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*A register based study of the
Danish birth cohort born 1966*

*Mogen Nygaard Christoffersen
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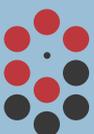
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Risk factors for adolescent's attempted suicide

A prospective register based study of the Danish birth cohort born 1966

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Abstract

Background: In planning a strategy to prevent suicidal behaviour among adolescents it would be valuable to know if altering the conditions of children's upbringing could contribute to a reduction in the incidence of this behaviour.

Method: Population-based registers covering several aspects for children aged between 14 and 27 years, and their parents: health, education, social networks, family dissolution, self-destructive behaviour, substance abuse, criminality, and unemployment. A discrete-time proportional hazard modelling was used to analyse the longitudinal observations.

Results: Adolescents' first-time suicide attempt tends to be characterized by parental psychiatric disorder or suicidal behaviour, family violence, especially child abuse and neglect. An increased risk was also found among adolescents who had a psychiatric disorder or a physical handicap, those who had been sentenced, were addicted to drugs, or had unstable education and employment records.

Conclusion: A common feature of these significant risk factors seemed to be stigmatisation or social exclusion of the adolescent and their families, combined with mental disorders.

Introduction

Suicide and attempted suicide among adolescents is causing great concern. Only few longitudinal community-based studies have been performed on risk factors among this group, because both suicide and attempted suicide are rare events; hence large samples are necessary to obtain solid data.

Among adults, several risk factors have been identified e.g. male sex, family history of suicide, psychiatric disorders, especially affective disorders and schizophrenia, suicidal ideation, previous suicide attempts, substance abuse, and the use of tricyclic antidepressants (Mitterauer, 1990; Linkowski *et al*, 1985; Shafii *et al*, 1985; Egeland *et al*, 1985; Donovan *et al*, 1998; Klerman, 1987; Mann, 1987; Kjoeller *et al*, 2000).

Among adolescents, Beautrais *et al* (1996) found psychiatric morbidity and social disadvantage to be independent risk factors for suicide attempts among young people aged 13 to 24 years. In Denmark, suicides among young people aged 15 to 19 years have been related to parental unemployment (Sommer & Jensen, 1987; Vange, 1986; Krarup *et al*, 1988).

Subjects and methods

Here we investigate risk factors for attempted suicide among adolescents using population-based registers following Danish children born in 1966 (N=84,765). The study was made possible by access to personal data collected annually during the period 1980 to 1993, while the children in focus were between 14- to 27-years-old.

The nationwide registers used were the following: Population Statistics, Medical Register on Vital Statistics, Register of Causes of Deaths, Population and Housing Census, Unemployment Statistics, Education Statistics, Social Assistance Act Statistics, Crime Statistics, Income Compensation Benefits, Labour Market Research, Fertility Research, Danish National Patient Register, Danish Psychiatric Central Register, Medical Birth Register. Personal identity numbers were initially used to link information for each individual born in 1966 together with information about their parents. Later, the personal identity numbers were erased from the database for security and ethical reasons.

The method of using general population samples as a control group, provides a standard of reference and the possibility of generalizing the results (Breslow & Day, 1980; 1987; Hosmer & Lemeshow, 1989; Allison, 1982; Breslow, 1992). The controls were based on years at risk of the total birth cohort not being hospitalized because of suicide attempts during the observation period. Adolescents did not contribute to years at risk after the first suicide attempt or once they had died, or emigrated. Pooling the years of all individuals amounted to 1,062,608 person-years at risk. The analyse methods illuminate the calendar year preceding the first suicide attempt, beginning with 1981 when the adolescents were approximately 15-years-old.

The statistical method was developed by Allison (1982), and Breslow (1992) also describes this discrete-time proportional hazard modelling of a longitudinal study. The purpose of the present analysis is to locate relevant risk factors and describe both the strength (Odds Ratio) of different risk factors and the overall exposure of risk factors (P) among children and adolescents in the total cohort, born in 1966.

