



Original article

No correlation between rates of suicidal ideation and completed suicides in Europe: Analysis of 49,008 participants (55+ years) based on the Survey of Health, Ageing and Retirement in Europe (SHARE)

K. Lukaschek^{a,1}, H. Engelhardt^{b,1}, J. Baumert^a, K.-H. Ladwig^{a,c,*}^a Institute of Epidemiology II, Helmholtz Zentrum München, German Research Centre for Environmental Health, Neuherberg, Germany^b University of Bamberg, Bamberg, Germany^c Department of Psychosomatic Medicine and Psychotherapy, Klinikum rechts der Isar, Technische Universität München, München, Germany

ARTICLE INFO

Article history:

Received 2 April 2015

Received in revised form 29 June 2015

Accepted 27 July 2015

Available online 25 September 2015

Keywords:

Suicide

Suicidal ideation

Epidemiology

Aging

Cross-national survey

ABSTRACT

Background: Little is known about country-specific variations in suicidal ideation (SID) by sex and how they correspond with completed suicide rate. Therefore, the aim of the present study was to assess variations in SID prevalence rates by sex and its correlation to completed suicide rates across European countries.

Method: SHARE is a cross-national European survey of individuals over the age of 50 and their spouse of any age. The present study relied on wave 4 conducted in 2010–2012 including 49,008 participants aged 55 to 104 years from 16 countries. SID was evaluated using a single item from the Euro-D. Data on completed suicide rates were taken from the WHO mortality database.

Results: Of the study population ($n = 49,008$, 44.3% men, mean age 68.2 ± 9.1 years), a total of 4139 (8.5%, 95% CI 8.2–8.7) reported suicidal ideation within the last month. The women:men ratio in SID prevalence ranged from 1.30 in Estonia to 2.25 in Spain and Portugal. Regarding country-specific variation, the SID prevalence patterns of both men and women did not correspond to the completed suicide rates for males and females aged 55+ reported by the WHO (2013). Correlations were rather moderate in men ($r = 0.45$) and especially weak in women ($r = 0.16$).

Conclusion: The study showed remarkable differences in SID prevalence by sex. The most exciting finding was that SID rates did not correspond with completed suicide rates in each country under investigation. However, the strength of these patterns substantially differs across countries. This unexpected finding need to be further evaluated.

© 2015 Elsevier Masson SAS. All rights reserved.

1. Introduction

Suicide is among the leading causes of unnatural death [18], especially in men, and is the main fatal outcome of psychiatric diseases [16]. In Europe, there is a notable east-west divide in suicide mortality, with higher suicide rates per 100,000 inhabitants in Eastern countries (e.g. Lithuania: 34.1; the Russian Federation: 30.1; Hungary: 24.6; Slovenia: 21.9) compared to Western countries (e.g. Germany: 11.9; UK: 6.9; Italy: 6.3) [29]. The prediction of suicide, and thus its prevention, remains a challenge.

The suicidal process is commonly viewed as a progression that begins with occasional thoughts of death and ends with completed suicide [28]. Similarly, movement from a death wish or suicidal ideation (SID) through to a suicide attempt has been interpreted as a hierarchy of intent with an underlying gradient of severity [6,13]. SID is generally thought to be a high risk factor for suicide [4].

In Europe, the overall average *lifetime* SID rate was reported as 7.8% [5]. Two investigations on country-specific *point-prevalences* SID rates have been published, using SHARE data: Saia et al. investigated the impact of socio-environmental factors on SID among the elderly using data from 2006/07 [26] and Ayalon, using data from 2004 and 2006/7, stratified for geographic region only [2].

To our knowledge, variations in SID prevalence rates by sex across European countries were not investigated so far. Additionally, no study has investigated *correlation* between SID prevalence

* Corresponding author at: Helmholtz Zentrum München, Institute of Epidemiology II, Ingolstädter Landstr. 1, 85764 Neuherberg, Germany.
Tel.: +49 89 3187 3623; fax: +49 89 3187 3667.

E-mail address: ladwig@helmholtz-muenchen.de (K.-H. Ladwig).

¹ These authors contributed equally to this work.

and completed suicide rates across European countries. Thus, the present study aimed to assess sex-specific SID prevalences and to compare SID prevalences with patterns of completed suicides rates in men and women aged 55+ years in a European transnational survey including 16 countries, using the latest SHARE wave 4 conducted in 2010–2012.

