



# Socioeconomic risk factors for hospital admittance due to a suicide attempt in Belgium: a population-based study using administrative data

Marc Roelands<sup>1</sup> · Johan Vanoverloop<sup>2</sup> · Leila Maron<sup>2</sup> · Johan Bilsen<sup>1</sup>

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## Abstract

**Purpose** This population-based study aims to investigate socio-economic factors, depression and psychosis as independent risk factors for a suicide attempt that requires hospitalization, and estimate the incidence of suicide attempts.

**Methods** Individual-level administrative data were analysed that were collected for all members of the Socialist Health Insurance Schemes in Belgium during the period 2011–2013 ( $N=3,156,030$ ) in the context of the financing of the health care services provided. Bivariate and multivariate odds ratios were calculated for multiple socio-economic factors, socio-demographic factors and the presence of depression and psychosis.

**Results** During the study period, 4063 persons were hospitalized due to a suicide attempt. The incidence of suicide attempts with hospital admittance was 48.0/100,000 persons/year. Being unemployed, incapable of work over a shorter or longer period with substitute income, living on social welfare, having an increased healthcare reimbursement, living alone and using antidepressants or antipsychotics were identified as independent factors that contributed to the risk of hospitalization due to a suicide attempt.

**Conclusions** Persons from low income groups, however defined, those living alone, or persons using antidepressants or antipsychotics are at an increased risk of attempting suicide and needing hospitalization for it. A social policy that focuses on the improvement of these factors or their consequences may be expected to have a favourable effect on the number of suicide attempts. Funding of mental health care should also better match population needs.

**Keywords** Suicide · Socioeconomic status · Depression · Risk factor · Hospitalization · Public health

## Introduction

Suicide and suicide attempts have become major health problems and their prevention should be prioritised, according to the World Health Organization [1]. In Belgium, 4.2% of the population have attempted suicide at some point in their lives and an estimated 35,000 persons attempt suicide each year [2]. Moreover, suicide is the most important external cause of death in our country. Belgium is one of

the European countries with the highest prevalence rates, resulting in about 2000 suicides yearly [2]. Mortality due to suicide in 2013 is 17.3/100,000 inhabitants while the European mean is 11.7 [3].

Differences exist by region in the country. The mortality rate due to suicide is higher in the Walloon Region (mean between 2006 and 2010: 22.3/100,000 inhabitants) than the Brussels Capital Region and Flemish Region (respectively, 6.8 and 14.2/100,000 inhabitants) [4]. There is a corresponding difference in suicide attempts: nearly 6% of the population of the French Community (which population consists mainly of the population in the Walloon Region) has attempted suicide during their lifetime, which is nearly twice the proportion in the Flemish Community Region, with 3.4% [2].

Suicide is a complex, multi-causal phenomenon, determined by a complex interaction of socio-demographic, biological, genetic, environmental, psycho-social and

✉ Marc Roelands  
marc.roelands1@telenet.be

<sup>1</sup> Vrije Universiteit Brussel (VUB), Faculty of Medicine and Pharmacy, Mental Health and Wellbeing Research Group (MENT), Laarbeeklaan 103, 1090 Brussels, Belgium

<sup>2</sup> National Union of Socialist Health Insurance Schemes, Sint-Jansstraat 32, 1000 Brussels, Belgium

socio-cultural factors [5]. The most important proximal factors are the presence of mental disorders and a history of suicide attempts. In addition, some factors decrease the risk, e.g. treatment of mental disorders. Treatment can breach the process of suicidal ideation, wishes, plans, threats and attempts, ending recurring attempts and preventing suicide. Therefore, more knowledge is needed about the characteristics of persons who attempt suicide to adjust health policy for suicide prevention and care.