When the cohort was aged between 15 and 27 years approximately 10 per thousand (that is 867 out of 84,765 persons) had attempted suicide according to hospital admissions. The paper compares these case-events with the person-years at risk.

Attempted suicide (the dependent variable): The definition of suicide attempts included only behaviour that conformed to the following three conditions: (1) Suicide attempts that had led to hospitalization, (2) specialist assessment of the trauma being an act of self-mutilation, (3) the trauma had to be included in a specified list of traumas traditionally connected with suicide attempts: cutting in wrist (carpus), firearm wounds, hanging, self-poisoning with pesticide, cleaning fluids, alcohol or carbon monoxide. ICD 8-Diagnoses in the National Inpatient Register and the National Psychiatric Register were in use in Denmark throughout the observation period.

Risk factors (the independent variables):

Abortion: Adolescents hospitalized because of induced abortion. This procedure was legal throughout the observation period.

Alcohol abuse: According to hospital admissions the following diagnoses were expected to be associated with long-term alcohol abuse: Alcohol psychosis, alcoholism, esophageal varices, cirrhosis of liver (alcoholic), chronic pancreatitis (alcoholic), delirium, accidental poisoning by alcohol.

Battered/neglected children and battered adults: Victims of violence, abuse or neglect, which led to hospitalization and professional assessment of the injury being wilfully inflicted by other persons (E960-E969, 996.89, 796.00, 796.01, 796.02 according to the Danish modification of the ICD-8 classification).

Conviction for violence: The Criminal Statistic Register includes persons convicted for violence. This category comprises a wide range of criminal behaviour of various degrees of seriousness: manslaughter, grievous bodily harm, violence, coercion and threats. This category does not include accidental manslaughter in combination with traffic accidents, or rape, which belongs to the category of sexual offences.

Family separation: Family dissolution includes information on all children who had experienced divorce, separation and the death of a parent before they were 18-years-old. The Danish Central Population Register (CPR) includes information that connects all children to their parents whether they are married or not.

Psychiatric disorder: Parental mental illness according to hospital admissions (e.g. psychoses ICD-8: 290-299, neurotic: 300, 305 or personality disorder: 301-302). Only few of the fathers' neurotic disorders were disclosed in the national psychiatric register; nevertheless some of the fathers were registered instead in the national inpatient register with symptoms in the cardiovascular system (e.g. ICD-8: 782.09-29 chest pain, irregular heart beat or 782.50-59 loss of consciousness).

Parental suicidal behaviour: suicide attempts or parents' suicide according to the Register of Causes of Deaths.

Severe handicap: Adolescents who had been hospitalized within the observation period for a severe handicap or chronic disease other than mental handicap and psychiatric disease. Diagnoses included severe diseases of a chronic nature from all organ systems.

Teenage-mother: The age difference between the mother and the child in focus being less than 20 years.

Unemployment: The number of days unemployed during a calendar year according to registers of Income Compensation Benefits, Labour Market Research, and Unemployment Statistics.

Results

During the 13 years, 1981 – 1993, 867 adolescents (378 males and 489 females, respectively) born in 1966 were hospitalized for the first time because of a suicide attempt. The estimated relative risk ratio for a first suicide attempt in males compared to females was 0:7. During the years 1979 to 1993, 139 adolescents - 110 males and 29 females born in 1966 - committed suicide, with an estimated relative male/female risk-ratio of 3:6.

Table 1 Suicide attempts in adolescents and young adults born 1966. Denmark, 1981 – 1993.

Calendar year	Corresponding years of age	First suicide attempt	Persons at risk	%
1981	15	27	84,506	0.03
1982	16	35	84,373	0.04
1983	17	48	84,216	0.06
1984	18	57	83,959	0.07
1985	19	69	83,617	0.08
1986	20	87	82,880	0.10
1987	21	122	82,150	0.15
1988	22	98	81,490	0.12
1989	23	72	80,663	0.09
1990	24	59	79,850	0.07
1991	25	53	79,031	0.07
1992	26	78	78,313	0.10
1993	27	62	77,560	0.08
1981-93	15-27	867	1,062,608	0.08

The distribution of suicide attempts for age and calendar year is shown in table 1. The estimated odds ratio for each calendar year and corresponding age group varies between 1.3 and 3.1, the other risk factors having been taken into account. Rates tended to be the lowest in the 14–17-year-olds, and on a relatively higher level in the 18-26-year-olds.