2. Data and methods

2.1. Study design

The present study was based on data from the Survey of Health, Ageing and Retirement in Europe (SHARE), which included detailed cross-national information on health, well-being, economic circumstances and social networks for 19 European countries (+Israel) [7]. SHARE covered the non-institutionalised population aged 50+, and their current spouses or partners, independent of age. The data of the present analysis were drawn from 'Release 1.1.1' of SHARE wave 4 conducted in 2010–2012 [19]. The following sixteen countries were involved; for regional grouping, we adopted the terminology suggested by the SHARE project: Scandinavian countries (Sweden and Denmark), Central European countries (Germany, Austria, Switzerland, France, Belgium, and the Netherlands), Mediterranean countries (Spain, Italy, and Portugal), and Transition countries (Hungary, Poland, Estonia, Czech Republic, and Slovenia). Among all participants of SHARE wave 4, a total of 50,161 individuals were in the age range 55–104 years. Of those, a total of 49,008 respondents giving valid answers to the suicidal ideation variable comprised the study population of the present analyses.

2.2. Assessment of suicidal ideation (SID)

Suicidal ideation was asked by the question "In the last month, have you felt that you would rather be dead?" and classified into yes ("any mention of suicidal feelings or wishing to be dead") or no ("no such feelings"). This item was drawn from the EURO-D, an instrument developed to compare symptoms of depression in different European countries [22,23]. Since suicidal ideation is a key symptom of major depression, we decided to use the term suicidal ideation (SID) throughout the paper, being aware of the fact that the question might also cover longing for being dead because of e.g. unbearable physical pain or sudden fatal illness (death wishes).

2.3. Assessment of completed suicide (CS) rates (WHO)

Completed suicide (CS) rates per 100,000 were taken from the World Health Organization [31]. The WHO mortality database is a compilation of cause-specific mortality data by age and sex, as reported annually by member states from their civil registration systems. Cause-of death data are coded according to the ICD-10.

2.4. Statistical analyses

All analyses were performed separately for men and women. Confidence intervals for proportions were estimated by normal approximation. Using exact or Poisson approximation revealed similar results. To assess age-adjusted differences in prevalence by sex and to account for varying effects over countries, multilevel logistic regression models with random intercepts were estimated with age included in the model [24]. To assess the importance of unobserved country-specific characteristics the residual intraclass correlation (ICC) was estimated. Spearman correlation was used to assess how the country-specific SID prevalences and CS rates were correlated, i.e. whether higher SID prevalences correspond to higher suicide rates as well as higher SID prevalences or CS rates in men correspond to higher respective values in women.

A P value < 0.05 of the two-tailed tests was considered to be statistically significant. All analyses were done with the ado-file xtlogit using the statistical software package Stata (Version 12.1); correlation analyses were done by SAS (Version 9.3). The study follows the STROBE guidelines for cohort studies [30].

3. Results

3.1. SID by country and sex

Of the study population ($n = 49,008$, 44.3% men, mean age 68.2 ± 9.1 years), a total of 4139 (8.5%, 95% CI 8.2–8.7) reported suicidal ideation within the last month. Age-adjusted SID prevalence was higher in women (9.1%, 95% CI 9.1–9.2) than in men (5.3%, 95% CI 5.3–5.4) leading to an overall women to men ratio of 1.72 (Table 1, last line). The correlation between SID prevalences in men and women was strong ($r = 0.92$), meaning that higher SID prevalences in men correspond to higher SID prevalences in women. The higher SID prevalence among women was observed in all countries under

Table 1

Number and mean age (SD) of participants per country with SID prevalence (in %), completed suicide (CS) rate (per 100,000) including women/men ratio and SID/(CS/1000) ratio.