In the Netherlands, persons who have attempted suicide are often admitted to hospitals [6], which seems to be the case in Belgium too, as the role of the general practitioner in persons who attempted suicide has been reported to decline [7]. We could not find studies about hospital admission in a general population sample of persons who attempted suicide. Therefore, this population is well suited for a study of suicide attempters in general, as a significant proportion of the total population of suicide attempters is captured. Data about this population is available to health insurance schemes (in Dutch: “mutualiteiten”) as they have data about the health care use of each of their members.

The current study aims to examine the incidence of SA, describe the profile of members of the Socialist Health Insurance Schemes in Belgium who were admitted to a hospital after a suicide attempt and investigate the relationship between these characteristics and the occurrence of a suicide attempt. Research questions are: (a) what is the incidence of SA in Belgium, (b) what is the socio-economic, socio-demographic and mental health profile of persons who were admitted to a hospital after a suicide attempt; and (c) which characteristics are independent predictors of the occurrence of a suicide attempt?

## Methods

### Design and participants

The study used administrative data collected by the Socialist Health Insurance Schemes in Belgium in the context of financing health care services on the basis of the services supplied and reimbursement of their members that used these services. In Belgium a compulsory health insurance system exists (all inhabitants are entitled) which is financed by contributions withheld from income. The level of one's contribution depends on one's income. For the reimbursement of health care costs, a handful of health insurance schemes are entitled to be the “interface” between the National Statutory Insurance body (INAMI-RIZIV) on the one hand, and the health care services and population on the other hand. The Socialist Health Insurance Schemes (in Dutch: “Socialistische Mutualiteiten”; in French: “Solidaris - Mutualité Socialiste”) is a health insurance company with

3.2 million members, representing 28.2% of the Belgian population. The health insurance schemes dispose of a large administrative data set on the reimbursement of medical care and the payment of work incapacity benefits. Persons of all ages are included in this database. Figures are based on the data at individual level concerning hospital admittances of their members. In agreement with the Belgian law, each Health Insurance Fund receives the reason for admission to the hospital related to its insured members, which is noted by a medical doctor. Suicide attempts were extracted from the text field “reason for admission” with a query on relevant Dutch words referring to suicide attempt, also taking into account possible spelling errors. Therefore, all registrations in the database for the years 2011, 2012 and 2013 were investigated, which happened in the offices of the Fund and under supervision of the medical management. A double check of the selected text increased the reliability of the data.

A population which consists of members of a Health Insurance Scheme changes over time due to mortality, birth and mutations to other Insurance Schemes. To have a stable population for the analysis, the mid-year population is used. The study population included all members of the mid-year population of the study period 2011 to 2013, which is the population on 1 July 2012.

As the study focusses on suicide attempters and not on cases of suicide, persons that died during hospitalisation or within 30 days after hospitalisation were excluded from the sample. Where there were multiple attempts per person, only the first attempt was included in the study.

### Measurement

The variables included as predictors are: gender, age, region, being unemployed, incapable of work with substitute income, receiving a disability benefit, living on social welfare, having an increased healthcare reimbursement, living alone, using antidepressants, and using antipsychotics. The dependent variable is hospitalization due to a suicide attempt.

As our data do not include any diagnoses (except the reason for admission to the hospital), two proxies for the presence of mental disorders were used, namely the use of antidepressants and of antipsychotics. We investigated the use of antidepressants and antipsychotics during 3 months before the attempt. For members of the population who did not attempt suicide, a random day in 2012 was selected and the delivery of antidepressants and antipsychotics during the 3 months previous to this reference day was measured. The delivery of the medication at the pharmacist, prescribed by a doctor for a specific person, is registered on the person's name, not the actual use by this person. Regarding antidepressants all medication with ATC-codes starting with

“N06A” was included, regarding antipsychotics all drugs with an ATC-code starting with “N05A”. Duration, continuity and dose were not taken into account.

Employment status was recorded with the categories “employed” and “unemployed”, the latter receiving a benefit during the year. The Health Insurance Schemes distinguish between incapacity for work during the first year and incapacity for work after 1 year. Persons living on social welfare were distinguished from those who were not with a dichotomous variable, as were those receiving an increased reimbursement of health care costs due to their low income.