Table 2 shows for each risk factor the number of suicide attempts in which that risk factor was present, the share of person-years with this risk factor present in the case group, the share of person-years with the risk factor present in the control group (P), and the odds ratio (OR) and its confidence interval (C.I.) at 95% level.

Table 2 Risk factors for suicide attempts, unadjusted results from bivariate analysis. Children born in 1966 followed 1981 to 1993. Denmark.

Risk factor:	Type	No. of cases	% of cases	P % of controls	OR	C.I. at 95% level
<i>Factors associated with the parents / family circumstances:</i>						
Father or mother hospitalized due to psychiatric disorder	III	89	10.3	4.8	2.3 ^{xxxx}	1.8-2.8
Parental substance abuse	III	76	8.8	4.4	2.0 ^{xxxx}	1.5-2.5
Parents hospitalized or convicted for violence	III	57	6.6	1.9	3.2 ^{xxxx}	2.5-4.3
Parental suicidal behaviour	II	55	6.3	1.9	3.5 ^{xxxx}	2.7-4.6
Parents with a sentence	II	47	5.4	3.0	1.9 ^{xxxx}	1.4-2.5
Mother was a teenager	III	107	12.3	8.7	1.6 ^{xxxx}	1.3-1.9
Family separation	II	130	15.0	12.1	1.2 ^x	1.0-1.5
Father with no vocational training	III	449	51.8	49.7	1.1	1.0-1.2
Mother with no vocational training	III	457	52.7	50.6	1.1	1.0-1.2
Father unemployed >21 weeks	I	89	10.3	6.1	1.8 ^{xxxx}	1.4-2.2
Mother unemployed >21 weeks	I	149	17.2	9.3	2.1 ^{xxxx}	1.7-2.5
Adolescent in residential care	II	202	23.3	4.8	6.2 ^{xxxx}	5.3-7.3
Adolescent has been battered/ neglected	III	55	6.3	0.7	10 ^{xxxx}	7.6-13.2
<i>Factors associated with the adolescent:</i>						
Drug abuse	II	21	2.4	0.02	66 ^{xxxx}	42-102
Psychiatric disorder	II	49	5.7	0.3	30 ^{xxxx}	22-40
Severe handicap	II	75	8.7	2.9	3.5 ^{xxxx}	2.7-4.4
Adolescent has had an abortion	II	78	9.0	3.4	2.5 ^{xxxx}	2.0-3.2
Adolescent with a sentence	II	79	9.1	1.1	9.0 ^{xxxx}	7.1-11.3
Adolescent with no vocational training	II	771	88.9	78.3	2.2 ^{xxxx}	1.8-2.7
Adolescent not graduated	II	795	91.7	83.5	2.2 ^{xxxx}	1.7-2.8
Adolescent unemployed > 21 weeks	I	361	41.6	11.5	5.6 ^{xxxx}	4.9-6.4
Adolescent is male	III	378	43.6	53.1	0.7 ^{xxxx}	0.6-0.8

Note: ^x Significant at 0.05-level. ^{xxxx} Significant at 0.0001-level. Type I: risk factor the previous year. Type II: risk factor at least one of the previous years. Type III: risk factor for all the years under investigation. The total number of adolescents who had attempted suicide according to hospital admissions: N=867.

Not unexpectedly OR was the highest in adolescents who had earlier been hospitalized because of psychiatric disease or drug abuse. Furthermore, adolescents who had been battered or neglected, who had been in residential care or who had been sentenced had an increased risk of suicide attempts the following year; however, each of these risk factors counted only for a minor part of cases. A total of 19 risk factors were identified, while 1 was borderline and 2 non-significant.