Country	n	Age Mean (SD)	SID prevalence			CS rate			SID/(CS/1000)		
			Men	Women	Women/men	Men	Women	Men/women	Men	Women	Women/men
Denmark	1778	68.0 (9.6)	2.5	4.1	1.64	37.2	11.6	3.21	65	362	5.57
Sweden	1902	69.9 (8.8)	3.9	5.2	1.33	27.2	8.9	3.06	146	596	4.08
Austria	4277	68.1 (8.7)	4.2	6.8	1.62	47.6	11.2	4.25	86	591	6.87
Switzerland	3068	67.8 (9.1)	4.3	6.0	1.40	54.0	22.5	2.40	78	266	3.41
Germany	1518	68.4 (8.5)	5.2	8.7	1.67	32.3	9.8	3.30	158	845	5.35
France	4663	68.6 (9.7)	10.6	16.3	1.54	43.2	13.0	3.32	243	1283	5.28
Belgium	4219	67.9 (9.7)	6.5	14.1	2.17	42.6	14.6	2.92	150	971	6.47
Netherlands	2426	67.7 (8.8)	3.4	6.2	1.82	18.6	7.3	2.55	181	823	4.55
Portugal	1679	67.2 (8.5)	6.5	13.6	2.09	36.0	7.7	4.68	166	1753	10.56
Spain	2987	69.7 (9.6)	5.9	13.5	2.29	22.5	5.8	3.88	277	2416	8.72
Italy	3104	68.4 (8.6)	2.1	3.4	1.62	18.4	4.5	4.09	114	738	6.47
Hungary	2607	66.6 (8.6)	9.3	17.1	1.84	72.8	17.3	4.21	121	966	7.98
Poland	1629	66.8 (8.9)	7.9	15.6	1.97	36.0	7.7	4.68	216	1938	8.97
Czech Republic	5096	67.4 (8.5)	7.5	11.9	1.59	38.2	7.1	5.38	191	1655	8.66
Slovenia	2301	67.6 (9.1)	5.2	9.4	1.81	62.2	18.1	3.44	80	521	6.51
Estonia	5754	69.0 (8.9)	7.3	9.2	1.26	48.4	11.4	4.25	152	839	5.52
Total	49,008	68.2 (9.1)	6.1	10.3	1.69	38.8	10.8	3.59	157	954	6.08

SID: suicidal ideation.

investigation, although the women: men ratio varied considerably ranging from 1.30 (Estonia) to 2.25 (Spain, Portugal). The residual intraclass correlation coefficient (ICC) was estimated by the multilevel logistic regression as 0.056 (95% CI 0.027–0.113) for men and 0.080 (95% CI 0.040–0.152) for women. Thus, a proportion of 5.6% in suicidal ideation in men and 8.0% in women can be attributed to unmeasured country-specific characteristics.

3.2. SID by country, sex and age group

In most countries, SID prevalence was substantially higher in the oldest age group, as can be seen on Fig. 1 (men) and Fig. 2 (women). Comparing SID prevalence in the oldest versus the youngest age group by the oldest-youngest-ratio, this pattern was more pronounced in Slovenia (3.28) and the Netherlands (2.78) in men and in Slovenia (5.02), Denmark (3.51) and Sweden (2.45) in women. Fewer differences in SID prevalence by age could be found in Poland (1.14) and Denmark (1.26) in men and in Portugal (1.46) and Belgium (1.48).

3.3. CS rate by country and sex

Table 1 also presents the completed suicide rate for persons aged 55 years or older per country for men and women separately based on data released by the WHO. The correlation between CS rates in men and women was very high ($r = 0.84$), meaning that higher suicides rates in men correspond to higher suicide rates in women. The men:women ratio differed substantially between the 16 countries, with Czech Republic showing the greatest difference in completed suicide rate between men and women (5.38), followed by Poland and Portugal (4.68), Estonia and Austria (4.25), Hungary (4.21) and Italy (4.09). Sex-specific CS rate differences were lowest in Switzerland, Belgium and the Netherlands (2.40–2.92).

3.4. Relation SID prevalence and CS rate

Regarding country-specific variation in suicidal ideation among persons aged 55+, the SID prevalence patterns of both men and women did not correspond to the completed suicide rates for males and females aged 55+ reported by the WHO. Correlations were rather moderate in men ($r = 0.45$) and weak in women ($r = 0.16$).

Fig. 3 shows the agreement of order of the 16 countries regarding SID prevalence and CS rate, i.e. from the country with lowest value (position “1”) to country with highest value (position “16”). This figure gives an impression whether SID prevalence and CS rate correspond across countries; one would expect that countries with higher SID prevalence have also higher CS rates (analogously, countries with lower SID prevalences are expected to have lower CS rates). A rather high agreement therefore means that the positions follow on or near the diagonal line (which represents the case of equal order of SID prevalence and CS rate over the 16 countries). Especially in women, the positions were rather far away from the diagonal line. A high agreement of order can be found for Italy (position “1” for SID prevalence and CS rate in both sexes), the Netherlands (“3” and “2” for men and “5” and “4” for women) and Hungary (“15” and “16” for men “15” and “14” for women).

Finally, to compare SID prevalence and CS rate across countries in men and women, we calculated the ratio of SID prevalence and CS rate divided by 1000 (i.e. then referring to 100 instead to 100,000). This measure denoted as “SID/(CS rate/1000)” gives a rough estimate about the relation between the number of subjects with SID and CS, i.e. about how many SID cases for one CS case can be roughly observed overall and in each country (Table 1, three columns on the right side). Although this is a rather rough estimate and the number itself should be taken with caution, it provides an impression about potential differences in the SID-CSR-relation across countries.