## Data analysis

First, the population characteristics are presented with descriptive statistics. Second, mental disorders, socio-demographic and socioeconomic characteristics were subjected to bivariate investigation as risk factors for suicide attempts with odds ratios. The significance of relationships in  $2 \times 2$  tables was tested with odds ratios with 95% confidence intervals. Third, significant factors were investigated for their independent contribution to the prediction of suicide attempts with logistic regression analysis. In a first logistic model, the sample was limited to the age group 18–65 years old to study characteristics related to unemployment and incapacity for work. Afterwards, 2 separate models were tested for the younger and older age groups. In the age groups 9–17 years old and persons older than 65 years, incapacity for work, disability benefit (which starts after 1 year of incapacity for work) and unemployment are not applicable and were, therefore, not included in the model. In the younger age group living alone was not applicable either and, therefore, not included; in the older age group “living on social welfare” was not included for the same reason. If a characteristic had more than 2 values, such as age group

and region, the last value was used as reference. In the case of region it was Brussels Capital Region, regarding age it was the age group 60–65 years. In the younger age group, age was measured as a continuous variable.

The data were analysed with SAS version 9.2 [8].

## Results

### Population

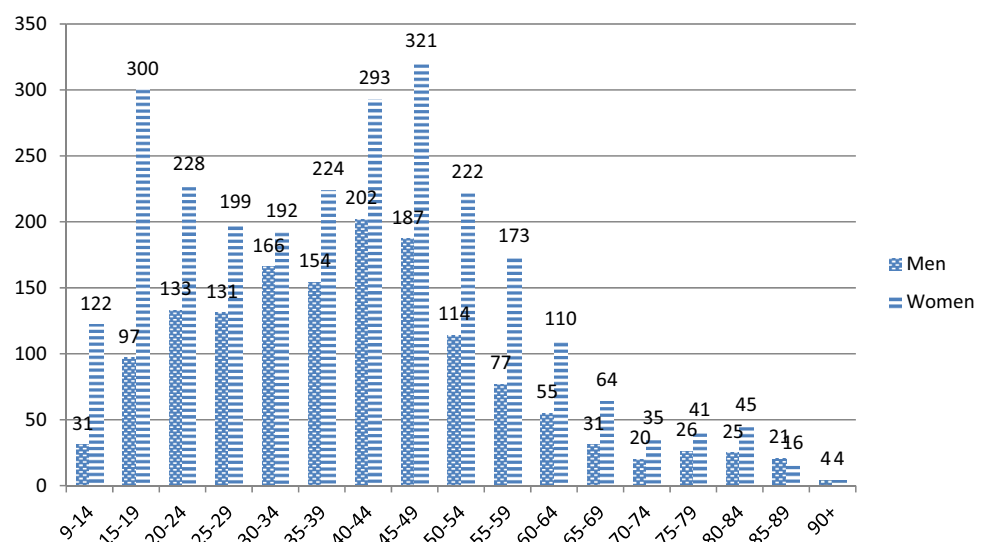
#### Number of attempts

Ninety-two persons died and were, therefore, excluded: 69 during hospitalisation and 23 within the 30-day period after hospitalisation. In total 4542 attempts by 4174 people were registered over the 3 year period with information about the hospital stay. The large majority (93%,  $n = 3888$ ) made one suicide attempt, 6% ( $n = 242$ ) made two and 1% ( $n = 44$ ) three or more attempts that resulted in a hospital admittance. As such, the incidence of suicide attempts with hospital admittance in the 3 year period in this database is 144/100,000 persons or 0.14% ( $4542/3,156,030$ ), which equals 48.0 attempts/ 100,000 persons/ year for the population of this Health Insurance Scheme. After selection of the mid-year population on 1 July 2012, 4063 people remained in the population and were included in the analyses.

