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ORIGINAL PAPER

Sustainable effects on suicidality were found for the Nuremberg alliance against depression

Ulrich Hegerl · Roland Mergl · Inga Havers · Armin Schmidtke · Hartmut Lehfeld · Günter Niklewski · David Althaus

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Abstract During an intense four-level community-based intervention program conducted in Nuremberg (490,000 inhabitants) in 2001 and 2002 [Nuremberg Alliance Against Depression (NAD)], the number of suicidal acts (main outcome completed + attempted suicides) had dropped significantly (−21.7%), a significant effect compared with the baseline year and the control region (Wuerzburg, about 290,000 inhabitants). To assess the sustainability of the intervention effects the number of suicidal acts was assessed in the follow-up year (2003), after the termination of the 2-year intervention. Also, in the follow-up year (2003), the reduction in suicidal acts compared with the baseline year in Nuremberg (2000 vs. 2003: −32.4%) was significantly larger than that in the control region ($P = 0.0065$). The reduction was even numerically larger than that of the intervention years (2001, 2002). Thus, 1 year after the end of the main intervention, preventive effects on suicidality of the NAD remain at least stable. The four-level intervention concept appears to be cost-effective and is presently implemented in many European regions.

Keywords Depression · Suicidality · Intervention · Sustainability

U. Hegerl (✉) · R. Mergl · I. Havers
Department of Psychiatry, University of Leipzig, Semmelweisstr. 10, 04103 Leipzig, Germany
e-mail: Ulrich.Hegerl@medizin.uni-leipzig.de

A. Schmidtke
Department of Psychiatry, Psychosomatic Medicine and Psychotherapy, Julius-Maximilian-University Wuerzburg, Füchsleinstr. 15, 97080 Wuerzburg, Germany

H. Lehfeld · G. Niklewski
Hospital for Psychiatry and Psychotherapy, Prof.-Ernst-Nathan-Str. 1, 90419 Nuremberg, Germany

D. Althaus
Praxis for Psychotherapy, Hermann-Stockmann-Str. 18, 85221 Dachau, Germany

Introduction

In the developed countries, unipolar depression has been identified as a leading cause of suffering, disability and premature mortality [16, 18, 19]. This fact results from the high lifetime prevalence (exceeding 20% [20]) and the profound suffering associated with this disorder [26] leading to attempted and completed suicides [5, 22, 29].

There are different reasons that account for the fact that depressed patients frequently abstain from seeking treatment, especially shame, fear, financial barriers [28], stigma [3, 14, 15], hopelessness and insufficient energy to seek help. Further possible reasons are general reservations and concerns about psychotherapy, psychotropic drugs and psychiatry, lack of availability of physicians and treatments [6, 8], as well as lack of knowledge [7] leading to deficient recognition of the symptoms, underestimation of severity [13] and false hypotheses regarding causes, symptoms and available therapy of depression. These findings point to the necessity to create a public environment that helps persons with mental problems to come forward and to enhance de-stigmatization.

It appears that programs to improve the care of depressed patients and for preventing suicidality are especially promising when they are targeting simultaneously several of these and other factors [1]. Strong empirical evidence for that has been provided by the Nuremberg Alliance against Depression (NAD). A four-level intervention program to

improve the care of depressed patients and to prevent suicidality was established (for details see "Method"). As a priori defined primary outcome, the number of suicidal acts (completed suicides + attempted suicides) was used and changes were studied at Nuremberg (about 490,000 inhabitants) during the intervention years 2001 and 2002 when compared with the baseline year 2000 as well as to corresponding changes in the control region (Wuerzburg: about 290,000 inhabitants). A statistically significant and clinically highly relevant reduction in the number of suicidal acts of −24% compared with baseline was observed after the second intervention year [9].

For assessing the efficiency of this intervention concept, it is important to study whether or not these effects are stable after the end of the intervention. Only transitory reduction in suicide numbers has been observed in the island of Gotland after training all general practitioners on how to treat depression [24, 25]. Although the number of completed suicides observed within the Gotland study is too low for drawing strong conclusions, this observation has been interpreted as suggesting that positive effects of awareness programs might only be short lasting. However, it would be surprising if the activities of the four-level intervention program would not extend in the follow-up years, because improving the knowledge and motivation to seek help of those affected and starting long-term treatments as well as the training of primary care providers and community facilitators should have enduring effects.

Aims of the study

The aim of this study is to analyze whether or nor the reduction in suicidality observed during a 2-year intervention is sustainable in the follow-up year.