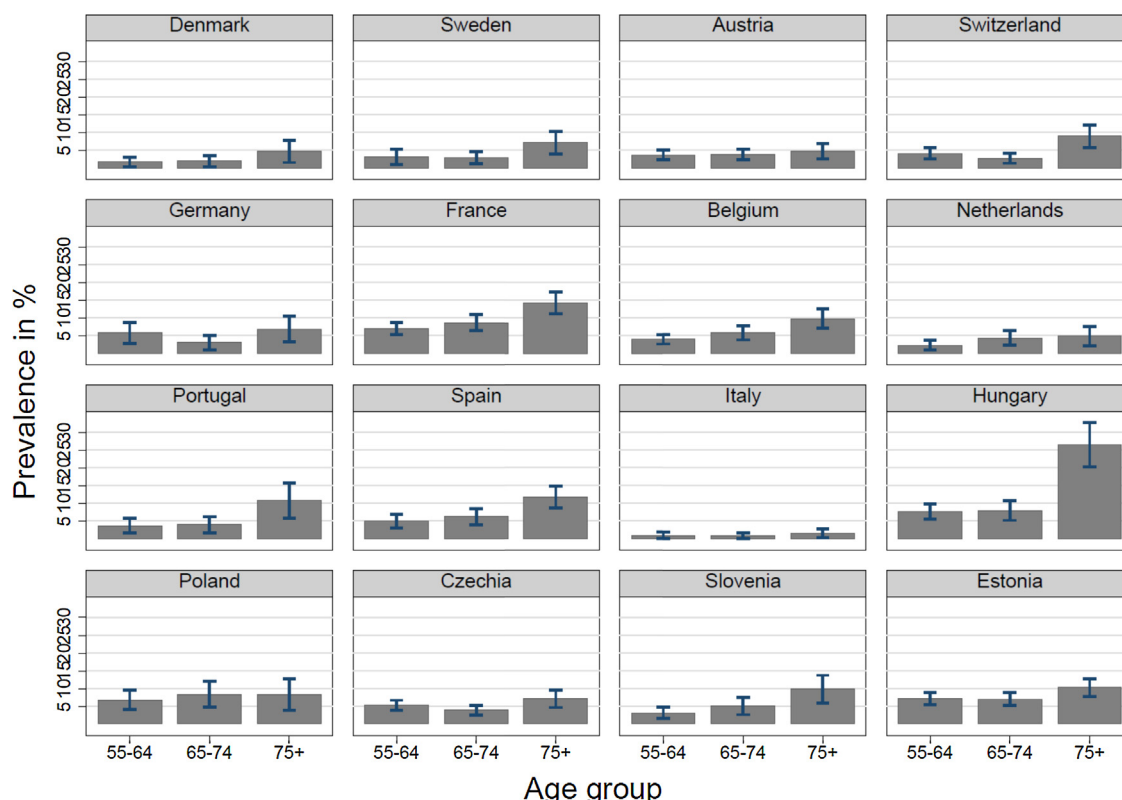


Fig. 1. Suicidal ideation prevalence in 16 European countries per age group in men.