#### Number of attempts by age and sex

The mean age of attempting suicide is 40 years. The youngest person is 9 years old, the oldest 96 years; 64% are women. The largest groups are women in the age groups 15–19 years old and 40–49 years old and men between 40 and 49 years old (Fig. 1).

**Fig. 1** Members of Socialist Health Insurance Schemes who attempted suicide by age and sex, 2011–2013, Belgium ( $N = 4063$ )



## Risk factors

Incidence was especially elevated among persons with multiple days of incapacity for work, those who have been unable to work for more than 1 year (disability benefit), those living on social welfare, and those with mental disorders according to their use of antidepressants or antipsychotics. Incidence of suicide attempts was also higher

among women, persons living alone, the unemployed, persons with an increased healthcare reimbursement, and persons living in the Flemish and Walloon Region rather than Brussels Capital Region (Table 1).

We found that 39.9% (1621/4063) of this population of suicide attempters used antidepressants (all ATC-codes “N06A”) and 18.9% (768/4063) used antipsychotic medication (all ATC-codes “N05A”) during the period before the attempt.

**Table 1** Three year incidence of suicide attempts among members of the Socialist Health Insurance Scheme by risk factors and odds ratios of categories within the risk factors, Belgium, 2011–2013 ( $N=3,156,030$ )

Risk factor	3-year incidence per 1000 persons	Number with SA	Number without SA	Total number	Percentage	Significance OR (CI)
<b>Sex</b>						
Women	1.6	2589	1,615,975	1,618,564	51.3	1.67 (1.57; 1.78)
Men	1.0	1474	1,535,992	1,537,466	48.7	1
<b>Region</b>						
Brussels CR	0.5	180	378,094	378,274	12.0	1
Flemish Region	1.1	1501	1,400,016	1,401,517	44.4	2.25 (1.93; 2.63)
Walloon Region	1.8	2357	1,319,610	1,321,967	41.9	3.75 (3.22; 4.37)
Abroad or unknown	0.5	25	54,247	54,272	1.7	0.97 (0.64; 1.47)
<b>Increased reimbursement</b>						
Yes	2.2	1591	729,883	731,474	23.2	2.12 (1.99; 2.26)
No	1.0	2452	2,390,265	2,392,717	75.8	1
Unknown		20	31,819	31,839	1.0	0.61 (0.39; 0.95)
<b>Incapacity for work<sup>a</sup></b>						
Yes	4.7	807	171,494	172,301	5.5	4.31 (3.99; 4.65)
No	1.4	3256	2,980,473	2,983,729	94.5	1
<b>Disability benefit<sup>b</sup></b>						
Yes	6.7	785	116,963	117,748	3.7	6.21 (5.75; 6.72)
No	1.4	3278	3,035,004	3,038,282	96.3	1
<b>Unemployed</b>						
Yes	2.2	890	401,516	402,406	12.8	1.92 (1.78; 2.07)
No	1.6	3173	2,750,451	2,753,624	87.2	1
<b>Social welfare</b>						
Yes	4.3	377	87,013	87,390	2.8	3.60 (3.24; 4.01)
No	1.2	3686	3,064,954	3,068,640	97.2	1
<b>Living alone</b>						
Yes	2.1	1060	505,962	507,022	16.1	1.85 (1.72; 1.98)
No	1.1	3003	2,646,005	2,649,008	83.9	1
<b>Use of antidepressants</b>						
Yes	7.2	1621	222,804	224,425	7.1	8.73 (8.19; 9.29)
No	0.8	2442	2,929,163	2,931,605	92.9	1
<b>Use of antipsychotics</b>						
Yes	12.0	768	64,791	65,559	2.1	11.11 (10.27; 12.03)
No	1.1	3295	3,087,176	3,090,471	97.9	1

<sup>a</sup>In accordance with health schemes in Belgium, incapacity for work is defined as 1 month sick leave in case of employees and 14 days in case of workers

<sup>b</sup>Disability benefit starts after 1 year of incapacity for work

## Multivariate modelling

In the logistic model for the age group 18–65 years old, all the characteristics studied remained significant predictors of a suicide attempt (Table 2). In case a variable was not included in the analysis, Table 2 shows “–”.