Method

Site

Nuremberg and Wuerzburg both are located in the southern part of Germany, federal state of Bavaria, with a distance of 100 km from each other. The intervention region Nuremberg had 488,400 inhabitants before the intervention in 2000 and 493,500 at the end of 2003 which is a small increase in inhabitants of 1.04%. The control region Wuerzburg is smaller than Nuremberg and is surrounded by a rural area. It had 287,000 inhabitants in 2000 and 292,500 in 2003, with a similar increase of 1.92% from 2000 to 2003. Intervention and control region differ in unemployment rate (Nuremberg 10.1% in 2000 increasing to 11.8% in 2003 vs. Wuerzburg 5.6% in 2000 and 7.1% in 2003) and percentage of migrant population (Nuremberg > Wuerzburg). These differences were considered as tolerable because the aim of the study is not to compare the base rates, but changes in suicidality. The baseline suicide rate as observed in Wuerzburg with 20.22 per 100,000 in 2000 was comparable with that in Nuremberg (20.48 per 100,000).

Intervention

A 2-year intervention program had been performed in Nuremberg (years 2001–2002). Interventions took place at four levels. (1) Primary care physicians were sensitized and trained to improve knowledge and care standards. Cooperation with primary care physicians is crucial, since most depressed patients are treated in a primary care setting. (2) Media and public: a professional public relation campaign was implemented [10]. A media guide was handed out to local media informing about the so-called "Werther effect" (imitation suicide) [21]. Addressing the issue of suicidality was of central importance in the training of professional, but not in the public communication. (3) Around 2,000 community facilitators, such as teachers, priests, policemen and geriatric care givers were trained. (4) Depressed persons, suicide attempters and their families were supported. Establishment of self-help groups was encouraged and assisted. Emergency cards were handed out to high-risk suicide attempters as shown effective in the "green card study" [17]. A detailed description of the four-level intervention can be found in an earlier publication [9]. This intense intervention was stopped at the end of the second intervention year (2002). In the follow-up year (2003) only minor interventions like a "depression day" (in order to increase depression-specific awareness), self-help activities and lectures about depressive disorders took place.

Data collection

Attempted suicides in Nuremberg were assessed in local hospitals. All major hospitals in Nuremberg took part in the assessment of suicidal acts. In addition, assessments took place in outpatient settings such as 28 psychiatric practices, crisis intervention centers and with the help of local authorities including the police and the local agency for health. One questionnaire was filled out for each suicidal act conducted. The questionnaire contained major items of the monitoring form used by the WHO/EURO Multicentre Study on Suicidal Behavior. Data collection in Wuerzburg happened within the WHO-EURO Multicentre study on suicidal behavior [27]. Data assessment in the two regions was homogenized and interviewers were regularly supervised.

Inclusion criteria were attempted suicides as defined according to the definition of parasuicide [4]. Acts of self-harm judged to be habitual self-harm within impulsive personality disorder or as non-suicidal overdose in drug addiction were excluded.

The study has been reviewed by the appropriate ethics committee and has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. An algorithm for pseudonymization was used for data concerning suicide attempts to assure confidentiality.

The assessment of attempted suicides in this study is not aimed to calculate an exact epidemiological rate, but instead to conduct a stable collection of comparable data in the two regions over the years. Thus, possible changes in the frequency of suicidal acts during and after intervention can be detected. To assure a high reliability, the number of participating institutions remained constant. Calculation of rates of attempted suicides would not be accurate as not all possible settings were ascertained. Owing to the lack of resources accurate assessment of attempted suicides was only possible in the year following the main intervention (2003). Therefore, attempted suicides between 2000 and 2003 will be considered in this article.

Data about completed suicides in the intervention and control region were provided by the Bavarian State Office for Statistics and Data Processing and were analyzed for 4 years following the main intervention (until 2006).

Outcome measures

Primary outcome criterion was the number of suicidal acts, which includes both completed and attempted suicides. A number of suicidal acts 1 year after the end of the intervention were analyzed with respect to the baseline year and the control region (Wuerzburg). Secondary outcome was the number of attempted suicides.

Statistical analysis

Owing to the relative low base rate of completed suicides and the correspondingly high yearly fluctuations of this number, differences in suicide rates cannot be expected to be detectable for a town with a population of 500,000 inhabitants. Power analysis revealed that not even a 30% reduction in completed suicides in Nuremberg would reach significance. Therefore, completed and attempted suicides combined as suicidal acts served as primary outcome criterion. Assessed raw data on attempted suicides were added to the data on completed suicides as provided by the Bavarian State Office for Statistics and Data Processing. Confirmatory tests concerning the outcome criterion of differences in changes for intervention versus control region when compared with the baseline data were carried out using χ^2 analysis or Fisher's exact test, where appropriate. χ^2 analyses can be applied to assess group differences, since no relevant changes in the base populations occurred during and after intervention.