After this, a final forward stepwise logistic regression analysis was performed, initially with the risk factors found to be significant at 5 per cent level.

Table 3 shows the results from the final analysis attempting to show the influence of each risk factor independent of other risks. Only 14 factors show to be significantly over-represented in the case group. For nearly every risk factor the crude OR in the initial bivariate analysis was higher than the adjusted OR in the final multiple logistic regression analysis.

Risk factors from negative childhood experiences as well as more recent risk factors were present after controlling for other risk factors. The highest OR was seen for adolescents who had earlier been hospitalised for psychiatric disorders (4.7), drug addiction (3.0), violence, neglect (4.2), and for adolescents who had been sentenced (2.9), or for those who had been unemployed for >21 weeks during the year before the suicide attempt (2.9). Apart from long term unemployment, only few of the adolescents had experienced these risk factors and therefore only few of the suicide attempts could be attributed to these encumbrances.

Some of the risk factors were widespread but with a lower OR among the adolescents: not having fulfilled vocational training (1.5), and not graduated from gymnasium (1.8), recent long-lasting maternal unemployment (1.4) and being a girl (1.7 viz. inverse of being a boy: 0.6). The remaining risk factors were less widespread and with a lower OR; nevertheless, they added significant information to the prediction of suicide attempts among 15 to 27-year-old adolescents; having been in care (2.2), while the odds ratio for parental suicide or suicide attempt was (1.6). Additionally, parental hospitalization for psychiatric disorder (1.5), violence concerning one of the parents (1.5), and severe physical handicap in the child (1.9), were also connected with significant OR for a suicide attempt.

Table 3 Risk factors for adolescents hospitalized due to a first suicide attempt. The final stepwise regression model. Children born in 1966, followed 1981 - 1993. Denmark.

Risk factors included in the final model:	Type	No. of cases	% of cases	P % of controls	OR	C.I. 95% level
<i>Factors associated with the parents/family circumstances:</i>						
Father or mother hospitalized due to psychiatric disorder	III	89	10.3	4.8	1.5 α	1.2-1.8
Parents hospitalised or convicted for violence	III	57	6.6	1.9	1.5 α	1.1-2.0
Parental suicidal behaviour	II	55	6.3	1.9	1.6 $\alpha\alpha\alpha$	1.2-2.2
Mother unemployed > 21 weeks	I	149	17.2	9.3	1.4 α	1.1-1.6
Adolescent in residential care	II	202	23.3	4.8	2.2 $\alpha\alpha\alpha$	1.8-2.6
Adolescent has been battered/neglected	III	55	6.3	0.7	4.2 $\alpha\alpha\alpha$	3.2-5.7
<i>Factors associated with the adolescent:</i>						
Adolescent's drug abuse	II	21	2.4	0.02	3.0 $\alpha\alpha\alpha$	1.7-5.2
Psychiatric disorder	II	49	5.7	0.3	4.7 $\alpha\alpha\alpha$	3.2-6.7
Severe handicap	II	75	8.7	2.9	1.9 $\alpha\alpha\alpha$	1.5-2.5
Adolescent with a sentence	II	79	9.1	1.1	2.9 $\alpha\alpha\alpha$	2.2-3.9
Adolescent with no vocational training	II	771	88.9	78.3	1.5 $\alpha\alpha$	1.2-2.0
Adolescent not graduated	II	795	91.7	83.5	1.8 $\alpha\alpha\alpha$	1.4-2.3
Adolescent unemployed > 21 weeks	I	361	41.6	11.5	2.9 $\alpha\alpha\alpha$	2.5-3.5
Adolescent is male	III	378	43.6	53.1	0.6 $\alpha\alpha\alpha$	0.6-0.7

Note: All risk factors are significant on 0.05-level. α 0.01-level; $\alpha\alpha$ 0.001-level; $\alpha\alpha\alpha$ 0.0001-level. Type I: risk factor the previous year. Type II: risk factor at least one of the previous years. Type III: risk factor for all the years under investigation. The total number of adolescents who had attempted suicide according to hospital admissions: N=867.