In the model for young persons between 9 and 17 years old, sex, region and increased reimbursement remained significant independent predictors. The likelihood of a suicide attempt increased by 36% by each additional year of life. The effect of using antipsychotics and especially antidepressants was much stronger in this age group compared to the previous one.

In the model for persons older than 65 years, place of residence and living alone remained as significant factors. The effect of use of antipsychotics and antidepressants was less strong compared to both other age groups. The significant effects of age, sex and increased reimbursement disappeared.

## Discussion

In this study, being unemployed, incapable of work with substitute income, receiving a disability benefit, living on social welfare, having an increased healthcare reimbursement, living alone and using antidepressants or antipsychotics were found to be independently related to hospitalization due to a suicide attempt in persons of working age.

## Strengths and limitations

This study has some strengths. First, we analysed risk factors in a total nationwide population of members of a group of Health Insurance Schemes, which includes a large proportion of the total population in the country. These characteristics of the study population have two advantages: (a) they support generalisation of the descriptive findings to the entire population of Belgium, and (b) the heterogeneous

**Table 2** Multi-variate logistic regression analysis of risk factors for suicide attempts among members of the Socialistic Health Insurance Scheme, Belgium, 2011–2013

Variables	Model 1: 18–65 year			Model 2: 9–17 year			Model 3: >65 year		
	Odds-ratio	95% confidence interval		Odds-ratio	95% confidence interval		Odds-ratio	95% confidence interval	
Women	1.40	1.30	1.50	3.87	3.03	4.94	0.84	0.66	1.06
Age by year	–	–	–	1.36	1.29	1.42	1.00	0.99	1.02
18–25 <sup>a</sup>	4.07	3.37	4.91	–	–	–	–	–	–
26–30	3.01	2.46	3.67	–	–	–	–	–	–
31–35	2.73	2.24	3.32	–	–	–	–	–	–
36–40	2.64	2.18	3.21	–	–	–	–	–	–
41–45	2.74	2.27	3.31	–	–	–	–	–	–
46–50	2.39	1.97	2.88	–	–	–	–	–	–
51–55	1.76	1.45	2.15	–	–	–	–	–	–
56–60	1.28	1.04	1.58	–	–	–	–	–	–
Inhabitant of Flemish Region <sup>b</sup>	2.37	2.01	2.79	2.03	1.26	3.28	3.35	1.76	6.36
Inhabitant of Walloon Region <sup>b</sup>	3.24	2.76	3.81	4.01	2.54	6.35	3.94	2.08	7.47
With increased reimbursement	1.29	1.19	1.41	1.52	1.23	1.87	0.94	0.74	1.19
Incapacity for work	2.11	1.94	2.30	–	–	–	–	–	–
Disability benefit	2.10	1.90	2.32	–	–	–	–	–	–
Unemployed	1.30	1.19	1.41	–	–	–	–	–	–
Social welfare	2.38	2.10	2.70	–	–	–	–	–	–
Living alone	1.47	1.35	1.60	–	–	–	1.35	1.06	1.73
Using antipsychotics 3 months before attempt	3.43	3.10	3.79	5.70	3.65	8.92	2.12	1.53	2.94
Using antidepressants 3 months before attempt	5.24	4.82	5.70	11.96	8.14	17.56	4.13	3.25	5.24