Considering completed suicides, 95% confidence intervals (CI) were calculated based on a linear model of the form.

$$Y = a + bX$$

where a represents the intercept and b refers to the rate of change in completed suicides over time.

This was possible because data on completed suicides were available from 12 years before the intervention, as opposed to data on suicide attempts. In a first step, we pooled 12 years (1989–2000) of suicide data regarding the intervention region (Nuremberg) for linear regression analysis. This approach has two advantages: more precise estimates and more stable suicide rates by averaging their yearly fluctuations.

Then, we answered the question whether or not the observed numbers of completed suicides at Nuremberg for 4 years after the implementation of the suicide awareness program were within the 95% CI for the predicted numbers of completed suicides (based on the data for 1989–2000). SPSS (version 12.0; SPSS Inc.; Chicago, IL, USA) was used for statistical analyses.

Results

Suicidal acts (main outcome criterion)

A significant reduction in suicidal acts that had been observed during the 2-year intervention (−24.0%) was also found for the follow-up year: the number of suicidal acts (attempted + completed suicides) in the intervention region (Nuremberg) decreased from 620 at baseline to 419 (−32.4%) during the first year of follow-up as shown in Fig. 1. In the control region (Wuerzburg), the number of suicidal acts changed from 183 at baseline to 173 (−5.5%) during the first year of follow-up. Confirmatory tests revealed a significant reduction in suicidal acts in Nuremberg when compared with the control region (2000 vs. 2003: $\chi^2 = 7.42$; $df = 1$; $P = 0.0065$; two-sided test).

Attempted suicides (secondary outcome criterion)

Attempted suicides in the intervention region decreased from 520 at baseline to 331 (−36.2%) in the first year of follow-up. In the control region, Wuerzburg, the number of attempted suicides increased from 125 at baseline to 131 (+4.8%) in the same time interval. The difference was significant ($\chi^2 = 12.05$, $df = 1$; $P = 0.0005$; two-sided test).

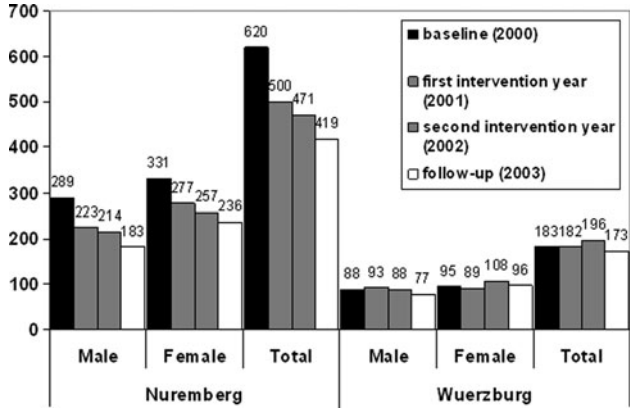

Fig. 1 Number of suicidal acts in Nuremberg and Wuerzburg during baseline (2000), intervention (2001–2002) and follow-up (2003)

High-risk versus low-risk methods

Based on the lethality of different methods high-risk methods (hanging, jumping, shooting, being run over and drowning) and low-risk methods (medication overdose and cuts/stabs) can be separated [9]. Reduction in attempted suicides was especially pronounced for high-risk methods. In the intervention region, the absolute frequency of attempted suicides with "high-risk" methods decreased from 72 at baseline to 27 during follow-up (−62.5%), whereas the frequency of "low-risk" methods decreased from 400 at baseline to 288 at follow-up (−28%) (see Fig. 2).

Completed suicides

A number of registered completed suicides in the four follow-up years at Nuremberg (2003: 88; 2004: 87; 2005: 68; 2006: 72) were inside of the (extrapolated) 95% CI

