

Participants

Data are from the Caerphilly Health and Social Needs Electronic Cohort Study, a prospective cohort study of adult residents of Caerphilly County Borough (CCB), Wales, UK.[2] Briefly, a baseline postal questionnaire in 2001 elicited 10 892 responses (60.6%). In 2008, a follow-up survey on the 9551 participants still residing in the borough provided 4426 valid mental health scores.