Model 1: LR: 5716, Score: 11393, Wald: 7476,  $p < 0001$ . Max rsq = 0.1173

Model 2: LR: 696, Score: 2034, Wald: 879,  $p < 0001$ . Max rsq = 0.1175

Model 3: LR: 213, Score: 293, Wald: 242,  $p < 0001$ . Max rsq = 0.041

<sup>a</sup>Reference group was the age group 60–65 year old

<sup>b</sup>Reference group was Brussels Capital Region

population supports multivariate analysis of the risk factors. Second, as data were analysed for a 3 year period, the impact of accidental fluctuations over time on the incidence estimates was limited. Third, the possibility of recall bias is excluded as administrative data on the services and medication provided were used instead of interviewing methods. Fourth, the administrative database allowed the inclusion of 4063 persons who attempted suicide. This considerable sample size of suicide attempt cases, which can hardly be reached with a survey study design, increases the reliability of the incidence estimate and allows multivariate statistical analyses to measure the independent effect of each factor that is studied. Fifth, the reason for admission is filled in by a medical doctor, limiting the number of false positive suicide attempts. Further taking into account the relative taboo regarding suicide compared to aggression by others and accidents, it is highly unlikely that persons will pretend that they attempted suicide if they did not. Finally, this study is the first to investigate living arrangements as a risk factor for suicide attempts in a population-based sample; moreover, it is also the first to use multivariate analysis for this purpose.

This study has also some limitations. First, the study population consists of members of only one group of Health Insurance Schemes, who could have a specific socioeconomic profile and who have a different geographical distribution to the total population. The study population is characterised by some overrepresentation of persons from the Walloon Region as they are about 42% of the study population (see Table 2) and only 32% of the Belgian population in 2016 [9]. As far as this is the case and taken into account the higher incidence of suicide attempts in this Region, with a lifetime suicide attempt prevalence of 5.5 vs. 3.4% in the Flemish Region [2], it will result in some overestimation of the general incidence, but would have no impact on the sub-group estimates and the multivariate analyses. Second, only persons who were admitted to hospital were included. Due to the method used, those who attended the emergency department and returned home after a very short while risked not to be registered in the ED administration system and therefore were not included; persons that had no contact with health services and those who only visited a general practitioner were also not included. We could not find any study that allowed us to compare the physical and mental health status and care needs of these groups. However, we hypothesize that the declining role of the GPs in the care for suicide attempters [7] is compensated by the widely available and very accessible EDs. Moreover, from the perspective of prevention, the suicide attempts of the group included result in a substantial burden for themselves, relatives and the health care system. Based on survey data, it is estimated that about 35,000 persons in the total Belgian population attempt suicide each year [2]. Third, information on the presence of other mental disorders apart from

indicators of depression and psychosis is lacking in the database, thus underplaying the impact of mental disorders on the incidence of suicide attempts. Fourth, the measurement of the diagnoses of depression and psychosis is not that strong regarding its specificity and sensitivity; in other words, it is not clear to what degree related diagnoses may also be included and whether all persons with depression and psychosis are indeed included. Moreover, false positives may occur regarding depression diagnosis in cases when the medication was started for a minor, temporary mood disorder. However, this will probably be true in a limited number of cases. Few would make a case for the existence of temporary, minor psychosis. Notwithstanding this limitation, the use of medication belonging to the specific groups of antidepressants and antipsychotics remain valuable proxies for the presence of mental disorders.

## Incidence

This study shows that the issue of suicide attempts is sizeable and important. Over a 3 year period, some 4000 members of a population of about three million attempted suicide and needed comprehensive care such that hospital admittance was necessary. Based on the current study, with 4063 attempts in 3 years in a study population of 28.2% of the total Belgian population, the incidence of hospital admissions due to a suicide attempt can be estimated at 4803 persons per year in Belgium, all ages included. The estimated incidence rate for all ages in Belgium, which was found to be 48.0/100,000 persons/year, may be an overestimation of the real incidence of hospital admissions due to a suicide attempt in Belgium, taking into consideration the higher market share of this Health Insurance Scheme in the Walloon Region with its higher incidence of suicide attempts.