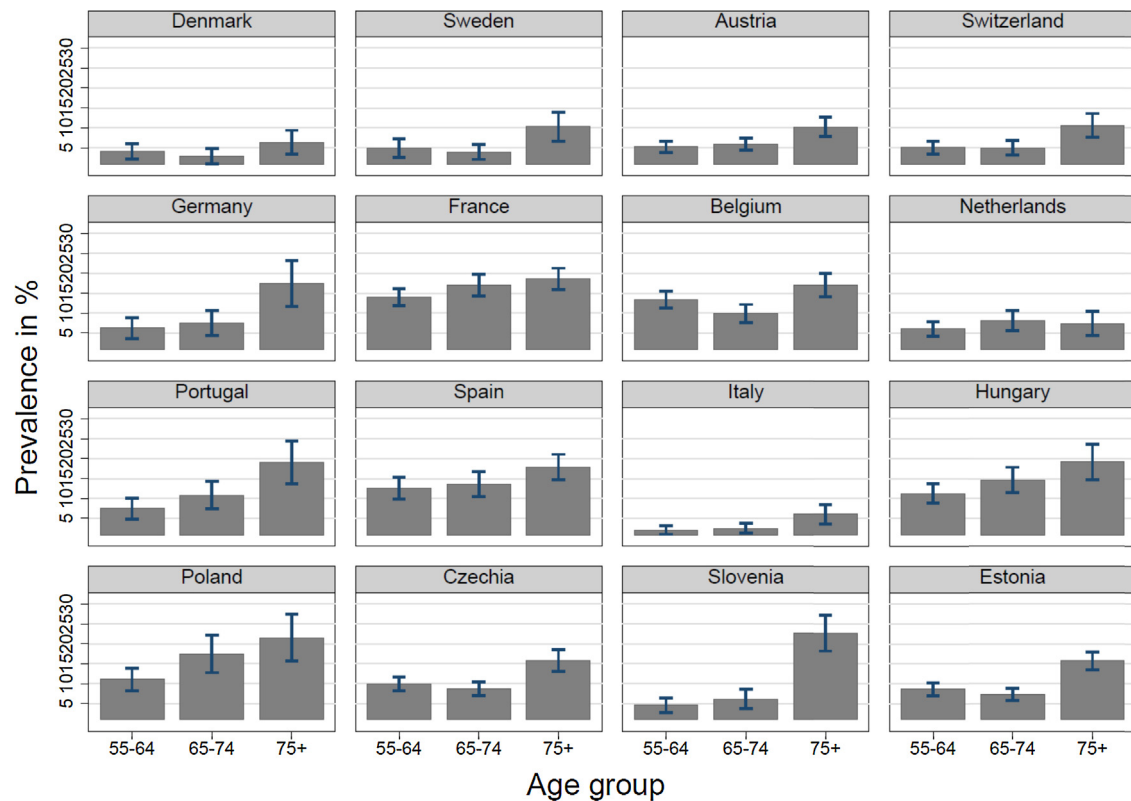


Fig. 2. Suicidal ideation prevalence in 16 European countries per age group in women.

The overall ratio was 157 for men and 954 for women meaning that 157 SID cases for one CS case in men and 954 SID cases for one CS case in women were roughly observed. Overall, as well as in each country, this ratio was substantially higher in women than in men, i.e. the number of SID cases for one CS case was much higher for women than for men. Therefore, the relevance for SID as precursor for completed suicide may be more pronounced in men compared to women. A closer look to

the country-specific ratios showed also remarkable differences across countries with ratios ranging from 65 in Denmark to 277 in Spain for men and 266 in Switzerland to 2416 in Spain for women. These country-specific differences indicated that the impact of SID on subsequent CS had a different strength across countries. Moreover, the women:men ratio of this number varied substantially between countries ranging from 3.41 (Switzerland) to 10.56 (Portugal).

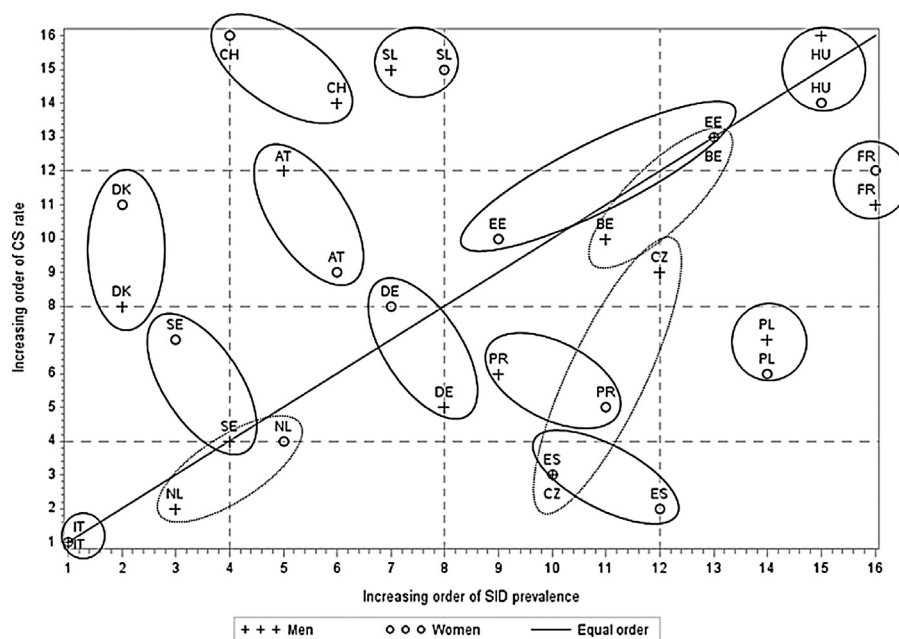


Fig. 3. Agreement of order of suicidal ideation prevalence and completed suicide rate in men (+) and women (○).