Discussion

A suicide attempt must be taken seriously and be treated thoroughly to alleviate distress and prevent future suicide and suicide attempts. Studies of persons who have committed suicide reveal earlier attempts, and an earlier suicide attempt increases the risk of committing suicide (Beautrais *et al*, 1996; Blumenthal, 1990; Holley *et al*, 1998; Brent *et al*, 1999).

A suicide attempt may indicate a very definite wish to end an unbearable situation, while at other times it is a means of communication to the ambient (Arcel, 1989). Despite the suicide attempt being mainly to alert the family or others, the act often implies a real risk of dying, for example, if the person is unaware of the toxicity of the drug, or is not found before death occurs.

A common feature of the mentioned significant risk factors seems to be stigmatisation or social exclusion of both parents and the adolescents in focus; in particular adolescents treated for a psychiatric disorder make up a risk group. This should be considered when planning a strategy to prevent suicidal behaviour among adolescents.

Age and gender differences in suicide attempts

The finding in this study that more women than men attempt suicide, while more men than women commit suicide, is in line with findings in most other studies (Blumenthal, 1990) but Beautrais *et al* found no gender differences (1996). Women in an attempted suicide usually intoxicate themselves with drugs, eg. paracetamol which is an over the counter drug and easy accessible. Men often use more violent methods: shooting, hanging, jumping from heights (Kjelsberg *et al*, 1994; Brent *et al*, 1999). Brent has also pointed out that male adolescents who commit suicide have more often shown conduct disorders than females. The reason why women use less violent methods may also be, that they more frequently communicate and seek help when they are stressed (Seiffgke-Krenke, 1995; Arcel, 1989). A woman attempting suicide may try to signal that she disclaims the responsibility for her life and dies in a symbolical way: this would not be in accordance with a traditional male role (Arcel, 1989). We found a lower rate of hospitalization for suicide attempts in those younger than 18-years-old, in accordance with other studies (Brent & Kolko, 1990).

Multiple risk factors during life span

Blumenthal (1990) states that suicide usually results from unlikely convergence of multiple predisposing and immediate risk factors, and these risk factors must come together in the absence of multiple protective factors. In the present study the same seems to be true for suicide attempts necessitating hospitalization. The estimated OR in the initial bivariate analysis was diminished after inclusion in a multiple logistic regression analysis, owing to the fact that several adverse risk factors would often be present at the same time.

The identified risk factors are presumed to operate and to have operated at different times of the life span. Factors that appear in childhood often leave the adolescent or young adult with worse chances in life. Parental psychiatric disorders or substance abuse may cause isolation, truancy, poor concentration, and less support from parents.

Factors associated with the parents or family

A fourfold increase in risks was seen if the adolescent had been a victim of violence, sexual abuse or neglect in the family, and a twofold increase was seen if the child had been in care. Children who have been detached and perhaps neglected may lack the feeling of being accepted, respected and being important to somebody. Our results are in accordance with a retrospective Danish study that shows an increased share of suicidal ideation and suicide attempts in children who had been in care, and still higher risks if they had also been battered, neglected, or sexually abused (Christoffersen, 1994; 1996). Physical and sexual abuses are serious attacks on a child's integrity, if executed by the child's nearest social network, these misdeeds undermine the child's trust in others, identity and personal development. Sexual abuse will often be accompanied by guilt, shame, depression, fear, lack of self-esteem, and disturbed relations to others.

OR was elevated if one of the parents had been involved in violence, either as a victim or as a perpetrator. Likewise, Botsis *et al.* (1995) found an association between family violence and adolescent psychiatric inpatient's suicidal behaviour.

Consistent with other studies (Brent & Kolko, 1990), an increased risk was found if one of the parents had been hospitalized for a psychiatric disorder; this may be attributable to genetic factors and insufficient care and insufficient care. In a bibliographic study parental death including parental suicide was regarded as a risk factor for suicide (Lester, 1989).