## Risk factors

### Gender

Due to the large database about the general population we could analyse risk factors with multivariate techniques, showing the independent likelihood for each factor. The higher incidence among women was expected [10–12]. More importantly, this study points strongly to the increased likelihood associated with mental disorders and socioeconomic factors for the incidence of suicide attempts, being important independent factors in women as well as in men.

### SES

Regarding socioeconomic factors, we have distinguished different low income groups. Being unemployed, incapable for work over a shorter or longer period with substitute income,

living on social welfare, or receiving increased healthcare reimbursements were all found to be independent factors that contributed to the likelihood of attempting suicide. It has been confirmed that the level of unemployment in a country is related to the frequency of suicide [13]. However, few other studies investigated the impact of these socioeconomic factors with individual level data and multivariate analysis. Beautrais, Joyce and Mulder [14], found using a case-control design that young persons with lower socioeconomic backgrounds have an elevated likelihood of a medically serious suicide attempt. In separate multivariate analyses, using data from a general population survey, Taylor et al. [15] found a significant increase in lifetime incidence of suicide attempts among persons of low occupational status, the unemployed and those receiving government benefit. Their later analyses confirmed these findings [16]. Suicide attempts at age 18–19 have been found to be independently predicted by living in a poor neighbourhood but not by SES of the household, measured with an index combining the parents' educational attainment, their occupational prestige and household income [17]. Although it is difficult to understand the specificity of employment-related factors in this context, they may all have a downward social mobility and a lower socioeconomic situation in common, which have a negative impact on the person due to the stress they provoke. Moreover, a lower socioeconomic situation is associated with a low income which influences one's housing quality, neighbourhood, transportation and recreation/leisure activities, etc. As our study shows, socioeconomic characteristics are independent factors and as such they increase the likelihood cumulatively. This sociological perspective [18] helps us understand why the aforementioned groups have an increased likelihood of suicide attempts even when social welfare in a developed country provides financial compensation to some degree. Currently, the economy in most if not all European countries is still suffering from the 2008 financial crisis, with consequences for financing social welfare. However, adequate financing remains of foremost importance. A social policy that focuses on the improvement of these factors or their perceived consequences may be expected to have a favourable effect on the number of suicide attempts. A cross-national analysis in Europe has shown the preventive effect of active labour market programmes on suicides in men arising from unemployment [19]. "Active labour market programmes include all social expenditure (other than education) which is aimed at the improvement of the beneficiaries' prospect of finding gainful employment or to otherwise increase their earnings capacity." [20] However, if political decisions were to decrease social benefits or increase unemployment, our results suggest this would increase the incidence of suicide attempts requiring hospitalisation. But even if political decisions support individuals' income level whatever its source, the ongoing immigration

flow will result in an increasing group of persons that will be confronted with a low socioeconomic status, and as such might have an increased probability of attempting suicide.

## Mental health

In multivariate analysis the presence of a mental disorder, indicated by the use of antidepressants and/or antipsychotics, was found to be the most important factor. This finding is in line with the few studies that measured mental disorders more directly, in the form of a history of psychiatric treatment among older suicide attempters at an emergency department when compared to the general population [21], or the presence of a mental disorder in multivariate analyses of general population survey data [12, 15]. In agreement with the directives of the WHO [1] the government of the Flemish Region has launched an elaborated suicide prevention plan and supports financially universal, selective as well as indicated prevention actions, aiming for a reduction of the number of suicides by 20% between 2000 and 2020 [22]. Young people with mental disorders are one of the target groups of the selective prevention actions. These actions are supported by our finding that, of all age groups, they have the highest likelihood of being hospitalised due to a suicide attempt. Early detection and effective treatment of mental disorders, especially in teenagers, is part of the strategy to prevent suicide attempts and suicides. Although half of all lifetime cases of mental disorders begin by age 14 [23], effective psychotherapeutic treatments for mental disorders in children do exist [24], and additional psychotropic medication can be useful in some cases. Unfortunately, in Belgium, only psychotherapy by a psychiatrist is partially refunded by the health insurance system; psychotherapy by a self-employed psychologist is not [25]. The ambulant mental health care services also provide psychotherapy, but accessibility is perceived as being hampered by their stringent intake criteria and long waiting lists. Admission to an emergency department is another opportunity to prevent repetition of the attempt if mental health care is provided during the hospital stay. However, barriers to optimal care at the emergency department have been described by head of emergency and psychiatry departments [26]. Notwithstanding the necessity of an accessible mental health care system, in Belgium, only 6% of total health expenditure goes to mental health care, which is low compared to the neighbouring countries, especially when one realises that the total cost of all consequences of mental distress is estimated to be 3.5–4% of the GNP [27]. A more appropriate financing of the mental health care system would have a positive effect on public mental health and its indicators such as the number of suicide attempts.