4. Discussion

4.1. Overall

The first remarkable finding of the present investigation was a point-prevalence of SID 8.5% across 16 European countries. Although short-time or point-prevalence SID rates [10,12,15] are generally lower than lifetime SID rates [9], our finding is higher than the 7.8% lifetime SID prevalence reported by Bernal et al. [5]. This might be due to the fact that the ESEMED data set used by Bernal et al. also included younger subjects (age range: 18 years and older).

4.2. SID by country and sex

Overall, women reported an almost two-fold excess prevalence of SID than men (women:men ratio 1.72). This finding confirmed previous studies reporting that women were almost twice as likely to have SID as men [15,25,27]. However, the strength of this relationship differed between countries ranging from 1.30 to 2.25.

The proportion of variance in suicidal ideation, which can be attributed to country level characteristics, was rather limited (about 5.6% for men and 8.0% for women) in the present study. This finding may be due to unmeasured regional or country-specific differences and/or due to cultural differences [11] in, for instance, reporting styles of suicidal ideation.

4.3. SID by country and age group

The present investigation showed an excess risk of SID prevalences in the oldest age stratum of most countries, which confirms and extends earlier findings [15,17,26]. Apparently, elderly subjects have a high risk for SID, which may be due to typical old age-related life-events (e.g. confrontation with a severe end stage disease condition, loss of family members and generation friends, giving-up of the social network). These adverse events can provoke hopelessness and a loss of a future perspective among the elderly, thus inducing the wish to die and SID. The present study impressively shows that similar SID age-patterns can be found in the whole of Europe with few exceptions. These findings may indicate specific conditions and mechanism appearing in these countries that remain unclear so far and have yet to be discovered. Especially results from Denmark are remarkable where the ratio of oldest-to-youngest was among the lowest over all countries in men but among the highest in women.

4.4. Relation SID prevalence and CS rate

The most important finding is that SID prevalences did not correspond with CS rates, which has never been shown before in a population-based study. This observation holds true for all countries under investigation, but is especially striking in Transition countries, where CS rate is high, but SID is rather moderate or low.

Our study estimated a substantially higher number of SID cases per one CS case in women compared to men (overall 954 to 157) indicating a less impact of SID on suicide mortality in women than men (this relation was seen in all 16 countries). These findings corresponds to the so-called “gender paradox of suicidal behaviour” meaning that men more often committed completed suicide but less often attempted suicides [8], whereas women men reported more often SID than men. The higher rates of completed suicide among men might be explained by the assumption that men respond to adverse social, financial or mental health conditions with maladaptive coping strategies [21], whereas women might more readily turn to help-seeking behaviour and social networks and thus, do not

proceed beyond SID. However, SID on its own is a serious problem, since there is evidence that SID has complex and bi-directional associations with mental health conditions. The association of suicidal ideation and mental disorders, particularly major depressive disorder, is well known [20] and subjects suffering from SID also show an increased risk for impaired self-perceived health [14]. Furthermore, independent of suicide risk, subjects suffering from SID also have an increased mortality risk [3].

4.5. Potential explanations for the discrepancy between SID and CS rates

A variety of adverse conditions, which are seen with different strength across countries may further contribute to the country-specific differences, e.g. income and living conditions, prevalence of mental disorders, addictive behaviours (e.g. alcoholism) or health care system (e.g. use of and access to psychiatric treatment). We also assume that religious beliefs may play a greater role. This may also contribute to a potential underreporting of suicides in several countries. Furthermore, the availability of means plays a role. In Denmark and Sweden the most common method to commit suicide is self-poisoning [1], a rather “soft-method”, where the chance to be found in time is high or the dose often too small. Thus, independently of the intention (suicide or cry for help), the suicide can be prohibited. In contrast, in e.g. Poland or Hungary, the most common methods are “hard-methods” (hanging, falling); thus, the suicide victim is less likely to survive.

4.6. Strengths and limitations

The strength of the present analysis is that it was based on a huge, population-based dataset carried out in 16 European countries, the latest SHARE data set (wave 4) at the time conducting the study.

As a limitation, SID was evaluated using the EURO-D item on the occurrence of death wishes in the last month. Although this single item only captures a small time frame, it was designed to be both accurate and brief in order to enhance its utility in clinical practice. The dichotomous response format might raise concern, but it places additional emphasis on the severity of the outcome: no such feelings compared to any mention of suicidal feelings or wishing to be dead. Regarding the nature of our data, a caveat is warranted. Aggregated-level associations between variables may differ from individual-level data due to ecological fallacies.