Family dissolution, which included divorce, separation and the death of a parent, showed no significant association in the final analysis. This is in accordance with a study of suicide in adolescents by Gould *et al.* (1998). In a bibliographic study parental death including parental suicide was regarded as a risk factor for suicide (Lester, 1989).

Maternal unemployment during the previous year was associated with adolescents' suicide attempts, but risks the year after the adolescents' own unemployment were notably higher. The elevated risks may be due to the fact that unemployment degrades and humiliates parents and puts considerably strain on the families (Christoffersen, 2000).

Factors in the adolescent other than gender

Our study seems to be one of few that has found that severe impairments or chronic diseases is a risk factor in adolescents, while the increased risk is well known in elderly people (Brent & Kolko, 1990). The group is heterogenic, but impairments, pain, difficulty in social integration, easy access to drugs and perhaps decreased self-esteem might be intermediary factors.

There was an increased risk of suicidal behaviour in adolescents who had been imprisoned; this is in accordance with that found in another study (Christoffersen, 1996). There are several reasons for this: in Denmark, persons taken into custody are sometimes held in solitary confinement even if this is known to increase the risk of psychiatric disorders and despite suicidal behaviour sometimes being seen (Andersen *et al.*, 1994). Other precipitating factors might be: shame and guilt, stress caused by an often long insecure period from the criminal act to the sentence, and personal contacts, work or education often being interrupted during both this period and during imprisonment.

Unadjusted OR for substance abuse in the adolescents was 66, but only 3.0 after adjustment for other risk factors, these adolescents will often also have other psychosocial problems: easy access to drugs, antisocial behaviour and low self-esteem.

Unadjusted OR for earlier hospitalization in a psychiatric department was 30 and 4.7 after adjustment. Other studies have also found increased risks for suicide and suicide attempts in adult and adolescent psychiatric inpatients. Among those who committed suicide only few were actively engaged in treatment at the time of death (Brent & Kolko, 1990). In a Norwegian prospective study with a 15-year follow-up, there was a sixfold increase in suicide rates in men and a nineteenfold increase in suicide rates in women who had been inpatients in a child- or adolescent psychiatric department, compared with the general population, after having controlled for age (Kjelsberg et al, 1994).

Those who committed suicide, had received poorer follow-up treatment than those who did not: some were even discharged without further treatment. During the investigation period there had been a scarcity of beds in wards for adolescents with psychiatric disorders, and sometimes adolescents had been admitted to wards for adult psychiatric patients with far fewer staff. Lack of child and adolescent psychiatrists may deter possibilities for a sufficient follow-up. There is also lack of institutions that treat adolescents with dual diagnoses.

The odds ratios for not having had vocational training and not having graduated from gymnasium are moderately but significantly elevated, and for recent long-lasting unemployment still more elevated. These risk factors are more widespread in the birth cohort. School education, vocational education, and employment may be regarded as protective and even promoting factors that improve the adolescent's identity, self-esteem, access to social support, and development of coping abilities.

Limitations of the study

A register study can only identify risk factors noted in the registers used, and it should be noted that the study was done during a period (1980-1992) with high unemployment. Soft data such as psychological factors: rejection of help, communication problems, personal events such as bullying in school, or arguments with a loved-one cannot be revealed. Also, life events during the same year as the suicide attempt were not analysed because it would not have been known whether it was the event or the suicide attempt that occurred first. The effect of this would probably be under-estimated odds ratios for life events.

Implications of the findings

Having been hospitalized due to a psychiatric disorder, drug abuse, having been a victim of domestic violence, abuse or neglect, having been in prison, together with recent unemployment carried the highest risks for suicide attempts. Better care, after-care and rehabilitation would probably diminish marginalisation and suicide risks. This could be done by appointing a person whom the adolescents could always contact when in need of support or contemplating suicide. An example of an inpatient unit treating adolescents with suicidal behaviour is described by Ottino (1999), in a few Danish cities centers for youth with suicidal behaviour have been established. Long-lasting unemployment was a frequent risk factor, and careful action should be taken to avoid leaving young people without sufficient education, vocational training or employment.

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