Our finding that depression, as measured with the use of antidepressants, is the mental disorder that is most

strongly related to suicide attempts confirms the findings of four other studies that used multivariate analysis with different study designs, including three surveys in the general population [11, 12, 28, 29]. When we realise that the prevalence of depression is higher in older age groups [30] and taking into consideration the continuing ageing of the population, we can expect an increasing prevalence of depression during the next decades. If our findings are correct, this will lead to an increasing number of suicide attempts if no additional preventive measures are taken.

### Living arrangement

We found that persons who live alone were at an increased risk. The few studies to date that have investigated living arrangements as correlate of suicide attempts all confirmed the relationship. Living alone was found to be a risk factor in three smaller studies with a case-control design: two in older community dwellers [19, 31] and one in psychiatric in-patients [32]. Other studies looked at related concepts such as marital status [11, 28], social support [16, 33, 34], and the feeling of aloneness [35]. A review of research on these and other social factors proposed the overarching term “social connectedness” [36]. To conclude, the current study points to a group at risk, persons living alone, but qualitative research is needed to unravel the relevant underlying factors among the related but different concepts that have been studied up to now.

At this time, no comprehensive, regular overview exists in Belgium or its regions of the epidemiology of suicidal behaviour and the corresponding use of health services. However, some important initiatives have been developed. In the Flemish Region, the Unit for Suicide Research (Ghent University) has presented a yearly report since 2008 on the epidemiology and characteristics of suicide attempters that were admitted to the emergency department of hospitals [37]. Recently, in the context of a research project, the Mental Health and Wellbeing Research Group [Vrije Universiteit Brussels (VUB)] has started with similar reporting in the Brussels Capital Region [38]. Since 1 January 2016 all emergency departments in Belgium are obliged to register medical data on all patients that enter the service, which will be a considerable step towards more official statistics on suicide attempters. It could be part of a system that allows the evaluation of a policy aiming at the prevention of suicidal behaviour, regularly monitoring both care use and epidemiology. However, this necessitates sufficient long-term financial support of research entities responsible for the analysis of these data and the reporting of the findings in every region of the country.

### Future research

Notwithstanding the finding that the risk factors are independent, further research could focus on the simultaneous occurrence of risk-factors in the same persons.

### Conclusion

We found that different socioeconomic factors increase the incidence of suicide attempts that required hospitalisation, as do living arrangements and the presence of mental disorders. Persons from low income groups, however defined, those living alone or who have a mental disorder have an increased likelihood of attempting suicide.

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### Compliance with ethical standards

**Ethical considerations** The study has been performed according to the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. The manuscript does not contain clinical studies or patient data. Administrative data were anonymised before analysis. These anonymised data remained property of the health insurance schemes and analyses were performed under supervision of the medical management.

**Conflict of interest** Two authors are members of the research department of the National Union of Socialist Health Insurance Schemes, but all authors declare that they have no potential competing interests. No sponsors were involved in any phase of the research work.

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