5. Conclusions

This latest and most extended investigation on the prevalence on SID and death wishes across Europe revealed remarkable country-specific differences by sex. Interestingly, SID rates did not correspond with completed suicide rates in each country under investigation. However, the strength of these patterns substantially differs across countries. Further investigations, particularly on the country-specific level, are needed to explain this unexpected finding.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Acknowledgements

“This paper uses data from SHARE wave 4 release 1.1.1, as of March 28th 2013 or SHARE wave 1 and 2 release 2.5.0, as of May 24th

2011 or SHARELIFE release 1, as of November 24th 2010. The SHARE data collection has been primarily funded by the European Commission through the 5th Framework Programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life), through the 6th Framework Programme (projects SHARE-I3, RII-CT-2006-062193, COMPARE, CIT5-CT-2005-028857, and SHARELIFE, CIT4-CT-2006-028812) and through the 7th Framework Programme (SHARE-PREP, No. 211909, SHARE-LEAP, No. 227822 and SHARE M4, No. 261982). Additional funding from the U.S. National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, R21 AG025169, Y1-AG-4553-01, IAG BSR06-11 and OGHA 04-064) and the German Ministry of Education and Research as well as from various national sources is gratefully acknowledged (see <http://www.share-project.org/> for a full list of funding institutions)."