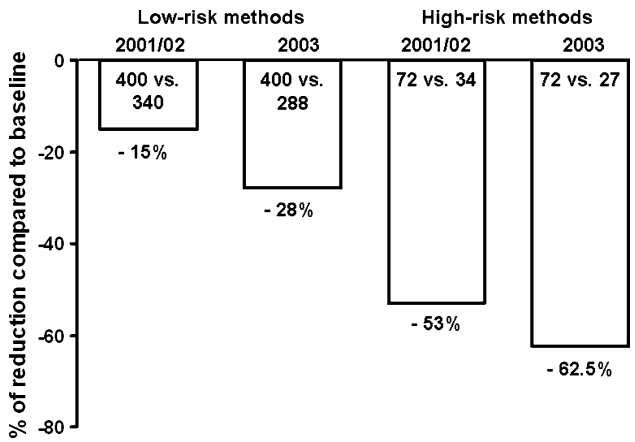

Fig. 2 Reduction of suicide attempts in Nuremberg during intervention and follow-up was more pronounced for high-risk than for low-risk methods (baseline: 2000; intervention: mean of 2001 and 2002; follow-up: 2003)

computed for the completed suicides at Nuremberg in the 12 years before onset of the NAD (Fig. 3). In the first intervention year (2001), the lowest suicide number ever recorded in Nuremberg was observed and an even lower number was observed in the follow-up year 2005.

The annual fluctuations of suicide rates were high in Nuremberg and Wuerzburg and a significant intervention effect was not detectable.

Discussion

The NAD is a multilevel community-based intervention program that was run for 2 years in the town of Nuremberg [9]. It was evaluated against a baseline year and a control region. Primary outcome criterion was a reduction in suicidal acts (suicides + suicide attempts). The main result of the present study is that the reduction of suicidal acts observed during the intervention [2, 9] remained stable after the intervention. The effect was significant in comparison to the control region Wuerzburg. Suicidal acts even numerically decreased further from 471 in the second intervention year (2002) to 419 in the follow-up year (2003).

In the intervention region, the absolute frequency of attempted suicides with "high-risk" methods decreased during follow-up by 62.5%, whereas the frequency of "low-risk" methods decreased by only 28%. Attempted suicides with high-risk methods are more reliably detected

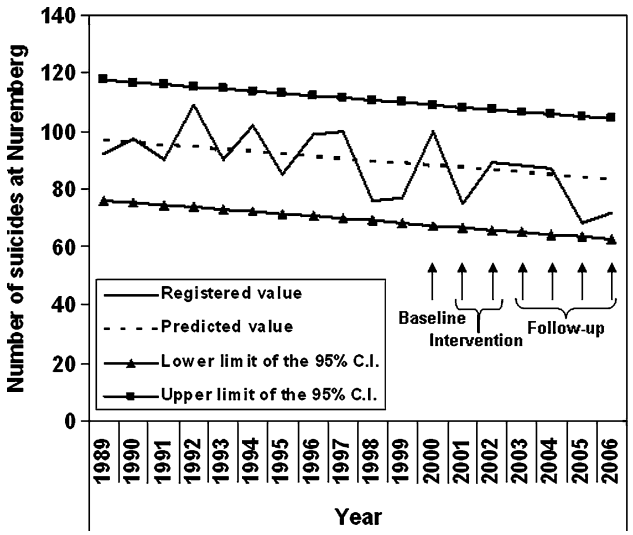

Fig. 3 Number of completed suicides in Nuremberg from 1989 to 2006. The parallel lines visualize the upper and lower limits of the 95% confidence interval the width of which was computed for the completed suicides at Nuremberg in the 12 years before the onset of the Nuremberg Alliance Against Depression (intervention: 2001–2002), based on linear regression analysis. *95% CI* 95% confidence interval

than those using medication overdose. Therefore, the lower reduction for low-risk methods may be an underestimation of the real effect of the intervention. The increased awareness created by the intervention program may have led to a higher recognition rate for attempted suicides with low-risk methods; such an assessment bias has not to be expected for the high-risk methods.

The observed reduction in the number of suicidal acts is mainly due to a significant reduction in the number of attempted suicides. A number of completed suicides during follow-up were numerically lower than at baseline. The number of 68 in 2005 was the lowest number ever observed in Nuremberg. However, because of the high annual fluctuations, these numbers were still within the 95% confidence interval when the general decline in suicide rates in the last decade [23] was taken into consideration (see Fig. 3).

It should be mentioned that less intense interventions were still going on in Nuremberg during the follow-up years. The NAD organized some information meetings, self-help activities and a depression day. However, no resources were available to continue the intense four-level intervention campaign.

In summary, our study demonstrates sustainable suicide preventive effects of a four-level community-based intervention to reduce suicidality and supports the cost-effectiveness of the intervention.

For the time being, the NAD is expanding to several other regions in Germany: more than 50 community-based local campaigns now constitute the German Alliance Against Depression. Based on the main results of the NAD, similar activities have also been started in 16 European countries within the "European Alliance Against Depression" (http://www.EAAD.net) [11, 12] and recently within the project "Optimized suicide prevention programs and their implementation in Europe" (http://www.ospi-europe.com) funded by the European Commission.

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