References

- [1] Ajdacic-Gross V, Weiss MG, Ring M, Hepp U, Bopp M, Gutzwiller F, et al. Methods of suicide: international suicide patterns derived from the WHO mortality database. *Bull World Health Organ* 2008;86:726–32.
- [2] Ayalon L. The prevalence and predictors of passive death wishes in Europe: a 2-year follow-up of the Survey of Health, Ageing, and Retirement in Europe. *Int J Geriatr Psychiatry* 2011;26:923–9.
- [3] Batterham PJ, Calear AL, Mackinnon AJ, Christensen H. The association between suicidal ideation and increased mortality from natural causes. *J Affect Disord* 2013;150:855–60.
- [4] Bebbington PE, Minot S, Cooper C, Dennis M, Meltzer H, Jenkins R, et al. Suicidal ideation, self-harm and attempted suicide: results from the British psychiatric morbidity survey 2000. *Eur Psychiatry* 2010;25:427–31.
- [5] Bernal M, Haro JM, Bernert S, Brugha T, de Graaf R, Bruffaerts R, et al. Risk factors for suicidality in Europe: results from the ESEMED study. *J Affect Disord* 2007;101:27–34.
- [6] Bertolote JM, Fleischmann A, De Leo D, Bolhari J, Botega N, De Silva D, et al. Suicide attempts, plans, and ideation in culturally diverse sites: the WHO SUPRE-MISS community survey. *Psychol Med* 2005;35:1457–65.
- [7] Borsch-Supan A, Brandt M, Hunkler C, Kneip T, Korbacher J, Malter F, et al. Data resource profile: the Survey of Health, Ageing and Retirement in Europe (SHARE). *Int J Epidemiol* 2013;42:992–1001.
- [8] Canetto SS, Sakinofsky I. The gender paradox in suicide. *Suicide Life Threat Behav* 1998;28:1–23.
- [9] Encrenaz G, Kovess-Masfety V, Gilbert F, Galera C, Lagarde E, Mishara B, et al. Lifetime risk of suicidal behaviors and communication to a health professional about suicidal ideation. Results from a large survey of the French adult population. *Crisis* 2012;33:127–36.
- [10] Forkmann T, Brahler E, Gauggel S, Glaesmer H. Prevalence of suicidal ideation and related risk factors in the German general population. *J Nerv Ment Dis* 2012;200:401–5.
- [11] Hoven CW, Mandell DJ, Bertolote JM. Prevention of mental ill-health and suicide: public health perspectives. *Eur Psychiatry* 2010;25:252–6.
- [12] Husky MM, Guignard R, Beck F, Michel G. Risk behaviors, suicidal ideation and suicide attempts in a nationally representative French sample. *J Affect Disord* 2013;151:1059–65.
- [13] Kuo WH, Gallo JJ, Tien AY. Incidence of suicide ideation and attempts in adults: the 13-year follow-up of a community sample in Baltimore, Maryland. *Psychol Med* 2001;31:1181–91.
- [14] Ladwig KH, Klupsch D, Meisinger C, Baumert J, Erazo N, Schneider A, et al. Gender differences in risk assessment of death wishes and suicidal ideation in the community: results from the KORA Augsburg F3 study with 3079 men and women, 35 to 84 years of age. *J Nerv Ment Dis* 2010;198:52–8.
- [15] Ladwig KH, Klupsch D, Ruf E, Meisinger C, Baumert J, Erazo N, et al. Sex- and age-related increase in prevalence rates of death wishes and suicidal ideation in the community: results from the KORA-F3 Augsburg Study with 3154 men and women, 35 to 84 years of age. *Psychiatry Res* 2008;161:248–52.
- [16] Levi F, La Vecchia C, Lucchini F, Negri E, Saxena S, Maulik PK, et al. Trends in mortality from suicide, 1965–99. *Acta Psychiatr Scand* 2003;108:341–9.
- [17] Linden M, Barnow S. 1997 IPA/Bayer Research Awards in Psychogeriatrics. The wish to die in very old persons near the end of life: a psychiatric problem? Results from the Berlin Aging Study. *Int Psychogeriatr* 1997;9:291–307.
- [18] Lukaschek K, Erazo N, Baumert J, Ladwig KH. Suicide mortality in comparison to traffic accidents and homicides as causes of unnatural death. An analysis of 14,441 cases in Germany in the year 2010. *Int J Environ Res Public Health* 2012;9:924–31.
- [19] Malter F, Borsch-Supan A. SHARE Wave 4: innovations & methodology. Munich: MEA, Max-Planck-Institute for Social Law and Social Policy; 2013.
- [20] Mann JJ. A current perspective of suicide and attempted suicide. *Ann Intern Med* 2002;136:302–11.
- [21] Moller-Leimkuhler AM. The gender gap in suicide and premature death or: why are men so vulnerable? *Eur Arch Psychiatry Clin Neurosci* 2003;253:1–8.
- [22] Prince MJ, Beekman AT, Deeg DJ, Fuhrer R, Kivela SL, Lawlor BA, et al. Depression symptoms in late life assessed using the EURO-D scale. Effect of age, gender and marital status in 14 European centres. *Br J Psychiatry* 1999;174:339–45.
- [23] Prince MJ, Reischies F, Beekman AT, Fuhrer R, Jonker C, Kivela SL, et al. Development of the EURO-D scale – a European Union initiative to compare symptoms of depression in 14 European centres. *Br J Psychiatry* 1999;174:330–8.
- [24] Rabe-Hesketh S, Skrondal A. Multilevel and longitudinal modeling using Stata. College Station, Texas: StataCorp LP; 2008.
- [25] Rancans E, Lapins J, Salander Renberg E, Jacobsson L. Self-reported suicidal and help-seeking behaviours in the general population in Latvia. *Soc Psychiatry Psychiatr Epidemiol* 2003;38:18–26.
- [26] Saias T, Beck F, Bodard J, Guignard R, du Roscoat E. Social participation, social environment and death ideations in later life. *PLoS One* 2012;7:e46723.
- [27] Thomas HV, Crawford M, Meltzer H, Lewis G. Thinking life is not worth living. A population survey of Great Britain. *Soc Psychiatry Psychiatr Epidemiol* 2002;37:351–6.
- [28] Thompson AH, Dewa CS, Phare S. The suicidal process: age of onset and severity of suicidal behaviour. *Soc Psychiatry Psychiatr Epidemiol* 2012;47:1263–9.
- [29] Varnik P. Suicide in the world. *Int J Environ Res Public Health* 2012;9:760–71.
- [30] von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP, et al. The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet* 2007;370:1453–7.
- [31] WHO. 2013. WHO internet data base: http://www.who.int/healthinfo/mortality_data/en/ [last access: 11.08.2015].



Karoline Lukaschek received her PhD in Ethnology. After successfully completing the Master of Science program in Epidemiology at the Ludwig-Maximilians-Universität München (Germany), she joined the Mental Health research unit at the Institute of Epidemiology II, Helmholtz Zentrum München.



Henriette Engelhardt-Wölfler studied Sociology and Statistics and is now Professor for Demography at the Otto-Friedrich-University of Bamberg. Her research interests are in the fields of social demography, family demography, population ageing and causal analysis.



Jens Baumert carried out his PhD in the field of melanoma epidemiology. Since 2002, he has been working as a scientist and statistician at the Helmholtz Zentrum München and has participated in numerous studies related to biological, genetic and behavioral determinants of cardiovascular, metabolic and mental diseases.



Karl-Heinz Ladwig is Professor of Psychosomatic Medicine and Psychological Medicine at the Medical Faculty of the Technical University of Munich (TUM). Furthermore, he is the head of the Mental Health Epidemiology Unit of the Institute of Epidemiology II, Helmholtz Zentrum München.